

**DAILY MOBILITY IN THE REGIÓ METROPOLITANA DE BARCELONA**

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**Introduction**

Mobility is closely linked with each region's social and territorial characteristics and it becomes a factor that enables us to interpret the spatial distribution of urban activities, the availability of transport services and their infrastructure, and the functional relations that are set up between different geographical areas. In the same way, mobility guidelines are also influenced by working hours, the opening hours of commercial establishments and services and the places where people undertake their daily activities. In addition, people's individual and family circumstances also more or less decisively condition individual mobility patterns, both as a result of timetable constraints and the means of transport used in order to meet the individual's mobility requirements.

This article, which concentrates on the Regió Metropolitana de Barcelona (RMB) deals with mobility behaviour patterns in this territorial area, paying particular attention to the social and geographical features of its overall pattern.

The first section therefore deals with the territorial relations that arise within the Barcelona region and with the remaining territorial areas of Catalonia. After studying basic mobility characteristics in this area, flows on the municipal, district and Catalonia-wide scales are analysed from both internal and connecting perspectives. The article in this way seeks to discover the level of territorial integration of the different areas in relation to the reasons for travelling and the means of transport available.

Additionally, the mobility of the resident population in the metropolitan area is analysed. This second section focuses on the reasons for individual journeys, both as regards occupational activities and for personal reasons, as well as the means of transport employed in order to meet travelling requirements and the configuration of the modal networks. After dealing separately with each one of these, the text then focuses on the relationship between the two variables in order to understand the link between the reasons and the means for mobility used by the population.

In the framework of this section, reference is also made to the time dimension of the journeys undertaken, both in terms of the time of day when they take place and the duration of the journeys. This study enables us to see the time given to mobility for undertaking different activities, in addition to knowing at which times of the day people undertake different activities and satisfy their travelling requirements.

Finally, the article addresses the mobility characteristics of different population segments according to the age, sex and social/professional category of each group. Here our aim is to discover the impact of these variables on the average time taken for travelling, the reasons that lie behind the journeys and the means of transport that each group employs.

**1. Territorial relations**

**1.1. Mobility patterns and territorial dynamics**

Data from the Survey of Daily Mobility (SDM) 2006 give a figure of 147.9 million journeys<sup>1</sup> per week in the Regió Metropolitana de Barcelona, which represents over two thirds of the number of journeys recorded for Catalonia as a whole. The concentration of mobility in the Barcelona area is due to the high population figures and the activities concentrated in and around the Catalan capital, in which 68% of the population of Catalonia live and 68% of its business activities take place<sup>2</sup>. This movement density is constant throughout the week with an average of 16 million journeys on working days and 11 million journeys on days off.

Over 90% of these journeys have their origin and destination within the boundaries of the metropolitan area, although a significant increase in making connecting journeys (with their origin or destination outside the metropolitan area) is recorded for days off, a figure that doubles in absolute terms as a result of people undertaking more personal, leisure activities far from their place of residence. Thus, the high capacity for self-containment in the area on working days lessens on days off, during which the potential attraction of other Catalan regions increases. Indeed, if the connecting journeys between the Barcelona region and other territorial areas<sup>3</sup> are taken into account, it can be seen that on working days people from

Barcelona make only one out of every two connecting journeys, whereas on days off this rises to three out of every four connecting journeys made.

Despite the high percentage of journeys undertaken via non-motorised means, which in the interior of the region comes to over 45% of the daily total, most journeys undertaken in the Barcelona area are undertaken via motor vehicles. Due to the increased distance involved, motorised means of transport are used in practically all connecting movements, in which the quota for private transport use is very high. In this way, whereas on working days almost 20% of connecting journeys are undertaken via public transport, on days off this percentage falls to little over 10% of the journeys undertaken via motorised means.

Above and beyond the distance involved between daily activities, which limits the possibilities of managing without motorised means of transport, the differences observed in the modal distribution between public and private transport bring about two mobility patterns that reveal the marked territorial imbalances in the public transport network and the availability of its services. Thus, whereas the central city and its most immediate surroundings are integrated in a more or less optimum manner through transport services such as the Generalitat de Catalunya Railway Network (CGR) the Renfe Commuter Train Network, daily and night-time bus services, the underground or the tramway, public transport operations fall off where communications with the rest of Catalonia are concerned, with the exception of the main centres of population. As is outlined in the second part of the article, the network's arterial character, the restricted nature of the routes and the limited timetable scope of public transport services outside the metropolitan centre account to a significant degree for the variations in the abovementioned modal distribution, which for connecting journeys, especially on days off, favours the private vehicle.

**1.2. The Regió Metropolitana de Barcelona: functional relations and territorial integration**

Mobility is an activity that enables us to identify the functional relations set up on different territorial scales, both within the metropolitan area and with the rest of Catalonia.

