Transport Research Knowledge Centre

Directorate-General for Mobility and Transport

EUROPEAN COMMISSION

• USER-FRIENDLY AND SECURE PASSENGER TRANSPORT

Contents

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Additional information on transport research programmes and related projects is available on the Transport Research Knowledge Centre website at **www.transport-research.info**

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Foreword

This Policy Brochure focuses on improving **passenger transport services**. These are defined as services provided by a transport operator, whether by road, rail, air or water, where in most cases services run to a timetable, and passengers pay a fare to use them. In return for their fare payment, users would normally expect a certain **level of service**, such as an acceptable level of reliability, comfort, cleanliness, safety, security, information and customer service.

Policy and research into the above aspects aim to make passenger transport more attractive to users, as well as safer and more secure. This brochure presents recent policy issues and related research in these areas, with the exception of safety. This has been done because safety is a major topic in itself and closely related to other factors such as traffic management, vehicle technology, legislation, training and enforcement.

Although the focus is on recent **European research projects**, some national initiatives have been included on a very selective basis where relevant and where information has been made available. Many good practice or innovative implementations have been made in the passenger transport sector by transport operators, public authorities and vehicle manufacturers, however as these are not pure or applied research projects they are not the focus of this brochure. Such initiatives are well documented elsewhere, for example on the websites of ELTIS, UITP and CIVITAS (see the reference list at the end of this brochure).

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User-friendly and secure passenger transport: The scope of the topic

Passenger transport, within the scope of this brochure, covers local, regional and long-distance transport services provided by a transport operator for the use of the general public, usually in return for a fare. It covers transport by bus, coach, train, tram, metro, air, ferry, and innovative modes like Personal Rapid Transit (PRT). It may run to a published timetable, or provide a semi-flexible or entirely on-demand service, and may be run commercially or under a contract to one or more public authorities, typically with financial support. Private or individual transport by for instance car, bicycle or motorcycle, including car sharing and public bicycle schemes, are not within the scope of this brochure.

In 2007, some 1,621,000 million passenger-kilometres were travelled by collective public transport means across all modes in the 27 Member States of the European Union, at a total cost to the consumer of €169,175 million, or €341 per EU Member State resident per year (CEC, 2009b).

These means of collective passenger transport account for a quarter of passenger-kilometres travelled in the EU by motorised transport means: 8.8% of passenger-kilometres is by air, 8.3% by bus and coach, 6.1% by train, 1.3% by tram and metro and 0.6% by sea (CEC, 2009b). Given that average journey lengths by bus, tram and metro are shorter than those by train, and considerably shorter than journeys by air, measuring by passenger-kilometres masks the high number of individual trips made using local public transport. This adds up to approximately 60 billion passenger journeys a year (UITP, 2009c).

While passenger transport for all modes except by ship and ferry is growing, passenger transport by land (like by bus and by rail) is growing at a slower pace than individual car transport. Air travel within the EU on the other hand has grown by over a quarter since the year 2000 (see p. 3).

Prices paid by passengers for public transport since the year 2000 have increased for land-based transport at a greater rate than for air or sea transport as well as for individual car use (see p. 3).

Percentage change in passenger-kilometres from 2000 to 2007 For domestic and intra-EU journeys in the EU-27 (Source: CEC, 2009b)	
Car	+ 9.2%
Bus and coach	+ 4.1%
Train, tram and metro	+ 7.1%
Air	+ 25.2%
Sea	- 2.3%

Percentage change in consumer prices from 2000 to 2007 For domestic and intra-EU journeys in the EU-27 (Source: CEC, 2009b)	
Car purchase (price of vehicles)	+ 5.9%
Car operations (fuel, maintenance, etc)	+ 26.9%
Regional and intercity bus and coach fares	+ 34.4%
Train fares	+ 29.2%
Local public transport fares	+ 30.2%
Aire fares	+ 18.7%
Ship and ferry fares for passengers	+ 24.7%

This brochure focuses mainly on research to improve passenger transport from the user's point of view. The main **policy objectives and associated research** covered by this publication are those that aim:

- to enable efficient, interoperable and user-friendly passenger information and payment systems;
- to ensure that passenger transport services meet the needs of users in terms of when and where they run, including connectivity, multimodality and access to and from rural areas);
- to make transport fully accessible for people with mobility impairments;
- to provide a comfortable and pleasant travelling environment;
- to reduce threats or perceived threats to transport users;
- to reduce threats to transport operations or infrastructure, whether from revenue fraud, vandalism, sabotage or terrorism.

This publication does not cover operational issues such as traffic or fleet management, or technological issues such as vehicle design, although many of the socio-economic factors covered may have an impact on operational or technical requirements. Traffic management aspects for road and rail modes, including passenger transport, are covered in a separate Policy Brochure entitled **Traffic Management for Land Transport** (TRKC, 2009a). This brochure also does not cover environmental aspects like pollution or noise from passenger transport. These aspects are covered in the **Transport and the Environment** Policy Brochure (TRKC, 2009b).

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Policy background: Measures to improve levels of service to users

Key policy areas regarding passenger transport, within the scope of this brochure, are **accessibility, security, and quality of service issues**, such as level of service, user friendliness, comfort, image and reliability. Policy areas that are not covered, as they are major areas of policy, research and legislation in their own right, include safety, competition and market entry, transport integration and coordination, and pricing and funding of services that are not commercially viable.

Much of the policy, for land transport at least, is set at national level, but this is guided by a number of key pieces of EU legislation. The 1998 European Commission Communication **Developing the Citizens' Network** (CEC, 1998) dealt for the first time with the importance of local and regional transport, saying it should play a fuller part in sustainable development.

This initiative provided support for the responsible authorities and operators at national, regional and local level by stimulating information exchange, including the development of the **European Local Transport Information Service (ELTIS)** and by stimulating benchmarking of services. Other support included the establishment of a political and legal framework aimed at increasing the use of public transport, using regional policy, cohesion policy and **Trans-European Networks for Transport (TEN-T)** policy. Another tool to achieve this is the promotion of **Intelligent Transport Systems (ITS)**.

The Commission's 2007 **Green Paper on Urban Mobility** (CEC, 2007b) recognised that over 60% of the EU's population lives in urban areas and looked at solutions which are applicable on the European level. This covered promotion of the exchange of good practice, as well as developing common standards and harmonisation, providing financial aid where necessary, encouraging research and simplifying legislation where needed. The five main challenges identified were to improve fluidity in towns, to reduce pollution, to make urban transport more 'intelligent', to make it more accessible, and to make it more safe and secure.

