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Commission



Innovation in urban mobility

Policy making and planning

COMMUNICATING TRANSPORT RESEARCH AND INNOVATION

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Transport



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Preface

The EU recognises that urban transport plays a fundamental role in meeting the objectives of economic competitiveness, social cohesion and sustainable growth. In accordance with the subsidiarity principle, the EU is supporting local governments in tackling mobility issues which form common patterns across Europe.

Demand for passenger and freight transport is constantly increasing in cities and towns, contributing to congestion, pollution, and traffic accidents. Combating congestion is a common challenge for governments and transport authorities in all EU Member States. According to the EU, putting current mobility trends on a sustainable path requires a total rethink of urban mobility.

Local decision makers need to deliver sustainable and integrated transport policies that optimise the use of all transport modes in the urban network for both passengers and goods. The challenge is to respond to citizens' requirements for accessible, reliable, and safe transport. Meeting these challenges requires forward looking policies that incorporate innovative measures to meet pressing societal challenges and environmental constraints.

EU-funded research on urban transport is directed to supporting local decision makers in delivering sustainable and integrated policies and offering smart and green solutions. Fundamental research is backed by demonstration projects and pioneering initiatives to accelerate market take-up in cities and towns in Europe and elsewhere.

An essential element is sharing innovative solutions among local authorities and thus the exchange of research results and best practices is incorporated in research programmes.

This brochure is produced as part of the development of the EU Transport Research and Innovation Portal (TRIP), a comprehensive information source on transport research, development and innovation funded by the EU and the Member States. The brochure highlights the contribution of research and innovation to integrated and sustainable urban transport systems that support economic prosperity and social cohesion in Europe.



1

INTRODUCTION

Challenges in urban mobility

Increasing demand for passenger and freight transport in urban areas is a challenge for governments and transport authorities in all EU Member States. Congestion in cities and towns is contributing to air pollution and to traffic accidents, and is hampering accessibility. As well as the detrimental impacts on the urban environment itself, congestion adversely affects economic competitiveness, social cohesion and sustainable growth in Europe. Mobility issues in European cities and towns have reached such proportions that the EU is now calling for a total rethink of urban mobility.

Currently, some 74% of Europe's population lives and works in cities and towns, and by 2050 some 82% of the continent's population will be concentrated in urban areas (UN World Urbanization Prospects, 2011). Urban concentrations provide impetus for economic and social development, and cities and towns are key drivers of the economy, contributing up to 85% of EU Gross Domestic Product (GDP).

Efficient urban transport is essential to the competitiveness of European cities as commercial

and economic hubs in their national economies and for the EU in the global context. Cities are pivotal in long-distance transport and constitute the 'last mile' in many transport services.

Traffic congestion

Urban expansion and high dependence on the car and truck have led to congestion in cities and towns across Europe. Congestion and the accompanying issues of road safety and environmental pollution



present major challenges in planning for improved accessibility and reducing the environmental impact of transport. The priority is to create urban transport systems that meet individual needs for mobility and the economic and social demand for rapid and efficient movement of goods and people, safely and cost-effectively. An integrated component of efficient urban mobility is minimising environmental and health impacts, particularly in densely populated areas.

Changing mobility culture

Breaking the cycle of increasing urban congestion and accompanying impacts on economy, society and the environment requires a change in mindset by both decision makers and transport users. A new culture in urban mobility is needed in order to deliver integrated and sustainable transport planning, and users need to adapt their attitudes and behaviour with regard to mobility.

Effective transport planning involves more than constructing and extending transport infrastructure. It requires a strategy based on the principles of sustainable development, with optimal use of all transport modes in the local network. An integrated approach to urban mobility requires a global vision on urban transport policy and planning supported by appropriate decision-making tools and methodologies.

Transport users must be central in mobility strategies because individual choices affect the sustainability and efficiency of urban transport systems. Too often, user requirements for reliable, safe and easy access are met by the private car, further contributing to urban congestion and pollution. The challenge is to find appropriate strategies that provide effective alternatives to the car and that entice drivers, passengers and pedestrians to adopt more responsible mobility.

Societal and environmental challenges

With growing car dependency, an ageing population, and demands for new and flexible lifestyles, cities are faced with finding new transport solutions for rapid and easy movement of people. Furthermore, new technologies create high expectations for



smart mobility options, such as real-time traffic information for travellers, drivers, fleet operators and network managers. New technologies also bring opportunities for integrating data for journey planning and electronic ticketing, and smart cards to facilitate interoperability between public transport modes.

The challenges of global warming, scarce energy sources and increasing energy prices are on the top of European, national and local policy agendas. In this context, green solutions are needed to reduce the environmental impact of transport in urban areas. A major concern is to find ways and means to sustainably reduce transport emissions because urban traffic is responsible for 40% of CO₂ emissions and 70% of other emissions from road transport in the EU (EC, 2007a).

2

POLICY CONTEXT

Policy and research on urban transport

The strategic importance of urban transport in achieving the overall economic, social and environmental objectives of the EU is stressed in major EU policy documents and significant funding is provided for research and technology innovation for urban transport systems. Urban transport is now on the EU policy agenda with dedicated funding programmes to support cities and towns move towards a sustainable and integrated approach to urban transport.

Dedicated EU policy on urban transport

The principle of subsidiarity limits the EU in developing policies for implementation at national and local level. However, concerns about the importance of the urban dimension in meeting transport policy targets have led the EU to develop a strategy on urban transport compatible with the principle of subsidiarity. This is also evidenced by the prominence given to urban transport in research funded under major EU framework programmes.

The first move to a strategy on urban transport was made in 1995 with the Green Paper *Citizens' Network* and was followed in 1998 with the Communication on *Developing the Citizens' Network*. To promote sustainable transport and to meet mobility needs, initiatives were taken on information exchange, benchmarking, and the targeted use of structural and research funds.

More recently, a comprehensive policy framework on urban transport was presented in the Green Paper *Towards a New Culture of Urban Mobility* published in 2007, which was complemented by targeted actions in the Action Plan on Urban Mobility of 2009. Inclusion of a dedicated section on urban transport and commuting in the 2011 White Paper *Roadmap to a Single European Transport Area* further underlines the priority given to urban mobility in EU transport policy.