*a. Municipal and district relations*

On the local level, 70% of the journeys that take place on working days in the Regió Metropolitana de Barcelona are of an intra-municipal nature, with insignificant differences recorded as far as the self-containment capacity factor of the different localities is concerned. In most cases, the latter works out at percentages of around 60%, with the highest indices recorded in the municipalities of the Vallès Occidental district and the lowest in the Vallès Oriental. However, the municipalities of the central Barcelona conurbation<sup>4</sup> must be excepted, where the self-containment capacity factor is close to 80%, a value marked by the presence of the city of Barcelona. These differences between the central area and the metropolitan surrounding area can be explained by the urban and territorial structure proper to each of the two areas, as well as by the location patterns for residential, economic and service activities in the heart of the metropolitan area. These are factors which, at the same time, are linked with the level of municipal, district and metropolitan integration of the whole of the region.

On a different scale, the data involving district self-containment (which indicate the percentage of journeys that have their origin and destination within the same district) also reveal differences between the territorial units that make up the region. District self-containment records its highest level in the Barcelonès district, with a capacity factor of 90%; the lowest figure is recorded, however, for the Baix Llobregat district, with 74%. This difference is due, to a considerable extent, to the geographical proximity of both districts and to the strong functional attraction between the Barcelonès and Baix Llobregat districts, particularly in the area nearest the coastline. The Vallès Occidental district has the second highest self-containment level, with internal journeys reaching 85%, whereas the figure recorded is slightly lower for the remaining districts. In global terms, the sum total of intra-county movements which take place on working days in the Barcelona region comes to 88% of all journeys undertaken in the metropolitan area. These values therefore indicate the existence of a metropolitan conglomerate made up of districts with a significant functional self-supplying factor, despite their articulation within the overall Barcelona context.

It should also be underlined that these intra-county movements record different volumes for each of the districts. 6.5 million journeys take place each day in the Barcelonès district; in the Vallès Occidental, the second highest district in terms of internal movements, the figure is 2.4 million; and in the Baix Llobregat, 1.9 million. Lower down the scale come the Maresme district and that of the Vallès Oriental, with 1.2 million and 1 million movements, respectively; and, finally, the Garraf and Alt Penedès districts, with 362,000 and 278,000 internal movements each.

As for journeys between the different metropolitan districts, which represent 12% of the remaining movements, the demographic influence and concentration of activities in the Barcelonès district also makes this the district from which most connecting flows originate, with a total of 708,000 movements, slightly below 40% of the inter-county journeys undertaken in the Regió, a figure to which the 633,000 connecting movements recorded for the Baix Llobregat closely approximates, motivated above all by the abovementioned close link with the city of Barcelona.

In fact, taking both directions of movement into account, the main relations between the districts of the Regió Metropolitana are recorded with the Barcelonès district, particularly with Barcelona itself. Thus, the relation with the highest two-way flow is also the one recorded between the Barcelonès and Baix Llobregat districts, with 38% of the inter-county movements of the region. The second highest inter-county flow by order of magnitude is that between the Barcelonès and Vallès Occidental districts, with 421,000 movements, whereas the relations between the Barcelonès and the Maresme, Vallès Oriental, Garraf and Alt Penedès districts fall to under half of this latter value.

Conversely, the main inter-county relation not linked with the Barcelonès district is that recorded for the two Vallès districts, with a flow of 110,000 movements per day caused to a high degree by the number of workers travelling between both districts in order to get to their place of work, above all on industrial estates or in the service sector.

Of the remaining inter-county relations, only the movements between the Baix Llobregat and Vallès Oriental districts reach 50,000 journeys per day, also motivated by the presence of important urban centres and numerous industrial areas. The relations between the Garraf and Alt Penedès districts record very low volumes of movement.

In similar fashion, there are significant territorial differences as regards the modal behaviour of journeys made at the district level, which varies according to the place of origin and destination. On working days the highest use of public transport is recorded between the Barcelonès and the Garraf, Alt Penedès, Baix Llobregat and Vallès Occidental districts, with percentages of over 40% recorded for motorised journeys. Yet in the case for journeys not involving the Barcelonès district, the quota of public transport use is much lower, even when large volumes of movement are recorded; such is the case of relations between the Vallès Oriental and Vallès Occidental districts, where only 8% of motorised journeys are made via collective public transport.

For days off, however, mobility behaviour in Barcelona's municipalities and districts changes, a phenomenon being recorded which matches what happens between the whole of the metropolitan area and the remainder of Catalonia. Not only is an overall decrease in the self-containment capacity of the municipalities recorded, but this is especially marked in the case of the conurbation, which falls to a figure of 71%. This decrease, which is also recorded significantly in the Vallès Oriental, Vallès Occidental and Alt Penedès districts, is due above all to the increase in people undertaking leisure activities or other journeys of a personal nature towards places outside the municipality where they normally live.

