MOBILITY IN EUROPEAN COUNTRIES

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Executive summary

This paper describes the methodology and results of studies carried out on mobility in European Countries by the authors in the framework of EPATS project (European Personal Air Transportation System). The objective of these studies was to analyse the main characteristics of the mobility in Europe when particularly focusing on the mobility features on the connections where personal aviation could potentially operate. Besides this general analysis of mobility in Europe we also focus on the mobility analysis in two particular countries: France and Poland. Both indeed belong to the countries with the highest traffic level in old European countries and new European countries.

The mobility analysis made at a EU 15 level highlights that the long-distance journeys characteristics change according to the customer profile: business and leisure traveler do not travel the same way (difference in terms of transport mode, duration, traveler features (age, gender, etc.)). Characteristics of long-distance mobility therefore vary a lot according to the trip purpose.

We identify that 15 223 connections between 28 countries can be considered as EPATS potential connections. All together these potential connections represent 24% of the total existing NUTS 2 connections in Europe.

Despite the lack of detailed data on the traffic occurring on these connections the analysis manage to provide very interesting and important information on the current traffic levels and modal splits. The total traffic on the potential EPATS connections is 2400 billion passengers amongst whom 436 million travel to and from France and 93 million to and from Poland. The analysis also highlights the large market share of the road transport mode on these connections since 79% of the passengers travel by car. The air transport market share often exceeds the road one for distance over 1500 Km and reaches 100% for distances over 2000 Km.

The road transport mode preponderance on the potential EPATS connections hence tend to mean that the traditional air transportation is often less competitive than the road transport mode. But could a different way of travelling by air such as the personal aviation be an alternative to the traditional air transport as well as to road transport.

The answer to this question is the next step of the analysis aiming at assessing the traffic that could be potentially transferred to EPATS by 2020 as well as the EPATS aircraft fleet that would be necessary to satisfy this demand.

1. INTRODUCTION

In modern society, the need to travel within Europe is more and more important, and is expected to increase. The extension of the European Union to 27 members amplifies this phenomenon. However, current transport modes have limitations and suffer already from congestion in some places: most large airports are congested or could quickly reach their maximal capacity. Conversely, other areas, especially in Eastern Europe, are hardly accessible.

Moreover, society is evolving: passengers are becoming more exigent in terms of time and cost, but their behaviour is also changing: a phenomenon of individualisation is taking place little by little, meaning that people want to have a choice. Future mobility therefore cannot be entirely satisfied by current transport systems, such as hubs, railways or highways.

A new transport mode is thus needed, and from this perspective, a new concept, the Personalized Aviation, has been proposed. It would consist in realizing long-distance trips in a short time at an acceptable cost, thanks to the use of small aircraft (jet, turboprop, pistons) departing from small airports. These aircraft, operating in all weather conditions, could deserve any kind of location, but their interest would be overall to serve inaccessible areas. The concept of personalized aviation implies the development of a system. This system is called "EPATS": European Personal Air Transportation System which is a complex collection of systems, procedures, facilities, aircraft and people, working together. EPATS would be developed especially in regions where the airlines are extremely little present and where high-speed trains do not work, owing to the low flow of passengers.

At first, EPATS will help to meet the needs of a society that is more and more mobile and demanding, by increasing passenger choice. Then, EPATS aims at improving the accessibility of some areas in Europe and at attenuating the disparities relative to networks development. This system proposes an alternative mode to road transport by private car. But EPATS is also a means to make a stronger aeronautical Europe by developing technologies needed for this kind of aircraft and by strengthening general aviation. Lastly, EPATS should increase the operational capacity and the efficiency of air transport system

Our objective is to analyse the main characteristics of the mobility in Europe when particularly focusing on the mobility features on the connections where personal aviation could potentially operate. Besides this general analysis of mobility in Europe we also focus on the mobility analysis in two particular countries: France and Poland. Both indeed belong to the countries with the highest traffic level in old European countries and new European countries. With 5.2 billions of passengers in 2000 (on trips over 100 km) France belongs to the top 4 of old European countries while with 1.4 billions of passengers (Figure 1-1), Poland is the new European country with the highest traffic level in 2000 (Figure 1-2). Both countries are therefore particularly interesting to be analysed in terms of mobility features as representative of old and new European countries.

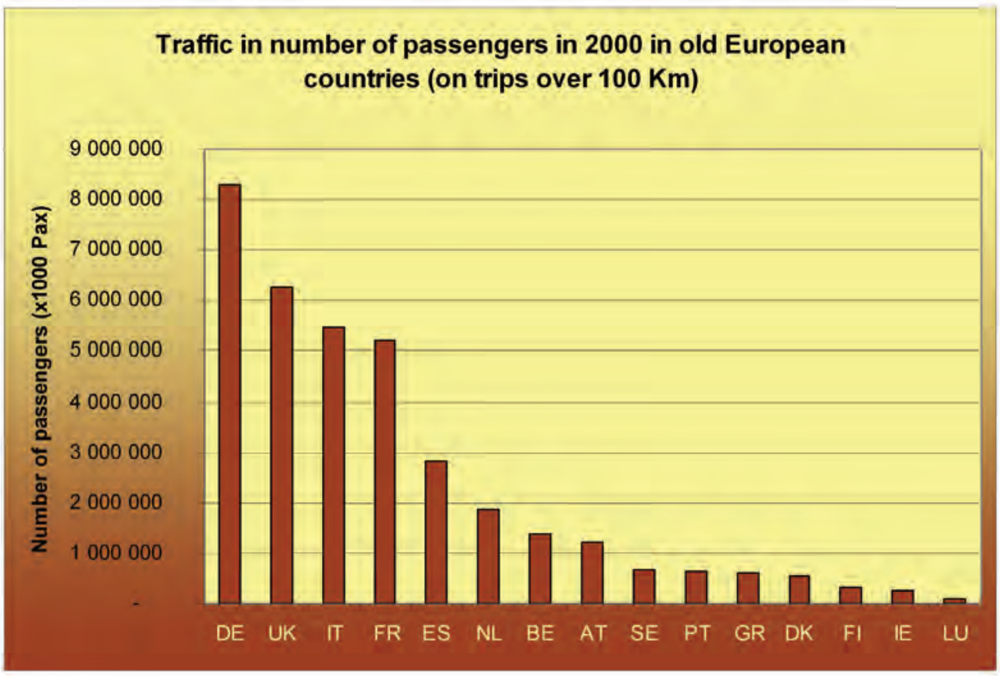


Figure 1-1. Traffic in number of passengers in 2000 in old European countries (Source ESPON)

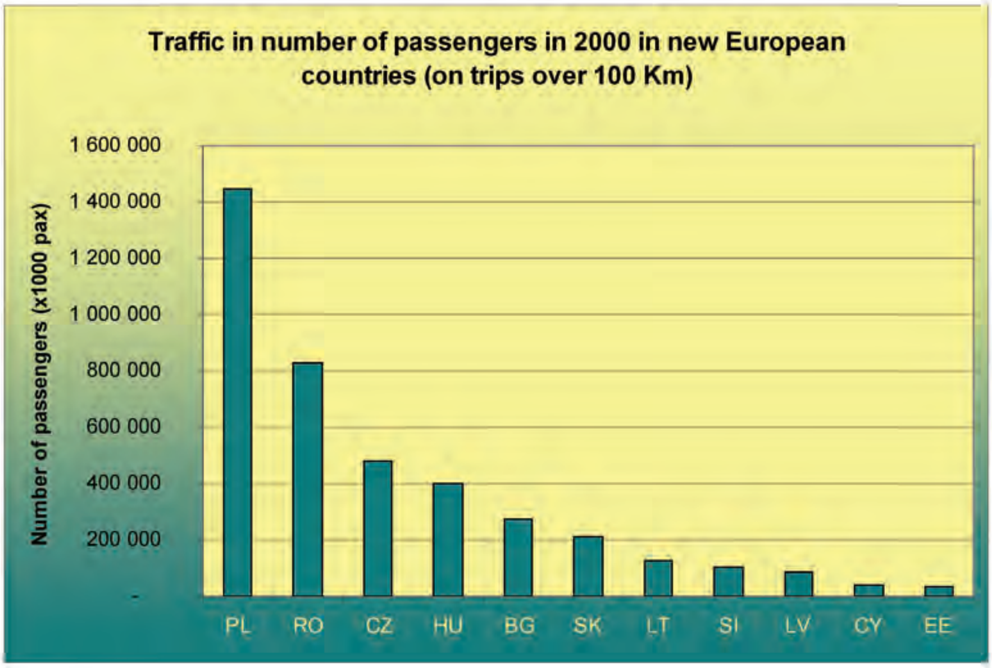


Figure 1-2. Traffic in number of passengers in 2000 in new European countries (Source ESPON)

Knowing the general features of the mobility in Europe is essential before going deeper in the mobility analysis when focusing on particular areas. That is why we start this paper by providing an overview of European mobility aiming at giving global traffic levels as well as at identifying the main features of this general mobility (modal split, trip duration, travelled distances, etc.). More generally, it is also particularly interesting to analyse the main determinants of this mobility.

Once knowledge of European mobility is better, the next step consists in analysing more closely the mobility features in areas where the use of the personal aviation is relevant. We therefore identify the connections between NUTS 2 (Nomenclature of Units for Territorial Statistics – NUTS 2 indicates the regions populated by 800 thousand. to 3 million inhabitants) in Europe that are the most relevant in the EPATS context while taking into consideration criteria of accessibility, economic attractiveness and traffic level. Then we analyse more precisely the mobility features on these connections from available traffic data.

2. EUROPEAN MOBILITY OVERVIEW

2.1. Traffic and Evolution

Data on passenger transport in EU-25 has become increasingly available since 1995. Before this date, we do not have enough information for the whole countries. The analysis first of all focuses on the traffic evolution in EU 15 only, to have a large overview on transport activity in Europe since 1970. In a second step the analysis outlines the recent evolution of traffic in EU 25 and provides an insight of the current situation in transport.

2.1.1.Traffic evolution in EU-15 from 1970 to 2001

During the period 1970 – 2001, passenger transport in European Union 15 has more than doubled: it has been multiplied by 2,28, going from 2 117 billions to 4 834 billions passenger-km[1]. This corresponds to an average annual growth of 2,7 %. Transport growth was particularly strong at the beginning of the period, as shown in Table 2-1 (+ 3,4 % per year from 1970 to 1980), but since the 1990's, the annual growth has slowed down and does not exceeded 1,8% per year.

[1] Passenger-km = unit of passenger traffic. It represents the movement of one passenger over one kilometre.

Table 2-1. Passenger Traffic Growth by transport mode in EU 15 between 1970 and 2001 (Source: European Commission Ref 13)

Average annual growth rate (%)	Mode of transport					Total
Period	Car	Bus - Coach	Tram -Metro	Railway	Air	All
1970 – 1980	3,7	2,6	0,3	1,3	8,4	3,4
1980 – 1990	3,4	0,6	1,8	0,8	7,8	3,0
1990 – 2001	1,7	1,1	1,2	1,2	5,6	1,8
1970 – 2001	**2,9**	**1,4**	**1,1**	**1,1**	**7,2**	**2,7**

However the growth in passenger traffic significantly differs between transport modes. Figure 2-1 points out this gap between modes: the growth of air traffic in passenger kilometers (intra EU 15 + domestics) was significantly stronger than that of the other modes between 1970 and 2001. Indeed, air transport increased by 766 % over the period, while transport modes such as bus / coach, Tram / metro and Railway hardly grew by 50 %. At the same time, the level of car traffic was multiplied by more than two between 1970 and 2001, in terms of passenger km. Besides, the annual growth in car traffic (+ 2.9 % per year) is quite close to that of transport in general. This growth of individual road transport, particularly strong between 1970 and 1990, is mainly due to an increase in the level of motorization.

More precisely we observe two different trend in terms of growth rates evolutions: while the dynamic growth of the air market decreased over the period (5,7 % traffic growth per year between 1990 and 2001, versus 8,4 % between 1970 and 1980), the growth rates of rail transport, particularly low between 1980 and 1990, increased over the last 10 years because of the development of the high speed rail network.

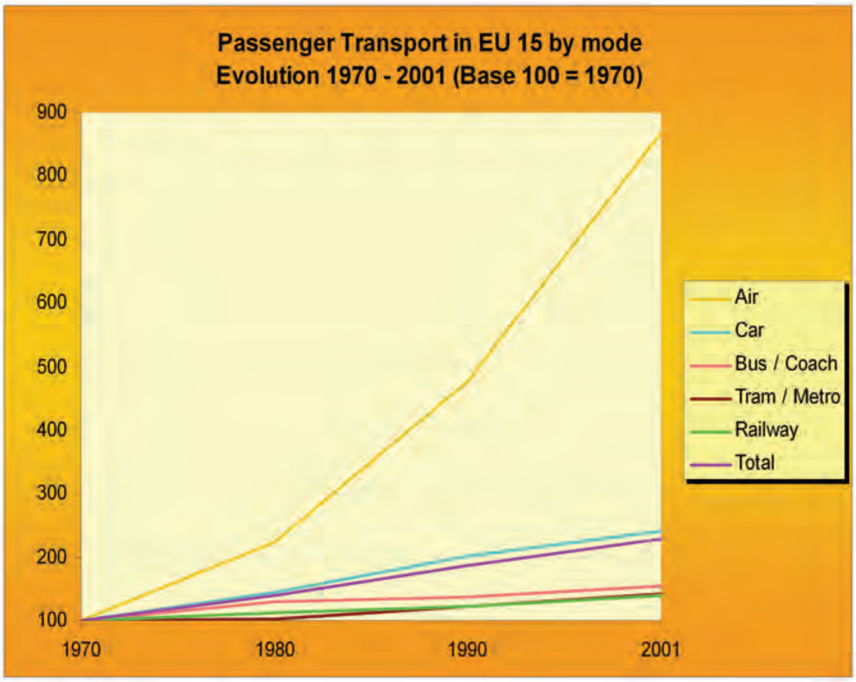


Figure 2-1. Evolution of passenger transport by mode in EU 15 between 1970 and 2001 (Source: European Commission Ref 13)

This growth difference between modes generated an evolution in modal split. Figure 2-2 shows that the shares of air and road traffic in the total passenger km traffic continually increased since 1970: car transport was and is dominant over the other modes, with a market share of 73,8 % in 1970, reaching more than 78 % in 2001. The rise in the air transport market share is even more outstanding: it rose from 1,6 % to 5,9 %. Conversely, the market shares of Bus / Coach, Tram / Metro and Railway widely fell from 23 % to 16 %.

