EMTA
EUROPEAN METROPOLITAN TRANSPORT AUTHORITIES

CONSORCIO TRANSPORTES MADRID

EMTA BAROMETER OF PUBLIC TRANSPORT IN EUROPEAN METROPOLITAN AREAS (2006)

January 2009

Presentation

EMTA is the association of European Metropolitan Transport Authorities that brings together the public authorities responsible for planning, co-ordinating and financing the public transport systems in 31 of the European largest metropolitan areas plus Montreal (Canada) promoting the exchange of information and good practices in the field of public transport.

Where they exist, public transport authorities are the only organisations with a broad view of mobility issues in large urban contexts. **Metropolitan areas have in fact multimodal and multioperators public transport networks but have to be understood as an integrated system**. Data collection should therefore be a key responsibility of public transport authorities.

As a first step to achieve this objective, a *Barometer of Public Transport* was published in 2002 with the aim to present the most important figures of the socio-economic and transport contexts in the associated metropolitan areas. Afterwards, every two years a new edition of the barometer has been published, this present edition being the fourth one. The report shows absolute data obtained from a questionnaire and also makes comparisons and sets ratios, **therefore it becomes a useful source of information to understand the different realities of each transport authority**.

The methodological difficulties we have found on gathering the data to produce the report are:

- the definition of the indicators are not the same in many cities and countries, though a manual was delivered with the questionnaire trying to set the meaning of each figure requested;
- the availability of data is very heterogeneous depending on cities, and sometimes even between modes within the same city;
- even when the data exist, it is rare that a single organisation has them all. Their collection therefore requires a big amount of work;
- lastly, the comparison of data is a difficult exercise since it requires comparable contexts. This means that the analysis of raw figures needs to look carefully at the geographical, institutional and social reality behind names of territories, to be able to draw few conclusions. As in the previous editions, the data in the *Barometer* are based on the territories where the public transport authorities that submitted them have their competences.

These difficulties and biases are well known from experts. EMTA thinks it is time for a process of harmonisation of definitions at European level, in co-operation with the representatives of the public transport sector. **It is desirable the indicators used in the *Barometer* become more harmonised in the coming years for the metropolitan areas concerned**.

24 metropolitan areas have collaborated to this fourth edition of the *EMTA Barometer of Public Transport* by providing data based on year 2006: Stadsregio Amsterdam, Barcelona, Berlin-Brandenburg, West-Midlands (Birmingham), Brussels, Budapest, Greater Copenhagen, Frankfurt Rhein-Main, Helsinki, Greater London, Madrid Community, Greater Manchester, Greater Montreal, Paris Ile-de-France, Prague, Seville, South Yorkshire (Sheffield), Stockholm, Greater Stuttgart, Turin Metropolitan Area, Valencia, Vienna, Vilnius and Warsaw.

We would like to thank the responsible persons in transport authorities that have contributed to the updating of this Barometer because we know collecting all the information required for the questionnaire is so thorough.

Lastly, Consorcio Regional de Transportes de Madrid (Madrid Transport Regional Consortium) deserve our special thanks, namely Carlos Cristóbal Pinto, Head of Studies and Planning Department who supervised the document, and Laura Delgado Hernández responsible for aggregating the data, giving consistency and producing the *Barometer of Public Transport* .

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1. Basic Socio-Economic Data of Metropolitan Areas

These basic data have two main purposes:

- on one hand, they show a picture of the metropolitan areas and different contexts;
- on the other hand, they will be used as reference indicators that enable to compare the transport figures described along the present report in relative terms, which means that the data among the different metropolitan areas will be more comparable.

EU27 countries and EMTA Members by 2008

1.1. Metropolitan areas characteristics

The metropolitan areas included in this report sum 77,564,989 inhabitants (16% of the EU-27 total population, as many inhabitants as Italy, Czech Republic and Austria together) and 131,518 km2 of surface (3% of the EU territory, as wide as Greece). These are very heterogeneous in every socio-economic aspect considered (Table 1). For example, in terms of population, Paris Ile-de-France is the most populated region (11,491,000 inhabitants) and Vilnius the least (848,008 inhabitants), giving a ratio of 13.5. Greater London also has a great number of inhabitants (7,512,400 inhabitants) as well as Madrid Community (6,008,183 inhabitants) or Berlin-Brandenburg (5,952,000 inhabitants). Concerning the surface, Berlin-Brandenburg has the biggest metropolitan area (30,371 km^2), then Frankfurt Rhein-Main (14,000 km^2), Paris Ile-de-France (12,012 km^2) and Vilnius (9,731 km^2), while Helsinki has 745 km^2.([1])

([1]) *In order to compare easily between the different tables and graphs contained in this report, all the metropolitan areas that have contributed to this updating of the EMTA Barometer appear in all tables and graphs. When a particular data is not available, there is an empty space beside the name of the metropolitan area*

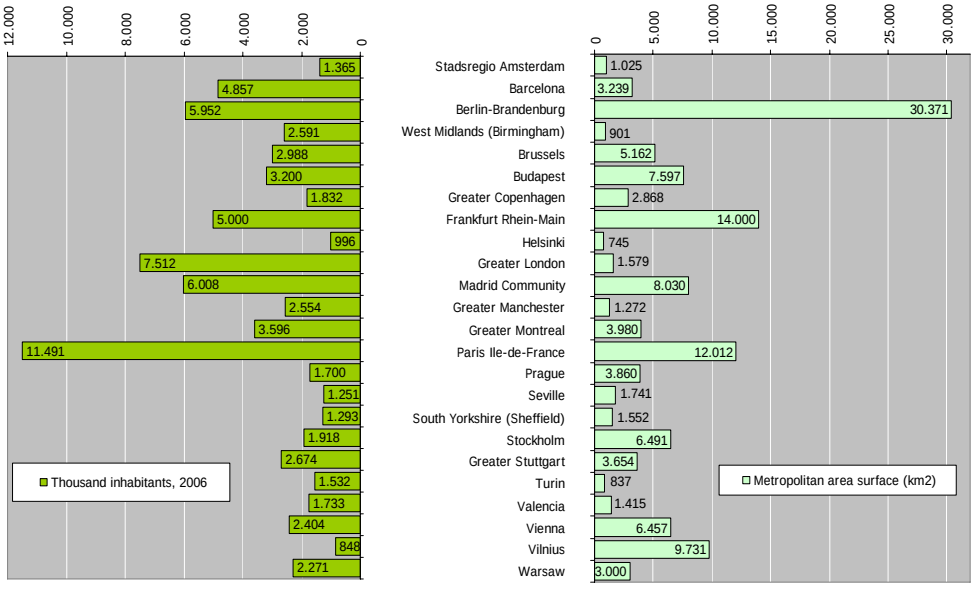
Table 1. Basic socio-economic data of metropolitan areas

Name of the region or metropolitan area	Population 2006 (inhabitants)	Surface (km^2)	Urbanised surface (km^2)	Family size	Annual GDP per capita (€)
Stadsregio Amsterdam	(1) 1,365,485	1,025		2.2	33,500
Barcelona	4,857,000	3,239	588	2.7	27,817
Berlin-Brandenburg	5,951,809	30,371	1,687	2.2	21,551
West Midlands (Birmingham)	(2) 2,591,300	901	435	2.4	(2) 24,387
Brussels	2,988,029	5,162	1,150	1.9	
Budapest (6)	3,200,000	7,597		2.6	(2) 14,070
Greater Copenhagen	1,831,751	2,868	642	2.1	(2) 46,535
Frankfurt Rhein-Main	5,000,000	14,000		1.8	35,000
Helsinki	996,000	745	240	2.2	42,857
Greater London	7,512,400	1,579	1,579	2.4	44,401
Madrid Community	6,008,183	8,030	(3) 1,049	2.9	(2) 28,064
Greater Manchester	2,553,800	1,272	959	(4) 2.4	(7) 26,031
Greater Montreal	3,596,000	3,980		2.9	24,024
Paris Ile-de-France	11,491,000	12,012	2,521	2.3	43,370
Prague	1,700,000	3,860			
Seville	1,250,597	1,741	307	3.1	18,164
South Yorkshire (Sheffield)	1,292,900	1,552		2.4	(4) 21,067
Stockholm	1,918,104	6,491		(5) 3.5	(2) 44,450
Greater Stuttgart	(1) 2,673,729	3,654	803	2.2	(2) 34,529
Turin	1,531,755	837		2.2	22,856
Valencia	1,732,830	1,415	325	2.6	19,747
Vienna	2,403,724	6,457			(3) 31,089
Vilnius	848,008	9,731	449	3.2	10,426
Warsaw	(1) 2,270,585	3,000		2.7	11,569

(1) 2007 data (2) 2005 data (3) 2004 data
(4) 2001 data (5) Considering only families with at least one child, no singles or couples are counted
(6) The figures in Budapest refer to the transport authority boundaries, which cover a wider area than the region limits
(7) The value in Greater Manchester is GVA (Gross Value Added) per inhabitant

We use “metropolitan area” to refer usually to the territorial framework the Public Transport Authority has competences on, although it not always coincides with a municipal or regional division. This leads to different administrative and institutional organisation of local authorities, highlighting the differences between metropolitan areas where public transport systems are co-ordinated on a regional basis (large parts of rural areas are integrated in the provision of services), like in Germany or The Netherlands, and those where public transport is organised in a more urban and local scale.

Graph 1. Metropolitan areas population and surface



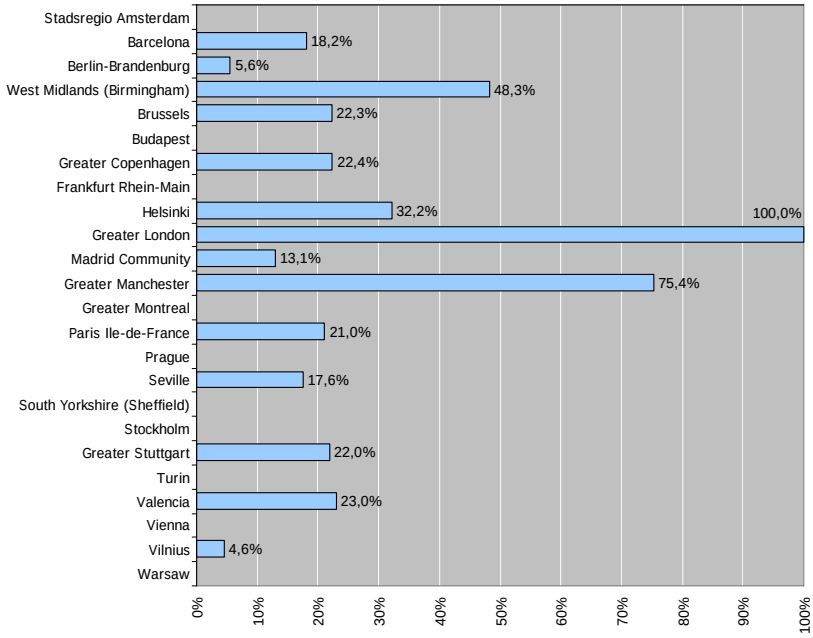
On average, the size of the families is 2.47 persons/family, but in the Spanish metropolitan areas, Budapest, Montreal, Warsaw and Vilnius the size is larger (2.60-3.2 persons/family) than in the rest of European cities, where it is less than 2.4 (Stockholm is not considered because no singles or couples are counted). It is remarkable that in Frankfurt Rhein-Main and Brussels (1.8 and 1.9) there are plenty of single-parent families or people living alone. In the rest of the analysed European metropolitan areas, the situation is quite similar. These figures mean that a couple has roughly one single child or any at all, revealing the serious ageing problem of the population.

If we look at the economic figure, the average annual GDP per capita is 27,942 €, with great differences from Greater Copenhagen (46,535 €/inhabitant-year) to Vilnius (10,426 €/inhabitant-year), 4.5 times lower. In addition, Stockholm, Greater London, Paris Ile-de-France and Helsinki have a GDP over 40,000 €/inhabitant-year. It is meaningful that the average GDP on the last Barometer edition (figures from 2004) was 25,255 €/inhabitant-year, what shows the economic growth Europe is experiencing on this period.

1.1.1. Urbanised area in metropolitan areas

A remarkable figure is the urbanised surface in the areas of our study (Graph 2). Where data are available it is an indicator of the nature of the region, whether it has wide rural areas or covers built-up zones. Though the definition of “urbanised area” might vary in different cities we can notice that Greater London and Greater Manchester have the greatest ratios comparing the urbanised surface with the total metropolitan surface (100% and 75%), followed by West Midlands (Birmingham) (48.3%) and Helsinki (32%). The rest of the regions range from 13% to 23%, with the exception of Berlin-Brandenburg and Vilnius where there are extended non-built areas.

Graph 2. Urbanised surface on metropolitan area / metropolitan area surface

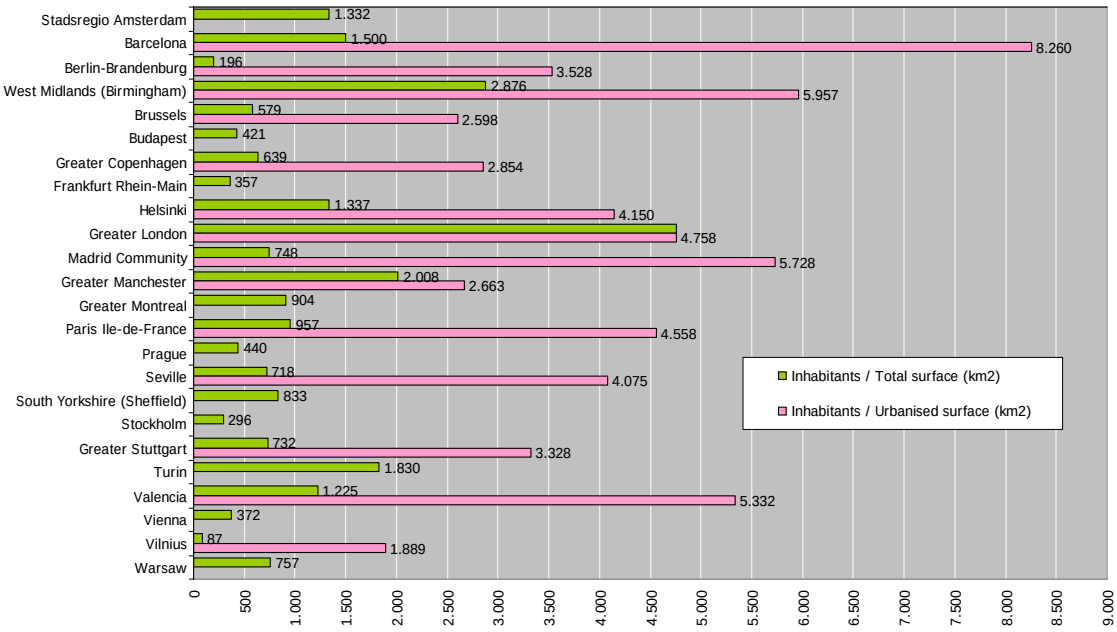


1.1.2. Density of population in metropolitan areas

Metropolitan areas whose administrative boundaries cover mostly urbanised areas like Greater London (4,758 inhabitants/km^2), West Midlands (Birmingham) (2,876 inhabitants/km^2), Greater Manchester (2,008 inhabitants/km^2) or Turin (1,830 inhabitants/km^2) reach much higher gross densities than those including large rural parts as Vilnius (87 inhabitants/km^2), Berlin-Brandenburg (196 inh/km^2) or Stockholm (296 inh/km^2) (Graph 3).

Therefore, it is more pertinent to look at the density in urbanised areas, which reach very high rates in cities having a tradition of collective housing such as Spanish cities Barcelona, Madrid and Valencia and also Birmingham where the net density is over 5,000 inhabitants/km^2 (or 50 inhabitants/ha).

Graph 3. Population density in metropolitan area (inhabitants/km^2)

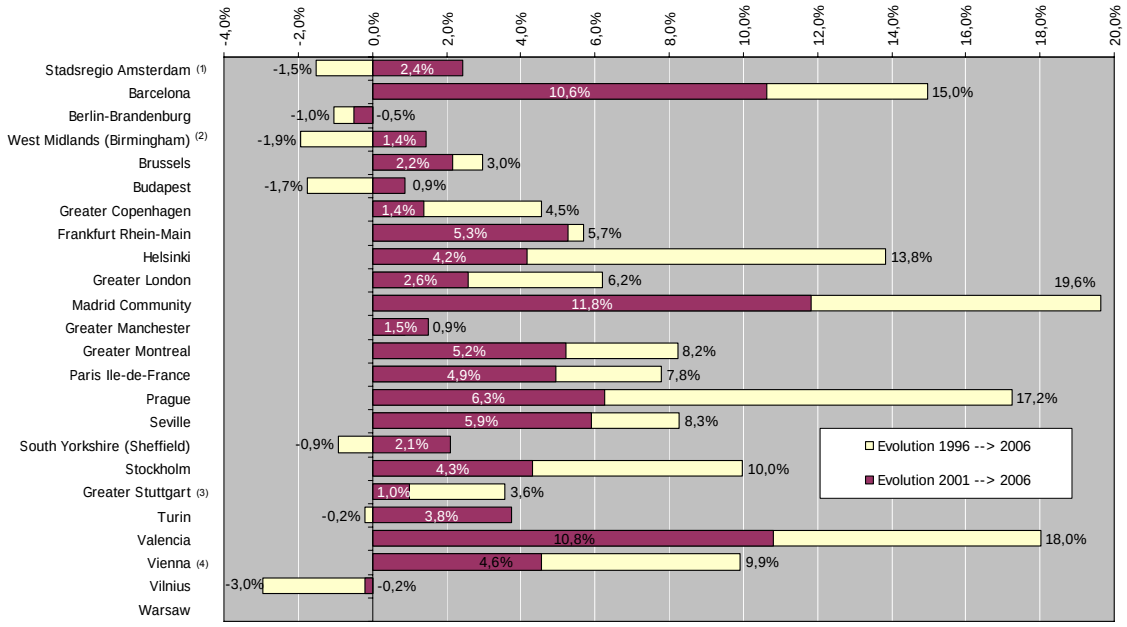


1.1.3. Evolution of population in metropolitan areas

During the period 1996-2006, most of the metropolitan areas have seen their population increase, with an average ratio of 6.2% (2% on the first 5-year period and 4% on the second 5-year period) (Graph 4).

Several of these metropolitan areas have seen an increase over 10% in the last 10 years. This is the case of Madrid, Valencia, Prague, Barcelona and Helsinki. In Madrid, Barcelona and Valencia the growth in the period 2001-2006 has been very significant, around 11% on average, due to the massive immigration that Spain is experiencing.

