DECARBONISATION: the public transport contribution

The decarbonisation strategy responds to a global policy context including the following international and European targets:

- The necessity to keep global average temperature increase below 2 degrees Celsius compared to pre-industrial levels (UNFCCC international agreements)
- The EU 2020 strategy targets in the area of climate change and energy: greenhouse gas emissions 20% (or even 30%, if the conditions are right) lower than 1990; 20% of energy from renewable; 20% increase in energy efficiency by 2020
- The EU Transport White paper target to achieve a 60% reduction in CO2 emissions within the EU by 2050.

The International Association of Public Transport (UITP) supports the ambitious targets proposed in the recently published EU Transport White Paper. The worldwide public transport sector is already helping to reduce greenhouse gas emissions and can play a major role in achieving low- or zero-carbon mobility. Achieving “clean” mobility will involve the process of decarbonisation.

What is decarbonisation?

Decarbonisation means reducing greenhouse gas (GHG) emissions produced as a result of transport, including emissions released directly during transport and emissions due to the production of transport - for example emissions from the production of electricity used to power a given mode. Decarbonisation also includes emissions resulting from the manufacture and/or disposal/recycling of products and vehicles.

What measures can be taken to help achieve decarbonisation?

Public transport, despite already having an excellent track record in ensuring low-carbon emissions compared to other transport modes, is prepared to do more to reduce its carbon footprint. Alongside changes that can be made directly by the public transport sector, other solutions will come in the form of urban planning and urban policy:

- Avoid/Shift/Improve: Low-carbon mobility in cities requires a holistic concept based on a mix of policy, technology and behavioural changes, the well-known Avoid/Shift/Improve concept.

- Modal shift: Strong modal shift towards public transport, walking and cycling is needed, as technology alone cannot deliver the required changes in a short time frame. Modal shift will also generate a number of additional benefits in terms of employment, congestion, health, accidents and energy supply.

- Increasing commercial speed and reliability for collective modes of transport, such as priority at traffic lights and reserved corridors/lanes, is vital. An increase of 5km/h in buses’ commercial speed on a busy line leads to 20% less energy consumption and attracts more passengers.

- The smart use of the resources through an efficient management of the energy on board and in the whole system is a key point.
• **Buses** account for 50-60% of the total public transport offer in Europe, and 95% still use diesel fuels. Long-term decarbonisation efforts obviously include buses powered by electricity, but also by second-generation biofuels.

• **Rail transport** in urban areas already runs almost exclusively on electricity. There are further energy savings to be achieved by using lighter weight/composite materials (30% potential energy savings), and by optimising energy recuperation devices (up to 45% potential energy savings) and train operation management.

• **Electric cars** should be deployed in captive car fleets complementary to public transport, such as taxis or car-sharing.

• **Operational efficiency gains**: Public transport companies employ qualified drivers that have various legal vocational requirements and training\(^1\), as well as voluntary corporate schemes. **Eco-driving** has proven to be a useful tool to increase passenger comfort and reduce energy consumption and GHG emissions.

• **Infrastructure**: There is great potential for energy savings in infrastructure, both for new and older assets. This includes escalators, lifts, building insulation, heating, cooling, cogeneration, lighting, etc. Another example is the increasingly popular production of renewable electricity from photovoltaic panels installed on roofs of maintenance and parking/stabling facilities when tax or investment incentives are available.

**Facts and figures**

• The transport sector is responsible for approximately 23% of energy related CO2 emissions worldwide and 13% of all greenhouse gas emissions emitted (IEA, 2009). CO2 emissions from the sector are predicted to increase by 120% on 2000 levels by 2050 (OECD/ITF, 2008).

• In **European urban areas**, public transport accounts for **21% of the total number of motorised trips** and is responsible for roughly **10% of transport related greenhouse gas** (GHG) emissions.

• Currently, between **40 and 50%** of public transport is already **powered by electricity**. Public transport is therefore already an established **electromobility provider**.

• **Rail transport** in urban areas is already running almost exclusively on electricity. In the last decade, passenger rail transport succeeded in decreasing its specific energy consumption by **22%\(^2\)**.

• **95% of buses still use diesel fuels**, i.e. fossil fuels. Buses account for 50-60% of the total public transport offer in Europe. Some cities have set the objective to renew their bus fleet into hybrid buses (La Valletta, London).

• The European Commission estimates that developing low-carbon energy and transport systems will require public and private investments amounting to around **EUR 270 billion annually** on average over the coming **40 years\(^3\)**. Governments, companies

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\(^1\) E.g. Dir. 2003/59/CE on vocational training requires a minimum of 35 hours every 5 years.