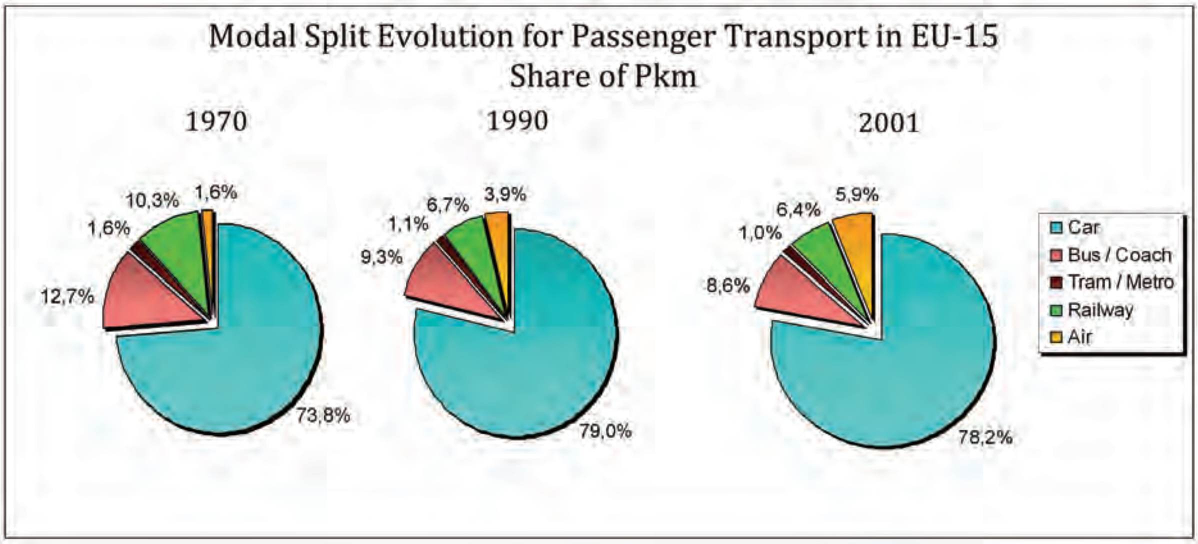


Figure 2-2. Modal Split Evolution for passenger transport in EU 15 (Source: European Commission Ref 13)

2.1.2. Traffic in EU-25

A very large share of traffic is concentrated in European Union 15, which accounts for 81 % of the total population in EU 25 (source: DG Tren). However this share tends to decrease, as shown in Figure 2-3: in 1995, EU 15 citizens made 88% of the total EU 25 traffic in passenger km, versus 85 % in 2001. Because of new member country development, we can reasonably assume a continuation of this trend from 2005.

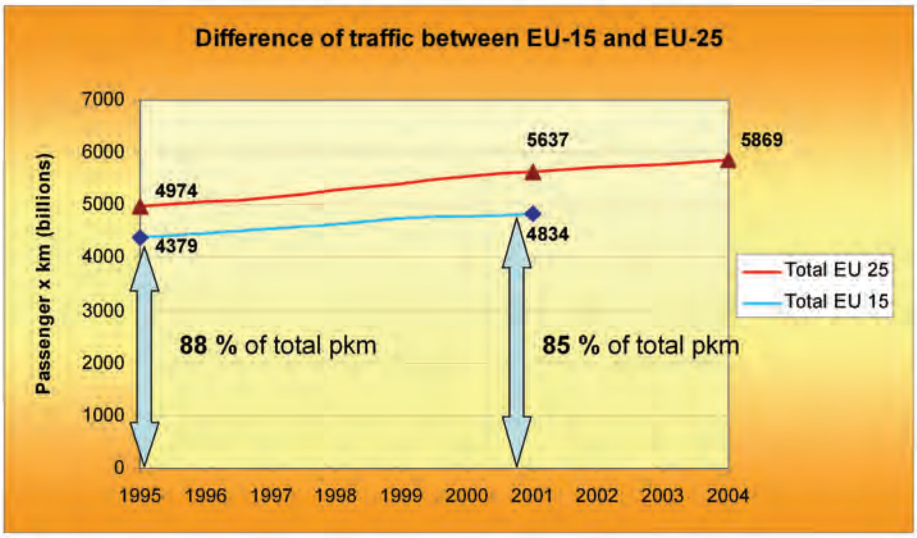


Figure 2-3. Difference of traffic between EU 15 and EU 25 (Source:Ref 12)

Now, let's have a look at the current situation of transport in European Union 25.

Over the period 1995 – 2004, we observe the same general trend as for the EU 15 in the late 90's: the yearly average growth rate in passenger traffic in EU 25 is 1,9 % (vs. 1.8% in EU 15). Moreover, the modal split for EU 25 in 2004 is close to the modal split of EU 15 in 2001.

Indeed as shown in Figure 2-4, the individual road transport is preponderant with a market share of 76 % (vs 78% in EU 15 in 2001). Air transport market share reaches 9 % (vs. 6% in EU 15 in 2001), and transport by rail only 6 % (same share than in EU 15 in 2001). The market share of other modes (metro, bus, coach and tram) is about 10 %.

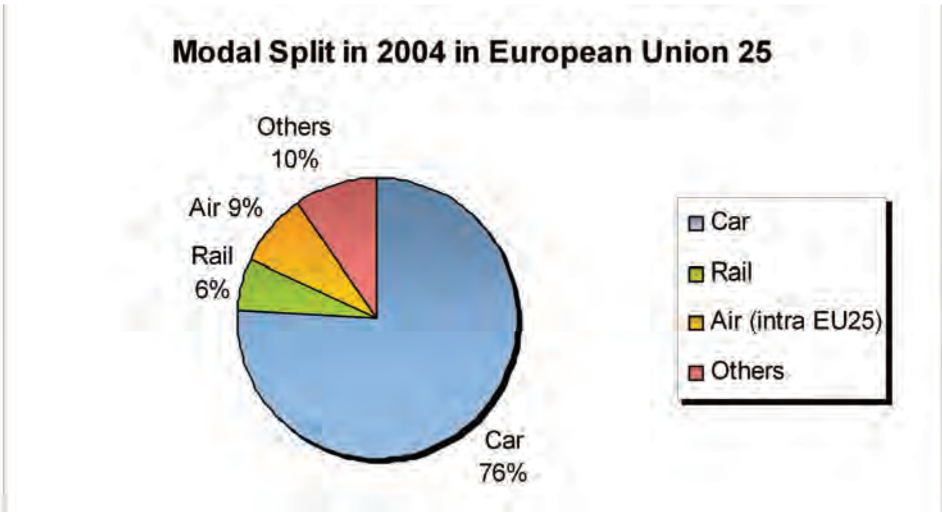


Figure 2-4. Modal Split in EU 25 passenger transport in 2004
(Source:Ref 12)

Finally, the traffic reaches 5689 billions of passenger-km in EU 25 in 2004, which corresponds to 12 370 pkm per capita each year.

However, characteristics of this mobility can change according to the trip distance. That is why it is important to differentiate two types of trips:

- Short-distance trips that concerns trips with a travel distance less than 100 km. They can correspond to trips linked to daily activities such as work, education or shopping but can also be more occasional trips;
- Long-distance trips concerns trips with a travelled distance above 100 km. They can be realized within a weekly, seasonal or annual activity: holidays, professional meeting, visiting family, etc.

In the scope of EPATS, only the long-distance passenger traffic is pertinent. That is why we focus our analysis on long distance mobility.

2.2. Long-distance journeys

After this large overview of passenger transport in Europe, we can now study in detail the features of long distance trips. Due to the lack of mobility statistics at a EU 25 level this long-distance mobility overview is mostly made at a EU 15 level.

The main source providing useful information for the analysis of the long-term mobility is DATELINE. Dateline is a European Project that realized a survey in all the EU 15 states about long-distance travel within Europe and that created a important database relative to the characteristics of the European long-distance journeys. The survey was carried out in 2001 – 2002.

When performing this mobility overview it would be particularly interesting to make comparison in terms of traffic features between EU 15 and France and Poland that are both countries that we consider in the estimation of the EPATS potential market. Unfortunately the DATELINE database does not contain information for Polish travel, which makes comparison impossible. This long-distance mobility overview therefore mainly focuses on EU 15 and French travellers and is completed with Polish data each time it is available.

When dealing with long-distance journeys it appears necessary to consider two kinds of journeys:

- Business Journey
- Leisure Journey

Indeed, leisure and business journeys have their own specificities and concern persons with different goals and budget.

They are defined as follows:

- Business Journey = journey realized for business purpose (professional conference, congress, meeting...). This definition does not include commuting journeys or professional travel (e.g. flight attendants, pilots, truck drivers, sea captains etc.). Business journeys represent about 20 % of the whole long distance journeys (Source Dateline).
- Leisure Journey = journey realized in all other cases, for instance to visit friends or relatives, for holidays, sport, shopping, etc.

The analysis of long-distance mobility provides elements on the share that long distance trips represent in the total number of trips, but also on the characteristics of these long distance trips in terms of modal split, distance, duration, number of people travelling together and also the share of journeys abroad.

2.2.1. Share of long-distance journeys

"Long distance journeys" is the segment of mobility which increased the most during the last half century. Many determinants such as the rapid development of air transport or the increasing level of motorization, but also the development of tourism contributed largely to the strong growth of long distance mobility: in France, the long distance traffic increased by 108 % between 1973 and 1993 (corresponding to an annual growth of 3,6 %), while short distance traffic only increased by 66 % (source: INRETS Ref 15). Despite fast growth, long distance traffic only represents 40 % of the total travelled passenger-kilometres (source: INRETS Ref 15).

According to the Dateline survey, the rate of European people travelling at least once in 2001 on long-distance reaches 70 %. More precisely, 69 % of the European citizens made at least one leisure journey. Besides, only 5% of the European citizens made at least one trip for business purpose in 2001. In France, the departure rate is slightly higher, as shown in the following table:

Table 2-2. Departure rate in 2001 in Europe and France (Source: Dateline)

Departure rate in 2001	Europe	France
all reasons	70 %	77 %
leisure journeys	69 %	76 %
business journeys	5 %	11 %

In addition, each French inhabitant makes on average 3,8 long distance journeys yearly, from Dateline: 3 journeys for Leisure reasons, and 0,8 for Business reasons. Unfortunately, we are not able to determine this average number of journeys for Europe, but we can assume that it does not differ too much from French results.

2.2.2. Long distance features

Modal Split of journeys

Train, car and aircraft are the three main transport modes used by Europeans on long-distance journeys. The analysis of the modal split between these three modes clearly shows the preponderance of the individual road transport mode since 71% of the traffic of EU 25 long-distance travellers (in number of passengers) is performed by car. Train is the second most used transport mode with a 19% share. The preponderance of the individual road transport mode is moreover higher in France and Poland (Figure 2-5). Another important difference in modal split between EU 25 and France or Poland is the traffic share of air transport. Indeed this transport only represents 3% of the domestic French traffic and 1% of the domestic Polish traffic.

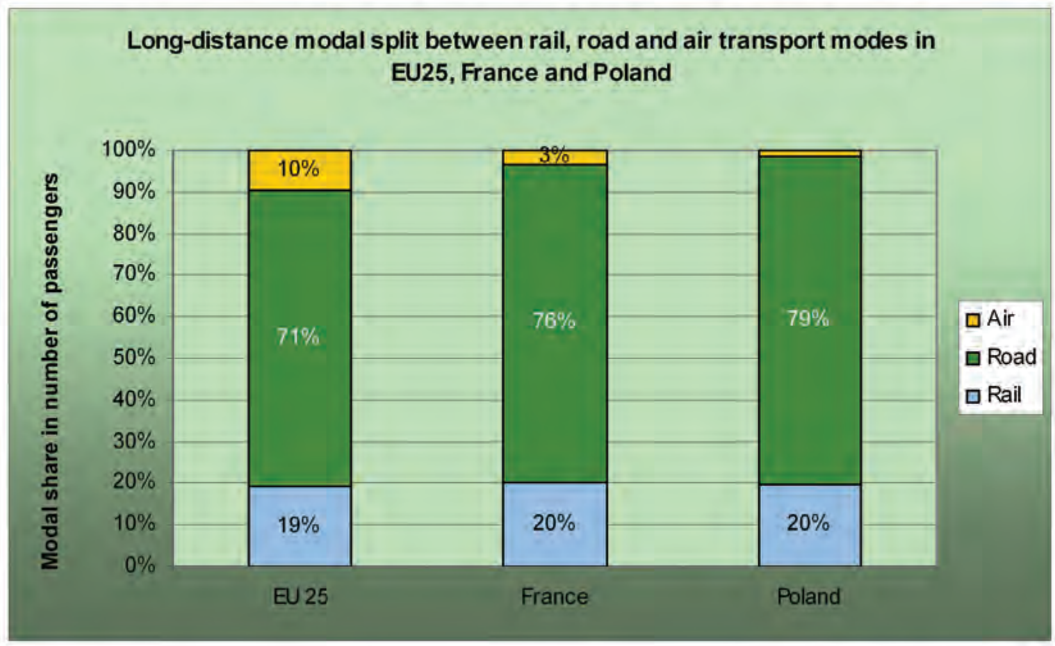


Figure 2-5. Long-distance modal split between rail, road and air transport modes in EU25, France and Poland (Source ESPON)

The lower use of the air transport mode in France compared to EU 25 is particularly marked for journeys exceeding 1000 Km. Indeed while representing 64% of the traffic over 1000 km in EU 25, the air transport mode is only used in 31% of the domestic journeys exceeding 1000 Km in France (Figure 2-7). On the other hand, the low share of the air transport mode in domestic Polish journeys can be explained by the non existence of domestic journeys exceeding 800 Km. Until 800 Km the modal share of air transport is quite close to the corresponding modal share in EU 25 or France (2-6).

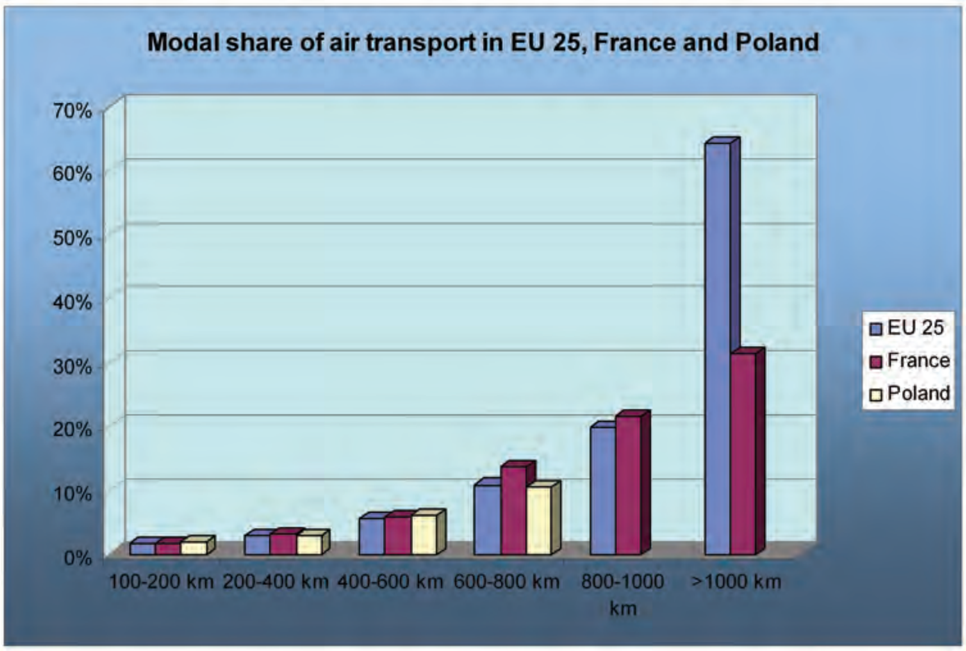


Figure 2-6. Modal share of air transport in EU 25, France and Poland (Source ESPON)

Another main difference between EU 25 and French behaviours also arises on distances exceeding 1000 Km where French travellers tend to use, to a larger extent, individual road transport modes than Europeans (Figure 2-7).