Graph 4. Population evolution 1996-2006 and 2001-2006 in metropolitan area



(1) Stadsregio Amsterdam, period 1995-2007 and 2003-2007

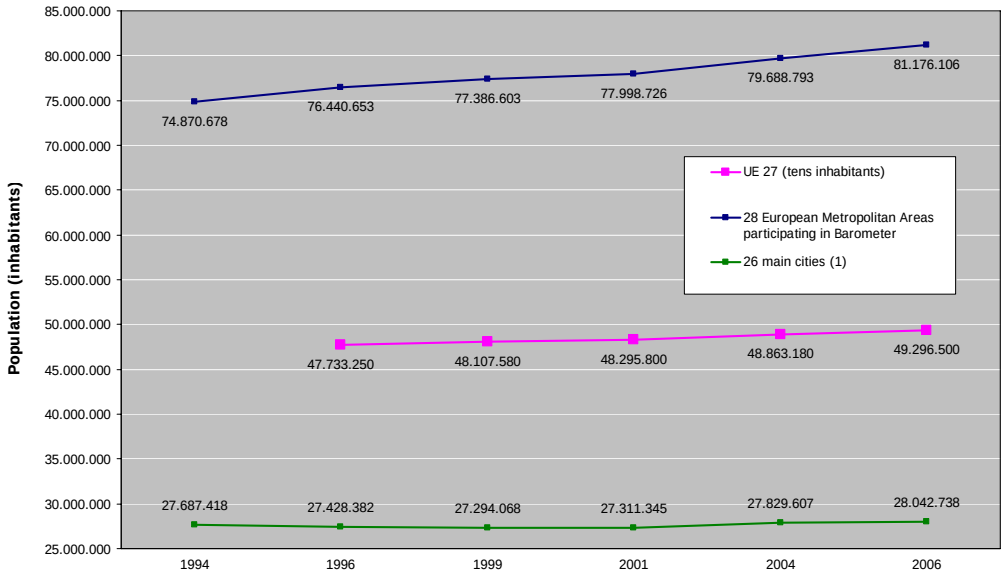
(2) Birmingham, periods 1996-2005 and 2001-2005

(3) Greater Stuttgart, periods 1997-2007 and 2002-2007

(4) Vienna, periods 1994-2006 and 1999-2006

Among the cities having provided data, just Vilnius experienced a steady decrease in population (-3.0%) attenuated on the last 5-year period. Some like Stadsregio Amsterdam, West Midlands (Birmingham), Budapest, South Yorkshire (Sheffield) and Turin showed an overall slight decrease for the past ten years (-1.5% on average) although the last five years have seen an increase in population. Furthermore, only Berlin-Brandenburg and Vilnius have showed a decrease on its population (-0.5% and 0.2%) during that period 2001-2006, what is proof of the increase of Europe's population, 2% in the same period for the EU-27 (Graph 5).

Graph 5. Population evolution 1994-2006



(1) There are two cities coinciding with the boundaries of the metropolitan area (Greater London, Montreal) which are not included in the list of "main cities"

1.2. Main city characteristics

The main cities gather altogether a population of more than 43 million people on a surface of 10,000 km2, what represents the 46% of the population on the 8% of the study area. The cities of London and Berlin are the most populated (7,512,400 and 3,404,000 inhabitants), and Manchester the less (452,000 inhabitants). The differences on surface are also noticeable, London (1,579 km2) is 15 times bigger than Copenhagen (98 km2), Barcelona (101 km2) or Paris (105 km2).

It should be noted that the Greater London entries in the series of main city figures and graphs are the same as that for the metropolitan area because the whole administrative metropolitan region of Greater London is the same as the main city.

On average, the size of the families in the cities is 2.3 persons/family compared to the 2.47 persons/family in metropolitan areas, showing that the city centres are suffering intensely the ageing of their population due to the young families moving to the outskirts. Also cities are loosing families and children because young professional people move in to the city.

Table 2. Basic socio-economic data of main cities

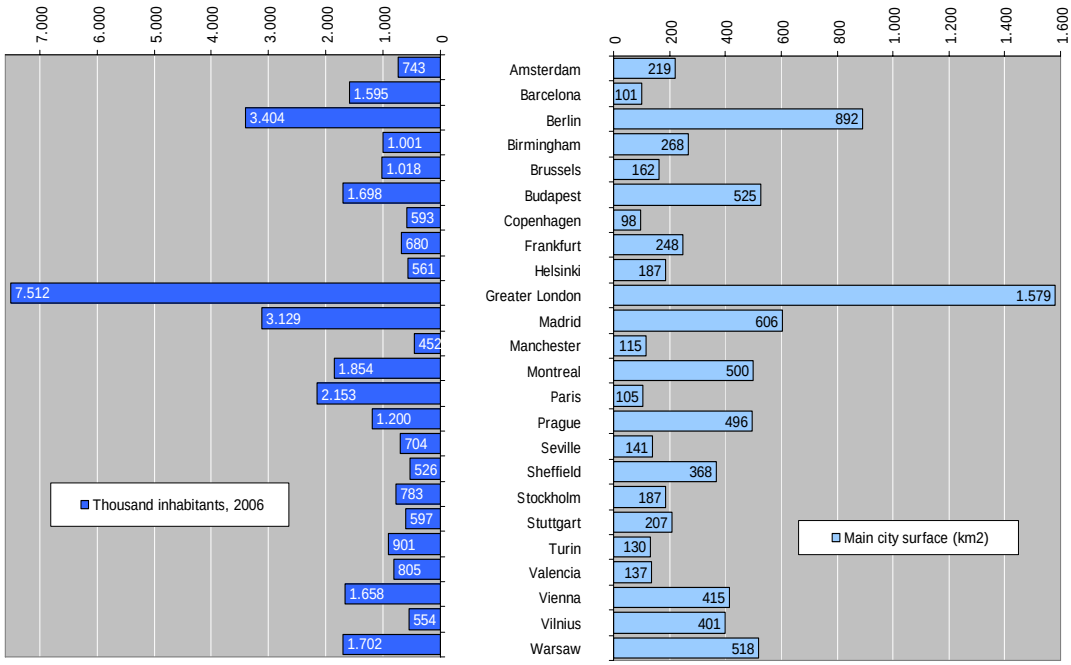
Name of the city	Population 2006 (inhabitants)	Main city surface (km^2)	Urbanised surface (km^2)	Family size	Number of jobs	Annual GDP per capita (€)
Amsterdam	(1) 743,027	219	133	2.0	414,386	28,500
Barcelona	1,595,000	101	80	2.7	1,250,000	27,300
Berlin	3,404,037	892	363	2.2	1,571,500	23,715
Birmingham	(2) 1,001,200	268	153	2.5	(2) 545,000	(2) 26,308
Brussels	1,018,029	162	140	2.0	660,000	56,500
Budapest	1,698,106	525		2.6	(2) 760,145	(2) 18,400
Copenhagen	593,013	98	89	1.8	370,787	57,467
Frankfurt	680,000	248		1.3	590,000	70,000
Helsinki	561,000	187		2.2	373,000	44,792
Greater London	7,512,400	1,579	1,579	2.4	4,670,000	44,401
Madrid	3,128,600	606	(3) 326	2.8	(3) 1,775,525	(2) 33,801
Manchester	452,000	115	109	(4) 2,4	168,000	
Montreal	1,854,000	500		2.9	1,145,585	32,031
Paris	2,153,000	105	105	1.9	1,540,000	
Prague	1,200,000	496	213	2.4	750,000	17,155
Seville	704,414	141	(2) 107			
Sheffield	525,800	368	163	2.3	(5) 230,000	(4) 23,900
Stockholm	782,885	187		(6) 3.4	(2) 524,549	
Stuttgart	(1) 597,158	207	(1) 106	1.9	340,134	(2) 55,082
Turin	900,569	130		2.0	434,000	23,900
Valencia	805,304	137	(4) 58	2.5	383,800	
Vienna	1,657,559	415		2.0	833,800	(3) 40,300
Vilnius	553,981	401	107	3.1	388,020	12,000
Warsaw	(1) 1,702,139	518		2.4	778,023	21,825

(1) 2007 data (2) 2005 data (3) 2004 data (4) 2001 data
(5) 1991 data (6) Considering only families with at least one child, no singles or couples are counted

The main city concentrates more than 50% of the jobs in metropolitan area, with an average of 58 jobs per hundred inhabitants, varying from 34 jobs/100 inhabitants in Manchester to 88 jobs/100 inhabitants in Frankfurt. Looking at the jobs density in main cities, the average is around 3,000 jobs/km2 but Paris (14,667 jobs/km2) and Barcelona (12,376 jobs/km2) have very high ratios due to their limited city surface.

If we look at the economic figure, the average annual GDP per capita in the cities is 34,600 €, 24% higher than in the whole metropolitan area.

Graph 6. Main cities population and surface



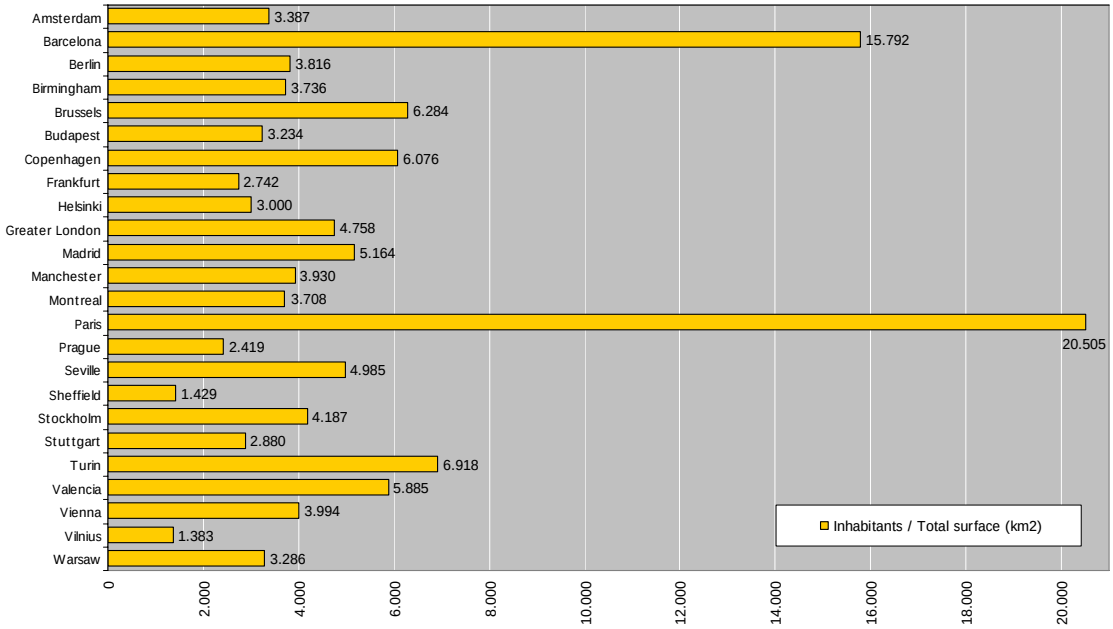
1.2.1. Urbanised area in main cities

The urbanised area in main cities cover most of the surface. The highest ratios are in Paris and Lonodn (100%), Manchester (95%), Copenhagen (91%), Brussels (86%), Barcelona (79%) and Seville (76%), where the built-up areas cover more than 70% of the total main city surface. As average, 65% of the city surface, while the same ratio in the whole metropolitan area is 30%.

1.2.2. Density of population in main cities

Those cities with high percentage of urbanised areas have higher gross densities than those with lower percentages. These are the cases of Paris (20,505 inhabitants/km2) and Barcelona (15,792 inhabitants/km2), and at a second level Turin, Brussels and Copenhagen (6,000-7,000 inhabitants/km2).

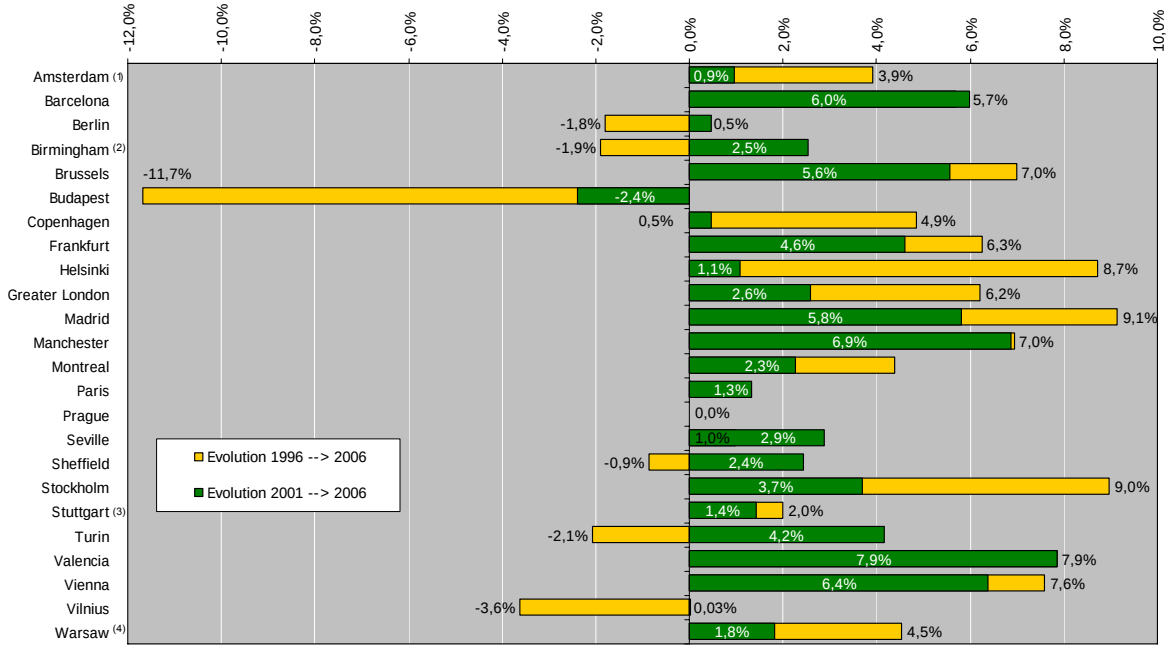
Graph 7. Population gross density in main cities (inhabitants / km²)



1.2.3. Evolution of population in main cities

During the period 1996-2006, most of the main cities have seen their population increase, with an average ratio of 3.0%, occurred mainly in the last 5-year period 2001-2006. This growth is appreciably smaller than the metropolitan area's growth, where it is 6.2%, showing that the important population change is taking place in the surroundings of the cities.

Graph 8. Population evolution 1996-2006 and 2001-2006 in main cities



(1) Amsterdam, period 1995-2007 and 2003-2007

(2) Birmingham, periods 1996-2005 and 2001-2005

(3) Stuttgart, periods 1997-2007 and 2002-2007

(4) Warsaw, periods 1996-2007 and 2001-2007

The greatest population decrease in the period 1996-2006 occur in Budapest (-11.7%) and less intensively in Vilnius (-3.6%). Population growth around 8% in that same period happened in Madrid (9.1%), Stockholm (9.0%), Helsinki (8.7%) and Valencia (7.9%) (Graph 8).

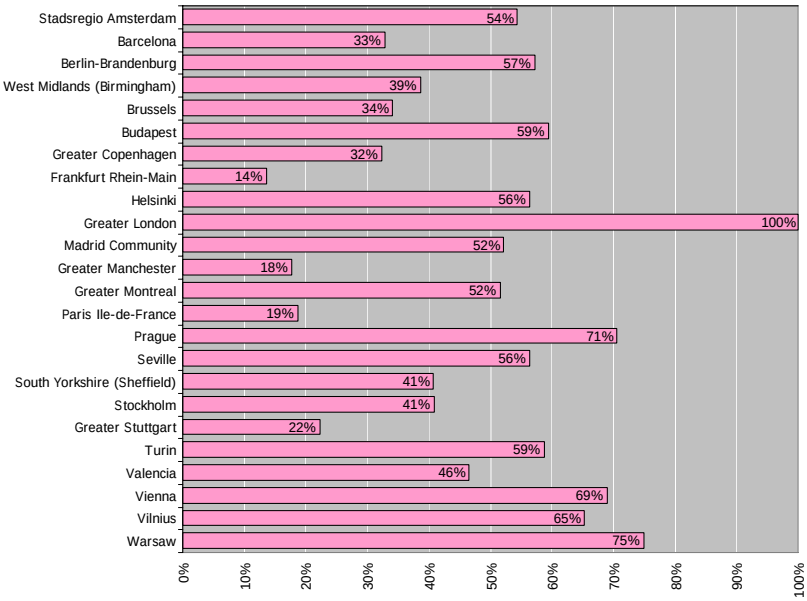
1.3. The weight of main city in the metropolitan area

The main city gathers on average almost 49% of the population of the metropolitan area, with great differences showing the diverse administrative frameworks and structures of the metropolitan areas (Graph 9). It is remarkable the increase of this percentage compared with 2004 figure, where it was 44%, showing the change in the metropolitan areas structure, where the city centres become more populated again after a period of leaving the centres to live in the suburbs.

On 2006 cities like Warsaw, Prague, Vienna and Vilnius host around two thirds of the population of the metropolitan area. Cities like Turin, Seville, Helsinki and Amsterdam concentrate more than 55% of the population due to the great surface of the city compare to the whole metropolitan area. Other cities like Berlin, Budapest, Montreal and Madrid also host more than 50% of the population due to the extension of the main city surface (over 400 km^2) in spite of an expanded metropolitan area. Greater London again appears with 100% in the graph because the metropolitan area falls under the administrative limits of the greater city surface.

Contrary to these cities, Paris and Manchester have low ratios (19% and 18%) due to a limited and completely developed city area without surface to expand, and also Frankfurt and Stuttgart (14 and 22%) because of the typical structure of German cities, based on conurbations.

Graph 9. Population main city / population whole metropolitan area



These different urban layouts have strong consequences for the coordination of the provision of public transport among the various local authorities concerned.

2. Mobility

This section gathers data related to mobility such as the main features of the trips in the metropolitan areas, car ownership and modal split (Table 3).

Table 3. Mobility parameters in metropolitan areas

	Trips per person per day	Motorised trips		Home to work & school trips/ total trips	Car ownership rate	No. of taxis
		Average duration (min)	Average distance (km)	(%)	(Vh/1,000 inh)	
Stadsregio Amsterdam	(1) 3.12	30	20	30.0%	490	2,400
Barcelona	3.41	29	9	37.0%	433	11,226
Berlin-Brandenburg	3.13			40.0%	567	
West Midlands (Birmingham)	2.95	23	13	23.0%	482	8,181
Brussels	2.60	(1) 31	(1) 10	50.0%	(1) 350	(1) 1,247
Budapest	3.03	29	(1) 5	46.6%	329	6,900
Greater Copenhagen	3.28	45	32		333	
Frankfurt Rhein-Main	3.30	74	13	38.0%	592	4,500
Helsinki	3.62			34.0%	395	
Greater London	2.85			31.0%	330	21,681
Madrid Community	2.60	34	8	56.4%	500	16,086
Greater Manchester	3.13	26		29.0%	405	11,401
Greater Montreal	2.20			26.7%	500	
Paris Ile-de-France	3.50	29	7	34.0%	455	
Prague (1)	3.10			65.0%	196	4,500
Seville	2.33				466	2,311
South Yorkshire (Sheffield)	2.83	23	14	25.0%	550	3,229
Stockholm	2.60	26	12	38.0%	401	
Greater Stuttgart	(2) 4.05		(2) 16	(2) 42.8%	590	
Turin	2.71	28		35.6%	620	1,570
Valencia	2.50	24	10		522	985
Viena (1)					484	
Vilnius	3.00	(1) 35	(1) 4	(1) 88.0%	(1) 513	1,445
Warsaw	1.80	39			235	

(1) Just in the city (2) 1995 data

2.1. Main characteristics of the trips in metropolitan areas

The number of daily trips varies significantly across the metropolitan areas; this is due partially to the method followed to calculate the figure. In some metropolitan areas walking trips of less than five minutes are not considered into the calculation, in other cases trips under a certain length are not considered either. Despite this, the number of trips per person per day is between 1.8 and 3.6 with an average of close to 3 trips. At the other end, Greater Stuttgart has a mobility ratio of 4.05 trips per person per day (data from 1995).