\(^2\) Verband der Bahnindustrie in Deutschland, **Politikbrief**, January 2011

\(^3\) A Roadmap for moving to a competitive low-carbon economy in 2050 COM(2011)112 final, page 10.

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and citizens will need to invest **billions of Euros each year for several decades** in order to reach the decarbonisation targets and help mitigate the equally high cost of climate change.

**Frequently asked questions**

- **What is public transport’s carbon footprint at the moment?**
  In European urban areas, public transport carries 200 million people everyday and accounts for 21% of the total number of motorised trips. It is responsible for roughly **10% of transport related GHG emissions in cities.**

- **How does public transport perform compared to other modes?**
  On average, public transport consumes 3.4 times less energy per passenger kilometre than automobiles. This ratio is even more favourable during rush hour.

- **If the future lies in electromobility, why not just rely on electric cars?**
  Electromobility is only one part of the solution. Electric cars may emit less GHG gas, however, in terms of their carbon footprint, the entire production process and recycling of the cars should be taken into account.

  Electric cars remain an individual mode. Electric cars will not solve the problem of congestion faced by cities, as relying on individual cars will not reduce traffic.

- **Electromobility, however, can provide a solution if used to power collective modes such as public transport, or in conjunction with public transport. From a practical point of view, bus fleets in Europe could be massively modernised into electric fleets without any disruption to the existing grid and installed power. Can the same be said for the entire car fleet, or even a part of it?**

- **It is therefore impractical to envisage mobility based on an electric car fleet, however, electric cars can be used in car-sharing schemes if fully integrated with public transport networks, to supplement transport systems.**

**Glossary**

**Carbon footprint**
Amount of the carbon dioxide gas emitted as part of an activity. This includes the emissions of gas from exhaust pipes, as well as that ‘embodied’ in the manufacture and disposal and/or recycling of products or vehicles. For electrically powered vehicles, the emissions associated with providing energy at the electricity-generating power station should be counted. In transport terms, CO2 is usually described in terms of the amount emitted for each passenger transported – CO2 per passenger km (or gCO2/pkm).


**Modal ‘share’ or ‘split’**
Percentage of journeys using each mode of transport (taken as main mode by distance) over the course of a year, usually measured in terms of arrivals to a site. It can also be used to measure visitor arrivals and business trips. When measured as a percentage, rather than actual employee numbers, this helps with organisations that are increasing or decreasing total numbers employed but not the overall proportion of those driving as compared to other modes.

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**Modal shift**
Change in percentage of journeys using each mode of transport, judged by comparing before and after figures or using data collected annually over a number of years.

**Avoid/Shift/Improve**
The traditional approach applied to deal with increased transport demand has been the provision of additional road space by means of new and expansive road infrastructure. This supply-side oriented approach has, however, not delivered the expected benefits. Induced traffic continues to produce excessive levels of congestion, GHG emissions and other externalities. For this reason, the traditional approach in the current years is considered ineffective and "old school". Therefore, a new approach to tackling current transport problems is required. Inspired by the principles of sustainability, this alternative approach focuses on the demand side, as opposed to the conventional approach. The new approach, known as A-S-I (from Avoid/Reduce, Shift/Maintain, Improve), seeks to achieve significant GHG emission reductions, reduced energy consumption, less congestion, with the final objective to create more liveable cities. The objective of the A-S-I approach is to promote alternative mobility solutions and to develop sustainable transport systems. The current factsheet emphasises the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) model of Avoid-Shift-Improve (ASI).

**Eco-driving**
Eco-driving is a way of driving that reduces fuel consumption, greenhouse gas emissions and accident rates. Eco-driving is about driving in a style suited to modern engine technology: smart, smooth and safe driving techniques that lead to average fuel savings of 5-10%.

**Best practices**

**Modal shift**

- **Gothenburg, Sweden:**
  Today, Gothenburg is taking a bold decision and a big step towards increasing public transport’s market share. In March 2010, the city of Gothenburg decided to introduce congestion charging and in June the national decision was made to implement congestion charging as of 1st January 2013. The tax will be used for different infrastructure projects in the region, with the majority directed towards public transport development and improvement. The congestion charging does not only make infrastructure investments possible, but also makes public transport more competitive. A new parking policy has also been introduced recently, which increases the advantages of public transport compared to private cars.

- **Vienna, Austria:**
  36% of all journeys in Vienna are made using public transport – more than are made in cars (31%). This is one of the highest shares of any city in the world.

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This continual shift to public transport could be explained by the fact that 96% of Viennese residents live within walking distance of a Wiener Linien stop.