An Action Plan on Urban Mobility was published by the European Commission in 2009 (CEC, 2009c) with the aim of stimulating cities to develop policies to combat climate change, to create an efficient transport system and to strengthen social cohesion. Actions related to passenger transport include:

- **promoting reliable travel information and protection of passengers' rights;**
- **supporting the sharing of experience and knowledge;**
- **encouraging integration, interoperability and interconnection between transport networks to optimise urban mobility.**

Policy on **security of urban transport** has traditionally been set and implemented at local level, tying in with general policies on law and order (discouraging attacks and preventing vandalism), and concerns aspects such as design, surveillance and staffing of public transport vehicles and stations/interchange points. However, since the terrorist attacks on public transport systems in Madrid in 2004 and London in 2005, as well as the more recent threats of influenza pandemics, public transport security policies have moved more into the European and international domain. Public transport systems are open to all users and airline style controls are not practical given the mass usage and walk-on nature of the service. Furthermore most of the infrastructure was not built with security in mind. Nevertheless it is essential to make urban passenger transport less vulnerable to attack as well as to prepare plans for what to do in the event of an attack, without compromising the unrestricted access and ease of use that passengers depend on.

The European Commission Communication **Stepping up the Fight Against Terrorism** (CEC, 2007c) proposed an Urban Transport Security Expert Working Group with a Focal Point in each Member State in order to exchange best practice and lessons learnt in four key areas: organisational measures, surveillance and detection, more resilient equipment and installations, and incident management. This could lead to commonly agreed security criteria and benchmarks, allowing authorities and operators to carry out self-assessments and to develop security plans.

The EU's **maritime transport policy** (CEC, 2009d) recognises the need for a 'security culture' in shipping and port operations. Seafarers need to be trained to deal with terrorism threats. The policy also calls for the implementation of an integrated information management system to enable the identification, monitoring, tracking and reporting of all vessels at sea and on inland waterways to and from European ports. This system should include vessels in transit through or in close proximity to EU waters (part of the e-Maritime initiative).

In the **aviation sector**, security had been a concern mainly of national civil aviation authorities. It began to be dealt with more at the European level following the 1998 bombing of an aeroplane above Lockerbie in Scotland and, more intensively, since the 11 September 2001 attacks in the USA. Following the latter disaster, the European Commission adopted a Regulation on **Establishing Common Rules in the Field of Civil Aviation Security** and thus provided the basis for allowing harmonisation of aviation security rules across the European Union with binding effect. From April 2010, this is superseded by Regulation 300/2008. This covers areas such as methods of screening, listing articles which are prohibited on board aircraft, criteria for staff access control, staff training, defining critical parts of security restricted areas, criteria for recognising security standards in a third country and technical specifications of security equipment (European Parliament and Council of the EU, 2002 and 2008). The European Commission's **Action Plan for Airport Capacity, Efficiency and Safety in Europe** (CEC, 2007d) mentions security as a paramount consideration when planning to increase airport capacity.

Passenger rights have been a key area of EU legislation. The 2001 **Transport White Paper** (CEC, 2001) proposed to put users at the heart of transport policy, and one of the earlier outcomes of this was legislation in 2004 to protect **air passengers** who are delayed, are denied boarding or who are downgraded to a lower class of service than that which they booked and paid for. This was followed in 2007 by a regulation on **rail passengers**' rights and obligations, covering liability of the operator in case of an accident, equal treatment of disabled or mobility-impaired persons, availability of tickets and security in stations. This also contained provisions regarding minimum provision of information and an obligation on operators to simplify rail transport, in particular for trips where the services of more than one train operator are used (such as availability of through tickets). EU **maritime** policy proposes addressing the rights of ferry and cruise ship passengers through promoting a quality campaign, for example giving awards for the best ferry operators (CEC, 2009d).

In the area of **bus and coach** travel, the EU recognises that this sector needs to guarantee:

- efficient, high-quality services;
- greater passenger comfort;
- the right to information on fares;
- contractual terms, handling of complaints and mechanisms for resolving disputes;
- vehicles better adapted to the needs of persons with reduced mobility.

Legislation was enacted in 1992 to provide common rules for the international carriage of passengers by coach and bus, including obligations of carriers. The Commission is currently looking at ways of extending the rights given to international air and rail passengers to bus and coach passengers too. The **Action Plan on Urban Mobility** is committing the Commission to work with stakeholders to agree a set of voluntary commitments on passenger rights in urban transport as well as including urban mobility in the EU Disability Strategy.

The European Commission's **Action Plan for the Deployment of Intelligent Transport Systems** (CEC, 2008) focuses on the road mode, but includes several actions with respect to public transport. Action 1.5 in this plan for example proposes the promotion of the development of national multimodal door to door journey planners, taking due account of public transport alternatives, and their interconnection across Europe, with a target date from 2009 to 2012. Cooperation and coordination actions, including an 'Urban ITS platform', guidelines on public funding and the development of an ITS decision-support toolkit, are other areas of this ITS Action Plan.

Finally, **connectivity** of passenger transport services is an area of EU policy focus. The European Commission's **Airport Action Plan** (CEC, 2007d) includes a section on promoting comodality of transport modes, stating in particular that air and rail travel should become more complementary. EU policy is to facilitate not only rail links between airports and city centres, but also other regional links within airport catchment areas. It promotes high speed links with other metropolitan areas that could reduce the need for short-haul flights and free up airport slots for long-haul flights. Increased air/rail intermodality can improve the overall efficiency of the transport network and of airports in particular, and improving the availability

of integrated ticketing is seen as a key step to help achieve this. EU **maritime policy** proposes that the EU promotes measures to facilitate better connection of islands and long-distance intra-EU passenger transport through quality ferry services and appropriate terminals (CEC, 2009d). At an urban level, proposals to improve interconnections between networks are mentioned above under the Action Plan for Urban Mobility.

The International Road Transport Union (IRU) is pressing for future EU transport policy to adopt the objective of doubling the use of **bus and coach transport**. This can be achieved through measures such as improved infrastructure to promote comodality, information and new technologies, accessibility, service quality, security, ticketing, marketing, and awareness-raising (IRU, 2010). The IRU argues that such a doubling of bus and coach use in the EU would lead to a reduction in CO_2 emissions by at least 50 million tonnes per year, more than 3,000 fewer deaths due to road accidents, around 10-15% reduction in car traffic and the creation of four million new jobs.

3

The research context: Key research axes to help achieve policy goals

A key area of policy is to increase the **attractiveness of public transport**. It is important to create conditions where car users opt to take public transport instead. Thus the goal of supporting research is to find solutions to make public transport more attractive and understandable. This is key for non-regular users or for visitors to an area who may be unfamiliar with the services, or indeed even intimidated by certain aspects, such as lack of information and lack of certainty, physical access, what to do if things go wrong, or personal security concerns.

