

# **Towards a sustainable mobility in the European metropolitan areas**

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## **Review of public transport trends and policies in the EMTA metropolises**

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## **INTRODUCTION**

*The Association of European Metropolitan Transport Authorities (EMTA) forms a venue for meetings, and exchange of information, research and experience between authorities in charge of urban transport in the main European cities.*

*A working group comprising EMTA members has studied mobility trends in the European metropolises and examined the policies of transport authorities. The document that follows summarises this work. It was written by Alain Meyère (STP), Stéphane Lecler (STP/EMTA), Carlos Cristobal-Pinto (CTM), Jörg Lunkenheimer (RMV) with the assistance of Chris Hyde (LT) for the translation. It starts by highlighting some strategic issues to achieve a sustainable urban mobility and is then divided into three parts :*

- *The first part is an analysis of mobility and of public transport (PT) modal share in the European metropolises. It is based on information and data contributed by the following institutions : NYFER (Amsterdam), OASA (Athens), ATM (Barcelona), Ministère de la Région de Bruxelles-Capitale (Brussels), RMV (Frankfurt), Office des Transports et de la Circulation (Geneva), Camara Municipal (Lisbon), London Transport (London), CTM (Madrid), GMPTE (Manchester), STP (Paris-Ile de France), SL (Stockholm)*
- *The second part focuses on the main projects and policies of public transport authorities*
- *The annexe summarises the main public transport trends and policies in some European metropolitan areas*

## **VIEW OF EMTA PUBLIC TRANSPORT AUTHORITIES ON STRATEGIC ISSUES FOR A SUSTAINABLE URBAN MOBILITY**

Keeping a high level of mobility in their territories is one of the major challenges facing metropolitan areas. These big cities can indeed only remain viable and ensure their ability to grow with efficient transport systems. The policies carried out in this field have major consequences on the quality of life of inhabitants, competitiveness of companies, efficiency of the retail sector and the kind of urban development.

In the midst of urban transport systems, public transport provides one of the answers to the mobility needs of people and plays a crucial role. This can be explained by its high share of trips, its social role and its contribution to reducing damage caused to the environment.

The analysis of recent tendencies in European metropolises shows the crucial role of public transport, especially in the dense areas of cities. Public transport makes up indeed for about one third of all motorised trips in EMTA member cities and more than half of the trips in city centres. But these good results could only be achieved through an active policy of public authorities.

The patronage of public transport is linked to many factors, only a few of which depend on the transport operators (e.g. quality of service). Other factors depend on public authorities and on their policies regarding urban planning and traffic management. Lastly, the economic growth or the changes in life styles significantly influences mobility needs and the use of public transport.

In fast changing societies, public transport must adapt quickly to remain attractive in competition with the automobile, which has always been strong at incorporating technological innovations. It must also consider the needs of people for door-to-door trips and therefore think as itself as a part of longer trips using other modes.

In this context, transport authorities must pay much attention to understanding on-going changes and must always adapt themselves to bring in new and appropriate answers to the needs of people.

### ***Better understanding for better decisions***

Many factors explain the modal choice of people, and the interactions are complex. Analysing and understanding this reality is one of the key missions of transport authorities if they want to make the right decisions. They should therefore have at their disposal some data on the following topics :

#### **- overall mobility and its evolution in a metropolitan area**

The function of a 'mobility observatory' should be to produce regular statistics which are useful for transport operators and key indicators for all policy makers to orient their strategic decisions.

#### **- attitude of people when it comes to choosing between different transport modes.**

This knowledge and the understanding of the factors at stake can help define strategies to increase the share of public transport.

#### **- forecast the future trends of mobility**

The trends of mobility should be analysed in relation to demography (ageing population), trends of life styles (new forms of work, consumption and leisure) or progress of technology. The objective is to be able to anticipate and prevent some negative trends which may affect the transport system.

For all these fields of investigation, national or international comparisons can be very useful. Benchmarking programmes launched by the EU or exchange of information between EMTA cities are ways of increasing knowledge in the sector, of disseminating examples of good practices and eventually of making right decisions.

### ***A need for strong transport authorities***

The complexity of mobility-related issues in metropolitan areas makes it necessary for public transport authorities to consider other fields outside the sphere of public transport so as to be able to offer travellers an integrated system of transport.

- **A relevant metropolitan territory**

For an efficient coordination of transport services in metropolitan areas, transport authorities must have a geographical competence consistent with the reality of the mobility of people. This relevant territory must be devised so as to encompass all the trips of people in the metropolitan area, be they related to work or not.

- **An integrated public transport system**

In this relevant metropolitan territory, the main mission of transport authorities is to implement an integration of services provided by the transport operators so as to offer travellers a real network. The first stage of this process aimed at facilitating the trips of people is usually the fare integration between the different operators. Integrated information and timetables are also of great importance.

- **An integrated approach for public transport and other modes**

Public transport issues can only be addressed in relationship with private car policies. Transport authorities have to organise a real differentiation and complementarity between public transport and private car, so that the private car is used only when it is necessary. An integrated approach will therefore be needed to attract people out of their car. The promotion of Mobility Management approaches and the development of Mobility Plans, like those devised in Belgium (Plan IRIS) or in France (PDU), with the objective of reducing the use of car and stimulating alternative modes of transport (walking, cycling and public transport) must be encouraged. Parking provision and costs are key elements in this respect. There is a need to develop traffic management techniques and parking policies which minimise the amount of car traffic in the cities. At the same time, intermodality between public transport and other modes should be fostered: the attractiveness of public transport stations can be increased thanks to P&R facilities as well as bike routes and secure parking for bikes.

- **An integrated approach for transport issues and urban planning**

The current trends on land use are not in favour of public transport. The control of urban expansion is a major concern for metropolitan authorities. Public transport authorities have to work in close cooperation with the public bodies in charge of urban planning. The aim is to take into account the impact on mobility in general and on transport modal shift of new urban developments. Public transport authorities have to firmly promote the idea that the current and potential public transport accessibility in urban planning at the different scales (regional and local) is a major concern to achieve a sustainable urban mobility.

## **I- DATA ANALYSIS : KEY DETERMINANTS OF PUBLIC TRANSPORT MODAL SHARE IN THE MAIN EUROPEAN CITIES**

The analysis of EMTA member cities shows strong differences on global use of public transport (PT) and PT patronage trends.

Fig. 1 Use of public transport in EMTA member cities and public transport patronage evolution (88/97)

Metropolitan area	Population (Million)	PT modal share for motorized trips (97 or 98 figures)	PT modal share evolution (88/97)
Madrid	5.0	54%	+29%
Barcelona	4.3	42%	-5%
London	7.1	40%	+4%
Stockholm	1.8	40%	+9%
Lisbon	2.5	38%	-23%
Athens	3.7	35%	-20%
Brussels	0.95	34%	+14%
Amsterdam	1.8	29%	NA
Paris	11.0	27%	+4%
Frankfurt	5.0	22%	+21% (92/97)
Manchester	2.6	21%	-26.5% (84/94)
Geneva	0.4	21%	NA

The aim of this part is to highlight the reasons accounting for the different levels of PT modal shares and thus the reasons for the strong gaps between cities.