The duration of motorised trips is comprised between 23 and 45 minutes with the extreme case of Frankfurt Rhein-Main (74 min), giving a total average of 33 min. The average length of those trips is 12.3 km, with most of the figures between 7 and 17 km, inducing an average speed of 22.5 km/h. On the basis of 3 trips per day, this means that the majority of the population spends between one and two hours

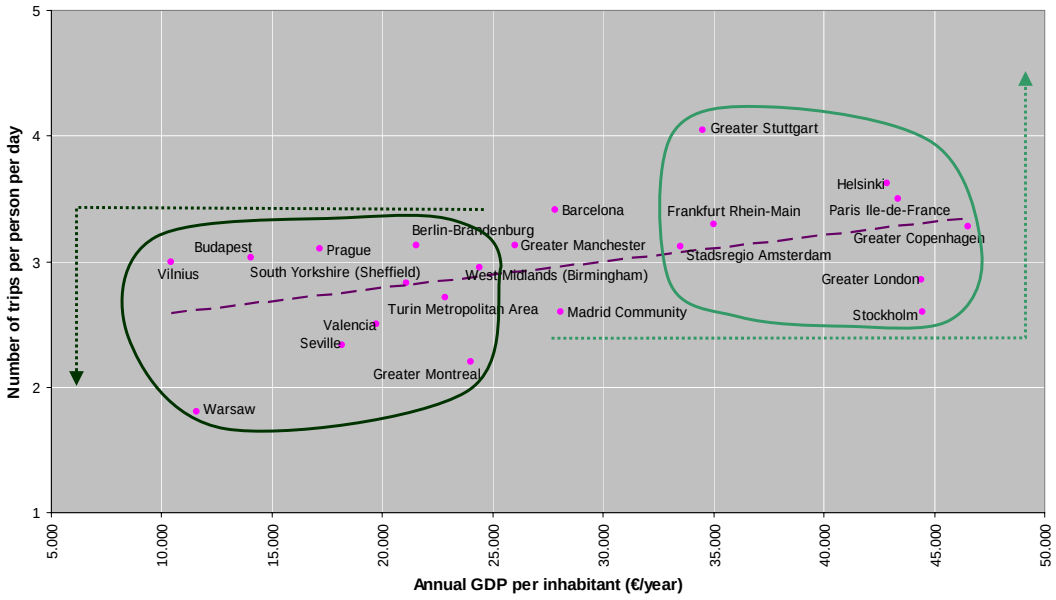
travelling everyday in metropolitan areas. Therefore it is important to promote safe and comfortable transport systems to make this long period of time as pleasant as possible.

Interestingly there is no clear relationship between the size of the metropolitan area and the length of the trips. As an example, in the largest areas (with the exception of Berlin-Brandenburg whose figure is not available) Paris Ile-de-France, Frankfurt Rhein-Main and Madrid Community, the average trip is quite shorter (7 and 13 km) than in some medium sized metropolises as Stadsregio Amsterdam (20 km) or Copenhagen (32 km).

Regarding obliged mobility (trips to work or to school), it still appears as the main purpose adding to more than 40% of the total trips. It is a figure to take into account since this mobility has a very high concentration on peak hours. Few European metropolitan areas have a commuting trips ratio under a third of the total trips, these are West Midlands (Birmingham) (23%), South Yorkshire (Sheffield) (25%), Greater Montreal (26.7%), Greater Manchester (29.0%), Stadsregio Amsterdam (30%) and Greater London (31%).

Last Barometer edition showed a slight trend relating the GDP per inhabitant and year and the number of trips made per person per day. Graph 10 shows that the trend is less noticed. However, we can observe two groups in the dispersion: the metropolitan areas with less GDP per inhabitant (under 25,000 €/inhabitant-year) make as maximum 3 trips per day, and the metropolitan areas with higher GDP (over 35,000 €/inhabitant-year) make more than 2.6-3 trips per day. One explanation would be, among others, that the travel cost weights less when the income is higher, therefore travelling becomes more usual. Another reason would be that lower GDPs lead to less leisure time, thus less mobility needs.

Graph 10. Link between annual GDP/inhab-year and number of trips per person and day

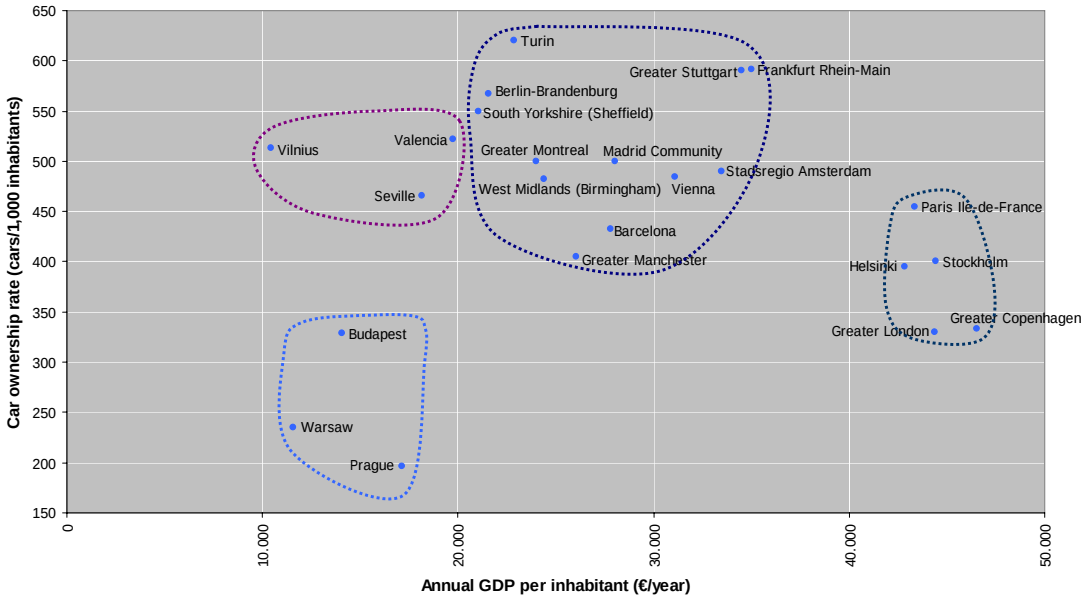


2.2. Car Ownership

In these metropolitan areas car ownership rate is on average 448 cars/1,000 inhabitants ranging from the lowest levels of 196 cars in Prague (figure for the main city) or 235 cars in Warsaw to the highest levels of 620 cars/1,000 inhabitants in Turin or 590 cars in German regions such as Frankfurt Rhein-Main or Greater Stuttgart (Table 3).

On Graph 11 seems that car ownership rate tends to relate to annual GDP per inhabitant thus acting as a socio-economic indicator. We can observe different groups of metropolitan areas with very diverse motorization ratios: between 10,000 and 35,000 €/inhabitant-year the car ownership in Spanish, English, Italian and German regions are over 400 cars/1,000 inhabitants, while Warsaw, Budapest and Prague have lower motorization ratios (under 330 cars/1,000 inhabitants). On the other hand, the more wealthy metropolitan areas have the car ownership under 450 cars/1,000 inhabitants, showing that the higher GDP per inhabitant, the lower car ownership ratio. Thus, the public transport authorities have growing responsibilities in the metropolitan areas to offer an attractive public transport to a less car dependant society.

Graph 11. Link between annual GDP/inhab and car ownership rate (cars/1,000 inhab)



2.3. Modal split

We can say generally that the modal split in the areas surveyed is 28% of non motorised trips (mainly walking), 21% are trips made on public transport and 47% are trips using private vehicles. This fact highlights the wide participation of the private vehicle in our mobility, though it seems to decrease the dependency on them (in 2004 the figure of the modal share for private vehicles was 50%, and 19% for public transport), and the need for a change in these patterns. However, besides these general figures, clear differences in mobility behaviours of each of the metropolitan areas appear in Table 4 below.

Table 4. Modal split in whole metropolitan areas

	TABLE I: GENERAL MOBILITY				TABLE II: PUBLIC TRANSPORT MOBILITY			
	Modal share NON MOTORISED TRIPS (%)	Modal share of cycling (%)	Modal share of walking (%)	Modal share MOTORISED TRIPS (%)	Modal share of PT in motorised trips in whole region (%)	Modal share of PT main city ↔ main city trips (%)	Modal share of PT suburbs ↔ main city trips (%)	Modal share of PT suburbs ↔ suburbs trips (%)
Stadsregio Amsterdam	27.0%	24.0%	3.0%	73.0%	16.4%	47.6%		
Barcelona	46.1%	0.8%	45.3%	53.9%	37.7%	64.7%	43.0%	12.3%
Berlin-Brandenburg	35.9%	16.7%	19.2%	64.1%	11.7%	33.3%		
West Midlands (Birmingham)	23.8%	1.6%	22.2%	75.9%	12.0%		54.0%	
Brussels	(1) 13.6%	(1) 0.8%	(1) 12.8%	(1) 86.4%		30.7%	40.0%	10.0%
Budapest	30.6%	5.7%	24.8%	69.5%	53.9%	64.0%	40.9%	21.8%
Greater Copenhagen	34.4%	17.1%	17.3%	65.7%	13.4%			
Frankfurt Rhein-Main				20.0%				
Helsinki	29.0%	7.0%	22.0%	71.0%	37.8%	64.0%	62.2%	21.0%
Greater London	22.0%	2.0%	20.0%	78.0%	47.4%			
Madrid Community	31.2%	0.1%	31.1%	68.8%	49.5%	63.6%	46.0%	28.3%
Greater Manchester	24.0%	0.8%	23.2%	76.0%	12.9%			
Greater Montreal	12.0%	1.2%	10.8%	89.4%	17.4%	28.4%	17.7%	3.0%
Paris Ile-de-France	35.3%	1.3%	34.0%	64.7%	29.4%	63.6%	59.7%	16.1%
Prague	(1) 15.3%	(1) 0.4%	(1) 14.9%	(1) 84.7%		57.0%		
Seville	32.4%	1.9%	30.5%	67.6%	19.8%			
South Yorkshire (Sheffield)	5.2%	0.4%	4.8%	94.7%	21.3%	29.4%		
Stockholm	33.0%	3.4%	29.5%	67.1%	35.4%	56.0%	42.5%	17.9%
Greater Stuttgart (2)	28.9%	22.0%	6.9%	71.1%	18.1%	32.8%		
Turin	30.9%	2.2%	28.7%	69.1%	22.8%	31.1%	22.2%	5.7%
Valencia	43.0%	→	43.0%	57.0%	23.4%	(2) 39%	(2) 25%	
Vienna	27.0%	5.0%	22.0%	73.0%	30.1%	50.7%		
Vilnius	(1) 35.1%	→	(1) 35.1%	(1) 64.9%		33.9%		
Warsaw	32.5%	4.8%	27.7%	67.5%	44.8%	70.0%		

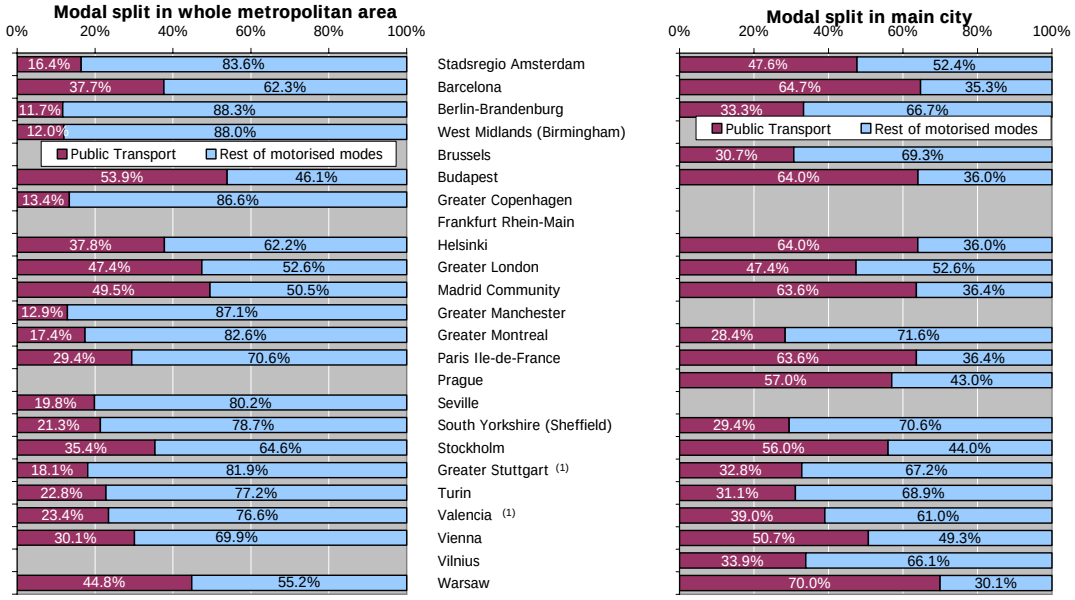
(1) Just in the main city (2) 1996 data in Valencia, 1995 in Stuttgart

The metropolitan areas with higher share of non motorised trips are Barcelona, Valencia, Berlin Brandenburg, Paris Ile-de-France and Vilnius. At least in all metropolitan areas 20% are non-motorised trips except in Brussels, Montreal and South Yorkshire (Sheffield) where the modal share is between 5 and 14%. The walking trips represents more than 30% of the total trips in Barcelona (45%), Valencia and Vilnius (including cycling, 43% and 35%), Paris Ile-de-France (34%), Madrid and Seville (31%), becoming one of the most important ways to travel in these regions. Stadsregio Amsterdam has an outstanding participation of cycling in non motorised modes (24% of total trips).

2.3.1. Modal split in motorised trips in whole metropolitan area and main city

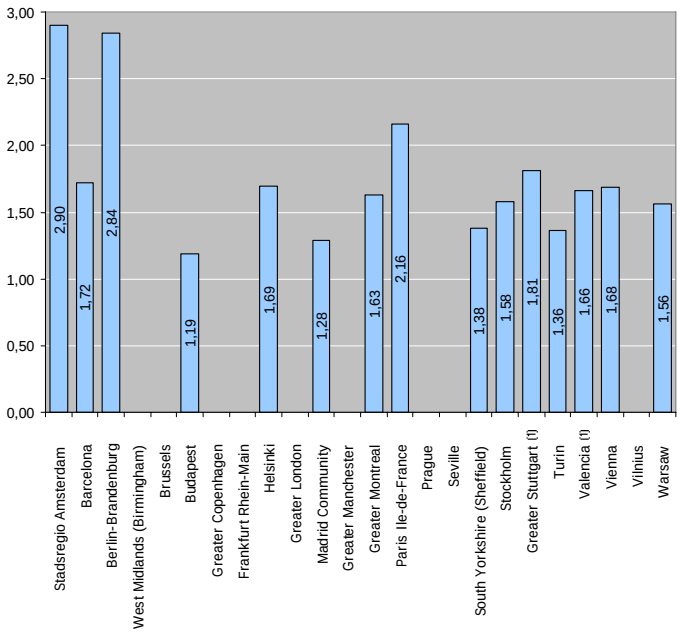
Budapest is the metropolitan area where the public transport accounts for the highest percentage within motorised trips (53.9%), followed by Madrid Community (49.5%), Greater London (47.4%), Warsaw (44.8%), Helsinki (37.8%), Barcelona (37.7%) and Stockholm (35.4%) (Graph 12). In the case of Madrid, the figure is even more interesting considering the high rate of car ownership 500 cars/1,000 inhabitants meaning that half the population owns a car. In the rest of metropolitan areas, the public transport is used in less than one third of the motorised trips, coming down to Berlin-Brandenburg (11.7%), West Midlands (Birmingham) (12%), Greater Manchester (12.9%), Greater Copenhagen (13.4%), Stadsregio Amsterdam (16.4%), Greater Montreal (17.4%) and Greater Stuttgart (18.1%), all of them under 20%.

Graph 12. Modal split in metropolitan areas in motorised trips



(1) Valencia, 1996; Stuttgart, 1995

The higher ratio “in main city” (Graph 12 right part), reflects the denser transport networks in city centres compared to suburbs and the implementation of parking policies in those areas. In general, the figure is over 30% in the main cities surveyed, meaning that at least one out of three motorised trips are made on public transport. Warsaw (70%), Barcelona (64.7%), Helsinki and Budapest (64%), Paris and Madrid (63.6%) are the cities with the highest modal share for public transport.



Graph 13. Modal share of Public Transport in motorised trips: Ratio PT in main city / PT in whole region

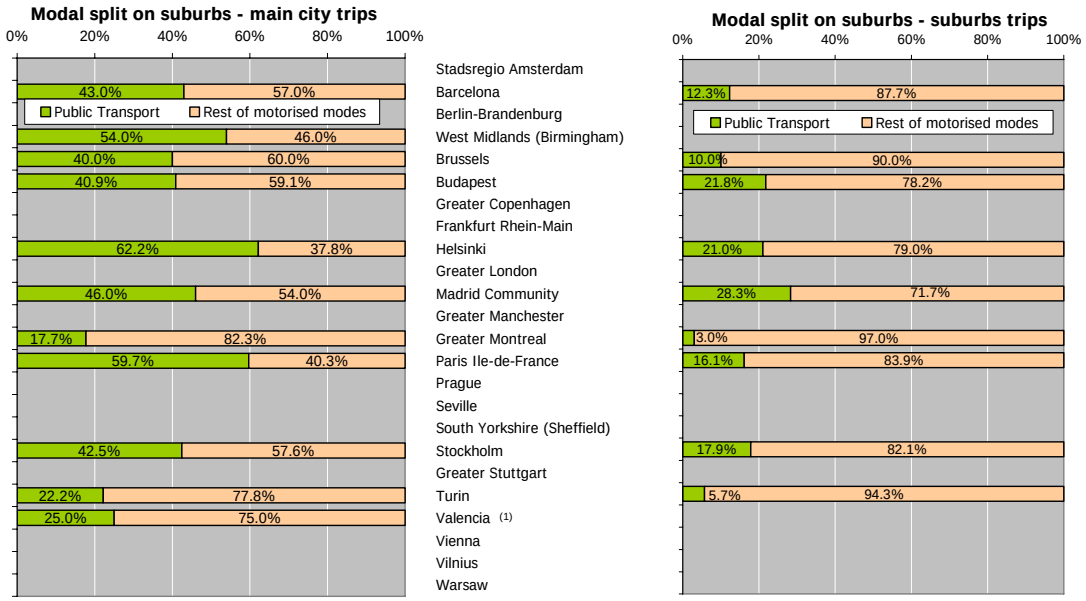
(1) Valencia, 1996; Stuttgart, 1995

Graph 13 highlights the strong gap between modal share in main city and in the whole metropolitan area. The ratio varies between 2.90 in Stadsregio Amsterdam (the use of public transport in the main city is more than twice as high as in the metropolitan area) and 1.19 in Budapest. When figures are close to 1, we can say that the use of the public transport is more homogeneous in a broad view in the whole metropolitan area.

2.3.2. Modal split in metropolitan area in radial and transversal trips

Looking more into details of trips (Graph 14) helps understanding the leading role of the private vehicle. The radial trips between metropolitan ring and the main city, are done in majority by other modes (mainly private car) reaching up to 82.3% in Greater Montreal, 77.8% in Turin and 75.0% in Valencia. However, there are noticeable exceptions where the public transport is dominant in Helsinki (62.2%) and Paris Ile-de-France (59.7%).

