TRAINING MODULE 4

TRANSPORT LEARNING

www.transportlearning.net

# Public transport models

Photos: eltis.org, FGM-AMOR

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Location, Date

# Training modules

1) Parking space management, access restriction and speed control
2) Mobility management measures for families, kindergartens and schools
3) Land use and housing in mobility management
4) **Public transport models**
5) Street design, streetscape and traffic calming
6) Walking and cycling – counselling municipalities
7) Design and implementation of sustainable mobility campaigns
8) Communication training


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# Contents

- Introduction to PT
- Economic concepts of PT
- Environmental aspects of PT
- Improving PT
- Financing of PT
- PT contracts and assignments
- Practical training projects



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# What is this training module about?

After understanding this module, you will be able to better:

- Assess the environmental benefits of Public Transport
- Develop actions to improve Public Transport v/v operational efficiency and increased attractiveness
- Understand financing options of Public Transport
- Cope with organisational, financial, and regulatory Public Transport structures
- Define and select Public Transport Organisational Models
- Improve own capabilities through the TL mini projects



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# What is Public Transport

**Public transport** comprises all transport systems in which the passengers do not travel in their own vehicles, but share the transport mode. It usually provides scheduled services on fixed routes on a non-reservation basis.



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# Public Transport has many diverse types

- Bus, trolleybus and coach
- Rail
  - Commuter, intercity, and high-speed rail
  - Tram and light rail
- Rapid transit (metro/subway)
- Cable-propelled transit
- Ferry and other waterborne vessels
- Taxi (when used for a shared ride)
- Airplanes
- Other??


# And why should people rely on Public Transport?

| Advantages | Disadvantages |
|---|---|
| Lower costs for the community | Set routes are inconvenient |
| Energy efficiency | Scheduled times of service are not always suitable |
| Reduced carbon footprint/pollution | No privacy / limited comfort |
| Increase of safety | Limited space |
| Lower traffic congestion | |
| Smaller urban space requirement | |
| Improved accessibility | |
| Improved mobility | |



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# Public Transport brings value to the local economy and society!

## Empowers the Economy

- Time for change v/v this systemic crisis incl. societal change
- Abandon car-dependent life-style
- Safe and green jobs (largest employer of a city)
- Every €1 in PT generates €4 in total economy

## Helps the planet breathe

- Transport = 30% of total energy consumption (EU) | 19% of GHG emissions in the world
- PT consumes 3-4 time less energy per pass-km

## Brings everyone everywhere

- Efficient municipal function only through public transport systems
- PT is the most cost-effective mobility offer
- PT links people to their jobs and free time activities
- PT promotes healthier life-styles and improves safety for all

## Alleviates congestion

- PT consumes urban space more efficiently than a car-dominant society
- A car commuter consumes 90 times more space than a rail commuter
- Congestion limits cities

**Source: UITP**



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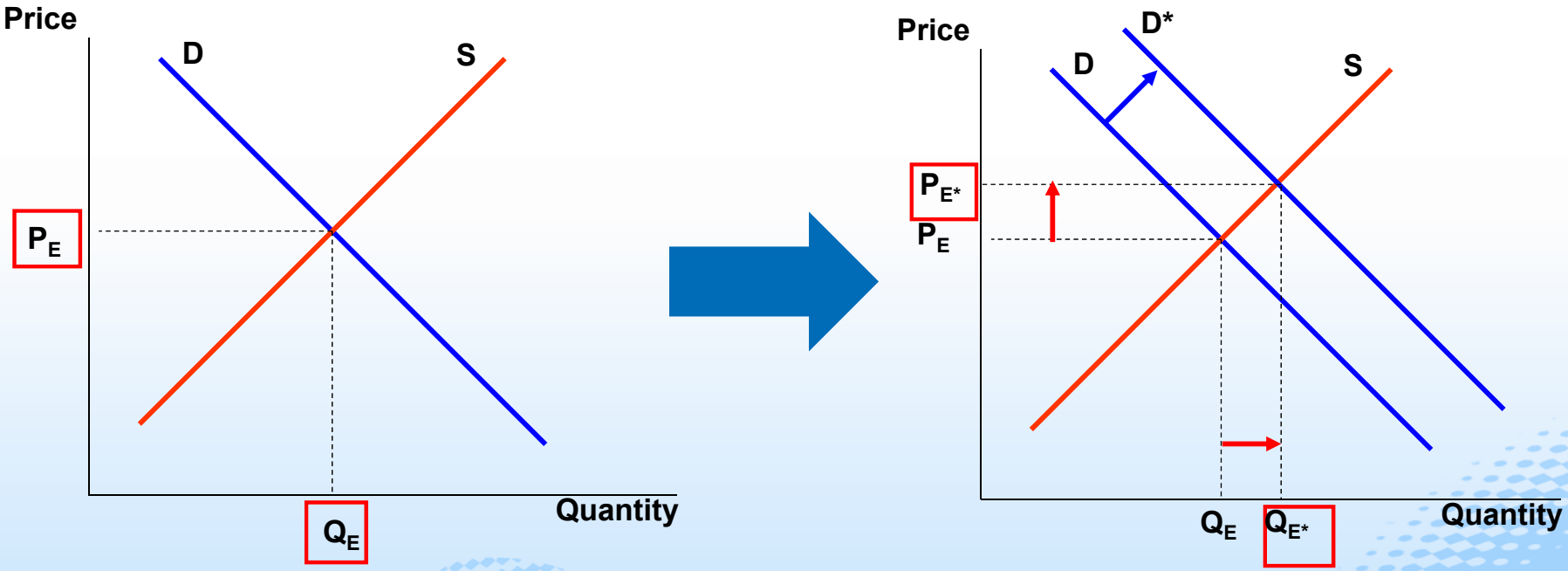
# Basic Market Dynamics (1/3)



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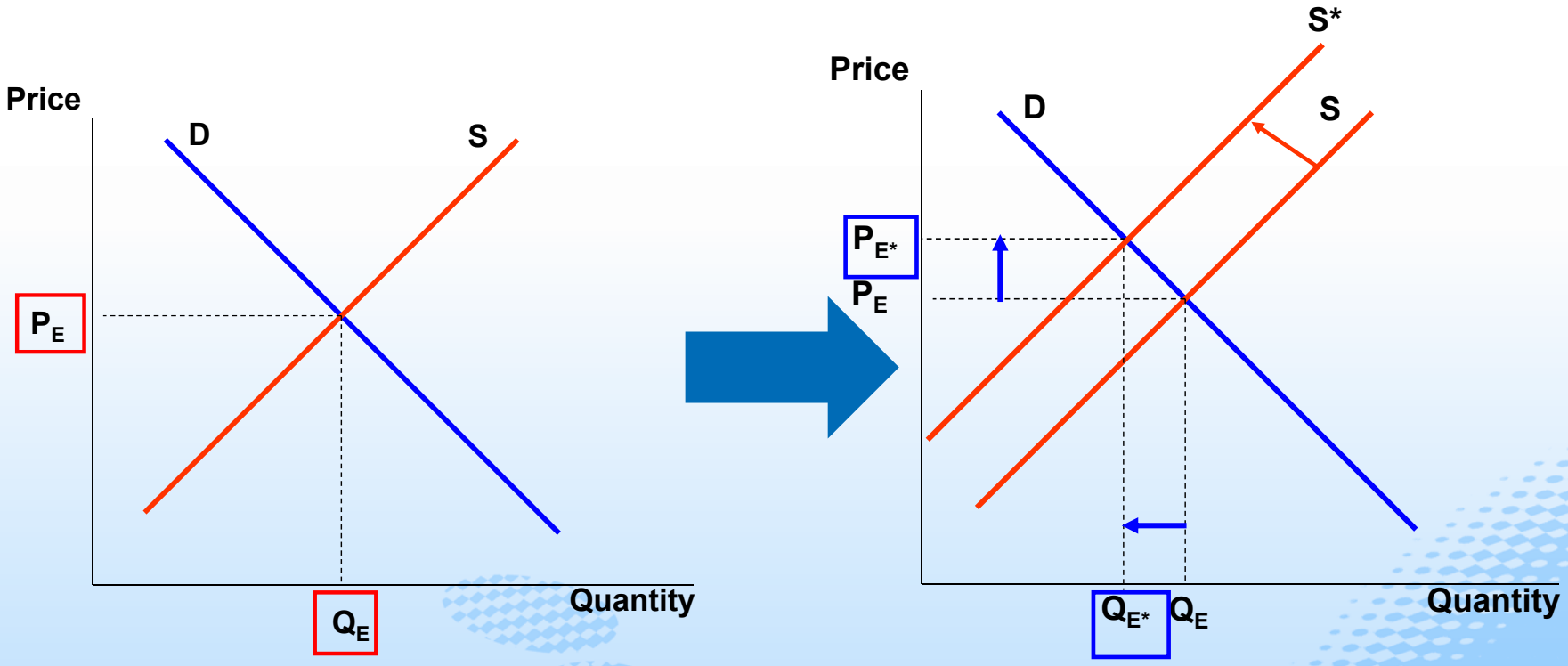
# Basic Market Dynamics (2/3)





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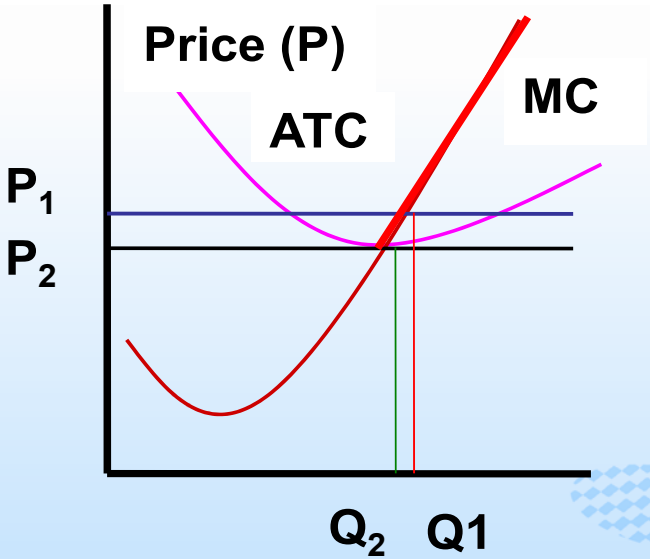
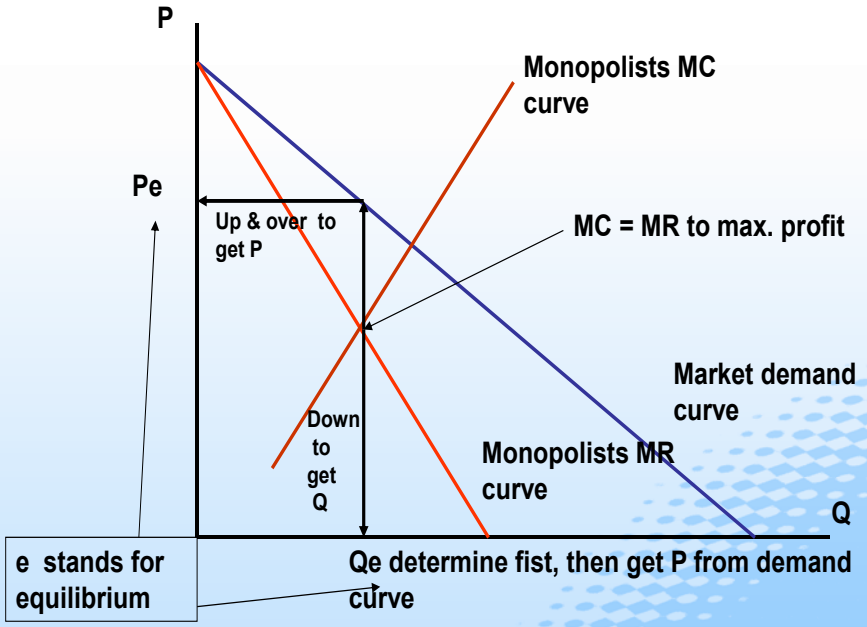
## Basic Market Dynamics (3/3)

