

**European Commission
DG Mobility and Transport**

**Specific Support Action
Transport Research
Knowledge Centre**

Thematic Research
Summary:

Integration and Policy Development

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Date 25 January 2011

Foreword

This paper has been produced as part of the TRKC (Transport Research Knowledge Centre) project of the Sixth Framework Programme, priority thematic area “Sustainable Development, Global Change and Ecosystems”.

The role of TRKC, as with its predecessor project EXTR@Web, is to collect, structure, analyse and disseminate transport research results. It covers EU-supported research as well as key research activities at the national level in the European Research Area (ERA) and selected global programmes. The main dissemination tool used by TRKC is the web portal at www.transport-research.info

The approach to dissemination of results of research projects adopted by the TRKC team includes the following three levels of analysis:

- Project Analysis, which provides, project by project, information on research background, objectives, results, technical and policy implications;
- **Thematic Analysis**, which pools findings of research projects according to a classification scheme based on thirty themes, fixed for the project life time; the product of this analysis activity is the set of **Thematic Research Summaries (TRS)**; the present document belongs to this set;
- Policy Analysis, which pools findings of research projects according to combinations of themes, based on ad-hoc policy priorities which are agreed with the European Commission and a representative group of research users.

This Thematic Research Summary deals with Integration and Policy Development. The aim is to provide the reader with a synthesis of completed EU-funded projects which have dealt with the theme. The paper is intended for policy makers at the European, national and local levels, as well as any interested reader from other stakeholders and from the academic and research communities.

Disclaimer

The TRKC team is fully responsible for the content of this paper. The content of this paper does not represent the official viewpoint of the European Commission and has not been approved by the coordinators of the research projects reviewed.

Executive Summary

This paper has been produced as part of the TRKC (Transport Research Knowledge Centre) project of the Sixth Framework Programme. The role of TRKC, as its predecessor project EXTR@Web, is to collect, structure, analyse and disseminate transport research results. TRKC provides comprehensive coverage of transport research in EU programmes as well as key research activities at national level within the European Research Area and selected global programmes.

The paper is one of the thematic research summaries (TRS). The TRSs aim at providing a synthesis of research results and policy implications from completed projects. Each TRS deals with a theme according to the classification which the TRKC project has adopted. The theme of this TRS is Integration and Policy Development.

The first part of the paper includes a brief analysis of the scope of the theme, and a policy review where the main policy developments at EU level are summarised.

The Integration and Policy Development theme is wide ranging, covering all transport modes and overlapping with several other themes. It includes upstream analysis of policy options, long-term visions and scenario-building, as well as transport planning aspects on a transversal level, e.g. taking into account economic, environmental, social, land use or other factors.

This paper summarises results of 12 projects (11 of them EU projects and 1 national activity), spread across four sub-themes.

The first of the four sub-themes deals with **visions and scenarios**, in which results of three projects are described:

- ERTRAC Vision 2020 and Challenges (for road transport);
- ERTRAC Road Transport Scenario 2030+; and
- Waterborne Vision 2020.

The second sub-theme covers **transport and infrastructure planning** and also **roadmaps**. The three projects in this section are:

- ERRAC Strategic Rail Research Agenda 2020;
- MEDA TEN-T – Mediterranean and Trans-European Networks for Transport;
- CARS 21 – A Competitive Automotive Regulatory System for the 21st century.

The third sub-theme focuses on **multimodal networks and infrastructure**. Two new projects are included here:



- ARTS – Action on the integration of Rural Transport Services;
- FREIGHTWISE – Management framework for Intelligent Intermodal Transport.

The fourth sub-theme is on **policy assessment**. The projects covered are:

- SUMMA – Sustainable Mobility, Policy Measures and Assessment;
- SIZE – Life quality of Senior Citizens in relation to Mobility conditions;
- National Policy Frameworks for Urban Transport; and
- CP/37 – An Integrated Instrument for the Environmental Evaluation of Local Traffic Plans

A final section summarises implications and recommendations for further research, based on some key outputs of the projects reviewed.

This is not a comprehensive compendium of all integration research results: the projects chosen are selective and cover those for which results have made available to the TRKC project and with a bias towards projects with some policy implications rather than purely technical projects, and with projects related to integration of physical infrastructure and services omitted as these now fall under other themes in the TRKC thematic structure.

The annex at the end of this paper lists the projects with information on the TRKC website (www.transport-research.info) which are relevant to the integration and policy development theme, arranged by the four sub-themes above. This listing includes projects described in this paper and older projects already described in the preceding version of this paper (EXTR@Web, 2006). This annex lists projects by name/acronym, including information on the programme to which it belongs, the project website (if any) and in which Thematic Research Summary (TRS) it is described.

Acronyms

ATM	Air Traffic Management
CEC (or EC)	Commission of the European Communities (or European Commission)
ERA	European Research Area
ERRAC	European Rail Research Advisory Council
ERTRAC	European Road Transport Research Advisory Council
EU	European Union
EXTR@Web	Exploitation of Transport Research via the Web (predecessor project to TRKC)
DGMOVE	Directorate General for Mobility and Transport (European Commission DG from 2010)
DGTREN	Directorate General for Transport and Energy (European Commission DG up to end of 2009)
FP5 / 6 / 7	Fifth / Sixth / Seventh Framework Programme (EU R&D programmes)
ICT	Information and Communication Technologies
ITS	Intelligent Transport Systems
KA	Key Action (sub-groupings in FP5)
NoE	Network of Excellence
PTA	Priority Thematic Area (sub-groupings in FP6)
R&D	Research and Development
SRA	Strategic Research Agenda
TEN /TEN-T	Trans-European Network / Trans-European Networks for Transport
TRKC	Transport Research Knowledge Centre
TRS	Thematic Research Summary
TTI	Traffic and Travel Information
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe

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1. Introduction

This paper provides a structured review of the research relating to integration and policy development carried out in EU-funded research projects. “Integration and Policy Development” is one of thirty themes in the classification scheme adopted by the TRKC project, shown in the table below.

