

Green mobility: chance and challenge for the public transport sector

All capital regions in Europe suffer from the negative impact of private mobility in terms of congestion, air pollution and noise emissions. As public transport bundles the transport demand in one vehicle, it has an environmental advantage compared with the private car. Therefore public transport should be seen as the key element for sustainable mobility in capital regions.



Courtesy of the European
Commission central
multimedia library

More and more cities and regions in Europe set up strategies for cutting the negative impact of mobility in their region. These strategies try to reduce the number of private cars by implementing road pricing and parking fees or by reducing the access to the city centre for cars with high emissions. As alternative to the private car, public transport services together with bicycles and walking have to be supported.

But also the car industry is working on greening private mobility. The public transport industry has to be aware of this development and should make sure to keep the environmental bonus by supporting the development of green vehicles for buses, trams, metros and railways. This is one of the big challenges for the sector over the next years.

Currently different approaches are followed over Europe in order to make public transport more environmentally friendly.

In Switzerland there has been a renaissance of electrically powered vehicles in urban transport (trams and trolley buses) over the last years. Due to the high efficiency of the engines, electric systems have the potential to be the most environmentally friendly ones. To be called a green energy, the electric power has to be produced from renewable resources. As Switzerland has a high percentage of electric energy from water power plants, the renaissance of the tram and trolley bus on busy lines with high loading factors is an exemplary good practice for green mobility in Europe.

Especially for buses in city centres, hybrid vehicles are an alternative to reduce fuel consumption and emissions. Hybrid vehicles are on the market from serial production and the higher investment prices should be equalled out over the lifetime of the vehicle through the lower fuel consumption.

A promising research project is currently carried out in Hamburg. With the support of the European Union hydrogen powered fuel cells are fitted into buses and tested in daily services. From the technical point of view the hydrogen fuel cell seems to be working in daily services but the investment costs for the new technology still are too high for serial production.

On the long run, fuel prices will increase as diesel and gas are limited resources. Cities and regions should be open for testing and implementing new powering systems for public transport in order to be prepared to introduce alternative energies. Investments into new vehicles should take the fuel consumption into account. Higher investment prices can be equalled through lower consumption quickly - with benefit for the environment.

3rd CAPRICE workshop in Romania on 'Sustainable mobility, energy efficiency and implementation of clean fleets in public transport - experiences about the use of low pollution vehicles'



The workshop stressed on the overview of the topic 'Sustainable mobility and green vehicles in the field of public transport'. The main points and challenges were explained by VBB (e.g.: limited resources, public transport increasing costs and decreasing advantages) as well as an outline about different technologies that make public transport more environmental-friendly (e.g.: improving fuels, hybrid vehicles, electric vehicles, hydrogen fuel cell...). Another relevant aspect lies in energy efficiency improvement, especially through efficient transport and urban planning.

The first part of the workshop was dedicated to an overview of sustainable mobility, which was chiefly addressed through the French case of Ile-de-France. Thus, STIF shared its experience of regional urban mobility plan (PDU in French standing for 'Plan de Déplacements Urbains d'Ile-de-France'). According to legislation on air pollution from 1996, urban mobility plans have to be set up in all larger French cities (more than 100,000 inhabitants) in order to reduce pollution and noise emissions.



Several objectives are set for a period of five years and aim at promoting public transport through:

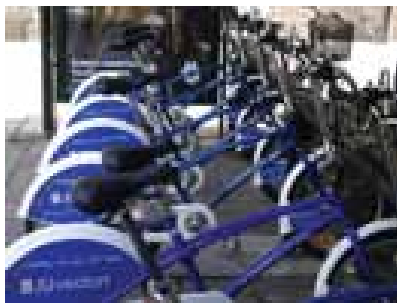
- the reduction of motor traffic;
- the development of public transport and any other environmental-friendly modes;
- the operation of main roads network in order to enhance the efficiency and the use by all modes of transport;
- the organisation of public parking provision as well as freight transport (goods delivery) to reduce the impact on road traffic and environment;
- the promotion of staff's mobility management for companies and public administrations.

The PDUIF was elaborated by the French State and first adopted end of 2000 for five years (until 2006). Since the 'Decentralisation Law', STIF has been responsible for the evaluation and the revision of the PDUIF which started in January 2007. On the whole, the objectives set out in the PDUIF have not been achieved and a new urban mobility plan is being worked out by STIF linked with all stakeholders in Ile-de-France.