# Perfect Competition VS Monopoly

**Individual Firm**




- Market price ($P_1$) equals marginal revenue (MR) and average revenue (AR)
- Optimal level of output is where MR = MC = $P_1$



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# In order to measure the change we use Price Elasticities…

## Transportation Elasticities (Goodwin 1992)

| | Short-term | Long-term |
|---|---|---|
| Petrol consumption WRT petrol price | -0.27 | -0.71 |
| Traffic levels WRT petrol price | -0.16 | -0.33 |
| Bus demand WRT fare cost | -0.28 | -0.55 |
| Railway demand WRT fare cost | -0.65 | -1.08 |
| Public transit WRT petrol price | -0.34 | |
| Car ownership WRT general PT costs | -0.1 to -0.3 | |

$$\varepsilon_p = \frac{\%\ \text{Change in Quantity}}{\%\ \text{change in Price}}$$

**➔Elastic Demand: |ε| > 1**

**➔ε=1**

**➔Inelastic demand: |ε| < 1**

## Passenger Transport Elasticities

| | Auto | Bus | Rail | Air |
|---|---|---|---|---|
| Urban Passenger, Price | -0.47 | -0.58 | -0.86 | |
| Urban Passenger, In-Vehicle Time | -0.22 | -0.60 | -0.60 | |
| Intercity Passenger, Price | -0.45 | -0.69 | -1.20 | -0.38 |
| Intercity Passenger, Travel Time | -0.39 | -2.11 | -1.58 | -0.43 |



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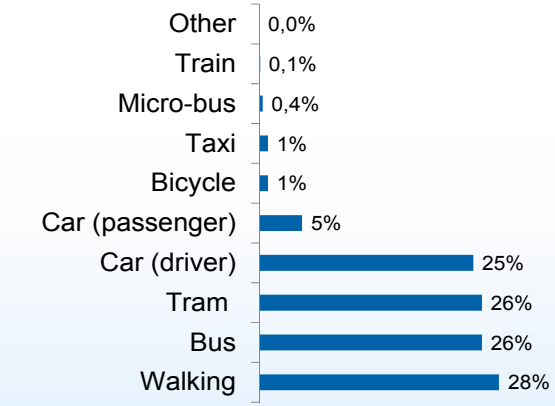
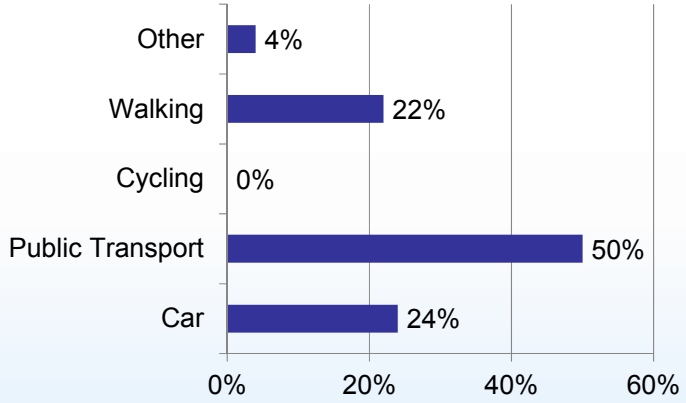
# Modal split: public transport VS car use in European cities

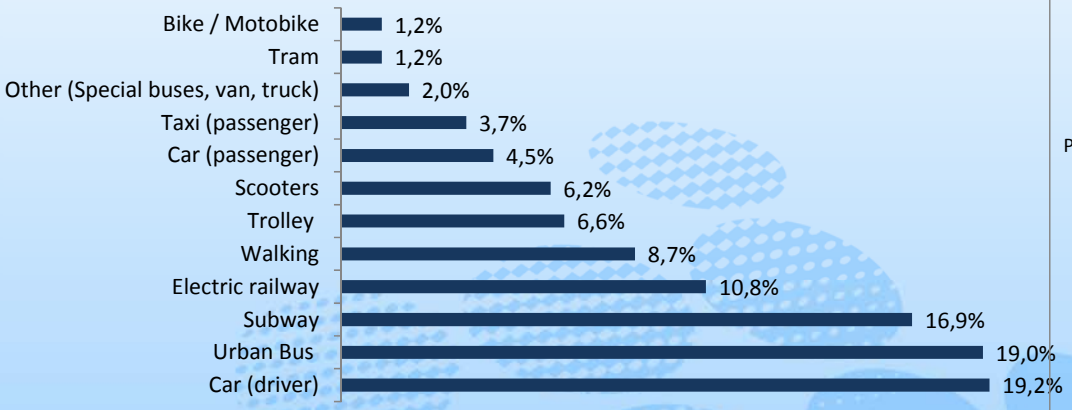
## Krakow Modal split (2010 data)



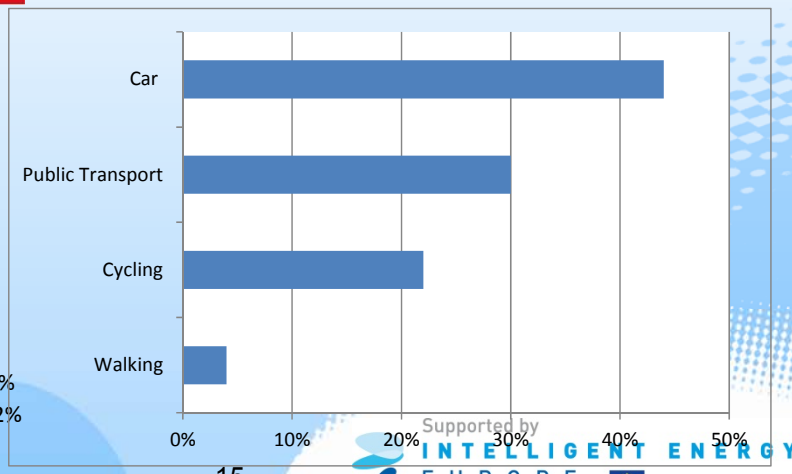

## Bucharest Modal split (2007 data)




## Athens Modal split (2006 data)




## Amsterdam Modal split (2004 data)



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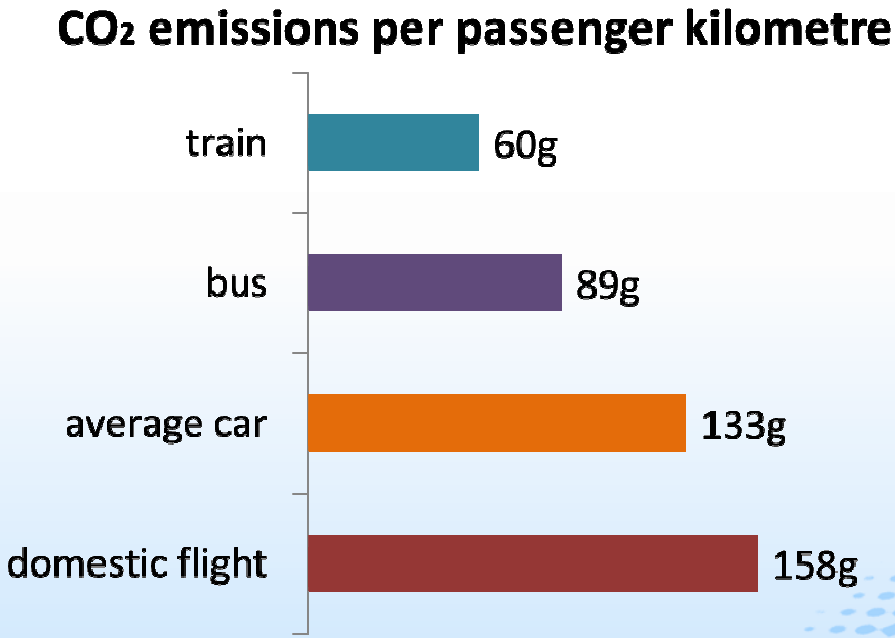
# Environmental Benefits of Public Transport

Public Transport, reduces automobile use, therefore:

1. Improves Air Quality, by diminishing harmful greenhouse gas emissions, and other pollutants, which can damage the environment, and cause public health problems.




Source: www.scotrail.co.uk



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## Public VS. Private Transport: Required Infrastructure

2. Alleviates traffic congestion and therefore promotes energy-efficiency, and reduces dependence on foreign oil

3. Requires less land use than road infrastructure, thus helping to reduce individual carbon footprints, while preserving and enhancing mobility

**Source: www.pednet.org**



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# Some (basic) examples: Please fill in the table (~5 min)

| $\varepsilon_p$ | Change in Price | Price $_{Before}$ | Price $_{After}$ | Change in Quantity | Quantity$_{Before}$ | Quantity$_{After}$ |
|---|---|---|---|---|---|---|
| -0,25 | 10% | 1,00 | 1,10 | -2,5% | 500.000 | 487.500 |
| | | 2,00 | 2,50 | | 400.000 | 385.000 |
| -0,3 | -30% | 2,00 | | 9,0% | 250.000 | |
| -0,5 | 10% | 1,50 | | -5,0% | | 285.000 |
| -0,58 | | 1,00 | 2,00 | | 150.000 | 63.000 |
| -0,6 | 9% | | 2,18 | -5,4% | | 946.000 |



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# Some (basic) examples: Please fill in the table (~5 min)

| $\varepsilon_p$ | Change in Price | Price $_{Before}$ | Price $_{After}$ | Change in Quantity | Quantity$_{Before}$ | Quantity$_{After}$ |
|---|---|---|---|---|---|---|
| -0,25 | 10% | 1,00 | 1,10 | -2,5% | 500.000 | 487.500 |
| -0,15 | 25% | 2,00 | 2,50 | -3,8% | 400.000 | 385.000 |
| -0,3 | -30% | 2,00 | 1,40 | 9,0% | 250.000 | 272.500 |
| -0,5 | 10% | 1,50 | 1,65 | -5,0% | 300.000 | 285.000 |
| -0,58 | 100% | 1,00 | 2,00 | -58,0% | 150.000 | 63.000 |
| -0,6 | 9% | 2,00 | 2,18 | -5,4% | 1.000.000 | 946.000 |

**You can now see the effects in the total returns of your PT company (:Revenue= P*Q)**

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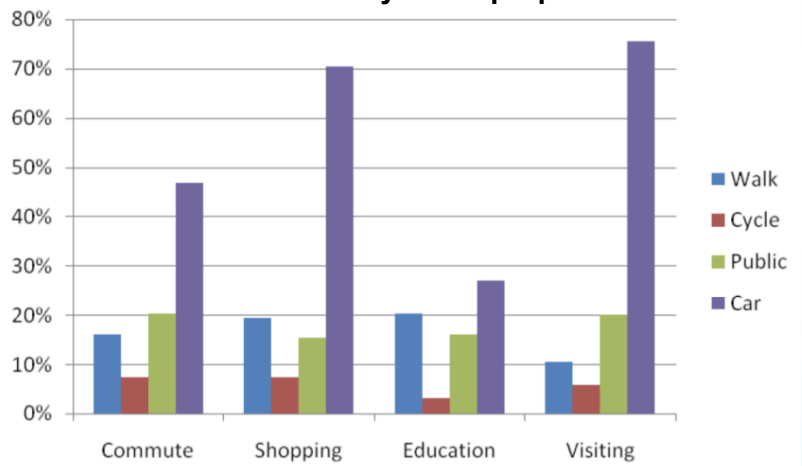
# What can we change in order to favour PT usage