At the district level, despite the important decrease in the volume of journeys, working days maintain the close relation between the Barcelonès district and the Baix Llobregat, Vallès Occidental and Maresme districts. However, a decrease is recorded where journeys between the more urbanised districts are concerned (the Barcelonès, Baix Llobregat and Vallès Occidental districts); whereas for journeys taking in the whole metropolitan area towards rural areas with more natural surroundings, whether on the coast or inland (Alt Penedès, Garraf, Maresme and Vallès Oriental districts), an increase is recorded.

This fact is accompanied by modifications in modal behaviour, which now slants basically in favour of the private car. In relations involving the central Barcelona area, the percentage use of private vehicles comes to over 20% in the Baix Llobregat and Vallès Occidental districts, but in the three inter-county flows that exclude the Barcelonès district (which altogether come to 190,000 motorised journeys), those using public transport only come to 3% of the total for motorised journeys (Vallès Occidental - Vallès Oriental, Baix Llobregat - Vallès Occidental and Maresme - Vallès Oriental).

This pattern, which clearly responds to the morphology of communication infrastructures within the metropolitan area, reveals the arterial character of the regular public transport network in the Barcelona context, especially as regards transport means of a fixed nature (like the Generalitat de Catalunya Railway Network and the Renfe train service), which are the ones that offer a greater service capacity and therefore absorb a greater number of passengers. The remainder of the country, however, is served mainly by inter-city bus routes that can carry much lower numbers of travellers.

Thus, as can be seen also on the Catalonia-wide scale, the deficiencies within the metropolitan region in a basically radial, fixed, public transport network designed to serve the central city and offering few connections of a transversal nature, are simply reproduced.

In this way, inter-county relations within the wider Barcelona context are organised into two markedly contrasting scenarios; whereas radial routes can be catered for via collective public transport, the flows recorded for other directions display a modal combination that slants basically in favour of the private car.

For this very series of reasons, only in the case of the central Barcelona nucleus is the percentage for journeys using public transport on working days higher than that for private vehicles, with a quota of 60% of journeys made via motorised means. In the remaining cases, the use of public transport as the means of travelling is far less significant. The highest values are around 15% for the Vallès Occidental and Baix Llobregat districts, which drops to 5% in the case of the Alt Penedès.

#### *b. The functional region, according to the day of the week*

Above and beyond the administrative boundaries of the metropolitan region, mobility flows also enable us to identify the functional relations set up with the remaining geographical areas and their degree of integration with the Barcelona area, which is directly linked with the spatial/temporal distance separating the metropolitan region from other Catalan regions.

By closely examining the total number of journeys in the Regió Metropolitana de Barcelona and the remaining territorial areas it can be observed that the main connecting relations are recorded for areas that border on the Barcelona region: the Comarques Centrals, Comarques Gironines and the Camp de Tarragona (reaching 58% of the total for working days and 83% for the total on days off). Worth noting in particular is the volume of relations with the districts bordering on the Regió Metropolitana de Barcelona, which gradually integrate into the dynamics of the metropolis. Thus, the Selva, Baix Penedès, Anoia, Bages and Osona districts record between 30,000 and 60,000 connecting movements with the metropolitan area on working days; connecting volumes that come close to the figures recorded between the Barcelona districts themselves. Likewise, above and beyond the areas most immediate to the metropolitan area, the intensity of territorial exchange flows greatly decreases; not only as a result of the increased distances involved and the decrease in the main communication routes, but also from the lower numbers of population and activities recorded for these areas. In this way, journeys with their origin or destination outside Catalonia, with a figure of 4% on working days and 8% on days off, represent a much higher volume of movements than those recorded between the Regió Metropolitana de Barcelona and the Terres de Ponent, Terres de l'Ebre and Alt Pirineu i Aran, areas with which territorial relations are greatly minimised.

With reference to the abovementioned flows, it is worth underlining the increase in the volume of movements recorded on days off to and from the Comarques Gironines, the Camp de Tarragona and the Terres de Ponent, for which the figures recorded for weekdays double; whereas in the case of the Alt Pirineu i Aran district they triple. As regards the Central Catalan districts, the increase in journeys made on days off is much more modest, emphasising their greater daily integration with the metropolitan area. The Terres de l'Ebre district is the only one for which a significant variation between the connecting flows, either for working days or days off, is not recorded.

Consequently, bearing in mind the different intensity in relations recorded between the metropolitan area and the remaining areas of Catalonia, a decline in the daily functional integration of these areas can be observed as the distance from the Barcelona area, and the central city in particular, increases. In this way, during the week the majority of flows taking place from or to the metropolitan region are recorded between the nearest, most built-up and best-connected areas. It is on days off that the relations map bringing in the remaining areas records an increase in the number of connecting journeys with the more distant areas, particularly towards mountainous and rural areas.