Table 1. The classification scheme adopted in TRKC

<i>Dimension 1: sectors</i>
<ul style="list-style-type: none"> • passenger transport • freight transport
<i>Dimension 2: geographic</i>
<ul style="list-style-type: none"> • urban transport • rural transport • regional transport • long-distance transport • EU accession issues
<i>Dimension 3: modes</i>
<ul style="list-style-type: none"> • air transport • rail transport • road transport (including walking and cycling) • waterborne transport • innovative modes • intermodal freight transport
<i>Dimension 4: sustainability policy objectives</i>
<ul style="list-style-type: none"> • economic aspects • efficiency • equity and accessibility • environmental aspects • user aspects • safety and security
<i>Dimension 5: tools</i>
<ul style="list-style-type: none"> • decision support tools • financing tools • information and awareness • infrastructure provision including Trans-European Networks (TENs) • integration and policy development • Intelligent Transport Systems (ITS) • regulation/deregulation • land-use planning • transport management • pricing and taxation • vehicle technology

The scheme has been adopted to enable search facilities in the TRKC portal, and to ensure comprehensive coverage of research results and appropriate policy analysis in the

Thematic Research Summaries (TRS). Definitions for each theme are found on the TRKC portal at http://www.transport-research.info/web/projects/transport_themes.cfm.

The TRKC project has produced final versions of the TRSs for 28 of the 30 themes by 2010 (EU accession issues and Innovative modes not being covered due to lack of projects), with some of the TRSs treating two themes together where there were low numbers of contributing projects and where similarities existed between the themes.

A limited number of research projects have dealt with the integration and policy development theme. The "Integration" TRS produced in the predecessor project to TRKC (EXTR@Web, 2006), reviewed research from 25 projects, mostly EU projects within the Fourth and Fifth Framework Programmes for R&D (FP4 and FP5) and a few selected national projects. However, the TRKC project has modified the definition and scope of the theme from that used in the EXTR@Web project. In EXTR@Web, the "Integration" theme included aspects of physical integration of transport systems and operations, including information technology aspects. Under the TRKC project, the definition has been re-oriented under the name "Integration and Policy Development" to include the combination of different measures (or "tools") such as including infrastructure, management, regulation and pricing, as well as integration between transport and land-use policies. Operational aspects of integration are no longer covered in this theme, and are instead covered under the modal themes (road, rail, etc) and/or under the passenger and freight themes.

The present paper adds 12 new projects, mainly European projects from FP5 and the Sixth and Seventh Framework Programmes (FP6 and FP7) and other miscellaneous European projects or actions, as well as one national project.

The research reviewed in this paper does not represent the entire range of research dealing with integration and policy development carried out in Europe. The paper focuses on research from those projects which have made documentation on results available to the TRKC team after the issue of the EXTR@Web paper in 2006. A summary of the research on integration topics reported on in the previous EXTR@Web paper (which are still relevant to the revised scope of the theme) is also included to make the reader aware of the full range of research in this area.

The paper is organised as follows. Sections 2 and 3 set the scene. Section 2 includes a brief analysis of the scope of the theme. Section 3 provides an overview of the policy priorities at EU level which underpin the research objectives.

Section 4 reports on the results from research. The section is structured into four sub-themes to make the broad area of research in the integration and policy development field more manageable. For each sub-theme, overall research objectives are presented and linked to policy goals, then research findings are synthesised. A special focus is given to



the policy implications of research results. Sources for Section 4 are documents available from the projects and reporting on their achievements, essentially the project final reports.

The sub-themes covered in section 4 are:

- Visions and Scenarios
- Transport and Infrastructure planning, and Roadmaps
- Multimodal Networks and Infrastructure
- Policy assessment.

The Annex includes the list of the EU-funded research projects for each of the four sub-themes. Addresses of the websites of the projects are included with hyperlinks. In several cases these websites make the project documentation available to the public. This may include final reports and project deliverables.

2. Scope of the Integration & Policy Development theme

The “Integration & Policy Development” theme as regards transport research covers cross-sector actions to improve the performance of the transport system. Strategic integration can involve the coordinated planning of several modes of transport so that each contributes more effectively. It can involve the combination of different measures or “tools”, including infrastructure, management, regulation, taxation, pricing and land-use policy.

The research emphasis is on how best to achieve benefits from such integration, either by increasing the benefits or by overcoming barriers to the implementation of any measure. Hence the theme also addresses research into the wider issue of policy development, as well as links between transport policy and other policy areas (energy, environment, economic development, security, inclusion and accessibility, etc).

The scope of this theme focuses on strategic integration rather than operational integration. Operational integration, which includes such aspects as intermodal freight transport chains, common pricing for different public transport modes/operators, interoperability of transport infrastructure or operations (e.g. overcoming differences between railway electrification or signalling systems), is covered under other various other TRKC themes. These include the modal themes (road, rail, air, waterborne, freight intermodality) and themes such as freight, passenger, efficiency, infrastructure provision and transport management.

This theme does however include strategy studies, including visions, scenarios and roadmaps, which contribute to policy development and delivery, as well as ex-post policy assessment.

3. Policy context

The 2001 EU White Paper on Transport identified as major difficulties the following issues: the imbalance in the development of the different modes, congestion on the main overland routes and in cities, as well as in airspace, and the major impact transport is having on the environment and on citizen's health. Transport and traffic management is a key tool to address these problems, alongside infrastructure investments, pricing, regulatory and fiscal measures and Intelligent Transport Systems.

Developing and improving economic and resource efficiency is the key objective for the renewed Lisbon strategy (2005). Increased economic efficiency will enable a reduction in transport costs and in resource use. Detailed objectives of the Lisbon strategy with relevance to this theme include improved utilisation of existing networks, tackling congestion and increasing accessibility, developing urban transport schemes, developing charging policies, increasing synergies between modes and improving logistics in all transport systems.

The economic well-being of citizens and businesses and social cohesion in Europe are to a considerable extent based on an efficient, accessible and competitive transport system which reconciles the need for mobility meeting users' needs using advanced traffic management systems, helping travellers, freight distributors and transport operators make a more efficient use of the networks.