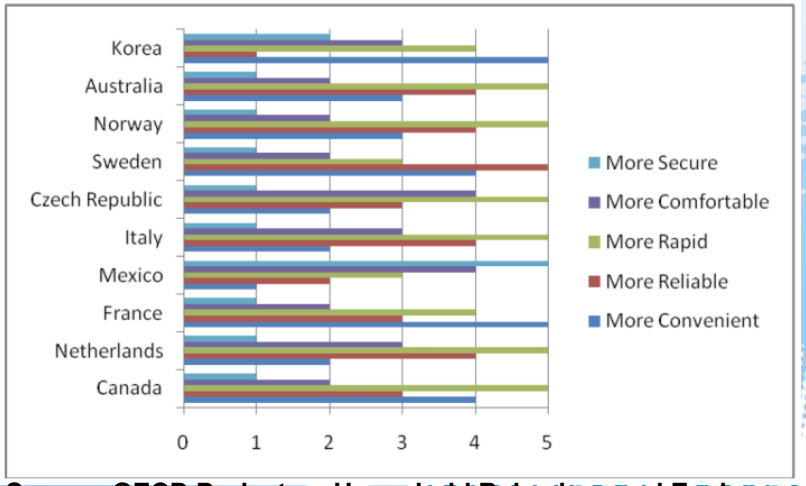
## Determinants

- Availability and cost of car parking spaces
- Conditions of traffic congestion/ capacity of road network
- Price of petrol
- Price of PT fares
- Frequency of PT provision
- Duration of trip with PT/ PT route
- Personal security
- Proximity of residence to PT stop

**Mode choice by travel purpose**




**Influence of improvements in public transport on increasing use**
(1 = least important and 5 = most important)




**Source: OECD Project on Household Behaviour and Environmental Policy**



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# Perceived problems faced by bus systems affecting efficiency

- Inadequate service capacity
- Unreliable service
- Irregular frequency
- Poor route coverage
- Excessive transfer requirements between routes
- Excessive fares
- Low profitability
- Excessive subsidy requirement
- Poor vehicle quality
- Poor safety performance
- Traffic congestion caused by buses
- Pollution caused by buses
- Mistreatment of passengers



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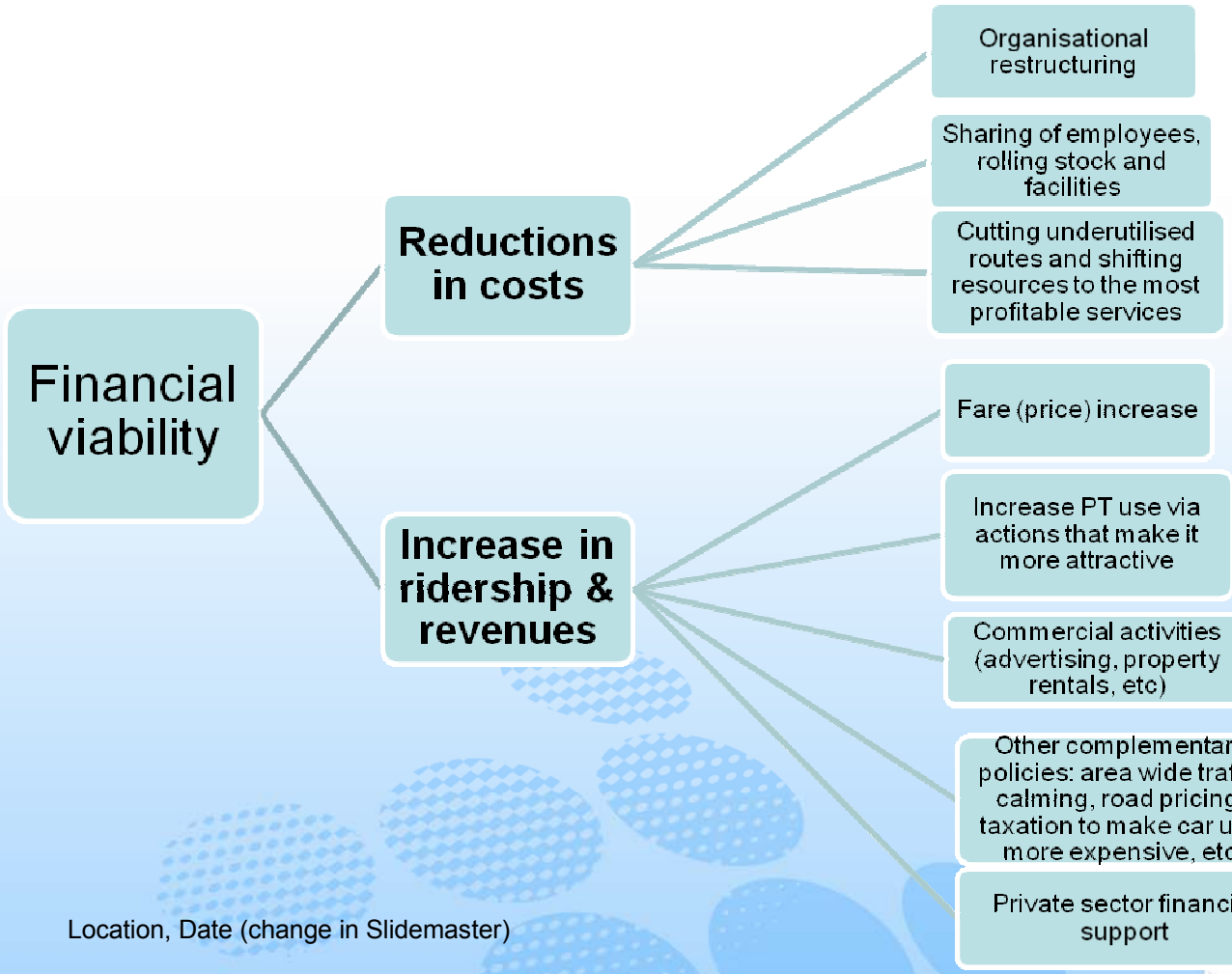
# Operational measures to improve financial viability of public transport



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# Video

## Monitoring the bus transport system

http://eltis.org/index.php?ID1=7&id=61&video_id=86



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# An example: The German Case

- Federal system of government, the interaction of national, state and local levels shapes transport policies
- Significant government involvement in the PT sector
- Very wealthy country : per capita income $40900  in 2008
- High rate of car ownership 560 cars per 1000 inhabitants
- Extensive roadway system
- Car manufacturing is very important to national economy (20% of GDP)
- Car is an important symbol of mobility and freedom


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# The German Case: Trends in PT demand

- PT accounted for 8% of all trips in Germany (2001/2002 MiD data, this varies, other sources state 11%)
- Average household income for German passengers were 4$ below the German average (2001/2002)
- The majority of PT trips are made for commuting
- Also, 5% of social and recreational trips are made by PT
- PT use has been increasing from 1990 to 2007 (both in terms of annual trips and kilometres of travel). Growth in ridership was stronger for metro and commuter rail (50%) than for rail and buses (7%)
- Increases in PT use were concentrated in the western part of the country, while former socialist eastern Germany saw a drop in PT patronage



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# The German Case: Trends in PT supply and financial sustainability

- From 1992 to 2007 German public transport did not expand its overall supply but improved its financial productivity and efficiency
- Vehicle kilometers of bus and light rail service declined slightly between 1992- 2007
- Over the last 20 years German PT companies have recovered an increasing share of their operating budgets with farebox revenues (PT fares accounted for an increasing share of operating expenses: 59% in 1992 to 77& in 2007)
- The share of government subsidy in PT operating budgets was 23% in 2007
- German transit demand increased faster than transit supply
- Farebox revenue per vehicle km increased sharply (more passengers per vehicle km and increased transit fares)
- Improved labour productivity (vehicle kms of transit service per employee)
- Operating deficit decreased by 25% between 1998 and 2006, due to improved labour productivity, additional farebox revenue and more PT users
- Germany has averaged less than $5 billion a year in government subsidies for transit capital investments from 1997 to 2006.


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# 1. Reduction in costs

EU transport regulations: subsidised transit services could be subject to competitive call for tender process. Government could be forced to award operating licenses to lowest cost providers. Most local PT services in Germany are subsidised.

Most German PT agencies have started to get ready for competitive tendering since the mid-1990s, with the prospect of potential future competition and shrinking revenues of municipal utilities.

- Several cost cutting measures: reduced workforce, decreased salaries (between 1995 and 2003 PT employees salaries fell by 30%), restructured their organisation, focused on overall cost effective provision of transit service.
- Many PT agencies founded subsidiaries for hiring new employees: these employees received lower salaries, fewer benefits and longer hours. These subsidiaries are cost efficient and are used to win bids in future calls for tender.



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# 1. Reduction in costs

• PT operators focused their services on profitable and attractive routes while cutting less profitable (with less ridership) routes

*Example*: BvG in Berlin saved 9.5 million euros annually by cutting less profitable routes with low ridership and providing increased service on arterials in the city itself.

• Neighbouring PT agencies reduced overall costs by sharing garages (yards and shop) and part of their vehicle fleet, and also personnel (IT and administrative)



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# 2. Increasing ridership and revenue (1/2)

- Regional monthly and annual transit passes for all groups
- Increased quality of vehicles, station and other services with focus on customer convenience.
- Increase fares: increased revenue per passenger for transit agencies. Also, total revenues increased because of the number of transit passenger trips rose despite the fare increase.
- Local governments limited car speeds and coordinated their transport and land use plans
- Tight Coordination of transit services, fares and schedule within metropolitan areas (regional transit organisations- verkehrsverbunds- to coordinate all aspects of PT operations and ticketing). For example, transfers between bus and rail are coordinated in terms of timing and distance walked (Freiburg verkehrsverbund saw an increase of over 50% in ridership between 1991 and 2007)


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# 2. Increasing ridership and revenue (2/2)

- **Integrated and coordinated PT services**: new coordinated timetables for rail aiming to integrate all rail PT operations with local PT services, thus making PT more attractive.
- **Integrated daily, monthly and annual tickets** and other concession type tickets (for students and seniors)
- **Improved customer services** and increased convenience to make PT more attractive : real time information, signal priority at intersections, integration of PT with cycling, electronic tickets to be purchased via mobile phone, improved websites etc


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# 3. Complementary policies

- Area wide traffic calming, car free pedestrian zones, increased fees for parking and reduced parking supply
- Federal taxation also made car use more expensive
- Improved conditions for cycling and walking, expanded bike paths and cycle lanes (the vast majority of german passengers access PT by bicycle or walking)
- Land use laws encourage dense and mixed use settlements which facilitate transit use and assure sort trip distances between origins and destinations (example: in 2007 65% of all Freiburg residents and 75% of all jobs were within 300 m of a PT stop)


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# Factors influencing bus system efficiency

The principal factors that influence the efficiency of a bus system are:

- Regulatory framework
- Fare control
- Enforcing rules and regulations
- Route planning
- Interchange facilities
- Through ticketing
- Operating structures and company size
- Vehicle size and type
- Fleet size
- Excessive operating costs
- Operating practices
- Vehicle maintenance
- Bus utilisation
- Revenue integrity
- Competition in the market
- Competition from the informal sector