New challenges for the future plan are to be taken into account:

- evolution of society and way of life (ageing population, evolution of trips purposes)
- new energy context (increase of oil cost, France's commitment to reduce green house gas emissions by -20% in 2020)
- new urban challenges for the Ile-de-France region (60,000 housing per year, control urban sprawl by promoting density in the center of the region or in existing urban poles)
- evolution of public opinion (increased awareness of sustainable development, evolution of modal choice behaviour towards private car as observed in Ile-de-France and nationwide).

In the second part of the workshop, the participants presented their individual approaches to sustainable mobility and green fleets in public transport.



The city of Vilnius has suffered a strong increase in car usage over the last decades, MESP said. Indeed, the number of cars has increased from less than 200 (1991) to approximately 560 cars per 1,000 inhabitants (2009). As a result, the city defined objectives for promoting public transport in a strategic plan for the period from 2002 to 2011. The first task of this strategic plan is to minimize the negative impact of transport traffic on the environment through the promotion of the usage of ecological fuel, giving the priority to electric means of transport. The second task is to ensure the development of sustainable mobility through the improvement of public transport and the development of non-motorised transport as well as walking. At the same time, the city also defined an air pollution reduction action programme for 2008-2011 which aims at reducing travels by car, improving vehicles technical conditions and increasing the share of eco fuel.

In Warsaw, the metro is very successful, which results in capacity problems during peak hours, ZTM Warsaw reported. A second line is planned and construction work is supposed to start in 2010. The tram network is going to be extended by the next years and the commercial speed of public transport is supposed to be increased by building separate lanes. This aims at first shifting the modal share from individual to public transport. Secondly, it is aimed at implementing basic improvements like the replacement of the old Ikarus-buses by EURO-Norm vehicles. The third step would be the implementation of new technologies for green vehicles. Even though tests of CNG (Compressed natural gas), ethanol and hybrid vehicles were carried out during the last years, other topics are currently of higher importance.





On its side, the Municipality of Bucharest explained that a new bus fleet has just been bought. Thus, the question of new technologies might not be a topic of utmost importance until the current fleet needs to be renewed in about 10 years. The city of Bucharest suffers from very heavy car traffic. There are more than 600 vehicles per 1,000 inhabitants. Consequently, the emissions of public transport have only a very small share of the city's pollution and the city's current strategy is to promote public transport as an alternative to private transport rather than making it environmental-friendly. Nevertheless, Bucharest is working on renewing its public transport fleet. Approximately 80% of the buses are in line with EURO III or EURO IV standard. The next step will be to fulfil EURO V standard which may be combined with hybrid vehicles. Trams are currently equipped with choppers in order to make them more energy efficient, which impacts on the environment due to the lower energy consumption. The city also made good experiences with trolley buses (except during winter time because of ice). Important network extensions for trams and trolleys are currently planned. With the objective of reducing noise emissions, tram lines were the first to be equipped with green tracks. This will also be extended within the next years.

STIF (Paris / Ile-de-France) presented the different technologies which were tested in Ile-de-France. Several experiences related to green technologies were thought and then stopped such as water diesel emulsion, liquefied petroleum gas (LPG), liquefied natural gas (LNG). New experiences have been developed and regard biofuel, hybrid and electric technologies. Precisely, there had been a few vehicles driven by bio fuels but today, hybrid vehicles are being tested. Green technologies for light rail have also been designed and a new concept of BRT (Bus rapid transit) called 'TZEN' has emerged in Ile-de-France. It is a high quality material running on special lanes with real stations.



As far as the metro vehicles are concerned, new cars will successively replace the existing rolling stock on the oldest part of the underground network. The Paris MF 01 (former MF 2000) is a five car unit, with an attractive design combined with high levels of comfort, security, reliability and hardly noisy. Passengers can move freely throughout the entire length of the train via wide gangways. These new vehicles provide high environmental demands as the energy consumption has been improved by around 30%, besides the choice of recycled materials.

Regional railways are also concerned by green technologies. A new suburban train was launched in Ile-de-France on 12th December 2009. It is an articulated, single-level train in a 'boa' design, composed of fully-fitted, extra-wide carriages with seats that are wider than those in existing trains. Capacity varies from 800 to 1,000 passengers, depending on the number of carriages. The design of this train, called 'Francilien', is particularly impactful on energy savings (30%) and the environment.





VBB (Berlin-Brandenburg) shared the experience of two projects related to green vehicles that had been carried out in the Berlin-Brandenburg region over the last years. The first project deals with the implementation of a new bus fleet in Frankfurt (Oder) on the basis of CNG (Compressed natural gas) buses. The project was already implemented in the year of 2004 and has proven successful, which helped to improve the local public transport's image. At the same time, the passengers' satisfaction increased strongly.