Some areas of policy require more research than others. Areas like passenger rights are not strong research topics as they mainly concern agreements or legislation. Other areas, **like Intelligent Transport Systems** (ITS) or **accessibility** issues, are more important areas of research in Europe. ITS is often considered to focus on road traffic management, cars and lorries, but the use of such technology in public transport can make a key difference in quality, security and reliability. ITS for public transport includes **ticketing**, pre- and on-trip **information systems**, **fleet management**, control and surveillance systems to improve **efficiency**, **reliability and security**, and dynamic measures for public transport priority, such as bus priority at traffic lights.

The research and application of ITS for different transport modes as well as on a multimodal basis is therefore a growing area, recognised by the **Action Plan for ITS**. Research into means to improve security needs to take into account the needs of the traveller in terms of freedoms and civil liberties.

Research also focuses on **'soft' issues** related to the end-user. These issues are related to user incentives towards behavioural change, users' rights, or on-board quality and comfort. In particular, behavioural change addresses a broad set of themes, such as ease of appropriation by the user of various systems, applications or devices. These enhance ergonomics research, or enable the propensity to switch to greener and safer modes. In relation to this, research to increase passenger comfort and quality of services adds to the attractiveness of particular modes, in particular if this leads to the setting up of mobile workspaces, or allows for leisure activities.

Business case issues are central to all improvements or regulations regarding passenger transport. The investment required to improve, for instance, security, accessibility and quality should be seen in relation to the benefits obtained, the resulting cost to the end user or to the taxpayer, and the competitiveness of the transport mode concerned. A level playing field is necessary. If a mode of passenger transport is over-regulated it could become uncompetitive and lose traffic to other, less regulated and perhaps less safe and secure modes.

4

Research programmes: Action at EU and national levels

European programmes

Passenger transport issues have been addressed in numerous EU projects, mostly within the research framework programmes supported by the European Commission's DG Mobility and Transport (DG MOVE). Older research in the Fourth Framework Programme (FP4) included early projects on aspects such as passenger information and intermodal terminals, such as the SWITCH project (Sustainable workable intermodal transport choices).

The main body of research within the Fifth Framework Programme (FP5, with calls for proposals being issued up to the year 2002) relating to passenger transport took place within the **Competitive and Sustainable Growth** sub-programme (GROWTH), notably within Key Actions 2 and 3 (Sustainable Mobility and Intermodality, and Land Transport and Marine Technologies respectively). The FP5 **User-Friendly Information Society** sub-programme (IST) also funded some relevant projects of a more technical nature.

The Sixth Framework Programme (FP6, with calls being issued up to 2006) included two relevant Priority Thematic Areas: **Sustainable Development, Global Change and Ecosystems** (SUSTDEV), and **Information Society Technologies** (IST).

Within FP5 transport relevant security projects have been rare and were implemented under the headline of 'safety and security'. After the major terrorist attacks in the USA, Madrid and London, a systematic security brainstorming and project clustering started within FP6.

Research in the Seventh Framework Programme (FP7) is currently underway; therefore only some limited interim results are available for this brochure. FP7 research relevant to passenger transport is mostly included in the sub-theme on **Sustainable Surface Transport**.

FP7 is the first European framework programme to include **Civil Security Research** as a separate subject area. The primary ambition of the security theme is to provide enhanced security-related technologies and to facilitate their take-up as soon as possible, so security policies and programmes can be implemented.

While actions under this FP7 theme are generally methodology and technology-oriented, there is a separate European Commission Framework Programme outside FP7 on **Security and Safeguarding Liberties**, which focuses on actions related to policy and operational work in the area of law enforcement and combating and preventing crime, including terrorism (CEC, 2010).

The **CIVITAS Initiative** started under FP5 and continued into FP6 and FP7, bringing together cities in different countries to research, implement and share urban transport and traffic solutions. CIVITAS I (2002-2006) comprised four projects under FP5 with actions in a total of 19 cities, CIVITAS II (2005-2009) is also made up of four projects under FP6, bringing together 17 additional cities. Five new FP7 projects under CIVITAS PLUS (2008-2012) include a further 25 cities.

Projects have also been commissioned on an ad hoc basis by the European Commission's former Directorate-General for Energy and Transport (DG TREN), whose transport functions were taken over by the new DG MOVE in January 2010. Examples of projects are the **Urban Transport Benchmarking Initiative** and **National Policy Frameworks for Urban Transport**.

National research

The focus of this publication is on European research projects. However, some national initiatives have been included on a selective basis where relevant and where information has been made available, in particular where this is complementary to European research or covers areas not well represented at the European level.

Various national and international actors have their own programmes and are encouraged to cooperate and to coordinate their efforts in order to avoid unnecessary duplication and to explore synergies wherever possible.

Examples of research programmes at national level with projects included in this brochure are:

- the PREDIT 3 Land Transport Research programme in **France**;
- in **Germany**, the *Stadtverkehr* (urban transport) programme within the Federal Ministry of Transport, Building and Urban Development (BMVBS), and the Research and Technology for Mobility and Transport programme led by the Federal Ministry of Education and Research (BMBF);
- the **Spanish** Strategic Plan for Infrastructure and Transport, led by the CEDEX study centre of the ministry responsible for public works and infrastructure;
- programmes organised by the **Swedish** Agency for Innovation Systems (VINNOVA) and the Swedish Research Council for the Environment, Agricultural Services and Spatial Planning (FORMAS) and the Swedish Rail and Road Administrations;
- the programme of the **Swiss** Federal Office of Spatial Development (ARE);
- programmes organised by the **United Kingdom** Department for Transport (DfT) on rail and on regional and local transport, as well as projects within the DfT's Accessibility and Equalities Unit.

5

Research results: Benefits from key projects

Information and journey planning

Journey planning, along with e-ticketing, has grown in its scope, viability and pervasiveness in step with increasing access to the internet and mobile services. These have grown steadily and include several multimodal systems: **TransportDirect** in the UK, **MATKA** in Finland and **A nach B** in Vienna and north-eastern Austria being just three examples of major deployments resulting from extensive research and planning. Over the years these have evolved in both content and delivery options. For instance some journey planners allow the calculation of carbon footprint as part of their functionality and many planners can now be accessed from a range of mobile devices, and assist in the planning of personal trips.

One of the driving factors behind the increased availability of advanced journey planners is the steady proliferation of Urban Traffic Management and Control (UTMC) and Automatic Vehicle Location (AVL) systems in urban areas. This information, which in addition to aiding traffic management applications, can be incorporated into the planning process, giving the traveller real-time information. This can include information on disruptions, delays, predicted arrival times at stations or stops, and journey time predictions.

However, the provision of such information has brought with it a range of issues such as how to interface this in a user-friendly and standardised manner, typically through using a Service Interface for Real-time Information (SIRI) (see for example LeicesterTravel Info). Such services have become so widespread that they are now in part the domain of over-arching organisations such as **RTIG-INFORM**, within the UK which forms a focus point for authorities, operators and system suppliers as well as system development.