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# Video

## New improved public transport network in Vitoria Gasteiz, Spain

http://eltis.org/index.php?ID1=7&id=61&video_id=98



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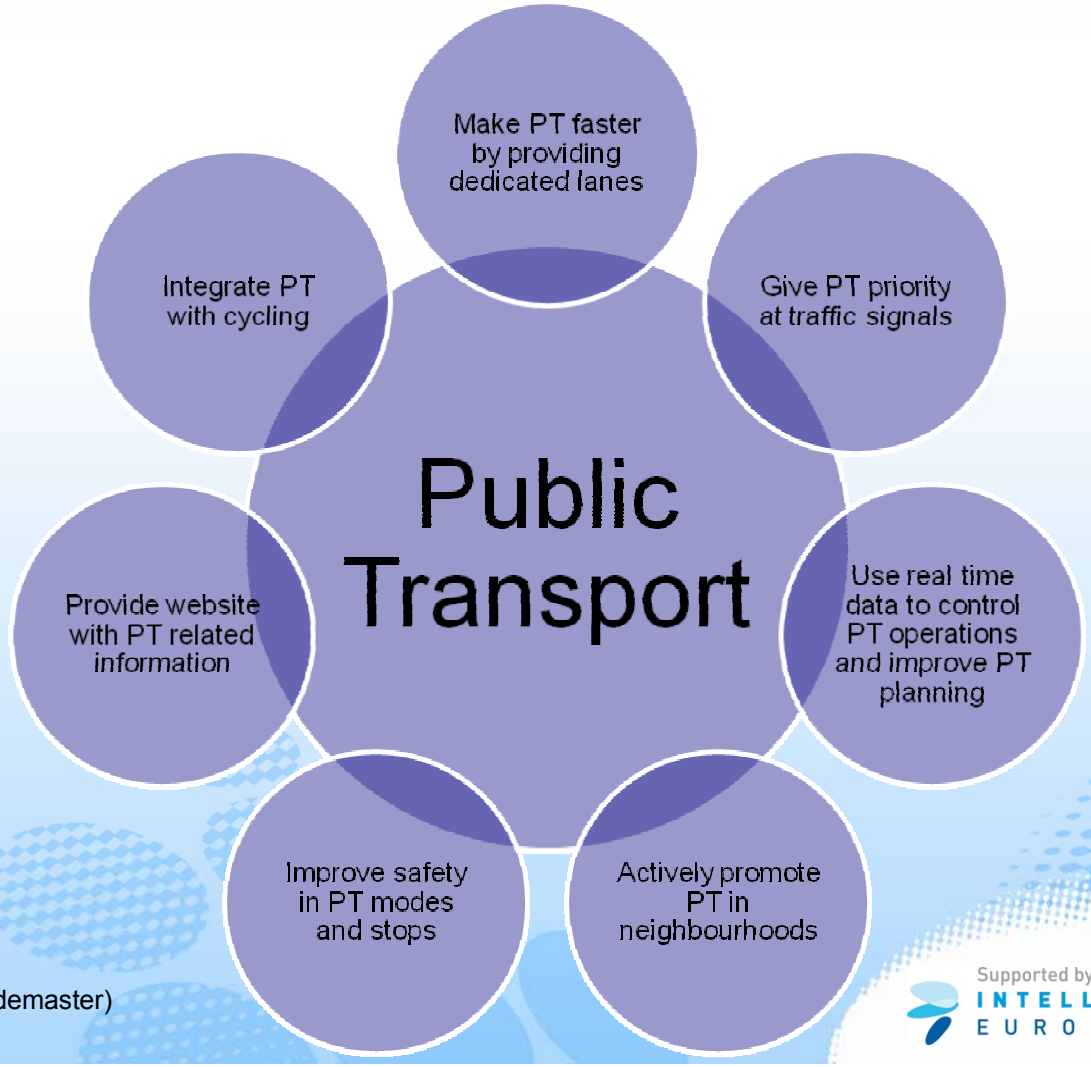
# Actions to improve Public Transport operational efficiency and increase attractiveness



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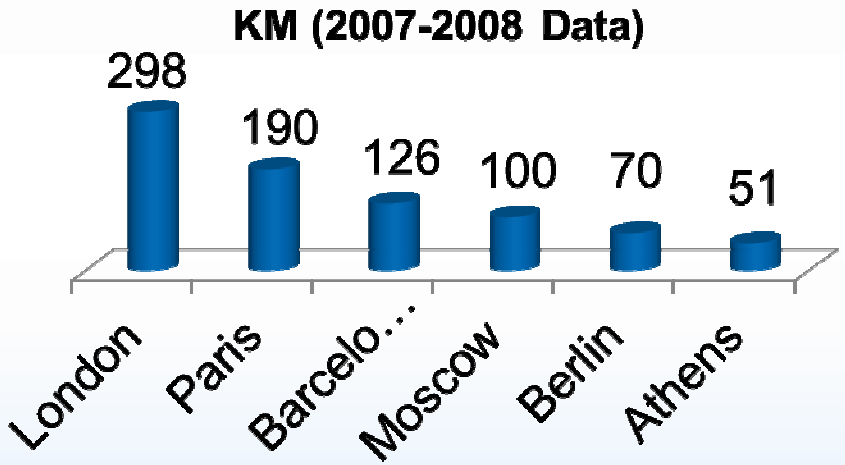
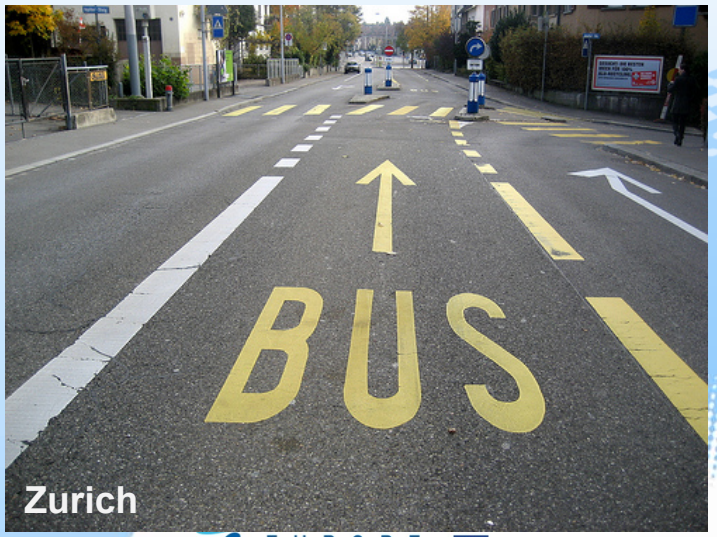
# Bus lanes in Europe have a range of applications





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# Video
# Budapest coloured bus lanes
# http://eltis.org/index.php?ID1=7&id=61&video_id=6


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# Dedicated lanes improve PT operations, but have to be carefully designed

| Advantages | Disadvantages |
|---|---|
| Decrease in travel time (for buses) | Increase of average queue lengths and car delays |
| Increase schedule adherence | Loss in parking provision (usually bus lanes are implemented by converting previous parking lanes) |
| Increase bus service reliability | Deterioration of operating conditions in the surrounding area due to traffic re-assignment |
| Improve bus passenger journey times | Implementation costs: Costs involving the studies, construction works, and operation |
| Encourage use of public transport | |
| Reduce traffic pollution | |
| Provide a safer lane for cyclists | |

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# Bikes could also share bus lanes

| Advantages | Disadvantages |
|---|---|
| Cyclists are not squeezed between the door zone of parked cars on the right and adjacent traffic on the left | Decrease of average bus speed |
| Bus traffic tends to be relatively light | Increase in accidents |
| Bus drivers are professionally trained to co-exist with cyclists | Private PT operators' unwillingness to support |
| Buses can merge part-way into the adjacent lane to overtake a cyclist. | |

## Shared lanes in European cities

- In **Paris**, 160 km of bus lanes are accessible to cyclists (RATP)
- In **London**, following the completion of two trials, it has been decided that cycles (and motorcycles) will be given permanent access to bus lanes on the majority of London's red routes from 23 January 2012 (TFL)
- In **Athens**, there was a trial from the 20th of June until the 18th of September 2011 in order to observe the effect of cyclists using bus lanes



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# Practical examples of bus/bike lanes


Madrid


London


Berlin



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# Public transport priority at traffic signals (1/3)

- Providing priority for public transport vehicles at signalised intersections is a way of **increasing PT speed / reducing PT travel time** and **increasing schedule reliability**

- Increasing the speed of buses and trams will:
  - ➢ make service **more attractive** to customers and **increase ridership**
  - ➢ **reduce the cost** of providing service since fewer vehicles and operators are needed to provide a certain level of service

- How can we increase PT speed: **Traffic Signal Priority**

When a bus or tram approaches a traffic signal, the traffic signal turns green, allowing it to proceed through the signal without stopping.



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# Public transport priority at traffic signals (2/3)

## PT Prioritisation

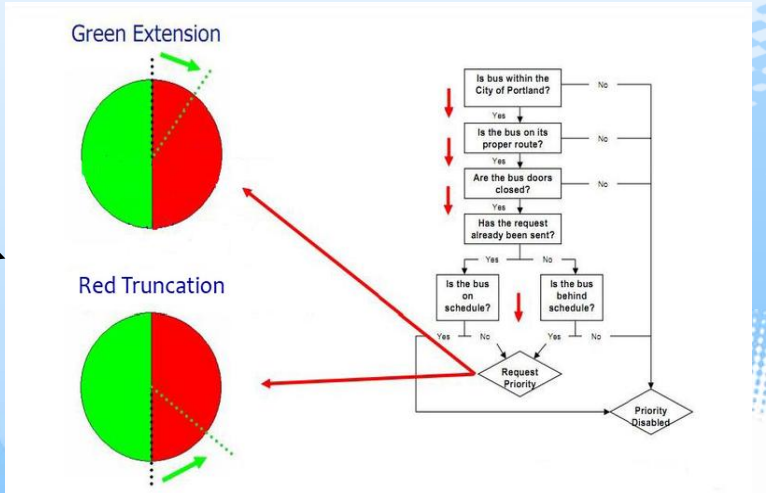
**Timing Changes: longer green time for PT (passive priority)**

The traffic signal timing is adjusted: the amount of time provided to the traffic signal 'phase' for the bus or tram is extended, when the public transport vehicle sends a signal to the traffic signal controller.

**Phasing changes (active priority)**

The traffic signal turns green for public transport every time the vehicle approaches, by adjusting the traffic signal 'phasing' when an approaching bus or tram sends a message to the traffic signal.


http://busmeister.wikispaces.com/intro_TSP



# Public transport priority at traffic signals (3/3)

## Bus priority in Europe

• **Zurich**

A combination of both systems has been implemented in Zurich since the early 1980s, which gives maximum preference for buses and trams at signalised junctions, with the aim of ensuring **'zero waiting time zero' for public transport**.

• **London**

The iBUS system utilises GPS technology and other on-bus systems to communicate with the bus' on-board computer. When a virtual detection point is reached, as programmed into the iBIS plus software, a signal is sent to the transceiver in the signal controller **requesting bus priority**, and to a central location for performance monitoring.