Graph 14. Modal split in metropolitan areas in motorised trips



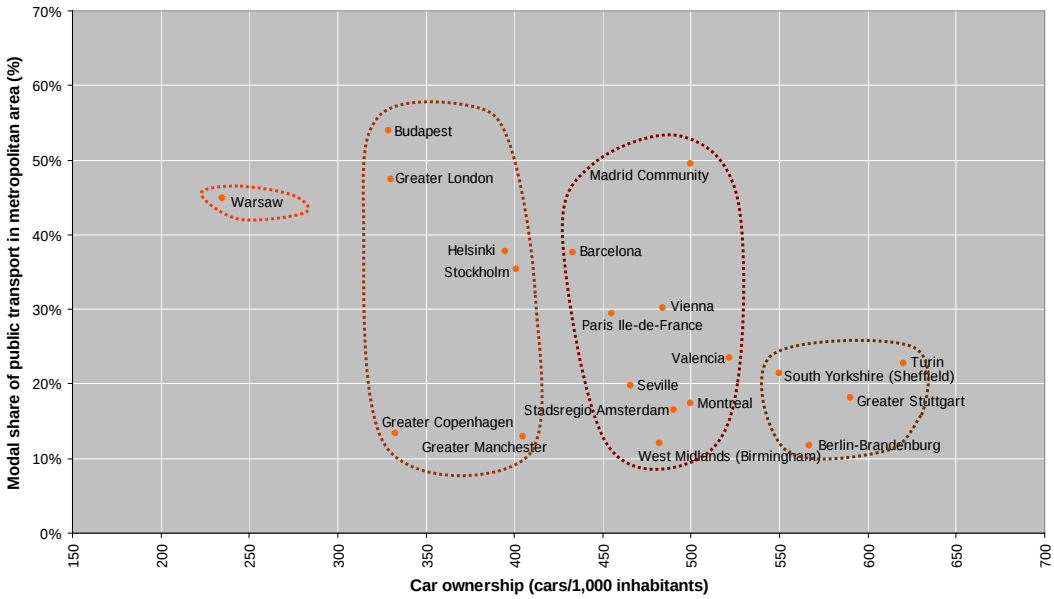
(1) Valencia, 1996

On the reverse, figures for trips from suburbs to suburbs show an absolute predominance of the private vehicle. The lowest ratios here of public transport use are in Montreal (3.0%) and Turin (5.7%), while in some cases the share is over 20% as in Madrid (28.3%), Budapest (21.8%) and Helsinki (21.0%). These figures become even more important when we realise that the tendency in our metropolitan areas is to grow within these suburbs, though we have to bear in mind the complexity of the territories when comparing the figures.

Finally, on Graph 15 we try to verify the hypothesis that high car ownership rates lead us to low modal shares of public transport in the metropolitan areas. Although there is a big dispersion in the graph,

therefore different groups of figures, we can observe the two extreme groups: on one extreme metropolitan areas with low car ownership ratios have high modal share of public transport; and in the other extreme are the cases with high motorization level and lower use of public transport.

Graph 15. Link between car ownership rate (cars/1,000 inhabitants) and modal share of public transport in metropolitan area



3. Description of the Public Transport System

3.1. Public transport networks

3.1.1. Bus

The metropolitan areas surveyed have very dense bus networks. Paris Ile-de-France, Frankfurt Rhein-Main and Berlin-Brandenburg are the metropolises with the greatest number of bus lines (both urban and suburban lines) with 1,494, 943 and 919 lines respectively (Table 5). Also two of the British metropolitan areas (West Midlands, Greater Manchester and Greater London), Madrid, Barcelona and Budapest have more than 600 lines.

Table 5. Characteristics of bus supply in metropolitan area

	Number of lines	Lines length (km)	Number of Stops-network	Number of vehicles	Veh - km (million / year)	No. of operators
Stadsregio Amsterdam	151	(3) 1,614	1,709	(1) 260		5
Barcelona	609	10,363	9,796	1,780	108.1	43
Berlin-Brandenburg	919	27,488	13,627	2,409	171.8	28
West Midlands (Birmingham)	900	(3) 7,524	12,500	2,200	133.0	54
Brussels	102	680	2,124	691	(1) 19.85	3
Budapest	601	6,860	6,376	2,414	159.1	6
Greater Copenhagen	272	5,590	8,000	890	77.3	10
Frankfurt Rhein-Main	943	(1) 296	11,900	2,595	125.6	142
Helsinki	257	4,500	6,692	1,370	82.8	14
Greater London	678	(3) 3,730	18,956	8,000	458.0	25
Madrid Community	650	24,267	11,314	3,910	262.6	43
Greater Manchester	840		12,191	1,746	111.0	51
Greater Montreal	489	9,677		2,512	115.4	14
Paris Ile-de-France	1,494	(3) 24,207	33,394	(2) 8,298	287.7	(2) 75
Prague	344	5,212		1,312	87.8	18
Seville	94	2,067	1,552	563	26.1	9
South Yorkshire (Sheffield)	370	6,837	8,841	950	70.8	23
Stockholm	485	9,650	5,208	(2) 2,919	100.2	3
Greater Stuttgart	358	(3) 3,753	3,282	1,275	52.4	40
Turin	131	7,313	(1) 3,200	1,268	52.8	9
Valencia	112	2,960	2,286	607	31.0	9
Vienna	260	6,230	10,742	(1) 487	(1) 29.1	13
Vilnius (1)	75	818	972	300	19.5	1
Warsaw	191	3,508	1,673	1,728	103.4	5

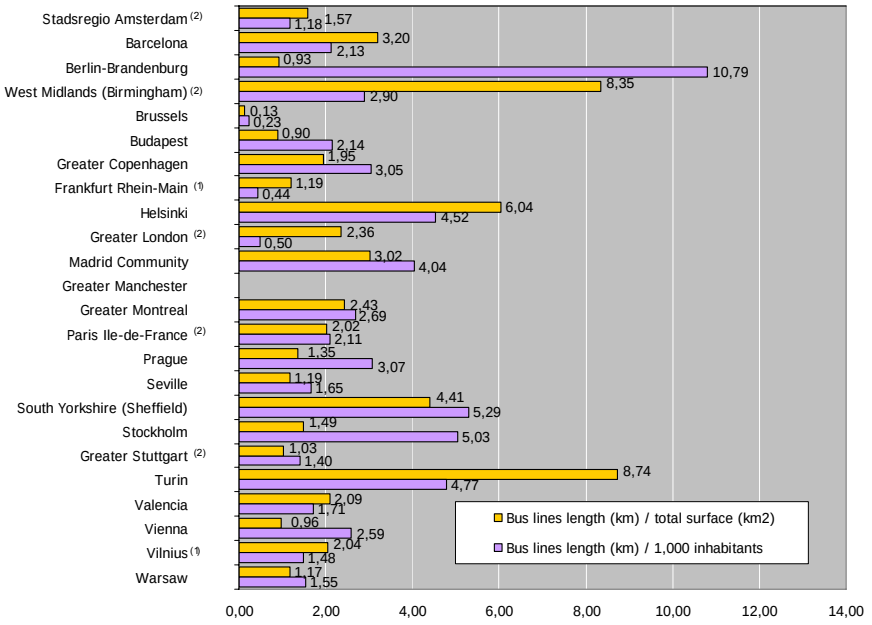
(1) Only urban bus, and Turin includes tram stops (2) Only suburban bus (3) Network length

The average length of a bus route including interurban lines is around 18 km. One single company operates an average of 32 routes and this figure is even higher if we take into account that in the main city (where there is a high density of routes) usually there is no more than one company operating the urban lines. This is the case for example of Madrid (209 lines urban bus lines), Berlin, Budapest and Montreal (192 urban bus lines each) where one single operator runs around 200 bus lines.

Regarding the density of lines per km^2 of surface (Graph 16), Turin (8.74 km of bus lines/km^2 surface), West Midlands (Birmingham) (8.35 km of bus lines/km^2 surface) and Helsinki (6.04 km of bus lines/km^2

surface) appear with more than 5 km of bus lines per km^2 of surface, probably as a consequence of a small metropolitan area (less than 900 km^2) and the provision of small rail network.

Graph 16. Bus lines density in metropolitan area



(1) Frankfurt and Vilnius, just urban bus

(2) Stadsregio Amsterdam, Birmingham, London, Paris and Stuttgart give km of network instead of km of lines

If we compare the figures mentioned above with the density in terms of bus lines length per 1,000 inhabitants, we note in some cases a significant difference between these two figures. This is related to population density. Metropolitan areas with strong gap in the two bus density figures have either a very high (West Midlands, Greater London) or very low (Berlin, Stockholm) density of population.

Also we have obtained that each bus runs between 40,000-70,000 km per year as average.

3.1.2. Tramway/Light rail/Trolleybus

As in previous editions of Barometer every metropolitan area operates or implements medium capacity systems highlighting the tendency of the public transport networks to include trams, light rails or trolleybuses as modern, safe and clean modes of transport standing between buses and metro systems. Of the surveyed cities, only four could not provide data. In two of them (Seville, Madrid) tram is under construction in 2006.

As we see in Table 6 Prague has the longest tram network (559 km and 35 lines), then Vilnius (457 km of trolleybus lines), Berlin-Brandenburg (409 km), Warsaw (406 km), Budapest (344 km), Vienna (227 km), Brussels (217 km) and Amsterdam (213 km). Cities where the number of lines are the highest in fact never removed the trams from their streets. Most of the cities mentioned above together with Stockholm,

Manchester and Turin have the most dense tram networks (Graph 17) with more than 600 m of tram lines/km^2 in main city. Especially high are the trolleybus lines density in Vilnius (824 km/million inhabitants) and tram lines density in Prague (466 km/million inhabitants). The tram densities are referred to surface and population of main city because trams usually serve urban environments. The average distance between stations is 700 m, and the number of trains is around 1-1.5 trains per km of line.

Table 6. Characteristics of tram supply

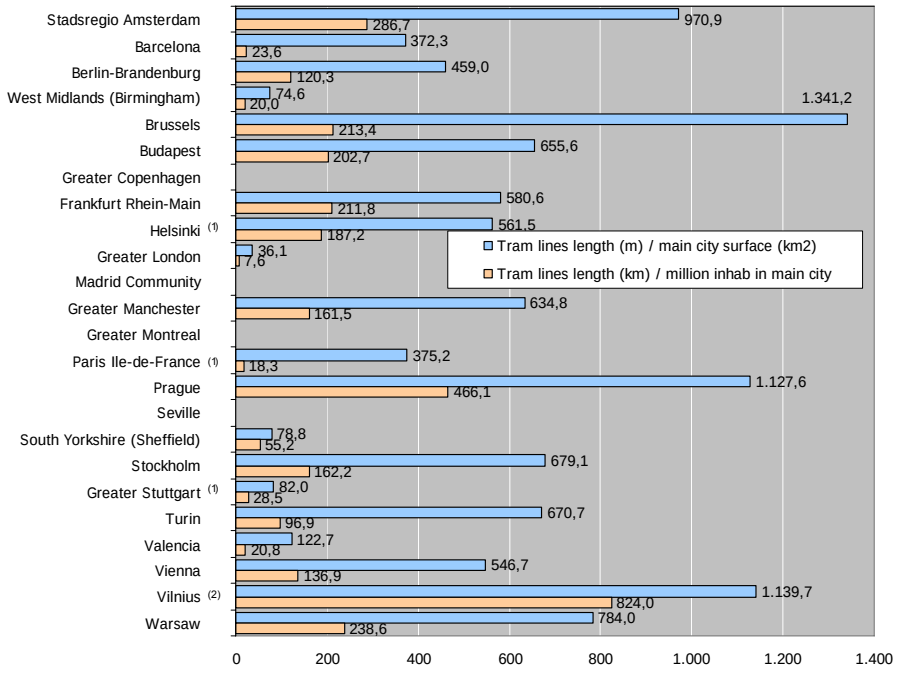
	Number of lines	Lines length (km)	Number of Stations - network	Number of trains	Veh - km (million / year)	Number of operators
Stadsregio Amsterdam	16	213.0	226	236	10.3	1
Barcelona	5	37.6	47	37	2.0	1
Berlin-Brandenburg	44	409.4	795	574	27.0	7
West Midlands (Birmingham)	1	20.0	23	16	1.7	1
Brussels	18	217.3	(1) 2,124	290	11.6	1
Budapest	36	344.2	678	411	18.0	1
Greater Copenhagen						
Frankfurt Rhein-Main	20	144.0	205	228	10.9	
Helsinki	11	(2) 105.0	240	131	5.2	1
Greater London	2	57.0	72	118	2.5	2
Madrid Community						
Greater Manchester	3	73.0	37	32		1
Greater Montreal						
Paris Ile-de-France	4	(2) 39.4	55	61	6.6	2
Prague	35	559.3		703	49.8	1
Seville						
South Yorkshire (Sheffield)	3	29.0	48	25	2.4	1
Stockholm	5	127.0	98	188	11.9	1
Greater Stuttgart	2	(2) 17.0	20	40	1.3	1
Turin	8	87.3	(1) 3,200	265	8.1	1
Valencia	1	16.8	35	25	1.1	1
Vienna	32	226.9	1,137	826	37.0	1
Vilnius (3)	19	456.5	230	259	16.3	1
Warsaw	27	406.1	47	440	48.8	1

(1) Includes urban bus stops (2) Network length (3) Trolleybus

Graph 17. Tramway lines density in main city

(1) Helsinki, Paris and Stuttgart give tram network length instead of lines length

(2) In Vilnius is trolleybus



3.1.3. Metro

Out of the 24 cities surveyed, only Birmingham, Manchester, Sheffield and Vilnius haven't got a metro system (Table 7), in Seville is under construction and in Copenhagen there is, but there is no information available. The most developed networks in relation with number of lines are in Paris (16 lines), Stuttgart (14 lines), Madrid and London (12 lines), but regarding the network length the most populated cities come first, as London (408 km), then Madrid (233 km) and Paris (200 km). Between 100 and 200 km of network length are Stuttgart (192 km), Stockholm (149 km), Berlin-Brandenburg (145 km), Valencia (133 km) and Barcelona (112 km).

Table 7. Characteristics of metro supply

	Number of lines	Lines length (km)	Number of Stations - network	Number of trains	Train - km (million / year)	Number of operators
Stadsregio Amsterdam	4	81.0	52	106	4.8	1
Barcelona	6	112.3	132	128	68.5	2
Berlin-Brandenburg	9	145.0	170	637	90.0	1
West Midlands (Birmingham)						
Brussels	3	43.8	64	37	4.8	1
Budapest	3	34.8	78	88	6.2	1
Greater Copenhagen						
Frankfurt Rhein-Main	7	85.0	84	224	7.3	1
Helsinki	2	21.0	17	54	13.1	1
Greater London	12	(1) 408.0	275	521	66.0	1
Madrid Community	12+1	233.0	196	279	(2) 151.0	2
Greater Manchester						
Greater Montreal	4	66.0	65	759	59.8	1
Paris Ile-de-France	16	(1) 200.0	381	689	227.1	1
Prague	3	54.9		405	47.2	1
Seville						
South Yorkshire (Sheffield)						
Stockholm	3	149.0	100	548	88.9	1
Greater Stuttgart	14	192.0	178	167	12.2	1
Turin	1	7.5	12	20	2.3	1
Valencia	3	133.5	83	68	5.5	1
Vienna	5	65.3	81	682	62.6	1
Vilnius						
Warsaw	1	18.1	17	18	16.8	1

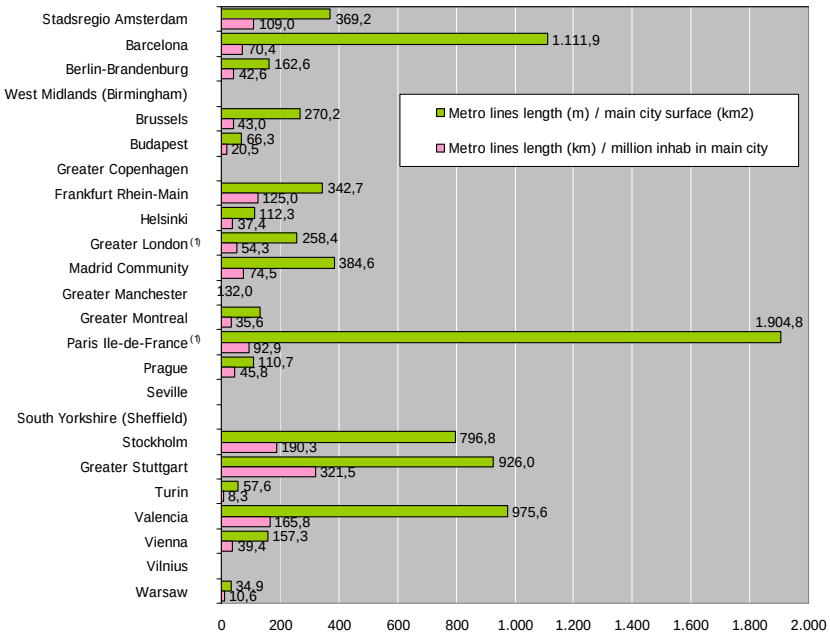
(1) Network length (2) Vehicles-km

The average length of a line is 19 km, but it varies from 44 km in Valencia (34 km in London) thus serving a metropolitan area larger than the sole core urban centre, to 7.5 km in Turin. The average distance between stations is 0.9 km. However, stations are more distant in London (1.5 km) and Valencia (1.4 km), while they are closer in Budapest (0.45 km) or Paris (0.5 km).

Usually one single company operates the whole metro network. Madrid and Barcelona have two operating companies. In Madrid, the second company operates a short section of the network as a concession, while in Barcelona the second company operates the suburban part of the system, actually an old train route upgraded to a metro system.

In terms of density (Graph 18), it is more indicative the density expressed in m of metro lines per km^2 of main city surface because the metro systems are usually inside the boundaries of the main city, where there is a high density of population. The lowest densities are in Warsaw (34.9 m of metro lines/km2 of main city surface), Turin (57.6 m/km^2) and Budapest (66.3 m/km^2), while the highest are in Paris (1,904 m of metro lines/km2 of main city surface) and Barcelona (1,112 m/km^2) due to the compactness of these cities, followed by Valencia and Stuttgart (close to 1,000 m/km^2).

Graph 18. Metro lines density in main city



(1) London and Paris give metro network length instead of lines length

3.1.4. Suburban railway

Nearly all the cities surveyed have a suburban rail system serving metropolitan and regional purposes (in Copenhagen there is no information available but the commuter railway is a very popular mode of transport). The number of lines varies from just 3 or 4 lines (Stockholm or Seville) to 59 in Berlin-Brandenburg (of which 15 are S-Bahn railway lines) or 37 in Vienna (Table 8). In the case of Greater London the National Rail system is operated by 12 different Train Operating Company franchises, who serve a network comprising 788 km of lines.

The average length of a line is 43 km, but again there are differences, from Paris Ile-de-France (113 km) or Stockholm (72 km/line) to Stadsregio Amsterdam (5 km), South Yorkshire (Sheffield) or Helsinki (14 km). The distance between stations is around 3.8 km on average, varying from 11.9 km in Warsaw to 1.0 km in Brussels.