In addition, the European Commission's *Thematic Strategy on the Urban Environment*, adopted in 2006, stresses the contribution of urban mobility trends to the environmental challenges faced by many cities and towns in Europe. These challenges include air pollution, greenhouse gas emissions, noise hindrance, damage to the built environment and social exclusion, as well as increasing traffic volumes and congestion.

All policy documents highlight the EU's facilitating role in defining policies that are further worked out and implemented at local level in the Member States. The EU does not impose top-down solutions, but rather outlines policy guidelines to support cities and towns in moving towards a new mobility culture through developing and adopting sustainable and integrated approaches to urban transport.

Dedicated framework for research and innovation

The EU supports implementation of sustainable transport policies and measures at local level with research funding for developing sustainable and innovative urban transport solutions. In addition to Structural and Cohesion Funds, research on urban transport is included in the Framework Programmes for Research and Development. The first dedicated framework for research targeting cities was introduced in the Fourth Framework Programme

CIVITAS INITIATIVE

Launched by the European Commission in 2002 as a programme 'of cities for cities', the **CIVITAS** Initiative promotes a new urban mobility culture based on integrated planning of all modes and forms of urban transport. Ambitious strategies are being implemented, demonstrated, and evaluated directed to increasing the mobility of all citizens and to providing more sustainable urban transport systems. A key element of the programme is the exchange of knowledge and results in 'demonstration' cities with stakeholders in other urban areas in Europe. By linking cities with common mobility challenges, CIVITAS facilitates exchange of know-how, ideas and experience, and offers financial and technical support to local authorities.

Strategies for sustainable urban mobility focus on:

- Energy efficient, cost-effective and clean public and/or private vehicle fleets;
- High-quality and innovative collective passenger transport;
- Demand management strategies based on economic tools, regulatory measures and tele-services;
- Mobility management plans and communication campaigns for managing mobility demand;
- Safe and secure road infrastructure and transport for all users;
- New forms of vehicle use and/or ownership and a less car-dependent lifestyle;
- Energy-efficient freight logistics and new concepts for goods distribution;
- Innovative transport telematics systems for traffic management and travel support.

The CIVITAS community has become a driving force for innovation in cleaner and more efficient urban transport in Europe. Currently, the community includes 58 demonstration cities and over 200 cities in the Forum Network, representing 68 million citizens in 31 countries. The number of participating cities is constantly increasing.

www.civitas.eu

See CIVITAS presented as a success story in the TRIP Policy Brochure '*Innovating for a competitive and resource-efficient transport system*' (page 11).

(FP4), following the first Transport White Paper in 1992. The Fifth Framework Programme (FP5), under the action *City of Tomorrow*, had a large component dedicated to sustainable urban transport.

Introduced in 2002 under the Sixth Framework Programme (FP6), the CIVITAS Initiative is an example of how research is contributing to meeting policy objectives. CIVITAS is the backbone of EU research on urban transport with an integrated package of measures on sustainable and efficient urban transport systems (see text box).

The Seventh Framework Programme (FP7) includes an activity area on sustainable urban mobility, and the forthcoming Horizon 2020 framework programme for research and innovation includes 'Improving transport and mobility in urban areas' as a specific activity in achieving smart, green and integrated transport.

Targeted research on urban transport

EU-funded research on urban transport focuses on developing mobility strategies and solutions for passengers and goods in cities and their hinterlands, and on reducing congestion and pollution in urban areas. The objective is to provide decision makers at local and national level with innovative methodologies

and tools to deliver sustainable and integrated policies and plans. To this end, research is directed to improving traffic planning and demand management with the use of intelligent transport systems, and to facilitating high-quality public transport and non-motorised transport.

Research is also directed to increasing the attractiveness of public transport for all citizens. Attention is being given to making transport more accessible and safe by optimising access to and security of vehicles, and by improving interoperability between transport modes. An essential element in making public transport more attractive is improving its image and the perceptions of citizens.

Research is ongoing for the next generation urban vehicle with lower emissions and higher energy efficiency. Innovative approaches to city logistics are being developed that incorporate new mobility concepts and seamless mobility services. Urban areas are becoming 'laboratories' for technological and organisational innovation in transport and mobility.

From fundamental research to the market take-up

New developments are brought closer to the market through applied research in demonstration

projects, pioneering initiatives, and market take-up actions. The switch to cleaner vehicles and transport modes is also promoted in innovative and green procurement strategies, and in changes to regulations for urban areas. In addition, participatory processes engaging stakeholders help to bridge the gap between research and market take-up. The EU promotes sharing innovative solutions with transport operators, key stakeholders and citizens by including dissemination of results and best practices in research programmes, and through information and communication tools such as the ELTIS portal.

Launched by the European Commission in 2003, the **Intelligent Energy Europe programme (IEE - STEER)** focuses on initiatives in energy saving and efficiency in the transport sector. In putting 'intelligent energy' into practice, STEER promotes market take-up of innovative measures, ranging from new and renewable fuel sources to enhanced alternative fuelled vehicles, and promotes non-motorised transport such as cycling and walking.

In July 2012, the European Commission presented its proposal for a European Innovation Partnership in Smart Cities and Communities. The Partnership aims



ELTIS

Created more than ten years ago, **ELTIS** is now Europe's main portal on urban mobility supporting the development of urban transport that uses less energy and produces less emissions, while improving urban competitiveness, and the mobility and quality of life of citizens. The site presents information on fundamental research, applied research and demonstration projects, as well as innovative solutions adopted by individual towns and cities. In addition, the website provides news and tools for policy makers and transport experts.

www.eltis.org

to boost the development and wide-scale application of smart technologies in cities – by pooling innovations in energy, transport and ICT.

THE SMART CITIES INITIATIVE

Smart urban solutions can make a major contribution to addressing the dual 'urban' objectives of reducing greenhouse gas emissions and delivering more efficient public services.

The European Innovation Partnership (EIP) in Smart Cities and Communities is a European Commission initiative proposed in 2012. Its added value is to connect local initiatives (existing partnerships of local government, business and community-based organisations) and to offer tools for meaningful exchange and assistance to cities, civil society and business for using smart city solutions to meet their local needs.