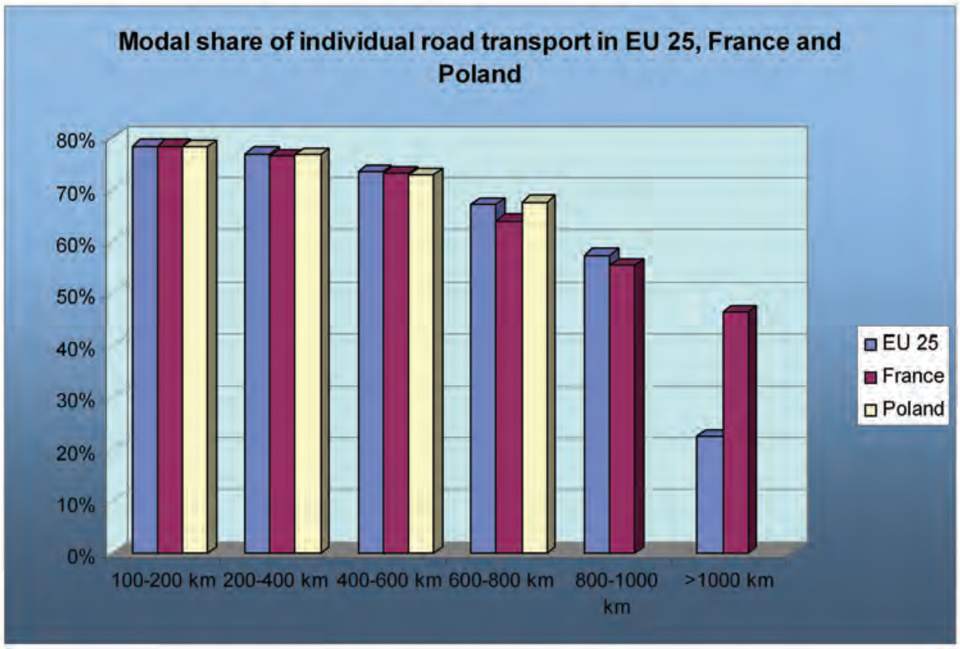


Figure 2-7. Modal split of individual road transport in EU 25, France and Poland (Source ESPON)

However, these general modal splits can vary a lot according to the purpose of the trip that is why it is particularly interesting to go deeper in the analysis when differentiating business from leisure trip purposes. The following graphs show the modes distribution by travelled distance category. The travelled distance corresponds to the distance of a one way trip.

Business Journeys

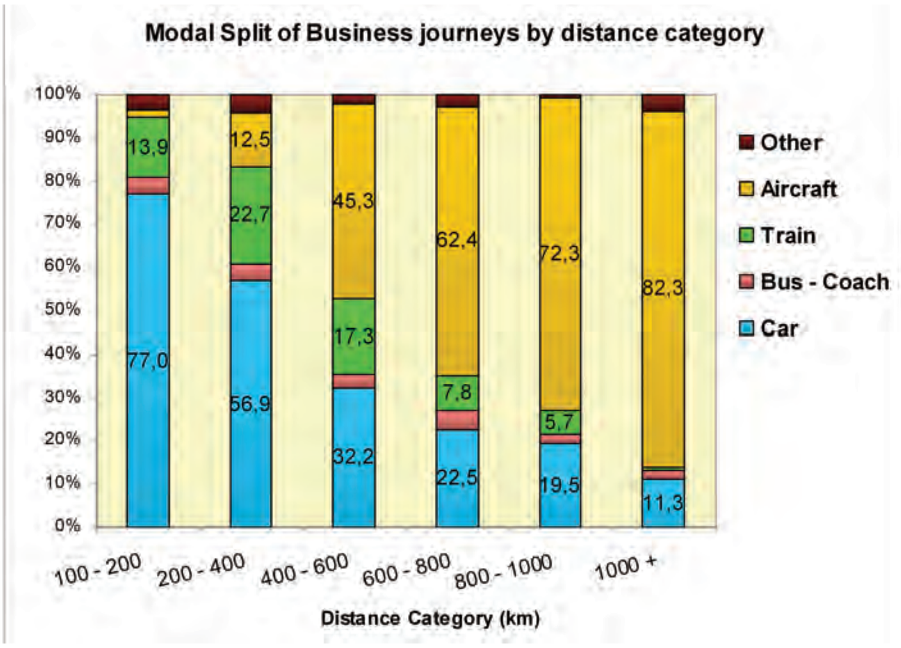


Figure 2-8. Business Journeys - Modal Split by distance category in Europe (Source: Dateline)

In business travels the individual car dominates the other modes on short distances, i.e. distances comprised between 100 and 400 km. Above this limit of 400 km, businessmen widely prefer aircraft, because of their higher speed which wastes less time. Train is interesting to a lesser extent for medium distances (200 – 600 km). The other modes (Bus, coach, ship) are hardly used by the business passengers, due to their low speed and their lack of convenience.

A similar analysis on the behaviour of French travellers in long-distance trips tends to show significant differences with the European behaviour. This difference mainly comes from the larger use of rail transport by French people than by typical European people, what can be explained by the large French high-speed rail network. However, we have to be careful when considering Figure 2-9 since the sample of French business travellers extracted from DATELINE is very small which means that shares of modal traffic may not be representative of the real modal split of French business travellers.

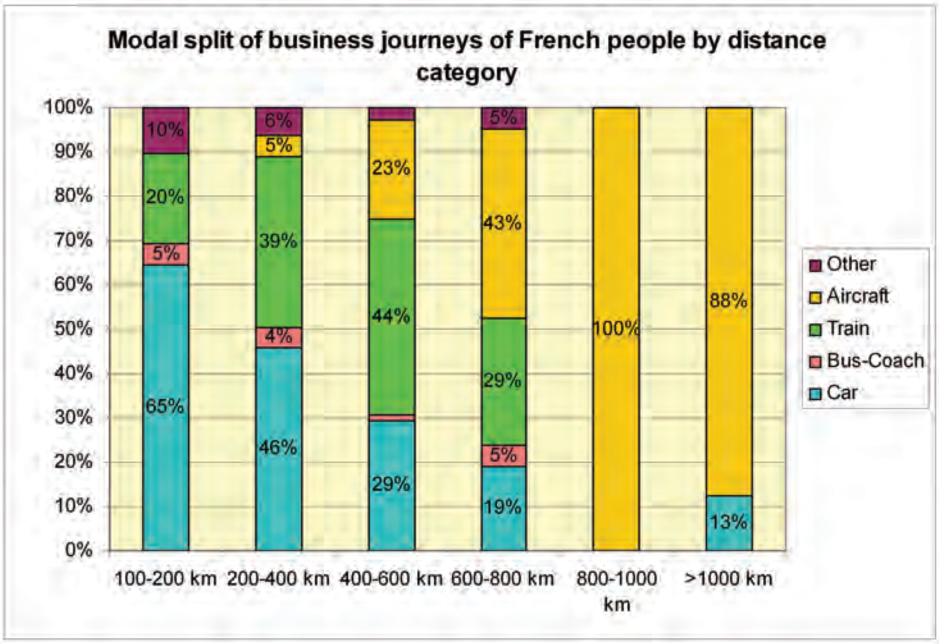


Figure 2-9. Modal split of business journeys of French people by distance category (Source: Dateline)

Leisure Journeys

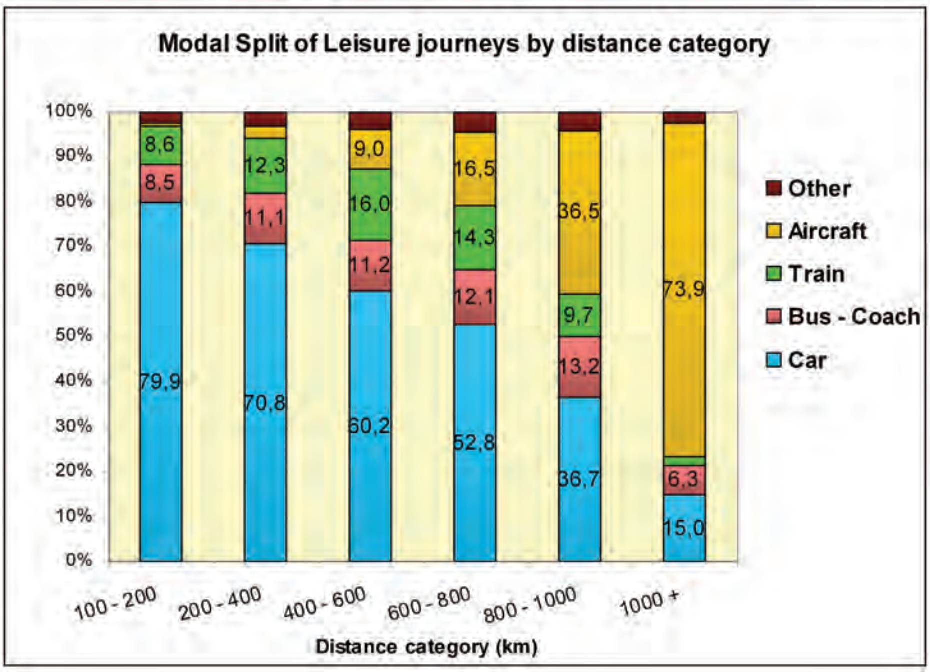


Figure 2-10. Leisure Journeys - Modal Split by distance category in Europe (Source: Dateline)

The modal split of leisure journeys mainly differs from business journeys due to the preponderance of the car in main distance categories. The high flexibility of a car compared to the other transport modes explains this predominance up to 800 km. From this distance air transport takes over. As opposed to business travellers, leisure travellers do not hesitate to use transport by coach and bus because of their low price. Finally, the train is mainly used on distances comprised between 200 and 800 km.

As in case of business travel, the main differences in modal split between European and French people mainly comes from the larger importance of rail transport mode. However it is important to note that this higher modal share of rail is not at the expense of the individual road transport. Indeed the traffic share of cars is always higher for French travellers than on average in Europe. On the other hand French travellers are less inclined to use the air transport mode for leisure purposes than European travellers.

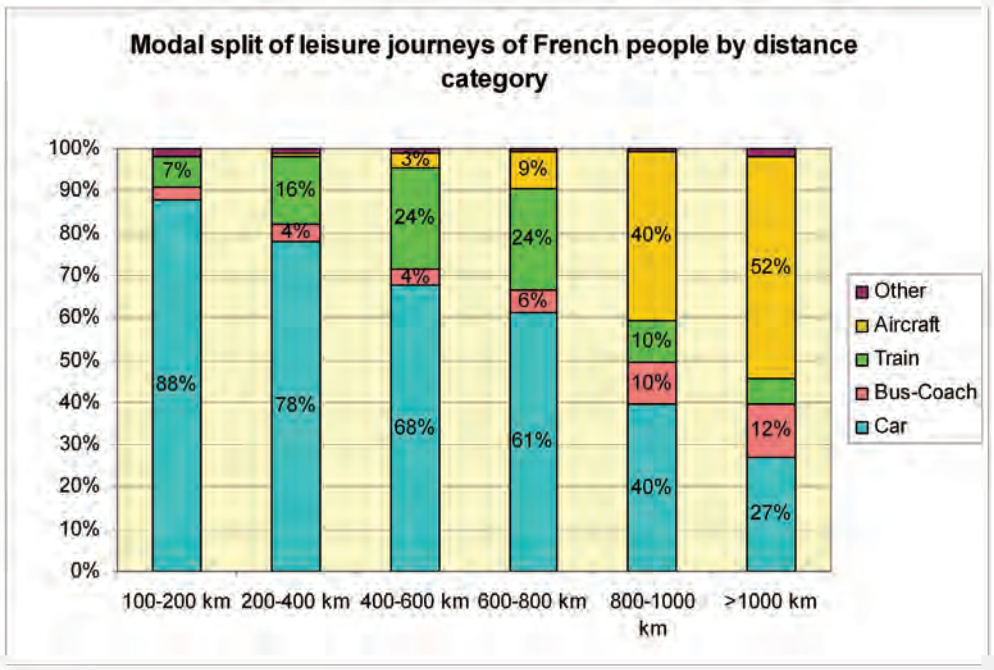


***Figure 2-11**. Modal split of leisure journeys of French people by distance category (Source: **Dateline**)*

All these graphs therefore show the difference of behaviour between business and leisure passengers, and outline the fact that business travellers care about time much more than other travellers.

Travelled distance

Whether it is for business or leisure travel, about three journeys in four are realized at less than 400 km from home (Figure 8). Then, the percentage of journeys by distance category clearly decreases. Lastly, journeys above 1000 km represent 5 to 7 % of the long distance journeys made by European travellers. This graph therefore points out the preponderance of trips below 400 km, and also shows that business and leisure journeys are distributed in the same way.

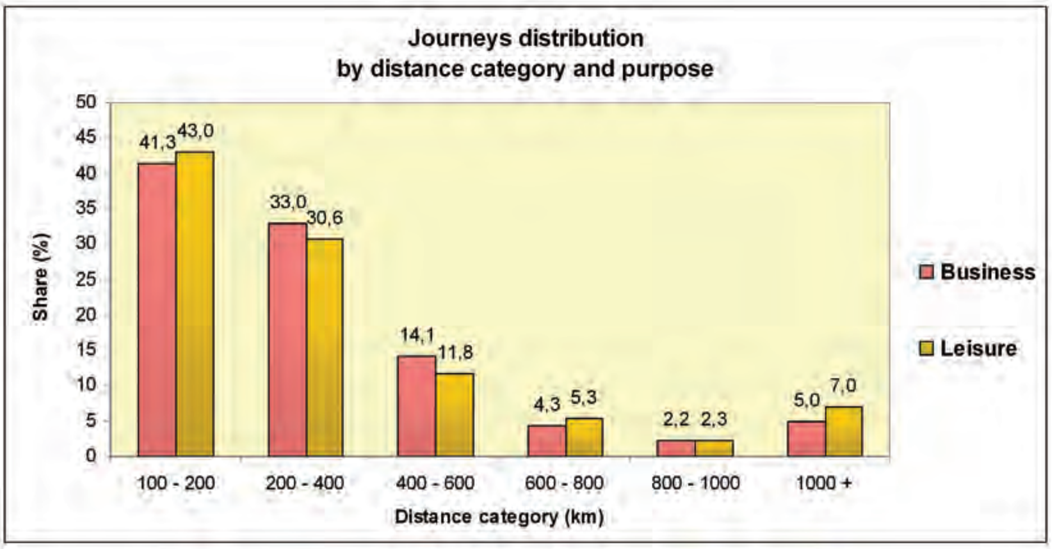


Figure 2-12. Journey distribution of European travellers by distance category and by purpose (Source: Dateline)

When comparing the French travelling behaviour with the European one we observe that French tend to travel less for leisure purposes between 100 and 200 km than Europeans while they travel more on the other distance categories (Figure 2-13). Conversely, French tend to travel more for business purposes on very short distances (100-200 Km) and less on longer distances than Europeans.