The French **MOUVER.PERSO** project focused on improving traveller information to students and other young people. It investigated how information can be adapted to the needs of this specific group as well as how they make travel decisions (in particular the extent to which they make individual or group decisions). The main axis of research is the response of this user segment to personalised information for their daily mobility needs, in particular 'context awareness' and human-machine interface issues. A prototype application was developed and evaluated. It was found that some improvements to the algorithms and filtering were needed to further optimise the application, which, once implemented, could allow its deployment on a wider scale.

Payment

As e-payment and electronic finance transactions have evolved over the last decade so has the prevalence of e-ticketing. Indeed by 2001 Berlin, London, Paris and Rome had all deployed large scale contactless systems (UITP, 2001). Transport applications in many cases have been seen to be an ideal testing ground for e-finance concepts allowing customers to become familiar with new concepts.

Such systems have been the focus of recent R&D projects, many of which have dealt with integration between ticketing and payment systems and applications. Examples include the Spanish project **DUPLO** and a range of projects within the French PREDIT initiatives, such as **Automated Fare Collection and Functional Interoperability** and the German **PNVREGION** group of projects. In the UK, one of the commercial banks offers a credit card which integrates Transport for London's pre-paid Oyster card for fare payment.

Perhaps the most recent of these R&D projects is **IFM**. It aims to facilitate seamless accessibility to different public transport networks in an attempt to eliminate payment processes as a barrier for the users of public transport by 2015, leading to pan-EU interoperability. The eventual goal is to provide travellers with shared styles of contactless media that can be used for multiple transport products in different regions and for modal switching, such as 'Park and Ride'.

Additionally it is important not to overlook the availability of ticketing and payment options which may make travel easier and eliminate delays that may be caused by the purchase of tickets on the vehicle. One example would be street ticketing trials that have been undertaken as part of the **CIVITAS SMILE** project.

Surrounding payment itself, a range of issues is affecting the feasibility of the payment system. These systems need interfaces to other systems in order to allow seamless operation of, for example, journey planning and tourism services. Ticketing, its practicality and methods, was a key issue in evaluating the requirements for intermodal journey planning in the EU-funded project **KITE**. The Swedish project **FOKAT** examined IT issues for demand-responsive travel and its integration with existing public transport.

Accessibility and ease of use

This theme relates to access to transport networks on a spatial level (coverage and frequency of networks) and on a physical level (for example accessibility of vehicles and terminals for disabled or less mobile people). It also deals with user-friendliness of passenger transport systems and user attitudes to them.

According to a public perception survey in 2004 among 3,000 persons in the EU-15, the majority of citizens of urban areas are satisfied with public transport in their city (**NPF-Urban Transport**). A majority, 60%, was satisfied with public transport overall, against 22% dissatisfied (the remainder had no opinion). Satisfaction was greatest in Luxembourg and Finland. 53%, of the respondents were satisfied with public transport frequency and network coverage in their city (against 29% dissatisfied) and 59% were satisfied with public transport reliability (against 24% dissatisfied).

Promoting accessibility to all EU citizens is one of the most prominent aspects of the EU's transport policy. This is reflected in the quantity and nature of related research projects. Studying the ways in which users can voice their concerns as stakeholders, **BUSREP** reviewed the strategies and tools that users have available. Taking an international look at the passengers' interests in the different stages of transport planning and operation process, it was found that 'passenger rights' and 'passenger participation' are complimentary strategies, improving user satisfaction, service attractiveness, and accessibility.

Focusing on accessibility design, **UNIACCESS** based its research on first providing a comprehensive review on the situation of 'accessibility' in public transport in terms of infrastructure, vehicles, and legislation and standards in Europe. This assessment served as the methodological guideline for building an 'Accessibility Roadmap'. This provides technical solutions to accessibility issues in particular configurations, as well as recommendations for future research work related to legislation, standards, policy and society. It concluded that accessibility issues are best resolved by a collaborative process between relevant stakeholders. UNIACCESS also provided an innovative design methodology for such collaboration.

The currently ongoing **MEDIATE** project follows on from UNIACCESS by developing a self-assessment tool that can be used by policy-makers to identify areas where upgrading will improve the accessibility of public transport. Related to this, the ongoing **APTIE** project is developing a web portal to enable the user to find information on, or references to, a wide range of matters related to accessibility in public transport, including good practices, legislation and projects.

Maintaining the autonomy and mobility of senior citizens is a central element of their integration in society. Through a series of qualitative and quantitative studies, as well as the organisation of workshops, the **SIZE** project assessed accessibility issues pertaining to seniors. These resulted in a set of technical proposals and policy recommendations for accessibility design, for instance in the areas of adapted vehicles, public transport stops' design, road infrastructure illumination and signage.

Kneeling Buses (DfT, 2005), carried out in the United Kingdom, examined the issues surrounding the deployment of re-configured buses. It studied how usage, local implementation, and acceptance by various stakeholders, influence vehicles' technical capacities. The project found that the technical capabilities of the vehicles would be extended by a gradual and phased introduction of the overall scheme. This would take into account the vehicles' users, but also the drivers themselves. Regulatory change, for example, should be preceded by a thorough consultation exercise with the bus industry. This should be accompanied by parallel awareness and training programmes towards educating drivers and other staff in the advantages of the vehicles. Other programmes should target the passengers, ensuring they understand that the vehicle will be accessible to them.

Accessibility relates not only to physical access to vehicles and terminals by people with reduced mobility. It also refers on a more general level to the accessibility of persons to services or transport. In some cases it is expressed in the geographical accessibility to the public transport network. This is a specific issue in areas of low population density where public transport can often be limited or non-existent. Making the 'last mile' of public transport in rural areas accessible was the focus of the Swiss ***Alpentäler-Bus*** project (ARE, 2007). Here trials were made of improved public transport supply in four mountainous areas over two years (2006-2007). These resulted in 23,000 passengers being carried, about 2.3 million Swiss Francs generated in the regions concerned and around 100 tonnes of carbon dioxide saved. The success means that these services are continuing. They demonstrate that further regions can be supported in building up attractive rural public transport services, their commercialisation and financing.

Also related to geographical accessibility, a Swedish project on **Efficient Commuter Travel to Large Peripheral Work Places** (Chalmers University, 2009) is providing a basis for planning better bus services at relevant times of the day. It is proposing tailor-made commuting trips to meet some needs and is looking at individualised direct marketing to encourage use of what public transport exists. In case public transport is not available, it will even try to facilitate car-pooling.

