






## BUS SYSTEMS: AN EFFICIENT MODE OF TRANSPORT

The bus is a very efficient mode of public transport, as it is cheap, flexible and, in many cases, tailored to the needs of end-customers both in terms of capacity and speed. Buses operate most of the time in mixed traffic. They are therefore in the front line in competing with private motorised transport. Buses require little infrastructure (mainly a depot and workshop), and are easy to put in service. From an economic, environmental and social point of view, buses still remain the most universal solution for a balanced and sustainable urban development. Indeed, the bus is the only public transport mode in many of the world's cities. It also plays a key supporting role in cities with rail transport modes.

**Demand/Capacity**  
**Transport 10.000 persons 1 km**

	Passengers (numbers)	Vehicles (numbers)	Space (m <sup>2</sup> )	Fuel (liters)
	5	2000	24000	200
	25	400	8800	120
	100	100	3400	50
	175	57	2850	35
	270/300	37	2370	26

*Figure 1-Demand/capacity Transport 10,000 persons 1 km*  
The transport capacity per vehicle depends on the size of the bus, ranging from mini or midi buses (9 to 11 metres in length) to standard, articulated and double-articulated buses (up to 25.5 metres). It depends on the interior lay-out and the ratio of seats versus standing passengers. As far as the standing passengers are concerned, this depends also on the number of standing passengers per square metre (around four in Europe). Source Volvo Bus Corporation.

- ➔ The capacity of buses is around 100 passengers for a single bus, and around 150 for an articulated bus.
- ➔ Buses use nearly 20 times less space to transport the same number of people than private cars.
- ➔ To carry 50,000 people per hour per direction it is necessary to have 175 m wide road used only by cars, or 35 m wide road used only by buses.
- ➔ In peak hours, it takes 60 cars to carry 75 people or one bus

## Emissions and energy

As far as the green house effect is concerned, buses perform much better than cars since the emissions per passenger/km of CO<sub>2</sub> equivalent gases are reduced, as shown below.

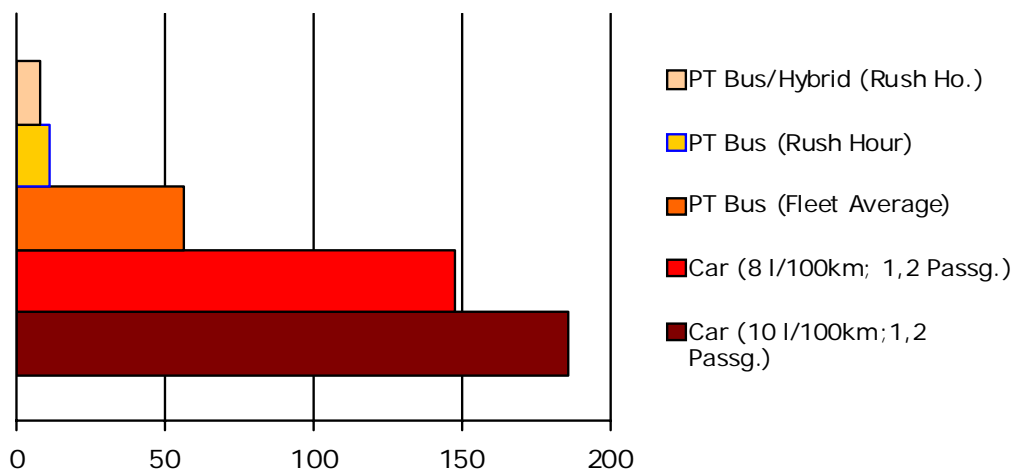


Figure 2- Emissions per passenger-km of CO<sub>2</sub> equivalent gases Source VDV  
The energy consumption of the bus per passenger/km is one-third of that of a car.