The second project, launched and managed within the framework of HyFLEET:CUTE Project (European Commission's 6th Framework Programme), deals with testing hydrogen powered buses at BVG in Berlin. The approach is to power a traditional engine directly by hydrogen. Unfortunately, the tests were only partly successful since a series of buses had to be returned to the manufacturer (MAN) due to poor reliability.



Courtesy of BVG

Green buses in Paris and Ile-de-France: potential technologies for the future



Among the different existing technologies developed to create 'greener' modes of transport, of which urban buses, some are more successful than others. Here are the examples of what was (or has been) implemented in Paris and Ile-de-France region over the last decade.

The electric bus called 'Montmartrobus'

The Montmartrobus is a bus service operated in the 'Butte de Montmartre' urban district in Paris. The route is 3 kilometres long with 33 bus stops. The Montmartrobus line is equipped with an electric vehicle called OREOS 55 which can contain 50 people, 39 of them standing up. The vehicle is 2,5 times more expensive (battery not included) than the diesel model. The battery (type nickel-cadmium) represents 15% of the total vehicle's weight when it is empty. So an additional cost about 12% or 13% has to



be taken into account once this type of vehicle has been bought. However, the electric bus in general has several advantages: it is reliable, noiseless and pleasant-driving. It also has a good engine output, the wide engine torque range is better than diesel at start, the maintenance is rather easy and cheap to run. Moreover, it does not emit greenhouse gas or polluting emissions. Nevertheless, the electric bus may be limited still for a long time to serving short bus routes, with rather small vehicles. Indeed, its development is strongly thwarted by the weight and the price of the storage battery as well as the cost of the vehicle itself.

The hybrid bus (electricity/fossil petrol)

Following the example of cars (e.g.: TOYOTA Prius), the hybrid bus associates an electric engine with a thermal engine in order to combine both advantages. The energy storage is also doubled as it contains a battery for electric energy and a petrol tank for thermal energy. However, existing hybrid buses are for the moment supplied with diesel fuel only, since the battery cannot be reloaded from an external source of supply. A hybrid bus is thus a vehicle with thermal engine, whose capacity is strengthened through its electric engine. It is almost ideal in urban networks where slowdowns, stops and restarting are frequent. Indeed, at these moments it is possible to get back a part of braking energy to reload the electric battery. At a theoretical level, the expected petrol consumption gain could be about 15%-25%.

An alternative: the hydraulic hybrid bus test 'HYNOVIS'



The RATP (French operator) has been testing the first European hydraulic hybrid bus called HYNNOVIS since February 2010. The objective is to reduce the CO₂ emissions by 30%, and the NO_x emissions by 50%. The bus-concept Hynovis is endowed with a hydraulic hybrid system. This allows to retrieve the braking energy and to implement the so-called 'stop & start' process stopping the consumption of diesel oil while in slow motion or at a standstill, and thus preventing any pollution. Innovation is also featured through the fitting-out and the architecture of the vehicle. The floor is low on more than 80% of the length thanks to the replacement of the classic back axle by a train with independent wheels which was reversed 1,50m backwards (under raised back seats) and by the choice of a double axle with small wheels in the front. Thereby, HYNNOVIS is equipped with a broad corridor was (1,20m instead of 0,90m), which increases considerably the accessibility and the movement of the travellers. Besides, the glazed surface was increased by 20% thanks to the installation of seats at the strict level of the floor. This option sets aside 0,20m of additional height whereas passengers can enjoy a panoramic vision on the left-hand side.

CAPRICE recommendations



Recommendations on sustainable mobility, energy efficiency and implementation of clean fleets in public transport were developed from the 3rd CAPRICE-workshop held in Bucharest from 16th to 18th November 2009 during which all partners shared their views and experiences about that issue.