### ***Urban structure***

#### **Density of population**

Densely populated cities, and more especially centers of metropolitan areas, are more suited to PT trips than private cars (PC). Indeed, space is scarce and that causes problems both for car driving and parking. Besides, the density of population allows the provision of extensive and frequent public transport services. As an example, PT modal share often exceeds 50% inside dense cities or in the centre of metropolitan areas

Fig. 2 Public transport modal share in densely populated areas and in the rest of metropolitan areas

	PT share in whole metropolitan area	PT share in the centre of metropolitan area
London	40%	69%
Madrid	54%	66%
Barcelona	42%	63%
Paris	27%	61%
Lisbon	38%	52%

In line with this first finding, it can be observed that the car ownership (motorisation) rate is generally lower in densely populated cities and at the heart of metropolitan areas than in other parts of urban areas. (Fig. 3).

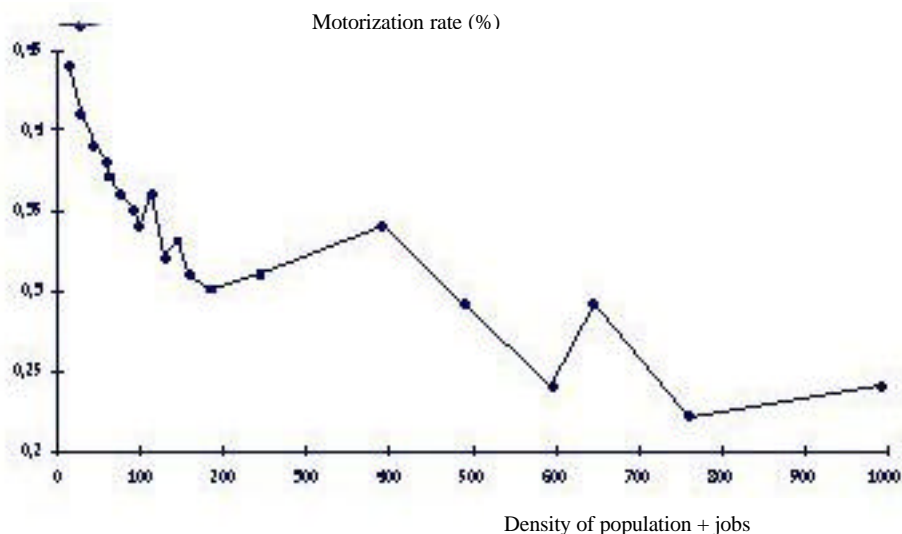
Fig. 3 Car ownership rate (cars per 1000 population) in Paris, Madrid, Lisbon and in the UK

		Car Ownership Rate (96 & 97)	Trend (Paris : 97/83 ; Madrid : 96/87 ; Lisbon : 98/73 ; London : 97/81)
Paris	Paris City	310	+7%
	Metropolitan area	440	+16%
Madrid	Madrid City	290	+27%
	Metropolitan area	322	+40%
Lisbon	Lisbon City	272	+17%
	Metropolitan area	327	+92%
UK	London Metropolitan area	333	+18%
	Other UK cities	356	+52%

The link between density of population and car ownership of households can also be illustrated with the case of Amsterdam where a relatively high density of population (4,350 inhabitants/km<sup>2</sup> in the city of 720,000 people) goes hand in hand with a very low car ownership rate (295/1000 in 1998). New-York City is an interesting case in one of the countries with the highest car ownership rates in the world : only 22%<sup>1</sup> of New-York households own a car vs 50% in London and Paris.

The following chart, based on the situation in the Paris region, shows that car ownership decreases (down from 450 cars /1000 inhabitants to less than 250) when the density of population and jobs increases.

Fig. 4 Car ownership and density of population and jobs in the Paris region



Besides, a recent trend has occurred in the center of big cities, with the car ownership rate stabilising and even decreasing over the past few years :

London : -1% between 1996 and 1997

Stockholm : -1.5% between 1989 and 1998

Paris : -3% between 1991 and 1997

Amsterdam : -6% between 1988 and 1998

In contrast to the situation in dense city centres, it is hard to serve suburbia efficiently with PT. Some metropolises (e.g. Madrid) have a tradition of growth through dense urban extensions (corridors), contiguous with existing urbanized zones (PAUs). Others, which favoured urban sprawl through suburbia for many years, have witnessed the consequence of this policy upon PC use and are now trying to return to dense

<sup>1</sup> IAURIF, sept. 98

urban form and to linking new urbanization with the existence of PT service (cf. objectives of Urban Transport Plan, PDU, in Paris-Ile-de-France Region).

### Location of population and employment in metropolitan areas

Population and employment are growing in most EMTA member cities. However, it can be noticed that, in most cities, suburban areas are growing faster than the centres, which are, for some of them, stagnating or even declining.

Fig. 5 Population growth in centres vs suburban areas

	Barcelona (96/75)	Madrid (96/86)	Paris (99/90)	Manchester (97/86)	Lisbon
City centre	-14%	-6%	-1.6%	-5.1%	-29%
Rest of metropolitan area	+20%	+21%	+2.6%	-0.3%	+7%

As far as business is concerned, metropolitan areas have undergone very different trends. Two categories can be identified :

- Metropolises whose centres still play a key economic role in spite of the overall growth of the metropolitan area. Thus, Central London and Paris City still employ 1/3 of the overall number of employees in their metropolitan areas (4.0 million in London and 4.9 million in Paris-Ile de France). However, the case of Paris is special, since over the past 30 years, public authorities have carried out a policy of limitation of job concentration in the city centre so as to promote the growth of sub-centres such as La Défense, which now employs more than 140,000 people, or new towns. At the same time, retail trade in suburbs has progressively settled in big shopping centres located near motorways.
- Metropolises whose inhabitants and economic activities have partially left the centre and sprawled across the whole metropolitan area. This is the case in Manchester, where most of shopping and leisure activities (multi-screen cinemas, bowling alleys, restaurants, hotels) now take place outside traditional town and city centres, often at large out-of-town food stores and retail parks (e.g. Trafford Center with 10,000 free parking spaces and good motorway access).

The increase of suburban housing and economic activities usually goes together with an increase of dispersed trips within the suburbs, whereas trips internal to many city centres are declining.

Fig. 6 Motorized trips in Paris and Madrid metropolitan areas

Motorized trips	Paris (91/76)	Madrid (96/87)
City centre	-0.7%	-2.6%
Suburbs	+54%	+91.9%

Given that city centres are generally the areas that are best served by PT, this trend is *a priori* bad for PT patronage.

The impact of this new urban geography on PT depends on the kind of urbanization of the suburbs (high population density vs urban sprawl) and of the quality of PT service in these suburban areas. In some metropolitan areas with low density suburbs or poor PT services, car use increases faster than PT use. In other cases, car usage can be limited thanks to high density of population and good PT service (Madrid).