On-board comfort

The **FACT** project's focus was to achieve infrastructure upgrading in order to use tilting trains, while avoiding passenger nausea. It aimed to maximise performance, while minimising passenger discomfort. FACT provided a methodology and simulation tool in order to identify the boundary conditions which limit the number of passengers experiencing nausea to a statistically acceptable level. FACT's published reports gave rich synthetic information on the consequences of track layout, comparing European standards and national limits. Moreover, the project also produced a specialised simulation tool, allowing for simulations without the need for full scale on-the-track experiments. Ultimately, the simulation tool produced by the project paves the way for the efficient design of track and/or coaches for a given performance and a given comfort level. This should help to reduce the time needed for introducing new rolling stock on new, renewed and existing lines.

ICE provided airframers (assemblers of aircraft fuselages and cabin systems) and airlines with operational knowledge in order to deal with concerns about the unknown combined effects of cabin environmental parameters (including, for the first time, cabin pressure) on the health of passengers in commercial aircraft. The project built a predictive model that considered environmental parameters, and also passenger profile and flight characteristics. If health risks resulted from a specific set of these parameters, they could be varied, in combination, to minimise such risks to acceptable levels in a technically feasible and economically viability manner. ICE also drafted relevant standards – for both passengers and aircraft operators – including the first scientifically-based standard for cabin pressure, and provided practical design guides and operational recommendations in cooperation with stakeholders. One of the conclusions of ICE was that flying in current commercial aircraft environments poses, in general, no significant health risk for passengers.

Research has been carried out in the fields of on-board services and entertainment systems. The prime objective of the studies was to reduce the weight and power consumption of these systems without impeding the vehicle's efficiency and/or safety. In this respect, the **ANAIS** project designed and tested a network architecture for in-flight cabin systems.

Various technologies were integrated into a single aircraft-compliant architecture, combining all the services – at server, network, and seat levels – minimising weight, power consumption, and space requirements, while improving ergonomics. Electrical consumption per seat, and system weight, were both reduced by around 50%.

Recognising that a first step towards promoting intermodality and multimodality is to provide seamless transport integration, the **Integrated Public Transport** project in Sweden sought to demonstrate practical solutions for a 'whole-journey-concept'. This encompasses local on-demand transport and regular transport, by bus or tram. The project experimented upon an improved fare system and timetables. It also tried out new ways of planning for relevant changing points throughout the area. It enabled each passenger to book the entire journey – including the return trip – from the actual starting point.

The Spanish project **INTERBUS** identified the operational design and profitability of interchange terminals and stops. Improving these could guarantee the efficiency and intermodality of the public transport networks within metropolitan or urban areas. INTERBUS designed and deployed an analytical model both cost-effective and user-oriented, as an evaluation tool for assessing the efficiency of the public transport networks on a multimodal basis. The model was deployed and calibrated experimentally with data from two Spanish cities. It allowed writing up criteria and guidelines for operating and maintenance plans and produced an interchange model guaranteeing users' speed, comfort and safety.

EMMA took this a step further, focusing on the end-user's acceptance of three transport demand management (TDM) measures: individualised marketing, road pricing and prohibition. The study tried balancing these with the user's perception of ease of use. Travel choice was conceived as an adaptation to changes, where users select different available options over time, depending on particular and contingent activities. Based on an analysis of user needs and an assessment of demonstrators in eight cities across six European countries, EMMA provided several innovative solutions. These consist of combinations of policy measures capable of effectively managing demand of private cars in metropolitan areas. The project demonstrated that users accepted and adapted to the less coercive measures and that the adaptations followed a psychological cost-minimisation principle. However, the study also found that efficient car use, using public transport, or changing activity patterns were more dependant upon the age of the car users, the type of trip (work, shopping, leisure), and the type of TDM measure. These results are correlated with other findings, showing that car users' choices relating to short-distance trips are influenced by perceived physical exertion.

An ongoing Swedish project **Activities on the Move**? (University of Gothenburg, 2010) is looking at people's changing use of time spent while travelling by public transport. The aim is to obtain detailed knowledge of travellers' demands and activities, including what equipment they use and what factors influence how they spend their travelling time on public transport, for instance the use of on-board facilities and journey time. This could provide input for improved public transport vehicle design and marketing of services.

Personal security

Personal security fears are often given as a reason for not using public transport. Nevertheless, a survey of 3,000 citizens of urban areas across the EU-15 Member States in 2004 found that 68% were satisfied with personal security on public transport in their own town or city, against 15% dissatisfied, the remaining 17% having no opinion. The country with the highest level of satisfaction with regards to personal security on urban public transport was Finland (94% satisfied) followed by Denmark and Austria where 78% in each were satisfied (**NPF-Urban Transport**).

A French project on **Personal Security in Urban Public Transport** (*Association française de psychologie appliquée aux transports*, 2002) conducted an interview survey of 500 people (100 each in five major French cities outside Paris) to ask about how personal security concerns influence their travel behaviour in the city. The study found a marked difference by age and sex of users of public transport according to the time of day. Most passengers are male before 7am and after 8pm, and most are female between these two times; elderly passengers mostly travel in the morning and early afternoon, while in the evening about half of public transport users are in the 17-25 age group. Among respondents who either avoid public transport at certain times, or do not use it at all, security concerns were mentioned as the main reason by 22% of them.

Opinions on public transport stops and stations were also sought. Some 52% considered them to be clean, 20% thought they were dirty, 18% said there were not enough staff, 15% found them comfortable but 14% felt uneasy waiting at them. Similar questions concerned public transport vehicles. About 60% found them comfortable, 25% found them well-lit, 23% felt at ease travelling on them but 17% felt uneasy. In all cases, women were more likely to be dissatisfied with security aspects on public transport than men, while differences by age were less marked.

Just over half of public transport users had witnessed at least one act of aggression on public transport, with the aggression being directed at the respondent in 9% of cases. About 43% of incidents witnessed being verbal assaults, 30% being altercations between passengers, 18% physical assaults, 7% thefts and 2% sexual harassment. Some 59% of witnessed incidents took place on a public transport vehicle and 41% occurred at a stop or station. Only 24% of witnesses to an aggression on public transport tried to intervene while 76% did not intervene. The intervention was strongest among under 16s and over 70s.

The feeling of uncertainty among public transport passengers has been systematically studied in a German cluster activity (**SuSi-PLUS**). Darkness, potentially threatening people, emptiness and neglect among other factors have led to solutions like more security personnel, more light and friendly design of stations as well as technical support. The project found for example that 80% were positive about video surveillance on public transport.

These results highlight that security cannot be optimised by the development and use of technologies alone. Acceptance of such security measures is decisive, in particular in the context of the protection of transport infrastructures and the users of such infrastructures. The comprehensive solutions envisaged by many follow on security projects and programmes are therefore evaluated in terms of ethical, legal and data protection aspects, among others. The accompanying social research also includes the study of the requirements regarding education and training of rescue and security personnel. Such research also looks at the development of decision-making aids for authorities and emergency personnel.