Within the EU's 7th Framework Programme for Research and Development (FP7 - 2007-2013), technological innovation in transport contributes directly to the European competitiveness, environmental and social agendas. Based on the Strategic Research Agendas developed by the European Technology Platforms in Transport, activities include the "greening" of surface and air transport, the modernisation of Air Traffic Management (ATM), decongesting European transport corridors, urban mobility, intermodality and interoperability, safety and security in transport and a competitive industrial base. A key part of the work of these platforms is to provide visions and scenarios in the medium to long-term and then to propose the actions required in the areas of research and policy to meet the aspirations and challenges identified.

4. Research findings

4.1 Introduction

The research which is reviewed in this Thematic Research Summary (TRS) deals with four sub-themes.

The first sub-theme deals with **visions and scenarios**. These projects generally look at policy development options and provide long-term goals.

The second sub-theme is centred on **transport and infrastructure planning**, and **roadmaps** (or route maps). Projects in this sub-theme generally take a step further than those in the sub-theme above, by proposing concrete actions and strategies to implement.

The third sub-theme concerns **multimodal networks and infrastructure**, looking at integration between different transport services (passenger, freight or infrastructure).

The fourth sub-theme concerns **policy assessment**, which is generally evaluation-oriented, looking at actual outcomes of different policies to enable lessons to be learned for the future.



Table 2 shows the projects (mostly EU-funded, complemented by a limited selection of national projects) which have dealt with each sub-theme. The table includes:

- Completed projects which are synthesised in this TRS and for which the following sub-sections report on research objectives, research results, policy implications and implications for further research;
- Projects which have already been synthesised in the EXTR@Web TRS on Integration (EXTR@Web 2006) and which are briefly summarised in the “background” parts of the following sub-sections;

- ERTRAC Vision 2020 and Challenges;
- ERTRAC Road Transport Scenario 2030; and
- WATERBORNE^{TP} - Waterborne Vision 2020.

4.2.2 Research objectives

Research objectives in this sub-theme concern:

- △ The definition – by high level representatives of road transport stakeholders – of an ambitious yet realistic vision for improved European road transport for the year 2020 and beyond. The objective is a road transport system that is more energy-efficient, inflicts less damage on the environment, is safer and more secure, and facilitates easier mobility.
- △ The provision of a forward-looking guide to the challenges presented in the above vision, and of an updated research agenda that will extend to the year 2030 and beyond (in some cases to 2050).
- △ The definition of a medium to long-term vision for the waterborne sector, with the aim of categorise where

the industry would like to stand by the year 2020, including targets and innovation challenges.

4.2.3 Research results

The ERTRAC Vision 2020 for road transport (ERTRAC, 2004) groups the future trends and challenges to achieve the Vision under four themes: Mobility of People and Transport of Goods; Safety and Security; Environment, Energy and Resources; and Competitive Design and Production Systems. Each of these themes comprises between 9 and 16 major aspects.

A selection of key aspects of the vision which are the most relevant to the integration and policy development theme are as follows:

“Mobility of People and Transport of Goods” theme: Goals identified relate to equity and accessibility issues, e.g. that people of all ages, incomes and physical abilities shall have ready access to convenient transportation (improvement in intermodal integration will contribute to this); improved integration of transport and land-user is foreseen in order to reduce unnecessary transport and parking demand; real-time information and demand

management will become commonplace in order to enable people to make informed choices and to optimise network utilisation. Technology and continuous investment will also contribute to optimising the efficient use of road space.

“Safety and Security” theme: Goals relate to road infrastructure characteristics, such as making roads (including signing and marking) understandable to drivers as well as “forgiving” in terms of limiting the consequences of driver errors. They also relate to ITS – intelligent vehicles and intelligent infrastructure, including continuous monitoring of roads, vehicle-to-vehicle (v2v) communications, vehicle security systems (anti- car theft, freight security, etc) and automated enforcement techniques. Finally, goals relate to education, training and awareness issues, such as driver training.

“Environment, Energy and Resources” theme: Main aspects of the vision focus on fuel-efficient vehicles to reduce emissions and energy use, as well as measures to increase the efficiency of roads to reduce congestion. Improved manufacturing and maintenance processes (for vehicles and for roads) to maximise the extent of recycling are foreseen, as are measures (relating to vehicle technology and to traffic management/control) to reduce noise from road traffic. Other approaches focus on minimising environmental effects on communities and natural habitats, for example cleaning technologies to minimise the impact on water quality from surface runoff.

“Competitive Design and Production Systems” theme: The ERTRAC vision with respect to this area includes new management, production and design systems; vehicles and infrastructure developed with an integrated view of road infrastructure, components, materials and fuels; systems of supplying parts for manufacturing which cause minimum environmental damage; robust and open information systems in vehicles and on roads, which can be updated or individualised; and new enabling technologies such as lightweight materials, electronic systems and nano-technologies. The vision also includes performance models and optimisation tools to improve infrastructure asset management, innovative construction and strengthening techniques for roads and bridges and modular pavements.

The ERTRAC Vision document was followed by the ERTRAC Road Transport Scenario 2030+ document (ERTRAC, 2009), which looked at future trends in and affecting the road transport industry, in the areas of public policy, environment and economy, society, and technology. It then set out scenarios in the areas of energy and environment, urban mobility, long-distance freight transport, and road transport safety.

It foresees that by 2030, public policy will be driven to a large extent by issues of climate change and energy security. Efficiency improvements will lead to greenhouse gas emissions from road transport stabilising, with the biggest gains being in the light-duty vehicle fleet. Climate change and competitiveness will drive increased intermodality in

freight transport, while financial and other incentives will encourage travel behaviour changes among people. While non-renewable fuels will continue to dominate the road transport sector in 2030, increased use of electric propulsion in urban transport will take place.

Urban mobility will have changed by 2030 due to ageing, migration, urbanisation, increases in energy costs, greater environmental regulation and the increased use of Information and Communication Technologies (ICT) in all aspects of daily life. The result will be a complex, efficient and integrated mobility system. However, while public transport will increasingly contribute to the shape of the urban environment, and walking and cycling will be further prioritised, the report predicts that car use in urban areas will not decrease significantly. Up to 15% of newly sold vehicles in urban areas, including cars, motorcycles and bicycles, are likely to be plug-in hybrid or fully electric by 2030. New services and business models will exist, such as shared ownership of vehicles, and ITS-based Traffic and Travel Information (TTI) will play a vital supporting role in mobility management.