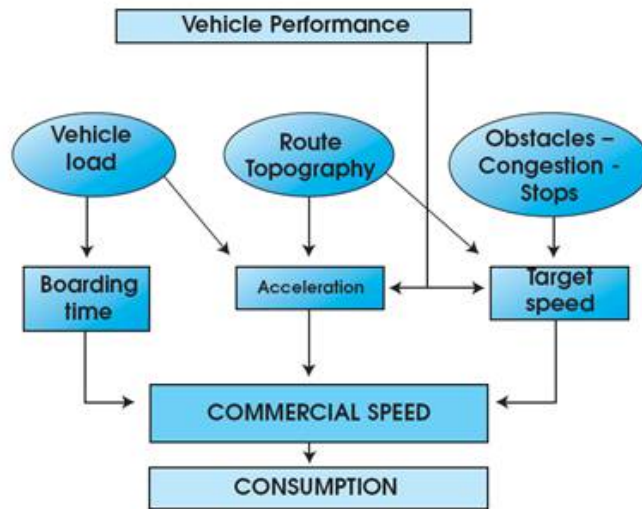
## Commercial speed: a key driver

One of the main factors orientating an individual's choice of transport mode is commercial speed/travel time. Over the past decades, increased road space consumption by private individual motorised transport has contributed to tremendous congestion. This has a direct impact on the operation speed of buses, and hence their service quality, reliability, energy consumption, economy and overall profitability.

City	Bus speed (in km/h)	Reference area
Helsinki	26	Yhteistyövaltuuskunta including Helsinki + Espoo + Vantaa + Kauniainen
Copenhagen	21.6	Greater Copenhagen region
Warsaw	21.5	City of Warsaw
Madrid	21	Comunidad de Madrid
Bern	20.2	Planning Region Bern (24 municipalities)
Berlin	19.5	State of Berlin (Land Berlin)
Vienna	19	City of Vienna
London	18	Greater London
Stockholm	18	Stockholms Lan
Lisbon	17.4	Area Metropolitana de Lisboa
Paris	17.1	Ile-de-France Region
Budapest	16.2	Municipality of Budapest (Fopolgarmesteri Hivatal Budapest)
Athens	16	Attika region
Rome	15.4	Commune of Rome
Dublin	14.6	Dublin Region (Dublin City Centre and counties of Fingal, South Dublin and Dún Laoghaire-Rathdown)

Source: *Mobility in Cities Database* © UITP 2006 Please quote the source when using the data. Reference year is 2001. Reference areas are metropolitan areas and comparisons should take into account different configurations of metropolitan areas.

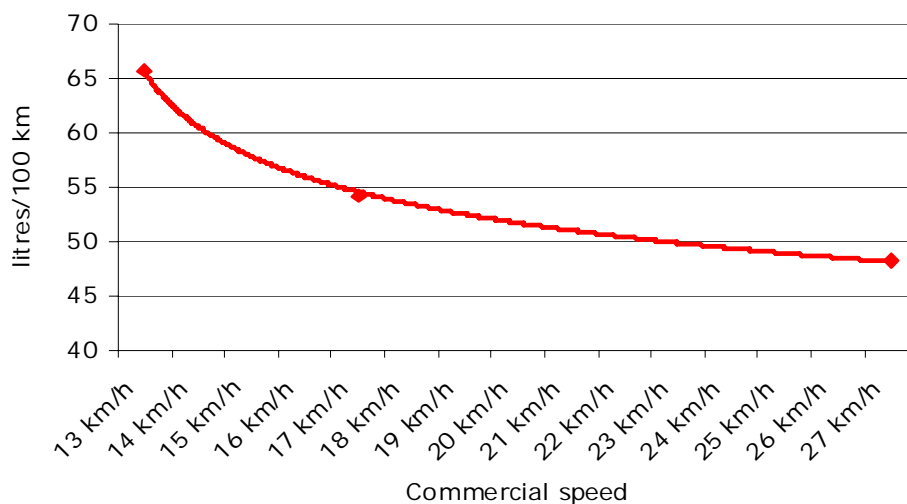
The commercial speed with which buses can circulate in a bus system directly determines their energy consumption. The schema below details the different influential elements.



*Schematic graph showing the influential factors on the average commercial speed and its interrelation with the fuel consumption of buses . Graph extracted from UITP's project SORT.*

Standardised fuel consumption measurements with SORT cycles show the tremendous effect of the average commercial speed on the fuel consumption on a busline. Indeed, the faster the average speed is, the lower the fuel consumption.

