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EU-funded research to ensure urban mobility



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Foreword

With up to 80 % of EU citizens living in cities, mobility in urban areas touches all our lives. Accessible, sustainable and free flowing transport is needed to encourage economic development and improve our quality of life. Yet cities all over Europe face the same problems of congestion, road safety, and air and noise pollution.

At the European Commission we find that the solution to these problems is not to stop using all transport and stay at home. We will, however, have to adapt our transport to urban settings. From a personal perspective I am a keen cyclist and public transport user. Professionally, DG Research supports the European research community to find innovative ways to improve urban mobility.

Even as far back as 2000, the European Heads of State and governments agreed that knowledge is power, and consequently decided, in the Lisbon Strategy, that research and innovation should be cornerstones of the European Union.

In the Framework Programmes for research funding (FPs), researchers from academia and industry are joining forces to make Europe the most competitive and dynamic knowledge-based economy in the world. Their research in the field of urban mobility is leading to entirely new technologies, to new applications of existing technologies, and to improved approaches to the transport of people and freight.

Europe's vision for 2020 is not just one of research and innovation. It is a vision of sustainability – economically, environmentally, and socially. That is why urban transport research does not stand alone. We maintain strong ties with decision makers. And our work is closely linked with areas such as transport policy, regional development, environmental policy and industrial policy.

In the end, innovation and research can come together to attain the goal of a smarter, greener, more competitive society. The research activities presented in this brochure show some examples of what is being done, with the support of the European Union, to improve urban mobility accordingly. I hope these examples will inspire you.



A large, stylized, handwritten signature in black ink, which appears to be 'R. Smits'.

Robert-Jan Smits
Director-General of DG Research

EU-funded research vital to improve urban mobility, sustainability and economic prosperity

One of the major hurdles to be overcome in framing sustainable, environment-friendly transport policies is the dilemma of urban mobility. The need is to reduce traffic congestion and pollution in Europe's towns and cities, while allowing efficient and convenient movement of people and goods to support the growth of economic activities and enhance the quality of life for citizens.

Towns and cities are the hubs of the European economy. More than 72 % of the EU population lives in urban areas, where almost 85 % of the Europe's gross domestic product (GDP) is also created.

Efficiently operating cities attract investment and jobs, but the large and growing concentrations of people in conurbations places increasing pressures on their infrastructures and facilities. Bottlenecks, missing links and lack of interoperability between transport modes all lead to inconvenience and reduced economic opportunities. Congestion is now responsible for a loss of 1 % of European GDP, while urban traffic produces 40 % of CO₂ emissions and 70 % of other pollutants generated by road transport. Moreover, one in three fatal accidents occurs in towns and cities, frequently involving vulnerable victims such as pedestrians and cyclists.

Surveys indicate that nine out of ten EU citizens regard traffic congestion, pollution and noise as major problems needing urgent attention. Improvement is also crucial to the success of the EU's policies to promote economic growth and continued competitiveness, combat climate change, and improve the safety and quality of life of citizens.

The role of research

Legislation and financial measures are important aspects of a holistic solution to the many challenges involved. Research and innovation are thus as essential to guide political decision-making as to provide the necessary technological breakthroughs.

Experience gained over more than a decade affirms that the achievement of sustainable urban mobility demands a 'transport systems' perspective, looking beyond individual technological advances to consider the interactions between vehicles, networks, infrastructures and the use of transport services. Central to the overall strategy is the concept of fully interconnected multi-modal movement of people and goods, readily accessible to all and employing the most energy-efficient means possible.

This entails a wide-ranging and multidisciplinary body of research, which at EU level involves a number of the European Commission's Directorates General. The role of DG Research, which is the subject of this publication, is to foster the implementation of new technologies in innovative applications related to transport in the urban context.

In fact, systematic support for initiatives relevant to this objective began under the 'Sustainable Surface Transport' theme of the Fifth Framework Programme (FP5 – 1998-2002). At that time, there was a divide between technological research, administered by DG Research, and policy-related research – including large scale socio-economic demonstration of clean and energy-efficient urban transport systems (CIVITAS – City-Vitality-Sustainability) – falling within the remit of DG Transport & Mobility and DG Energy.

Since the start of FP6 (2002-2006), there has been an attempt to remove the barriers between the two types of research, so that projects increasingly focus technological developments towards socio-economic and environmental considerations, thus securing improved prospects for implementation of the results.

Policy background

The European Commission's first policy proposals in the area of urban mobility, the 'Citizens' Network', date back to 1995 and 1998. They resulted in the launch of a series of initiatives based on a 'best practice' approach.

Following a mid-term review of the 2001 Transport White Paper (aiming to shift the balance between modes of transport), the Commission adopted the Green Paper 'Towards a new culture for urban mobility' in September 2007. This consultation document opened a broad debate on the issues of urban mobility, which led to the '**Action Plan on Urban Mobility**', published on 30 September 2009.

Under the Action Plan, the Commission aims to establish practical links between urban mobility and existing EU policies for health, cohesion and disability. Other proposals include an initiative to improve travel information, and to raise general awareness of the options available for enhanced mobility and urban freight distribution.

Collaborative activity at a European level is necessary to assemble a critical mass of manpower and resources to address the large-scale, complex issues involved. Transnational cooperation also harnesses the skills and talents of the diverse Community in searching for ambitious, innovative solutions and spreading best practices, so that towns and cities can become less polluted and more accessible, and traffic within them flows more freely.

To add value, actions at Community level must be as integrated as possible, combining technological innovation, economic incentives and amendments to legislation. However, individual towns, cities and regions have their own particular needs and priorities, which require the application of local knowledge and research effort.

In accordance with the subsidiarity principle, the EU must play a facilitating role without imposing top-down solutions that may not be appropriate for the diverse local situations. It nevertheless contributes by funding initiatives such as the **CIVITAS programme**. Now in its third generation under the Seventh RTD Framework Programme (FP7), this has organised demonstration projects in 61 cities across Europe since its 2002 start-up (for more information, see <http://www.civitas-initiative.org/>).

The underlying influences

In its foresight document 'ERTRAC Road Transport Scenario 2030+', published in October 2009 (see <http://www.ertrac.org>), the European Road Transport Research Advisory Council highlights the fundamental need for a healthy urban economy as a prerequisite for social stability. This is likely to create a growing demand for transport in and around cities, whereas long-distance extra-EU freight haulage could decline as a result of industrial production becoming localised closer to, or within, the EU. Consequently, development of the urban structure needs to move ahead at a faster pace than that of the interconnecting infrastructure.

Changing pattern

Pressures on energy supply and the increasing cost of fuel will make it imperative to achieve higher levels of efficiency in the networks. Regulation adopted by all levels of government to combat climate change and contain the level of greenhouse gas emissions is likely to trigger a broad range of developments, such as charging schemes, restrictions on vehicular access to city centres, and the prioritisation of sustainable transport modes and services.

As a result, population concentrations and the demand for mobility in peripheral areas will rise – resulting in growing urban sprawl. This may be slowed by a decrease in average household sizes, permitting the construction of more compact new dwellings and a return to inner city living. The latter trend would help to revitalise the cities, with a functional mix of housing and services contributing to the emergence of polycentric urban areas.

A continued increase in suburban traffic and pollution is nevertheless probable, unless it can be alleviated by large-scale investment in public transport, widespread adoption of cleaner vehicles and the introduction of viable alternatives to personal car use.

Foreseeable socio-demographic evolution – including an ageing population and rising numbers of lower-income immigrants – will also result in new mobility patterns and an increased requirement for personalised services such as leisure-related mobility for the older generations.



URBAN TRACK

Urban rail infrastructure in a harmonised Europe.

URBAN TRACK is promoting harmonisation of Europe's currently disjointed urban rail infrastructure by developing a series of modular track products combining high performance, safety and low noise with minimal maintenance and low life-cycle costs. The project addresses both the light and heavy rail sectors, as the basis of interoperable systems that can readily be adapted to cities' individual circumstances.

In addition to validation on transport networks in Belgium, France, Germany, Spain and the UK, the products are being trialled in Brazil and the Philippines.

Coordinator: D2S International (Belgium)

Total budget | EUR 18.6 million

EU funding | EUR 10 million

Start/end | 01/09/2006 – 31/08/2010

Website | <http://www.urbantrack.eu>

Rethinking the urban infrastructure

In average cities, around 20 % of the available space is dedicated to traffic. The scope for building new infrastructure in central areas is limited by the lack of additional space. Consequently, it will be essential to optimise the use of the existing resource for all forms of transport, while creating conditions that favour the most space- and energy-efficient.