The example of new towns in Paris-Ile de France is worth a comment : these areas were planned for high density population and economic activity and most of the time are served only by PT lines oriented radially toward Paris. Any person living in the suburbs and wishing to reach these new towns by PT has to travel via Paris, which is not the case when one uses an automobile thanks to bypass motorways.



Fig. 7 Public transport / Private car modal share trends in Paris metropolitan area

	Motorized trips 91/76	PT patronage (91/76)	PC use (91/76)
Paris City	-0.7%	+1%	-4%
Suburbs	+54%	+32%	+58%

Fig. 8 Public transport / Private car modal share trends in Madrid metropolitan area

	Motorized trips 96/87	PT patronage (96/87)	PC use (96/87)
Madrid City	-2.6%	-2%	-4%
Suburbs	+91.9%	+129%	+79%

### Transport infrastructure

The modal choice depends naturally on the level of existing infrastructures. Thus, the density of road infrastructures has a direct impact on private car use. Cities like Athens or Stockholm which, for different reasons, have a small network of motorways, are in sharp contrast to Frankfurt or Manchester, whose conurbations are structured by the motorway networks.

In the same way, the difference in PT modal share between London and Paris (the two main European metropolises) can be accounted for by the gap in the motorway networks in the dense areas of the two metropolises. In contrast to Europe, the high level of motorway density in most US cities, even in the centres, is a very strong incentive to the use of private car.

Fig. 9 Density of motorways and private car use

	Density of motorways in the urbanized area (m/km <sup>2</sup> )	PT modal share of motorized trips in the whole metropolitan area
London	40	40%
Athens	51	35%
Paris	210	27%

### Economy

#### Level of economic development

There is a strong link between the level of economic development and the car ownership rate of the populations, as shown by the example of Athens (250/1000). However, the increase of car ownership and the decrease of PT use are not unavoidable. Though the increase of car ownership is strong up to a certain level of wealth, it can then slow down and even be reversed under certain conditions :

- urban density
- attractiveness of PT
- policy of public authorities aiming at reducing PC reliance through a limitation of parking possibilities or increasing PC costs for the user

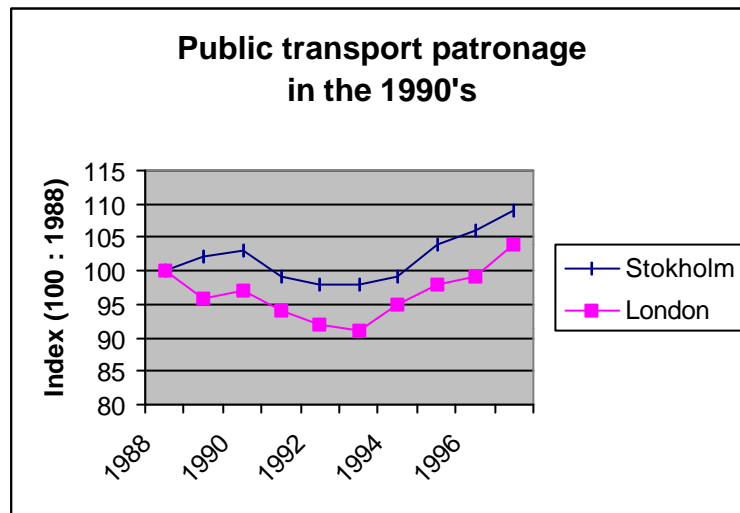
It is apparent that such conditions are usually gathered in the centre of big metropolitan areas. These factors can account for the low level of car ownership in some Italian cities as well as the stabilization observed recently in London, Paris or Amsterdam.

### Short-term economic trends

Economic short-term trends have an impact on mobility. Indeed, they influence directly the number of trips to work (60% of underground and 25% of bus patronage in London) as well as trips linked to shopping or leisure activities.

Two cases illustrate this impact very well. In London and Stockholm, the patronage of public transport decreased between 1990 and 1993 mainly because of economic recession.

Fig. 10 Public transport patronage in the 1990's in London and Stockholm



### Public transport supply

#### Components of public transport supply

The PT supply depends on the density of the networks (measured by line km/km<sup>2</sup>) and on the average headway. For historical reasons (radial lines towards city centres), the centres usually have a much greater density of networks. It is also very important to take the interchange possibilities into account.

Given that non-work related trips are increasing in all metropolises, the role of night and Week-End services is increasing. For example, in Stockholm, some PT lines are functioning all night. In the same way, in Paris, night buses (Noctambus) patronage grew significantly after the service was improved with better headways.

The problem which many metropolises now face is the discrepancy between PT level of service in the different parts of the metropolitan area. The case of Paris is a very significant example of that difficulty. Paris City has a very high level of PT supply within a small territory (105km<sup>2</sup>) : 168km of underground with 236 stations (among which 90 offer interchange possibilities), an average distance of 400m between two stations, 20km of express suburban trains (RER) and 556km of bus lines, with very high headway (less than 5 minutes at peak hours and less than 10 minutes on base periods for the underground). The suburbs are in contrast to this: PT networks are less dense and mostly consist of radial lines ; service frequencies are much lower and interchange possibilities scarce.

However a distinction must be made between suburban areas which aren't well served by PT networks for historical reasons (radial railways) and areas badly served because their density of population is not sufficient to support efficient PT networks. In the first case, solutions can be found (tramways, bus lanes, etc.). In the second case, however, only innovative solutions such as Demand Responsive Transport (DRT) can be economically viable. Allobus, a DRT line launched in 1998 to link areas in Paris northern suburbs

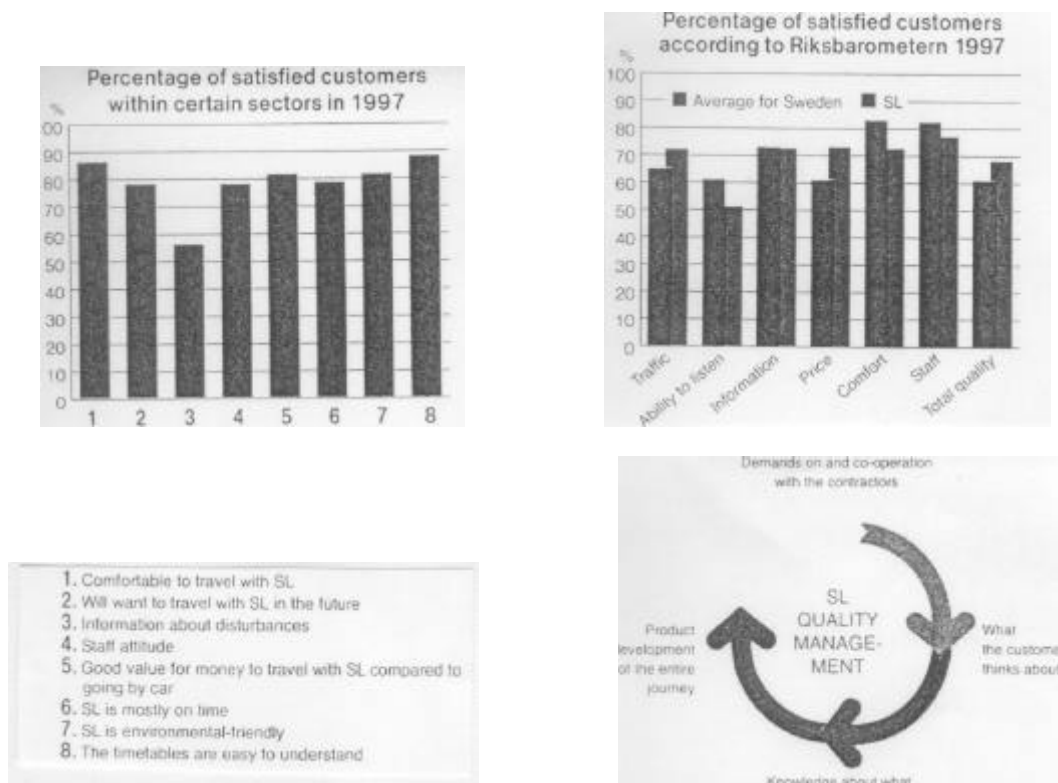
poorly served by PT with Roissy-CDG Airport (with its thousand of jobs) has been very successful in its first year (210 000 passengers).