Table 8. Characteristics of suburban railway supply

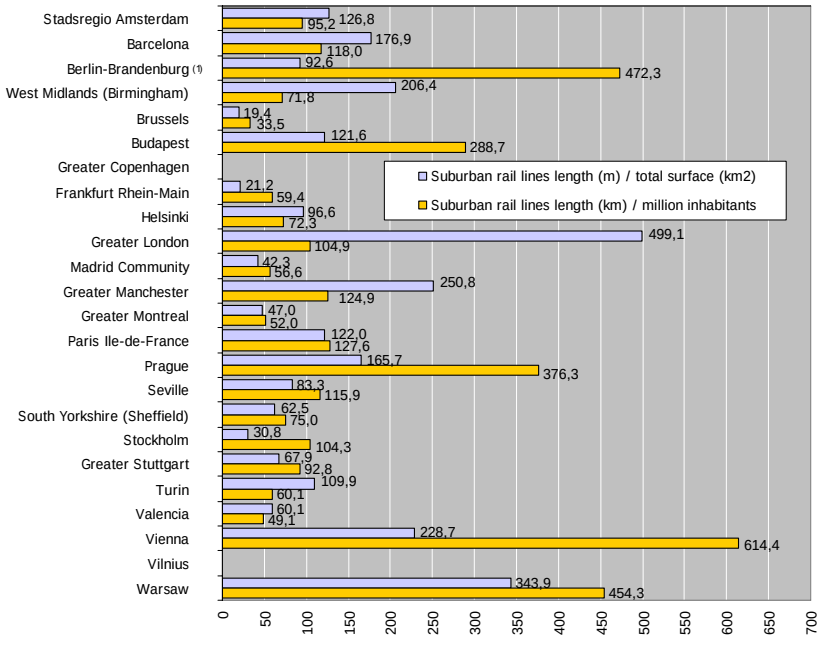
	Number of lines	Network length (km)	Number of Stations - network	Number of trains	Train - km (million / year)	Number of operators
Stadsregio Amsterdam	26	130.0	26			1
Barcelona	14	573.0	160	242	97.3	2
Berlin-Brandenburg (1)	59	2,811.0	487	690	70.2	6
West Midlands (Birmingham)	8	186.0	71	65	5.3	5
Brussels	6	100.0	100	100		1
Budapest	18	923.9	337	200	19.6	2
Greater Copenhagen						
Frankfurt Rhein-Main	9	297.0	109	160	13.7	1
Helsinki	5	72.0	34	110	5.0	1
Greater London		788.0	321			12
Madrid Community	9	340.0	99	(2) 794	(2) 108.1	1
Greater Manchester	9	319.0	98	80		2
Greater Montreal	5	187.0	50	193	10.2	1
Paris Ile-de-France	13	1,466.0	455	(2) 4,900	69.0	2
Prague	26	639.7		102	8.5	1
Seville	4	145.0	24	17	2.2	1
South Yorkshire (Sheffield)	7	97.0	29			7
Stockholm	3	200.0	51	272	16.4	1
Greater Stuttgart	6	248.0	71	148	8.5	1
Turin	6	(3) 92.0	(3) 23	39	3.6	2
Valencia	6	85.0	24	49	8.2	1
Vienna	37	1,476.9	863			3
Vilnius						
Warsaw	15	1,031.6	87	251	3.0	4

(1) Includes Regional Railway and S-Bahn, except on number of trains, which show only the number of S-Bahn trains
(2) Number of vehicles (or vh-km) instead of number of trains (or tr-km)
(3) These figures reflect the network length and number of stations within the administrative boundaries of the Consortium, the suburban rail services in the whole Torino province run 292 km network and 76 stations

Greater London has the highest density of network (499.1 m of suburban rail lines/km^2), followed by Warsaw (343.9 m/km^2), Greater Manchester (250.8 m/km^2) and Vienna (228.7 m/km^2) (Graph 19). In relation with the population in the metropolitan area, the greatest densities are those in Vienna (614.4 km/million inhabitants), Berlin-Brandenburg (472.3), Warsaw (454.3) and Prague (376.3 km/million inhabitants).

Graph 19. Suburban railway densities in metropolitan area

(1) Includes Regional Railway and S-Bahn

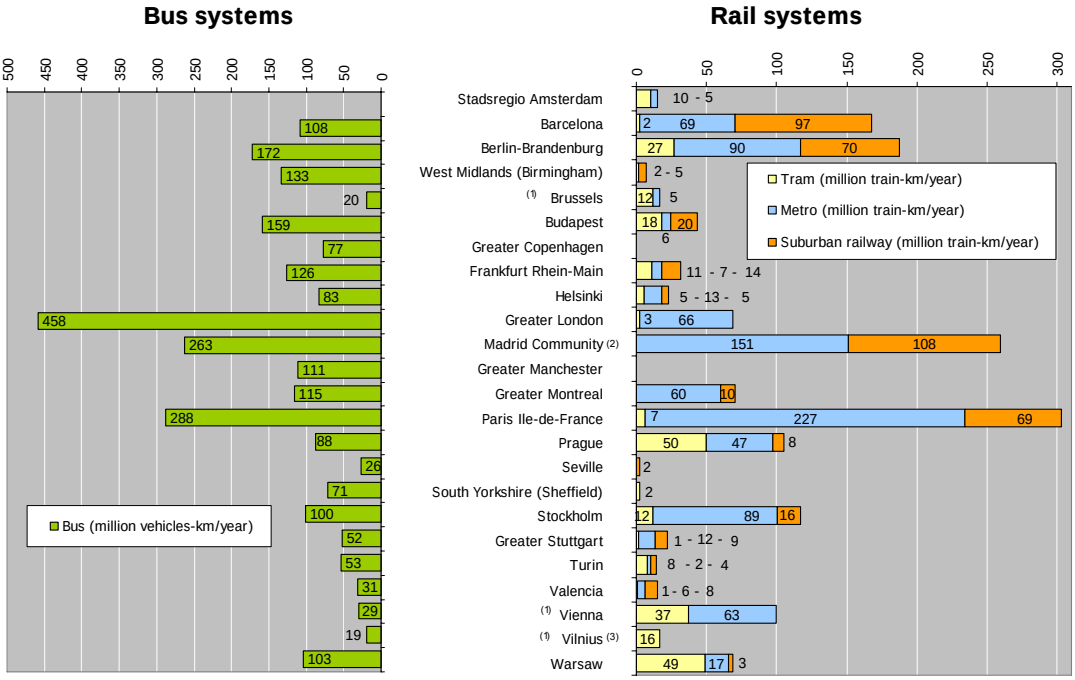


Please, note that the units used in bus systems densities (Graph 16) are “km of lines/km2” and “km of lines/1,000 inhabitants” while on rail modes (tram, metro, and heavy rail) are “m of lines/km2” and “km of lines/million inhabitants” (Graphs 17, 18 and 19). This difference is made to avoid the representation of decimal and centesimal figures, which are more difficult to understand and compare.

3.2. Public transport supply

The greatest supply (in vehicles-km/year) on bus systems is offered in Greater London, Paris Ile-de-France, Madrid and Berlin-Brandenburg, which is not surprising since these are the biggest and most populated areas (Graph 20).

Graph 20. Public transport supply in million vehicle-km (or train-km) / year



(1) Veh-km of Brussels, Vienna and Vilnius are just urban bus, do not include suburban bus

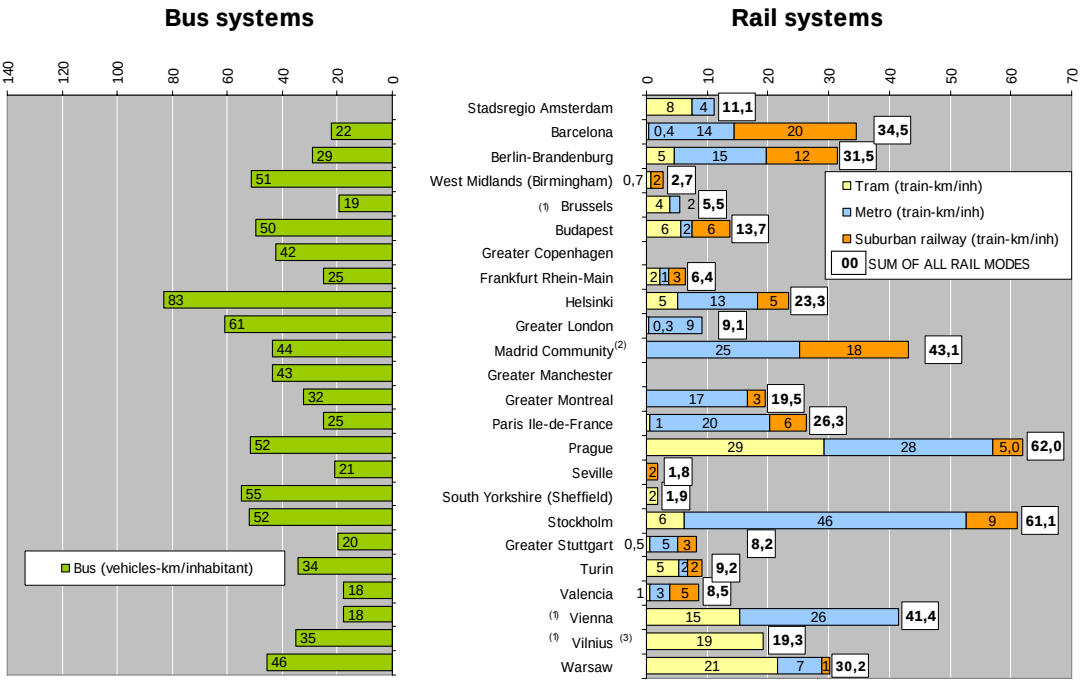
(2) Madrid Community figure for metro and suburban rail is veh-km

(3) In Vilnius the tram figure is trolleybus

The bus is the mode that provides the largest figures to such an extent that the number of vehicles-km provided by bus almost double the sum of all rail modes, though we have to bear in mind that we are comparing vehicle-km with train-km. This statement also has to be looked at carefully because there is lack of figures or small rail supply in some cities (integration is not fully achieved). Still it gives a picture of public transport supply in European metropolitan areas.

To be able to compare between the cities surveyed in terms of density and by modes we can look at Graph 21, where we see the largest bus supply are in Helsinki (83 veh-km/inhabitant), Greater London (61 veh-km/inhabitant) and South Yorkshire (Sheffield) (55). On tram supply, the head is Prague (29.3 train-km/inhabitant) followed by Warsaw (21 train-km/inhabitant); on metro supply the highest are Stockholm (46 train-km/inhabitant) and Prague (28), and on suburban railway the highest supply is given in Berlin-Brandenburg (12 train-km/inhabitant), since Barcelona (20.0 veh-km/inhabitant) and Madrid (18 veh-km/inh) give vehicle-km instead of train-km.

Graph 21. Public transport supply in vehicle-km (or train-km) / inhabitant / year



(1) Veh-km of Brussels, Vienna and Vilnius are just urban bus, do not include suburban bus

(2) Madrid Community figure for metro and suburban rail is veh-km

(3) In Vilnius the tram figure is trolleybus

3.3. Public transport demand

If we analyse the demand looking at the number of journeys on each mode, we will note that buses transport 12% less people than all the rail modes together (8,688 million journeys/year on bus, 9,933 million journeys/year on rail modes). However, if we compare the demand by the number of passengers-km, the result is most favourable to the rail modes, highlighting the different use of the modes depending on their functionality and the length of the trip. Around three quarters of the total demand (on passengers-km/year) on the European metropolitan areas surveyed are on rail modes (tram, metro, suburban rail) where suburban railway covers almost half the demand (45% of 127,094 million passengers-km/year), bus covers 28%, metro 24% and tram 3% of the demand (see Table 9 and Graph 22).

Table 9. Public transport demand

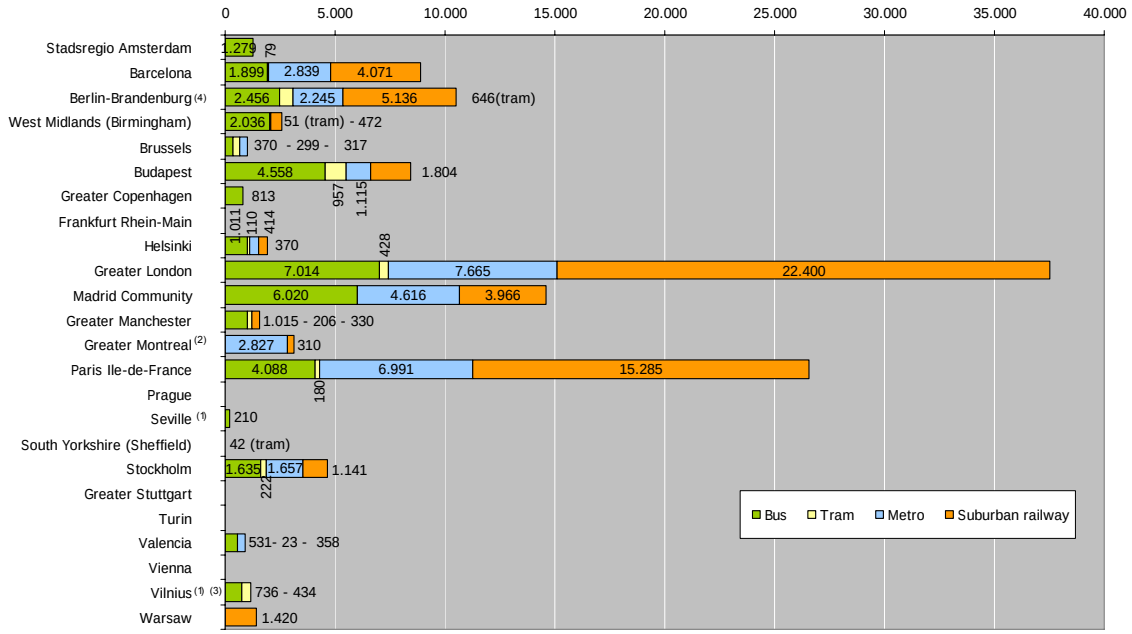
	Bus		Tram		Metro		Suburban Railway	
	Journeys / year (million)	Passenger - km (million)	Journeys / year (million)	Passenger - km (million)	Journeys / year (million)	Passenger - km (million)	Journeys / year (million)	Passenger - km (million)
Stadsregio Amsterdam	(1) 253	1,279						
Barcelona	340	1,899	17	79	397	2,839	157	4,071
Berlin-Brandenburg	(2) 450	2,456	(2) 194	646	(2) 408	2,245		(5) 5,136
West Midlands (Birmingham)	310	2,036	5	51			33	472
Brussels	86	370	71	299	123	317	68	
Budapest	812	4,558	391	957	293	1,115	103	1,804
Greater Copenhagen	173	813						
Frankfurt Rhein-Main	(2) 258		(2) 65		(2) 84		(2) 136	
Helsinki	150	1,011	53	110	57	414	41	370
Greater London	1,816	7,014	76	428	971	7,665	503	22,400
Madrid Community	758	6,020			660	4,616	204	3,966
Greater Manchester	223	1,015	20	206			21	330
Greater Montreal	(2) 212				(2) 220	(3) 2,827	(2) 15	310
Paris Ile-de-France	1,206	4,088	50	180	1,410	6,991	1,094	15,285
Prague	135		120		183		12	
Seville	99	(1) 210					7	
South Yorkshire (Sheffield)	115		14	42			6	
Stockholm	267	1,635	32	222	297	1,657	64	1,141
Greater Stuttgart								
Turin	(6) 166						(7) 14	
Valencia	119	531	5	23	60	358		
Vienna	(1) 118		205		450			
Vilnius	(1) 169	(1) 736	(4) 145	(4) 434				
Warsaw	452		249		88		46	1,420

(1) Just urban bus (2) Trips instead of journeys (3) Includes metro and urban bus (4) Trolleybus instead of tram
(5) Includes S-Bahn railway and regional railways (6) Includes urban bus, tramway and metro (7) 2004 figure

By dividing passenger-km by journeys, we can get an idea of the distance travelled on each mode of transport. The longest trip obviously is made on suburban railway, around 22 km as average distance. Metro systems average trip is close to 6 km long, very similar to those made on bus, which are 5 km. Trams average trip distance is around 2.5 km.

Looking at Graph 22 we observe that the highest demand on passenger-km come from the most populated metropolitan areas like Greater London, Paris Ile-de-France, Madrid, Berlin-Brandenburg, Barcelona and Budapest. Thus it is more interesting to analyse the figures by ratios related with population, for example journeys/inhabitant (Graph 23).

Graph 22. Public transport demand in million passenger-km/year



(1) Just urban bus, does not include suburban bus

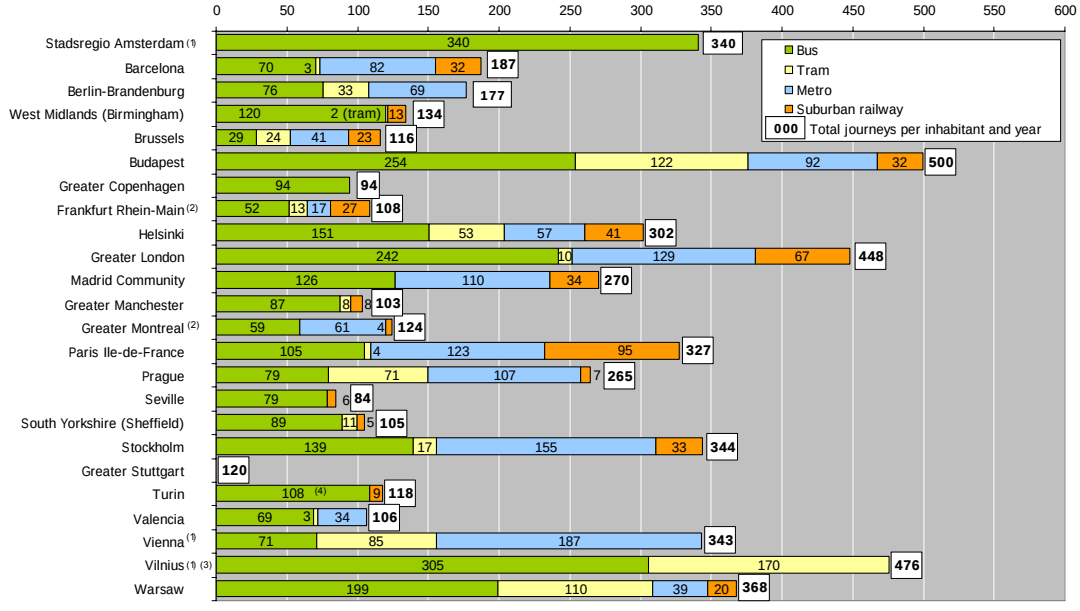
(2) Includes metro and urban bus

(3) Trolleybus instead of tram

(4) Includes S-Bahn railway and regional railways

Graph 23 allows us to compare the metropolitan areas notwithstanding their size. On average, the population travels 232 journeys/inhabitant-year on public transport. This means that every person does at least one journey on public transport every labour day. Half of the journeys are made on bus, highlighting the importance of this network in metropolitan areas, as a complement to the rail modes. Several cities have more than 350 journeys on PT/inhabitant-year such as Budapest (500 journeys), Vilnius (476), Greater London (448) and Warsaw (368).