As regards journeys with an origin or destination outside the Regió Metropolitana de Barcelona, it is also worth recording that in most cases only half of the journeys made on weekdays have an occupational reason, with a maximum figure of 63% for the Comarques Centrals and minimum values of 37% for the Terres de l'Ebre and Alt Pirineu i Aran, above all due to the distance separating them from Barcelona and their more rural, and agricultural, character. On days off, however, occupational journeys fall to between 2% and 4% of all journeys linking other territorial areas; with the exception of the relations with the Terres de l'Ebre district, which come to 7% of the total. It is worth noting, however, that most of the connecting movements undertaken by the inhabitants of the Barcelona region have occupational purposes, above all jobs; although personal mobility increases for days off. Conversely, most connecting movements undertaken by the non-resident population of the metropolitan area involve personal reasons, independent of the day of the week. This fact is explained by the significant availability of services and activities of different character concentrated in the city of Barcelona, where a part of the population from outside the metropolitan area go to satisfy their cultural and leisure activities, go shopping, undertake administrative business or visit the doctor, among other reasons.

In this way, a metropolitan area takes shape with a genuine scope that goes

beyond the administrative boundaries of the city of Barcelona. It becomes a dynamic region, articulated via flows that bring into contact more or less distant areas and populations that functionally complement one another.

Thus, on the one hand, an area of influence around Barcelona is articulated into which its most immediate neighbours integrate. This area, which brings together areas with more direct communications and a more urban character, includes a large part of the districts Comarques Gironines, Comarques Centrals and Camp de Tarragona, for which most flows of an economic and personal nature are recorded. However, on days off, the radius of the extent of metropolitan flows, which reach far more distant and far less well communicated areas, undergoes an expansion. In this way, undertaking activities of a personal nature (leisure-oriented activities, particularly) far from the Barcelona area leads to a far greater functional integration of the Alt Pirineu i Aran and the Terres de Ponent with the Regió Metropolitana de Barcelona, whose area of influence spreads with the arrival of the weekend.

## **2. Resident population mobility**

### **2.1. Reasons for making journeys**

Mobility is an activity that varies according to the purpose behind the journey and it therefore becomes a reflection of daily activities. In the case of weekdays, almost 7.1 million journeys involving work and study are recorded, which counts for almost half the journeys undertaken throughout the day. On the other hand, on days off the mobility generated for occupational reasons drops significantly, with only 0.8 million journeys recorded, less than 10% of all the movements undertaken on non-working days. Thus, a dichotomic behaviour pattern emerges, with marked contrasts between mobility on weekdays and on days off, especially for the type of activity undertaken.

Unlike occupational mobility, journeys for personal reasons record less marked variations, despite their increase (especially their relative increase) on days off. Thus, if on working days slightly over 8.7 million journeys are recorded for personal reasons, for days off these figures increase by 20%, and reach 10.3 million. This increase takes on special relevance from a global point of view: if, on working days, journeys for personal reasons represent 53% of all movements, on days off this figure takes in 93% of the total. The daily activities that generate this number of movements, however, present significant differences according to the particular day of the week. On working days, people tend to undertake journeys involving, above all, daily shopping activities, accompanying other persons, personal business, health and non-regulated training activities; all of these are

activities of a more or less obligatory and/or necessary nature for individual or family purposes. On the other hand, on days off there is a higher proportion of journeys involving leisure activities, visits to friends and relatives and non-daily shopping activities, options of a relatively voluntary and/or optional nature.

When it comes to studying how the sum total of these movements throughout the day is organised, the data show how they are distributed by forming multi-purpose chains. This guideline, which follows the same trend on working days and days off, indicates a greater influence of movements linking up consecutively, aimed at combining tasks and activities of different typology. Therefore, multi-purpose movements take shape with the aim of optimising the distance, time and cost of the journeys involved, which are variables that usually increase with undertaking journeys of a pendular nature.

## 2.2. Means of transport and modal chains

As has been explained above, over 45% of mobility in the Regió Metropolitana de Barcelona is satisfied via non-motorised means; whereas the remaining percentage, corresponding to motorised means, is shared out between the 34% of journeys that use public transport and the 66% using private vehicles.