### Quality of service

Quality of PT service encompasses many factors such as service speed, quality of information provided to passengers, comfort, tidiness and good organization of waiting areas, convenience of interchange, stability of networks over time, communication about PT supply, etc.

- In Madrid, a household survey in 1996 showed that the main reasons for not using public transport were travel time and comfort.
- In Athens, average speed of buses decreased by 25% over the last 12 years.
- In Manchester, the problem of the worsening of the quality of PT service over the past years has become particularly acute : ageing vehicles (the average age of buses has been up from 7 years in 1987 to 13 years in 1995), travel times uncompetitive with those by car, networks completely reshuffled after deregulation of networks. All these factors contributed to the strong decrease of PT modal share in the Manchester conurbation over the last years (-26% between 1984 and 1994).
- In Stockholm, detailed indicators (see below) are used to assess the level of satisfaction of passengers and to identify the areas where quality should be improved. Contracts between SL Transport Authority and PT operators include clauses that award contractors bonuses if they exceed agreed standards and penalties if they fail to meet them (punctuality, information about disturbances, coordination between train and bus, arrival at bus stop, staff attitude, security and safety, the way the vehicle is driven, state of the vehicle, ticket sales and checks).

Fig. 11 Quality management in Stockholm



In Paris, a survey carried out in 1998 showed that the main concern about using PT is linked to insecurity and the risk of aggression. Besides, STP devotes each year funds from road traffic fines (484 MioFF - 73.78 Mio Euros in 1998) to investment aimed at enhancing the quality of PT service (information of passengers, escalators, exclusive rights of way for buses, quality of interchange, P&R facilities, etc.).

### Public transport costs for passengers and fare structure

Fare policies are very different from one city to the other. For example in Madrid the price of passes increased less than inflation between 1987 and 1997, whereas in London, one of the most expensive cities in the world for PT, fares have increased faster than inflation.

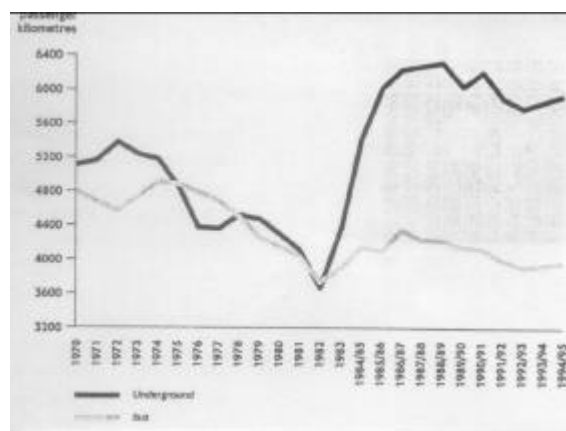
Moreover, the fare structure and especially the existence of passes that can be used on the whole network are key elements to facilitate the use of Public Transport. The strong increase in patronage observed in Madrid following the creation of the Multimodal Pass (1987) or in London after the launch of the Travelcard (1983) are good examples of this factor. More recently, VBB has launched a new fare system for the whole Berlin-Brandenburg area, which will enable passengers to travel through the whole area with one single ticket.

Policies tackling the needs of specific demographic groups such as school children, students, families, job seekers, etc. generally lead to strong increases in patronage. For example, the Carte « Imagine R » launched in Paris in 1998 for school children and students less than 26 was purchased by 360 000 people during its first year.

Fig. 12 Public transport patronage in Madrid and London



Public transport demand in Madrid (1974-1998)



Underground and bus patronage in London (1970-1995)

As a conclusion to this section on PT, it can be observed that the nature and the quality of PT supply, important though they might be, aren't enough to secure high PT use. For PT patronage not only depends on PT policy, but also, and maybe above all, on policy affecting the propensity to use PC. Therefore the next section will focus on the determinants of the use of PC.

**Competition with private car**

**Car ownership rate**

The modal share of PT is inversely proportional to the level of car ownership of the population. When people own a car, there's a strong probability for them to use it instead of PT. Figure 12 shows that there is a strong link between the modal share of private cars and the car ownership rate of the inhabitants of the cities (correlation rate  $\rho = 0.85$ ).

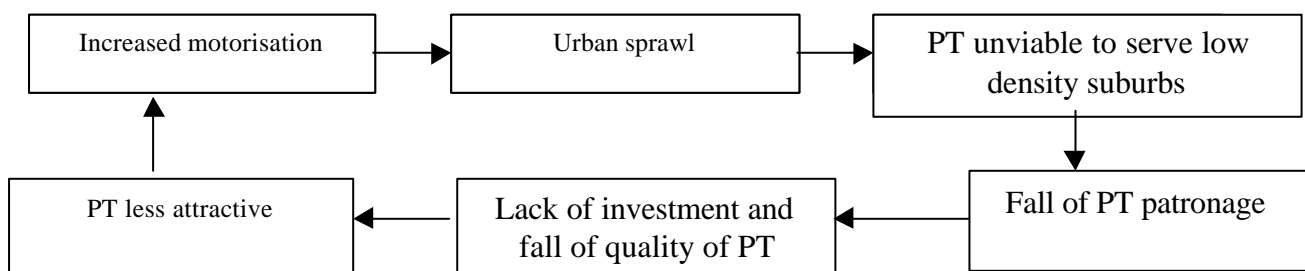
Fig. 13 Car ownership and private car modal share

	Car ownership rate* (/1000)	PC modal share in motorized trips*
Athens	250	43%
Lisbon	327	60%
London	330	60%
Stockholm	360	60%
Barcelona	414	58%
Manchester	415	79%
Paris	440	73%
Geneva	500	79%
Frankfurt	584	78%

\* figures are the last available for each city

Increased car ownership, in the absence of real city planning, leads to the following vicious circle :

Fig. 14 Car ownership vicious circle



**Parking policies**

As discussed previously, the existence of highways (radial and bypass motorways) and the availability of easy and cheap parking are two key factors underlying PC reliance (cf. Athens, Stockholm).