Graph 23. Public transport demand in journeys per inhabitant per year



(1) Just urban bus, does not include suburban bus

(2) Trips instead of journeys

(3) Trolleybus instead of tram

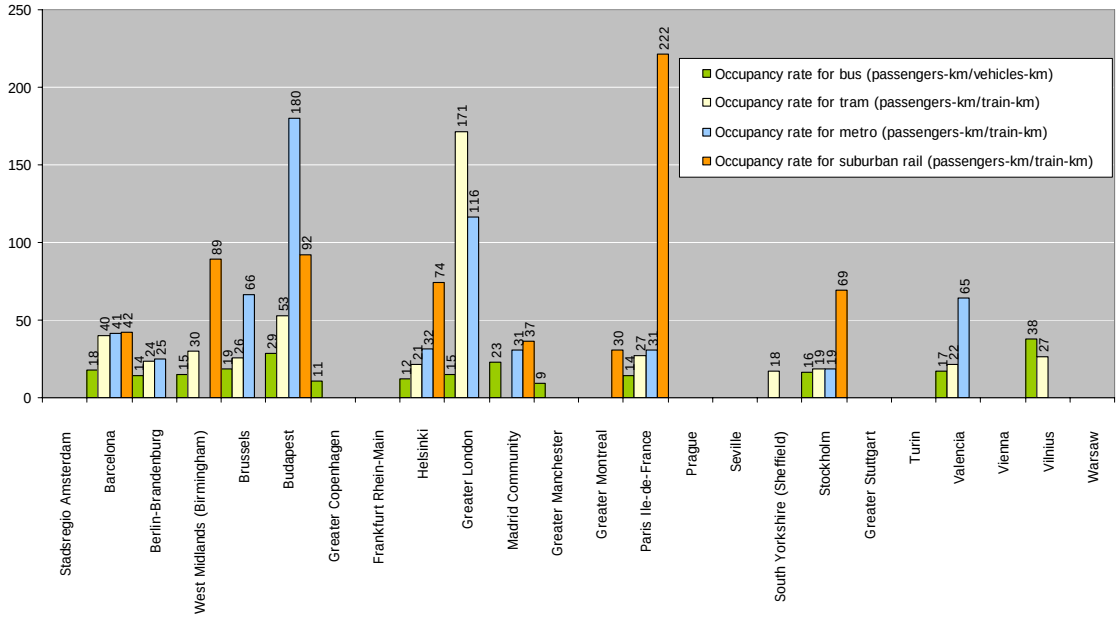
(4) Includes urban bus, tramway and metro

3.3.1. Occupancy rate of public transport modes

On Graph 24 is shown the occupancy rate by vehicle for the different public transport modes expressed as passengers-km/vehicles-km or train-km on rail modes. As we could expect, suburban railway and metro systems have the highest occupancy ratios (82 and 60 passengers/train on average respectively) because of the bigger capacity of the rolling stock. The tram average occupancy is 40 passengers and buses have a ratio of 18 passengers per vehicle.

Regarding the heavy rail occupancy, the highest ratio is in Paris, followed by Budapest and West Midlands (Birmingham). On metro, the highest occupancy is in Budapest, then London, Brussels and Valencia. It is noticeable the occupancy rate in trams in London; and on buses, the highest ratio is in Vilnius and then Budapest.

Graph 24. Occupancy rate by modes



3.4. Evolution of public transport supply and demand

On Table 10 we have gathered information of supply and demand from this present edition of the Barometer (2006) and the last one (2004). We have not taken into consideration previous data (2002 and 2000) because we would have obtained less homogeneous figures due to different participation of metropolitan areas throughout all these years.

We can observe that bus supply have slightly decreased (-0.5%) while the rail modes offer has had an important growth (+9.2%) highlighting the weight of the rail modes in the whole public transport system. The demand has decreased consistently with the supply in the case of buses (-1.9%), but not in rail modes, where the demand has been increased only around 1% despite the big effort in increasing the supply.

Table 10. Evolution of public transport supply and demand

	SUPPLY				DEMAND			
	BUS mill veh-km / year		RAIL MODES mill tr-km / year		BUS mill journeys / year		RAIL MODES mill journeys / year	
	2004	2006	2004	2006	2004	2006	2004	2006
Stadsregio Amsterdam	56.0	na	na	15.1	**248.0**	**253.0**	na	na
Barcelona	**101.3**	**108.1**	143.2	167.8	**327.4**	**340.2**	**540.9**	**570.4**
Berlin-Brandenburg	**172.0**	**171.8**	125.0	187.2	na	450.0	na	602.0
West Midlands (Birmingham)	**136.0**	**133.0**	**5.5**	**7.0**	**315.0**	**310.4**	**34.0**	**37.7**
Brussels	**19.3**	**19.9**	29.2	16.4	**(1) 77.3**	**86.1**	**(1) 237.9**	**261.3**
Budapest (2)	na	159.1	na	43.8	na	812.4	na	787.3
Greater Copenhagen	na	77.3	na	na	na	173.0	na	na
Frankfurt Rhein-Main	na	125.6	**38.0**	**31.9**	**306.0**	**(1) 257.9**	**331.0**	**(1) 283.9**
Helsinki	**89.0**	**82.8**	**23.5**	**23.3**	**162.0**	**150.1**	**149.0**	**150.5**
Greater London	**470.0**	**458.0**	**67.4**	**68.5**	**1,803.0**	**1,816.0**	**1,695.0**	**1,549.5**
Madrid Community	**247.0**	**262.6**	137.5	259.1	**750.0**	**758.4**	**814.0**	**864.6**
Greater Manchester	**114.6**	**111.0**	na	na	**218.0**	**223.3**	**37.5**	**40.6**
Greater Montreal	**115.9**	**115.4**	**68.1**	**74.0**	**(1) 206.0**	**(1) 212.3**	**(1) 231.0**	**(1) 234.7**
Paris Ile-de-France	**278.0**	**287.7**	118.0	302.7	**1,222.0**	**1,206.0**	**2,430.0**	**2,554.0**
Prague	**79.4**	**87.8**	**66.3**	**105.5**	**106.0**	**135.1**	**262.0**	**314.9**
Seville	**39.0**	**26.1**	**2.0**	**2.2**	**102.0**	**98.5**	**7.0**	**7.0**
South Yorkshire (Sheffield)	na	70.8	na	2.4	**120.0**	**115.0**	**18.8**	**20.3**
Stockholm	na	100.2	na	117.3	**(1) 253.0**	**267.0**	**(1) 369.0**	**393.0**
Greater Stuttgart	**52.0**	**52.4**	**25.1**	**22.0**	na	na	na	na
Turin	**52.0**	**52.8**	**10.5**	**14.0**	**165.0**	**166.0**	**14.0**	**14.0**
Valencia	**30.2**	**31.0**	**14.6**	**14.8**	**116.0**	**119.0**	**67.6**	**64.9**
Vienna	**30.0**	**29.1**	**99.0**	**99.6**	**162.0**	**117.5**	**709.0**	**654.6**
Vilnius	**32.7**	**19.5**	na	16.3	**277.0**	**169.2**	na	144.5
Warsaw	na	103.4	na	68.6	na	451.8	na	382.9
TOTAL	**2,058.4**	**2,048.9**	**420.0**	**458.8**	**6,935.7**	**8,688.1**	**7,947.7**	**8,015.9**
% VARIATION 2004-2006		**-0.5%**		**+9.2%**		**-1.9%**		**+0.9%**

On the calculation of the percentage only figures in bold are taken into account to avoid distortion. The figures not included are those expressing vehicles-km instead of train-km, or no figures available on one of the reference years

(1) Trips instead of journeys

(2) Budapest and Copenhagen don't show figures because they were not EMTA members on 2004

3.5. Quality of public transport supply

Public transport authorities and operators have regarded an improvement of the quality of services provided as one decisive way to improve the attractiveness of public transport systems over the past years. Quality of service includes very different features, and Tables 11 and 12 refer to some basic ones.

3.5.1. Bus quality indicators

Generally speaking, the commercial speed for urban bus lines is less than 20 km/h (close to 18 km/h on average), while on suburban lines commercial speed is clearly much higher (28 km/h).

It is noticeable than more than 80% of the urban bus fleets are low floor buses in most of the cases.

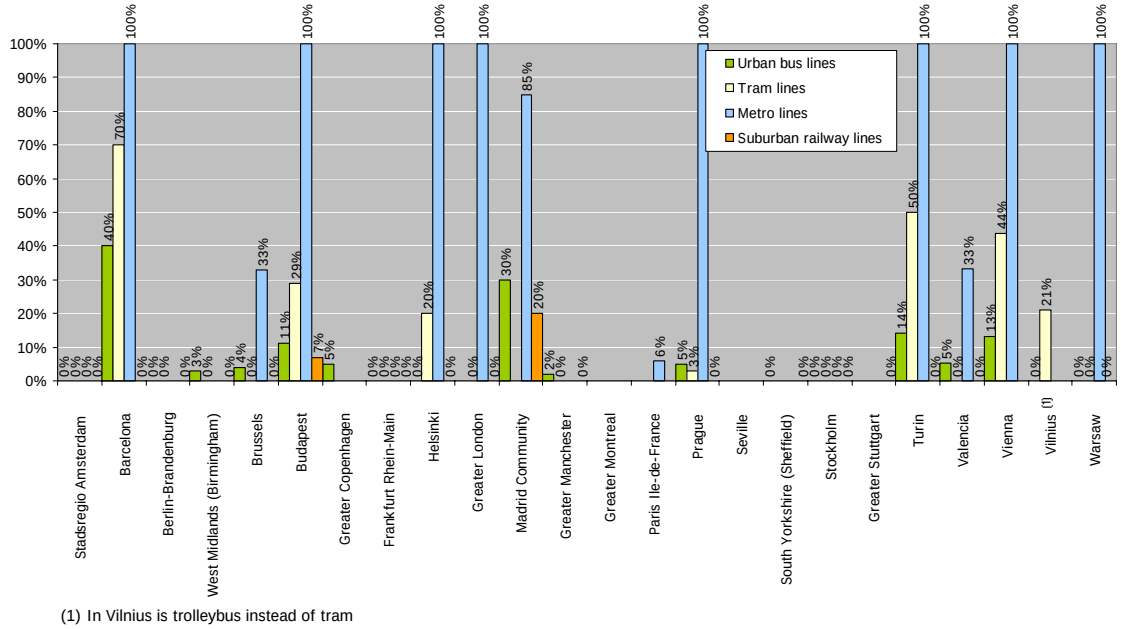
The average age of the fleet is quite high; several cities are over 10 years, such as Budapest (14 years), Turin, Warsaw and Paris, while Helsinki, Madrid and Seville do not exceed 6 years old.

Table 11. Supply quality indicators for bus and tram or light rail

	Bus (urban)				Tram			
	Commercial speed (urban/suburb) (km / h)	Amplitude of service (hours)	Low floor buses (%)	Average age of vehicles (years)	Comercial speed (km / h)	Amplitude of service (hours)	Station accesible for PRM (%)	Average age of vehicles (years)
Stadsregio Amsterdam	23 / 29	19.0	85%	8.0	15.3	19.0	(3) 85%	9.0
Barcelona	12 / 28	24.0	100%	6.7	18.0	19 - 24	100%	2.0
Berlin-Brandenburg	20 / na	24.0	80%	8.0	19.3	24.0		12.0
West Midlands (Birmingham)	(1) 20	(1) 18.0	(1) 72%	(1) 9.0	35.0	17.0	100%	7.0
Brussels	18 / na	19.5	11%	8.0	17.0	19.5	22%	32.0
Budapest	15 / 30	24.0	18%	14.0	12.8	22.1	85%	35.0
Greater Copenhagen	(1) 24	(1) 24.0	(1) 100%					
Frankfurt Rhein-Main		20.0	80%			22.0		
Helsinki	20 / 31	21.0	93%	5.2	16.5	20.0	92%	21.0
Greater London	18 / na	24.0	100%	8.0	22.0	19.0	100%	
Madrid Community	14 / na	18.0	98%	5.4				
Greater Manchester	19	20.0	48%		35	17.5	100%	
Greater Montreal		20.0	65%	8.3				
Paris Ile-de-France		19.0	76%	10.0		19.0	100%	7.0
Prague	26 / 33	24.0	31%	6.9	18.9	24.0	100%	15.0
Seville	12 / 26	18.0	91%	5.4				
South Yorkshire (Sheffield)	(1) 30	19.0		8.7	50.0	18.3	100%	13.0
Stockholm		24.0	67%			20.5	100%	
Greater Stuttgart								
Turin	(2) 17	20.5	45%	10.6	(2) 17.1	20.5		16.1
Valencia	13 / 22	18.8	1%	7.3	17.0	18.5	100%	12.0
Vienna	18 / na	20.5			15.2	20.0		
Vilnius	18 / na	18.5	28%	9.4	(4) 15.2	(4) 18.5	(4) 14%	(4) 12.7
Warsaw	22 / 26	19.0	(1) 47%	(1) 10.7	18.5	19.0		23.0

(1) Urban and suburban bus
(2) Data for urban and suburban bus and tramway
(3) Vehicles accessible for PRM´s
(4) For Vilnius is trolleybus instead of tram

Graph 25. % lines with frequency under 5 min on peak hour

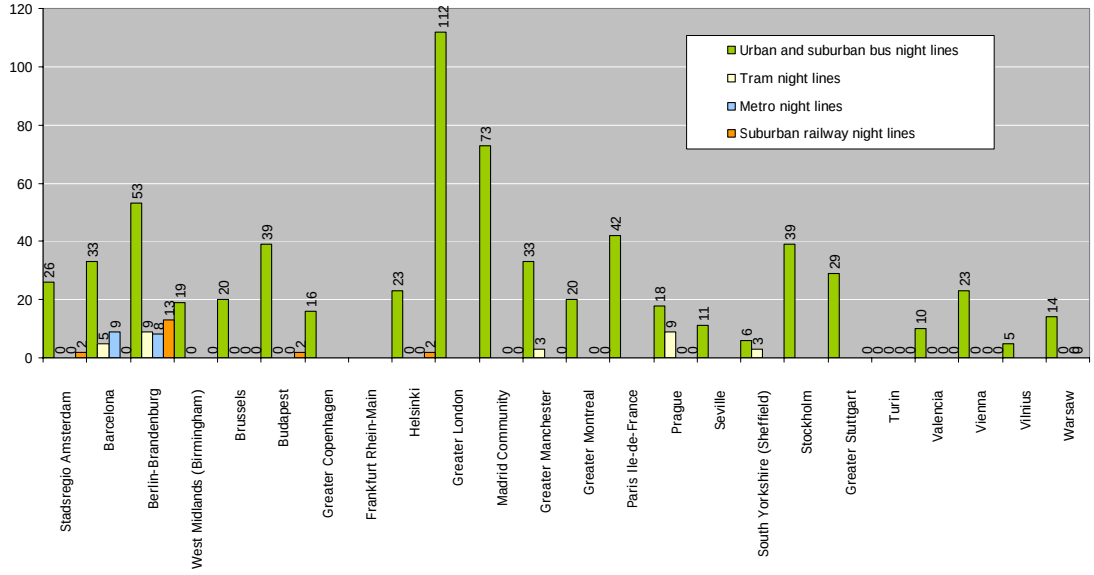


(1) In Vilnius is trolleybus instead of tram

Barcelona and Madrid have the highest bus frequency on peak hour, with respectively 40% and 30% of urban lines with less than 5 minutes of frequency on that period (Graph 25). All cities but Turin have night bus services on a weekend day from 5 lines in Vilnius to 112 lines in Greater London (Graph 26). It is

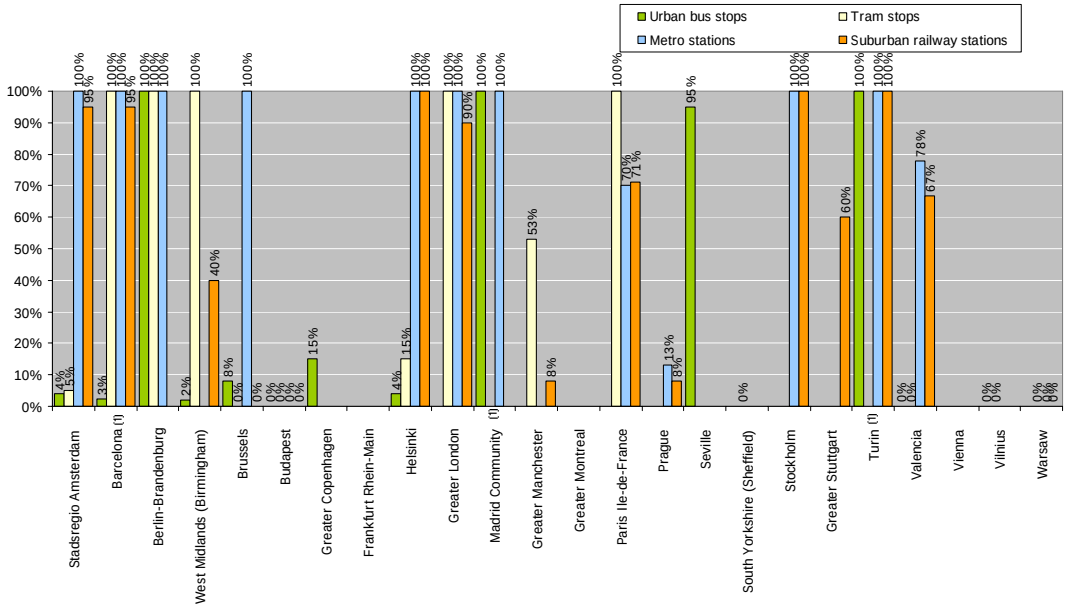
remarkable that the bus is the mode chosen in all cases to cover the public transport night services, due to the low demand and less operational costs.

Graph 26. Number of night lines on a weekend day



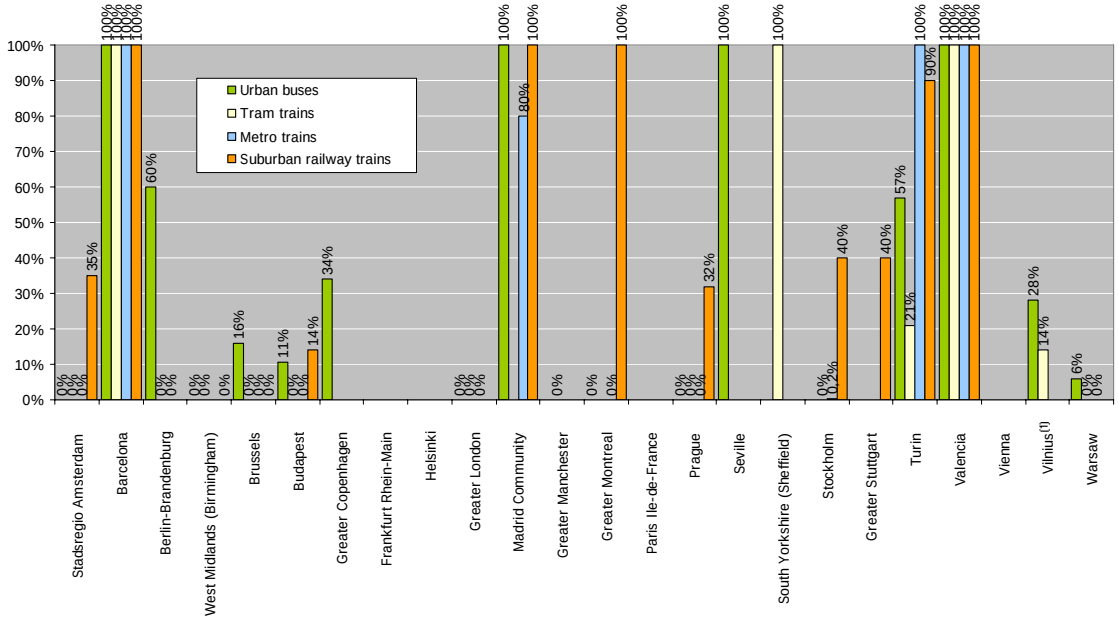
Regarding the bus vehicles with real time information (Graph 27), in Berlin, Madrid and Seville the bus network are very well covered with real time information on stops. In Graph 28, we can observe that most of the Spanish cities have 100% of bus vehicles equipped with air conditioning due to their high temperatures.