The Partnership's stakeholders define joint targets for 2020 and more specific operational objectives, they analyse barriers, and develop a shared innovation agenda ('Strategic Implementation Plan'). This Strategic Implementation Plan is followed through by the Partnership's members in cooperation with each other. They bring in their own commitments and contribute to mobilise other resources. In support of an EIP, the European Commission uses all its policy instruments;

political leadership, innovation and deployment support, standardisation mandates and regulatory measures. The Strategic Implementation Plan (running till 2020) will be presented by the European Innovation Partnership's High Level Group this autumn.

Developing 'smart cities' is not 'business as usual', nor is it a 'one size fits all' approach. It will engage many sectors (ICT, transport and energy) and areas (e.g. finance, technology, legislation, procurement). Increased cooperation between policy sectors and joining-up of measures taken by European, national, regional and local government organisations is essential to spur on local action and investment.

For more information, the Smart Cities and Communities Stakeholder Platform is available at: www.eu-smartcities.eu.

**Smart city solutions could include: innovative, integrated technologies and services with applications in buildings (heating/cooling), grids, mobility, traffic management, broadband communications that contribute to sustainable development in cities and communities.*

3 POLICY PRIORITY

Integrated and sustainable transport planning

The EU policy objective of reducing dependency on the private car is pivotal in achieving cleaner and more efficient transport in urban areas. The framework conditions have been created and financial incentives provided to support local authorities in developing Sustainable Urban Mobility Plans. At local level, sustainable mobility requires a long-term vision together with strong political will, and the support of innovative solutions based on sound research. Over the years, EU-funded research has contributed to broadening the range of measures that regulate transport demand while improving alternative and sustainable mobility offers, particularly in public transport.

Sustainable transport planning requires an integrated approach to manage transport demand and to provide services that enhance the overall urban system and surroundings. Thus, an integrated package of measures needs to be developed that includes consideration of the environmental and social impacts of transport, and that makes effective use of public space. Research has led to the development of tools,

models and field demonstrations to support decision makers in adopting integrated strategies and innovative solutions, understanding the social and environmental implications of policy options as well as the costs and benefits.

Sustainable transport planning requires policies and measures that cover all modes and forms of transport in the urban agglomeration, including



public and private, passenger and freight, motorised and non-motorised, moving and parking vehicles (see text box). Research has widened the scope of measures to be incorporated in sustainable mobility plans including, for instance, advances in urban traffic management systems, technological advances in public transport, and new mobility concepts.

Finally, sustainable transport planning is a matter for multi-level governance and requires synergies between regional and national administrations. Furthermore, early participation of stakeholders in local decision-making contributes to wider acceptance of new mobility measures. Various research initiatives have developed innovative ways to establish coordinated dialogue between policy makers, stakeholders and civil society.

Urban traffic management

Increasing transport demand is creating a major challenge in traffic management in urban areas

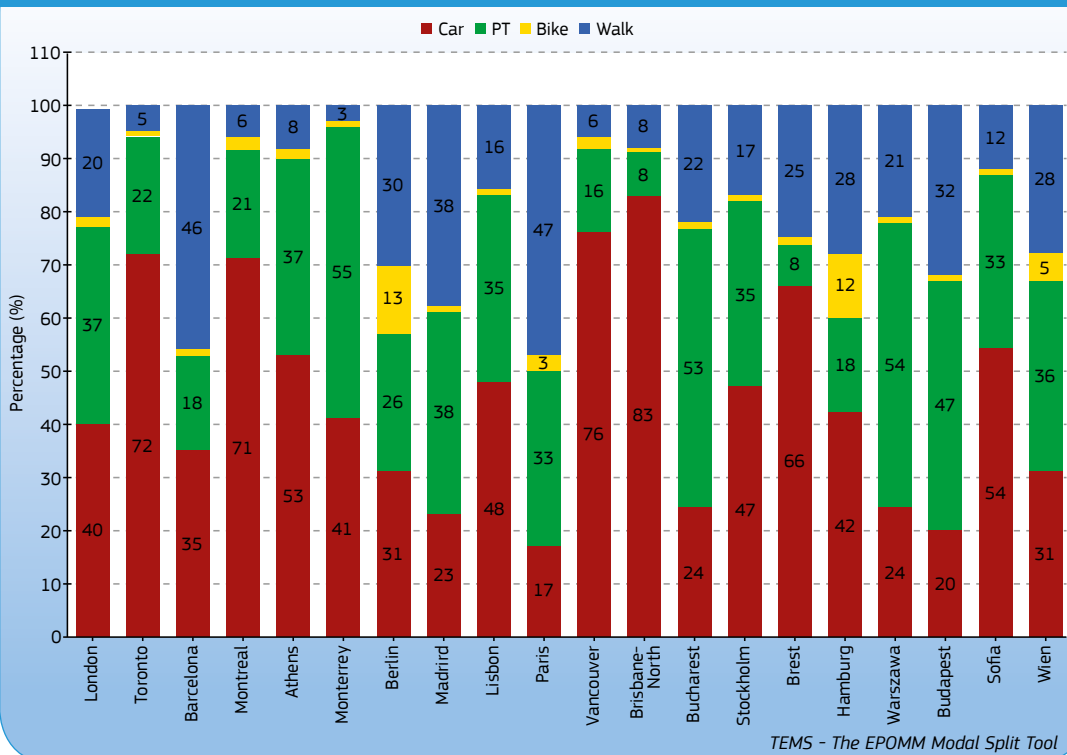
SUSTAINABLE URBAN MOBILITY PLANS (SUMPS)

The European Commission supports local authorities across Europe in developing Sustainable Urban Mobility Plans (SUMPS). A dedicated website has been set up to provide information and guidelines on how to develop and implement such a plan and provides examples of best practices. The website also provides information on events related to SUMPS that are organised with EU support. These events include technical training and awareness raising initiatives, such as the Sustainable Urban Mobility campaign, that give an award to European cities based on their SUMPS.

www.mobilityplans.eu

throughout Europe. Decision makers have at their disposal a wide range of technology solutions that have emerged from recent research and development, especially in Intelligent Transport

Figure 1. Modal split in cities with more than 500 000 inhabitants





Systems (ITS). These systems are now being employed to optimise use of road infrastructure and to manage urban traffic flows by balancing road use by private cars, public transport and freight vehicles, optimising energy consumption, and reducing congestion and transport emissions.