On the long-distance freight side, a high level of integration is expected by 2030, with ICT based logistical solutions and business models contributing to a more harmonious balance between flexibility and energy efficiency. Policy measures such as the internalisation of external costs will impact upon road freight transport, as will policies on vehicle weight, dimensions and ICT which will lead to new vehicle designs. Greater trade between Europe and Asia will lead to increased road and rail traffic between these continents, however this is from a very low current base and the major infrastructure improvements required, as well as many regulatory and institutional barriers, means that sea transport will continue to dominate for such intercontinental flows. Within Europe, road infrastructure will have been stretched to its absolute limit, despite an increase in market share for rail and inland waterway. Full scale and comprehensive traffic management on main corridors will be the norm, including the introduction of “green corridors” and vehicle platooning. The share of renewable fuel use for long-distance road freight transport will remain small compared with urban transport.

By 2030, despite the wide introduction of enhanced safety measures for vehicles, infrastructure and users, the ERTRAC Scenario sees that safety will remain an important social problem. Aspects that could reduce safety are an increasing number of older and vulnerable road users, an overall increase in mobility demand and an increase in accident incompatibility between vehicles (for example small vehicles designed for urban use, or vehicles equipped for platooning, interacting with other traffic). Safety-related technologies will become the norm on vehicles and widely accepted among drivers, as will training and education, e.g. for eco-driving.

The ERTRAC 2030+ Scenario report, in addition to the main scenario summarised very briefly in the above four paragraphs (called the “common-sense scenario”), developed two

alternative scenarios in each of these four main topic areas: one more “enthusiastic” than the main scenario and another more “pessimistic”.

The Waterborne Vision 2020 (WATERBORNE TP, 2008) was structured around three key pillars: Safe, sustainable and efficient waterborne transport; A competitive European waterborne industry; and Managing and facilitating the growth in transport volumes and the changes in trade patterns.

Regarding the first pillar, the vision foresees that in 2020, advanced technologies, procedures and systems for deep and short sea shipping, port services and inland waterways will enable waterborne operations to cope with growing demands while enhancing its position as the most efficient transport mode in terms of cost, resources, low environmental impact and safety. A series of targets and innovation challenges were set regarding safety and security (e.g. safe ship design, crashworthiness, performance monitoring, regulatory frameworks and navigation), environmental sustainability (pollution impact, recycling of life-expired vessels and more environmentally-friendly dredging) and efficiency (communications and vessel traffic management, a cost level of 20% or less compared to road transport, and greater integration of waterborne with other transport modes).

Concerning the theme of a competitive European waterborne industry, the vision states that In 2020, Europe will remain the leading player in waterborne transport thanks to proactive planning and investments in the transport chains, quality of service, and low transport costs. It sees that in 2020, 50% of intra-Europe trade will be by waterborne modes and that the number of cruise ship passenger-days in Europe will have doubled from 2008. Europe will remain a world leader in vessel and offshore facility manufacturing. Relevant targets and innovation challenges focus on transport and operations, shipbuilding and equipment, offshore services and technologies, recreational craft, and infrastructure, ports and dredging.

Finally, regarding managing and facilitating the growth in transport volumes and the changes in trade patterns, the report envisages that efficiency in shipping and maritime logistic chains will have further lowered the transport cost of many products and will have contributed to growth. Infrastructure and related facilities necessary to accommodate the shifts and the growth in trade volumes and passengers is expected to be in place. Targets and innovation challenges here mostly concern technology tools such as ICT, as well as further unitised cargo and planning processes for ports and hinterland connections.

4.2.4 Policy implications

The ERTRAC Vision for 2020 serves as a guide for the relevant public and private stakeholders in the road transport sector. Harnessing the full potential of this political initiative to the benefit of all road transport users however requires a new form of cooperation. This has already commenced through the creation of an Advisory Council for road transport research to better guide research for more targeted, efficient and effective use of research resources.

The main implication of the ERTRAC Scenario report is the need for an R&D agenda which will deliver a leap in efficiency in the areas of urban passenger and freight transport, long-distance freight, and the inter-connection between both of these.

The Waterborne Vision 2020 implies action from three major enablers. Firstly education and training must continue to deliver competent navigators, naval architects, marine engineers and general business managers for the sector. Secondly, an enhanced role for Information and Communication Technologies (ICT) is essential. Thirdly, policy, led by the European Commission, should deliver a collaborative and integrated approach to ocean and sea management. EU-led policy is also key in the areas of infrastructure, directives and regulations, balancing the needs of waterborne transport with other marine and coastline priorities (tourism, environmental protection, food supply, energy supply, coastal defence, etc), and providing synergies (e.g. developing marine science and research as well as new technologies for improved sustainable uses of the seas).

4.3 Sub-theme 2: Transport & infrastructure planning, and Roadmaps

4.3.1 Background

This is another new sub-theme, comprising projects that have moved forwards from the more abstract visions/scenarios stage (c.f. Sub-theme 1) to a more tangible Roadmap (or Route map) stage, including action plans. The subject of this theme is less research-based than the previous one and more focused on long-range planning. However the projects and documents in this sub-theme – even if they do not strictly fall within the definition of scientific research – are included as they are relevant to the overall policy development theme and illustrate integrated approaches bringing together different types of actors and functionalities across different sectors of transport, often in a way that has not been done previously.

Research projects new to this paper (although some have been covered in TRKC TRSs on other themes already, but are additionally covered here due to their relevance to the Integration theme) are:



- CARS 21 - A Competitive Automotive Regulatory System for the 21st century;
- ERRAC Strategic Rail Research Agenda 2020;
- ERTRAC Strategic Research Agenda 2010: Towards a 50% more efficient road transport by 2030; and
- MEDA TEN-T - Mediterranean and Trans-European Networks for Transport.