The need for transport derives basically from the separation of land areas serving different functional purposes – dwelling, working, shopping, leisure, etc. Measures to counter unsustainable urban development must therefore seek to limit such spatial fragmentation. This requires the **integration of mobility planning with other urban policies** such as those relating to land use, economic and social affairs, environment and energy.

It is particularly important to gain greater understanding of the impact new transport infrastructure has on land. Investment in new motorways, for example, can accelerate urban sprawl by facilitating the growth of edge-of-town shopping centres and residential zones. Similarly, the construction of public transport links such as light railways and tramways tends to increase housing densities around access points.

DISTILLATE, a project funded under the UK Engineering and Physical Sciences Research Council's research programme, concluded that, if development is planned specifically to encourage public transport, there can be a significant reduction in per capita car travel. Public transport nodes, including rail stations, serve as catalysts for more accessible land use by creating higher density, mixed-use, pedestrian-orientated centres.

Households living in such neighbourhoods tend to own fewer cars, and working people are more likely to commute by alternative modes (partly because they do not need a car for lunchtime errands). These factors result in higher levels of public transport commuting, increase non-motorised travel for non-commuting trips (such as shopping and school runs), and reduce car travel. As a result, there tends to be a leverage effect, bringing much greater reductions in vehicle movements than those accounted for by the direct shift from car to public transport.

Another urban problem tackled by research is the cost of installing and maintaining new transport infrastructures. Tools and methodologies developed under the URBAN TRACK project, for example, make it possible to achieve a reduction of at least 25 % in life-cycle costs for new rail infrastructure projects. Five innovative products have been introduced:

- Prefabricated track modules;
- Green light rail/tram tracks;
- Embedded metro tracks;
- Alternative low-cost tracks for floating slab mounting in tunnels;
- A maintenance-free interface between rail and street pavement for embedded tracks.

All are in accordance with the Vision 2020 document of **ERRAC** (European Rail Research Advisory Council – see <http://www.errac.org>), targeting low life cycle cost, high performance, modular, safe, low noise and vibration.

Demand-side measures



Modifying public attitudes to transport requires knowledge of the relevant socio-psychological triggers: perceived status, personal security, comfort and other emotions.

Major factors affecting households' choices of residence are the affordability of available properties, the match between neighbourhood amenities and their lifestyle aspirations, and the cost and convenience of travelling to work.

Many high-earning families opt for the considered appeal of more rural peripheral locations, while accepting the consequences of long commuter journeys. Those on lower incomes are frequently forced out by the large differential in prices between central and out-of-town land. Taxation schemes taking greater account of public contributions (such as infrastructure and utilities) to land values could mitigate this situation.

Potential options for urban authorities to **limit traffic flows** into and through their city centres range from **traffic restrictions** and the development of '**green zones**' favouring low-emission vehicles; through congestion charging schemes and other forms of road pricing; to parking policies, prioritisation of public transport and strategic infrastructural changes.

Such measures frequently meet with strong initial opposition from a public fearing the removal of established privileges and commerce concerned with reduced trading opportunities. However, findings of the CIVITAS initiative show that, when combined with compensatory actions such as enhanced public transport and access facilities, the demonstrable reduction in congestion, pollution and noise can progressively win back support.

Greater attention is therefore being given to the provision of pedestrian zones, cycle routes, park-and-ride schemes and car parks at city outskirts as means of reducing passenger car numbers. Research is also exploring ways to integrate different transport modes more effectively, and to make multi-modal travel more attractive to the general public, including the elderly and others with limited mobility.

CIVITAS suggests that even so-called '**soft measures**', such as awareness campaigns and education for children can often be more cost-effective than infrastructural modifications in encouraging people to switch to public transport or bicycles, or to avoid unnecessary journeys.

There is also scope for more positive incentives. Subsidies, the provision of special facilities, and tax and charge exemptions can all be used to reward users of eco-friendly forms of transport. Further possibilities include fiscal stimuli for employers to support workers' use of public transport, and to make greater provision for flexible working hours and tele-working.

The Commission Communication 'A European strategy on clean and energy efficient vehicles' (April 2010) points out that local and regional authorities could exert considerable influence as contracting authorities, making a smart use of public procurement rules to accelerate market uptake of electric, hybrid petrol/electric and alternative fuel burning vehicles in municipal fleets. This would also act as a spur to innovation, and set a good example to private operators.

The COMPRO project analysed all key elements and conditions for a common European scale-procurement of clean collective and public service transport vehicles at (i.e. natural-gas-powered and hybrid electric buses). This has laid the ground for a homogenisation of technical requirements and the creation of a buyer consortium of local authorities able to reach the critical mass needed to ensure a swift market development.

New ways to organise mobility

Flexible services

More new ways of organising urban mobility are also beginning to emerge. Various flexible services are being introduced to decouple car use from individual ownership:

- **car and taxi pooling**, which may be managed by commercial organisations or common-interest groups, provides for owner-drivers to carry one or more passengers who do not themselves necessarily own cars, but share in the cost of the journeys;
- **car sharing**, based on the concept of pay-to-use pick up and return of publicly or commercially-owned vehicles, subject to prior reservation through a call centre or on-line.

Car-sharing began in Switzerland, with a cooperative known as 'Sefage', as long ago as 1948. However, the movement really began to gather strength in the 1980s. Switzerland itself now has a fleet of 2 300 vehicles shared between 1 150 stations in more than 350 municipalities. More cities across Europe have implemented similar schemes, all with the same general aim, of reducing private car use and increasing occupancy rates. Take-up may be encouraged by the offer of additional incentives such as reserved lanes and parking spaces.

As part of its 'City of Tomorrow' key action, the Commission supported the 2001-2005 MOSES (Mobility Services for Urban Sustainability) research and demonstration project, which consolidated the principal experiences and supported the transfer of car-sharing practice into more countries.

In Bremen, for instance, what began as an environmentally orientated club of about 30 people in 1990 grew to a market-based car share company with more than 5 800 subscribers by 2010. It has 42 sites scattered around the city, with 160 rental cars estimated to have replaced more than 1 000 private ones.

Payment of a monthly credit card bill replaces the cost of car ownership, fuel purchase and parking fees – and is said to produce significant savings for participants. Bremen was even selected with its car-sharing system as 'Urban Best Practice' for the World EXPO 2010 in Shanghai ('Better City – Better Life') – presenting innovative solution to the parking problem in cities.

Bremen has developed a municipal 'Car-Sharing Action Plan' to quadruple the number of car-sharers by 2020. 'Car-sharing is a unique and efficient element to reduce the number of cars in the cities and to reclaim street space for a better urban environment – and at the same time even improve transport options for the citizens,' emphasises MOSES coordinator Michael Glotz-Richter. He estimates a potential for European cities to replace more than 500 000 cars – enabling a great deal of street space to convert from parking into liveable areas.

A US survey (Shaheen and Cohen) based on 2006 data reports that European studies estimated the maximum annual mileage up to which car sharing is more cost-effective than owning or leasing a personal vehicle to be between 10 000 and 16 093 km, depending on location and organisation. It also quotes a reduction in average user's CO₂ emissions of 39-54 %.

Similar schemes are springing up for **bicycle sharing** in many European cities, with automated or manned rental parks at locations such as rail terminals providing convenient collection points for commuters and visitors.

High quality public transport

Public transport is a powerful weapon in the battle against urban congestion and economic problems. It is the most efficient option in terms of space consumption per traveller, and is currently the best answer to mobility needs in densely populated areas.

Figures from UITP (the 'Union Internationale des Transports Publics') indicate that, on average, 60 cars are used to carry 75 people during peak hours. The same number of passengers can be carried by just one bus – which, compared with a car, consumes only one third of the energy per passenger/km. Moreover, employees need approximately the same amount of space to park their cars (about 20 m² per person) as to work in their offices.

In most European countries, local authorities have traditionally provided urban public transport, either directly or through associated companies. But, with growing car ownership and suburbanisation since the 1960s, it has become increasingly under-utilised, usually requiring subsidies to maintain an acceptable level of service.



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EBSF

European bus system of the future.

One of the largest surface transport R&D projects ever undertaken by the EU, EBSF brings together all major European bus manufacturers, operators and authorities. The consortium intends to demonstrate the full potential of a new generation of urban bus networks integrating breakthrough designs for vehicles, infrastructures and operations. Its research is exploring all features of traditional bus services, including their relationships with other modes of transport, as a basis for proposing an innovative 'EU Bus System of the Future'.

Coordinator: UITP – Union Internationale des Transports Publics (Belgium)

Total budget | EUR 26 million

EU funding | EUR 16 million

Start/end | 01/09/2008 – 31/08/2012

Website | <http://www.ebsf.eu>

Renewed investment in the large-scale deployment of green public transport, both road and rail, is thus an essential part of any integrated effort to improve the urban environment. It is already being assisted by EU funding in a number of cities, while development and demonstration projects to stimulate the interest of authorities and the general public are being pursued under FP7.