Traffic management can be further improved through integration and interoperability of the transport networks. To this end, there is increasing emphasis in urban areas on interconnecting road, rail, underground metro infrastructure and services, bus lanes, cycle lanes and pedestrian zones. The aim is to facilitate a shift to more environmentally friendly transport modes and to increase efficiency in freight logistics. The EU has funded various projects on data collection, monitoring and analysis of modal effects, and on ITS for integrated traffic management and multimodal information. Studies and implementation projects have demonstrated that innovative concepts, such as green zones, urban charging schemes and e-mobility, improve the performance of transport networks.

In addition to providing infrastructure such as new tramlines, roads and cycle lanes, mobility management can influence transport demand to some extent. Research has focused on information and communication on alternative transport options, such as awareness raising and information campaigns, organisation of sustainable home-work and home-school transport services, and mobility measures for large events. Investigations indicate that such measures do not require large financial





investment and may have a high cost-benefit ratio. The concept of mobility management has been investigated in various research projects, and a wide range of measures have been developed.

High-quality public transport

Public transport is highly efficient in terms of space per traveller and for mobility in densely populated areas. One bus can carry as many people as approximately 30 cars, while occupying the road space of just three (IRU, 2009). Thus, affordable and family friendly public transport solutions are essential in reducing car dependency.

The EU supports public transport and EU legislation regulates a large proportion of public transport investment and operations. The EU Regulation on Public Passenger Transport Services by Rail and Road (Regulation EC no 1370/2007) sets out conditions for competent authorities to grant exclusive rights and/or compensation to public service operators. The aim is to guarantee efficient, attractive, and high-quality passenger transport because this is in the public interest.

EU-funded research on public transport aims at developing and introducing more efficient vehicles and infrastructure, and integrating services into the urban transport network. Directed to stimulating use of public transport, research has been carried out on infrastructure design (such as, accessibility of stations), operational and maintenance systems, and on the public image of the public transport services.

Research on intermodal public transport is directed to seamless transfer from one mode to another by, for instance, smart ticketing systems and travel planners. Other innovative solutions include combined public transport, and car and bicycle sharing services.

New technologies are being developed to improve public transport use, such as PRT (Personal Rapid Transit), BRT (Bus Rapid Transit) and GRT (Group Rapid Transit), and new services such as demand responsive public transport. These technologies and services are being tested in the CIVITAS Initiative, in the CityMobil projects and in the Intelligent Energy – Europe (IEE) programme.

Sustainable mobility concepts

Research has shown that sustainable mobility concepts include solutions that stimulate sustainable car use (such as car sharing and car pooling) and use of flexible public transport services such as buses on demand.

Increasing attention is being given to non-motorised transport. For instance, cycling, which has moved from a 'sustainable' to a 'trendy' solution, is gaining acceptance in major European cities with bike sharing becoming a common form of mobility. Walking is being stimulated in a growing number of innovative initiatives, such as the 'pedi-bus' for children walking to school. To increase the attractiveness and safety of walking and cycling, EU research has funded initiatives to integrate these modes into the urban transport networks. The EU financed the development of a toolbox for a bicycle policy audit, an instrument that has helped to assess and improve local and regional cycling policy in more than 100 cities in 20 countries (ByPAD, 2008).

EUROPEAN BUS SYSTEM OF THE FUTURE (EBSF)

Buses to strengthen sustainable urban mobility

Project reference: European Bus System of the Future
Status: Completed
Total cost: €26 000 000
EU contribution: €16 000 000
Coordinator: INTERNATIONAL ASSOCIATION FOR PUBLIC TRANSPORT (UITP)
Website: www.ebsf.eu



Some 30 billion people travel by bus every year in cities throughout Europe but the bus is still perceived as the least attractive form of public transport. Bringing together 47 stakeholders in the bus sector, the European Bus System of the Future (EBSF) project launched a bus renaissance. For the first time, Europe's leading bus manufacturers have pooled resources in pre-competitive research to define innovations in urban buses. The R&D project is focusing on providing passengers with real-time multimodal information, quality services with improved accessibility, enhanced comfort, and on-board services. In addition, R&D included improving commercial speed by shortening journey times, improving reliability and punctuality of services, and enhancing safety for passengers and drivers.

BACKGROUND

All EBSF partners shared the conviction that the bus is the most versatile solution for urban transport in the new reality in European cities. The project aimed to rehabilitate the image of the bus by focusing on the system as a whole, which includes the vehicle and its integration into the city, infrastructure design, operations and maintenance, and governance. Promising solutions and standards have been developed

and tested based on in-depth analysis of bus stakeholder needs. As a result, the EBSF vision has been formulated for the bus system for the future to respond to passenger needs, social and environmental requirements, and goals in urban planning. It promotes political support and legislation, and presents a strategic research agenda for urban bus systems to secure global leadership. The main characteristics of the future bus system have been defined including reference architecture and basic functionalities.

RESULTS

Through the application of a system approach that incorporates vehicle, infrastructure and operation, EBSF has established innovative and high-quality bus operations in a new generation of urban bus networks in Europe. The EBSF system has been designed in its basic characteristics and functionalities. In addition, new key technologies and operational concepts have been developed, simulated and tested in urban scenarios. Four prototype vehicles have been tested by partner operators in eight cities across Europe: Bremerhaven, Brunoy, Budapest, Gothenburg, Madrid, Paris, Rome and Rouen. EBSF set up the initial framework for the harmonisation and standardisation of the solutions developed.

EBSF an intelligent system

To make efficient use of information, EBSF IT architecture was set up based on open technology to give operators and authorities access to public transport data from all over Europe by means of common mechanisms, standard rules, and protocols. This easy to install and cost-efficient architecture was tested in Madrid, Bremerhaven, Rome and Brunoy.