Parking is a very important factor, whether it is short-term (shopping, leisure) or long-term (work place, residential). Indeed, it is no use trying to deter people from using their car if parking space availability is high. For example CTM Madrid regrets that the public authorities of the Spanish capital city don't carry out a policy in line with their wish of limiting parking in the city centre.

Over the years, cities have carried out various parking policies. In France, for example, many local planning documents make it mandatory for real estate companies to build as many parking lots as flats in a building.

Most companies which build plants or offices see to it that there will be as many parking spaces available for their employees as possible. In order to constrain that approach, many cities try to deter parking through restrictive policies (by limiting availability of parking spaces and widespread charging, such as in London).

For example, in Paris City, out of 800 000 parking spaces, only 90 000 street spaces are free of charge. And this number decreases every year. Besides, the Urban Transport Plan, currently being developed, plans to deter parking at the work place (through taxes) since surveys have shown that the existence of free parking at the work place is the strongest incentive for employees to go to work by car.

However, parking can also promote the use of PT when it is provided as part of an intermodal approach. That's why many cities are fostering park and ride solutions. In Paris metropolitan area, 320 park and ride locations offer more than 115 000 spaces.

### Costs of private car vs public transport

To understand the modal share split between PT and PC, the cost of PT for passengers must be compared with that of PC for users.

First, it should be remembered that car users don't pay for all the costs sparked off by their vehicle (access to infrastructures, external costs on environment, public health, etc.) and also that car users often underestimate the real cost of their vehicle since they only pay attention to the cost of petrol, forgetting insurance, repayments, taxes, parking, tolls etc.

The situation differs strongly between the European metropolises on that matter. In some cities PT has always been cheaper than PC (Athens) while in others, fares have increased faster than petrol prices (Paris, Fig. 14).

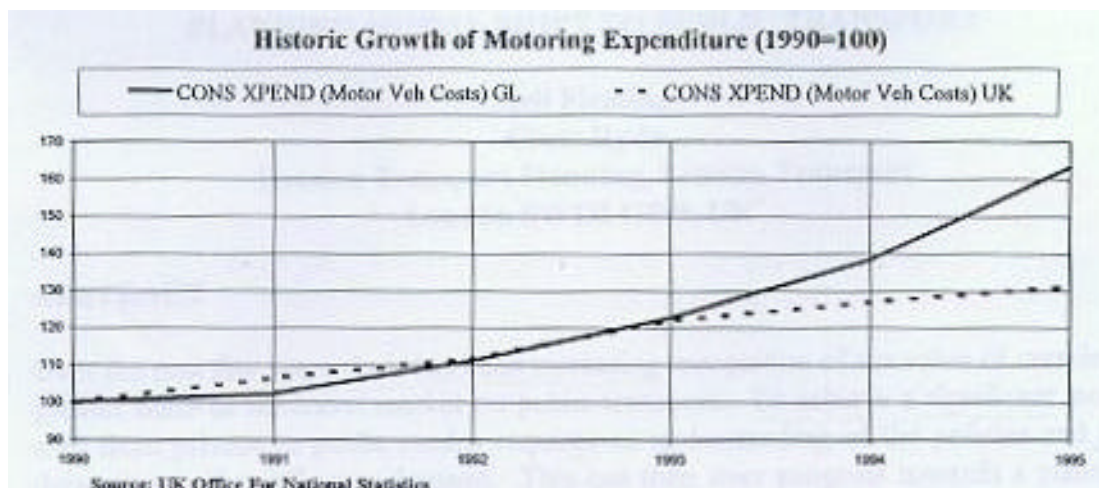
Fig. 15 Public transport fares and Petrol price trends in Paris

Paris	PT fares	Petrol price
Cost for the user (real prices) 99/86	+18.5%	-8%

London offers a good illustration of this analysis since competition between Public Transport and Private Car is rather in favour of PT. Many factors contribute to this situation :

- low car ownership due to a high density of population and a good PT network
- small motorway network in the dense areas and very high levels of road traffic congestion
- motoring costs are growing quickly in London, compensating for the high prices of PT

Fig. 16 Motoring expenditure in London and in the UK



### ***Competition between public transport and private car – Elements of understanding***

This survey, based on data analysis, confirms that the share of PT in a city depends on many factors, most of them interacting with others. But the main finding is the narrow link between three factors : urban structure, public policy regarding the use of private car, and public transport patronage. This conclusion can be illustrated with the findings of a survey conducted recently by a researcher of l'Ecole polytechnique fédérale de Lausanne (EPFL) :

- 1- **Travellers usually prefer the automobile** , which is synonymous with freedom, comfort and speed, whereas PT is often regarded as slow, constraining and requires sharing space with strangers. This means that a large majority of car users don't pay attention to the quality of PT supply and only contemplate using PT when the use of car is made difficult because of parking restrictions (scarceness, fees).
- 2- **Public Transport is often better than people think.** This is another proof of the general preference for the automobile.
- 3- **Environmental consciousness only incites a minority of travellers to use PT.**
- 4- **Minimizing travelling times is not the only criterion for travellers.** Therefore, in many cases when PT goes faster than PC, people will prefer PC nonetheless.
- 5- **An efficient PT supply is necessary but is not enough** to reduce the use of PC.
- 6- **Parking conditions are a key determinant of PT use.**
- 7- **Problems in reaching a destination can lead to changes in the choice of destination.** Any policy aiming at deterring PC use in town must ensure that acceptable alternative solutions exist. Otherwise there is a risk of people choosing new destinations (housing and work) that would be more accessible by car.

**Modal choices belong to life styles** and can't be changed without consequences for the everyday activities and habits.

## **II- PROJECTS AND OBJECTIVES**

The main projects carried out by public transport authorities aim at the following goals :

- maintain and improve the quality of existing public transport networks
- provide new and attractive products
- improve the quality of services delivered
- extend the role of public transport authorities

### ***Maintain and improve the quality of existing public transport networks***

#### **New vehicles**

Public transport authorities and transport operators are investing in new trains (including underground and suburban), wagons, and buses. This is for several reasons, including:

- the age and structure of existing fleet
- increasing number of passengers
- opening of new lines, extension of service
- launch of environmentally friendly vehicles
- improved accessibility for mobility-impaired people
- cost initiated change of product structure
- improvement of a negative public image of public transport
- modernization, research and development of new techniques

The extension of the underground network in Madrid and Paris, has been accompanied by investment in new vehicles. In Paris, entirely automated technology is used and monitored in a central control room. This is to reduce personnel costs and to decrease the probability of errors caused by human factors.

RMV in Frankfurt/RheinMain is continuing its investment in the high-comfort fleet of doubledecker-vehicles for regional rail. These vehicles are running on the main tracks. This is to deal with the higher demand and for the offensive strategy of improving the quality and image of public transport.