'People are conscious of the expenses of public transport, but do not recognise those of their private cars,' says Elios Pascual, strategic advisor to UITP for the EBSF project. 'If a multi-modal shift is the goal, profit cannot be the main motive. Means to share the cost of public transport among all users should be adopted, such as the small salary levy ('versement transport') applied in France.'

Pascual also highlights five key principles defined within EBSF, which are outlined in a long-term strategic vision document for the Göteborg Region of Sweden:

- **Link areas** – change from a radial structure to a hierarchical network, with local distribution routes spanning out from linked major nodes;
- **Reduce journey times** – prioritise public transport by investing in separate lanes along defined corridors, to facilitate reliable, punctual services;
- **Increase frequency** – reduce waiting times by replacing fixed timetables with short departure intervals between main nodes;
- **Develop the nodes** – make the interchanges attractive places for city development, with new businesses, housing and local services;
- **Guarantee high quality and service** – ensure that systems are safe and secure, with dependable interchanges and adequate, easily understandable information systems.

'The successful cities will be those that are able to transform mentalities,' Pascual concludes. 'That can only be done by making public transport an integral part of the overall urban development.'



MODURBAN

Modular urban guided rail systems.

To pave the way for new generations of urban guided rail transport, MODURBAN has produced an open architecture and interfaces embracing command control, passenger access and energy-saving subsystems. Common specifications for manufacturers are also proposed to ensure compatible development of new rolling stock. The approach is applicable both to new lines and to the renewal and extension of existing lines, encouraging cost-effective migration to driverless operation. Final results were demonstrated on the Madrid metro in December 2008.

Coordinator: UNIFE – Union of European Rail

Industries (Belgium)

Total budget | EUR 20 million

EU funding | EUR 10.40 million

Start/end | 01/01/2005 – 31/12/2008

Website | <http://www.modurban.org>

Demand-responsive transport

Conventional public transport operates according to fixed routes and timetables, and cannot take account of actual demand at any given time. In less densely populated areas, especially, vehicles may frequently circulate with minimal passenger loads, or even empty.

The most established on-demand alternative is the taxi: convenient, but relatively costly. The advent of technologies such as wireless data transmission, satellite tracking and routing has now given rise to a new bus service concept known as **demand-responsive transport (DRT)**, which more closely matches customers' real needs. Users can submit their journey requests – one-way or return – either on-line or by telephoning a call centre. The centre contacts the driver of a vehicle that is conveniently placed to respond. The passenger is then collected at an agreed pick-up point and time, typically in a small bus of around 8-25 seats.

Because the bus is shared with other passengers within a given zone, the trip may take longer than by taxi, but the service can be door-to-door and is available on a regular basis. Personal stops may be at or near peoples' homes, and the destinations virtually anywhere within a given zone, depending on how the scheme is structured.

DRT provides a cost-effective answer for low-density housing areas in and around city centres, for night travel in urban areas, and for access to long-distance rail or coach stations. It may still require subsidy, but provides a service that reduces unnecessary vehicle mileage and is both user-friendly and socially inclusive.

ICT-powered mobility services

The increasing pervasiveness of information and communication technologies (ICT) in all aspects of daily life is a powerful driver of change. New services and business models are facilitating journey sharing, shared ownership of vehicles and other collective services, as described above.

At present, citizens do not make the most effective use of all the available transport modes – either because they are unaware of them, or because they face difficulties in obtaining information in an appropriate form to permit interconnected travel.

On-line travel agencies currently offer package services for the booking of airline and train tickets, hire cars and hotel rooms; while some city authorities issue prepayable smart cards valid for use across their rail, metro, bus and tram networks – and even extendable to car/bicycle sharing.

Access will be made easier still with the advent of more comprehensive **multi-modal timetables, and journey planners** embracing options such as walking and cycling, all drawing on real-time travel and traffic information as necessary to ensure optimal accuracy. Together with integrated reservation, ticketing and payment portals, these will enable people to move seamlessly and efficiently from door to door. With the help of technology, entire transactions can be electronically scheduled, managed and implemented at the click of a few buttons. Mobile communications will also permit en-route customers to be updated via mobile phone or computer with information regarding delays, schedule changes and other critical matters.

ERTRAC predicts that, as well as receiving mobility information from various service providers, the on-line urban consumer will actively and passively reciprocate with feedback that will enable services to be aligned ever more closely with evolving patterns of use. It is estimated that making the most of the opportunities presented by multi-modal systems could bring a 20 % to 30 % gain in usable road capacity.

Access to a growing variety of on-line information and e-commerce outlets will also increase the demand for home supply of goods and services. Urban logistics strategies will thus need to focus on efficiency gains – again with greater integration of deliveries and optimised use of the infrastructure.



i-TRAVEL

Service platform for the connected traveller.

i-TRAVEL is laying the foundation for virtual 'e-Marketplace' connecting travel information providers to service providers and to users' mobile or handheld devices. Using real-time and context-specific data, trusted travel assistants will be able to plan each journey and guide travellers throughout their itineraries with timely advice and problem warnings. Publishing the content on a standardised platform will bring closer the vision of end-to-end travel services extending from pre-trip preparation to on-trip support and post-trip evaluation.

This project is part of a larger cluster of research projects on multimodal trip advisors, supported by DG Research, DG Mobility and Transport and DG Information Society and Media. It builds upon results of previous projects and shares results with others, supporting the Commission's ITS Action Plan, for the 'promotion of multimodal journey planner' (Action 1.5).

Coordinator: ERTICO – ITS Europe (Belgium)

Total budget | EUR 2.20 million

EU funding | EUR 1.40 million

Start/end | 01/01/2008 – 30/09/2009

Website | <http://www.i-travelproject.com>



WISETRIP

Wide scale network of e-systems for multimodal journey planning and delivery of trip intelligent personalised data.

Existing systems for journey planning and route guidance tend to be limited to single forms of transport and restricted in scale of coverage. Consequently, they do not respond to the need for multimodal travel. WISETRIP is therefore creating a 'Wide-Scale Journey Planner' as a one-stop shop able to answer complex questions by connecting inputs from various journey planners. Real-time personalised information will be accessible by travellers through mobile or fixed devices before and during their journeys.

Coordinator: Hellenic Telecommunications and Telematics Applications Company (Greece)

Total budget | EUR 2.14 million

EU funding | EUR 1.44 million

Start/end | 01/02/2008 – 31/07/2010

Website | <http://www.wisetrip-eu.org>

One-stop mobility

The traditional distinction between actors in the transport supply chain will progressively become blurred by a shift towards more integrated mobility solution providers.

Future mobility integrators will act as '**one-stop shops**', coordinating the functions of vehicle manufacturers, transport providers, service providers, technology providers and telecom operators.

One European auto-maker, for example, has launched a scheme that enables holders of a special pre-paid chip-card to rent vehicles from its own range, including bicycles, scooters, cars and vans, stocked at the premises of its agency and dealership network. Subscribers can also use the card to hire accessories, or to pay for travel and accommodation via a common call centre.

A challenge for researchers will be to develop the data exchange protocols and standards required to ensure the modal and geographical interoperability of such far-reaching ICT applications. However, the high take-up of smart devices such as the Apple iPhone is expected to provide ample scope for independent companies to build and launch their own personalised 'apps' to provide such services.

CONDUITS

Coordination of network descriptors for urban intelligent transport systems.

To promote Europe-wide adoption of ITS, CONDUITS is developing a number of tools to assist local authorities in making informed investment decisions. Key Performance Indicators (KPI) will enable the impact of ITS to be measured from efficiency, environmental, energy, safety and spatial perspectives. Building up an understanding of the ITS plans of European cities will permit comparison with worldwide practices and facilitate the exchange of good ones. The research will identify markets for specific applications and indicate barriers to implementation. The KPI system will be tested through case studies in Paris, Barcelona and Rome. A 'City Club' on ITS will also be set-up. CONDUITS directly supports the Urban Mobility and ITS Commission Action Plans.

Coordinator: ISIS – Institute of Studies for the Integration of Systems (Italy)

Total budget | EUR 0.95 million

EU funding | EUR 0.95 million

Start/end | 01/05/2009 – 30/04/2011

Website | <http://www.conduits.eu>

Support to local authorities

Intelligent Transportation Systems (ITS) are increasingly being deployed in urban areas as part of the response to the transport issues faced by authorities. ITS form the basis of services ranging from traffic control through public transport information to travel demand management. However, as each urban area tends to be autonomous and act in response to its own political pressures, it is very difficult to build a picture across Europe and beyond of how such systems are being used to provide solutions, and to compare their scale and effectiveness. It is important to have this wide picture because it can inform where future investment in research, training and deployment can be most productive, and where barriers need to be removed.