An early initiative (**PRISMATICA**) brought together six urban public transport operators (including London Underground; RATP, Paris; and STIB, Brussels) and several research and technology laboratories from across Europe. It aimed to integrate technical systems and operational processes to develop innovative security management systems for transport operators. As such, it contributes to more general efforts to make public transport systems more attractive to passengers, and more secure both for passengers and staff. The capability of automatic systems to detect potentially dangerous situations has been demonstrated. Furthermore, it has been shown that distributed systems can promptly alert operators by providing multiple sensor views of the events. Real-world trials at various sites have demonstrated the feasibility of the approach.

In order to avoid security breaches at airports which could lead to attacks on aircraft, knowledge about suspicious passenger movements is needed as well as closer monitoring of individuals considered to pose a risk to secure operations. One solution is to perform a live trial in an airport with passengers or other staff carrying tags, with cameras and tag readers networked to process the images, and provide tracking and other information to an operator. The developers will know the likely requirements for the system, a plan for implementation and a clear understanding of the legal and ethical factors involved in implementation (**OpTag**).

Probably the most vulnerable means of passenger transport for attack is an aircraft and to date some 15,000 shoulder-launched infra-red guided missiles (MANPADs) are in circulation globally, in uncontrolled hands. To protect civil aeroplanes from remote attacks a laser-based DIRCM (Directed IR Countermeasure) module for jamming fired missiles has been designed (**CASAM**).

Hostile persons may go through the different airport controls and security measures, access an aircraft, and even initiate hostile actions. There is therefore a need to secure the aircraft itself as the last barrier to attacks. The implementation of on-board threat detection systems and the provision of reliable threat information to the flight crew is needed. In the decision making and response management process, secured air/ground exchange of information on threat levels is foreseen (**SAFEE**). The outcome has direct impact to security bodies at national, EU and international level.

Security of critical infrastructures related to public transport

Due to the nature of security projects, many research activities and results are confidential. The results and expected results of ongoing projects in this relatively young area represent typical examples of the research activities which are in the public domain.

So far most security investments have been done in the aviation sector, although far greater numbers of passengers use urban public transport. The **DEMASST** project is treating this issue, with a first phase defining a strategic roadmap and ensuring EU-wide awareness. This ongoing project's second phase will comprise a demonstration of a consistent and integrated set of urban public transport security systems to secure transport networks, nodes and platforms, taking into account the specific requirements for each sector/mode and the particular cross-border dimension of mass transport. This covers:

- public transport like metro, tram, short-distance regional rail transport, city buses, water buses, airport shuttles including all infrastructures like tunnels and bridges;
- surveillance systems designed to meet specific requirements for mass transportation networks, transfer nodes and platform interiors;
- interoperability of different surveillance systems managed by different operators and/or between different EU countries;
- comprehensive threat detection systems fusing data across diverse and distributed networks and analysing threats via spatial/pattern recognition techniques. This would enable the detecting, tracking and tracing of individuals, crowds and objects within, and across, transport systems, while respecting the personal integrity of individuals;
- post-event situation analysis systems capable of rapidly accessing and piecing together different multi-media and digital data to re-enact a sequence of events;
- common operational picture integrating and displaying data from a diverse set of sources on optimised man-machine interfaces utilising intelligence-based alarm management;
- neutralisation and containment systems for attack avoidance, suppression or nullification.

DEMASST has already developed a first system of systems map. System of systems in this context has to be understood as a collection of task-oriented or dedicated systems. These pool their resources and capabilities together to obtain a new, more complex, 'meta-system' which offers more functionality and performance than simply the sum of the constituent systems.

An overview has been provided of security technologies that are currently in use in European mass transportation. Furthermore, technologies have been identified that represent recent or ongoing research, serving to highlight areas in which new research may be needed. Around 40 FP6 and FP7 projects are currently developing and optimising these technologies.

A smaller part of FP7 security research is carried out within the sub-theme 'Sustainable Surface Transport', activity 4 'Safety & Security'. One of the key projects here is **ASPIS**, which is developing a prototype surveillance system based on autonomous, smart monitoring devices that capture data only upon the occurrence of an incident. When triggered, the devices propagate the alarm signal to their neighbouring devices. They also upload the captured data to a central station, provide an overview of the incident, offer a dedicated bi-directional communication channel and serve as a 'black box' recorder. The system is for unattended surveillance in public transport (vehicles and stations) and serves for prompt and reliable situation awareness during early, critical emergency phases. The system will be tested and validated in underground network (station and rolling stock) and on a large ferry vessel.

Research for Civil Security, a major German programme (including cooperation with other countries, notably France) covers the protection of transport infrastructures in all of the following modes:

- **Road:** A system of self-sufficient radio sensor nodes holds potential for application in many areas beyond 'robust sensing walls'. Fire-resistant, ductile, ultra high-strength fibre-reinforced concrete can be used in many constructions besides tunnels and increase their robustness and durability (**AISIS**). Based on different threat scenarios, effective protective measures will be taken for construction, operation and organisation of vulnerable road structures like tunnels and bridges (**SKRIBT**).
- **Rail:** New methods of information provision to facilitate more efficient rescue operations such as evacuations are being investigated for underground railways. The new system guides passengers during the self-rescue phase to safe non-contaminated exits (**ORGAMIR**). A further new system is under design to automatically identify and report critical situations at railway stations (**SinoVE**).
  A specific knowledge database is under development to provide all institutions involved with the coordination process during a mass event (rail transport) with appropriate information for decision-making (**VeRSiert**).
- **Air:** Though air security measures are at a high level in Germany, faster and even more reliable processes are sought. Furthermore, a new holistic security management concept for airport infrastructures is under development. A cost/benefit optimisation of such complex security systems has been simulated using an expert system for risk management (**Critical Parts**, **FluSs**, **SiVe**).
- **Waterborne:** A collaborative waterborne activity (**VESPER**) systematically reviews the current security standard and improves hazard prevention measures for ferries. The focus is on security during access to the ships as well as on the shipboard and seaward measures. The emphasis is on the use and expansion of surveillance measures and detection systems as well as on optimised handling processes, while new technologies are taken into account.

Innovative transport concepts

Despite extensive progress with establishing new public transport systems over the last decade (both physically and in terms of IT for example) public transport remains an area that needs strategic focus. Research aims to address three main strands.

Firstly, 'traditional' modes and systems continue to be addressed. The **EBSF** project for instance attempts to increase the attractiveness and raise the image of bus systems in urban areas, developing new vehicles and technologies in combination with operational best practices. Project results will be validated through implementation in six European cities, building on existing clean vehicular technologies. Another research project, Transport for London's **iBUS**, has been a high-profile success by demonstrating the advantages of fleet-wide use of AVL and in-vehicle information displays. This provides passengers with real-time stop and routing information and offers highly accurate Real-Time Passenger Information (RTPI) at bus stops based on data from over 8,000 buses (TfL, 2009).