In addition, we can also note that the average distance of French trips has been increasing for more than 20 years: average distance of 346 km in 1982 and of 406 km in 1994. (Source INRETS Ref 16)

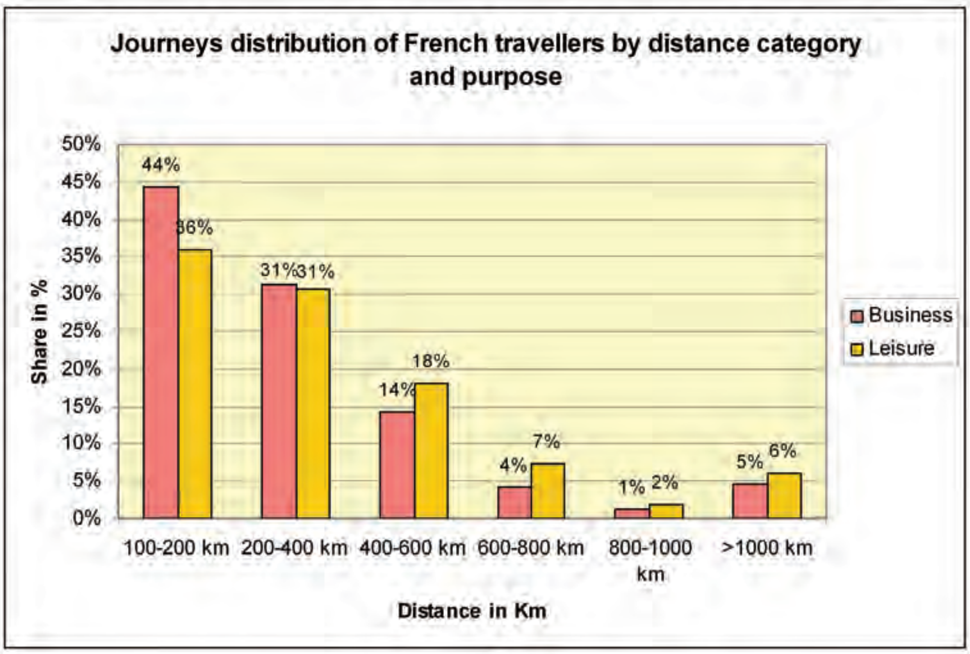


Figure 2-13. Journey distribution of French travellers by distance category and by purpose (Source: Dateline)

As the Europeans and the French ones, the distribution of the number of trips made by Polish decreases until 700 Km (Figure 2-14). The main difference comes from the lower share of trips between 100 and 200 km compared to the cases of France and Europe. Indeed they only represent 32% of the trips (as well for leisure as business purposes) while this share exceeds 40% for Europe.

Another particularity of Polish trips lies with the very low number of business trips made by Polish travellers.

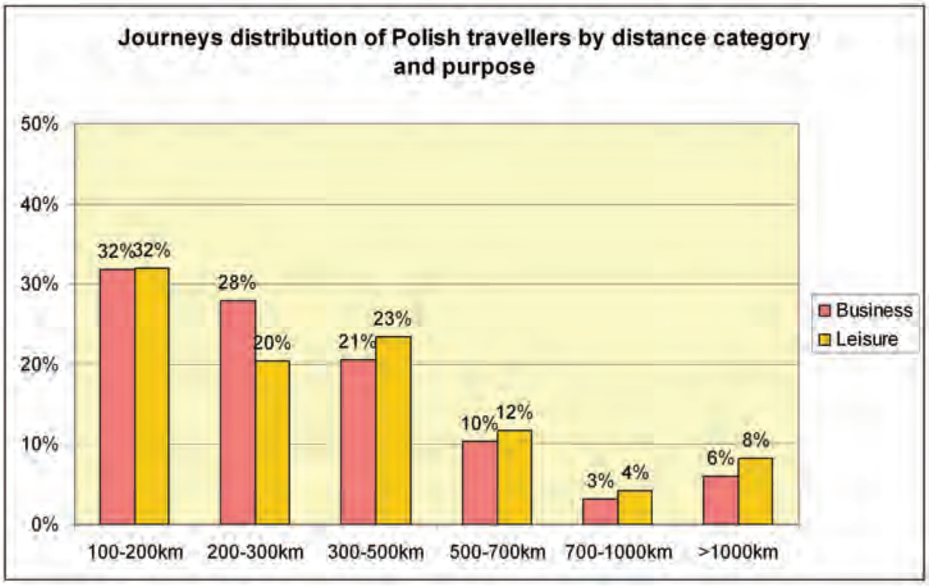


Figure 2-14. Journeys distribution of Polish travellers by distance category and purpose (Source Buczak Ref 1)

Travel Duration

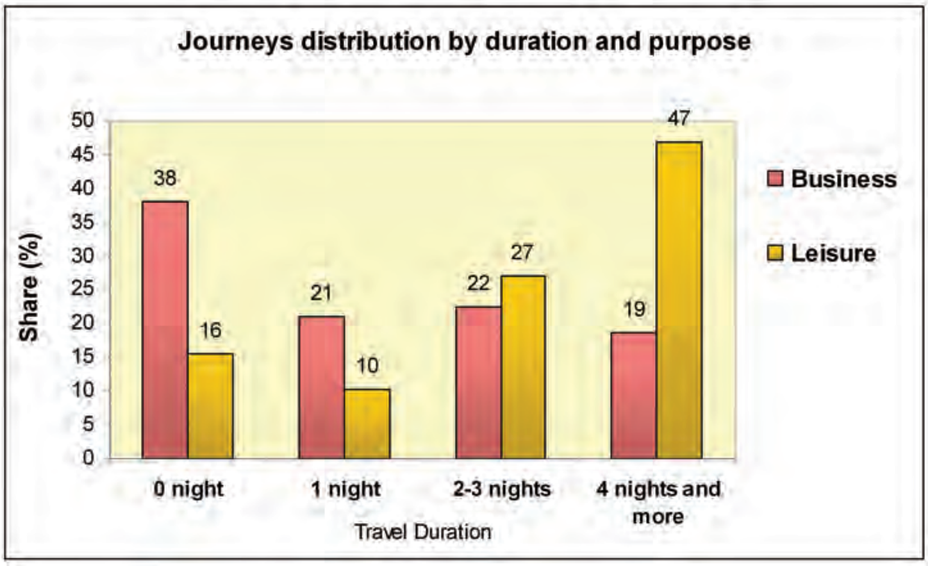


Figure 2-15. Journey distribution by duration and by purpose (Source: Dateline)

Figure 2-15 shows that journeys distributions by duration evolve in opposite direction according to the journey purpose: businessmen prefer journeys with short duration, and more particularly journeys undertaken in the day (38 % of all journeys). Conversely, leisure travellers realize only 16 % of journeys in the day, and even less journeys with only one night. They like long trips better. Besides, they especially enjoy travels with a duration of at least 4 nights: almost one leisure journey in two lasts 4 nights or more. This trend in the distribution of journeys according to the duration is similar in 2001 for French travellers (source DATELINE) than for European ones. However, the duration of leisure travels (lasting at least one night) tends to decrease for a few years (Cf. Annex 1). Moreover, the number of long trips (> 3 nights) in 2005 has considerably fallen in respect to 2004: - 3.1 %, while short trips have decreased by 1.9 % (Cf. Annex 1).

This distribution is easily understandable when referring to the different purposes of leisure journeys: Figure 2-16 outlines the importance of Holiday journeys (= journeys undertaken for the purpose of a holiday and including at least four overnight stays). They represent 41 % of all leisure journeys:

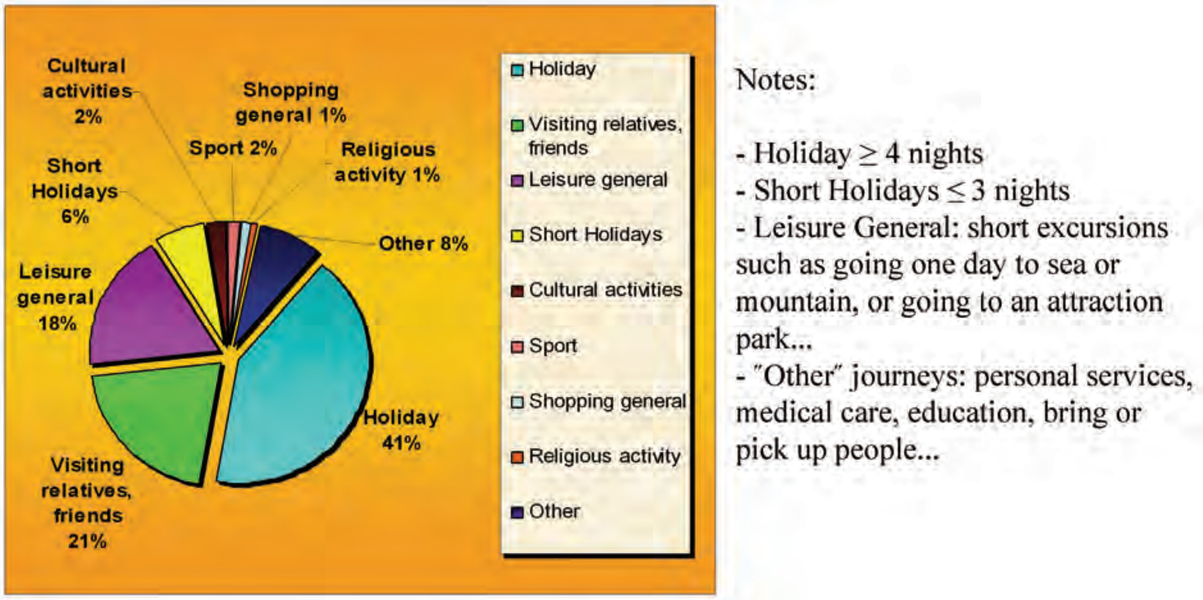


Figure 2-16. Leisure journeys distribution by purpose (Source: Dateline)

Two other purposes also stand out: visiting friends or family (21%) and general leisure (18%).

Average number of co-travellers per journey

Little information on the number of persons travelling together is available. A European study (Ref 10) relative to the features of long-distance travel only provides such information for some European countries in 1999. This study shows large differences from one country to another. For instance Danish people, who are relatively autonomous and independent, travel alone in 40% of the cases. Conversely, Spanish and Austrian prefer travelling in groups of at least 3 people. (source European Commission Ref 10).

Share of journeys abroad

According to Dateline, among the leisure journeys, 24 % take place abroad. However, this share differs noticeably between European countries, as shown in Table 2-3:

Table 2-3. Share of long distance journeys abroad in European countries (Source: Dateline)

Home country	AU	**BE**	DA	EI	FI	**FR**	GM	**GR**	IT	**LU**	NL	PO	**SP**	SW	**SZ**	UK
Share of journeys abroad	41,7	**70,8**	43,2	50,1	16,9	**13,0**	35,8	**6,2**	21,1	**100,0**	50,9	12,4	**7,6**	26,6	**57,8**	29,4

Note: The countries with the highest rate of journeys abroad are stressed in red, whereas journeys with the lowest rate are in blue.

The smallest countries (Luxembourg, Belgium and Switzerland) appear as the countries the most mobile abroad. Conversely, in the largest countries such as Spain, Greece or France citizens prefer staying in their home country and undertake few trips to foreign countries. This is mainly due to two factors: the size of the country and its diversity (sea, mountains, etc.).

2.3. Conclusion on the European mobility overview

Beside highlighting the strong global traffic increase over the past decades (especially in air transportation) and the preponderant share of long-distance trips (>100 Km) that represent 70% of the total European traffic, the overview of the European mobility also particularly stresses the differences in the characteristics of these long-distance trips according to the trip purpose.

The analysis indeed shows that leisure and business trips only present similarities in terms of journey distribution according to the traveled distance. As well for leisure as business purposes, around 74% of the trips are made between 100 and 400 Km.

The other trip characteristics are generally significantly different according to the leisure or business purpose:

- If the use of the air transport mode always increases with the travelled distance, the boundary distance from which the air transport market share exceeds 50% is significantly lower in case of leisure trip. This boundary is indeed 600 Km for business trips and 1000 Km for leisure trips.
- The trip duration is often shorter for business purposes. For instance the share of trips with at least 4 nights duration is 2.5 times higher in the case of leisure trips.
- Both trip purposes also significantly differ in terms of the age of the travellers since the share of travellers over 65 and below 25 is 3.5 times higher when the people travel for leisure purposes.
- The gender distribution also varies a lot between trip purpose since male travellers represent 76% of business travellers vs. 57% of leisure travellers.

The characteristics of the long-distance trips made by French people are very close to the general European characteristics. The main differences concern the modal split:

- the larger use of road transport mode on distance exceeding 1000 Km by French than by European travellers
- the larger use of the rail transport mode than European due to the important French high-speed rail network.

Comparisons between Europe and Poland appear to be very difficult to make due to the lack of data on the features of the Polish mobility. The analysis however manages to show the very low market share of air transport in Poland since only 1% of Polish travellers use this transport mode. In addition trips for business purposes only represent 1% of the total trips made by Polish travellers.

More generally, detailed data on long-distance trips made to and from all the 27 European countries is lacking**.** This lack of data is therefore an incontrovertible obstacle to the realisation of a total mobility analysis at a EU27 level.

3. MAIN FACTORS INFLUENCING MOBILITY

As we showed in section 2, the mobility features can change a lot according to countries, trip purpose, etc. More generally speaking the mobility is driven by numerous determinants that can be sorted into three categories**:**

- The demographic determinants: what are the characteristics of the traveller, in term of age, gender, occupation, localization,.. ?
- The socio economic determinants: GDP, households level of income, etc.
- The transport supply = what is proposed to the traveller: infrastructure / service (price, speed, quality, etc.)…

3.1. Demographic determinants

The goal is to identify and analyse demographic and socio-economic determinants by leaning on the observations at a micro level. Thus, three main factors, Demography, Economy and

Localisation, are investigated thanks to the study of the travellers' characteristics. In this section, we mainly base on the French surveys and we principally use as mobility indicators the departure rate, the number of journeys per year and the duration of the travel, by population group. These indicators are shown in Annex 2. Leisure travel is overall concerned.

The demographic growth is naturally a factor of mobility. In the future, the demographic growth is expected to be much lower than in the past. Thus, there is reason to believe that it will generate a slowdown of the transport demand growth. The features themselves of the demography are also important.

3.1.1. Gender

When considering EU 15 we observe a significant difference in travelling volume between genders since 60% of the total journeys are made by men. Moreover this share tends to stay constant whatever the considered distance class.

Nevertheless, behaviours are different in France, since the traffic volume is equally distributed between men and women, i.e. women tend to make the same yearly number of long-distance trips as men.