Graph 27. Stops and stations equipped with real time information



(1) In Madrid, Barcelona and Turin the 100% on stops is due to an SMS (mobile) information system

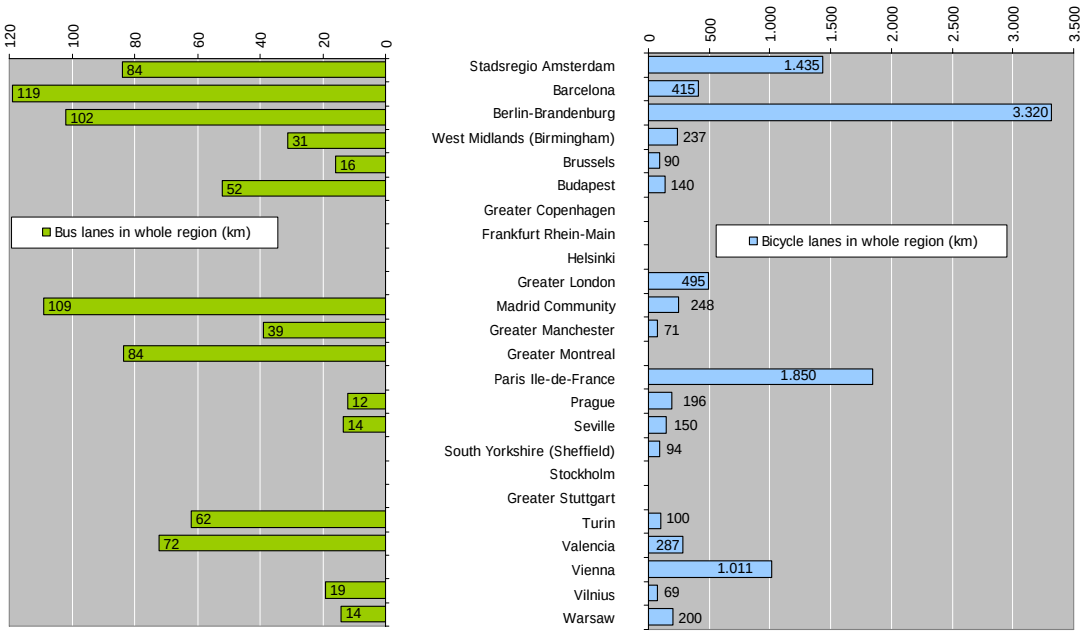
Graph 28. Vehicles equipped with air conditioning



(1) In Vilnius is trolleybus instead of tram

In the cities that provided information there are on average 55 km of dedicated bus lanes in whole region, varying from 12 km in Prague to over 100 km in Barcelona, Madrid and Berlin (Graph 29, left part). The length of bicycle lanes is much higher, with a minimum of 69 km in Vilnius (just in the city) up to 3,320 km in Berlin-Brandenburg.

Graph 29. Length of dedicated bus lanes and bicycle lanes in whole region



3.5.2. Light rail/tram quality indicators

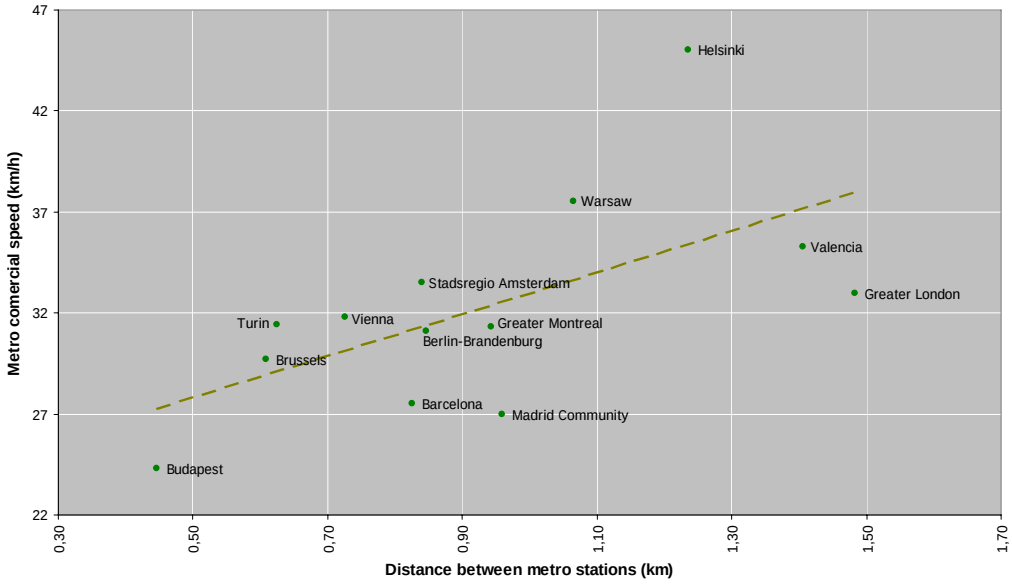
The commercial speed for tram systems does not exceed 20 km/h in all cases but London (22 km/h) and other cities of the United Kingdom as Birmingham and Manchester (35 km/h) and Sheffield (50 km/h) which are suburban networks (Table 11). It is worth noticing that the speed of the tram system is not higher than the speed of the bus system (including interurban buses) especially when they do no benefit from dedicated lanes. On the other hand, trams have other positive aspects such as higher capacity, regularity, image, urban regeneration, etc. The amplitude of the service is in general between 17 and 20 hours per day except for Budapest and Frankfurt (22 h), Prague and Barcelona (24 h). The great majority of the systems are 100% accessible for People with Reduced Mobility (PRM), but few cities with old systems keep a big quantity of non-accessible stations like Brussels (22%) and Vilnius (14%, referred to trolleybus). In the cities with newly inaugurated tram systems, the average age is very low compared to other older systems, but in average the vehicles are 15 years-old.

The ratio of frequency on peak hour varies very much depending on the case. In Barcelona, 70% of the tram lines have a frequency under 5 minutes on rush hour, while in many other cities this ratio come down to 0%. Turin (50%) and Vienna (44%) also have high frequencies. Barcelona, Berlin, Birmingham, London and Paris have all the tram network covered by real time information, devices more common in rail modes than in bus.

3.5.3. Metro quality indicators

On Table 12, we observe the commercial speed of the metro system is over 30 km/h in many cities, reaching 45 km/h in Helsinki. Contrary to this, Budapest has the lowest speed (24.3 km/h) due to the short distance between the stations, 450 m as average. As example of how the distance between stations in a metro network influences the commercial speed, see Graph 30.

Graph 30. Link between metro stations separation and commercial speed



The figure shows clearly that longer distances between metro stations lead to higher speeds, therefore this factor is determinant in the metro network operation. The characteristics of the rolling stock and other features have little influence in the commercial speed.

Table 12. Supply quality indicators for metro and suburban railway

	Metro				Suburban railway			
	Commercial speed (km / h)	Amplitude of service (hours)	Station accesible for PMR (%)	Average age of vehicles (years)	Commercial speed (km / h)	Amplitude of service (hours)	Station accesible for PMR (%)	Average age of vehicles (years)
Stadsregio Amsterdam	33.5	19.0	100%	18.0	69.0	20.5	100%	
Barcelona	27.5	19 - 24	49%	14.2	42.0	19.0	40%	19.0
Berlin-Brandenburg	31.1	20.0	40%		38.3	20.0	77%	
West Midlands (Birmingham)					38.0	18.0	80%	15.0
Brussels (1)	29.7	19.5	22%	18.0	60.0	18.0	0%	26.0
Budapest	24.3	18.7	0%	27.0	29.2	21.5	75%	28.0
Greater Copenhagen								
Frankfurt Rhein-Main		22.0				21.0		
Helsinki	45.0	18.0	100%	17.5	44.0	20.0	100%	22.0
Greater London	33.0	20.0	17%		56.0	24.0	31%	14.0
Madrid Community	27.0	19.5	59%	11.6	na	19.3	58%	na
Greater Manchester					40	17.5	52%	
Greater Montreal	31.3	20.0	0%	34.4	43.0	19.0	4%	22.0
Paris Ile-de-France		19.0	6%	30.0		19.0	28%	22.0
Prague	34.6	19.0	60%	8.9	39.5	21.0	99%	25.8
Seville								
South Yorkshire (Sheffield)								
Stockholm		24.0	100%			21.5	98%	
Greater Stuttgart					50.0	20.0	80%	9.8
Turin	31.4	18.0	100%	1.0	48.4	19.0	64%	
Valencia	35.3	19.0	95%	17.7	58.0	17.3	0%	12.7
Vienna	31.8	20.5				20.0		
Vilnius								
Warsaw	37.5	22.0	100%		24.4	20.0		

(1) Only for the city

Coming back to Table 12, the amplitude of the metro services is very high; the majority of the cities are between 19 and 20 hours, reaching 22 h in Frankfurt and Warsaw, and 24 h in Stockholm and Barcelona.

The newest metro networks are 100% accessible for PRM, these are the cases of Amsterdam, Helsinki, Stockholm, Turin and Warsaw, while in the oldest systems such as Budapest or Montreal the percentage come down to 0%, or in Paris, where 6% of the metro stations are accessible. Regarding the average age of the rolling stock there are big differences in the figures between the oldest systems (Montreal, Paris and Budapest, around 30.0 years) and the newest in Turin (1 year old) which is the period into operation of the metro system in that city.

Metro is the mode with highest frequencies on peak hour (Graph 25). In most of the cases, 100% of the metro lines have a frequency under 5 minutes on peak hour. However, the supply for night services is scarce in metro systems, only Barcelona and Berlin operate metro on weekend nights.

With regard to real time information at stations, also in most of the cases 100% of the stations network have real information, but Paris and Valencia where the percentage is between 70 and 80%.

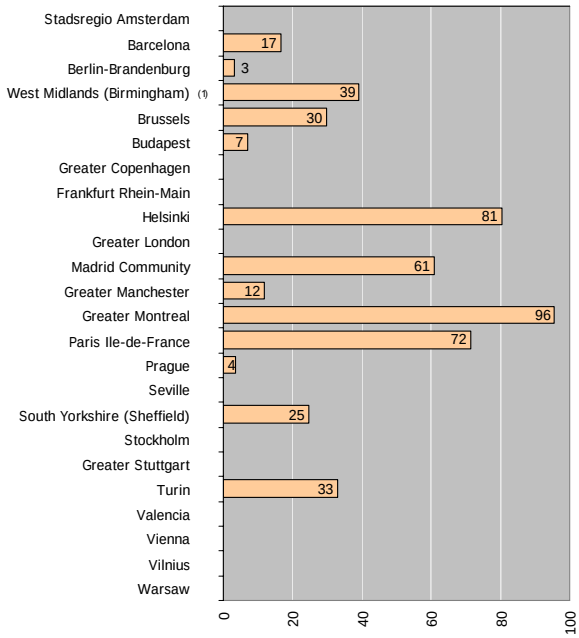
3.5.4. Suburban railway quality indicators

The majority of the suburban railway networks have commercial speed above 40 km/h, getting up to 70 km/h in Stadsregio Amsterdam, becoming the fastest public transport mode (Table 12). The amplitude of the service is similar to the rest of the modes, between 17 h and 20 h, highlighting the case of Greater London with 24 h of services. The accessibility to the stations for PRM is low, though the north European cities seem to have the most accessible suburban rail systems (Stadsregio Amsterdam, Helsinki, Prague and Stockholm) with close to 100% of accessible stations. The average age of the vehicles is comprised between 9.8 years (Greater Stuttgart) and 28 years (Budapest).

Only few lines in Madrid and Budapest have frequencies under 5 minutes on rush hour (20% and 7% of the lines respectively). Berlin has 13 suburban rail lines offering night services on weekends, and 2 in Stadsregio Amsterdam, Budapest and Helsinki. The coverage with real time information on stations is quite high, as we have seen in the other rail modes.

An important element of a suburban train system is the Park and Ride facility. In Montreal (Graph 31), there are more close to 100 parking lots per km of suburban rail network, 81 in Helsinki and 72 in Paris Ile-de-France. This policy leads the people to use public transport for radial trips from suburbs to city centre.

Graph 31. Number of Park and Ride places per km of suburban train network

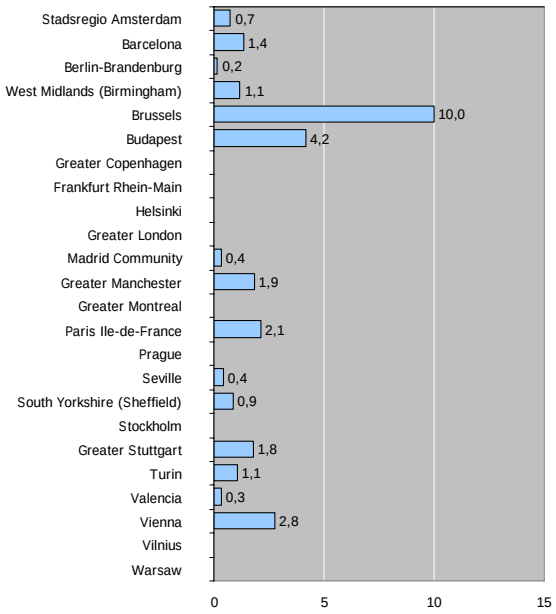


(1) In West Midlands (Birmingham) 15% of the Park and Ride places are related to bus ad tram networks

To have an idea about the policies developed by different metropolitan areas we can look at Graph 32 and 33. On Graph 32 we can see that Brussels and Budapest have developed more the suburban rail network than to highways (respectively, 10 and 4 times more length on train network than on highways). Out of the 15 metropolitan areas with data available, 9 have greater suburban rail network than highways

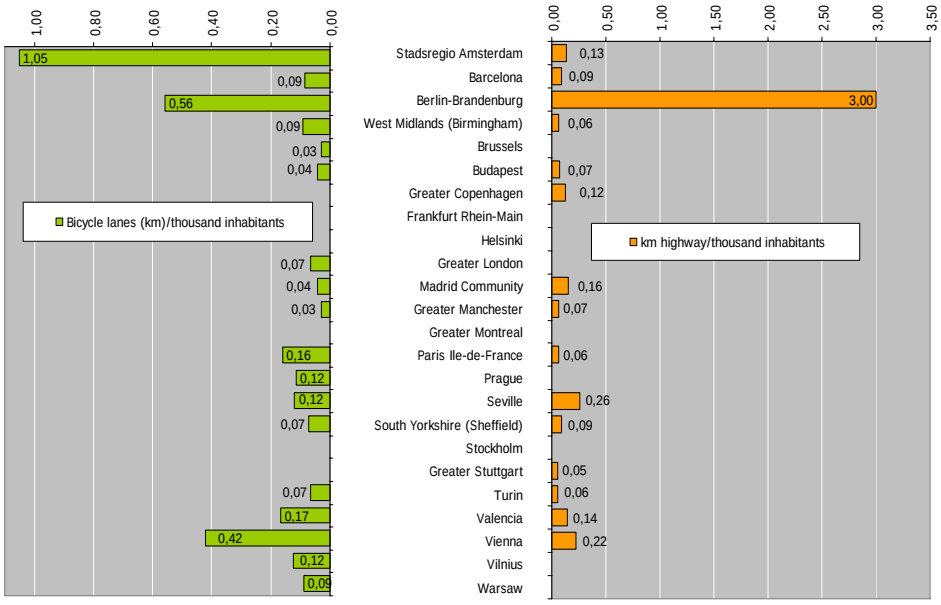
network. On the other hand, few cities have a longer network of high capacity roads than of railway network; the extreme cases are Berlin-Brandenburg (0.2, due to its great surface), Valencia (0.3), Madrid and Seville (0.4).

Graph 32. Suburban train network length (km) / highways length (km)



Graph 33 shows indicators to compare length of bicycle lanes with highways length. It is remarkable the high ratio of bicycle lanes in Stadsregio Amsterdam and highways length in Berlin, as we have seen before in other graphs. In general terms we can say that metropolitan areas are making a big effort on bicycle infrastructures, or at least are looking for a balance between cars infrastructures and soft modes.

Graph 33. Bicycle and highways length



4. Fares and Financial Aspects

4.1. Fares in main city and whole region

Most of the cities have besides the single ticket, a daily pass, some of them have a multiple trip ticket and season integrated passes, as well as discounts for students and elderly people (Tables 13 and 14).

Table 13. Fares in main city for all modes

	Single ticket (€)	Daily pass (€)	Multiple trips coupon (€)	Trip with multiple trip coupon (€)	Monthly pass (€)	Yearly pass (€)	Student pass (€)	Elderly people pass (€)
Amsterdam	0.87	6.30	6.50	0.93	35.10	351.00	23.15	23.15
Barcelona	1.20	5.00	6.65	0.67	42.75		(2) 118.0	
Berlin	2.10	6.10			70.00	650.00	26.00	49.50
Birmingham	(1) 1.65	8.66			82.09	873.13	41.05	free
Brussels	1.50	4.00	10.50	1.05	42.50	425.00	(3) 300.00	0.00
Budapest	0.73	4.54	6.57	0.66	27.21	306.83	10.25	10.25
Copenhagen	2.40	14.00			40.67		40.67	14.67
Frankfurt	1.40	3.40			33.50	335.00	25.10	
Helsinki	2.20	6.00		1.80	40.90	449.90	20.60	30.70
Greater London	4.45	9.20			126.63	1,318.26	88.48	
Madrid	1.00	4.00	6.15	0.62	39.00	429.00	25.40	9.90
Manchester (4)								
Montreal	2.28	5.86			46.21		27.66	27.66
Paris	1.40	5.40		1.09	52.50	530.20	(3) 263.70	
Prague	0.69	2.76			16.20	143.20	4.10	8.20
Seville	1.10				28.00			0.00
Sheffield	1.00	5.63			96.00	954.00	(3) 356.00	0.00
Stockholm	3.32	10.50			66.35	685.07	39.80	39.80
Stuttgart	1.80	5.10	6.30	1.58	47.20	472.00	35.10	35.20
Turin	0.90	3.00	12.50	0.83	29.00	265.00	16.50	(3) 131.00
Valencia	1.15	3.10	6.50	0.65	33.20	295.00	24.90	9.00
Vienna	1.50	5.00	12.00		45.00	417.00	27.00	(3) 209.00
Vilnius	0.32	1.74			17.38		3.48	8.69
Warsaw	0.63	1.88	5.64	0.56	17.23		8.61	8.96

(1) Single ticket just for buses (2) pass valid for 3 months (3) Pass valid for one year
(4) No figures shown for Manchester because ticket sales are not centrally governed and vary by operator and by mode

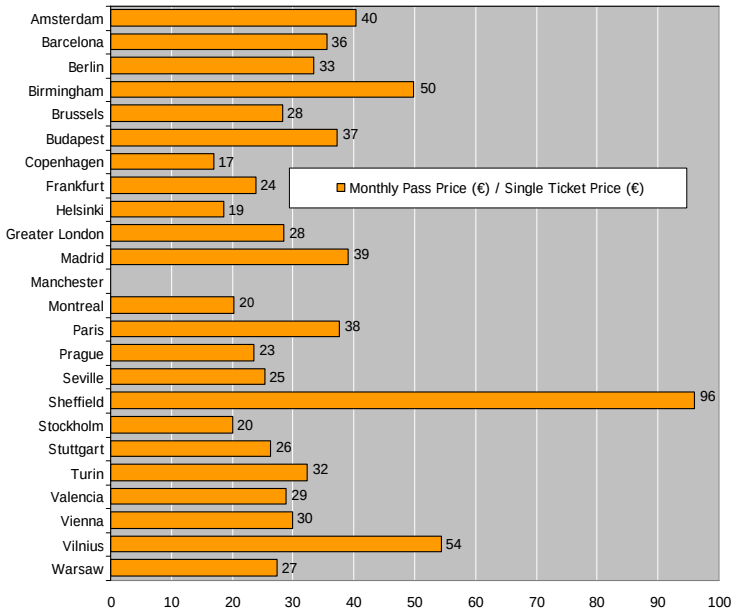
The price for a single ticket in the main city varies from 0.32 € in Vilnius to 4.45 € in London, but most of them are between 1.00 and 2.00 €.