In particular, of all forms of transport, the most frequent one is to travel on foot, with over 40% of journeys on both working days and days off. This is a figure that is well above that for other non-motorised means such as bicycles which, despite the high number of users of this form of transport, only totals 1% of journeys made. This high percentage of non-motorised journeys is a differential feature of the metropolitan area, particularly in the Barcelona conurbation and the main urban centres such as Sabadell, Terrassa, Granollers or Mataró, among others. This fact is closely linked with the existence of multi-functional spaces, where the simultaneous availability of different uses and activities enables travellers to meet their daily needs by means of relations of proximity. The presence of this model of territorial and functional planning therefore permits the development of more sustainable forms of mobility, from environmental and socio-economic perspectives. In this sense, it must be borne in mind that half of all journeys recorded for the city of Barcelona are undertaken via non-motorised means. This is a figure that becomes especially relevant, particularly if we consider that 33% of the inhabitants of the metropolitan region and 22% of the inhabitants of Catalonia live in this municipality.

Secondly, we have the journeys undertaken by people driving their cars, which total almost 25% of all journeys undertaken. On the other hand, journeys

made as car passengers come out well below this latter figure, with under one tenth of journeys for working days (although on working days this type of journey increases significantly, reaching almost 20% of the total). Thus, taking these behaviour patterns into account, the average figures for private vehicle occupancy come to 1.22 and 1.42 persons for cars on working days and days off – values that in the case of motorcycles are 1.06 and 1.13 persons, respectively.

Although its service is limited to the central Barcelona conurbation, the underground is the most frequently used public transport service in the whole of the metropolitan region, satisfying approximately one in every twenty journeys undertaken in the area. This average is thus higher than that for city buses which, although for working days it comes close to the figure for underground use, falls markedly on days off due to the reduction in the service available. Other transport services like the Renfe Commuter Rail service, the Generalitat de Catalunya railway service and inter-urban bus services are less widely used, and absorb 5% of journeys in each case. Journeys using other means of transport are residual and total under 1% of the whole.

As has been suggested in the first part of the article, this diversity by means of transport can be explained by factors of a different nature, among which the availability of means of transport in each locality is especially relevant. Whereas there is a great deal of mobility around the Barcelona area on foot, the most frequently used metropolitan centre and inter-municipal routes are served by a more or less diversified and efficient public transport network that enables travellers to make a high percentage of journeys via collective means, unlike the peripheral areas of the region, where the lack of public transport services (the railway, particularly) obliges travellers to use private cars. This situation leads to different mobility models that are defined in relation to the presence/absence of means of public transport, whereas the use of these means of transport in terms of their availability marks the degree of sustainability of the models of mobility and accessibility for each area.

However, this set of circumstances, which inclines the population of the central Barcelona conurbation towards a greater use of public transport on working days, changes on their days off. As has been seen above, with the increase in the proportion of journeys for personal and leisure reasons, on days off there is a significant flexibilisation in the journeys undertaken (both from a timetabling and geographical standpoint), parallel with an increase in journey distances, a situation to which must be added the lower availability of public transport in every sense, especially outside the central city and the metropolitan area.

It should also be underlined that most of these journeys consist of only one modal stage; in other words, in over 90% a single type of means of transport is used, whether public or private, collective or individual. Thus, bi-modal journeys do not reach 5% of all movements, whereas movements requiring the use of three or more means of transport come to under 3%. Of these combinations, the most frequent ones are recorded for public transport and non-motorised modes, followed by the consecutive use of different means of public transport.

This is due to the time spent making connections, especially when the services are not well co-ordinated, in addition to the awkwardness involved in having to change from one means of transport to another. Thus, the demotivation involved in combining different journey modes means that people who can travel in their own vehicle opt to make the whole journey using this means, especially when it is necessary to make more than one modal change.

## 2.3. Reasons and means of travelling

The reason why the population needs to make journeys is one other factor influencing the choice of one means of transport as opposed to another. This fact is related to the different distances to be covered when it comes to undertaking the different types of journeys and the possibilities everyone faces when choosing where to undertake their daily activities. This range of options depends on each individual's personal characteristics, the flexibility offered by the availability of urban, productive activities in the area and the infrastructures in their immediate surroundings.

Thus, it can be seen how journeys for personal reasons tend to be undertaken via non-motorised means, three out of five journeys being satisfied via these means. This is due to people being free to choose where they wish to undertake daily activities of a personal or family nature, where the desire to optimise the spatial, temporal and economic cost of the journeys is of major importance. This is a fact that leads them to opt for relations of proximity, facilitated by the models of compact, mixed cities in the metropolitan region. This is a feature that is reflected in the motive-related journey time involved, which will be analysed later.

Conversely, mobility involving occupational activities is usually undertaken via public or private motorised transport. In this way, more than two out of three journeys made for work or study reasons are undertaken via motorised means, as the serious restrictions imposed on the population when it comes to choosing where they wish to work or study often compels them to undertake longer journeys. This is a fact that then leads to the greater length of journeys for occupational reasons.