CONDUITS was set up to develop tools to help overcome this information void and support ITS decision-making. Its findings include a review of ITS today; the future plans of cities around the world; and the definition of a set of key performance indicators that should measure the impact of ITS on traffic efficiency, safety, pollution reduction, social integration and land use.

This is a timely initiative, given the various policy initiatives taken by the European Commission on ITS deployment, notably the ITS Action Plan and accompanying directive (Action Plan for the Deployment of Intelligent Transport Systems in Europe, COM(2008)886, December 2008) and the role of ITS in developing urban transport systems (Action Plan on Urban Mobility, COM(2009)490, September 2009).



Research integration vital for greener, more accessible cities

The 'total systems' approach to urban mobility research requires integration of all the above with parallel exploration of future vehicle designs, infrastructural aspects of multimodal use, and their mutual impacts.

Alternative fuels at heart of 'green cars' strategy

Under FP7, the European Green Cars Initiative (EGCI – see separate brochure or <http://www.green-cars-initiative.eu>), launched in 2008 as part of the EU's Economic Recovery Plan is coordinating major public-private investment into the development of energy-efficient and less polluting vehicles. 'The target is to make European road transport 50 % more efficient by 2030, taking into account both urban and long-distance applications, and the interconnections between them,' says ERTRAC Chairman Wolfgang Steiger.

Alternative energy sources are at the heart of the strategy for decarbonisation. The main candidates so far identified for a staged replacement of oil, culminating in full substitution, are **electricity, hydrogen and biofuels**. Electricity and hydrogen both show great promise for the improvement of energy-efficiency, but the efficiency of the supply path – production and storage – will also need to be addressed.

The lack of fuel availability is another notable impediment, tending to favour a research focus on the improvement of conventional fossil-fuelled cars – diesel in particular – to achieve improved efficiency and lower emissions. Given present levels of investment in manufacturing technology and fuelling infrastructure, plus the need to maintain market momentum, improved forms of the internal combustion engine (ICE) will retain a prominent role for at least the next 10-20 years.

'Electricity could provide a gentle transition from the old to the new,' suggested Ronnie Belmans, Chairman of the SmartGrids Technology Platform at a recent conference on EGCI in Valencia. 'For electric vehicles, batteries are the key element in the whole system; the problem arises in where and how to recharge them'.

On the other hand, the introduction of hydrogen-burning fuel cells for on-board electricity generation would depend on the installation of a whole new hydrogen distribution network. This might be more complex and costly than the deployment of electrical charging points, but would give rise to very efficient and clean vehicles with longer ranges.

It is therefore expected that different types of energy source could coexist in the future, depending on factors such as journey distance and payload – e.g. electricity for short trips and stop/start deliveries, combined electricity/hydrocarbons or hydrogen for medium distances, and hydrocarbons alone or hydrogen for longer runs.

Based on current battery technology, electricity alone offers vehicle ranges of up to around 200 km. To make purely electric vehicles (EV) more widely usable, research is urgently searching for ways to increase battery capacity, while also reducing their considerable weight and bulk. Much effort is also being put into the development of charging infrastructures, which in the future will comprise interacting power, communications and software layers.

Several recharging scenarios can be envisaged:

- charge at home – resulting in limited range, but little investment;
- charge when the car is at standstill – needing a great deal of ICT to locate filling sites, identify the supplier and manage payment (with significant data security implications);
- fast charging – which would have major impact on the grid and demand high infrastructural investment; and
- exchange of pre-charged batteries – demanding service stations with standardised pre-charged spares.

SmartGrids' vision is to introduce the flexibility to match price to demand and, through two-way energy flows, to utilise the storage capacity of idle batteries to smooth peaks and troughs. This in turn would raise a host of further questions: how to compensate the battery owners; how to encourage them to leave their vehicles connected when not in use, etc.

POLIS, a network of European cities and regions developing innovative technologies and policies for transport, cites numerous examples of initiatives already underway to promote the take-up of EVs, including:

- Barcelona – which has increased the proportion of EVs in its street cleaning fleet from 3 % to 30 % over the past two years;
- Madrid – with 41 public charging points, two electric minibus lines, a range of other service EVs and motor-cycles; free parking and tax incentives;
- Amsterdam – offering free charging points, free parking, vehicle purchase subsidies and use of bus/tram lanes to target 40 000 EVs by 2020;
- London – working with boroughs to increase numbers of charging points, offering permanent congestion charge exemption, and promoting EV ownership and sharing, to reach 100 000 vehicles by 2020;
- Paris – preparing for the 2011 launch of its Autolib' public EV share fleet.



Hybrid technologies

The most widespread type of electrified vehicle at present is the hybrid, employing one or more battery-powered electric motors, supplemented by a small conventional ICE to deliver higher total power and torque, and to extend the drivable range beyond that of the batteries alone. An extension of this concept, the 'plug-in hybrid', adds the ability to recharge the batteries by connection to any convenient mains supply.

The recovery and storage of kinetic energy produced by using the electric motor as a generator under deceleration and braking (regenerative braking) provides a way to further improve energy efficiency and reduce pollution.

In EVs and hybrids, this energy is stored in the batteries or a bank of capacitors for later use. Another energy storage method is by a rotating flywheel, as used in the mechanical KERS (kinetic energy recovery systems), which briefly made its appearance in some Formula 1 racing cars during the 2009 season.

Some EV and hybrid prototypes are equipped with electric double-layer capacitors ('supercapacitors') – which are devices able to store and release large amounts of energy extremely rapidly. They are thus very effective for capturing the energy released during events such as braking, and using it during the next acceleration.

If batteries were subjected to such rapid charge/discharge cycles, they would suffer damage and a reduction in lifetime. Supercapacitors, by contrast, can withstand hundreds of thousands of discharges as should easily be capable of surviving the full working life of a vehicle.

Buses, with their frequent stops and starts, are particularly suited to energy recovery. Flywheel KERS that can be installed in standard buses have been shown to offer more than 30 % percent fuel saving over a London test cycle.

Trials with various forms of supercapacitor-assisted buses have also been underway for several years. The short distances between stops on urban routes even makes it feasible to operate without need for a battery. The supercapacitor can be recharged at regular intervals, collecting sufficient energy when the bus is stationary for 20-30 seconds – i.e. the normal passenger unloading/loading times – to proceed for a further one or two stops. This has been done using so-called 'electric umbrellas' that rise from the vehicle roof to contact charging points similar to the overhead systems of tramways and light railways. A full recharge, taking perhaps 10 minutes, can be carried out when the vehicle reaches its terminal destination.



HCV

Hybrid commercial vehicle.

The HCV project is designing new urban buses and delivery vehicles incorporating advanced second generation hybrid electric power trains. Using common components, functions and communication standards, the target is to reduce cost by 40 % and fuel consumption by 30 %. To promote good acceptance by public transport authorities, delivery operators, drivers and passengers, demonstrations will be conducted under real-life conditions in a number of European cities.

Coordinator: VOLVO (Sweden)

Total budget | EUR 20 million

EU funding | EUR 10 million

Start/end | 01/12/2009 – 30/11/2013

Website | <http://www.eucar.be/projects-and-working-groups/HCV.pdf>

QCITY

Quiet city transport.

QCITY provided a portfolio of tools for use by local authorities in mapping and controlling ambient noise. This was done by developing and validating a range of solutions considering attenuation at both vehicle and infrastructure levels. Based on the identification and evaluation of problem hot-spots in nine European cities, the studies embraced road vehicles and all forms of urban rail transport: trams, metro, suburban rail and freight. Quiet vehicles and new tyre designs were also tested in various cities.

Coordinator: Acoustic Control ACL (Sweden)

Total budget | EUR 13.53 million

EU funding | EUR 7.40 million

Start/end | 01/02/2005 – 31/01/ 2009

Website | <http://www.qcity.org/>



SILENCE

Quieter surface transport in urban areas.

The SILENCE project addressed urban noise issues from first principles, taking a longer-term scientific perspective in developing an integrated system for the accurate measurement, subjective impact assessment and effective control of noise emanating from urban road and rail transport. A global model coherent with those used in earlier initiatives now allows prediction of overall noise emission in complex traffic situations. This can be used to determine the efficiency of noise abatement technologies and to validate their noise reduction potentials.

Coordinator: AVL List (Austria)

Total budget | EUR 15.81 million

EU funding | EUR 8.90 million

Start/end | 01/02/2005 – 31/01/2008

Website | <http://www.silence-ip.org/site>

Quieter travel

One of the positive consequences of introducing virtually silent electric road vehicles will be to make cities much quieter than they are today. Meanwhile, the nature and volume of the present traffic mix continue to raise serious public concern about the effects of noise and vibration in the urban environment. This has been exacerbated in recent years by the proliferation of calming measures, designed to improve safety by reducing average speeds, but giving rise to more frequent deceleration/acceleration events. In the case of speed humps, they also transmit frequent and sometimes severe shocks through the road surface, causing long-term damage to the infrastructure and nearby buildings.