• **Other cities** with bus priority at traffic signals: Genoa, Nantes  Malmo, Suceava, Stuttgart



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# Using real time data to control public transport operations

Real time information in public transport systems is used to:

1. **Control public transport operations**

   Public transport agencies have operation centres monitoring traffic conditions and other transport disturbances. Real time information helps in **maintaining schedules and reliable vehicle performance**

2. **Provide accurate information to customers**

   Provide public transport users with **detailed real time information** about vehicles

3. **Develop public transport improvement plans**

   Public travel agencies should take advantage of user-gathered information, by developing a plan for **collecting and analysing real time data** that can be incorporated into planning processes



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# Exercise: Identify the key data that are required by a frequent (commuter), leisure, elderly passengers

| Frequent (commuter) passenger | Leisure passenger | Elderly passenger |
|---|---|---|
| • _____ | • _____ | • _____ |
| • _____ | • _____ | • _____ |
| • _____ | • _____ | • _____ |
| • _____ | • _____ | • _____ |
| • _____ | • _____ | • _____ |
| • _____ | • _____ | • _____ |



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# Actively promote public transport in neighbourhoods

Effective promotional methods include:

**1. Branding**

➢ Developing an easily recognisable logo that will identify all public transport services and will be displayed in all public transits, as well as in print, electronic, and broadcast media advertising

**2. Advertising**

➢ Creating and publicising advertisements

➢ Creating and directly mailing leaflets that inform residents about the benefits of public transport services available

➢ Creating public transport services maps and transit guides that familiarise users with the transport system



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# Actively promote public transport in neighbourhoods

**3. Media Relations**

- Publishing helpful hints about transit in local newspapers and magazines
- Posting additional real-time transit information on the internet
- Sponsoring community events

**4. Promotions**

- Establishing ride-free days at key times during the year
- Introducing weekly/monthly tickets for commuters



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# Improve safety in PT modes and stops

In order to attract more passengers, PT modes and stops need to provide **safe travel and waiting areas**. In order to enhance security, it is important to:

- Provide enough space/bus shelters at bus stops that can accommodate people standing and waiting for their bus/tram
- Provide sufficient lighting at stops
- Provide video surveillance through CCTV systems in transport modes (buses, tubes, stops) and at stops to provide safe journeys and protect the infrastructure from vandalism
- Make use of video analytics to monitor threat and suspicious activities
- SECUR-ED is a demonstration project with an objective to provide a set of tools to improve urban transport security (www.secur-ed.eu)



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# Safety in PT modes and at stops


CCTV systems in Madrid metro


CCTV cameras in London tube



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# Accessibility improvements to and from stops

In order to make PT more **efficient and accessible** to all passengers, including vulnerable groups (elderly, children, people with reduced mobility) and allow **easy unobstructed access** to and from the stop, the following need to be considered:

- **Better vehicle design**: low floor buses to enable safe boarding, especially for people with reduced mobility
- **Better public transport stops design**: sheltered stops with seats, to protect from weather conditions and provide safe waiting time, without conflicting with pedestrians on footways
- **Provision of accurate information to passengers**: detailed information on PT frequency, routes, maps of bus stops in the surrounding area, real time information at stops


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# Video
# Public Transport for people with reduced mobility
# http://eltis.org/index.php?ID1=7&id=61&video_id=100


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# Accessible Bus Stop Characteristics




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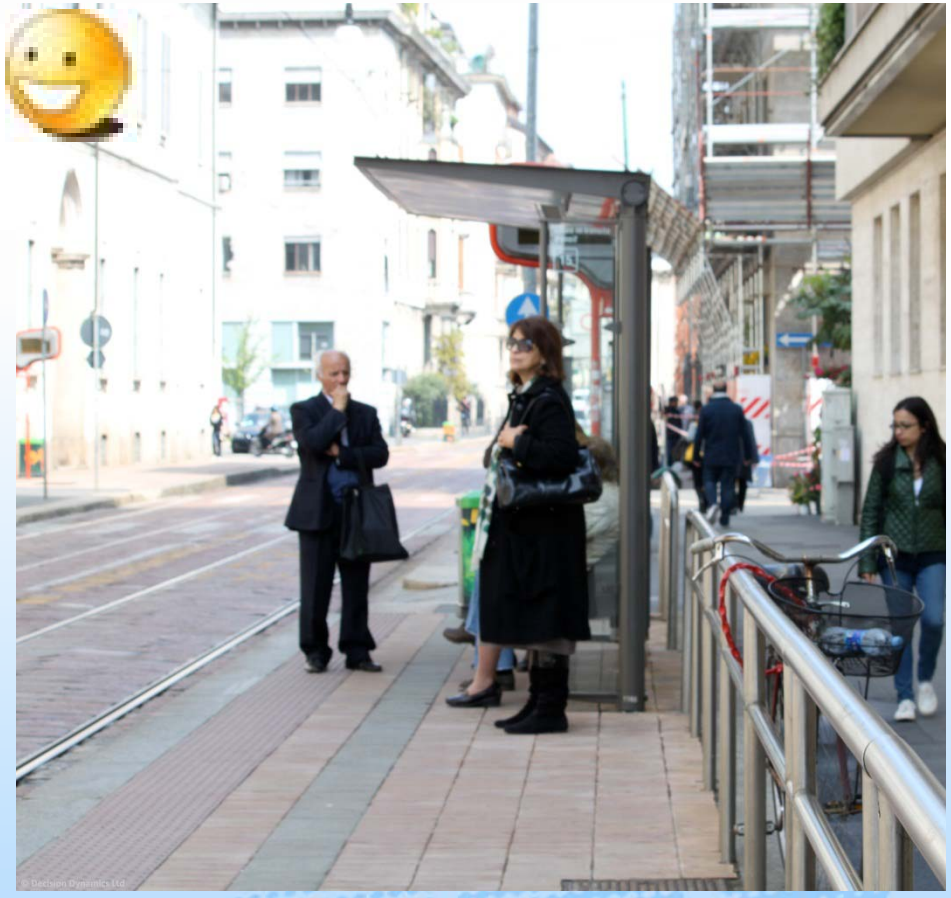
# Public transport stops- examples



Tram stop in Milan


Bus stop in Athens



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# Public transport stops- examples



Pictures 5 and 6: Tram stops in Krakow



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# Provide website with PT related information

In order to make public transport more efficient and attractive it is necessary to provide websites with **detailed and accessible information**, such as:

- Timetables and routes
- Door-to-door journey planner
- Maps of public transport network and public transport stops
- Information on public transport operators



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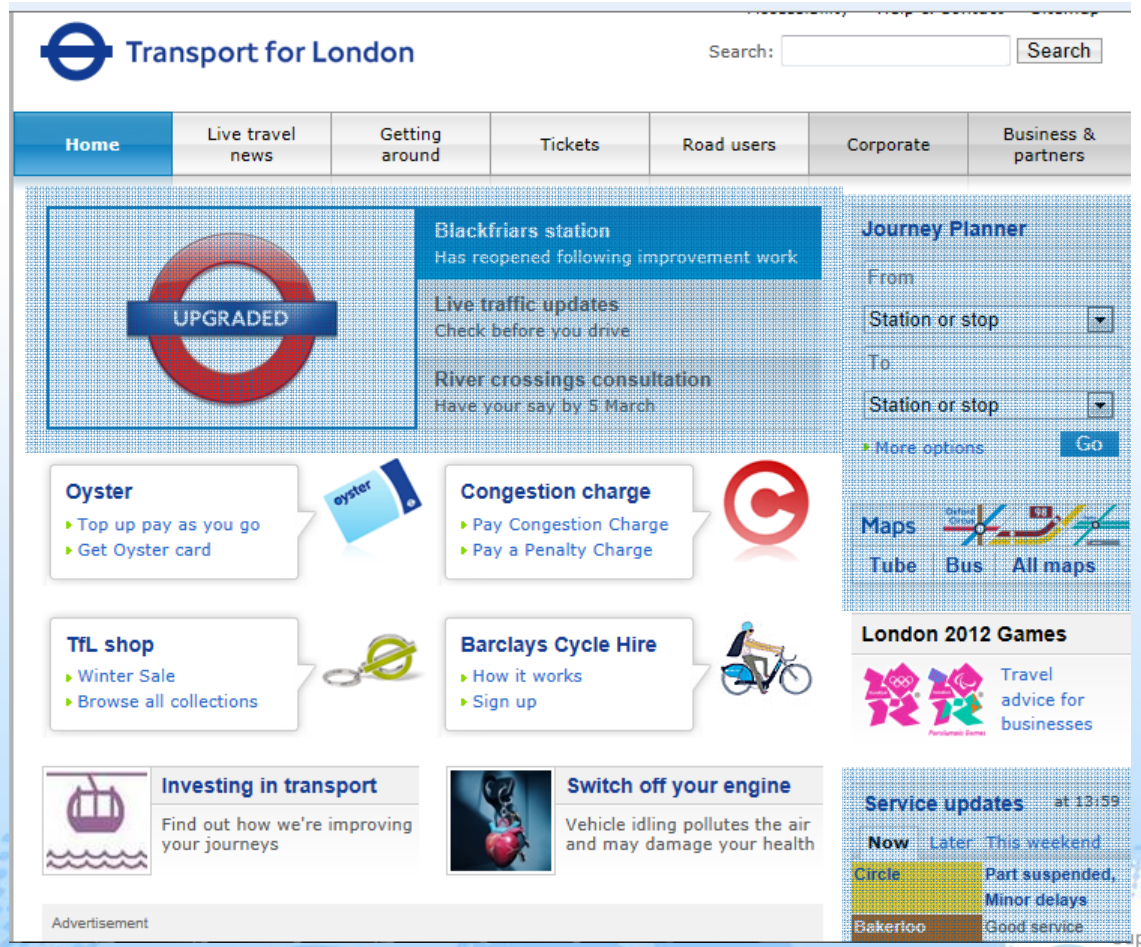
# Provide website with PT related information

Transport for London website



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# Integrate Public Transport with Cycling

**A necessary integration**: A transport system that integrates public transport methods and cycling can provide a **high level of mobility and sustainability** comparable to car travel.

The combination of these transport modes:

- Is very **friendly for the urban environment**, **highly improving air quality and personal health**
- Provides **relief from congestion and limited urban space**, contributing significantly on the livability of cities
- **Attracts new users** of bicycles and public transport

**Photo: http://www.podilates.gr/?q=node/260**



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# Integrate Public Transport with Cycling

## 1) Bike and Ride

The Bike and Ride (BR) is a journey chain, where a traveller cycles to a public transport stop, parks the bike, and travels onwards using public transport.

**Necessary Actions**: **Efficient Bicycle Storage**

- Bicycle users are concerned about protection against vandalism, theft, or bad weather conditions
- Important to provide good bicycle parking at transit stops and transportation terminals
- Mix of paid lockers and free racks may be appropriate, to accommodate commuters who require high level of security and commuters who require simple bike racks


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# Integrate Public Transport with Cycling

## Examples of good cycle storage facilities

- **France**: all metro and RER stations on the outskirts of the city have covered and guarded bike-parking facilities, to which any public transport ticket holder has free access.
- **Germany/Netherlands**: all main train stations have facilities for storage of bikes at PT stops, ranging from small covered areas to electronic boxes, or even big installations with maintenance and repair facilities.
- Similar bicycle parking facilities exist in other European countries like the **United Kingdom, Belgium, Sweden, and Switzerland**.

Bike Storage Facilities - Amsterdam



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# Integrate Public Transport with Cycling

## 2) Bike, Ride and Bike

The Bike, Ride and Bike (BRB) is a journey chain, where a user travels with a bicycle through the public transport system.