Innovative vehicles and infrastructure

The pioneering activities in the EBSF partner cities demonstrated a range of improvements in accessibility, functionality, and comfort for

passengers and drivers. These improvements include:

- An improved central driver cabin to increase driver safety and to provide a better view of the traffic situation;
- Wider and/or additional doors combined with gap filler and height regulation systems that improve accessibility for all and reduce time at stops;
- A new modular internal bus layout with folding or sliding seats enabling the driver to adjust space according to the passenger flow, providing room for more passengers in peak periods and more seats in non-peak periods;
- Improved on-board e-services with screens providing information on real departure times and disruptions with alternative routes, and tourist and public service information.

Integrated in European urban scenarios

EBSF is adapted to modern and old cities, and takes account of future mobility trends and services for passengers and operators. For example in Paris, the EBSF bus station offers diversified services to fulfil both transport and urban requirements: electric bikes for better inter-modality, library, public Wi-Fi, dedicated space for mobile retailers. EBSF can become the core of the transport network for seamless mobility of urban citizens.

Further steps

More than 100 bus stakeholders contributed to the EBSF Roadmap, which identifies key areas and priorities for research on bus systems. Incorporated in the European Road Transport Research Advisory Council (ERTRAC) programmes, the EBSF Roadmap focuses on:

- integration of bus systems in urban scenarios;
- standardisation and development of pilot applications for the IT platform;
- energy and environmental issues in electrification and hybridisation;
- development of vehicle technology to improve comfort, accessibility, and operational capabilities;
- modularity, a system approach including vehicle, infrastructure and operations;
- mobility for all.



4 POLICY PRIORITY

Mobility needs of EU citizens

To be an effective alternative to the car, public urban transport needs to be easily accessible, reliable, safe and secure. In achieving these objectives, the special needs of user groups in different cities need to be taken into account. European policy and research are dedicated to developing innovative solutions to attract more passengers to collective modes of transport.

More accessible urban transport

Easy access to efficient transport services – whether road, rail or waterborne – is essential to the quality of life of people in urban areas. Implementing policy to improve accessibility requires innovative solutions to remove economic and social barriers to mobility and to improve access to regular services in all appropriate transport modes. Policy focuses on improving the mobility of the disabled, the elderly, people travelling with small children, and people travelling with heavy baggage. This includes improving access to subway

stations, tram stops and bus stops. EU-funded research is testing new technologies and concepts to make public transport facilities more accessible for people with reduced mobility.

Under the CIVITAS initiative, a number of pilot projects are being conducted in European cities to test new accessibility concepts, such as talking bus stops and specially designed tram stops, and smart access facilities for wheelchairs. Accessibility of public urban transport has been incorporated in the EU Disability Strategy 2010-2020, directed to providing the



disabled with access to urban and other transport facilities on the same basis as able-bodied people.

Attention is being given to access to public transport for people who are socially and economically disadvantaged. This applies particularly to people living on the outskirts of urban areas that are often insufficiently integrated in urban transport networks. Research is focusing on closer coordination of transport planning with land use, housing and social cohesion to ensure more accessible jobs, services and facilities to help overcome social exclusion.

The key policy focus is to provide all citizens with easy access to alternative transport solutions to the car. Policy is directed to improving journeys within and between towns and cities that frequently require intermodal transfers. In support of such policies, research is being carried out to improve the physical integration of transport modes, thus making intermodal transfers and public transport easier for all citizens. For instance, EU-funded research is testing travel by bus in combination with publicly available or free bicycles in some cities. Research is also assessing the impact of easier access for cyclists and pedestrians.



Reliable and transparent information

An essential element in making public transport more accessible and thus a more attractive alternative to the car is adequate, reliable and up-to-date information. All passengers – commuters, local residents, visitors – need real-time information to make choices on when and how to travel, such as schedules, travel options, orientation guides, connecting services, and alerts to delays.

In Europe, research is being conducted to develop user-oriented information technologies and optimal channels to meet the needs of different user groups. One such measure being tested in European cities is personalised travel plans. Travel information centres in several cities are now providing citizens and visitors with real-time travel information and transport planning services both face-to-face and via the web.

While reliable information is often available for individual transport modes, information on intermodal transport tends to be limited in many EU Member States. Research programmes in cooperation with national public transport operators and authorities are developing central platforms for integrated information on transport modes. Users with a portal on multimodal public transport within the EU and particularly in major urban centres. The EU aims to provide a unique internet portal to facilitate multimodal trip-planning in and between major urban centres in Europe.

Research projects have focused on establishing common standards to ensure that information platforms are openly accessible through various types of mobile devices. This enables efficient pooling of information, which can be accessed by transport operators, infrastructure managers, information centres, and users before and during a journey. EU-funded research is also developing transport information systems to meet the specific needs of the disabled.

Safe and secure urban transport

Over the last ten years, transport has become safer because of improved safety standards and technologies, and better transport management. Nevertheless, safety in urban areas is affected by a

combination of factors including increasing transport demand, integration of transport into residential areas and increasing shortage of space in city centres.

To improve the safety of vulnerable groups - pedestrians, cyclists and motorcyclists - the European Commission supports the implementation of safety standards and systems with legislation and guidelines for local authorities. For instance, EU legislation makes it mandatory for motor vehicles to have energy absorbing car-front structures, advanced braking systems and blind-spot mirrors. Traffic regulations are examined to ensure effective incentives are provided for safe driving and safe behaviour in transport.

Legislation is complemented by EU-funded research initiatives that focus on advanced solutions, such as improved visibility of vehicles and infrastructure, speed management systems, traffic-calming measures and dedicated infrastructure for non-motorised transport. The EU is providing implementation support through the CIVITAS initiative, which is testing measures such as speed reduction zones, optimal lighting, separate cycle lanes, and campaigns on safe behaviour in transport.