On side tracks with lower demand, RMV is investing in Neitec-vehicles (Pendolino-approach) to increase the average travel speed. Investment in flexible light diesel-electric low-level railcars to bring about a reduction in investment and operational costs.

Barcelona is currently remodelling its fleet of interurban buses.

Stockholm is rebuilding and modernizing the commuter train carriages that will be introduced gradually from 1999 on. Also between 1990 and 1997 it tested a fleet of battery powered hybrid buses and ethanol engines are used in inner city buses. In Paris, RATP is progressively replacing its old and polluting buses and is testing electric vehicles as well as new fuels (LPG, NGV, aquazole, etc.).

#### **Higher quality for bus routes**

In towns suffering from strong congestion, the creation of bus lanes is often seen as a solution to improve the conditions of service. In Paris City, the first bus lane was created in the 60's and there are now more than 140km of them in the streets of the capital.

A very interesting and remarkable approach is to be seen in the northwest-zone in Madrid where there is the new HOV (High Occupancy Vehicle)-Lane. This HOV-Lane allows buses and commuter cars with more than one passenger to use a separated lane passing by traffic jams in the peak hours. One section of the new lane is exclusive for buses.

Besides, some towns (Stockholm, Paris, Manchester) are currently reorganizing their bus networks with the aim of creating "principal routes" (trunk networks) and neighbourhood services. The principal routes link major areas of the city and have a high quality of service (speed, frequencies, capacity) whereas neighborhood services aim at bringing passengers to interchange stations where they can have access to the whole area.



### **Stations (modernization / construction)**

Stations are the entrance to the public transport system and are, in effect, similar to the business card of the system. However, in the last decades stations and bus-stops were neglected by those in charge. Meanwhile a change in awareness has occurred. More and more stations have been modernized and renovated, as in Stockholm, where a renovation-programme for underground-stations started in 1998.

In other regions like in Frankfurt/RheinMain an existing network is enriched by the construction and opening of additional stations. One example is the new suburban-train station at the fair trade centre.

Of course an extension of the track networks is connected with the construction of new, modern and comfortable stations. Sometimes they are air-conditioned with sliding doors closing the platforms (Paris-subway).

### **Better use of railways**

European metropolises usually have dense railway networks, which have sometimes been neglected over the years. That's why some cities are finding ways to give a new life to these infrastructures through:

- better service : for some railway lines, an improvement of the service (higher frequencies and speed, more comfortable vehicles, better interchange possibilities, etc.) can greatly benefit the patronage. This is what happened in Paris with the replacement of traditional suburban trains by modern and regular RER trains.
- new usage of railways. Some railways only used for freight can have a new life for passenger transport, such as in Paris for suburban links and Barcelona with the freight line Mollet-El Papiol. Besides, some railways can be used for light rail enabling good connections between the suburbs and the inner parts of the cities (Metrolink in Manchester, Tramway n°2 in Paris).

### ***Provide new and attractive products***

#### **New network infrastructures**

##### *Areas served by new infrastructures*

New infrastructures are targetted at serving areas neglected by public transport networks. They can be of two kinds :

- **areas or facilities attracting people** (airports, commercial or leisure centres, employment areas, public facilities, etc.)

In some cities, these facilities are remote from the city centres and located in areas poorly served by public transport but near big road infrastructures. The increasing number of trips generated by these facilities makes it necessary to provide public transport access to avoid congestion of highways and to enable people without cars to go to these areas.

Example : links to the airports

The linkage between greater airports and the centres of the cities is a crucial element of development plans of greater metropolitan areas. In Manchester, a link is under construction. In London, in addition to the existing underground service, a direct express-train started operation in 1998. At Frankfurt-Airport a new long-distance train station was opened in July 1999 in addition to the existing long-distance and regional station.

In Athens preparing for the Olympics 2004, the planning of a railway link to the new international airport has started. In Barcelona, a new metro line is being considered (L9 or L1) to serve the airport.

An appropriate way of dealing with these key facilities is to integrate public transport at the early stages of the design of the project. This was for example the case with the Stade de France : the whole network was reviewed and some new stations created before the inauguration of this equipment with the 1998 Football World Cup. The authorities deliberately decided to limit the car parking facilities and to encourage people to use PT to go to the Stade.

- **suburban areas**

These areas often lack radial lines and also bypass public transport networks. The main problem is the low density of these areas in some cities, which makes large investment difficult to justify in cost-efficiency terms.

*Types of new infrastructures*

The choice of the right infrastructure is crucial. Cities now have at their disposal a wide range of PT modes :

*New and modernized heavy rail infrastructure*

These infrastructures are very well adapted for dense areas. They supply a high capacity but demand huge investment.

The European authorities are currently improving and extending their rail-track networks on regional, suburban, and central systems.

In the Frankfurt/RheinMain region, RMV has started the construction of a new 20 km suburban railway into the Rodgau-Area, with the opening planned in 2001. From Frankfurt to the north 2 new suburban train tracks are planned.

In Manchester a second line to Eccles via Salford Quays is under construction and due to become operational in 1999. Further lines are being planned.

Madrid, Paris and Athens are planning, or constructing, an extension of their Metro-/subway-networks. In Paris for example the new Meteor (METro Est-Ouest Rapide) subway line has started running from south-east Paris to the Madeleine-Saint-Lazare neighbourhood. This is to ease the overloaded RER line A and will be the first stage of a major automated subway.

In Barcelona, a new metro line (L9) is planned, which should carry some 80 million passengers a year and which should consist of 33 stations. The investment will be higher than 800 million Euros. Also, the AVE line will connect Barcelona Airport with Sagrera and Sants stations and that means building a new tunnel of 6km in the city of Barcelona.

*New and modernized light rail infrastructures*

Light rail is increasingly considered as a good solution which costs less than heavy rail but offers more capacity and quality of service than bus routes. Moreover, their creation is often a good occasion to reorganize overall traffic. That explains why many cities are currently planning and building light rail systems after they disappeared in most countries (with the exception of Germany, Switzerland and Austria).

In Stockholm, for example, the construction of a light railway system is going according to plan, with the result that in 1999/2000 new services will commence. In London a new tram link will be opened in stages through April and May 2000.

In Frankfurt an existing line is extended with the construction of new tracks now directly connecting the main-station and northern parts of Frankfurt. Buses can use the free tram tracks as well in order to increase the average travel speed.

In Paris, two tramways have been created over the past ten years, and several more are being planned for the future.

*New buslines*

Many towns are currently extending their bus network.

In Stockholm new bus services are planned as expansions of the fixed-track services.

It is to be noticed that many search programmes are being conducted to develop new and intermediary vehicles between bus and light rail. Guided buses or tramways on tyres seem to be more efficient than buses but at the same time more flexible than traditional tramways (tests in Paris).

*New and modernized interchange stations*

Interchange stations are at the core of PT networks. They play a major role for interchange between PT modes, but also between PT and other means of transport (PC, bikes, etc.). That's why many cities are currently extending their Park and Ride facilities, and trying to provide better access to stations for bikes.