Reconciling efficient mobility with the preservation of quiet areas and achieving high levels of health and quality of life thus remain important objectives. Following the 2002 Directive on Environmental Noise, which set out common policy objectives for tackling this problem across the EU, noise abatement has become a focus of EU research and a goal for legislation.

This was studied extensively in the thematic network CALM and the subsequent CALM II (Coordination of European research for advanced transport noise mitigation). The 'CALM Blue BOOK', published in 2006 surveyed European research projects in the field, followed in September 2007 by an updated strategy paper entitled 'Research for a quieter Europe in 2020' (<http://www.calm-network.com>).

The 'CALM Blue Book' contains information on (primarily) EU and national noise research projects, covering all transport modes (road, rail, maritime and air), outdoor equipment, health and socio-economic aspects including assessment of exposure to noise.

Two major EU projects (QCITY and SILENCE) have focussed on transport noise in cities. Both carried out research and demonstration exercises on road and rail traffic and provide support to EU legislation. SILENCE adopts a scientific ('first principles') approach, QCITY looks from the perspective of local authorities needing to implement pragmatic solutions which comply with legislative needs.



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CLEVER

Compact Low Emission Vehicle
for Urban Transport.

CLEVER is the culmination of three years of research and design by a European consortium (including BMW), set up to explore future environment-friendly transport concepts. The resultant urban passenger vehicle combines the safety of a micro-car with the useful maneuverability of a motorcycle, powered by a natural-gas-fueled engine that is fuel-efficient and low in noise and emissions. Its three-wheeled platform carries two passengers and their luggage in a fully enclosed weather-proof cabin. It is small enough – less than 1 m wide – to make a real difference to road and parking space usage, and meets current safety specifications for occupants and pedestrians.

Coordinator: TUB – Technical University of Berlin
(Germany)

Total budget | EUR 3.35 million

EU funding | EUR 2.2 million

Start/end | 01/01/2007 – 31/12/2009

Website | http://ec.europa.eu/research/transport/news/article_1389_en.html

Vehicles for tomorrow

Ultra-compact **city cars** are by now a familiar sight on the streets of Europe. While most employ conventional ICEs, manufacturers around the world are joining the race to introduce hybrid and electric versions or by using alternative fuels. Intelligent driver aids for speed control, collision avoidance and parking assistance will also progressively filter down to even the lower priced models, contributing to a safer, more relaxed driving experience.

In order to guarantee sustainable transport in the future, taking into account the urban space occupation, energy consumption and emissions, it is necessary to develop new concepts for individual transport. Within the CLEVER project, a small, light and compact urban vehicle fuelled by compressed natural gas (CNG) has been developed to answer to these challenges.

The **micro-car**, a three-wheeled vehicle with tandem seating, is powered by a single-cylinder CNG engine. Its unloaded weight, 400 kg, is half that of the smallest mass-produced cars now on the market. The performance of both the engine and the variable transmission delivers a top speed of 100 km/h and a rate of acceleration expected from an urban vehicle. CO₂ emissions are in the region of 60 g/km, and the combined volume of the two removable fuel tanks (2 x 6 litres at 250 bars) gives a range of at least 100 km in the standardised European MVEG (Motor Vehicle Emissions Group) cycle.

Although just 1 m wide, a tilting cab makes the micro-car very stable when cornering, with handling similar to that of a motorcycle. Its reduced width allows more efficient use of parking bays, and brings the possibility of introducing narrower lanes for such vehicles.

The CLEVER concept differs from previous attempts to create a small urban vehicle in that it is fully enclosed in a metal framework, is stylishly designed and is much safer. The roof is as high as that of other cars, and it is steered like a four-wheeled vehicle, using a conventional steering wheel.

Driverless travel

Advances in control and guidance systems, sensor technology and interactive vehicle-to-vehicle and vehicle-to-infrastructure communications, many of which are at or near market readiness, will make the concept of driverless automated vehicles sharing public highways with conventional forms of transport a realistic possibility. Many aspects of what are collectively described as **automated transport systems** (ATS) are now being studied by researchers in the EU and throughout the world.

Automated metro trains and airport shuttles have been in service for a number of years. The potential benefits the newer kinds of ATS for city use include added flexibility and convenience to bridge the gap between private cars and public mass transport, more efficient use of road space, and reduced noise and pollution.

Since the late 1990s, there has been a strong resurgence of interest in the concept of **Personal Rapid Transit** (PRT): a form of demand-responsive ATS that was strongly promoted during the 1960s and '70s, but foundered due to the lack of maturity of the technologies at that time. PRT uses small driverless electric vehicles – often called 'pods' – typically able to carry two to four passengers along dedicated rails or guide ways. At the time of writing, a world premier public demonstration of the ULTra PRT system developed in cooperation with the CITYMOBIL project series is undergoing extensive testing at Heathrow Airport, London. It is currently scheduled to commence commercial operation in autumn 2010.

In contrast to tramways and light rail systems, the principle is that users can summon a pod or join it at a convenient pick-up station, and instruct it to carry them in an unbroken journey to their selected destination.

To alleviate road congestion while maintaining a separation from general traffic, future **PRT networks** covering whole city areas can be envisaged as running entirely or partly on underground or elevated track ways, which are not massive structures and would require relatively modest infrastructural investment.

In the late 1990s, several projects supported by the European Commission developed a new concept which tries to fuse the concept of car-sharing with PRT: automated electric public vehicles known as '**cybercars**', which can run on demand on existing urban infrastructures that also accommodate pedestrians, cyclists and even a limited numbers of cars. These can be restricted in terms of ownership (i.e. residents and public services) and/or speed.

The first such system operated in a long-stay parking lot at Schiphol Airport, the Netherlands, with four automated electric vans from Frog Navigation. These ran for several years from December 1997. Under the CITYMOBIL project, a new installation in Rome, Italy, will serve the city's large exhibition centre.



CITYMOBIL

Towards advanced road transport for the urban environment.

The CITYMOBIL project builds on the results of recent European and national projects to create a complete automated city transport system with vehicles ranging from advanced city cars (with ADAS), and driverless track-guided PRT carrying up to four passengers, to mid-sized shuttles (cybercars) and hybrid buses/tramways combining automatic guidance with manual control. Large-scale public demonstrations are already well advanced at project sites in Heathrow Airport (PRT), London, Rome's new exhibition centre (cybercars) and Castellón, Spain (advanced buses). First European test track trials could begin as soon as 2011. These will be followed by limited open-road testing – after which, Europe-wide roll-out could be possible by 2018.

Showcase activities launched under CITYMOBIL are being continued in the follow-up CITYNETMOBIL project, which hosted events in Formello, Italy, and Clermont-Ferrand, France, during 2009.

Coordinator: TNO – Netherland organisation for applied scientific research (The Netherlands)

Total budget | EUR 42 million

EU funding | EUR 11 million

Start/end | 01/05/2006 – 30/04/2011

Website | <http://www.citymobil-project.eu>

So far, these cybercar systems have been located in fairly confined areas, far from the city centres. Now, La Rochelle, France, has decided to experiment with the new type of public transport in a central pedestrian zone. Its decision follows a demonstration that took place during CITYMOBIL and at the end of the CYBERCARS-2 project, featuring cybercars and advanced car-sharing vehicles capable of some automated manoeuvres such as parking and 'platooning'.

Theoretically, driverless cars could be integrated fully on public thoroughfares – although this is not permissible under present law. Some of the future scenarios that could be foreseen include:

- Town centre: dual-mode vehicles equipped for both human and automated control, able to circulate in historic town centres;
- E-lanes: high-speed dedicated lanes where vehicles operate in automatic mode;
- Inner city centre: fully automated low-speed vehicles in pedestrian areas;
- Shared traffic: dedicated lanes for automated and classical buses.

Other forms of automated vehicle can also carry larger groups of people. In Castellón, Spain, a CITYMOBIL pilot project links the city centre, university area and nearby coast by means of a 'reserved lane transport system' (TVRCas) carrying high-tech buses that can be operated in a mixed guided and manual mode. The precise optical guidance system provides opportunities to implant narrow dedicated bus ways in locations where road space is in short supply, while the presence of a driver with overriding control enables the vehicles to be used on sections of route that are shared with other traffic.