## Necessary Actions: Bicycles on Transport

- All public transport means should become more efficient in carrying bicycles
  - Buses should be equipped with bike-racks, or allow bicycles in designated areas
  - Trains and trams (low-floor vehicles) could allow travellers to carry their bicycles, especially during off-peak periods
- Bicycle access to transit stops should be improved through
  - Paths, bike lanes, and road improvements that would facilitate the access to transit stations
  - Maps that illustrate the best cycling routes between PT stations and common destinations



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# Integrate Public Transport with Cycling

### 3) Ride and Bike

The Ride and Bike (RB) is a journey chain, where a traveller uses a bike after using public transport.

### Necessary Actions: Public Bike Systems

- Travellers need an efficient way of performing short, practical, urban trips.
- Important to establish automated bicycle rental systems, with stations at public transit stations.



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# Integrate Public Transport with Cycling

## Examples of BRB practices

• **Germany**: In many cities, bicycles are allowed to be taken on trams and even on buses. Some cities even have tramlines with designated open wagons for bicycles. Furthermore, some regions have set up an internet route planning system for cyclists, providing information on bike routes to regional PT stops and alternative routes avoiding steep sections.

• **France**: In some cities, bicycles are authorised at the back of the trams during off-peak periods. In Paris, bikes are allowed on the RER, and on certain metro lines.

• In other European countries like the **Netherlands and the UK**, even though normal bikes are not permitted in trams and buses, folding bikes are allowed.

Bicycle Wagon in Train - Copenhagen



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# Integrate Public Transport with Cycling

**Examples of RB practices**

• In most northern European countries, such as **France, Germany, Belgium, Denmark, and the Netherlands**, short-term rental systems for bicycles are in operation. The bikes are usually fully automated, and largely used to cover short distances up to 3km within the city, with a peak at rush hours. The rental points are **often located near PT stops**.

• In some UK cities, the 'bike-about' service provides free cycle loan, with only an initial registration fee. This service is supported by the European Union, within the framework of the CIVITAS initiative (cleaner and better transport in cities) http://www.civitas.eu/index.php?id=69


Bike Storage Facility – Bilbao, Spain


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# Integrated ticketing

**What is an integrated ticketing system?**

A ticketing system which allows travellers to make a journey using different transport modes (bus, train, tram, subway) with a single ticket, valid for the complete journey.

Most use electronic technologies:

- magnetic stripe cards
- smart cards
- paper cash tickets allowing transfers within specified areas



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# Why integrated ticketing?

## Traveller Benefits

- Simplified switching between transport modes
- Increases passenger satisfaction
- Creates a level playing field for use of transport modes and provision of service across operators
- Only requires one card to be held for all ticketing needs
- Flexibility of card use reduces the dependence on cash
- Offers 'best price' for a journey as well as additional discounting opportunities
- Greater inducement to travel by public transport
- Improved journey times


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# Why integrated ticketing ?

## Operator Benefits

- Improved efficiency and reduced cost of operation
- Increased use of PT
- Reduction in cash and cash handling requirement
- Flexibility in fare policy and product definition
- Reduced dwell time at stops
- Reduced transaction and administrative costs
- Reduced fraud
- Vastly improved availability of travel data and passenger behaviour enabling service analysis
- Better capacity and network planning, more reliable and efficient services


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# Integrated ticketing system- Working steps

1.Collection of data required (study of the target area, behavioural survey, market research etc)
2.Formal decisions (agreements on financial contributions, approval by traffic departments, partnership agreements)
3.Elaboration of the ticketing system (designing of ticket products, agreement on monitoring and management, etc)
4.Tendering and negotiation with ticketing suppliers
5.Implementation and installation
6.Promotion of the new services and their advantages
7.Evaluation and monitoring of system

(Source: CIVITAS)


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# Costs of integrated ticketing system

- Costs for specifying and developing a new ticketing system (consultant, involvement of transport operators, etc.)
- Software for integrated ticketing systems (to connect the systems of different operators, internet tool for subscriptions, user software with an easily understandable interface, etc.)
- Equipment for vehicles, stops and stations (antennae, ticket vending machines, validators, etc.)
- Maintenance costs for the equipment
- Maintenance agreement for software, if proprietary
- Costs for updating the system and the software
- Additional costs (e.g. for the development of a monitoring system)

(Source: CIVITAS)


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# Integrated ticketing system in practice: London

Integrated ticketing has been introduced to smooth out public transport system services of London, including bus, light rail, tube services, and heavy rail services

Integrated tickets for all PT services in London:

- **Travelcard**: paper cash ticket
- **Oyster card:** magnetic stripe card



**Characteristics**

- organised according to a concentric ring structure with 6 zones
- fare paid is determined by the Travelcard ‘zonal coverage’
- time-based, sold in daily, weekly, monthly or annual form



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# Integrated ticketing system in practice: London

| **Benefits of integrated ticketing in London** (between 1983 and 1992, increase by) | |
|---|---|
| Number of tube passengers | 10% |
| Miles per tube passenger | 33% |
| Number of bus passengers | 16% |
| Miles per bus passenger | 20% |

Source: http://www.pteg.net/NR/rdonlyres/EACFCEE0-F212-467F-B342 2B9B9538DEED/0/integratedticketingreport221009.pdf



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# Park and Ride: The Scheme

- Park and ride (or incentive parking) are car park facilities with connections to public transport, allowing travellers to safely leave their vehicles and transfer to a bus, or rail system in order to travel to the inner city.
- Park and Rides are generally located in the outer regions of urban areas.

The benefits of park and ride schemes are several:

- They provide a way for commuters to avoid the difficulties and costs of parking within the city centre
- They provide great relief from traffic congestion, since people are encouraged to use public transport instead of personal vehicles
- They are useful as a fixed meeting place for travellers who engage in carpooling or Kiss and Ride



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# Park and Ride: Cambridge Park and Ride System- A Case Study

Cambridgeshire County Council considers the Park and Ride facility a means of great relief from the severe congestion in the city centre, and a method of promoting sustainable transport.

## The Scheme

The 5 Cambridge Park and Rides provide a convenient and stress free way of getting into Cambridge city centre:

- They are situated on the 5 main radial routes into Cambridge
- They provide around 5000 free parking spaces for vehicles
- They are connected to bus routes, through which travellers can travel to the inner city, by paying a normal bus ticket



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# Park and Ride: Cambridge Park and Ride System- A Case Study

**Benefits** of Cambridge Park and Ride scheme:

- **Private car mileage** experienced **a net decrease** from the use of Park and Ride facilities
- A **reduction in traffic in urban areas**, especially during the peak hours, represents an efficiency gain, and is likely to reduce air and noise pollution, and perceptions of danger
- Public transport usage was **successfully promoted**

It is important to note that the effect of such schemes will become even more significant if they are accompanied by other transport strategies, such as congestion charging systems or systems that aim to remove long stay car parking in the centre.



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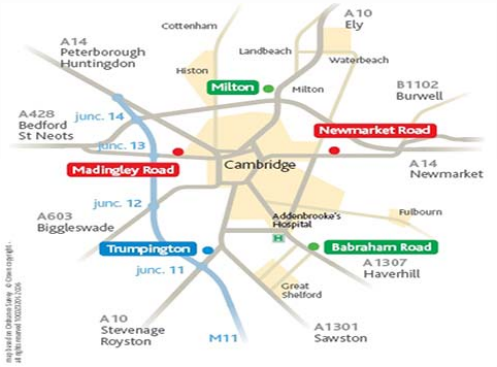


Source: http://www.cambridgeshire.gov.uk/


Source: Google Maps



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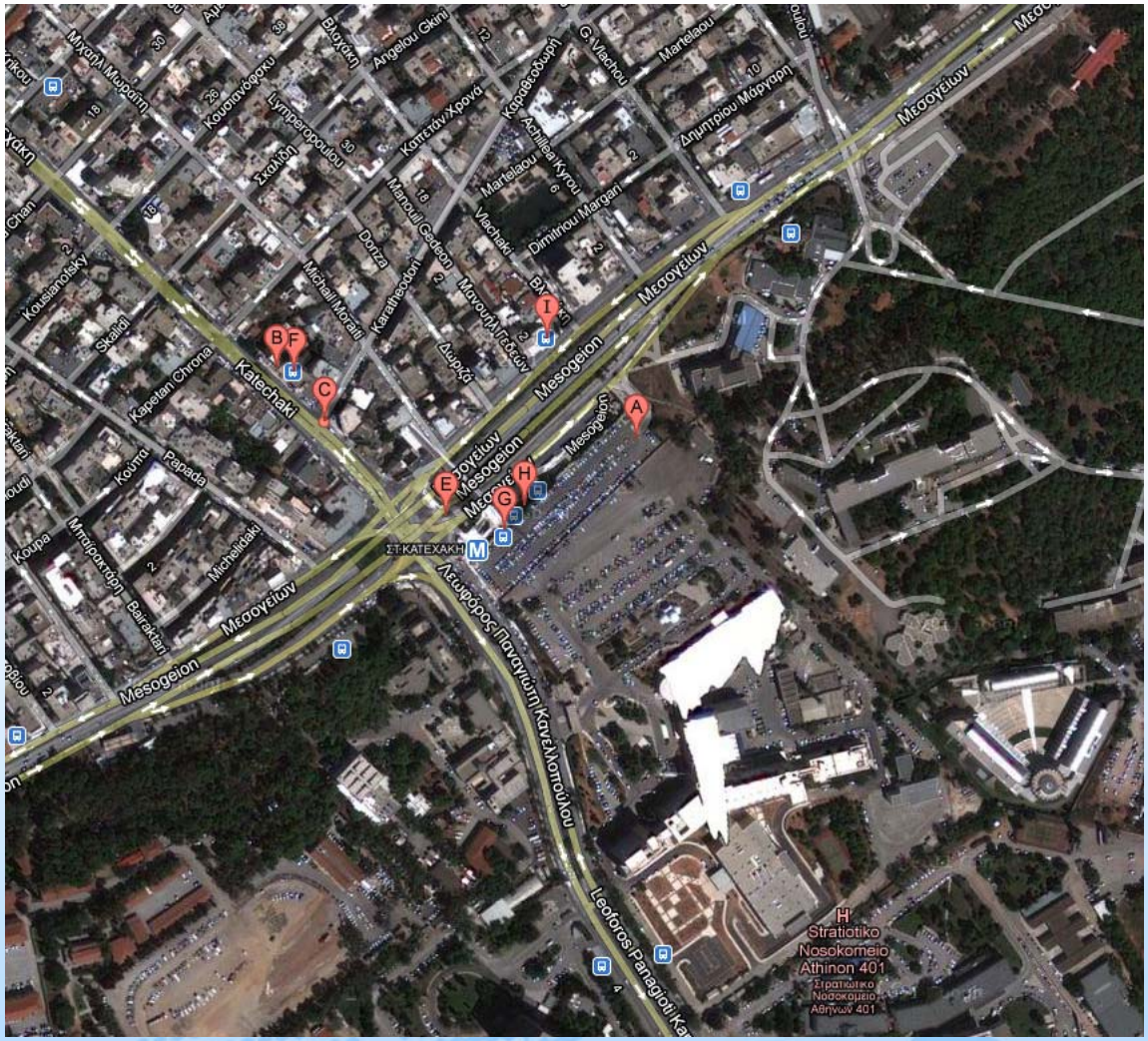


Source: Google Maps

# Operational Excellence (some more tips)

- Passenger surveys
- Quality monitoring system through passenger observation regarding the quality of PT provision
- Network setup
- Provision of staff training (e.g. energy efficient driving)
- Improvements on public transport route planning to enable interchange between transport modes
- Establishment of mobility information centres to promote sustainable means of transport
- Energy savings
- Alternative fuels
- Increase value (and profits)
- ……..(more ideas???)