In Madrid, CTM is carrying out with the different institutions involved an active policy of support for interchanges between the metropolitan buses and the underground network (Moncloa). A new private financed interchange will be inaugurated in Avenida de America on 20th December 1999.

In Barcelona, the remodelling of the Central Transfer station of Pl. Catalunya, with its 6 rail lines, is being studied. 435,000 passengers pass through this interchange station every day, 163,000 of which are transfer trips.

### **Other new products**

Many cities are currently experimenting with new products :

- night services
- demand responsive transport (DRT), especially adapted in the case of low-density areas
- serving industrial areas with buses connected to railway stations
- car sharing

Concerning car-sharing, some innovative schemes are currently being launched, as illustrated by the ZuriMobil programme in Zurich, which combines car rental and public transport. People owning a yearly PT pass have access to cheap and easy car rental.

### **Fare policy**

All metropolitan transport authorities have significantly improved the level of integration of fare structures between different transport modes and parts of the metropolitan areas. A price integration is planned in Brussels for the year 2001, when 4 companies can be used by one ticket only. The same result was achieved in London through the Travelcard as an intermodal ticket as well as in Paris and in Frankfurt/RheinMain.

To ease access to public transport and to reduce distribution costs, STP started its electronic ticketing project using contactless smart cards. RMV finished a pilot project in one town and is preparing the introduction of an electronic ticketing system for the whole region.

Athens has started a study for the extension of a one fare rate system over all modes with the option of also implementing an electronic ticketing system.

PT authorities also work to enlarge their range of fare products :

- for specific segments of passengers : school passes in Brussels or Paris, passes for elderly people, for families. For special groups of passengers RMV and VBB in Berlin Brandenburg offer special solidar financed tickets, like jobtickets for all employees of a single firm or student-tickets integrating all universities in their region. The price is calculated according to the usership in each group.
- for special occasions : according to the purposes of travels, RMV in Frankfurt/RheinMain offers special "Kombi-Tickets". The ticket for a sport event, opera, and concert is automatically the ticket for public transport. This is arranged in contracts with the responsible organisations for the events.
- giving access to specific services (offering travel on the whole network during the weekend, price reductions on some purchases, Hotel passes in Frankfurt, etc.).

### ***Improve the quality of services delivered***

To enforce the market power of services, authorities improve their public transport systems by new infrastructure, as seen above, but also by higher quality of services. To win and keep customers is the focus of marketing activities and the improvement of quality is a significant instrument to reach the named goals.

Quality can be reached by setting standards or certification (ISO), which guarantees that quality is a permanent concern. Such quality standards can be devised for vehicles, stations/stops, service, and maintenance (RMV, Stockholm). For standards to be effective quality needs to be defined, measured and monitored. Opinion polls or quality surveys can help determine the fields where quality should be improved (Paris, Stockholm).

There are quality standards for type and equipment of buses (e.g. low level buses in RMV), for train configuration, and so on. Concerning service staff the educational level can be defined and standardized.

### **Accessibility to vehicles**

Most transport authorities are currently pushing for public transport vehicles to be more easily accessible. This concerns of course handicapped people, but also all kinds of passengers with mobility-impairment (elderly people, parents with pushchairs, people with luggage or bikes, etc.). Low floor buses, larger doors in stations or trains, etc. contribute to make public transport more easy to use.

### **Punctuality of service**

Surveys show that the regularity and punctuality of service are important to passengers, possibly more so than the length of trips.

### **Cleanliness / Safety**

Railway stations, underground stations and vehicles are public areas ; soiling and vandalism of these facilities is an increasing problem with two negative effects. There is the problem of increasing cost and the negative impact on the comfort of passengers and on the image of the whole system. Facilitating interchange is also crucial.

More and more transport authorities and firms have security guards in the stations and vehicles. This is combined with greater efforts in maintenance and cleaning.

### **Information to passengers**

The provision of information has been extended in nearly all cities and is available to visitors in special offices, in mobility centres and in stations. On-trip information is given inside the vehicles by special mobile service staff (e.g.: Frankfurt/RheinMain) or passenger information systems. Fast access to information is given by telephone information service or the internet. For all this, information technology and telematics can play a great role by providing on-line information.

Waiting times (real time) and information when there is disruption of services are also important.

RMV in Frankfurt RheinMain provides seven mobility-centres located in Frankfurt and 5 other towns. These mobility-centres provide all relevant pre-trip and on-trip information.

Information and services are:

- Change of transport means (public/individual transport)
- Routing
- Timetable
- Tariff
- Car rental
- Parking
- Hotels/Restaurants
- Events
- Tourist Information

This service will be extended to booking and paying services.

### ***Extending the role of public transport authorities***

Some public transport authorities have been granted new responsibilities that seem to have had a positive impact on the patronage of PT :

- geographical extension of the area of competence
- better integration of all transport modes
- one single communication for the networks

The setting up of the Verkehrsverbund Berlin Brandenburg (VBB) covering two states with eleven counties and three cities in March 1999 is an example of a new integration of several public transport modes. All

transport modes are running according to one timetable with one tariff and can be used with one single ticket. The extension of the area covered by STP to the whole Ile-de-France Region in 1991 is similar.

The second aspect is to grant the transport authority the power to organize all public transport modes, including suburban rail. This is for example the case in Berlin, Frankfurt and Paris. This is necessary to obtain an integrated network with coherent prices and timetables.

Lastly, integrated public transport networks are very often part of common communication campaigns following a common strategy by the authorities or transport associations, instead of single activities of the different transport firms.

In Frankfurt/RheinMain, RMV develops the entire marketing strategy for the whole public transport system, in all 15 counties and eleven cities operated by 147 firms.

In Manchester GMPTE is following the same idea offering a common passenger information service which is available 7 days a week. London Transport provides a telephone-information-service of this kind in several languages and has a website in 13 languages. They offer a UK-wide multi-modal travel information.

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## **ANNEXE – SUMMARY OF PUBLIC TRANSPORT TRENDS AND POLICIES IN SOME EMTA CITIES**

The cities with the strongest public transport modal share (among motorized trips) are Madrid (54%), Barcelona (42%), Stockholm (40%) and London (40%). This annexe identifies the elements which account for the modal share of public transport in some EMTA metropolitan areas and highlights the main objectives of the transport authorities.

### **1. Athens**

PT modal share, remains high (35%) in spite of a fast decrease (fell from 40% to 32% in 10 years). This high share can be accounted for by the high density of population (6,800 inhab/km<sup>2</sup> in the urban area), the lowest car ownership rate of the cities surveyed, and a relatively undeveloped highway network. However, the PT supply is not very attractive (density of networks, quality, bad image) therefore it is not surprising that PT modal share fell by 20% over the last 10 years. The strong increase in mobility was mostly the result of an increase in PC use.

The strong PT share is due to the existence of a low income population captive to PT rather than to the attractiveness of PT. The current urbanization of places which are some distance from the city centre, at the same time as increased car ownership of the population resulting from economic growth, are real threats for the future of PT.