Consumption vs. Commercial speed



*Source: UITP SORT method. The points in the graph correspond with SORT 1, SORT 2 and SORT 3.*

## The importance of dedicated spaces

The efficiency, speed and performance of buses depend heavily on dedicated lanes and stops. Various forms of traffic segregation are possible - from a mere painted mark on the road, to various forms of road treatments (elevated lanes, movable barriers, 'bus locks', contra flow lanes etc), to dedicated dual lane infrastructure with 'metro-like stations'. The most advanced of such systems is referred to as 'Bus Rapid Transit' (BRT).

## Recent innovations

Some key innovations include:

- 'Bus Rapid Transit'
- Clean engines and alternative fuels
- Low-floor architecture
- Double articulated vehicles: up to 210 passengers
- Guiding devices

A recent trend is also to look beyond vehicle technology alone and to consider the wider system and its components, such as infrastructure and operations. This is commonly known and promoted as the 'bus system approach'.

## European Bus System of the Future

In recognition of the importance of bus systems and the challenges ahead the 'European Bus System of the Future (EBSF)' project was launched in September 2008 under UITP leadership. It is one of the largest surface transport R&D projects ever started by the European Union, and is funded under the 7<sup>th</sup> Framework Programme (its total budget is around EUR 26 million).

For the first time, this project brings together the five leading European bus manufactures (Evobus/Mercedes, Irisbus Iveco, MAN, Scania, Volvo) and 42 other partners including transport operators and national transport associations, public transport authorities, the supply industry and major research centres, universities and consultancy firms. The main objectives of EBSF are:

- To conceive and develop an **innovative high quality bus system** which is fully integrated within the urban environment and that will demonstrate the full potential of a new generation of urban bus networks.
- To make a **breakthrough design** of vehicles, infrastructures and operations.
- To maintain or improve the **competitive position** of the European bus manufacturers and operators by promoting a new concept under the brand 'the European Bus System'.

More information is available on: [www.ebsf.eu](http://www.ebsf.eu)

Visit the UITP website for more information on the Bus division:

[www.uitp.org/Public-Transport/bus/index.cfm](http://www.uitp.org/Public-Transport/bus/index.cfm)

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### Notes for Editors

UITP's World Congress and Exhibition will be held in Vienna, Austria, 7-11 June 2009. The theme of the event is 'Public transport: Making the right mobility choices'. For more information, visit [www.uitp.org/vienna2009/](http://www.uitp.org/vienna2009/).

See the congress programme: [www.uitp.org/vienna2009/Congress/programme-en.cfm](http://www.uitp.org/vienna2009/Congress/programme-en.cfm)

See the Expo Forums programme: [www.uitp.org/vienna2009/Congress/Expo-Forums-en.cfm](http://www.uitp.org/vienna2009/Congress/Expo-Forums-en.cfm)

Get a preview of the exhibition: [www.uitp.org/vienna2009/Congress/Expo-Forums-en.cfm](http://www.uitp.org/vienna2009/Congress/Expo-Forums-en.cfm)

Visit the Vienna Congress and Exhibition Media Room:

[www.uitp.org/vienna2009/news/index.cfm](http://www.uitp.org/vienna2009/news/index.cfm)

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## Bus systems during the 58<sup>th</sup> UITP World Congress and Exhibition

Tuesday 9 June 2009	14:00-15:30	SESSION 6
Profitable bus systems: selected business models		

This session will showcase some world class examples of self-supporting bus systems challenging the commonplace assumption that public transport systems are bound to be structurally in deficit. The conditions to increase the attractiveness of the sector for users and investors will be investigated as well as the efficient business models that are used.

Chair: David Martin, CEO, Arriva plc., Sunderland, United Kingdom

- Productivity of the CISA Bus System in Mexico  
Jesús Padilla Zenteno, General Manager, Corredor Insurgentes S.A. de C.V., Mexico City, Mexico
- Tender Recommendations for the procurement of new buses  
Lars Johansson, Director Global Product Marketing, Volvo Bus Corporation, Gothenburg, Sweden
- KGL approach in developing profitable bus services in the Middle East  
Khaled Al Awadhi, General Manager, KGL Passenger Transport Services, Safat, Kuwait
- Environmental friendliness and profitability of PT systems do not need to be contradictory  
Holger Suffel, BRT Solution - Daimler Buses, Evobus GmbH, Stuttgart, Germany

Tuesday 9 June	11:00-12:30	Expo Forum 6
The hybrid drive is here!		