4.3.2 Research objectives

Objectives in this sub-theme concern:

- ⤴ Making recommendations for the short, medium and long-term public policy and regulatory framework for the European automotive industry, that enhance global competitiveness and employment while sustaining further progress in safety and environmental performance at a price affordable to the consumer.
- ⤴ Identifying the research objectives to ensure that rail remains at the heart of Europe's transport system for the next decade and a half, and to ensure that road transport becomes 50% more efficient by the year 2020.
- ⤴ The development of a common approach for transport infrastructure in the Euro-Mediterranean ("MEDA") area and its contribution to a better integration of transport networks in the countries surrounding the Mediterranean Sea, within the policy context of the Barcelona Process of the Euro-Mediterranean Partnership (signed in 1995).

4.3.3 Research results

The CARS21 project was essentially a high-level group which produced a number of recommendations in several key areas such as regulatory simplification, environmental protection, road safety, research and development, trade, taxation/fiscal incentives and intellectual property. It examined the major policy areas which impact the competitiveness of the European automotive industry and developed recommendations.

The various policy areas examined were been grouped into chapters on better regulation, environment, road safety, trade, R&D, taxation and fiscal incentives, intellectual property, and competition.

The Strategic Research Agenda for rail (ERRAC, 2007) recommended actions in the following areas:

- ⤴ Intelligent mobility: a Europe-wide intelligent infrastructure is needed to support customer information systems to provide compatible technology between countries and across transport modes.
- ⤴ Energy and environment: new standards and regulations must not only increase the level of environmental protection but also safeguard the commercial competitiveness of the rail mode while reducing dependence on fossil fuels, reducing exhaust emissions, improving design and offering a systematic approach to noise and vibration.
- ⤴ Personal security: identify new methods of improving security for customers and staff in relation to both terrorism and the more common problem of vandalism.
- ⤴ Test, homologation and security: the spread of European homologation and acceptance procedures requires the speeding up of product approvals while squeezing out risk through improved safety management.
- ⤴ Competitiveness and enabling technologies: improving product attractiveness for customers and reducing life cycle costs through modern technology on all aspects of railway operation.
- ⤴ Strategy and economics: new accounting and planning models will provide a better understanding of the costs of operating and maintaining rail infrastructure and how these costs vary according to changes in the frequency and types of train service.
- ⤴ Infrastructure: cost efficient maintenance, and maintenance-free interoperable infrastructure systems will be developed that yield increases in traffic capacity, loading and track stability.

In road transport, the ERTRAC Strategic Research Agenda (ERTRAC, 2010) set a number of guiding objectives for the year 2030:

- ⤴ Energy efficiency: +80% (pkm/kWh) for urban passenger transport and +40% (tkm/kWh) for long-distance freight transport (compared to 2010)
- ⤴ Renewables in the energy pool for road transport: 25% biofuels and 5% renewable electricity.
- ⤴ Reliability of transport schedules: +50% compared to 2010 and improve urban accessibility.

- ▲ Reduce fatalities and severe injuries by 60% compared to 2010 and reduce cargo lost to theft and damage by 70%.

The MEDA TEN-T project (2005) carried out a comprehensive analysis of the Euro-Mediterranean transport system, providing a qualitative and quantitative description of the transport sector in the Mediterranean region. The MEDA TEN-T Demonstration Corridors allowed the assessment of the performances of this transport system against international and regional indicators, while the developed evaluation methodology permitted the main bottlenecks to be identified, the major issues to be addressed, and proposed actions for the implementation of the Strategic Master Plan in order to improve the overall efficiency of the transport sector in this region.

The project provided an overview of the transport infrastructure and services system in the Mediterranean, with emphasis on the integrated transport infrastructures development in the Mediterranean region. It also improved the interconnectivity and the interoperability between the Mediterranean countries and between the Mediterranean and the rest of the EU, in order to facilitate interaction and networking towards the establishment of a Euro-Mediterranean Free Trade Area. The TEN-T network has been effectively extended to the MEDA countries through the enhancement of maritime connections (in particular, the introduction of sea-motorways) and the integration of the air network. Lastly, the project developed the MEDA TEN-T Strategic Master Plan, which is a systematic procedural framework for the readjustment of transport policies by the EU and the Mediterranean countries, with the objective to overcome the barriers and enhance opportunities of transport network implementation at international, national and local levels in the Mediterranean basin.

4.3.4 Policy implications

The implications of the CARS21 project are its policy recommendations. These include, inter alia:

- ⤴ Improve international harmonisation by maintaining efforts with a view to increasing international harmonisation of motor vehicle regulations, involving the key vehicle markets and to extend harmonisation to areas not yet covered.
- ⤴ Simplify the automotive acquis: replacement of the 38 EC directives by UNECE regulations.
- ⤴ Regarding the Internal Market: extend the EC Whole Vehicle Type Approval procedure to all vehicle categories from the earliest possible moment on a voluntary basis.
- ⤴ Concerning the environment: reduce pollutant emissions from light duty vehicles in line with the Thematic Strategy on Air Pollution: adopt a proposal for Euro 5. Also, to reduce pollutant emissions from heavy duty vehicles in line with the Thematic Strategy on Air Pollution: Adopt a proposal for Euro VI; international harmonisation.
- ⤴ Support the increased use of biofuels; develop policy to encourage use of biofuels which offer greater greenhouse gas savings and support research and development efforts into 2nd generation biofuels; consider the adoption of a regulation on motor vehicles using liquid or compressed gaseous hydrogen as fuel.
- ⤴ Make mobile air conditioning systems (MACs) more environmentally-friendly: adopt the directive on MACs; co-operate on the international level so as to avoid or minimise the potential effects of regulatory isolation.
- ⤴ Pursue an Integrated Approach to road safety: improve road safety; improve safety of road infrastructures, improve safety of road use.
- ⤴ Approximation of Member States' taxation systems on passenger cars and introduction of a CO₂ based element: adopt the directive on passenger cars related taxes.
- ⤴ Co-ordination of fiscal incentives to avoid potential adverse impacts on the internal market.