Secondly, many new developments are now being undertaken through mobility-based 'cluster' projects, emphasising flexible transport services. The route, size of vehicles or departure time may be varied to suit the passenger and would include, for example, automated vehicles or Personal Rapid Transit (PRT). Initial projects in this area included **CONNECT** and more recently **NETMOBIL**. These aim to identify high-quality research in the area of new vehicle technology for transport, and find synergies between projects, applications and technologies. In addition, investigations into PRT were made within the **CIVITAS RENAISSANCE** and the **CITYMOBIL** projects. The two projects looked at a range of showcase technology demonstrations and carried out two major field trials in Sweden and France. They also involved the "ULTra" PRT – a type of personal automated taxi system running on its own guideway network.

Related to PRT, the Swedish project **Podcars** (IST, 2008) sought to provide a strategic foundation for government policies regarding the future stimulation of PRT. This includes defining how new technologies can make public transport more attractive, what the consequences are for architecture and urban planning and how to integrate PRT into existing transport systems and the role of public authorities.

The **NICHES** project established the state-of-the-art in developing innovative transport concepts including urban lift-sharing services, public hire bicycles, call-a-bus services and city-wide campaigns. It also assessed success factors, barriers and transferability of these concepts, and identified 11 integrated strategies combining the innovative concepts and measures to achieve specific objectives of urban transport and mobility policies. Its follow-on project, **NICHES+**, has recently been launched. It aims to promote these innovative measures for increasing the efficiency and sustainability of urban transport. Options are, for instance, tailored traveller information, passenger-friendly intermodal interchanges, infrastructure for innovative bus systems and mobile travel information services for the public as well as a range of new transport systems: PRT, Advanced City Vehicles and Cybernetic Transport Systems.

Finally, the importance of coordinating R&D is increasing. **EURFORUM** for instance attempted to coordinate policy and urban mobility within the urban sphere, complementing the functions of **ERRAC** and **ERTRAC** (see Chapter 7) and prioritising innovative technologies, systems and R&D. These objectives broadly shadowed those of **CAESAR**. Its focus complemented that of EURFORUM through its emphasis on both the 'competing' and 'complementing' areas of intermodality, freight and logistics. Additional coordination functions include establishing a range of information portals such as **ELTIS** bringing together policies and practices in this area.

6

European policy implications: What to do now?

The success of existing EU policies affecting passenger transport relies in part on the responses provided by industry, national, regional and local government and, in turn, associated research funding agencies. The commitment of all these actors is needed to enable EU institutions to respond to, and enact, policy directives and guidelines.

Organisations such as the International Association of Public Transport (UITP), the Community of European Railway and Infrastructure Companies (CER) and various national and European forums and associations all play a clear role in representing industry and operators. They provide an indication of how this diverse community is likely to respond. For example, the range of views in this community on current EU policy can be found in the **UITP's Strategic Research Agenda** for urban, suburban and regional public transport and urban mobility in the European Union (UITP, 2005). This was first published in May 2005 and has been updated several times since. National users' organisations, as well as European federations such as Transport and Environment (T&E) and the European Consumers' Organisation (BEUC) also play an informing and campaigning role.

The dependence on a wide range of actors to deliver policy poses challenges to the industry in pursuing EU policies on public transport attractiveness and on economic contribution. They also need to build more on intelligent transport, information and communication technologies that provide more user-oriented, integrated transport services, for instance, by drawing on mobile or Galileo-based technologies.

Making public transport more attractive has already been identified as being important. It is addressed through the **PROCEED** project, for example, which focused on improving attractiveness in small and medium-sized test cities of 25,000 to 200,000 inhabitants. The project produced guidelines and tools for increasing the success of public transport provision and strengthening its position within the transport planning process.

Another major theme is the added value of AVL. This is addressed in the RTPI area of the **CIVITAS RENAISSANCE** project. The link between congestion and road traffic volumes on one hand and planning on the other is now being looked at quite regularly. One example is **The Impacts of Land-use Planning on Transport Demand and Congestion** project (DfT, 2004). Other projects deal with best practice and methodologies for sustainable urban transport planning. For instance, the **PILOT** project developed a comprehensive methodology and tested it, going beyond the identification of best practices.

The interplay between public transport and urban planning is examined within the UITP position paper **Integrating Public Transport and Urban Planning: A Virtuous Circle** (UITP, 2009), which puts forward ten basic principles that should be followed. These include the consideration of public transport at the outset of any urban planning project; the involvement of a wide range of stakeholders; limiting car accessibility and adapting parking rules; design of public transport facilities with urban development in mind; and building a focus on accessibility and connectivity. The planned **ITS Framework Architecture for Urban Transport Mobility** (Action 2.3 of the ITS Action Plan (CEC, 2008)) also recognises this interplay, mentioning that architecture should take an integrated approach in areas such as travel planning, transport demand, and the use of parking and public transport.

Public transport is also a key enabler for many economic sectors which are of growing importance. One of these is tourism, which was highlighted in the Green Paper **Towards a New Culture for Urban Mobility** (CEC, 2007b) and is now being addressed through EU funding for the support action **CONCERTOUR**. This is dedicated to identifying policy solutions to create conditions for the provision of value-added transport services.

The **CIVITAS MOBILIS** project has already been actively investigating the potential impact of forthcoming satellite-based technologies, such as GNSS, EGNOS and Galileo. These systems will allow increased navigational accuracy, enhancing the information that can be provided to public transport operators, local governments, and above all, users.

Regarding ITS and ICT, some UITP recommendations seem to differ from – although complement - those of the European Commission's Action Plans for Urban Mobility (CEC, 2009c) and for ITS, two action plans that may affect future research directions. For example Action 1.5 of the ITS Action Plan advocates the

'Promotion of the development of national multimodal door to door journey planners, taking due account of public transport alternatives, and their interconnection across Europe'.

Theme 6, Action 20: 'ITS for urban mobility', of the Urban Mobility Action Plan promotes

'electronic ticketing and payment, ... travel information, ... and … (to) address the opportunities opened up by the European Galileo GNSS system'.

In this, it complements Theme 2, Action 6 – Improving travel information. As can be seen in Chapter 5 of this Policy Brochure, there are a range of excellent projects and initiatives now underway that support these themes.

UITP recommendations take a more detailed approach. For ITS, these advocate

- ***'further development of data transmission techniques, which take new research findings of the communications technologies sector into consideration';***
- ***'innovative design of systems and constituents' (such as potentially new and more flexible modes of transport), as well as***
- ***'research into innovative organisation and communications structures for public transport undertakings'.***

7

Outlook on research: What next?