The price of a monthly pass goes from 16.20 € in Prague to 126.63 € in Greater London, but this value does not consider the differences in economy and size between the cities, so we better see later few ratios in order to compare them. For example, in the case of London, “main city” figures refer in fact to the whole area of Greater London, this has already been stressed at the beginning of this report.

What is worth noticing is the ratio of the monthly pass in relation to the single ticket (Graph 34). In a lot fair number of cities it stands around 30, which means that the user who buys an integrated monthly ticket is paying the same as one single ticket per day (30 days per month). In one extreme, we find Sheffield, Vilnius and Birmingham with high ratios (96, 54 and 50), meaning that the single ticket is very cheap compared to the monthly pass (in the case of Birmingham because the single ticket is bus only). In

the other extreme we find Stockholm, Montreal and Helsinki with ratio 20, cities where the saving on the integrated ticket is very important compared with the single ticket.

Graph 34. Ratios in main city



The price of a yearly pass is 10 times the price of a monthly pass, which is a ratio very homogeneous in all the cities surveyed, varying between 8.8 in Prague and 11.3 in Budapest.

The student pass is on average around 43% cheaper than the adult pass of the same category (monthly, yearly) and almost every city has this kind of pass. The student pass in Vilnius, Prague, Sheffield, Budapest and Berlin have a significant discount, between 60 and 80% compared with the standard pass.

In case of ticket for elderly people, there is a wide range of discounts. In few cities it is completely free at least during off peak hours (Birmingham, Brussels, London, Seville, Sheffield) or has a symbolic low price under 15 € for a monthly pass (Copenhagen, Madrid, Valencia, Vilnius and Prague). Others have the same discount as students (Amsterdam, Montreal, Stockholm, Stuttgart, Warsaw) and in other cases there is no discount available (or not data given) for elderly people (Barcelona, Frankfurt and Paris).

In Table 14 fares for the whole metropolitan area are given, that is the most external ring or the outer zone in the fare areas division. The price of a single ticket for the whole region varies from 1.25 in Warsaw to 12.50 in Frankfurt, but that is obviously much related with the size of the metropolitan area.

Same kind of passes and level of discounts than in main cities are applied to the whole region fares, but in some cities are not available for trips outside the main city.

Table 14. Fares for the outer ring of the metropolitan area for all modes

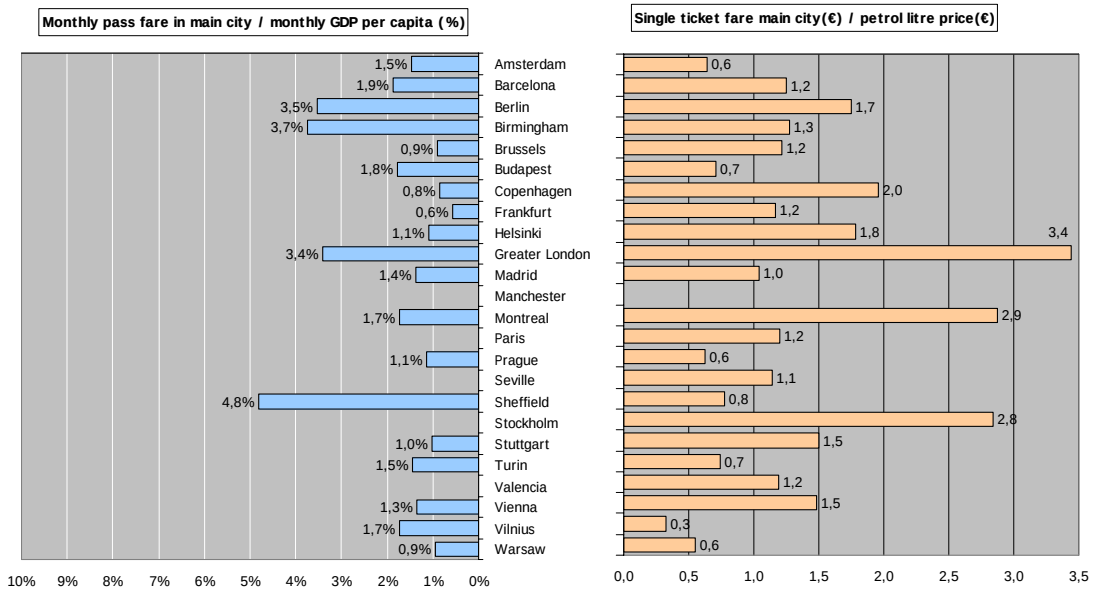
	Single ticket (€)	Daily pass (€)	Multiple trips coupon (€)	Monthly pass (€)	Yearly pass (€)	Student pass (€)	Elderly people pass (€)
Stadsregio Amsterdam	2.60	12.80	6.50	88.50	885.00	58.40	58.40
Barcelona	4.95	14.20	26.90	121.00		(3) 323.00	
Berlin-Brandenburg	2.70	6.30		86.00	805.00	64.50	61.00
West Midlands (Birmingham)		8.66		111.94	1,186.57	55.97	0.00
Brussels							
Budapest (1)	3.25			165.64		34.43	
Greater Copenhagen	8.40	14.00		138.67		81.07	19.60
Frankfurt Rhein-Main	12.50	25.00		214.50	2,145.00	160.90	
Helsinki	(2) 3.60	(2) 10.00		110.60	1,216.60	55.30	83.10
Greater London (5)	4.45	9.20		126.63	1,318.26	88.48	free
Madrid Community	3.85	8.00	26.20	71.00	781.00	44.85	9.90
Greater Manchester (6)							
Greater Montreal				130.83		104.79	104.79
Paris Ile-de-France	9.60	18.40		139.90	1,413.50	(4) 837.30	
Prague	4.14			60.80	631.80	26.24	52.84
Seville							
South Yorkshire (Sheffield)	4.60	7.74		108.00	1,076.00	(4) 552.00	0.00
Stockholm	8.29			66.35	685.07		
Greater Stuttgart	5.90	10.50	22.40	160.40	1,604.00	120.00	53.20
Turin	1.40		19.50	38.00	342.00	29.00	
Valencia	2.25		16.20	58.00	506.00	42.75	9.00
Vienna	1.50						
Vilnius							
Warsaw	1.25	2.51	11.28	23.49		11.75	12.22

(1) Ticketing system based on km (maximum price) (2) For each metropolitan ring (3) Pass valid for 3 months
(4) Pass Valid for one year
(5) Note that the entry for Greater London is the same than the entry for main city, because is the same administrative area
(6) No figures for Greater Manchester because ticket sales are not centrally governed and vary by operator and by mode

4.2. Comparison between main city fares ratios

Graph 35 shows two ratios to compare the fares in main city relating them to GDP per capita and petrol litre price.

Graph 35. Main city fares ratios



The monthly pass price in main city compared with GDP per capita (annual GDP in main city divided by 12) gives a ratio of 1.8% on average (Graph 35, left part). However, especially cheap are the monthly passes in Frankfurt (0.6%), Copenhagen (0.8%), Brussels (0.9%), Warsaw (0.9%), Stuttgart (1.0%), Helsinki (1.1%) and Prague (1.1%). The highest ratios are in Sheffield (4.8%), Birmingham (3.7%) and Berlin (3.5%).

When we compare the single ticket fare in main city with the price of a litre of petrol (unleaded 95) (Graph 35, right part) we observe a wide range of values. The most attractive price is in Vilnius, where a single ticket costs less than half of the petrol litre (0.3). This fact is opposite to the use of the private vehicle since the fuel of the car is much more expensive than the public transport ticket. On the other side, London has the most expensive public transport, the price being 3.4 times more than a litre of petrol, then comes Montreal (2.9) and Stockholm (2.8), values clearly higher than the ones showed in last edition of the Barometer, where the highest figure for this ratio was 2.6 (referred to Stockholm). This fact might be explained because of the decrease of the unleaded 95 price (while the diesel price has increased) or because of the increase in ticket prices.

4.3. Financial aspects

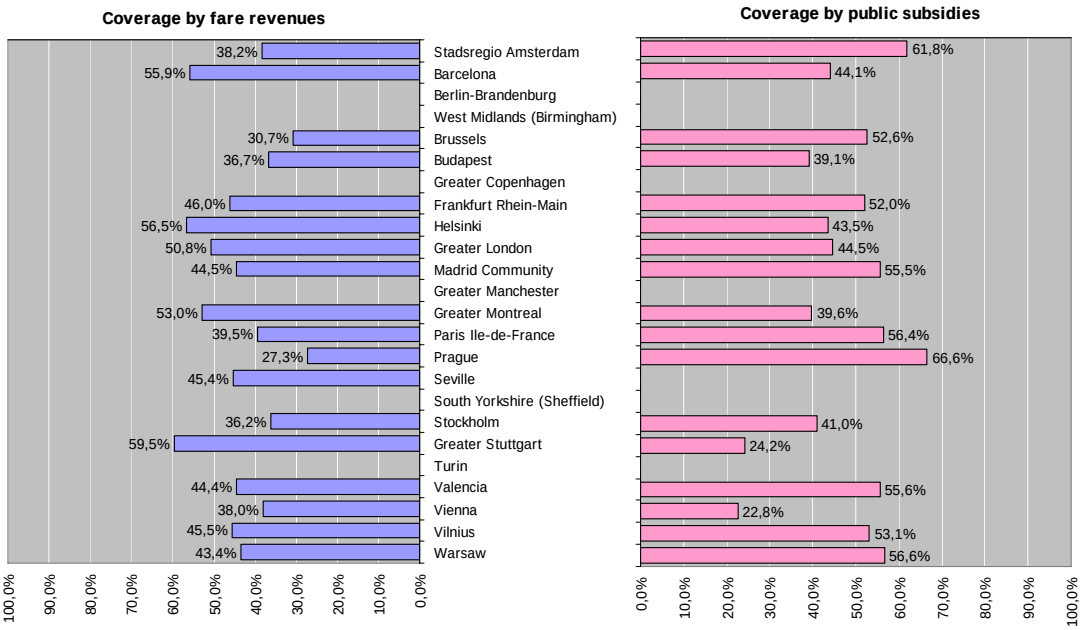
Table 15. Financial aspects

	Yearly operation cost (million € / year)	Revenues from ticket sales (million € / year)	Public subsidies (million € / year)	Other revenues (million € / year)	Modes included
Stadsregio Amsterdam	454.3	173.6	280.7		Bus-metro-tram
Barcelona	978.6	546.6	432.0	41.1	All (bus-metro-tram-HR)
Berlin-Brandenburg		931.0	841.0		All (bus-metro-tram-HR)
West Midlands (Birmingham)	265.0	30.7			All (Bus-tram-HR)
Brussels	566.2	174.0	297.9	94.3	Urban bus-metro-tram
Budapest	636.0	233.5	248.6	153.9	All (bus-metro-tram-HR)
Greater Copenhagen					
Frankfurt Rhein-Main	1,200.0	552.0	624.0	24.0	All (bus-metro-tram-HR)
Helsinki	366.1	207.0	159.1		All (bus-metro-tram-HR)
Greater London	4,433.0	2,252.0	1,974.6	485.0	Urban bus-metro-tram
Madrid Community	1,742.1	774.5	967.7	5.2	All (bus-metro-HR)
Greater Manchester					
Greater Montreal	666.1	352.8	264.1	42.4	All (bus-metro-HR)
Paris Ile-de-France	7,000.0	2,763.0	3,945.0	320.0	All (bus-metro-tram-HR)
Prague	494.0	135.1	329.0	53.7	All (bus-metro-tram-HR)
Seville	118.8	53.9		5.6	All (bus-HR)
South Yorkshire (Sheffield)					
Stockholm	1,237.1	447.9	507.5	281.6	All (bus-metro-tram-HR)
Greater Stuttgart	550.3	327.5	133.3		All (bus-metro-tram-HR)
Turin					
Valencia	203.0	90.2	112.8		Bus-metro-tram
Vienna	62.3	23.7	14.2	25.7	Interurban bus
Vilnius	43.7	19.9	23.2	0.5	All (bus-trolleybus)
Warsaw	282.6	122.6	160.0	4.2	All (bus-metro-tram-HR)

(HR) Heavy Rail

Table 15 is very heterogeneous on its content depending on the metropolitan area. A very important indicator on public transport financing is the percentage of the operational expenses that is covered by the revenues collected by fares and the percentage covered by public subsidies. However, the attribution of costs and revenues varies very much in the different metropolitan areas. On Graph 36 we observe that the coverage of operational costs by fare revenues is on average 44%, varying the percentage in cities where data are available between 27% in Prague up to 59% in Greater Stuttgart.

Graph 36. Coverage of operational costs



The other indicator, the coverage by public subsidies is on average 48% what means that close to half of the public transport operational costs are covered by fares and half by public subsidies from national, regional or local authorities depending on the local context. The balance share between fare revenues and public subsidies is a consequence of the public service obligations entitled to public transports services and the existence of reduced social fares as we have seen in the previous section.

The rest of the percentages up to 100%, that is 8%, are other revenues corresponding to publicity, congestion charging, taxi licensing incomes, bus enforcement fines, etc.

We should note that in few cases the figures are not consistent or do not include all modes, due to a lack of financial and rigorous information from different modes and operators and the difficulty to obtain them, even more when each case considers different items for each group of costs and different calculation. For example, British authorities in West-Midlands (Birmingham) or South Yorkshire (Sheffield) do not directly operate public transport services neither collect fares because of their deregulated system, thus they do not have available meaningful figures to allow comparison. The figures on Table 15 for West-Midlands and South Yorkshire include only the operational cost of some authority's activities (promotion, planning, co-ordination, etc.) and only the revenues from tickets supplied by these authorities, namely Centro and

SYPTE. Therefore, the figures are very different from the rest and not comparable. However, it must be said that the local public transport in those areas is privately operated and largely profitable.

5. Conclusions

The key facts we draw in this report are the following:

- **The metropolitan areas surveyed show differences in terms of surface in terms of population and in terms of urban density**. The different urban layouts have significant consequences for the coordination of the provision of public transport among the various local authorities concerned.

  Main cities gather 46% of the population of the metropolitan area on 8% of its surface. Mobility patterns in the city centre show specific characteristics that are not to be found in the rest of the area.

- **3 trips per person per day are done in average in the metropolitan areas surveyed.** Each motorised trip represents 33 min time. 40% are commuting trips as home-to-work and home to school.

- In average there is one car every two inhabitants, but the tendency is that **high GDP´s are related with lower motorization rates**. This is very important for the Public Transport Authorities, whom see their responsibilities growing to offer a more attractive public transport system to a less car dependant society.

- The high car ownership ratios explain why private car remains the favoured mode of transport (47% of total trips), followed by non-motorised modes (24% walking and 5% cycling) and public transport (212%). There is a trend to a link between car ownership and public transport use, though is not very strong and there is a big dispersion of data, pointing out that the more we own cars, the less we use public transport.

- **Public transport accounts for 48% of all motorised trips in the densest part of most of the metropolitan areas surveyed, this means the main cities**. This underlines the leading role of an efficient safe and fair public transport system in large urban territories. However when considering the whole metropolitan area, the share falls to 28% of motorised trips done by public transport against 72% of other motorised modes, mainly the private car. The lower level of public transport provision, but also the characteristics of urban development combined with road infrastructure provision have a determinant impact.

- **Metro systems are extending** or appearing in almost all the cities surveyed, being successful in dense areas.

- The number of tramway routes and systems is increasing very fast in several European metropolitan areas, based on the **new concept of tramways on dedicated platform called light rail system**. They represent an alternative for medium capacity modes.

- Considering public transport demand, **the bus attracts 15% less passengers than all rail modes together** (journeys/year). However, looking at the figures on passenger-km/year the suburban railway has the highest figures, followed by metro, both gathering 70% of the total demand on public transport expressed on passenger-km. Functionality and length of trips impact on the choice of mode.

- On average, the population does more than **230 journeys per inhabitant and year on public transport, this means almost one journey every labour day**.

- The fastest modes are the rail modes, with averages **commercial speed of 45 km/h for heavy rail, 32 km/h for metro, 23 km/h for bus (considering urban and suburban services) and 21 km/h for tram**. It is remarkable that tram and bus have the same speed though the tram usually runs on reserved platform.

- **The amplitude of public transport services is quite high, close to 20 hours** in all modes. The most accessible to people with reduced mobility is the tram; nevertheless, the bus is carrying out a big effort on low floor buses and to a lesser degree on on-board audio and visual information.

- **The single ticket price varies between 0.32 € to 4.45 €**. With the multiple trip coupon (usually 10 trips) one can save around 40%. The price of monthly pass is on average 30 times the single ticket, but for young and elderly people the pass is 50% cheaper than the normal monthly fare.

- Regarding the financing of the public transport systems, **operational costs are covered 44% by fares, 48% by public subsidies and 8% by other revenues** such as publicity, congestion charging, etc.

Annex I: List of Metropolitan Areas Surveyed

This is a chart with the metropolitan areas participants from the first edition of the Barometer until the present edition with the Transport Authority responsible.

	Country	Transport Authority	Barometer data 2006	Barometer data 2004	Barometer data 2002	Barometer data 2000
Stadsregio Amsterdam	Netherlands	Stadsregio	x	x		
Athens	Greece	OASA			x	x
Barcelona	Spain	ATM	x	x	x	x
Berlin-Brandenburg	Germany	VBB	x	x	x	
Bilbao	Spain	CTB		x	x	x
West Midlands (Birmingham)	England	Centro	x	x	x	
Brussels	Belgium	AED-BUV	x	x	x	x
Budapest	Hungary	BKSZ	x			
Cadiz Bay	Spain	CMTBC		x		
Greater Copenhagen	Denmark	MOVIA	x			
Dublin	Ireland	DTO			x	
Frankfurt Rhein-Main	Germany	RMV	x	x	x	
Helsinki	Finland	YTV	x	x	x	x
Lisbon	Portugal	AML				
Greater London	England	TfL	x	x	x	x
Greater Lyon	France	SYTRAL		x		
Madrid Community	Spain	CRTM	x	x	x	x
Greater Manchester	England	GMPTE	x	x	x	x
Greater Montreal	Canada	AMT	x			
Oslo Region	Norway	RUTER		x		
Paris Ile-de-France	France	STIF	x	x	x	x
Prague	Czech Republic	ROPID	x	x	x	x
Seville	Spain	CTS	x	x	x	x
South Yorkshire (Sheffield)	England	SYPTE	x	x		
Stockholm	Sweden	SL	x	x	x	x
Greater Stuttgart	Germany	VRS	x	x		
Turin Metropolitan Area	Italy	AMMT	x	x		
Valencia	Spain	ETM	x	x	x	
VOR Region (Vienna)	Austria	VOR	x	x	x	x
Vilnius	Lithuania	MESP	x	x	x	x
Warsaw	Poland	ZTM	x		x	
Zurich	Switzerland	ZVV			x	x

On this third edition, 24 metropolitan areas have collaborated, which is a great achievement since the first one surveyed 15 cities.

The questionnaire used to gather the information contains 383 questions. It has represented a strong involvement from the Authorities to collect data and a considerable work for CRTM to consolidate these data.

Annex II: List of Tables and Graphs

List of Tables

List of Graphs