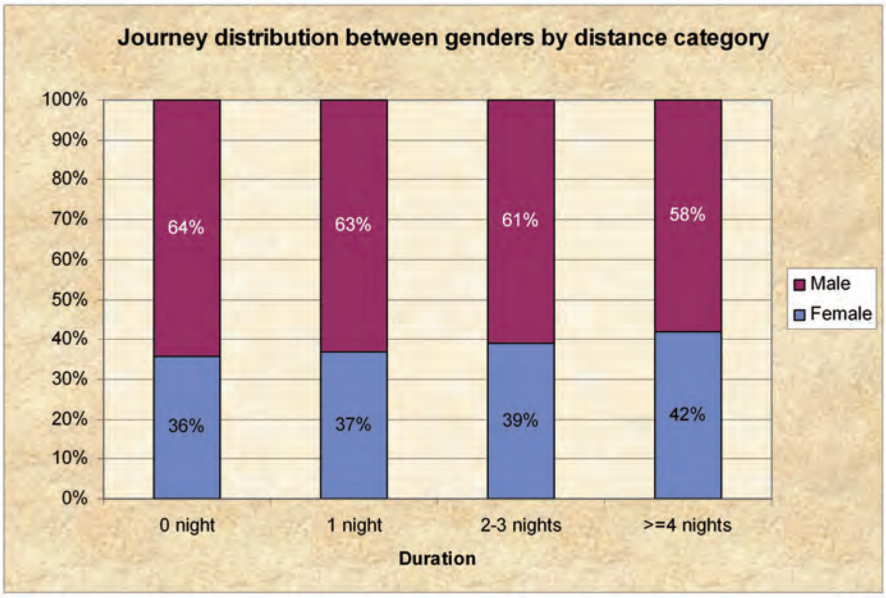


Figure 3-1. Journey distribution between genders by journey duration (Source Dateline)

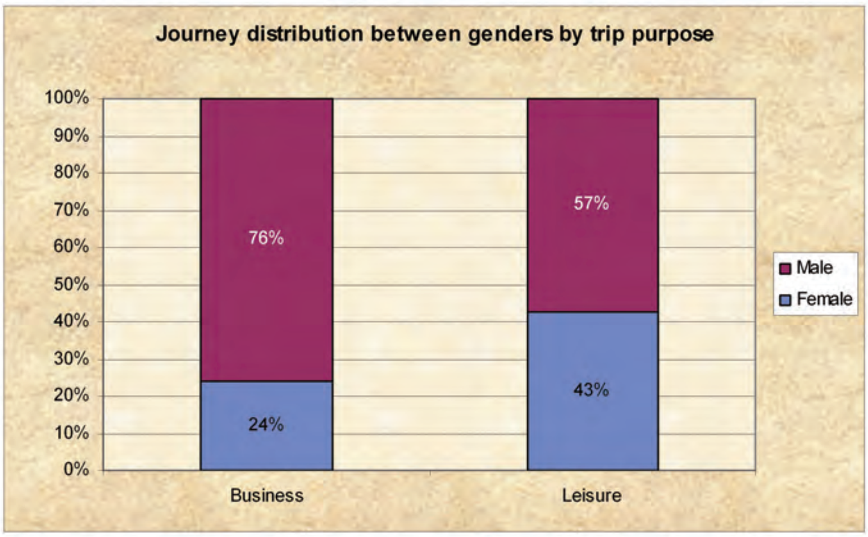


Figure 3-2. Journey distribution between genders by journey purpose (Source Dateline)

The higher number of journeys made by male travellers in EU 15 is also confirmed when differentiating the journeys according to their duration. The share of female travellers indeed increases with the journey duration (Figure 3-1). This trend is particularly marked for French travellers since while only around 40% of the journeys undertaken in the day or journeys with one night are made by women, this percentage is around 50% for other journey durations. This lower share of short duration journeys made by women can be mainly explained by the significant lower share of women travelling for leisure purposes compared to men (Figure 3-2), since we already showed that business trips often have short durations.

3.1.2. Age

When basing the analysis on the Dateline database we clearly observe that most mobile European people are between 25 and 64 years old. These travellers indeed make 93% of the business journeys and 76% of the leisure journeys.

This trend is confirmed in France by an INRETS study (Ref 15) comparing the holiday departure rates of French people. Young people (less than 30) and people aged 70 and over have the lowest departure rates. In addition, the number of long distance journeys and the travel duration is growing with the age, with exception of the group "70 and over ". The high level of mobility of the 60 – 70 group is not surprising: it corresponds to the advancement of the retirement age. These people have no occupation and their good health enables them to move. , the number of long distance journeys and the travel duration is growing with the age, with exception of the group "70 and over ". The high level of mobility of the 60 – 70 group is not surprising: it corresponds to the advancement of the retirement age. These people have no occupation and their good health enables them to move.

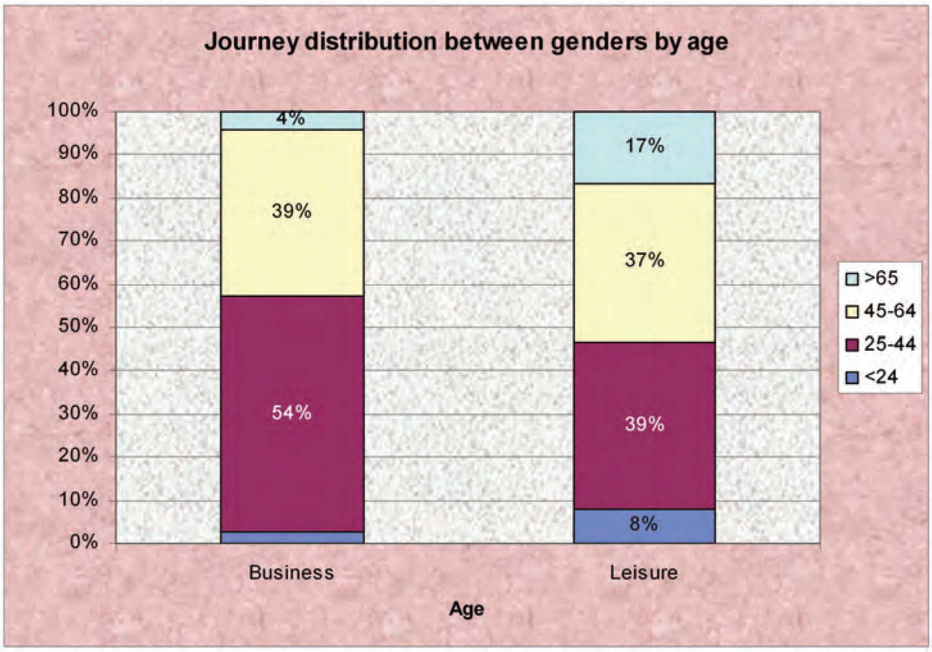


Figure 3-3. Distribution of the journeys according to the age of European travellers (Source Dateline)

3.2. Socio-economic determinants

Mobility growth is strongly linked to GDP growth, but for a few years, decoupling between both growths tends to appear, as shown in Figure 3-4. Decoupling corresponds to the difference between GDP and passenger transport growth.

However, this decoupling has not exceeded 0.5% per year. Much more data would therefore be needed to approve this trend. For some countries for example in Poland, the increase in passenger transport may be higher than GDP growth.

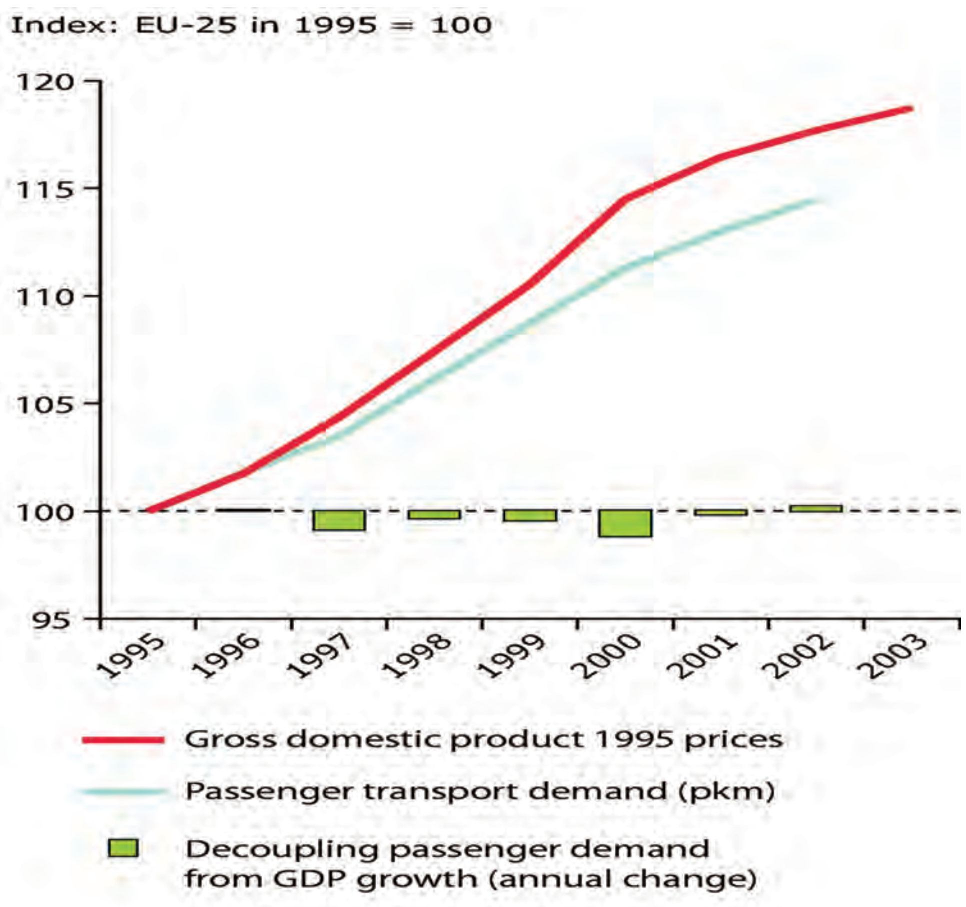


Figure 3-4. GDP and passenger transport growth
(*Source: Eurostat and DG TREN, European Commission*)

At a "micro" scale, the impact of economy on mobility is illustrated by the behaviour of people according to their type of occupation and to their income of course (cf. Annex 2)

3.2.1. Occupation

The fact of having an occupation supports mobility: 80 % of working people realizes leisure journeys, whereas only 65 % of people that have never worked participate each year to leisure journeys.

The category of occupation is also a determining factor. Managers and intellectual professions are the most mobile categories, with a rate of departure comprising between 87 and 93 %. The income and the cultural level indeed favour the need and the capacity to travel. But some constraints linked to the type of occupation (farmer, craftsmen, owner of a shop) also explain the fact that some categories can not travel as they want.

Lastly, we can notice that the employed in the public sector travel more than in the private sector. It results partially from the higher number of free days in public sector.

3.2.2. Location

The home location is also an important factor in the transport demand. Indeed, the level of mobility (departure, frequency) increases with the size of the agglomeration. Several reasons for this phenomenon: firstly, big cities represent stress, pollution, proximity, etc. People living all the year in city need generally to rest in quieter places (sea, mountain, countryside…). It also corresponds to a need of nature. Secondly, the transport system is more developed in and around the cities than in the countryside: airports are closer; High-Speed Train connects easily large cities, whereas small cities have only traditional trains. Thirdly, we can assume a higher level of income in big cities, which could as well justify their higher mobility.

3.2.3. Income

Mobility grows with the level of income: travel (journeys + accommodation) are expensive, thus money is an important parameter in the choice to realize a travel.

Departure Rate in France (INRETS Ref 15) show that the 34 % of the richest of the population undertake 50 % of the journeys.

Hence, one of the main determinants influencing transport mode choice while planning a journey is the level of wealth and individual income of travelers. The value of time, comfort needs and accommodation costs depend on this basis. These factors, expressed in monetary units, play important role in travel costs calculation, and their level depends, also, on chosen mode. His or her low income and low value of time determines a traveler for rational choice of less expensive mode, that cruises at lower speeds. The more one earns the faster and the more expensive vehicle is more advantageous solution. Staying aligned with these rules, the income distribution should be known when planning a transportation system. The more detailed information, the greater possibility to satisfy the needs.

Table 3-1. European average gross wages. [Source: UNECE]

	Indicator name:	GDP per capita	Population	Acitive population	Work activity	Monthly gross wage	Yearly average gross wage
	Unit:	US$ PPP	in millions			US$ currrent exchange rate	US$ current exchange rate
	Source:	UNEC for Europe	[GDP / GDP per capita]	UNEC for Europe, but missing values are the European average	[Active population / Population]	UNEC for Europe	[Monthly gross wage * 12], but for *USA, AT and IE - *OECD 2004 data*
	Year	2000	2000	2000	2000	2000	2000*
0	EU-27		482,42	205,81			
1	BE	26 653	10,25	4,09	0,40	2 430	29 154
2	CZ	14 812	10,27	4,64	0,45	353	4 232
3	DK	28 818	5,34	*2,33*		3 145	37 739
4	DE	25 553	82,19	*35,94*		2 865	34 382
5	EE	9 622	1,37	0,57	0,42	289	3 470
6	EL	16 635	10,92	3,95	0,36	1 130	13 562
7	ES	21 079	40,26	*17,61*		1 338	16 061
8	FR	25 927	60,71	23,42	0,39	2 051	24 611
9	IE	28 844	3,80	1,50	0,39		*34 250*
10	IT	25 880	56,94	*24,90*		1 535	18 418
11	CY	18 811	0,69	0,30	0,43	1 254	15 049
12	LV	8 078	2,37	0,95	0,40	247	2 958
13	LT	8 678	3,50	1,52	0,43	243	2 912
14	LU	50 727	0,44	*0,19*		2 754	33 053
15	HU	12 431	10,12	*4,43*		311	3 727
16	MT	17 864	0,39	*0,17*		964	11 566
17	NL	28 377	15,92	*6,96*		2 449	29 390
18	AT	28 714	8,01	3,78	0,47		*31 307*
19	PL	10 676	38,26	14,53	0,38	436	5 228
20	PT	18 372	10,23	*4,47*		969	11 627
21	SI	14 321	1,99	0,77	0,39	861	10 330
22	SK	10 836	5,40	2,00	0,37	248	2 980
23	FI	26 087	5,18	2,33	0,45	2 104	25 243
24	SE	27 175	8,87	3,73	0,42	2 428	29 132
25	UK	25 729	58,89	27,83	0,47	2 893	34 712
26	BG	6 250	8,00	2,86	0,36	112	1 345
27	HR	9 338	4,38	1,57	0,36	588	7 060
28	RO	5 762	22,12	10,06	0,45	131	1 570
30	IS	29 177	0,28	*0,12*		2 890	34 678
31	NO	36 573	4,49	2,27	0,50	2 779	33 353
32	CH	30 361	7,21	*3,15*		3 354	40 246
	EU27+HR+3		498,79	212,92			
	average EU+				0,44		
	US	34 759	282,43	135,21	0,48		*34 934*

"EU+" means all countries providing data concerning active population except for the USA

Available data

The internet data search for European detailed income information revealed that the United Nations Economic Commission for Europe[2] is the only free of charge, income data provider. The data is quite old (year 2000) and considers means of gross monthly wages[3]. Some of the information had to be extracted form other sources to fill the UNECE data list gaps[4].