In recent years, incidents in cities in Europe and around the world have shown that urban transport users are more vulnerable to robbery, violence, and terrorist attack. Furthermore, surveys indicate that low perceived security is a key barrier to public transport for many potential users. Security of urban passenger transport is a key element of the EU Internal Security

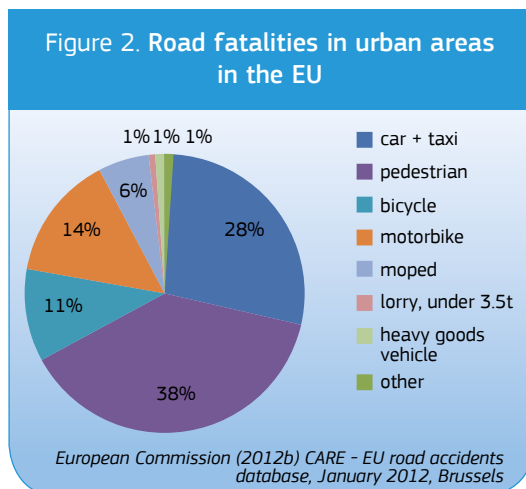


Strategy and of the EU strategy in the fight against terrorism. To ensure that increased security does not compromise ease of travel, research initiatives have been set up to develop efficient and effective security concepts.

Security measures for different transport modes have been developed and tested in CIVITAS projects in cities throughout Europe. These measures include installation of cameras in buses, trams, trains, stops and stations, and closer cooperation between transport operators and local security authorities. Surveys of public transport users, for instance in Stuttgart (Germany) and Malmö (Sweden), have shown that these measures have raised passenger confidence in the security of public transport.

Research is supplemented by a coordinated approach in all Member States to harmonise controls and to close security gaps. For this purpose, the European Commission has set up the Urban Transport Security Expert Working Group with a mandate to facilitate cooperation and exchange of experience between national authorities and transport operators. Security criteria and benchmarks are being developed to enable authorities and transport operators to assess security levels and to apply the most efficient and effective measures.

Figure 2. Road fatalities in urban areas in the EU



ACCESSIBILITY FOR ALL

MEDIATE

Reference: FP7-218684**Status:** Completed**Total cost:** EUR 1 097 797**EU contribution:** EUR 1 097 797**Coordinator:** STIFTELSEN SINTEF, Norway**Website:** www.mediate-project.eu, www.aptie.eu/site

ACCESS2ALL

Reference: FP7-218462**Status:** Completed**Total cost:** EUR 797 422**EU contribution:** EUR 797 422**Coordinator:** EUROPE RECHERCHE TRANSPORT, France**Website:** www.access-to-all.eu

Mediate and Access2All projects represent the start of a paradigm shift in urban public transport for disabled and vulnerable groups in switching from ‘tailored’ measures for a few to ‘inclusive’ solutions for all. These projects have developed a common methodology for assessing accessibility of public transport services and have identified best practices on how to improve urban mobility, thus eliminating barriers to public transport for the disabled, elderly and other ‘transport vulnerable’ citizens. The key success factors in these projects were the involvement of large user groups with different types of physical, social or economic disadvantages, and the development of innovative, advanced tools to promote inclusive-design solutions for all.

BACKGROUND

One in ten people in Europe is over the age of 60, and according to the United Nations, 10% of the population has some type of disability. To make transport accessible and user-friendly for everyone, travel opportunities need to be equitable for all. This includes

people for whom public transport is physically too far from where they live, and disabled people for whom public transport is not accessible to travel in relative comfort.

Even though disability-inclusive design, planning, and evaluation of public transport are well recognised at national level, much



needs to be done to implement measures in towns and cities where disadvantaged user groups live. This discrepancy prompted the European Commission to launch the Mediate and Access2All projects to establish a common framework to combat social exclusion and to provide access for all to public transport in urban areas. Both projects focused on meeting the day-to-day mobility needs of the disabled and other vulnerable groups for safe, reliable and comfortable public transport.

RESULTS

The projects resulted in solutions in urban mobility for disabled and vulnerable groups, thus breaking down barriers to public transport and providing transport on equal terms with able-bodied users. In close consultation with all user groups, tools were developed to assist public authorities and transport operators to improve access to public transport.

The Access2All project carried out a detailed user needs analysis and prepared a directory of best practices, which includes innovative

concepts for vehicles, infrastructure, services and public information directed to eliminating barriers in the public transport chain. In addition, a software tool was developed to assess the accessibility level of buses, stations and hubs, as part of an overall assessment of the accessibility of a route. Based on the results, best practices have been proposed to improve accessibility of routes and involving infrastructure.

The Mediate project developed a set of European indicators to measure accessibility of urban public transport, providing a self-assessment tool to support stakeholders in assessing the strengths and weaknesses in the transport system, and in defining appropriate actions. The project created a Europe-wide user platform for groups facing barriers to public transport.

Initiated by the Mediate project, the Accessible Public Transport in Europe portal (www.aptie.eu/site) has become the one-stop shop for initiatives, case studies, policy and standards, research and training on accessibility in Europe.



5 POLICY PRIORITY:

Innovative and green urban transport solutions

EU action supports local authorities in introducing innovative and green urban transport strategies. The 2011 Transport White Paper stresses the need to phase out ‘conventionally fuelled’ vehicles in the urban environment and to introduce lower emission vehicles. Moreover, the White Paper addresses a strategy for near zero-emission urban logistics in the EU by 2030 and the need for innovative approaches to city logistics. The EU supports pricing and market-based approaches in shifting towards cleaner transport, including new green procurement schemes.

Greener urban transport contributes to reducing transport’s impact on climate change, the environment and human health. While these problems occur at local level, their impacts extend beyond city boundaries. Thus, greening urban transport requires a collective effort at all levels - local, regional, national and EU.

Setting a policy framework at EU and national level for the market uptake of cleaner vehicles

and alternative fuels supports urban transport policy while respecting local competences and responsibilities. The EU approach is to provide incentives for consumers and public authorities to purchase more environmentally friendly vehicles.

New vehicles and fuel technologies

Transport in Europe is heavily dependent on oil, which accounts for 94% of the sector’s fuel consumption. At least 84% of oil is imported from unstable regions. This situation leads to concerns about security of supply as well as to a significant deficit in the EU trade balance and increasing costs to the environment. Road transport alone contributes two-thirds of transport-related emissions of greenhouse gases.