Wiener Linien, owned by the city of Vienna, continue to encourage modal shift, attracting more and more passengers to use public transport and to move away from the car by increasing and improving services and accessibility. In September 2010, the metro service was extended to 24-hour operations at weekends and during the nights before public holidays. Three times more passengers now use the overnight services (metro and night bus) compared to the earlier service offer.

In the 2010 business year, a record number of around 839 million passengers were transported. This means that, over the past five years, passenger numbers have increased by 67 million. But modal shift does not stop there. By expanding the transportation network, Wiener Linien aims to increase the proportion of journeys made by public transport compared to the total number of journeys made from 36% to 40% by 2020. For more information, see the abridged annual report: http://www.wienerlinien.at/media/files/2011/wl_annual_report_2010_55977.pdf

**Increasing commercial speed**

- **Iasis, Romania:**
  In Iasis, Romania, it was decided to improve the network and renew nearly 16.4km of tram infrastructure and restructure and improve the public transport services by introducing a Public Service Contract. Commercial speed increased by 39% and reliability of the service greatly increased, with maintenance costs falling by 58%. This has also changed the public's view of trams in Iasi, which were seen as an outdated means of transportation blocking car traffic, to an efficient, reliable, modern and ecological mode.

**Operational efficiency gains/eco-driving**

- **Geneva, Switzerland:**
  Transports public genevois (TPG) has found a 40% decrease in fuel consumption can be achieved between aggressive and ‘soft’ driving behaviour.

  As TPG has an annual fuel bill of some EUR 6 million - this is an interesting potential area for savings. The other added benefits are that drivers are less stressed and can better anticipate problems (preventative driving) avoid incidents and accidents. There are also fewer passenger incidents on the bus. Other cost savings have been observed such as increased life of tyres, less brake wear and other mechanical parts (gear box and engine). Tests over an 8km stretch of bus route showed that drivers who had received training and were implementing it used the brakes on average 838 times while untrained drivers typically used them 1,120 times. The distance required for braking was also reduced from 30.49m to 22.32m.

  In terms of security, 29 speed limit infractions were noted compared to eight for trained drivers and speeding occurred over a shorter distance. Driving this way also helps the planet. One litre of diesel is responsible for about 2.6kg of CO2 emissions. Saving 1,600 tonnes of CO2 (as found at TPG) with eco-driving is equivalent to 512 ‘years’ regular car driving (based on a fuel consumption of eight litres per 100 km and driving 15,000 km per year).
**Savings**

Fuel: 615,700 litres of fuel less at average price of 1.4 CHF (87 eurocents) (TTT1) = a saving of **862,000 CHF (537,000 EUR)**

Maintenance (brakes): **1,200 CHF (747 EUR)** spent annually = reduction of 30%.

**Energy savings in rail**

*Madrid, Spain:*
Metro de Madrid has reduced electricity consumptions by installing state-of-the-art static energy accumulators that enable braking energy to be used to start other trains, as well as a train movement simulator that optimises train speed so as to ensure that saved energy and coasting speed are optimal. Implementing these measures has given energy savings of 10-12% and a reduction in energy consumption of almost 41,000 MWh, not to mention a reduction in emissions of 13,778 CO2 equivalent tones – the same amount eliminated in a year by the 400,000 or so trees in the Casa de Campo park in Madrid.

**Infrastructure**

*Rotterdam, The Netherlands:*
RET is building an innovative tram depot costing some EUR 40 million that should be sustainable both in its construction and operations. This two-in-one concept combines a new depot and a Park and Ride for 500 cars. It is located next to the A16 highway, making it perfectly located for the Park and Ride facility with a direct interchange from the main highway to the tram giving direct access to the city centre of Rotterdam. This Park and Ride facility will be the roof of the tram stabling area, a way of using the same square metres in a multiple way. The building substructure will consist of over 3,000 concrete piles 20 metres deep. Over 500 will be energy piles, making geothermal heat and cold exchange possible. Trams will be washed and toilets will be flushed with grey water (rainwater and recycled water). Recycled materials (like granulate concrete) will be used as much as possible. Illumination will be daylight with lighting switched on and off by light detection sensors. Providing the permits are granted, RET will also build several wind generators next to the building.

**Bus**

*Oslo, Norway:*
Ruter (60% owned by the City of Oslo and 40% by Akerhus County Authority) plans, contracts and markets public transport services for Oslo and Akerhus, Norway. Ruter’s environmental strategy moves towards zero use of fossil fuels and reduction in local air pollution and noise. The CO2 emissions from buses in 2008 were about 67,000 tonnes. From July 2010, use of biofuels will reduce emissions by about 8,500 tonnes.

**Additional resources**


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