Future developments will be driven by attempts to fulfil the European Commission's Action Plans for Urban Mobility and for ITS. UITP has already highlighted Action 6.4 of the Action Plan on Urban Mobility through its **Draft Position on Urban ITS Platform** (UITP, 2010), as being of specific importance for public transport. It refers to *'..the set-up of a specific ITS collaboration platform between Member States and regional/local governments to promote ITS initiatives in the area of urban mobility..'.*

It suggests further actions that may guide the research agenda over the next few years. An example would be the need to 'acknowledge the complexity of public transport information'.

As part of this process the UITP in **A Sustainable Future for Transport** (UITP, 2009b), highlights the need for *'regular exchange of experience to enhance visibility of good and replicable practices'.*

It cites cluster initiatives such as **CIVITAS** and encourages their enlargement. This process is in broad agreement with Action 5.18 (Contributing to international dialogue and information exchange) and 4.14 (Optimising existing funding sources) of the Action Plan on Urban Mobility, and actions which had additionally been taken forward by **SPUTNIC**. This project addressed the challenges faced by local and regional public transport systems in transition. In addition to technical issues, it examined institutional issues and financing. The project produced recommendations covering many areas, including framework conditions, seamlessness of services, marketing, customer satisfaction and business performance.

These directions will be complemented by the **Strategic Research Agendas** compiled by some **European Technology Platforms**.

European Technology Platforms and Strategic Research Agendas

A series of European Technology Platforms was set up in response to the Lisbon European Council. These platforms are led by industry and aim to define objectives for medium and long-term research and technical development. These include:

- **ERTRAC – the European Road Transport Research Advisory Council;**
- **ERRAC – the European Rail Research Advisory Council;**
- **ACARE – the Advisory Council for Aeronautics Research in Europe;**
- **WATERBORNE TP – the Technology Platform for the Maritime and Inland Waterway Sector.**

These organisations, supported under FP6, produced Strategic Research Agendas, covering a wide range of recommendations and actions, including the ones relevant to passenger transport services.

The **vision for road transport in the year 2020** states the aim that *'people of all ages, incomes and physical abilities have ready access to convenient transportation thanks to a combination of collective transport and private vehicles within a better-integrated intermodal framework'* (ERTRAC, 2004).

Research into multimodal interfaces and innovative provision of information are two of the suggested ways to help achieve this. The more recent **Road Transport Scenario 2030+** has a major focus on urban transport. It predicts that by 2030, urban mobility

will have changed due to socio-demographic evolution, urbanisation, increases in energy costs, more environmental regulations and more ICT implementation. It also expects that the demand for public and collective passenger transport will increase significantly and that new services and business models will emerge as a result of these challenges (ERTRAC, 2009).

The **ERTRAC Research Framework** has a major focus on urban mobility and recommends research in the areas of physical infrastructure, information technologies, traffic, vehicles (including in-vehicle services), external factors (such as technology awareness, climate change and aging populations), policy development (for instance on demand planning and on security) and new systems and services (ERTRAC, 2008). A revised Strategic Road Research Agenda is to be published by ERTRAC later in 2010.

The **Strategic Rail Research Agenda for 2020** contains a range of actions in the field of intelligent mobility, personal security and infrastructure. It recommends that future intelligent mobility research priorities should focus on the customer and improve the service flexibility demanded by increasingly sophisticated travellers. This includes making ticketing systems compatible across borders, and allowing for combination with urban transit through the development of e-ticketing and contactless payment systems with common interface protocols (ERRAC, 2007).

In the area of **security**, more research is recommended into the subtle monitoring of passengers, as well as instant communications using mobile phones, smartcard tracking or other innovative technologies, while respecting civil liberties. This could lead to physical barriers at stations being dispensed with.

Regarding **infrastructure**, research is needed into the 'station of tomorrow'. This should cover the need to cater for defined market segments and improve the interchange between transport modes.

UITP has recently identified the need for an additional advisory council dealing specifically with urban issues in its own Strategic Research Agenda (UITP, 2005). It is concerned that the current councils might not treat multimodal urban transport as a sufficiently high priority. In terms of technology, a greater emphasis may be needed regarding, for example, intermodal interchanges, integrated public transport services and information.

In a similar vein, **LINK** (the European Forum on Intermodal Passenger Travel) has produced a series of recommendations, mostly on deployment or on legislation, but often with research implications. These cover:

- door to door information and ticketing;
- intermodal networks and interchanges;
- integration of long-distance transport and the 'last urban mile';
- planning and implementation;
- context conditions for intermodality, such as travellers' rights, quality standards in tendering and licensing, and changing behaviour.

8

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Glossary

AVL	Automatic Vehicle Location
CEC	Commission of the European Communities
CER	Community of European Railway and Infrastructure Companies
CIVITAS	CIty-VITAlity-Sustainability: EU initiative for cleaner and better transport in cities, comprising projects co-funded under FP5, FP6 and FP7
DfT	Department for Transport (United Kingdom Government department)
DG MOVE	European Commission Directorate-General for Mobility and Transport
DG TREN	European Commission former Directorate-General for Energy and Transport (abolished in January 2010 with transport functions passing to the new DG MOVE)
EC	European Commission
EGNOS	European Geostationary Navigation Overlay Service
ELTIS	European Local Transport Information Service
EU	European Union
FP4/5/6/7	Fourth / Fifth / Sixth / Seventh EU Framework Programmes for Research and Technological Development
Galileo	GNSS currently being built by the EU and the European Space Agency (ESA)
GNSS	Global Navigation Satellite Systems
ICT	Information and Communication Technologies
IRU	International Road Transport Union
IT	Information Technology
ITS	Intelligent Transport Systems
PRT	Personal Rapid Transit (a type of personal automated taxi system running on its own guideway network)
R&D	Research and Development
RTPI	Real-Time Passenger Information
SIRI	Service Interface for Real-Time Information
TDM	Transport Demand Management
TEN-T	Trans-European Network – Transport
TRKC	Transport Research Knowledge Centre
UITP	Union Internationale des Transports Publics / International Association of Public Transport
UTMC	Urban Traffic Management and Control


Fahrkarten
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This Policy Brochure addresses the theme of collective passenger transport. This is defined as transport services where users pay a fare to travel and the service runs to a timetable. Passenger transport includes urban transport systems as well as local, regional and long-distance transport by bus, coach, train, aeroplane and ferry. This brochure focuses on themes such as quality, accessibility, comfort, information and security of transport, including vehicles, terminals and customer services before, during and after the trip.

It does not address public transport regulation or management, traffic management or travel by individual private transport (for instance by car, motorcycle or bicycle), nor does it address transport safety, which is a major topic in its own right.

It focuses on recent EU policy and associated research, mostly from European Framework Programmes, together with some key results and implications.

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