The ERRAC Strategic Rail Research agenda and the ERTRAC equivalent for road recommended a number of research priorities connected to their respective visions, which should feature in future EC and national research programmes.

In the MEDA TEN-T project, the process used was successful, but the work is still ongoing. Further work is necessary and technical assistance is needed for monitoring progress. In particular, it is necessary to add the missing information, which could not be provided throughout the project's duration, in order to provide decision makers with all data they need to make their decisions concerning the future development of a complete MEDA Network. Furthermore, the Strategic Master Plan should be further developed in that it should also consider the sustainability of the transport sector in terms of protection of the environment, as well as safety and improvement of social conditions of transport users, workers and the public in general.

4.4 Sub-theme 3: Multimodal Networks and Infrastructure

4.4.1 Background

Research in this theme looks at strategic planning at a practical level for improved integration of passenger and freight services and their infrastructure. Several projects in the previous version of this TRS (EXTR@Web, 2006a) covered this theme (in this previous EXTR@Web paper, they fell under the old "Policy features" and "Infrastructure features" sub-themes). However, several of these are no longer relevant to the revised scope of the "Integration and policy development" theme as they covered physical or technical integration, and are therefore not included in this TRS paper. Those projects covered in the EXTR@Web TRS on Integration which are still relevant to this sub-theme are:

- ALPENCORS - Alpine Corridor South;
- Bahn.Ville - Promoting a rail-oriented urban development approach for urban regions in Germany and France;
- CROSSRAIL - Integrating Local and Regional Rail including Cross-border Aspects;
- Integrated Public Transport (Swedish project); and
- UG220 - Multimodal modelling, A new look (UK project).

Research projects new to this paper (although they have been covered in TRKC TRSs on other themes already, but are additionally covered here due to their relevance to the Integration theme) are:

- ARTS - Action on the integration of Rural Transport Services; and
- FREIGHTWISE - Management framework for Intelligent Intermodal Transport.

4.4.2 Research objectives

Research objectives in this sub-theme were:

- ⤴ To test and demonstrate the most effective ways of providing rural transport services and, consequently, produce a set of recommendations: a sort of guidelines for the planning and implementation of rural transport systems (ARTS).
- ⤴ To support the modal shift of cargo flows from road towards intermodal transport using short sea shipping, inland waterways and rail; facilitated by improved management and exchange of information between large and small stakeholders across all business sectors, transport modes and administrations (FREIGHTWISE).

4.4.3 Research results

The project on Integration of Rural Transport Services (ARTS, 2005) provided a classification of barriers that hinder the development and the integration of the transport services in rural areas. These concern financing and funding problems, legal and regulatory frameworks, cultural barriers (e.g. car as a status symbol and low willingness for voluntary initiatives), political barriers (perceived low importance of rural transport as an issue at national level), institutional issues (e.g. rural services often cross boundaries between local and regional government areas which are based on city-regions), operational issues, poor infrastructure (physical and ICT) and settlement patterns.

The project produced a handbook summarising three types of recommendations: technical, organisational and policy-related, providing linkage among strategies/measures and impacts/indicators.

In most of the participating countries of the ARTS project, national legal and regulatory frameworks only take into account conventional public passenger transport whereas innovative transport services are rather neglected. In some cases the legal framework restricts or prohibits the integration of regular and special services or the combination of passenger and freight transport (multi-purpose transport services). This situation forces operators offering innovative services to operate in a legal grey or to operate with 'special authorisation'.

A further problem is that the passenger transport market in many countries is strongly regulated and market access for new private operators is confined by strict rules of

competition, traditional structures, and a divided market which does not favour new competitors. In many European countries the transport market is fragmented and dominated by the state or by state-controlled organisations close to monopolistic positions. Besides, the traditional public transport market is not attractive enough to draw large amounts of private capital and bring in many private operators.

The FREIGHTWISE project (2009) made a breakthrough in the analysis of intermodal freight transport. This has shown that the complex nature of booking freight services can be reduced to just four roles and six messages. The roles and messages form a framework which has been named the “Freightwise Framework (FWF)”.

The FREIGHTWISE Framework (FWF) identified the four roles in intermodal transport as:

- ⤴ The Transport Service Provider,
- ⤴ The Transport User,
- ⤴ The Transportation Network Manager, and
- ⤴ The Transport Regulator.

The roles can be adopted either by four different persons, companies or authorities or two or more roles by the same person in the same company or authority.

The Freightwise Framework utilises six messages:

1. Transport Service Description (TSD),
2. Transport Execution Plan (TEP),
3. Transport Execution Status (TES),
4. Transport Item Status (TIS),
5. Transport Operation Status (TOS), and
6. Network and Traffic Status (NTS).

All the information that is necessary to publish, advertise, plan, book, execute and invoice an intermodal transport service is within these messages. This simplification in booking has huge implications for the management of intermodal freight. The implementation of the

FWF means that the evolution of intermodal transport is progressing to a stage that is revolutionary.

4.4.4 Policy implications

The ARTS project made several recommendations regarding operations, funding, regulation, etc of rural public transport services. However, perhaps the key one is to drive rural transport further up the political agenda. At present, this topic does not play an important role at the national level in most countries, so as a result of the missing awareness of this problem there is a lack of political mood for innovative transport solutions, apart from the lack of knowledge about how to develop them. At least at regional and local level this issue has to feature on the political agenda. In this respect, best practice examples could help to disseminate information about innovative services more widely.

Regarding FREIGHTWISE, a key result of an audience survey (of 80 participants in a major project workshop) was that the audience was in favour of the European Commission (EC) taking a lead on making FWF (the FREIGHTWISE Framework) a standard tool for use in managing intermodal transport.

4.5 Sub-theme 4: Policy assessment

4.5.1 Background

Research in this sub-theme looks at ex-post assessment of transport policies, in particular those dealing with integration. One project in the previous version of this TRS (EXTR@Web, 2006a) covered this theme:

- STP 14/6/12 - Integration of Multimodal Reliability in the Assessment of Transport Schemes (UK project)

Research projects new to this paper (although some have been covered in TRKC TRSs on other themes already, but are additionally covered here due to their relevance to the Integration theme) are:

- CP/37 - An Integrated Instrument for the Environmental Evaluation of Local Traffic Plans (Belgian project);
- National Policy Frameworks (NPF) for Urban Transport;
- SIZE - Life quality of Senior Citizens in relation to Mobility conditions; and
- SUMMA - Sustainable Mobility, Policy Measures and Assessment.