A long term solution for a sustainable urban transport could thus be found in a balanced split between high-capacity public transport (buses, trains and metros), which offer both space- and energy-efficiency, and innovative small vehicles (PRT) bringing the advantages of flexibility and availability. A well-judged mix of innovative services including these two modes will enable cities to offer improved mobility to all citizens.

Within FP7, the EU is supporting several other projects like CATS and PICA, where innovative urban transport services based on a new generation of vehicles are also developed.

Urban service vehicle fleets will also undergo a transformation in functional design. The requirements for more sustainable, efficiently organised public transport and goods delivery will have a strong influence on the search for new formats – giving rise, for example, to modular multi-purpose platforms and specialised small/medium-sized units, such as those proposed in the HOST project.

Within the French LUTB (Lyon Urban Truck and Bus) cluster, the MODULO-SYS programme foresees an urban public transport system that includes a **modular, extendable bus**. This can be adapted to variations in passenger demand by the addition or removal of one or more towed trailer units, according to the time of day. The aim is to show that it is possible to integrate a large single-deck bus capable of carrying 200-280 passengers into the urban environment – but that, outside peak hours, its dimensions can be reduced to save energy and liberate more road space. Capacity adjustment will be much more flexible than with a conventional articulated bus.



HOST

Human oriented sustainable transport.

A remarkably versatile modular vehicle platform developed in the HOST project comprises a chassis with variable dimensions and axle configurations, a hybrid power train, independent 'wheel corners' and detachable purpose-designed body units. 'Fly-by-wire' control gives maximum flexibility for body exchange, enabling a single vehicle to be used for different purposes – goods delivery, taxi services, refuse collection, etc. – according to demand at any given time. This opens the door to economical round-the-clock operation for a host of public and private applications.

Coordinator: CIRPS – University of Rome

'La Sapienza' (Italy)

Total budget | EUR 3.2 million

EU funding | EUR 2 million

Start/end | 01/01/2005 – 30/06/2008

Website | <http://www.hostvehicle.eu>





MEDIATE

Methodology for describing the accessibility of transport in Europe.

A common European methodology being developed in MEDIATE will enable urban authorities and public transport operators to assess the extent to which their systems are readily accessible to all citizens. The project is identifying indicators to describe accessibility, providing a measurement tool for self-assessment, comparing best practices, and exchanging knowledge among stakeholders. An end-user group including representatives of the elderly, those with disabilities and others facing barriers to transport provides the partners with valuable feedback. Its APTIE web portal ('accessible public transport in Europe') offers one-stop access to information on a wide range of accessibility-related matters.

Coordinator: SINTEF (Norway)

Total budget | EUR 1.1 million

EU funding | EUR 1.1 million

Start/end | 01/12/2008 – 30/11/2010

Website | <http://www.mediate-project.eu>;
<http://www.aptie.eu>

Improved accessibility

Population aging and the Commission's commitment to social inclusion mean that public transport accessibility has to be investigated from the viewpoint of physical dimensioning and entry/exit provisions for less mobile persons, as well as from the geographical routing and on-call availability perspectives addressed by complementing established services with new types of DRT.

In Spain, Burgos (associated with the MEDIATE project) is showing the way with a system designed to be easily accessible to all, including older and disabled people. The project covers the whole city with a bus network on which all of the vehicles are equipped for ramp access – as well as for on-board audio and visual information provision. Real-time information is also available at 80 % of the bus stops. New routes have been developed, drivers given special training, and timetables and frequencies increased to make public transport a more attractive option. The intention is to add more lines, and to further improve the infrastructure for intermodal exchange.

This scheme, introduced without legal requirement as a response by the City Council to requests from local associations of disabled people, has met with the near-unanimous approval of citizens. Bus use by the elderly and disabled target groups rose by more than 8 % after 18 months of operation.

ACCESS 2 ALL

Mobility schemes ensuring accessibility of public transport for all users.

Through the coordination of current research efforts, production of common research roadmaps, identification of best practice models and the appropriate use of ICT tools, ACCESS 2 ALL is defining guidelines and policy recommendations intended to ensure accessibility of public transport to all users, including those with impaired mobility. Its goal is to encourage transport operators to adopt new technologies and schemes appropriate to the special needs of passengers such as the elderly, disabled, ICT-uneducated, dyslexic and illiterate.

Coordinator: ERT – Europe Recherche Transport (France)

Total budget | EUR 0.8 million

EU funding | EUR 0.8 million

Start/end | 01/12/2008 – 30/11/2010

Website | <http://www.access-to-all.eu>



The growing traffic densities in cities also affect the urban supply chain, which is both a cause and a victim of such problems. If no measures are undertaken in the future, statistics show the risk of a continuous increase in traffic volumes that will be due in part to freight flows (about 20 %). Such a situation affects the quality of life as well as the environment, and means a loss of efficiency for the freight transport itself.

Today's solutions are often based on restrictive policies that include low emission zones, access control, road pricing or time limits for the logistical operations. It is only in the last few years that experimental initiatives have been turning towards a positive approach, in which public authorities offer ad hoc facilities like freight villages or reserved lanes.

Several research projects have developed a new approach for the freight delivery in urban space by proposing **purpose-designed vehicles** with high performance, a **reorganised logistic flow** and **telematic tools for logistics management**.

The expected benefits are social (less congestion/environmental effects due to freight delivery) and economic (more efficient operation). In terms of policy, the public authorities will have a greater degree of freedom in traffic control, with minimal effects on the operators.

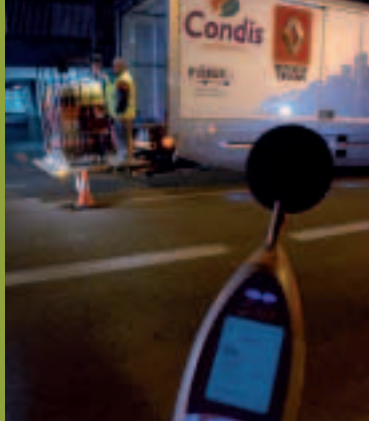
Urban delivery of goods will expand with a resumption of economic growth and the adoption of lifestyles that place greater reliance on on-line purchasing, as opposed to personal shopping trips for many staple commodities and services. Adjusting to these trends without adding unduly to congestion and delays depends on optimisation of the interfaces between long-haul transport and local services, and on logistical planning that favours free circulation and higher loading rates for in-town delivery vans.

Overnight restocking of inner-city commercial outlets from suburban warehousing depots is one way to reduce the risk of peak-hour traffic disruption, but the avoidance of noise nuisance is a factor that must be taken into account – by adopting quieter vehicles and taking advantage of ICT solutions for load grouping and route selection.

For several years, the EU supported the coordination action BESTUFS (<http://www.bestufs.net>) in the field of urban freight transport. This aimed to maintain and expand an open European network between urban freight transport experts; user groups/associations; on-going projects; the relevant European Commission Directorates and representatives of national, regional and local transport administrations and transport operators in order to identify, describe and disseminate best practices, success criteria and bottlenecks with respect to city logistics solutions.

The main results are:

- Policy and research recommendations (urban consolidation centres, last mile solutions, urban freight in small and medium sized cities, urban waste logistics, port cities and innovative urban freight solutions, managing urban freight transport by companies and local authorities);
- Best practice handbooks (waste transport logistics in urban areas, experiments and incentives for environment-friendly vehicles, control and enforcement in urban freight transport, city access restriction schemes);
- The BESTUFS 'Good Practice Guide' in 17 languages.



FIDEUS

Freight innovative delivery
in European urban space.

FIDEUS brought together the automotive industry, logistics companies and city decision-makers to define vehicle types and management tools as the elements of a coordinated goods delivery chain. The project proposed a complementary range comprising a battery-operated small goods carrier, an adapted 3.5-t van and 12-t truck, all incorporating advanced technologies and equipment to enhance operational efficiency and minimise environmental impacts. These were developed and tested in three cities: Barcelona, Hanover and Lyon. An ICT system interacting with the vehicles through specific web services handled information collection and sharing.

Coordinator: CRF – FIAT Research Centre (Italy)

Total budget | EUR 4.45 million

EU funding | EUR 2.30 million

Start/end | 01/05/2005 – 30/04/2008

Website | http://ec.europa.eu/research/transport/projects/article_5013_en.html

CITYMOVE

City multi-role optimised vehicle.

The delivery of freight in urban areas is based on general-purpose commercial vehicles that are not dedicated to operation in the specific confines for a city environment. CITYMOVE is developing a new concept for urban delivery vehicles, adding the latest state-of-the-art technologies to commercially available vehicle platforms, creating a breakthrough with potential for market introduction in the short term. The aim is to develop an innovative freight vehicle solution adaptable to the diverse needs of European cities: vehicles that are secure, flexible, reliable, clean, energy-efficient and safe.