Policies/Projects :

- better land planning, which is compatible with PT projects
- maintaining the social role of PT through a low fare policy
- limitation of car use in the city centre (traffic and parking restrictions)
- bus priority schemes on the main roads
- promotion strategy to improve the image of PT (social role + environment)
- make PT more competitive and improve the quality of service (2 new metro lines, extensions of existing lines, use of telematics, extension and better integration of suburban trains)
- promote intermodality (improvement of interchange stations, creation of park and ride areas)
- institutional reform (better definition of competences between authorities in charge of urbanism and transport)

### **2. Barcelona**

The rather high share of PT (42%) must be looked at carefully. PT make up 63% of motorized trips within the centre of the city, but only 46% of trips between the centre and suburbs and a small 19% of trips internal to suburbs. It is to be noted that the underground, which is very convenient in the centre, makes up 51% of all PT trips.

Household car ownership is increasing very fast (+10% between 92 and 97). There is currently a strong trend for growth of population and employment in the suburbs, where car trips reach 2/3 of all trips.

As a result, there is a risk that the decrease of PT share (-5% between 88 and 97) might continue.

Projects :

- PDI extension and modernisation of the rail network and light rail systems, with an investment of 3,000 Moi Euros.
- better integration of the overall system including timetables, frequency, fares (metro-bus ticket, Metro and urban sections of railway lines), etc
- better information thanks to opening of TransMet Information Centre
- building of new tramway (Diagonal-Baix Llobregat, length : 19km)

### **3. Brussels**

The PT modal share is linked to the strong concentration of jobs and inhabitants (5900 inhab/km<sup>2</sup> in the Region of Bruxelles-Capitale, where 2/3 of the overall population of the metropolitan area live) and the strong supply of PT (5km of TC routes per km<sup>2</sup> in the Region of Bruxelles-Capitale). The tendency has been

for most jobs to be located in the centre, but a new trend is appearing with new companies locating in the suburbs.

The share of PT is decreasing, due among other things to a declining quality of service (speed of buses decrease – 17km/h- insufficient headway).

Projects :

- improvement of the quality of service (headways)

#### **4. Frankfurt**

The very high modal share of PC (78% in 1997) is not surprising in the city with the highest car ownership rate of all cities surveyed. It should however be noticed that this modal share has decreased between 1992 and 1997 (falling from 82% to 78%).

The PT supply is quite strong, particularly as far as suburban and regional trains are concerned, but the density of PT of the metropolitan area (km/km<sup>2</sup>) remains average and cannot compensate for the polycentric structure of the conurbation and for the widespread road network. Moreover, more and more inhabitants and companies are leaving Frankfurt to establish themselves in the suburbs, where taxes are lower. As a result, the distance to work is increasing very fast (an increase of 250m each year) !

Projects :

- improvement of the quality of service (renovation of stations and rolling stock, telematics)
- communication on PT,
- creation of new services which will improve mobility and better integration of private car within PT policies (« if you can't beat them, join them »), for example cooperation with car-sharing companies, etc.

#### **5. Madrid**

The Spanish capital has the highest PT modal share among the cities surveyed (54%). A majority of trips are made by PT in Madrid City as well as between Madrid City and the suburbs. The PT network is very widespread, especially as far as bus routes between the centre and the suburbs are concerned (more than 15,000km). The car ownership rate is quite low, but is increasing very fast (+40% in 10 years in the metropolitan area). This rate is smaller in Madrid City than the average for the metropolitan area, whereas it was the opposite before 1985. Dense urbanization alongside major roads heading toward the centre enables good PT service on radial routes.

After many years of decline in the 80's, PT patronage has increased regularly since the creation of CTM in 1987 and the launch of multimodal passes. Over the past years, prices of PT have been rather competitive compared with PC since the price of passes has grown less fast than inflation since 1987.

Projects :

- new underground circle line in the metropolitan area
- extension of the airport metro line to the city centre
- increasing the quality of service (new PT vehicles, better information at home, at the stops/stations and during the trip)
- promote intermodality between PC/PT through a policy of P&R
- development of metropolitan bus terminal stations with bus lane accesses and private finance

#### **6. Manchester**

Manchester's PT modal share is the lowest among cities surveyed (21% of motorized trips in 1991 vs 32% in 1976). Many factors explain this low share : the urban structure of the metropolitan area, the car ownership rate, the organization of PT.

Manchester metropolis is in fact a conurbation of 2.5 millions inhabitants made of several towns with more than 200,000 people. These towns don't make a continuous urban area and some can be as much as 30km apart (Wigan is an example of a distant centre). The centres are linked to each other by a good network of highways, both radial and orbital.

Recently, many companies and shopping or leisure centres have left the urbanized area to settle in places which are not well served by PT (if at all). These centres generally provide parking facilities (for example

Trafford Centre with 10,000 free parking spaces off the M60). Lastly, the housing policy over the last 50 years has encouraged many families to leave the centres to settle in low density suburbs. As a consequence, only 20% of the trips in the metropolitan area are to and from City centre, town centres or major concentrations of employment. This is all the more unfortunate as PT are usually very competitive for these kind of trips. At the same time, 45% of trips are neither short (for which walking or cycling are the best answers), nor to or from centres. As one can expect, cars dominate these « dispersed » trips.

The car ownership rate is high (415/1000), and has increased by 43% between 1987 and 1997.

The ageing fleet of PT vehicles have lead to a fall in quality (average age of buses has jumped from 7 years in 1987 to 13 in 1995) and to the closure of many PT lines, mostly orbital railways, leaving PC as the only means of motorised transport for all trips internal to suburbs.

Projects :

- make the centres more accessible and attractive (improvement of walking and biking conditions, removal of through traffic)
- improve the PT network and the quality of service (5 new Metrolink extensions, bus priority schemes, restoration of stations)
- promote intermodality between PC and PT through park and ride areas
- restrain car in the centres, with a special focus on avoiding changes in destination

## 7. Stockholm

The high PT modal share (40%) can be accounted for mostly by the high density of the PT network (5km of routes per 1000 inhabitants), a rate of car ownership lower in the metropolitan area than in the rest of the country (360/1000 vs 430/1000 in average in Sweden), the cheap prices of PT (monthly pass giving access to the wole network costs 46Euros) and the geographic constraints to car traffic (islands linked together by a few bridges with limited capacity). It should be noticed that the car ownership rate has been stagnating over the past years (361/1000 in 1998 vs 366/1000 in 1989), since the rise in car ownership is smaller than the rise in the population.

The transport authority (SL) pays great attention to the needs of the population and to measuring the satisfaction of passengers (punctuality higher than 90% in 1998).

Among PT, the underground plays a key role (44% of PT trips), since it is well adapted to both the geography of the city and to weather conditions.

Projects :

- completion of institutional reform (procurement of underground and bus lines to operators linked with SL by contract)
- improvement of the quality of service (restoration of underground stations, modernization of rolling stock, cleanliness of the system and security of passengers- « zero tolerance » policy)
- extension of networks (light rail)

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