Moderator: Arno Kerkhof, Senior Manager Bus Division, UITP, Brussels, Belgium

- Developing a full range of hybrid diesel-electric buses  
Sven Somers, VAN HOOL NV Project Engineer
- On the road to emission-free urban buses - CITARO BlueTec@ Hybrid  
Richard Averbeck, EvoBus, Executive Managing Director
- The Solaris Urbino 18 Hybrid: Leading in Experience  
Wolfgang Presinger, Solaris Bus & Coach S.A., Senior Advisor to the Board
- MAN Hybrid City Bus - from Prototypes to Series Production  
Rolf Döbereiner, MAN, Head of development alternative

Tuesday 9 June	16:00-17:30	Expo Forum 9
Greener and more efficient city buses with advanced components		

Moderator: Arno Kerkhof, Senior Manager Bus Division, UITP, Brussels, Belgium

- Latest Aspects of Driveline Development for City Buses  
Joachim Foth, ZF Friedrichshafen AG, Director Product Development Powershift Transmission
- HJS Exhaust-Aftertreatment-Systems - New Technologies for clean buses  
Axel Middendorf, HJS Fahrzeugtechnik GmbH & Co KG, Head of Sales

- Voith Solutions for More Value for the Environment  
Robert Mueller, Voith Turbo GmbH & Co KG, General Manager Aftermarket Business
- Sustainable Public Transport with hybrid technology  
Martin Schmitz, Vossloh Kiepe GmbH, Vice-president

Wednesday 10 June	09:00-10:30	Expo Forum 10
Bus solutions for various operator demands		

Moderator: Arno Kerkhof, Senior Manager Bus Division, UITP, Brussels, Belgium

- How to meet the future challenges of bus public transport: a concrete approach with Hynovis  
Valery Cervantes, Irisbus Iveco, Public Affairs
- Sustainable Transport - A one-Stop-Shop Systems Solution  
Jonas Strömberg, SCANIA, Director Sustainable Systems
- TEMSA AVENUE – the new CityBus of Temsa  
Louis Kern, TEMSA EUROPE, Product advisor
- Sustainable fuels and efficient public transport - balancing sustainability and energy  
Edward Jobson, Volvo Bus Corporation, Environmental Director

Thursday 11 June 2009	09:00-10:30	SESSION 22
Identifying energy savers for consumption in the bus and along the line		

The session will highlight methods and techniques to monitor and measure fuel consumption taking into account all the influential factors: not only vehicle performance but also weight, vehicle load, boarding time, road topography, traffic lights and congestion; in order to identify the best potentials for energy saving.

Chair: Ezio Castagna, General Manager, CTM S.p.A., Cagliari, Italy

- Energy-saving solutions, including hybrid buses  
Henri Bordenave, Responsable Ingénierie Autobus, RATP, Paris, France
- Comprehensive sustainable Fuel Drive concepts for public service bus systems  
Ralph Pütz, Fachbereichsleiter Kraftfahrzeuge, Trolleybusse, Betriebshöfe und Werkstätten, VDV, Köln, Germany
- Reducing energy consumption in Hong Kong's buses  
Kane Shum; Principal Bus Engineer, The Kowloon Motor Bus Co Ltd, Hong Kong, China

Panellists:

- Georges Despaigne, Responsable Filière Production, Département Innovation Métier et Produit, Transdev SA, Issy-les-Moulineaux, France
- Rolf Hedberg, Product Manager, Scania CV AB, Södertälje, Sweden
- Valéry Cervantes, Responsable des Affaires Publiques, Irisbus Iveco, Saint Priest, France
- Richard Averbeck, Executive Managing Director Product Engineering, Evobus GmbH, Ulm, Germany
- Eberhard Hipp, Senior Department Manager, MAN Nutzfahrzeuge, Munich, Germany

Exhibitors include (April 2009)

- Belkommunmash
- Breda Manarini
- Foton
- Kutsenits
- MAN
- MAZ
- Mercedes
- Scania
- Solaris
- SOR Libchavy
- Tedom
- Temsa
- Trans- Alfa
- Van Hool
- VDL
- Volvo
- Volzhanin
- Youngman