For these journeys the public or private option depends on the area of residence. Journeys in the metropolitan area linked with work and study can be undertaken more or less easily on public transport, which satisfies almost one third of the occupational journeys undertaken using motorised means. This can be explained because on weekdays, when most occupational journeys take place, more fixed itineraries are usually followed and public transport services are more widely available (both as regards time span and service frequency, and the maps of the routes involved), although the routes used for driving in private vehicles are highly congested at peak hours and it proves difficult to find parking spaces in the city centre.

#### 2.4. Mobility - the timetabling dimension

The timetabling dimension displays important oscillations throughout the day, with a small number of journeys during night hours and more or less continuous movement during the day. Journeys are irregularly distributed across this time segment, although the differences between peak and non-peak hours tend to be reduced. This is due to the fact that people's working and living arrangements lead to making journeys for different reasons at different times of the day, resulting in a high volume of journeys being recorded across the whole working day.

During the week, the highest volume of flows takes place in the period between 7:00 a.m. and 10:00 p.m., when 93% of daily mobility is recorded. During this time span, different movement peaks are recorded, alternating with periods of relative reductions, giving rise to patterns of intensity that vary according to the reasons for the journeys.

The beginning and end of people's occupational activities are two of the main conditioning factors behind the temporal dimension of the mobility. Whether for paid work or for attending classes in educational centres, most journeys for occupational reasons are concentrated between 7:00 and 9:00 a.m., with over one million journeys for reasons of employment and over 700,000 movements for study every day. Apart from the latter, return journeys from the place of employment or study are mainly distributed between 1:00 and 3:00 p.m. and 5:00 and 6:00 p.m., with around 500,000 journeys per hour, either when the working day ends or time off is granted.

Moreover, the opening hours of commercial establishments and the time available for catering to the general public in the majority of services also greatly condition the timing of the journeys. In accordance with the latter, mobility for personal reasons is recorded mainly

between 8:00 a.m. and 1:00 p.m. and between 4:00 p.m. and 9:00 p.m., with around 2.9 million and 3.9 million journeys during each span. Specifically, the activities usually undertaken in the morning are the ones involving daily shopping activities, personal business and medical visits, whereas in the afternoon most time is given over to undertaking non-daily shopping and leisure activities, going for walks, visiting friends, visiting relatives and undertaking non-regulated training activities. Eating in restaurants for reasons not involving leisure is an activity that is particularly noticeable at midday for those people that have no time to return home and then return to work, and journeys to accompany other persons are undertaken mostly in the mornings or in mid-afternoon, coinciding with school opening and closing hours.

Changes are also detected in the timetable guidelines behind people's movements on their days off, as well as the differences in absolute terms where different types of journeys are involved. Thus, as well as there being a relative decrease in occupational journeys and an increase in the proportion of personal journeys, the latter also occur over other time spans. As for journeys to work or study, the highest concentrations are recorded from 8:00 to 10:00 a.m., a conclusion that is repeated for the case of non-regulated training. Journeys made in order to undertake the remaining activities, of a personal nature, take place above all during the central morning and afternoon spans, except for leisure activities, journeys involving which stretch into the early morning hours, or for accompanying other persons, which stretch throughout a good part of the day.

#### 2.5. Journey duration

As for their duration, journeys motivated by occupational questions usually involve a greater period of time than those motivated by personal questions, a situation that is inverted on days off. During the week, movements for work and study have a duration of 24 and 18 minutes, respectively. These are values that increase significantly for return journeys home, as people generally travel under less pressure to arrive punctually at their destination. Thus, personal mobility works out at an average of 19 minutes for each journey, the duration for return journeys to their place of residence also undergoing a slight increase.

On days off, however, the time spent on journeys for working purposes decreases, to a good degree because of the greater ease of mobility in private transport; unlike journeys for study purposes, a good percentage of which is undertaken on public means of transport. In addition, the fact of having more free time available for leisure activity, making orders and undertaking other activities means that the journey time for personal reasons also undergoes a sharp increase.

Of the journeys made for personal reasons, the activity to which most time is devoted is walking, with an average figure of 35 minutes. Next to this, with values between 20 and 25 minutes, come activities such as going to the doctor, undertaking personal business formalities, visiting friends or relatives and making non-daily purchases. The activities to which less journey time is devoted are: attending non-regulated training courses, leisure activities, eating in restaurants for reasons not involving leisure and, lastly, daily purchasing, to which a period of only 13 minutes is devoted. As for days off, the most significant time differences are recorded for journeys to undertake leisure activities and accompany other people, which undergo an average increase of almost 8 minutes, as is also the case with undertaking non-regulated training courses and eating in restaurants for reasons other than leisure, for which increases of up to 5 minutes are recorded. The only case for which a significant decrease in journey time is recorded is that for undertaking medical visits, with a decrease of 3 minutes.