4.5.2 Research objectives

The project objectives in this sub-theme were:

- ⤴ To develop an integrated methodology for the evaluation of impacts of local traffic plans on accessibility, traffic “livability”, noise nuisance and air quality. Then, to develop and use new methods and models to evaluate all these impact categories at the district or street level and to formulate recommendations for local policies related to mobility, environment, road safety and urban planning.
- ⤴ To collect information on urban transport performance at national level in the 15 'old' EU Member States, to provide comparative analyses between countries and on a temporal basis, and to draw conclusions in relation to performance and data collection issues.
- ⤴ To explain and describe the present mobility and transport situation, the problems, needs and wishes of different groups of senior citizens from their own perspective compared with experts' points of view; to motivate action by the relevant public authorities, and to identify solutions for existing problems and provide guidance.
- ⤴ To provide an assessment of policy options for promoting sustainable transport and mobility, in order to support policy-makers with a framework for making trade-offs among the economic, environmental and social components of sustainability.

4.5.3 Research results

The project “CP/37 - An Integrated Instrument for the Environmental Evaluation of Local Traffic Plans” (Int Panis, Bastiaens, et al, 2005), developed emission factors and vehicle fleet data for local and slow traffic in the present and future situation (2010), a dispersion model that predicts hourly values for air quality parameters at the city and street levels, a model that converts data on emission factors and traffic flows into noise levels at the street and city levels, and an impact module that links population distributions to variations in noise and air quality levels. It also provided a detailed (in space and time) analysis of exposure for different population groups, a methodology to quantify accident rates, crossover possibilities and spatial quality of major roads, developed an instrument to estimate impacts on livability at the local level, and a database of livability indicators linked to livability levels that depend on the type and function of a district.

The National Policy Frameworks for Urban Transport project (NPF-Urban Transport, 2005) developed 25 indicators to measure urban transport policy performance, made up of 7 'context' indicators (population density, car ownership, fuel prices, etc), 7 'input' indicators (investment, age of public transport fleet, parking prices, etc), 5 'intermediate outcome' (or

output) indicators (costs for certain types of car and public transport journey, passenger-km, etc), and 6 'outcome' indicators (safety, energy use, emissions, etc).

A huge amount of data related to these indicators was found to exist, but most is either at a national or regional level, or at a city or conurbation level. The former are not suitable for urban transport policy framework analysis as they also contain significant regional, rural and interurban transport elements, whereas the latter are not representative of the whole country, but depend on the size of the urban area and its particular characteristics. A very diverse range of results were found, making it difficult to identify countries which are performing well and those which are not, and whether these performances are due to policy frameworks or external factors.

However, At a very general level (out of the 15 EU Member States at the time, for which data was collected), the Nordic countries appear to be successful in most areas, including investment, modal split and safety. Denmark and Finland do however score poorly in terms of PM10 (particle matter) emissions: this may be due to the way they are measured (note also that this indicator is at a national level). The UK is successful in terms of safety but much less so in terms of investment and support for public transport. Public transport investment and integration seems to be successful in Austria, where public operation of transport is the norm. Although energy use is lowest in Greece and Portugal, this is likely to be because of lower car ownership than successful urban transport policies aimed at reducing energy use (note also that this is an indicator at the national level). In both countries energy use has risen significantly in recent years, and even more so in Ireland. In general, changes have been most marked in Greece, Portugal, Ireland and Spain, due to rapid economic growth in these countries since the 1980s. Many of these changes have been negative, such as increased use of cars, coupled with urban transport structures which have not significantly evolved. On the other hand, there has been increased public transport investment, especially in Spain, and public transport fares remain low in most southern European countries.

The NPF-Urban Transport project also surveyed 3000 citizens by telephone (200 per country in the EU-15). This presented an interesting snapshot of public perception towards urban transport problems, issues and policies in Europe. At the European level, a majority of respondents consider congestion, accidents and pollution in urban areas to be a problem, and that 88% of respondents consider the use of fossil fuels (petrol and diesel) in transport (at a national level) to be a problem. Most respondents were dissatisfied with the way their national governments are tackling the above issues: only 28% were satisfied with their governments. Most respondents were however satisfied with public transport in their city, even those who do not actually use it. A significant majority of European respondents (over 60%) felt that the authorities responsible for transport should spend more over the next five years on improving existing roads and on provision for walking and cycling. 56% wanted to see more spending on existing public transport services and 47% wanted more

spending on new public transport infrastructure. Only 35% wanted more spending on new roads and a similar number wanted to see spending on new roads reduced. In terms of raising additional revenue for transport investment, the split of those favouring general taxation and those favouring targeted pricing or taxation (e.g. parking charges or urban road tolls) is remarkably similar at a Europe-wide level, however this masks some significant differences between individual Member States.

The project “Life quality of senior citizens in relation to mobility conditions” (SIZE, 2005) concluded that quality of life is a construct of the question groups used in the project on "satisfaction and autonomy index", "pension", "subjective statements about safety and fears", and "reliance on mobility aids (e.g. walking stick)". But it is also necessary to prove the importance of concrete preconditions and environmental framework elements, which experts as well as senior citizens appreciate as influential on quality of life in the context of mobility. Two different approaches were taken in fulfilling this task: A ranking of the elements which are assessed as mostly satisfying and those which are least satisfying.

This project found that most elderly participants in the survey were satisfied with street lighting, and also with the possibility of finding company to go out with and places to sit and to rest. But the senior citizens have relatively little trust that speed limits will be respected by drivers. They also criticise poor infrastructure for cycling, a lack of financial resources for mobility aids and a lack of toilets in public spaces.