New technologies are being developed to enable a sustainable shift from fossil-driven to decarbonised transport. Promising alternatives are now being investigated to bring them closer to market entry. To facilitate the development of a single market for alternative fuels for transport, the European Commission launched the Clean Power for Transport strategy in 2013. A key activity is the evaluation of alternative fuels to substitute oil such as:

- Electricity, hydrogen and biofuels;



- Natural gas in the form of Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), or Gas-To-Liquid (GTL);
- Liquefied Petroleum Gas (LPG).

Strategies on public transport focus on large vehicle fleets such as buses that are particularly suitable for alternative propulsion systems and fuels. The EU is supporting large-scale demonstration projects for alternative bus fleets in various cities in Europe, for instance in Budapest, Gothenburg, and Madrid, as shown in the EBSF project (see page 11).

The EU Green Cars Initiative is directed to technologies and infrastructure essential for breakthroughs in the use of renewable and non-polluting energy sources. Research focuses on internal combustion engines, biofuels, electric and hybrid vehicles, logistics, and hydrogen fuel cells.

In addition to alternative fuel technologies, the switch to cleaner transport in urban areas is facilitated by shorter travel distances, making

lower range vehicles viable options such as cars with electric propulsion, electric bikes and personal transporters (for example, Segways).

Innovative approaches to city logistics

Optimising freight transport logistics is paramount to reducing urban congestion and vehicle emissions. However, to ensure efficient 'last-mile' delivery, the entire freight logistics chain needs to be optimised, including links between long-distance, inter-urban and urban transport. The goal is to reduce 'last mile delivery' to the shortest possible route because delivery in urban destinations has been shown to be the most inefficient part of the logistic chain. In addition to TEN-T funding for urban freight transport, EU-funded research is developing approaches to freight delivery in urban areas that involve re-organising logistic flows and using ICT tools in logistics management.

Research has led to innovative approaches, such as the CityLog project, which is increasing the sustainability and efficiency of urban goods



CLEAN POWER FOR TRANSPORT

In 2013, the European Commission launched the Clean Power for Transport (CPT) initiative to break the over-dependence of European transport on oil and to facilitate the development of a single market for alternative fuels in Europe.

The *Communication on Clean Power for Transport: A European alternative fuels strategy* evaluates the main alternative fuel options available to substitute oil, and suggests a comprehensive list of measures to promote the market development of alternative fuels in Europe.

A *Proposal for a Directive on the deployment of alternative fuels infrastructure* aims to ensure the development of an alternative fuel infrastructure and the implementation of standard technical specifications across Europe. It also defines fuel labelling at refuelling points and on vehicles to ensure clarity in the consumer information on vehicle/fuel compatibility.

The Clean Power for Transport is built on extensive consultation with industry and civil society, public authorities and the wider public.

delivery through adaptive and integrated mission management, and innovative vehicle solutions.

Innovations and best practices are being promoted across the EU through coordinated actions and support initiatives. These initiatives focus on promoting efficient management of freight logistics through exchange, discussion, and transfer of policy experience, knowledge and best practices. Largely based on this research, the 2011 Transport White Paper proposes a strategy for near zero-emission urban logistics by 2030. This strategy incorporates measures to stimulate the establishment of multimodal logistic centres on city outskirts and the deployment of local trains, river transport and subway networks for night freight movement.

Technological advances have opened the way to establishing a roadmap for integrated ICT applications for an information management system for freight movements throughout the EU. This concept known as e-Freight will operate in and across transport modes.

Pricing and market-based solutions

In contrast to the benefits, the cost of the environmental impacts of transport is generally not borne by the transport user. Policy intervention is needed to ensure that users take into account these external costs in making transport decisions. The Action Plan on Urban Mobility promotes internalisation of external costs in the urban context, and a corresponding EU framework is presented in the 2011 Transport White Paper. Research is being carried out on the effectiveness and efficiency of pricing solutions based on the user pays principle. Studies include implementation issues such as public acceptability, social consequences, cost recovery, availability of ITS tools, and how urban pricing policies can be combined with other green zone arrangements.

A step further in the user pays principle is the integration of environmental impacts into procurement decisions with the development of guidelines and legislation on Green Public Procurement (GPP).

The Directive 2009/33/EC on the Promotion of Clean and Energy Efficient Road Transport Vehicles requires that energy use and environmental impacts of a vehicle over its life cycle are incorporated in purchase decisions. The directive covers vehicles purchased by public and private entities providing public transport services. Such requirements are expected to enhance market uptake of environmentally friendly vehicles, while research is assessing the impact of this new public procurement scheme on transport system innovation.

CLEAN VEHICLES PORTAL

The Clean Vehicle Portal was set up by the European Commission to support public procurement of vehicles and to help citizens in purchasing cleaner and more energy efficient cars. The portal uses Europe's largest vehicle database and provides energy consumption and emission data on vehicles as well as an online calculator for lifetime costs of vehicles, as required by the Directive 2009/33/EC. An internet forum enables procurers to team up in joint procurement calls to achieve economies of scale with larger volumes.

www.cleanvehicle.eu

SMARTFREIGHT

Smart Freight Transport in Urban Areas

Project reference: FP7-216353

Status: Completed

Total cost: EUR 3 012 324

EU contribution: EUR 2 200 000

Coordinator: SINTEF ICT

Website: www.smartfreight.info



SMARTFREIGHT has designed and developed technical solutions for innovative and greener city logistics, making urban freight mobility safer, more efficient and more environmentally friendly. As freight vehicles emit more pollutants and noise than passenger cars, **SMARTFREIGHT** has introduced new ways of monitoring and controlling emissions based on engine class and other characteristics. By providing powerful tools that incorporate real-time traffic information to freight companies, **SMARTFREIGHT** has contributed to optimising routes, load factors, deliveries and pick-ups, resulting in smarter, more energy efficient city logistics.

BACKGROUND

Freight is a significant but often overlooked element in urban mobility. While crucial for goods delivery to commercial enterprises and households, freight is responsible for 25% of CO₂ emissions, 30% of NO_x emissions, and almost half of particulate matters generated by urban transport. These emissions are mainly produced by older commercial vehicles and inefficient urban supply chains, with low load factors (goods volumes carried compared to vehicle capacity) and frequent and uncoordinated deliveries. Despite the need for greener city logistics, commercial transport has not been

given sufficient attention in transport planning and management systems.