The outcome distribution approximations

When calculations of all distributions for each countries are done using exponential function and Pareto power law theory, the average European gross wage distribution is compared to the one of the USA. The results, shown below on Figure 3-5 , indicate that the USA has more population earning higher wages than the average of 27 Member States of European Union, but it may be caused by different year of the EU and the US income data (2000 and 2004) The estimated distributions approximations are taken in consideration for further works.

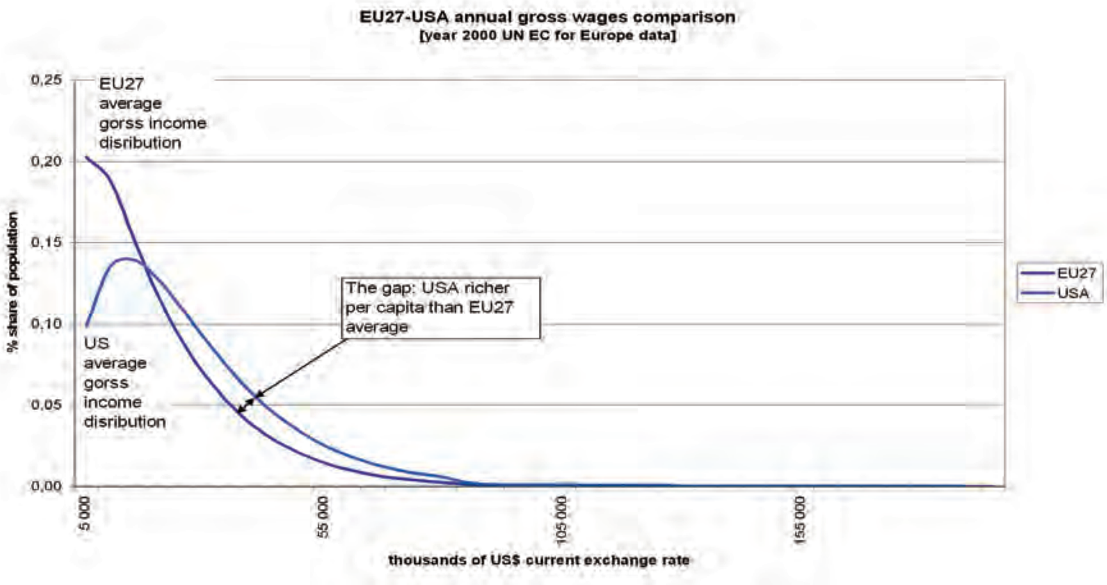


Figure 3-5*: *Comparison of EU27 and USA gross wages distributions using exponential function and Pareto power law theory.

2 http://w3.unece.org/pxweb/DATABASE/STAT/2-ME/3-MELF/3-MELF.asp

Wages and salaries are defined as the total remuneration, in cash or in kind, payable to all persons counted on the payroll, in return for work done during the accounting period. In the ECESDB the data refer to Average monthly gross wage. Average monthly gross wage covers all earned incomes (basic wages and salaries, payments additional to wage or salary, direct remuneration and bonuses, payments for days not worked, remuneration for being on call to work, and other wage or salary components) all charged to be paid to employees for the related period. The data are based usually on a sample surveys - monthly, quarterly and annual. Information on compilation methods and practices in individual countries can be found in the IMFs Special Data Dissemination Standards (SDDS) available on the Internet at http://dsbb.imf.org/Applications/web/sddshome/ (IMFs Special Data Dissemination Standards (SDDS)).

3 Gross Average Monthly Wages for: Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom are derived by dividing Average Gross Annual Earnings in Industry and Services (Of full-time employees in enterprises with 10 or more employees) by 12.

Gross earnings are remuneration (wages and salaries) in cash paid directly to the employee, before any deductions for income tax and social security contributions paid by the employee. Data is presented for full-time employees in industry and services.

4 OECD, Economic Outlook No 77, June 2005 and Taxing Wages (2004).

3.3. Transport infrastructure in Europe

The transport infrastructure is an essential parameter in mobility for several reasons: firstly it impacts on the decision to travel or not (the phase of generation is directly concerned). Secondly, supply has effects on the choice of the transport mode (i.e. on the phase of modal split).

The existence and development of such infrastructure are strongly linked with transport policies. That is why it is particularly interesting to deal with such European policies when focusing on transport infrastructure.

3.3.1. Transport policy objectives

The European transport policy has developed considerably over the last fifteen years. The border opening allowed the free circulation of persons, and thus stimulated the passenger's transport growth within Europe. This development of mobility went hand in hand with an improvement of transport systems: advancements with regards to security, passenger's rights and facilities have been performed. But this strong growth has its limits and impacts negatively on pollution, congestion and accidents. The goal of the EU's common transport policy is therefore to develop transport systems that meet with a triple challenge: a economic, social and environmental challenge. More precisely, the European transport policy aims at providing users transport systems with the following features:

- Efficient and effective
- Affordable
- Offering high quality: more security, safety, facilities, comfort, less congestion
- Consolidating passenger's rights

These transport systems should ensure a high level of mobility within European Union while taking into account environmental matters such as pollution, accidents, congestion, in other words the negative effects of transport. To summarize, a sustainable mobility is needed. Adopted by the European Commission in 2001, the White Paper "European transport policy for 2010: time to decide" develops these objectives and identifies the main problems relatives to transport development. It then proposes policies to confront these difficulties.

"The White Paper offers a dynamic plan of action to achieve a better balance of transport modes which will ease bottlenecks and congestion, and reduce pollution."

How to take up such a challenge ?

- Many infrastructure projects, called the trans-European transport networks (TENs) have been launched for around ten years. They enable time-saving, reduction of pollution and a balanced approach to land settlement. Even though considerable progresses have been made in the network advancement, it remains plenty to do if we want to finish the realization of all the European corridors by 2020.
- Research and Technological innovations must be much more developed in order to make transport more environmentally friendly. They should optimize each mode's own potential and limit their negative side-effects. Galileo is an example of innovation programmes led by the European Union, in line with the transport white paper's objectives. Furthermore, research in engine technology must be carried on so as to make the engine more efficient and more economical in energy. The use of alternative energy source has to be strengthened.
- The modal transfer to transport modes less polluting (particularly for long distance and urban trips) must be enhanced in order to balance better the transport modes.
- Co-modality, i.e. the efficient and optimal combination of transport mode will also help to perform the objectives set by the white paper.
- Lastly, measures and standards must be set in order to make movements safer and to fight against pollution as well. France often plays a role in the setting up of these standards;

Evolving context

The objectives of the European transport policy remain unchanged, nevertheless the general context has evolved, notably between 2001 and 2007**:**

- The European Union has enlarged: the UE is gone from 15 to 27 countries in 2007. Such an enlargement has important consequences on the network framework. New axes have appeared. In addition, the new member countries have priorities that totally differ from EU15's whereas the states of EU 15 focus on problems of pollution, congestion or land use, the main concern of the new member is to improve their accessibility.
- The issue of environment has become a priority: during the last years, environmental pressure applied on the governments have been intensified in order to show that environment has to be taken into account. Indeed, transport is the sector that increased the most its CO2 emissions between 1990 and 2004: + 29 %. The share of transport in CO2 emission accounted for 21 % in 1990 to reach 26 % in 2004 (84 % come from road). Conversely, sectors such as industry, household and services, have seen their share in CO2 emission decreasing (Source: Eurostat).
- The international context has evolved: the terrorism threat has intensified and is now a priority in the transport: as a result of the 11th of September, many measures have been taken, especially in airports (for example, the new law in Europe relative to liquid products).

The transport policy impacts directly on the supply, and the supply itself conditions the transport demand.

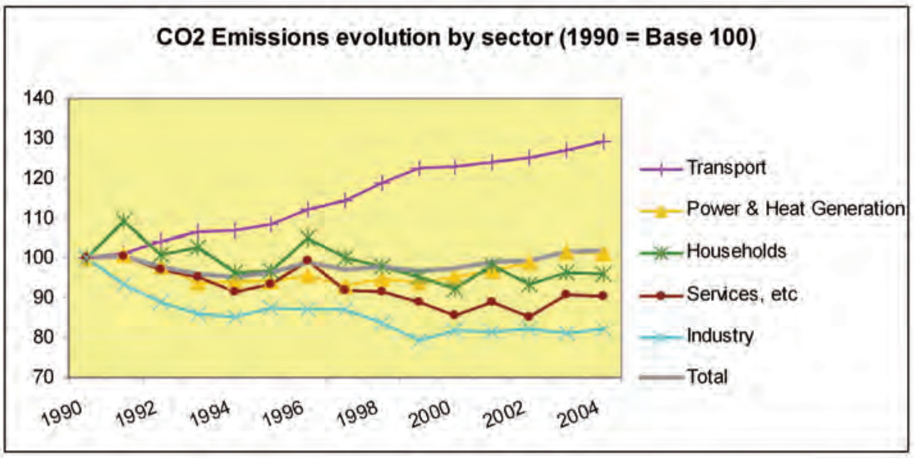


Figure 3-6*: *Comparison of CO2 evolutions by sector
(Source*: *Ref 12)

3.3.2. Infrastructure

Infrastructure development played an important role in the past growth of mobility, and should continue in this way.

During the last half century, the development of transport systems was mainly profitable to fast networks**:**

- The length of motorways in EU15 has more than tripled, as shown in Figure 3-7 it went from 16 000 km in 1970 to 55 700 km in 2004. This development combined to the growing motorization of households explains the predominance of car over the other modes.
- Although the length of railways decreased during this period (-15 % in 35 years as shown is figure 11), the high speed rail network appeared in 1981 has strongly developed: high-speed lines reach now 4 800 km. The high speed rail network is expected to increase in size: between 2007 and 2009 12 lines have to be constructed.
- The number of airports has considerably grown since 1960 (source: Ref 11).

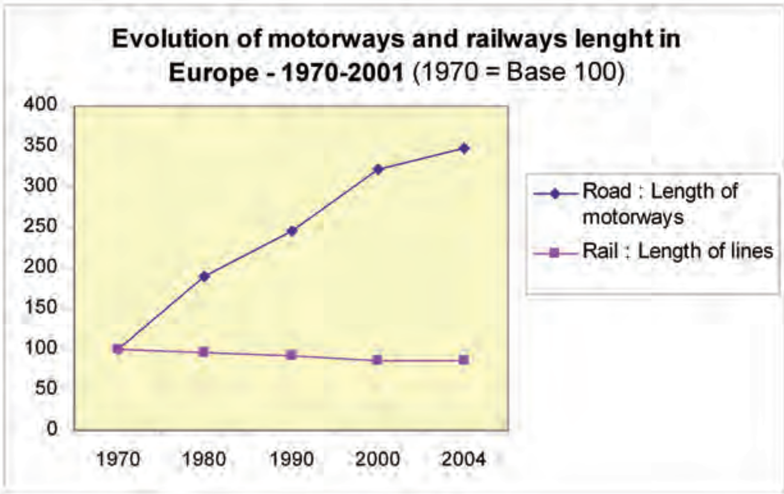


Figure 3-7: Evolution of motorways and railways length between 1970 and 2001 in Europe (Source: Ref 10)

3.4. Conclusion on the mobility determinants

Although we observe links between the mobility evolution and features and some economical, demographic and infrastructure factors, the previous analysis is not able to quantitavely measure these links. This is mainly due to the lack of detailed data on the European mobility features and evolution. A deeper analysis of the mobility determinants would then first of all require to get relevant data to estimate how the association of some identified factors can impact the level and the charcateristics of the European traffic.

4. MOBILITY IN AREAS WHERE EPATS IS RELEVANT

EPATS aims at opening up some European regions by providing a new way of travelling in areas badly served by air transport and not connected to the high-speed train network. Evaluating the mobility level in areas where EPATS would operate requires:

- Identifying the potential connections on which EPATS would operate
- Evaluating and analyzing the traffic levels on these potential EPATS connections

4.1. EPATS potential connections

If a bad level of accessibility can be considered as an essential feature of the potential EPATS connections this element is not sufficient to identify these connections. Indeed, thanks to the implementation of interactive transportation system EPATS would be pertinent on all connection where there is a need of individual transport.

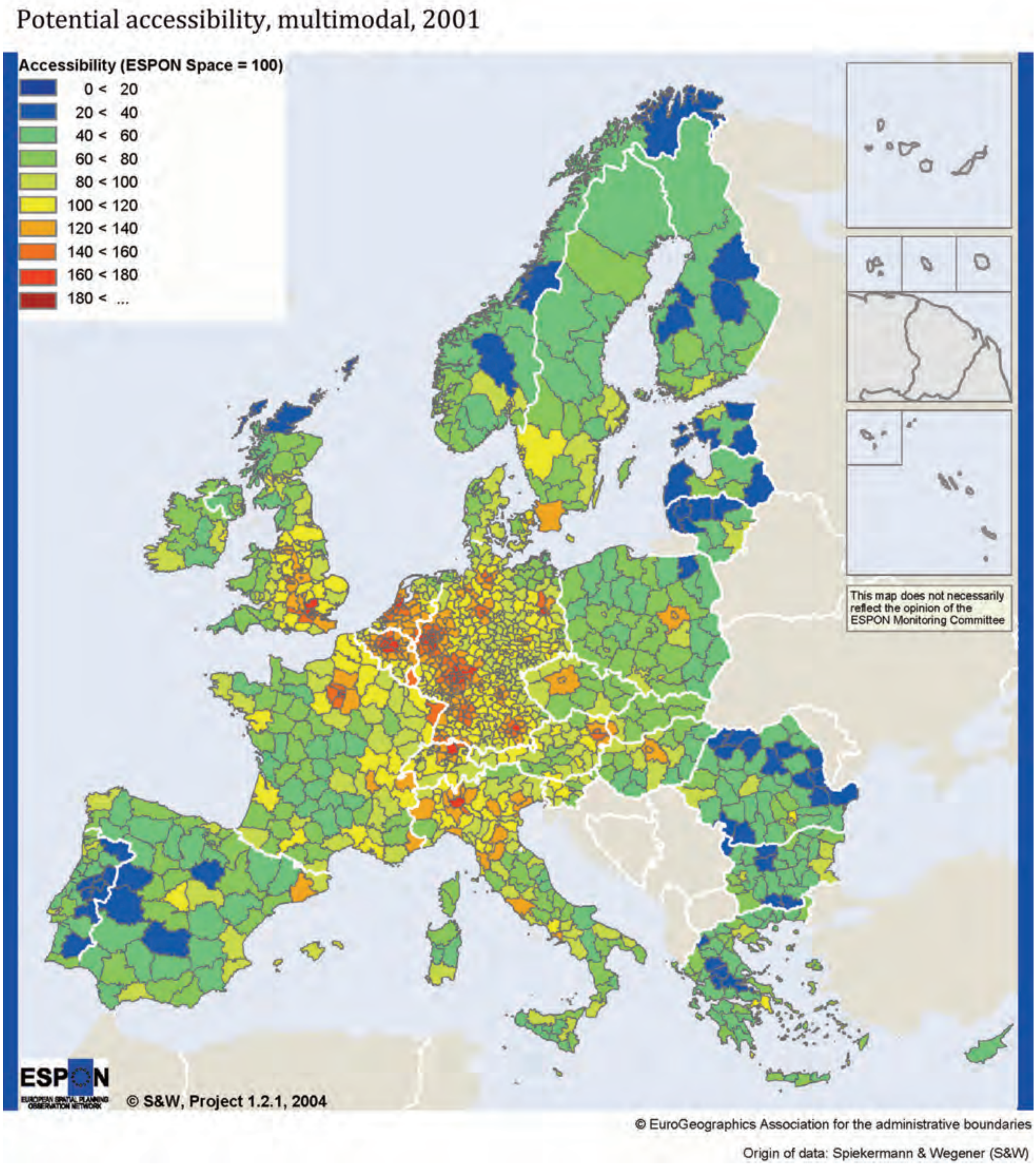
The ESPON project provides accessibility indicators that describe the location of an area with respect to opportunities, activities or assets existing in other areas and in the area itself, where “area” may be a region, a city or a corridor.