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# Video
# Sihlcity - Transport solutions for a shopping mall (impact of mobility management measures in conjunction with public transport improvements)

http://eltis.org/index.php?ID1=7&id=61&video_id=76



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# Financing of PT: Identifying funding options for PT

- **Revenues from PT fares**
- **National sources**: governmental funds (e.g Local Sustainable Transport Fund in the UK), funds from ministries (e.g Greek Ministry of Economic Affairs)
- **Other funding options** which support planning objectives: road charging, parking pricing, emission fees, marketing space for sale/rent, rent buses
- **European sources**: Cohesion Fund, ERDF, ISPA, INTERREG
- **Banks**: World Bank, EIB, EBRD
- **NSRF 2007 – 2013:** Operational Programme Road Axes, Ports & Urban Development, Operational Programme Railways, Airports & Public Transport
- Fund Transition Facility
- …..Other????


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# Financing of PT: Road Charging - London Congestion Charging Scheme

It was introduced in February 2003 in order to:

- reduce congestion
- make radical improvements to bus services
- improve journey time reliability for car users
- make the distribution of goods and services more efficient

How it works:

- Cameras at entrances, exits and around the zone read car number plates
- Standard charge £10/day for vehicles that travel within the zone between 07:00 and 18:00 (Monday-Friday only)
- Some vehicles, like buses, axis, ambulances, motorcycles, alternative fuel vehicles, and bicycles are exempt from the charge
- a penalty of between £60 and £180 is levied for non-payment



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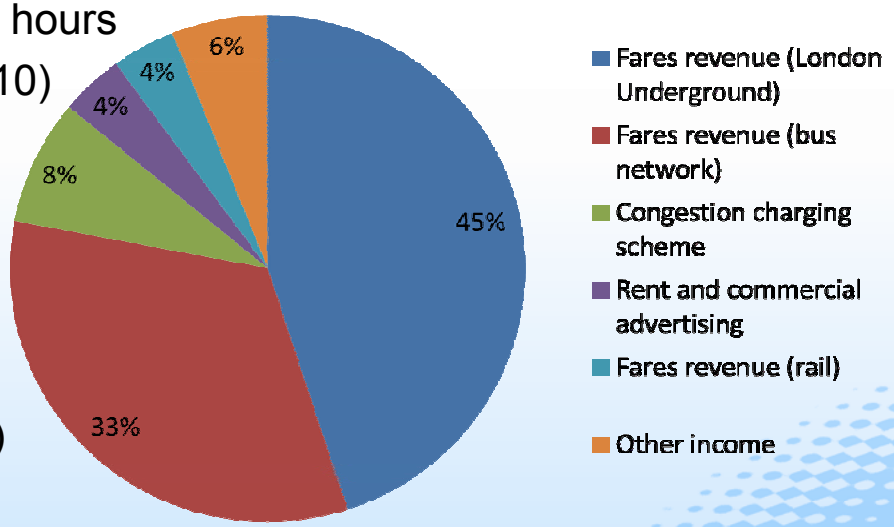
# Financing of PT: Road Charging- London Congestion Charging Scheme

Transport for London

**Revenue breakdown (2010/11)**




## 1. Advantages

- 6% increase in bus passengers during charging hours
- **All net revenue** (£148m in financial year 2009/10)

is **re-invested in improving transport in London**

## 2. Disadvantages

Congestion has risen back to pre-charging levels

(although would be much worse without the charge)

This is due to:

- Widespread water and gas main replacement works, which have greatly reduced the road capacity
- Traffic management measures to help pedestrians and other road users

(data source: TfL)



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# Private and Privately owned firms VS Public VS Municipal firms

- Private firms expect a profit, therefore have a minimum allowable rates of returns
- Different rules in taxation and financing
- Different set of goals, therefore they respond to different incentives and disincentives
- Different measures and criteria for evaluation
- Different vision
- Different scope
- Different business models



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# Organisational, financial, and regulatory structures (1/2)

## Unlicensed, unregulated, unsupported private ops

- there is no preset level of service or fare
- there is no preset fare structure
- generally operated where the government is very weak, typically in low income context or in fast-growing fringe areas

## Licensed unsupported private ops

- a first-step that can be taken against chaotic conditions
- licensing is intended to limit the number of operators or/and to impose some standards on them
- revenue from license fees also provides the means for enforcement

## Licensed but publicly supported private ops

- may still have wide control in selecting routes and schedules…
- …but some measure of public control is usually expected in return
- service hours might be expanded to guarantee service is provided at times even when it is not profitable

***Government Intervention***



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# Organisational, financial, and regulatory structures (2/2)

## Publicly planned & supported, private ops

- planning of routes is done publicly
- private operators deliver the services
- responsibility for routes, schedules, and other service design issues s are placed squarely on the planning authority
- public support depends on each case
- dominant model in much of South America

## Publicly planned, supported, and operated network

- usually no private operator can create competing services without permission
- similar to public monopoly in electricity or water
- services have to be coordinated in order to maximise benefits from investments in multimodal public transport systems
- predominant model in North America, and until recently, in the European Union

***Government Intervention***



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# The Balancing Act Facing the Public Authority


**Source: "Better Transit Systems" Bruun, 2007**



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# Public Transport Organisation Models: Contracting models

## Infrastructure

- Traditional - Separation of Project Phases
- Design - Build
- Design - Build - Operate - Maintain (DBOM)
- Build - Operate - Transfer (BOT)

## Operations and maintenance

- Gross Contract Models
- Net Contract Models
- Composite Contract Models



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# Contracting models for operations and maintenance: Gross Contract Model

**Characteristics**

- Planned and administered by a public agency separate from public and private operating entities
- Public subsidy is set through competitive proposals to operate services
- Winning operator commits to a certain level of service by time of day and by route
- A contract could be cancelled in the middle of its term in case of underperformance
- From *funding agency's* perspective
  - Positive: incentive for cost control in order to maximise profit
  - Negative: lack of incentive to improve service or attract additional passengers
- From *public authority's* perspective
  - Negative: high employee turnover rates



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# Contracting models for operations and maintenance: Net Contract Model

**Characteristics**

• Public agency is in charge of service planning

• Public subsidy sufficient to guarantee only a minimum level of service- the remainder of financial support coming from operating revenues

• The contract operator has an incentive to deliver higher quality service to maintain revenue and ridership

• From *public authority's* perspective
Positive: strong incentive for the operator to participate in the creation of additional ridership
Negative: potential loss of control



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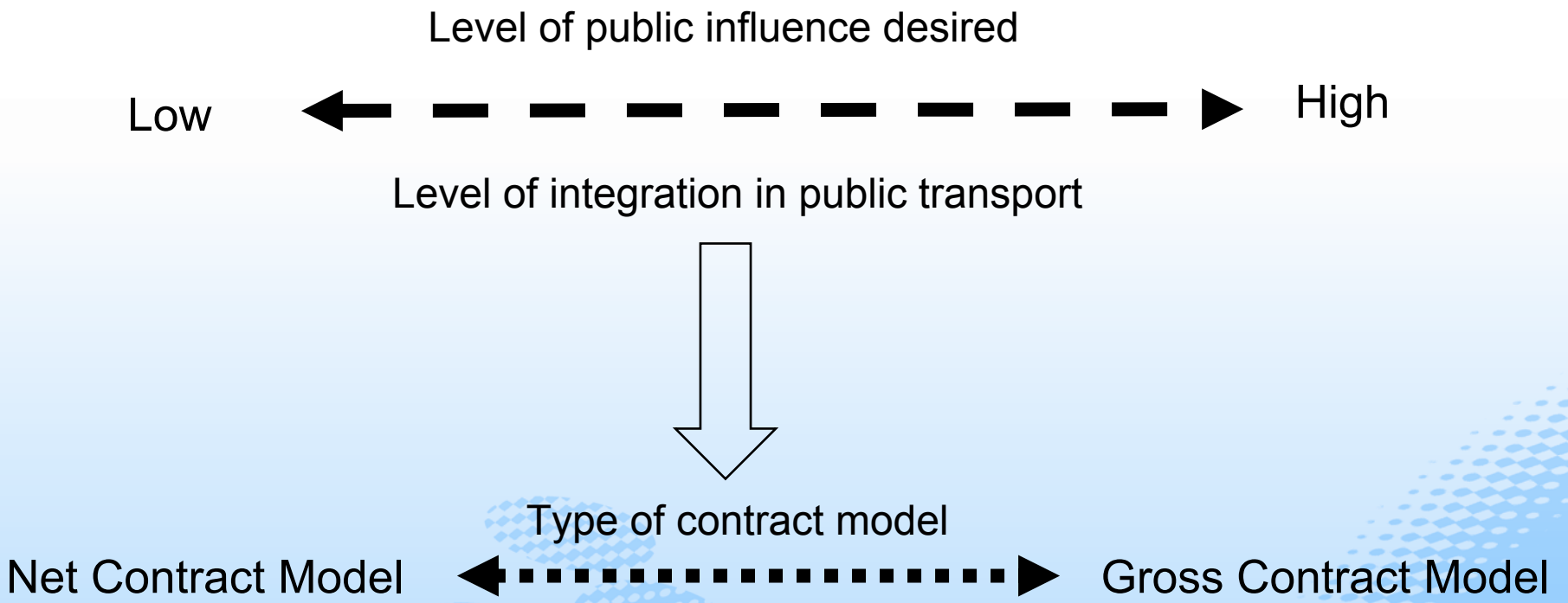
# Contracting models for operations and maintenance: Net and Gross Contract Models




Source: Bruun, 2007

# Contracting models for operations and maintenance: Composite Contract Model

**Characteristics**

- Captures positive points of Gross and Net Contract models
- Quality Bonus based on periodic survey of customers
- Adds a percentage of revenues collected to the gross amount paid in the contract – this bonus creates an incentive to increase ridership
- Operators can add, remove or amend service offerings as long as these changes meet with public approval
- Can be modified with minimum wage requirements to reduce staff turnover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# Items to consider (items of conflict and of business interest)

- Duration
- Scoping (route assignment & geo-range)
- Modifications options
- Asset type (rail, buses, metro)
- Asset ownership
- Awarding process (auction, direct assignment )
- Monitoring processes