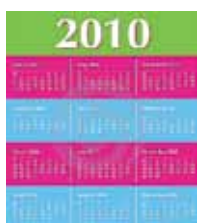
Recommendations at regional and national level

- All capital regions in Europe suffer from the negative impact of private mobility in terms of congestion, air pollution and noise emissions. Public transport is the key element for sustainable mobility in capital regions. Strategies for cutting the negative impact of mobility therefore have to foresee a key role for public transport whilst reducing the amount of private cars in urban areas.
- Regions and cities should set up regional mobility plans providing a strategy for strengthening environmentally friendly modes of transport (public transport, bicycles, walking) and implementing measures to reduce the number of cars.
- As public transport bundles the transport demand in one vehicle, it has an environmental advantage compared with the private car. Nevertheless the car industry is working on greening private mobility. The public transport industry has to be aware of this development and should make sure to keep the environmental bonus by supporting the development of green vehicles for buses, trams, metros and railways.
- The public transport sector has a long experience with electrically powered vehicles. Due to the high efficiency of the engines, these systems have the potential to be the most environmentally friendly ones if the electric power is produced by green energies. Especially on lines with high loading factors, electric systems should be introduced. Good examples for this approach can be seen in Switzerland and France, where modern tram and trolley bus systems were implemented in the last years.
- On the long run, fuel prices will increase as diesel and gas are limited resources. Cities and regions should be open for testing and implementing new powering systems for public transport in order to be prepared to introduce alternative energies. Investments into new vehicles should take the fuel consumption into account. Higher investment prices can be equalled through lower consumption quickly - with benefit for the environment.
- Capital regions should start to develop long term strategies on how to organise transport without fossil fuels. Increasing oil prices as in 2008 will lead to more passengers in public transport as more and more people will not be able to afford the prices for fuel for daily usage. Public transport must be prepared to play a stronger role in capital regions than today.

Recommendations at European level

- The European Union should encourage the implementation of regional mobility plans. Through initiatives as in CAPRICE or CIVITAS, an exchange of experiences in the field of regional mobility plans should be supported.
- Regions must get the right to restrict the usage of private cars in urban areas and to introduce road pricing systems. The European Union should clearly state that restrictive measures for greening mobility do not have a negative impact on the European single market and are supported by the European Union.
- The European Union should extend the funding of research and implementation of alternative energies for public transport. Projects which are focused on green energy (like research on hydrogen buses in Hamburg) need constant funding, as new energies are not yet competitive with traditional fuels. This should be taken into account for the preparation for the next funding period 2014-2020.
- The European Union should develop a policy for greening taxes and fees in the transport sector. Today in most countries, the green modes of transport pay the highest tax rates and fees for the utilisation of infrastructure whilst the competitors (private car or flight traffic) pay less. On the contrary, a sustainable pricing system would charge dependent to the negative impact on the environment.

European events & meetings



A large series of events related to public transport in urban areas is regularly organised or promoted by different institutions, networks and associations at European and international level such as EMTA, Polis, Civitas, CODATU, UITP and Eurocities.

EMTA

- 30 September / 1 October 2010: Board meeting, Barcelona (Spain)
- 11-12 November 2010: Autumn General Meeting, Barcelona (Spain)

For more information: www.emta.com

POLIS

- 7-10 June 2010: Transport Research Arena, Brussels (Belgium)
- 22 June 2010: DG MOVE ITS Conference, Brussels (Belgium)
- 22-25 June 2010: Velo-City Global 2010 in Copenhagen (Denmark)
- 1-3 July 2010: Green Energy City conference, Pisa (Italy)
- 16-22 September 2010: Mobility week
- 27-29 September 2010: ICT 2010, Brussels (Belgium)

For more information: www.polis-online.org

European events & meetings

CIVITAS

- 17 June 2010: CIVITAS MIMOSA and CIVITAS CATALIST workshop on Mobility Management - Smart Solutions for smart cities, Berlin (Germany)
- 28-29 September 2010: CIVITAS Forum Conference 2010, Malmö (Sweden)

For more information: www.civitas.eu

CODATU

- 8-10 June 2010: IT-TRANS, The international meeting place for decision makers in public transport, railways and mobility, Paris (France)
- 11-15 July 2010: 12th World Conference on Transport Research, Lisbon (Portugal)

For more information: www.codatu.org

UITP

- 7 June 2010: Joint UITP/UTP Conference Six months' experience of the PSO Regulation, Paris (France)
- 9-11 June 2010: 6th International Bus Conference & Study Tour on 'Fuelling Public Transport: do green buses bring more customers?' Lyon (France); Pre-Conference Study Tour 5-9 June 2010 in London, Lille, Paris and Lyon
- 12 June 2010: Trolleybus Workshop, Lyon (France) in conjunction with the 6th International Bus Conference
- 16-17 June 2010: Training programme 'Contracting for better public transport', Bologna, (Italy)
- 24-25 June 2010: Final Conference Urban Track New products and strategies for urban rail infrastructure, Prague, Czech Republic

For more information: www.uitp.org

EUROCITIES

- 21-22 June 2010: Mobility Forum Meeting, Copenhagen (Denmark)

For more information: www.eurocities.eu