In other words, when personal activities are involved, people are prepared to spend more time when it comes to making journeys of a sporadic or a highly specific nature, whereas they try to shorten the duration of the journey time necessary to undertake activities that they have to carry out more regularly.

Despite this, it must be borne in mind that journey duration is closely linked with the distance and means of transport employed. First comes the inter-relationship between distance and time according to speed factors<sup>9</sup>. A further important element is distance, not only in quantitative terms (expressed in spatial units), but also considering the qualitative elements of the surrounding area that mark this distance, which affect the speed involved (and, therefore, the time). Finally, journey time also depends on the means of transport used: non-motorised means (going on foot, by bicycle...) and motorised means (public and private transport). In other words, the relation between the means of transport and journey time is expressed in terms of speed, which in its turn depends on the spatial distance involved, the structural characteristics of the surrounding area and the specific circumstances of each moment.

#### 2.6. Travelling by population segment

In addition to the region's geographical and functional characteristics, the availability of communication infrastructures and the existing availability of transport services, personal mobility is strongly conditioned by the population segment to which people belong, whether in terms of sex, age or social and occupational situation, among others. Initially, the average number of journeys undertaken by each group only oscillates slightly (around

3.41 journeys per person on working days and 2.39 movements per person on days off), but significant differences for reasons and modes of transport employed are recorded.

In this sense, the diversity of personal circumstances means that the number of daily journeys differs according to sex, age and socio-professional situation. In general, on working days the population groups that record greatest mobility are those for women of an active age (16 to 64), with averages ranging from 3.63 to 3.71 journeys per person, whereas for children and elderly people, it is males who make most journeys, with 3.58 and 2.97 journeys in each case. This situation is explained by the fact that women are often the ones who undertake domestic duties and look after their family, thus often undertaking a double working day. Therefore, above all for cases of working women, in addition to journeying to their place of work, they also undertake a high number of journeys geared to satisfying the requirements of the home. Men, on the other hand, usually undertake journeys of a much more pendular nature, basically between their place of residence and place of work.

On days off, however, when more time is available to undertake leisure activities, there is a prevalence for journeys undertaken by men, independent of their age. Divergences minimise in the group between 16 and 29, ages at which there is a less marked dualisation as regards taking responsibility for tasks involving the family, whereas these increase as age increases, reaching a maximum for persons over the age of 65.

In addition to the influence of variables like age and sex, changes are also evident in people's mobility pattern in accordance with their social and occupational situation. During the week, the population segment that undertakes a greater number of journeys is that of active people without a job, with an average of 3.76 journeys per person, due to the fact that they usually have more time available than people in jobs and a better state of health than the majority of pensioners and elderly people. Next come groups of students, active persons in jobs and those involved in non-paid domestic work, with an average of 3.5 and 3.6 journeys, respectively. Retired persons and pensioners are the two groups with least mobility, which works out at 2.79 and 2.58 journeys per person in each case. On working days there are no great differences in the order occupied by the different groupings in the mobility hierarchy; it can be seen, however, that active people in jobs make most journeys on non-working days, whereas non-occupied persons display lower mobility patterns, conditioned by the lower purchasing power of this latter group.

The purpose behind the journey also changes according to the social group

involved. As regards the latter, men tend to undertake a much higher proportion of journeys of an occupational character over the total of movements undertaken (52%), whereas for women a much higher proportion of personally-motivated journeys is the case (62%). In a parallel way, as age increases, the percentage of movements motivated by occupational questions gradually decreases and this reaches a minimum after age 65, when the retirement stage begins for many professional persons; meanwhile, the relative weight of journeys for personal reasons evolves in the opposite direction, reaching a maximum for this latter age group. As for days off, most journeys are of a personal nature. Of the population taken as a whole, the only groups that record a relatively significant percentage of movements for occupational reasons are those corresponding to women between 16 and 29 and between 30 and 64, with proportions of 11% and 7%, respectively; these are values that are inverted for men in the same age groups.

In addition, the data obtained on the means of transport used by the different groups also reveal the existence of various patterns. In broad terms, age is the factor that most conditions the type of means. On the one hand, it is observed that children and elderly people tend to move using non-motorised transport, with a quota of journeys made on foot ranging from 65% to 71% of the total. Young people and adults, conversely, make the majority of their journeys on motor transport, although particularly significant gender differences are observed for persons of greater age, when differences between men and women for journeys using this form of transport are accentuated. Thus, where men from 16 to 64 and women from 16 to 29 use motorised means in over 65% of occasions, women from 30 to 64 use them on only 51% of occasions.

Women, in addition to older persons, usually make a more daily use of public transport, and worthy of particular note is the fact that the group of women over 65, which is the only group that uses public transport more often than private vehicles, records 69% for motorised journeys. This is a value that is markedly above its male equivalent, the percentage for which only comes to 45%. The other main users of public transport are women from 16 to 29, with a figure of 49% of the total motorised figure. This is due to the fact that women, particularly in these age brackets, have a vehicle of their own to a lesser degree than their male counterparts.