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# 4 Public transport models

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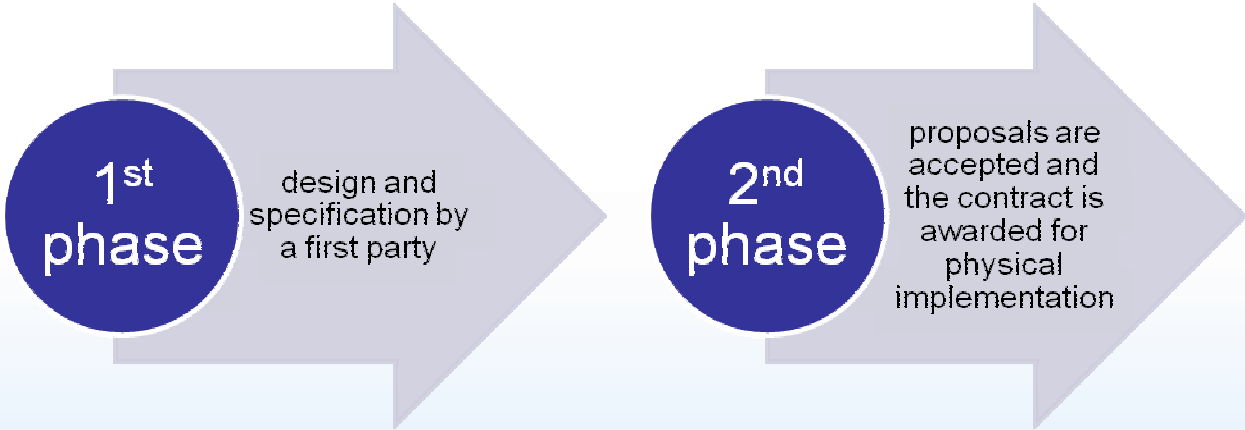
| | Duration | Scoping (route assignment) | Modifications options | Asset Ownership | Monitoring processes |
|---|---|---|---|---|---|
| **Amsterdam**  | 3 years | Responsibility of transport provider | Yes | A) Basic infrastructure (eg. transport networks): State<br>B) Vehicles and other equipment: Executive agent | Monitoring of services (accuracy, number), passenger traffic, and passenger satisfaction. |
| **Barcelona**  | 2 years | Responsibility of transport provider | - | A) Basic infrastructure (eg. transport networks): State<br>B) Vehicles and other equipment: Executive agent | Monitoring of progress every 3 months: financial results, investments, quality of services offered |
| **Brussels**  | 5 years | Responsibility of transport provider | Yes | A) Basic infrastructure (eg. transport networks): State<br>B) Vehicles and other equipment: Executive agent | Control of passenger satisfaction |
| **Krakow**  | 14 years | Responsibility of transport provider | Yes | A) Basic infrastructure (eg. transport networks): State<br>B) Vehicles and other equipment: Executive agent | - |
| **London**  | 5 years | Responsibility of transport provider | Yes | A) Basic infrastructure (eg. transport networks): State<br>B) Vehicles and other equipment: Executive agent | Monitoring of services (accuracy, number, security), passenger traffic, and passenger satisfaction (detailed research with many criteria) |
| **Lombardy**  | 7 years | Responsibility of transport provider | For changes over 3%, modification of contract | A) Basic infrastructure (eg. transport networks): Public Authority<br>B) Vehicles, offices, and other equipment: Executive agent | Evaluation system (time, quality, safety, etc.) |
| **Munich**  | 6-7 years | Responsibility of transport provider | Transport provider can ask for modification of terms of contract | A) Basic infrastructure (eg. transport networks): Public Authority<br>B) Vehicles, offices, and other equipment: Executive agent | Quality control of services offered<br>Customer satisfaction surveys<br>Productivity Analysis<br>Management of customer complaints |

# Contracting models for capital projects: Traditional Model

## Characteristics

• Separation of project into phases




## Why this model

• Expertise for system development to meet societal goals is different from expertise to manage manufacturing and construction
• Removes conflicts of interest: the total value of the design and specification portion of a project is a small part of the physical construction and manufacturing portion
• Funding authorities can control the progress of the project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# Contracting models for infrastructure projects

## Design - Build Model

- Synergies: The same firm designs, constructs and procures equipment
- The firm optimises project phasing based on its resources->cost savings
- No delays due to the need for negotiation
- Disputes are settled internally between the prime contractor's internal divisions and its subcontractors
- From funding agency's perspective: some of the project cost risk and completion date risk is shifted to a turnkey provider
- Rewards and bonuses for early completion / completion under budget - penalties for late completion
- Great success in Asia

## Design - Build - Operate - Maintain (DBOM) Model

- A single firm is responsible for the operation
- Based on the concept of minimising the life-cycle cost of an investment
- Not suitable for extensions to existing rail lines because the particular completed project cannot be operated in isolation from existing services
- Not to be confused with organisational structure that requires no public financial support

## Build - Operate - Transfer (BOT) Model

- The construction firm operates the system for an interim period; the system is handed over to public ownership and operation
- If this period is long, then this model is quite similar to the DBOM
- Is it is only for a few years this model functions as a training mechanism: administrative, supervisory, operating, maintenance and repair training



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# Public Transport Organisation Models: The UK experience

## Bus Deregulation in London

Characteristics of UK bus industry, prior to mid-1980s:

- public ownership at local level
- heavily subsidised
- slowly declining ridership
- little innovation in technology, service, or management
- little responsiveness to public needs or concern

A needed transformation of the public transport system


http://www.planetbods.org/blog/2011/10/25/london_bus_deregulation



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# Public Transport Organisation Models: The UK experience

## Outside London: Bus Deregulation (1986)

- Commercial services (concessionary fares reimbursement and fuel taxes rebates) VS Non-commercial (needed for social reasons)

Objectives:

- Create a competitive market
- Reduce costs
- Improve resource allocation

## Results

- Reduction of about 50% on operating costs, immediately after deregulation
- Reduction (about 30%) of subsidies
- Increase in bus kilometres of service
- Increase of fares, particularly in major metropolitan areas
- Great majority of services (80-85%) operated in commercial regime
- Relatively little sustained on-the-street competition
- Significant decline in ridership



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# Public Transport Organisation Models: The UK experience

Deregulation was not introduced inside London (due to congestion and rail system implications concerns).

## The process

- Decentralisation of London Buses Limited (LBL) operations, giving progressively more independence to LBL depots
- Awarding ~ 50% of competitive tenders to LBL subsidiaries (the rest to independent private bus operators)
- LBL subsidiaries to restructure labour contracts and management strategy
- By 1994 all LBL subsidiaries were privatised

## Results London Bus Privatisation

- Unit cost reductions of approximately the same amount as outside London
- Increase of service provided by a similar amount to outside London
- Modest growth of ridership
- Substantial decline in subsidy

# Results from the First Eight Years of Bus Privatisation in the UK

| Expectation | Effect of Deregulation | Effect of Contracting (London) |
|---|---|---|
| Encourage Innovation | Mixed – increased use of minibuses only important service innovation | Mixed – some service innovations from more enterprising operators |
| Encourage cost reductions | Yes – 25% reductions or more | 25% reductions |
| Provide a service which better corresponds to the needs of the customer | No – worsened regularity and poor information have offset the benefit of a substantial increase in service provided | Yes – large improvement in quality |
| Reduction in fares | No – fares up 30% | No – fares up 6% |
| Arrest reduction in bus travel and reduce reliance upon the private car | Mixed – traffic down 30%, although in a few areas with only one operator there have been large increases in travel and reduced reliance upon the private car | Yes – ridership maintained |



**Source: Bruun, 2007**



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# Advancing the PT Authority to Mobility Provider

- Open Discussion:
  - What are the missing items from your local PT agenda?
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____


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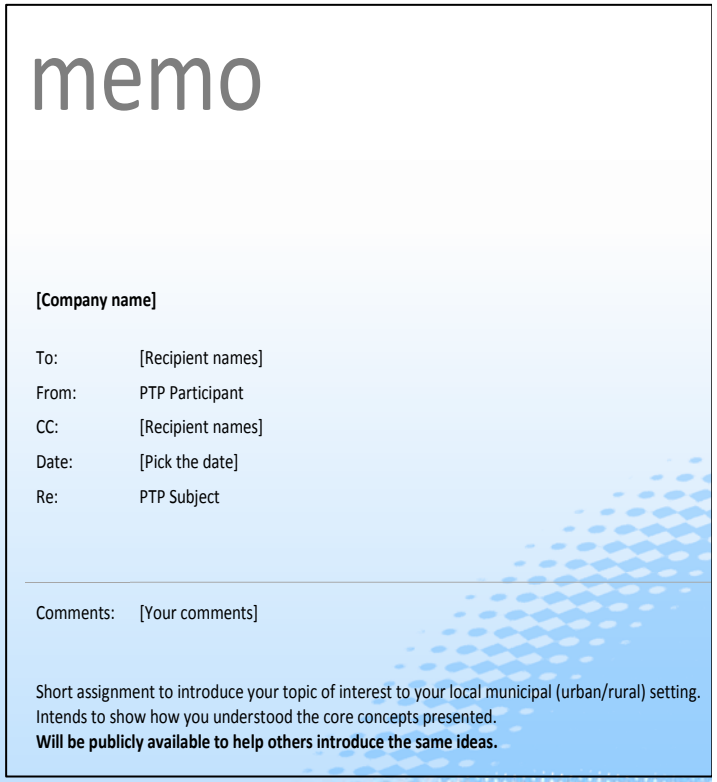
# What are the Practical Training Projects (mini-projects)

- Duration of mini projects: six weeks to five months
- Mini-projects can be implemented in teams – ideally one public official and one employee of an energy agency
- A great opportunity to put the new findings into practice and at the same time profit from a personal mentor, giving advice and assisting in the implementation process
- Trainees have the possibility to communicate with their personal trainer via a communication platform
- Training certificate  from the TU Dresden after successful implementation of the mini-project
- Provisional List of PTPs available, however, availability to choose topic of interest



memo

**[Company name]**

To: [Recipient names]
From: PTP Participant
CC: [Recipient names]
Date: [Pick the date]
Re: PTP Subject

Comments: [Your comments]

Short assignment to introduce your topic of interest to your local municipal (urban/rural) setting.
Intends to show how you understood the core concepts presented.
**Will be publicly available to help others introduce the same ideas.**



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# Mini Projects - Suggested topics

1. Provision of a range of public transport information for a local area
2. Provision of bus timetables at bus stops
3. Integrated ticketing between operators
4. Intensive local marketing campaign for bus routes in a specific neighbourhood
5. Allow bikes on buses/trains/trams
6. Real time information at bus stops
7. Financing of PT and ownership in a certain city
8. Website analysis and requirements for PT in a certain city
9. Promotion of PT and alternative promotion/dissemination channels
10. Change of traditional PT to Mobility Organisations
11. Awareness raising activities to promote the use of PT (e.g create a TV or radio spot promoting PT)
12. Set up mobility packages ('starter packet') for new citizens of the city
13. Develop an action day with pupils or with design students, theme: "pimp my bus station" – present results to the public



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# Mini Projects – Suggested topics

14. Conduct a small survey/market study about the satisfaction with the PT system in the city (develop questionnaire, interview PT users and non-users, analyse the results and write a report). Present your findings to the PT operator
15. Create and promote job ticket offers to companies
16. Create and offer “PT use” classes for seniors and create and design information materials for seniors; align PT use to seniors’ needs
17. Offer special PT tickets for families e.g. allowing the kids to ride for free
18. Create WLAN use option or “PT-stop to PT-stop communication” to make waiting time at PT-stops more attractive to children and youth
19. Reimburse tickets for shopping trips (by the shops - instead of reimbursing parking costs)
20. Organise a public transport day
21. Organise urban transport race from one point to another in the city to prove which transport is faster compared, to the CO2 emissions.
22. Loyalty programme for PT passengers


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# Mini Projects

## Any suggestions? Where can we help you?



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# Videos

- Monitoring the bus transport system

http://eltis.org/index.php?ID1=7&id=61&video_id=86

- New improved public transport network in Vitoria Gasteiz, Spain

http://eltis.org/index.php?ID1=7&id=61&video_id=98

- Budapest: Coloured bus lane

http://eltis.org/index.php?ID1=7&id=61&video_id=6

- Public Transport for people with reduced mobility

http://eltis.org/index.php?ID1=7&id=61&video_id=100

- Sihlcity - Transport solutions for a shopping mall (impact of mobility management measures in conjunction with public transport improvements)

http://eltis.org/index.php?ID1=7&id=61&video_id=76

- SUMP and improvements on PT

http://eltis.org/index.php?ID1=7&id=61&video_id=49 (part 1)

http://eltis.org/index.php?ID1=7&id=61&video_id=48 (part 2)



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