Coordinator: CRF – FIAT Research Centre (Italy)

Total budget | EUR 5.4 million

EU funding | EUR 3.3 million

Start/end | 01/01/2010 – 31/12/2012

Website | <http://www.citymoveproject.eu>



Promoting and disseminating innovation

'Innovation can contribute to a more sustainable and efficient urban mobility system. The results of research must be disseminated in cities across Europe to be implemented widely', says Sylvain Haon, executive director of POLIS. 'It is important that innovative technologies, systems and policies are integrated in urban mobility strategies and plans to be efficiently deployed.'

Several of the projects supported under the Sustainable Surface Transport theme are pursuing activities aiming to highlight the choices being made available as a result of research, and to raise awareness at all levels of the benefits that could accrue from their adoption.

Champion cities

To transfer promising new concepts, initiatives and projects from 'niche' applications into mainstream urban policy actions to **support local authorities**, NICHES+ is preparing demonstrations to show how transport innovation can move from theory to practice.

Within four thematic areas identified as particularly important in facing the challenges of urban transport, the initiative is investigating 12 innovation concepts:

- **Accessibility enhancement:** travel training for public transport, neighbourhood accessibility planning, tailored information for users with reduced mobility;
- **Efficient planning and use of infrastructures:** passenger-friendly intermodal interchanges, innovative cycling facilities for intermodal interchanges, infrastructure for innovative bus systems;
- **Traffic management centres:** finance models for traffic management centres, mobile travel information services for the public, using environmental pollution data in traffic management;
- **Automated space-efficient transport systems:** cybernetic transport systems, personal rapid transit, advanced city vehicles.

A NICHES+ jury of experts selected seven 'champion cities': Artois-Gohelle (France), Burgos (Spain), Cork (Ireland), Daventry (UK), Skopje (Macedonia), Trondheim (Norway) and Worcester (UK). In each location, implementation scenarios, site visits, plans and recommendations for take-up will be developed.

NICHES+

New and innovative concepts for helping European transport sustainability – Towards Implementation.

The NICHES+ consortium is building a comprehensive coordination platform for innovative urban transport solutions, based on work done in its forerunner project NICHES. The aim is to transfer promising new concepts, initiatives and projects from 'niche' applications into mainstream urban policy actions. This is supported by wide debate between stakeholders from across the EU and accession countries. Seven 'Champion Cities' will develop implementation scenarios in cooperation with the NICHES+ partners and external experts. To stimulate wider debate, the project established OSMOSE (Open source for mobile and sustainable city), a new web portal aiming to become a comprehensive information source for interested stakeholders.

Coordinator: POLIS (Belgium)

Total budget | EUR 1.24 million

EU funding | EUR 1.24 million

Start/end | 01/05/2008 – 30/04/2011

Website | <http://www.niches-transport.org;>
<http://www.osmose-os.org>



Awareness drive

In order to raise the profile of the new technologies, the previously mentioned CITYMOBIL project series is **showcasing innovative vehicles in cities** around Europe. These events aim to show to a predominantly local audience (authorities, general public, businesses, press) what automated transport can look like in practice. A small fleet of three cybercars and three advanced city vehicles has been built to be brought to interested cities for one- to two-week demonstrations.

A cybercar showcase has already taken place in the city of Daventry (UK). Others are planned in Vantaa (Finland) and Trondheim (Norway). A similar event for advanced city vehicles took place in La Rochelle (France). The city of Uppsala (Sweden) was chosen as a site for a study evaluating the feasibility of a pilot PRT system. In Madrid (Spain), Trondheim, Vienna (Austria) and Gateshead (UK), modelling studies have been conducted and evaluated. The city of Lausanne (Switzerland) has also been selected for a small-scale demonstration.

In a further exercise to canvass public opinion, MOVE TOGETHER assembled a transnational focus group of citizens from 27 Member States to evaluate and discuss the results of EU research projects in this field. All were regular users of urban transport, both public and private, on a frequent basis. Their basic concerns included public health and wellbeing, and the fostering of a genuine partnership among all stakeholders in city mobility.

Project coordinator Carlo Sessa of Italy's Institute of Studies for the Integration of Systems (ISIS) says, 'The key belief of this project is that increased awareness of current or expected achievements of EU research will help citizens and decision makers across Europe to 'move together' towards a new and more sustainable urban mobility culture.'

The focus group participated in workshops and in a major conference with urban transport stakeholders. They also carried out a review of the current state of knowledge and research on urban transport. In addition, a randomly selected panel of 25 citizens living in different districts of the city of Rome and surrounding municipalities participated in two workshops and a final conference.

Finally, a programme of communication was undertaken, involving media events, a travelling exhibition, town exhibitions and other dissemination activities in a number of cities. A final 'Citizens' Statement' put together by the participants calls for more work in several main areas:

- **More space** for pedestrians and cyclers, and better connections between successive pedestrian zones and bicycle lanes;
- **Improved** reliability of public transport systems in order to better compete with individual car use;
- **Better social integration**, including new pricing schemes for the less privileged;
- **Improved accessibility** for the elderly, the young and the disabled;
- **Equal enforcement of rules** for pedestrians, cyclists and vehicle drivers; and
- **Increased safety** with priority for slower and more vulnerable users.

The group also recommends key changes in the way research topics are selected and prioritised for funding. It suggests that projects should be more closely aligned with the real interests of European citizens, by involving the public from an early stage and throughout the whole life-cycles.

Also, according to the 'Statement', there needs to be a move towards solutions that are informed by social and cultural contexts. More effort needs to be made to understand ways of changing people's behaviour, particularly through improving education, rather than always looking for technology-based solutions.

MOVE TOGETHER

Raising citizens' awareness and appreciation of urban transport research in Europe.

The MOVE TOGETHER project focused on raising citizens' awareness of how EU research can help to improve the quality of their lives by making urban transport more sustainable, i.e. safer, more secure, more efficient and better for the environment. A key objective was to foster more responsible choices: encouraging people to move away from heavy reliance on privately-owned vehicles, towards greater use of collective transport alternatives – including any form of mass public transport, flexible on-demand services, car pooling, car sharing, etc.

Coordinator: ISIS – Institute of Studies for the Integration of Systems (Italy)

Total budget | EUR 1.01 million

EU funding | EUR 0.82 million

Start/end | 01/01/2008 – 31/12/2009

Website | <http://www.move-together.net>

International cooperation

Sustainable urban mobility is a concern for all cities around the world. Cities and metropolitan areas face ever-increasing demand on their transport systems, especially in developing regions, with growing car ownership and large urban migration.

Commission policy seeks to extend research cooperation to countries beyond the EU itself, to embrace partners throughout the rest of the world. 'The global challenges we face cannot be addressed if we simply confine our action to Europe,' explains Research DG Project Officer Patrick Mercier-Handisyde. 'This is why we are opening our research funding to emerging economies. Supporting interesting and innovative research projects in the field of transport is a great way to start. At the same time, promoting development in third countries enhances European industrial competitiveness via transfer of technologies, and will have positive knock-on effects that will benefit the world economy'.

Urban mobility projects launched under FP7 take advantage of the SICA (Specific International Cooperation Actions) mechanism, which allows the EU to collaborate in addressing specific needs of mutual interest to itself and targeted International Co-operation Partner Countries (ICPC) or regions.

SICA projects have already been launched to raise the performance of transport systems operating during large events hosted by major cities (e.g. in South-Africa and India); and to improve transport planning and reduce traffic congestion in the world's megacities (e.g. Brazil and China).

Support also extends to the sub-Saharan countries of Africa, for which the FP7 initiative TRANS-AFRICA is devising proactive policies in favour of sustainable public transport development. Jointly led by the International Association of Public Transport (UITP) and the African Association of Public Transport (UATP), the project will deliver an overall review of the state-of-the-art of the sector, followed by relevant recommendations for its future viability. It will determine basic technical specifications of vehicles best adapted for operation in the climatic and infrastructural conditions of the African continent, and disseminate information on existing good practices such as the BRT (bus rapid transit) system operated in Lagos (Nigeria) and the ongoing professionalisation of the informal transport sector in Dakar (Senegal).



VIAJEO

International demonstrations of an open platform for transport planning and travel information.

Cities face ever increasing demands on their transportation systems, especially in developing regions with growing car ownership and rapid urban migration. Even more than heavy infrastructure investment, strategic mobility management is becoming the most important tool for meeting this demand. The VIAJEO project will design, demonstrate and validate an open platform which will facilitate data sharing and exchange from different sources and provide data processing and management to support a variety of services. The project will integrate the open platform with local components and demonstrate its applications in Europe (Athens), Brazil (São Paulo), and China (Beijing and Shanghai).