The multimodal potential accessibility indicator has been calculated in the ESPON project for all NUTS 3 regions of the EU (see map 4-1). Again, accessibility has been standardized to the average accessibility of the EU space. Regions colored in green have a below-average multimodal potential accessibility, regions in yellow and red an above average accessibility.

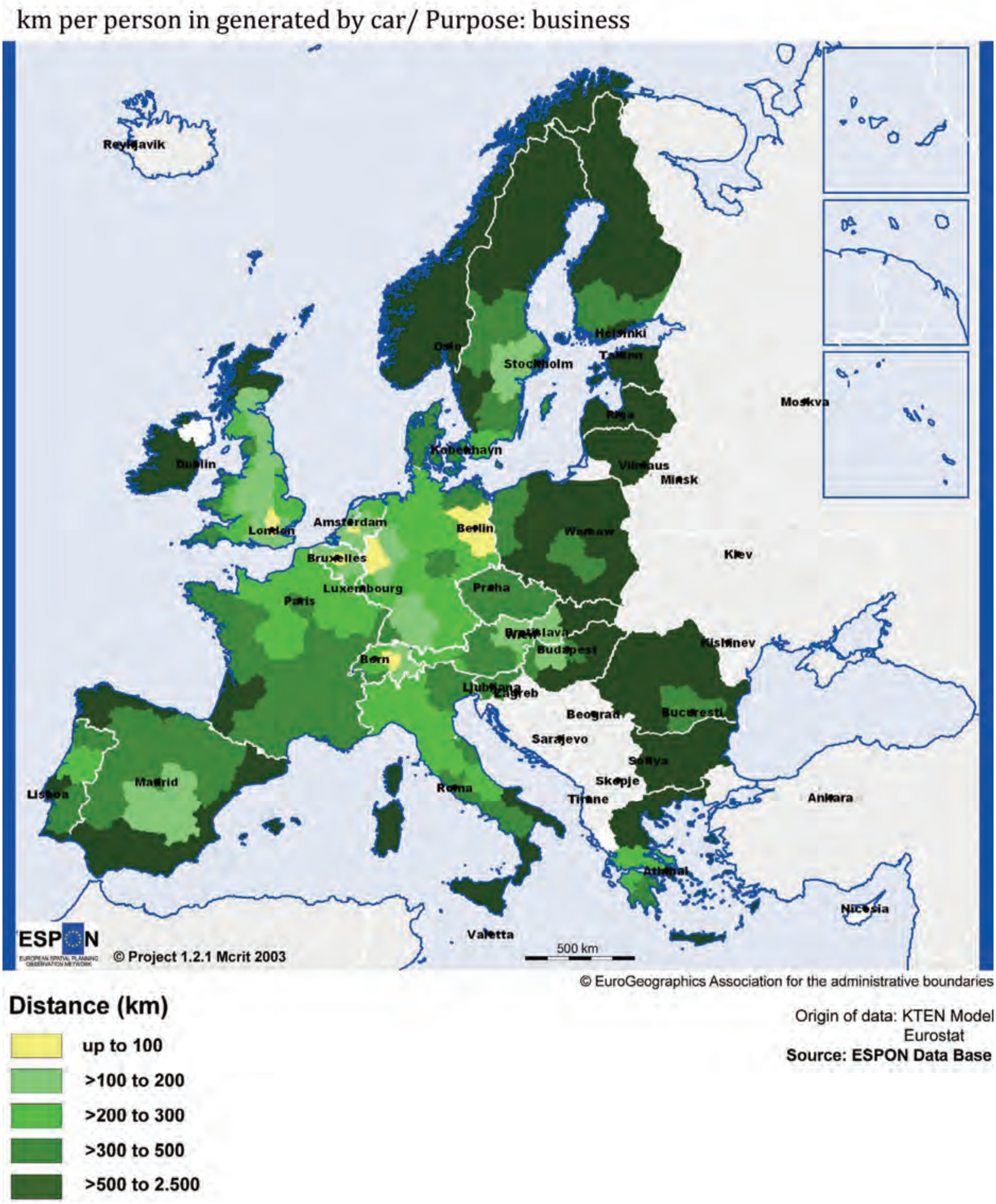
Several regions in Germany, Austria and France have below average accessibility values, some of them are even extremely peripheral. Many regions in Portugal, Spain, Ireland, Scotland, Wales, Norway, Sweden, Finland, Southern Italy and Greece have very low accessibility values. Those regions do not have good access to international flight services. Nearly all regions of the candidate countries do have below average accessibilities. The only exceptions are the capital cities and partly their surrounding regions because of international airports and important connections. For all other regions the combined effect of low quality surface transport infrastructure and lack of air accessibility leads to the low performance in terms of accessibility. In general, the enlargement of the European Union leads to a decrease in average accessibility.

The number of km per person per road by obligated (business) trips has been also calculated for all NUTS2 of the EU space. See map 4-2. Regions colored in dark greens are the ones corresponding to the periphery of the EU space, and so the distances to their destinations are generally higher than the ones the regions situated in the centre of this space.

As shown by comparison of maps 4-1 and 4-2 , where multimodal accessibility potential is small, the traffic is dominated by car. This area colored in dark green are the regions, where cars can be replaced by small aircraft and where there is greatest potential for EPATS development



Map 4-1. ESPON Multimodal potential accessibility 2001, [ESPON project 1.2.1,2001]



Map 4-2

According to ESPON project the potential accessibility is a construct of two functions, the activity function representing the activities or opportunities to be reached and the impedance function representing the effort, time, distance or cost needed to reach them (impedance function) (Wegener et al., 2002). For potential accessibility the two functions are combined multiplicatively, i.e. are weights to each other and both are necessary elements of accessibility:

$$A_i = \sum_j W_j^{\alpha} \exp(-\beta c_{ij})$$

where A_i is the accessibility of area *i*, W_j is the activity *W* to be reached in area *j*, and c_{ij} is the generalized cost of reaching area *j* from area *i*. Ai is the total of the activities reachable at *j* weighted by the ease of getting from *i* to *j*. The interpretation is that the greater the number of attractive destinations in areas j is and the more accessible areas j are from area i, the greater is the accessibility of area *i*. Occasionally the attraction term W_j is weighted by an exponent α greater than one to take account of agglomeration effects. The impedance function is nonlinear. Generally a negative exponential function is used in which a large parameter β indicates that nearby destinations are given greater weight than remote ones. The accessibility model used here (based on Spiekermann and Wegener, 1996) uses centroids of NUTS 3 regions as origins and destinations. The accessibility model calculates the minimum paths for the road network, i.e. minimum travel times between the centroids of the NUTS 3 regions. For each NUTS 3 region the value of the potential accessibility indicator is calculated by summing up the population in all other regions including those outside ESPON space weighted by the travel time to go there.

The aggregation over modes is introduced in the impedance function of the accessibility model by combining the information contained in the modal accessibility indicators by replacing the generalised cost c_{ij} by the 'composite' generalised cost

$$\bar{c}_{ij} = -\frac{1}{\lambda} \ln \sum_m \exp(-\lambda c_{ijm})$$

where c_{ijm} is the generalised cost of travel by mode m between *i* and *j* and λ is a parameter indicating the sensitivity to travel cost. This formulation of composite travel cost is superior to average travel cost because it makes sure that the removal of a mode with higher cost (i.e. closure of a rail line) does not result in a - false - reduction in aggregate travel cost.

Finally the folowing general formula is obtained:

$$A_i = \sum_j \left(f_1(Opportunities) * \sum_m f_2(c_{ijm}) \right)$$

The method developed to identify these EPATS potential connections is the following:

1. We compute the multimodal accessibility level of all European NUTS 2 connections by multiplying the accessibility level of both NUTS2 origin and NUTS2 destination given by ESPON
2. We keep NUTS 2 Origin_Destination (O_D) connections for which the multimodal accessibility level is below the average accessibility level in all European connections
3. We compute economical activity levels of each connections by multiplying the GDP levels of both NUTS2 O-D given by ESPON
4. We keep connections for which economical activity level exceeds the average value on all the considered connections or if the traffic flow exceeds the average traffic flow on the considered connections (assumption which requires future considerations and deeper analysis)
5. We finally keep connections with a distance less than 2500 km which is the maximum range of EPATS aircraft

This methodology is then applied on 28 countries: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Netherlands (NL), Norway (NO) Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), and United Kingdom (UK).

We then obtain that 15 223 connections among the 62 483 total NUTS 2 connections in all the 28 considered countries are EPATS potential connections. All together these potential connections represent 24% of the total existing NUTS 2 connections in Europe. Figure 4-1 presents the total EPATS potential connections between the 28 countries.

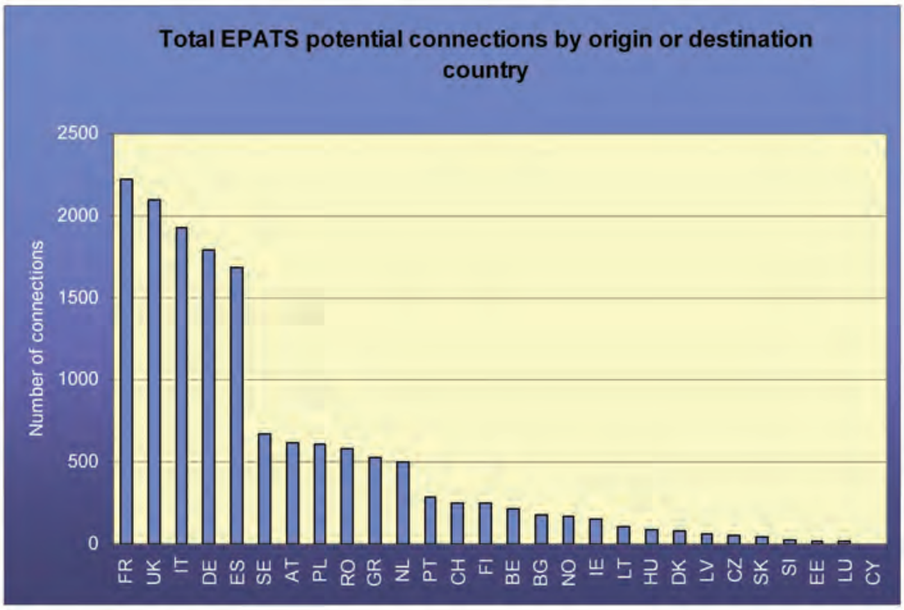


***Figure 4-1**: Total EPATS potential connections by origin or destination country*

Among all these identified potential connections 63% are made to or from 5 European countries: France, United Kingdom, Italy, Germany and Spain. With 2223 connections to or from French NUTS 2, France is the country concerned by the highest number of EPATS connections while Poland is in eighth position with 607 potential connections to or from Polish NUTS 2.

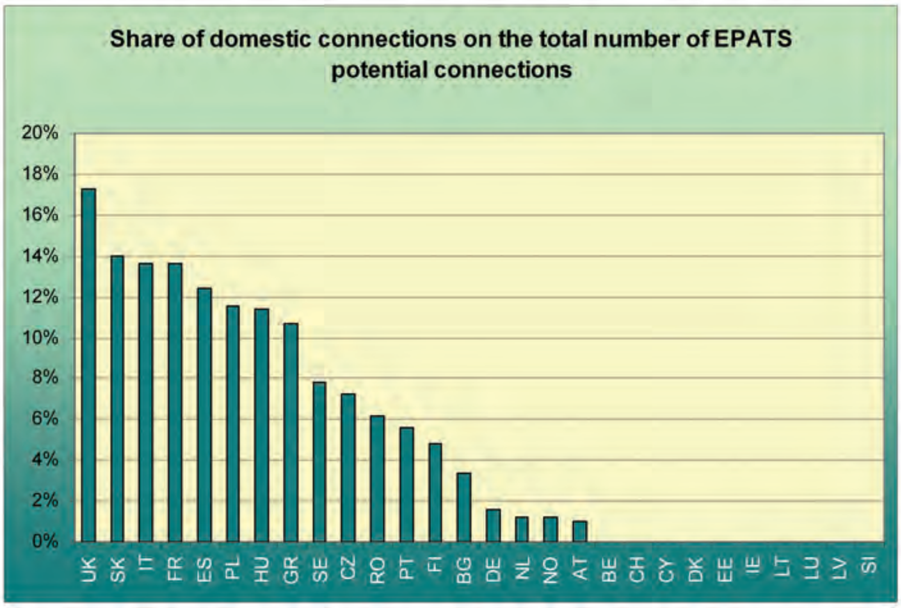


***Figure 4-2**: Share of domestic connections on the total number of EPATS potential connections*

Separating domestic and international connection we found that domestic connections do not represent more than 17% of the total EPATS potential connections (Figure 4-5). All together, domestic connections only represent 9% of the total EPATS connections. This means that most of the EPATS connections are made between two different countries. Figure 4-6 gives the number of other countries with which each country has potential EPATS connections. This figure shows that 16 among the 29 considered countries have connections with more than 17 other countries.