SMARTFREIGHT brought together consulting and academic partners in ten cities to address the impact of freight vehicles on urban areas and to provide ICT solutions for innovative city logistics, new traffic management measures, and improved interoperability with freight management systems.

RESULTS

SMARTFREIGHT has contributed to innovative solutions in green transport for city logistics in many ways.

New traffic management framework

Concepts and generic service interfaces for urban freight transport have been defined for cities with different needs. Based on open ICT software systems, prototypes and applications have been developed for activities such as truck access control, dynamic tunnel access control, and vehicle and cargo monitoring. Potential outcomes of the SMARTFREIGHT solutions are the automatic detection of incidents and traffic violations and increased awareness of emergency situations in a wide range of cities. An application implemented in Trondheim, Norway, was used to validate the project concepts and technical specifications.

Identification of freight vehicles based on environmental performance

SMARTFREIGHT solutions showed how to assign priorities and access rights to trucks delivering goods in low emission zones and neighbourhoods under specific environmental or cultural protection. The technique effectively eliminated the most polluting vehicles from protected areas.

Tools to optimise urban supply chains

Tools have been developed to optimise urban deliveries, by providing truck drivers with real time information for routing and re-routing delivery vehicles, more efficient use of loading and unloading spaces, and systems to track freight vehicles and cargo. These tools are based on open ICT software, on-board equipment, heterogeneous wireless communication infrastructure and CALM (platform for vehicle-to-vehicle and road-to-vehicle communication) implementation in on-board and on-cargo units. Specific systems have been designed for monitoring hazardous cargo, which is a major concern for city managers and freight companies.

In addition, SMARTFREIGHT has provided input to standardisation and regulatory bodies such as the European Telecommunications Standards Institute.

SMARTFREIGHT will also have an impact on collective knowledge and future research because the monitoring systems developed can be used to collect and integrate freight data in urban mobility statistics.



6 WHAT'S NEXT?

Policy and research outlook

The EU acknowledges its role in supporting urban transport authorities to meet the manifold challenges posed by the increasing demand for passenger and freight transport. A policy framework to support cities and towns in Europe to move to more sustainable and integrated urban mobility is presented in the Green Paper *Towards a New Culture of Urban Mobility*, the Action Plan on Urban Mobility and the White Paper on Transport. The policy aims to minimise the consequences of congestion and pollution in the urban environment, and to increase living standards, economic competitiveness, and social cohesion.

The guidelines on the Sustainable Urban Mobility Plans recently released by the European Commission offer an overarching methodology for a sustainable and integrated approach to urban mobility planning. The practical implementation of the plans is in the hands of local governments for adaptation to the local context.

Research and Innovation are essential in developing and implementing measures to create more sustainable urban mobility. EU-funded research has contributed to improving urban transport planning and traffic management systems, making public transport more attractive and accessible to all users and developing more sustainable vehicles.

New mobility concepts have been investigated to influence transport demand, including incentive schemes for more sustainable use of transport modes and infrastructure. In addition, mobility management strategies to influence citizens' behaviour and to improve stakeholder participation in the decision-making process have been implemented with the EU support. Innovative approaches have been tested to increase the use of ICT tools for more efficient management of city logistics.

Since 2002, the CIVITAS initiative has been the 'cities for cities' programme supporting research and demonstration actions in European cities committed to implementing and integrating sustainable urban mobility measures. The integrated packages of measures required by CIVITAS include the development of a long list of innovative solutions that improve transport and mobility for citizens in an increasing number of European cities.

Future research on the mobility of people and goods will build on progress made and particularly on the CIVITAS experience. The new European framework programme for research and innovation *Horizon 2020* explicitly incorporates objectives to reduce congestion, to meet urban mobility needs of citizens and to make urban transport more environmentally sustainable.

Particular attention will be given to non-polluting transport modes and their market take-up, and to the 'next generation vehicle', bringing together all elements of clean, energy efficient, safe and intelligent transport systems. Further research on new transport and mobility concepts for passengers and freight, innovative organisational and mobility management schemes, and high-quality public transport will be undertaken to improve accessibility for all and more safety, while improving intermodality.

Future research on urban mobility will contribute to strengthening integrated and sustainable planning, and to developing smart and green solutions. The focus is on making transport more sustainable and more accessible, and on fostering social inclusion. In doing so, research will help to meet the individual transport needs of the citizens, and the societal and environmental challenges of tomorrow.

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Glossary

APTIE	Accessible Public Transport in Europe portal
BRT	Bus Rapid Transit
CARE	European road accidents data base
CIVITAS	Clean and Better Transport in Cities
CNG	Compressed Natural Gas
CO ₂	Carbon dioxide
CTS	Clean Transport Systems
DG MOVE	Directorate General for Mobility and Transport
EBSF	European Bus System of the Future
EC	European Commission
EPOMM	European Platform on Mobility Management
ERTRAC	European Road Transport Research Advisory Council
EU	European Union
FP	Framework Programme (for research and development)
GDP	Gross Domestic Product
GPP	Green Public Procurement
GRT	Group Rapid Transit
GTL	Gas-To-Liquid
ICT	Information and communications technology
IEE	Intelligent Energy Europe
IRU	International Road Transport Union
ITS	Intelligent Transport Systems
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
NO _x	Nitrogen Oxide
PRT	Personal Rapid Transit
R&D	Research and Development
R&I	Research and Innovation
SUMPs	Sustainable Urban Mobility Plans
TEMS	The EPOMM Modal Split Tool
TRIP	Transport Research and Innovation Portal
UITP	International Association for Public Transport

Urban transport is strategically important for the economic competitiveness, social cohesion, and sustainable growth of Europe. Thus, combating traffic congestion and associated air pollution and traffic accidents are challenges for governments and transport authorities in all EU Member States. The EU is providing guidelines for cities and towns to move towards sustainable and integrated urban transport and is promoting research and demonstration of innovative and green solutions to meet the societal and environmental challenges of tomorrow. This Policy Brochure produced by the Transport Research and Innovation Portal (TRIP) highlights the contribution of research in delivering innovative solutions for sustainable and integrated urban transport.

www.transport-research.info

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