Coordinator: ERTICO-ITS Europe (Belgium)

Total budget | EUR 5.9 million

EU funding | EUR 3.60 million

Start/end | 01/09/2009 – 31/08/2012

Website | <http://www.viajeo.eu>

STADIUM

Smart transport applications designed for large events with impacts on urban mobility.

To improve the performance of transport systems operating during large events hosted by major cities, the STADIUM project is developing a set of management support guidelines and tools based on experiences gathered during past sporting events. These take account of the mobility requirements of visitors, employees, participants and VIPs, within the framework of general event logistics. Demonstrations at the 2010 South-Africa World Cup and India Commonwealth Games will be followed by a third at the London Olympics in 2012.

Coordinator: ISIS – Institute of Studies for the Integration of Systems (Italy)

Total budget | EUR 5.75 million

EU funding | EUR 3.60 million

Start/end | 01/05/2009 – 30/04/2013

Website | <http://www.stadium-project.eu/site>



TRANS-AFRICA

Promoting public transport in Africa.

Transport improvements are acknowledged as essential to growth, poverty reduction and human development in Africa. Although much of the R&D effort to date has concentrated on interregional, interurban and rural solutions, it is now recognised that majority of sub-Saharan Africans are likely to be living in urban areas by 2025. The EU-supported TRANS-AFRICA project, led by the International Association of Public Transport (UITP) and the African Association of Public Transport (UATP), is therefore studying the regulatory, financial, operational and technical preconditions for implantation of sustainable public transport in the region's cities.

Coordinator: UITP – Union Internationale des Transports Publics (Belgium)

Total budget | EUR 0.40 million

EU funding | EUR 0.40 million

Start/end | 01/06/2008 – 31/12/2010

Website | <http://www.uitp.org/transafrica>

Conclusions and the way forward

Transport scenarios

ERTRAC's 2010 SRA sets the goal of delivering, by 2030, a road transport system that is 50 % more efficient than that of today. The SRA is based on the ERTRAC Road Transport Scenario 2030+ Road to Implementation, and the European Roadmap: Electrification of Road Transport, published in cooperation with EPoSS (European Technology Platform on Smart Systems Integration) and SmartGrids. The objectives for urban mobility derive from the common work of two technology platforms: ERTRAC for road transport and ERRAC for rail transport.

A statement from the ERTRAC Chair explains that the efficiency improvement target 'addresses the societal demand for decarbonisation, reliability and safety of the road transport system, as well as the growth, employment, skills and resource issues that are of critical importance for a globally competitive European road transport industry. Indeed, meeting the evolving demand for new sustainable and affordable mobility solutions will require a major transition towards a wide range of complementary, energy-efficient vehicle designs and powertrains. These new technologies will enable the introduction of a variety of (renewable) energy sources to the transport system and, through the use of information and communication technology (ICT), will become highly integrated with the next generation of road infrastructure and services.'

However, whereas the ERTRAC and ERRAC documents cover the whole field of road and rail transport, an SRA published in 2008 by EUFORUM (the European Research Forum for Urban Mobility – see http://www.ectri.org/Documents/Activities/WG/SRA_EURFORUM.pdf), continues to offer a valid overview of the appropriate future directions for research in the more specific context of city environments.

The SRA takes up issues considered crucial for the future development:

- innovative strategies for clean urban transport;
- tools to support urban transport policy development;
- exchange of know-how and dissemination of good practice experiences coming from different transport sectors;
- tools to fill the gap between available knowledge and realised implementation by identifying barriers and developing appropriate solutions;
- coordinated information and communication strategies targeting transport users, operators and infrastructure managers;
- intermodality between existing mobility services and innovative intermodal mobility services in urban areas;
- improvement of the knowledge base on urban mobility Europe-wide (i.e. across agglomerations);
- research including and combining the subjects identified in existing modal technology platforms, (ERRAC, ERTRAC, WATERBORNE, ISTAG, EIRAC, ACARE, etc.), in order to cover transversal intermodal issues addressing similar priorities (e.g. traffic planning, traffic management).

Four components for future research

EUFORUM perceives the urban mobility system as comprising four main components. The first two of these relate to transport demand:

- users' needs and behaviour, as the starting point of both passenger and freight transport; and
- urban structure – land use, urban sprawl and the relationship with mobility and infrastructure.

The remaining two concern transport supply:

- integrated mobility services – often ICT-based, e.g. travel information and payment services, which permit dynamic interaction between demand and supply; and
- integrated transport systems – the 'hardware' of road and rail infrastructure, and the operation of public and private road and rail vehicles.

Specific research topics are identified and grouped according to the four components.

1. User needs and behaviour

- Understand the mobility behaviour of individuals and enterprises;
- Improve the accessibility and sustainability of cities;
- Know the user, through market research;
- Measure the impact of policy measures and system innovations on mobility behaviour;
- Measure the impact of societal changes on mobility behaviour;
- Determine how to actively influence user behaviour;
- Conduct user acceptance analyses.

2. Urban structure

- Analyse and assess interactions between urban land use and transport;
- Make land development more sustainable through more efficient taxation;
- Use existing transport infrastructure more efficiently;
- Develop approaches for integrated planning;
- Foster the use of integrated planning approaches.

3. Mobility services

- Advance seamless multimodal transport;
- Make urban mobility services more compatible, customisable;
- Develop sound business models and organisational frameworks.

4. Integrated systems

- Reduce negative impacts of urban transport (including: safety, security and environmental impacts);
- Integrate urban transport networks (including: infrastructure sharing, funding, intermodality, intelligent integrated network management);
- Implement new urban freight concepts;
- Strengthen alternatives to the private car – including: walking and cycling – with better data for improved public transport, taxis and other options;
- Review the organisational and regulatory framework for urban transport, encouraging innovations in public transport infrastructure and vehicles.

The fifth dimension: policy support

All of the above give rise to requirements that must be coordinated at EU level in order to fulfil the broad policy objectives of European competitiveness and employment, social and economic inclusion, accessibility, safety and security, and sustainability.

EUFORUM also proposes recommendations for research into demand analysis and modelling as the foundation of a strategy to support integrated policy decision-making.

- Improve data collection on the issues of urban passenger and freight transport;
- Standardise survey design and indicators;
- Develop improved methods for data fusion and synthetic matching;
- Enhance the complementarity and reliability of data collection;
- Strengthen understanding of user aspects by modelling user behaviour;
- Create improved transport models integrating all fields of urban planning and management;
- Lower the barriers to practical use of up-to-date models;
- Improve urban freight transport models and support their application.

Glossary

ACARE	Advisory Council for Aeronautics Research in Europe
ATS	Automated Transport Systems
BRT	Bus Rapid Transit
CATS	City Alternative Transport System
CIVITAS	City-Vitality-Sustainability programme
CNG	Compressed Natural Gas
CO₂	Carbon Dioxide
DG	Directorate-General
DRT	Demand-Responsive Transport
EGCI	European Green Cars Initiative
EIRAC	European Intermodal Research Advisory Council
EPoSS	European Technology Platform on Smart Systems Integration
ERRAC	European Rail Research Advisory Council
ERTRAC	European Road Transport Research Advisory Council
EU	European Union
EURFORUM	European Research Forum for Urban Mobility
EV	Electric Vehicle
FP	Framework Programme
GDP	Gross Domestic Product
ICE	Internal Combustion Engine
ICPC	International Cooperation Partner Country
ICT	Information and Communication Technologies
ISTAG	Information Society Technologies Advisory Group
KERS	Kinetic Energy Recovery System
MVEG	Motor Vehicle Emissions Group
PICAV	Personal Intelligent City Accessible Vehicle System
PRT	Personal Rapid Transport
RTD	Research and Technological Development
SICA	Specific International Cooperation Action
SRA	Strategic Research Agenda
UATP	Union Africaine des Transports Publics
UITP	Union Internationale des Transports Publics
UNIRE	Union of European Rail Industries
WATERBORNE	European Technology Platform on Waterborne Transport

European Commission

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Urban mobility is a major priority for the EU, and since 1998, the EU has invested over EUR 300 million in urban transport research.

This brochure offers a snapshot of European urban transport research, and explains how the results of EU-funded projects are already helping to improve passenger and freight flows in cities.

The projects profiled cover all aspects of urban mobility, including urban infrastructure, demand side measures, new forms of organisation of urban mobility (public transport, car-sharing, car-pooling, demand-responsive transport), urban mobility services (with the support of information and communication technologies), urban mobility systems (innovative and clean urban vehicles, accessibility of vulnerable users, quiet cities) and city logistics. In addition, actions to promote and disseminate urban transport research and international cooperation are highlighted.

Many of the projects featured are still in their early stages, so this brochure gives an exciting insight of the state of the art of urban transport research, and provides a glimpse of the urban transport technologies and systems we can expect to see in our cities in the near future.



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