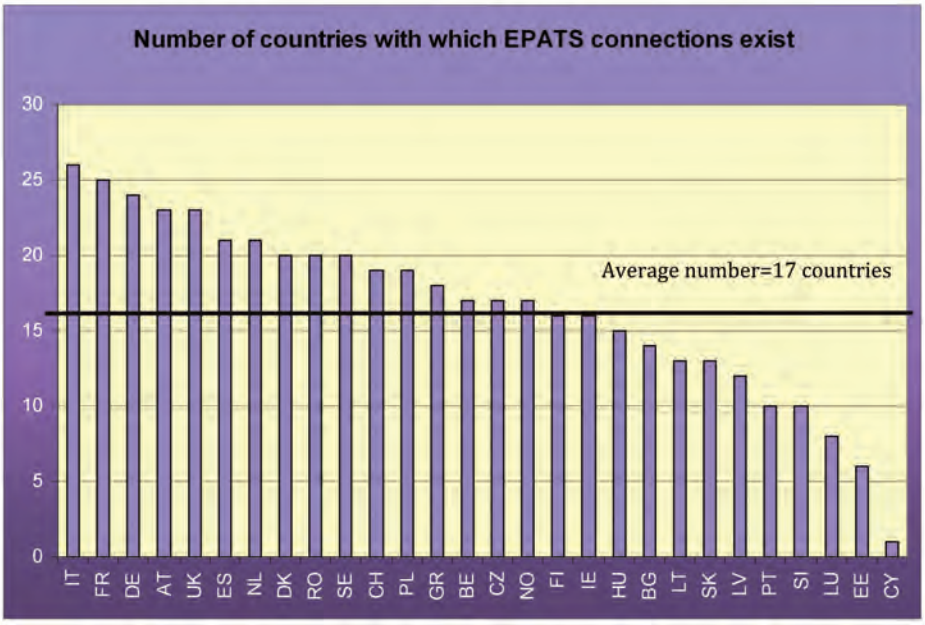


Figure 4-3*: *Number of other countries with which EPATS connections exist

4.2. Current traffic flows on EPATS connections

Existing traffic levels on the EPATS potential connections can be expressed in two different units: in number of passengers and in number of passenger-kilometers. Both units providing different information on the traffic features and levels it is particularly interesting to differentiate them in the mobility analysis. The current traffic levels on potential EPATS connections are in addition considered for two transport modes: individual road transport and air transport modes. Rail transport mode is indeed not pertinent on such connections with low accessibility levels (meaning bad connections with the rail and in particular high-speed rail network).

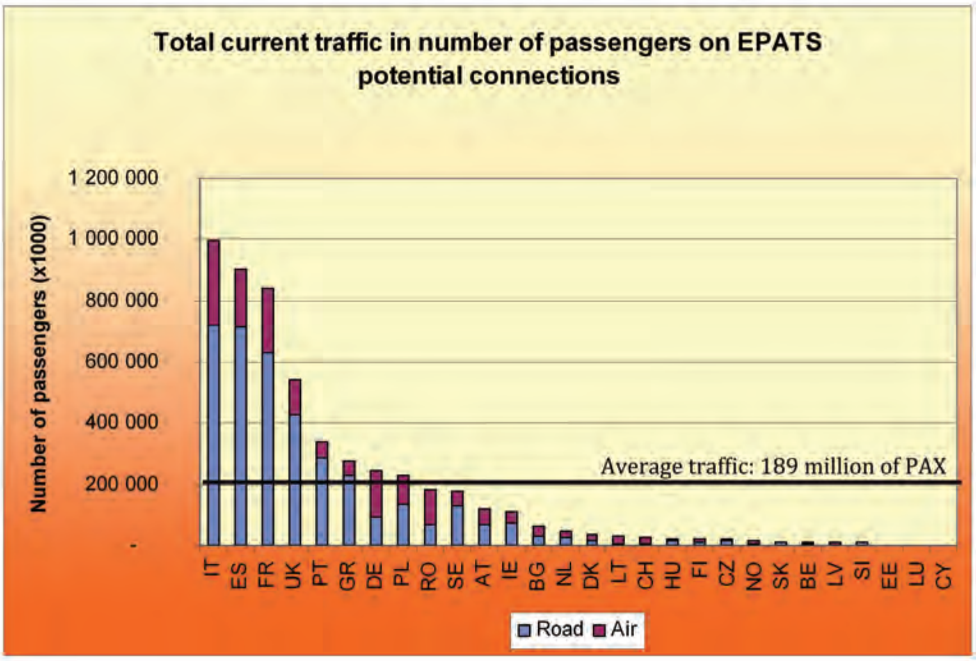


Figure 4-4*: *total current traffic in number of passengers on potential EPATS connections

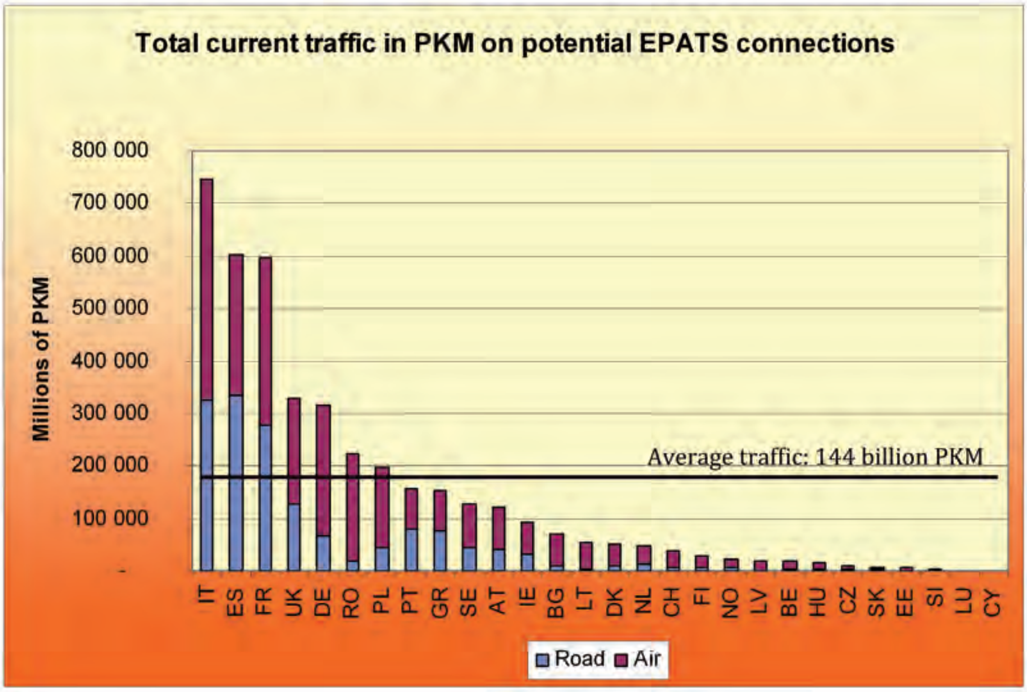


Figure 4-5*: *Total current traffic in PKM on potential EPATS connections

Using the results of research on interregional mobility in Europe, carried out in ESPON project (ref. 9) we calculate the traffic on EPATS connection. In total in 2000, the traffic on all the potential EPATS connections is 4 billion passengers and 2400 billion passenger kilometers.

The road traffic is predominant when being expressed in terms of number of passengers, since 79% of the total passengers traveling on potential EPATS connections travel by car. However the market share of road transport decreases dramatically in terms of passenger kilometers since it only represents 47% of the total PKM traffic. Air transport mode is indeed mainly used on connections for which the distance between NUTS2 exceeds 1000 Km. Indeed, on one hand connections with distances exceeding 1000 Km represent 79% of the total potential EPATS connections. On the other hand, the air transport market share is predominant on such connections since the number of air passengers exceeds the road one on 10 009 among the 11 989 connections with a distance exceeding 1000 Km (i.e. on 83% of the connections exceeding 1000 Km).

As well in terms of number of passengers as in PKM, the highest traffic levels are to and from Italy, Spain and France. These three countries also are the ones with the highest domestic traffic levels as well in terms of passengers as in terms of PKM.

4.3. Some remarks on mobility in areas with poor accessibility level

Regions considered in the context of EPATs are therefore many regions mainly marked by their low accessibility level, as written in the ESPON project (Ref 9): "multimodal potential accessibility (see map 4-1) locates regions with clearly above average accessibility mainly in an arc stretching from Liverpool and London via Paris, Lyon, the Benelux regions, along the Rhine in Germany to Northern Italy. However some agglomerations in more remote areas such as Madrid, Barcelona, Dublin, Glasgow, Copenhagen, Malmö, Göteborg, Oslo, Rome, Naples Thessalonica and Athens are also classified as being central or at least intermediate because their international airports improve their accessibility. At the same time the European periphery begins in regions that are usually considered as being central. Several regions in Germany, Austria and France have below average accessibility values, some of them are even extremely peripheral. Many regions in Portugal, Spain, Ireland, Scotland, Wales, Norway, Sweden, Finland, Southern Italy and Greece have very low accessibility values. These regions do not have good access to international flight services. Nearly all regions of the candidate countries do have below average accessibilities. The only exceptions are the capital cities and partly their surrounding regions because of international airports and important connections. For all other regions the combined effect of low quality surface transport infrastructure and lack of air accessibility leads to the low performance in terms of accessibility. In general, the enlargement of the European Union leads to a decrease in average accessibility. […]

For example, the mountainous areas like the Massif Central , the Alps in Austria or the Carpates have a low accessibility, by contrast with river basins as in the northern Italy with the Pô. The case of coastal areas is more contrasted, according to local particularities. […]

The coherence of the Nordic network appears clearly with the role of gateway of Kobenhavn. The Baltic States are clearly related to the Nordic triangle, even if the connections could be improved as for example, from Stockholm to the Baltic states capitals. Indeed, the connections between the Baltic States and continental Europe according to this indicator are inexistent.

In the Iberic Peninsula, a high level of integration is reached between Madrid and the major Spanish and Portuguese cities, but the gap with continental Europe is here[...]"

The mobility analysis on the potential EPATS connections has however to be restricted to a general traffic analysis without providing more detailed information on the mobility features. Indeed, a deeper knowledge of the mobility features on these connections would need detailed data that currently miss.

5. CONCLUSIONS

When presenting the main characteristics of mobility in EU15, the overview of the European mobility shows the importance of the long-distance traffic (i.e. over 100 Km) in the total traffic since 70 % of European travellers have made long distance journeys in 2001. In addition, the analysis also clearly highlights that the long-distance journeys characteristics change according to the customer profile: business and leisure traveller do not travel the same way (difference in terms of transport mode, duration, traveller features (age, gender, etc.)). Characteristics of long-distance mobility therefore vary a lot according to the trip purpose.

The analysis also highlights that providing a similar mobility analysis at a EU27 level is unfortunately not feasible due to the lack of detailed data on long-distance traffic. As a consequence, data is lacking to perform a detailed deep mobility analysis on the connections where the personal aviation would be pertinent, i.e. on connections associating bad accessibility levels, economic attractiveness and significant traffic flows.

We identify that 15 223 connections between 28 countries can be considered as EPATS potential connections. All together these potential connections represent 24% of the total existing NUTS 2 connections in Europe.

Despite the lack of detailed data on the traffic occurring on these connections the analysis manage to provide very interesting and important information on the current traffic levels and modal splits. The total traffic on the potential EPATS connections is 2400 billion passengers amongst whom 436 million travel to and from France and 93 million to and from Poland. The analysis also highlights the large market share of the road transport mode on these connections since 79% of the passengers travel by car. The air transport market share often exceeds the road one for distance over 1500 Km and reaches 100% for distances over 2000 Km.

Forecasting of interregional & intra-European personal transportation, especially including EPATS small aircraft transportation requires exhaustive knowledge on interregional passenger traffic as well as on socio-economic situation including complex and authoritative information concerning wealth and income distribution of population.

During passenger flow and their structure analysis (modal split, directions and distances, volume, purpose and wealth (income) structure of travellers), the following, available sources were used: domestic and European Statistical and transport Institutions databases (Eurostat, Eurocontrol, AIS), Research Institutes and Research and Development Facilities compilations, European Programmes framework research analysis, especially including: ESPON, DATELINE, TREMOVE, SCENES, EUNET, ASSESS and numerous internet publications and data.

Despite huge amount of gathered data and analyzed it was not possible to depict complete image of interregional passenger traffic structure in the European Union. Its main sources are:

- lack of source and complex information concerning long distance personal car travel (volume and O-D travel directions), which constitute more than 70% of passenger traffic
- incoherence and gaps in data concerning air traffic, especially air-taxi and on-demand traffic.
- lack of authoritative information on total existing airport infrastructure. The available complete information is limited to 420 communication airports only, which number reaches 20% of total existing airports in Europe,
- no data gathering, storing and formatting procedure compatibility in Member States publications
- no authoritative knowledge on wealth and personal income structure in respective regions especially in terms of the top last quintile and percentile of distribution (i.e. people who use the fastest, individual modes of transport)
- the existing data concerning transport infrastructure and flow are far from reality in many cases, especially in new Member States of the Union. This data is also correlated with income distribution in respective regions (lack of knowledge on number of travels, distances and mode of transport according to income distribution)
- no complex and reliable models describing accurately interregional and inter-sub regional passenger flows

The abovementioned state-of-art created need for many assumptions (data published in the above mentioned European programmes reflect the reality and income distributions take shape of Lorenz-Pareto law) and using passenger flow models adequate to the current knowledge and allocated resources. Main EPATS system passenger traffic flow directions, their volume and characteristics should be taken with reserve and used for orientation where the main areas of system implementation are. These areas, including EPATS characteristics are one of the initial assumptions for a new conception of air traffic management and control system planned in the SESAR programme.

Main reason of lack of complex and authoritative information on European interregional passenger traffic is the lack of particular transport and economic objectives and no Central European Institution coordinating achieving transport system development strategy. The importance of it is arising especially outside main communication channels, despite a fair number of undertaken researches and participating research centres. This knowledge cannot be acquired basing on fragmented and not always compatible data gathered and processed according to particular, own Member State methods. Transport system is interconnected among all countries and requires complex and homogenized operation procedures as well as statistical and research, similarly to Single European Sky. Attempt in reaching databases concerning transport and passenger flows of particular Member States is at the mercy of statesmen goodwill and prone to failure, putting aside the quality of very diversified data in terms of definitions, criteria and format. One of the result are divergences of the outcomes of abovementioned programmes.

Coherent and sustainable European Union transport system development and implementation of tailored to this development policy of balanced development of European regions, which is one of the main aim of EPATS project, requires undertaking common initiative at the European Union level, Member State and regional powers in order to create a common platform of planning, coordinating and surveillance of research concerning European transport system, mobility, accessibility to public goods and future needs of personal transport forecasting.

According to the abovementioned, it is proposed:

1. Creating European Centre for Personal Interregional Transport as a common research platform of the EU Members and taking responsibility for preparation of fundamentals for political decisions taking regarding interregional personal transport development.
2. Planning and initiating research on EPATS interactive transport system aligned to research on 4-dimensional flight planning system. EPATS Interactive Transportation Management Centre (ITMC) initiative should be correlated to System Wide Information Management – Inter-Operability Centre (SWIM-IOP)
3. Planning and initiating European interregional passenger transport modelling and forecasting using authoritative mobility database especially taking under consideration EPATS transport subsystem.
4. Including adequate research to the prepared ESPON 2013 programme in order to verify potential EPATS connections and forecasted volume of transport transferred from personal car transport.
5. Initiating a close cooperation among European programmes responsible for personal air and surface transport in interconnected topics and including common goals. It is especially valid for ESPON 2013, SESAR and EPATS programmes. It is coherent with SESAR and ESPON 2013 performers intentions, which the application for further research writes the following sentences: "A user oriented approach shall be adopted for the ESPON 2013 Programme. The ESPON 2013 Programme shall through a strong involvement and awareness be raising offer targeted analytical deliveries upon demand, responding to needs."

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