The project “Sustainable Mobility, policy Measures and Assessment” (SUMMA, 2005) developed a tool in the form of the FSM (Fast Simple Model). In creating the FSM, many valuable lessons relevant for both researchers studying sustainable transport and mobility and policy-makers responsible for promoting sustainable transport were learned. It is very difficult, if not impossible, to define sustainability in a way that is acceptable to everyone.

The modelling tool developed in SUMMA is a powerful, easy to use tool that allows its users to quickly estimate and present the impacts of policy measures on a whole range of outcome indicators. This tool combines demand generation and policy assessment capabilities in one tool allowing users to select a policy, to estimate the effect of the policy on a variety of outcome indicators, and to study the results.

The FSM uses a large amount of disaggregate and aggregate data from all over Europe. Unfortunately, as for NPF-Urban Transport, the quality and availability of data is not the same for all the countries. From some countries, predominantly the original EU-15 most of the required information was available. For the new member states a lot of the data was not available at the time of the SUMMA project.

4.5.4 Policy implications

The NPF-Urban Transport project made a number of “methodology recommendations” as well as policy recommendations. The first group included the definition of a series of population thresholds for urban areas, for which national transport data should be disaggregated and reported to Eurostat, measuring performance in a consistent manner when assessing it against common overarching national and European objectives, and the definition by the EC/Eurostat of a small number of 'quick win' indicators for which the Member States should provide data at urban level, measured in a consistent way. These should concentrate on outcome indicators for which there are common objectives at the European level and for which national data is already collected for all countries. There should also be a standard definition for transport fatalities and serious injuries, continued research aimed at defining means to characterise and benchmark transport outcomes, and the launch of a periodic (e.g. every 3 to 4 years) Eurobarometer survey on urban transport issues for the EU-27.

Policy Recommendations include the European Commission preparing a short policy document setting out its broad vision, interest, and high-level goals for urban transport (this has now been done in the Urban Transport Green Paper – CEC, 2007b), and also that local, regional and national authorities should place a greater emphasis on public involvement, perception and opinion in urban transport policy development, particularly in view of the European Transport White Paper objective to place users at the heart of transport policy.

The SIZE project on mobility for senior citizens identified a number of implications at the social and political level, e.g. the urgent need to better enforce speed limits; regarding walking, e.g. improving quality of pavements and longer crossing times on a green man at pedestrian crossings; regarding infrastructure, e.g. road lighting; and regarding public transport (vehicle accessibility, bus stops and PT fares) and driving by seniors (adapted vehicles, licensing regulations, etc).

A number of specific recommendations were made that build on the work done in the SUMMA project. These included that the European Commission develops, disseminates, and encourages the use of a standard approach for data collection and modelling urban transport. Doing so would make it easier to compare transport problems in different cities as well as the performance of policy measures in different cities. The interdependence between freight and passenger transport should be explicitly modelled and there should be an improvement in the relationship between the policy levers and the functioning of the transport system. As far as available the work on operationalisation and monetary valuation should be guided by existing knowledge of the importance of certain effects, and



lastly, more emphasis should be placed on generating new policies that are considered effective in terms of sustainability. With these policies the FSM can be used to produce policy inventories for every country with policies that seems to be the most effective in terms of sustainability.

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SUMMA (2005), Sustainable mobility, policy measures and assessment, Final Report (FP5)

WATERBORNE^{ETP} (2008), Waterborne Vision 2020, www.waterborne-tp.org

Sub-theme 3: Multimodal Networks and Infrastructure				
Project acronym	Project title	Programme	Project website	Coverage
ALPENCORS	Alpine Corridor South	INTERREG	http://alpine-space.org/alpencors.html	Covered in EXTR@Web paper
ARTS	Action on the integration of Rural Transport Services	FP5	www.rural-transport.net	This paper
Bahn.Ville	Bahn.Ville – Promoting a rail-oriented urban development approach for urban regions in Germany and France	DEUFRAKO (French/German bilateral action)	www.bahn-ville.net	Covered in EXTR@Web paper
CROSSRAIL	Integrating Local and Regional Rail including Cross-border Aspects	FP5	Website no longer online	Covered in EXTR@Web paper
FREIGHTWISE	Management framework for Intelligent Intermodal Transport	FP6 – PTA 6 “Sustainable Development, global change and ecosystems”	www.freightwise.info	This paper
-	Integrated Public Transport	Swedish project	None	Covered in EXTR@Web paper
UG220	Multimodal modelling, A new look	UK project	www.dft.gov.uk/rmd/project.asp?intProjectID=11344	Covered in EXTR@Web paper

Sub-theme 4: Policy assessment				
Project acronym	Project title	Programme	Project website	Coverage
CP/37	An Integrated Instrument for the Environmental Evaluation of Local Traffic Plans	Second Scientific Support Plan for a Sustainable Development Policy (SPSD2) - Belgian research programme	http://193.191.208.76/belspo/fedra/proj.asp?!=en&COD=CP/37	This paper
NPF-Urban Transport	National Policy Frameworks for Urban Transport	EC DG-TREN project (service contract)	Website no longer online	This paper

Sub-theme 4: Policy assessment				
Project acronym	Project title	Programme	Project website	Coverage
SIZE	Life quality of Senior Citizens in relation to Mobility conditions	FP5 – Quality of Life and Management of Living Resources	www.size-project.at	This paper
STP 14/6/12	Integration of Multimodal Reliability in the Assessment of Transport Schemes	UK Department for Transport - Transport - LINK programme	www.dft.gov.uk/rmd/project.asp?intProjectID=10038	Covered in EXTR@Web paper
SUMMA	Sustainable Mobility, Policy Measures and Assessment	FP5	Website no longer online	This paper

Remark: the projects listed in the annex are those that have had the focus on the theme Integration / Policy Development according to the new TRKC definition. Projects focusing on technical integration and interoperability that were covered in the EXTR@Web TRS on Integration are not included. On the TRKC portal www.transport-research.info it is possible to use the “advanced search” functionality, with the option “integration and policy development”, and find all research projects, EU-funded and national, which have treated, to a variable extent, aspects related to the theme (including those conforming to the old definition of the theme, which are not included in this TRS).