The model division for journeys is also linked to social and occupational standing. Thus, it can be seen that the main users of motor vehicles are persons in jobs, for whom 72% of journeys are made using private transport; remaining groups, on the other hand, undertake journeys mainly via non-motorised means, especially in

the case of retired people, pensioners and persons involved in non-paid domestic work, with levels of around 70% of the total, unlike students and active persons without a job, who make around 55% of their journeys via non-motorised means.

However, aside from the factors adduced thus far, two elements that often prove decisive when it comes to explaining the reasons lying behind population mobility patterns should be taken into consideration: holding a driving licence, and the availability of a private vehicle. In the Regió Metropolitana de Barcelona over one quarter of the population aged over 14 have a moped licence and almost one fifth of those over 16 have a motorcycle licence, while two thirds of the population over 18 have a car driving licence. Taken as a whole, 67% of the population over 14 have some kind of driving licence, meaning that the remaining 33% have no kind of licence.

However, if two thirds of those over 14 have some form of driving licence, only 54% of the population in the metropolitan area have some kind of private vehicle. It can therefore be deduced that there is a high proportion of the population that, despite having a driving licence, have no vehicle of their own.

Consequently, there are many persons who either because of having no driving licence or no vehicle of their own on a daily basis, cannot use or gain access to different destinations in the area, especially those areas insufficiently catered for via public transport services and infrastructures. This situation, which has a greater effect on groups composed of younger people, elderly people, women and unemployed persons or those with lower purchasing power, among others, contributes to a worsening of the disparities existing between the different social segments.

### 3. Conclusion

The data emerging from the Survey of Daily Mobility 2006 indicate that in the Regió Metropolitana de Barcelona there are over 4.3 million persons who make journeys on working days and almost 3.7 million persons who are mobile on their days off, an average of 3.6 and 3.0 journeys per person, respectively.

Over 90% of these journeys have their origin and destination within the metropolitan region itself, although on days off a certain increase is recorded for connecting journeys, leading to an extension of the functional metropolitan region. This is a pattern that repeats itself on the local and district levels, showing the existence of a metropolitan conglomerate made up of territorial units with a significant functional self-supply factor that is articulated, at the same time, for the whole of Barcelona. In this sense, worthy of special emphasis are the links between

the different metropolitan population centres and the city of Barcelona, which are well above those recorded for other localities.

As regards the modal distribution, over 45% of mobility in the metropolitan region is satisfied via non-motorised means; the remainder, involving motorised means is shared out between the 34% of journeys made on public transport and the 66% made in private vehicles. However, the analysis of modal behaviour patterns for journeys in the Barcelona region reveals different mobility models, which denote the marked territorial imbalances in the public transport network and the availability of services on a regular basis. Thus, the consequences of an infrastructure system mainly designed to serve the central city, with a basically radial projection and few connections of a transversal character, can be seen.

Despite this, consideration must be given to the differences between mobility on working days and on days off, particularly as regards the activities undertaken. In this sense, if 47% of journeys made on working days are for occupational reasons and 53% of the remainder are for personal reasons, at weekends these figures work out as a ratio of 7% to 93%, respectively.

Indeed, the reason why people need to make journeys greatly influences the timetabling profile of their mobility, the distances to be covered and the choice of means of transport to be used. In this way, journeys for occupational reasons usually cover longer distances, which use up a greater period of time and require the use of motor vehicles, whereas journeys for personal reasons tend to be related with proximity, the reduction of journey time and the use of non-motorised means (although the undertaking of more activities for leisure purposes far from the place of residence on days off is translated into a lengthening of the journeys involved and a greater use of private vehicles).

Nevertheless, despite the general mobility profiles, the nature of people's journeys is markedly influenced by the population segment to which they belong, whether in terms of sex, age or social and occupational circumstances. These are features that give rise to marked differences in the purposes and means of transport used to make journeys. Thus, while on working days men undertake 52% of journeys for occupational reasons, women, on the other hand, make 62% of their journeys for personal reasons. These represent differences that are maintained where the use of means of transport is concerned, with a majority use of private vehicles on the part of employed men, whereas women, children and elderly people usually make greater use of public transport and non-motorised means.

Notwithstanding this, one highly conditioning factor for mobility is having

a driving license and, especially, the availability of a private vehicle, a situation in which only one half of the population in the Regió Metropolitana de Barcelona finds itself. Therefore, the mobility model is shaped not only in accordance with territorial features and the existing availability of transport services and infrastructure, but also from the personal characteristics of each individual and social group.

- 1 This figure takes into account all the journeys recorded for the Regió Metropolitana de Barcelona, whether undertaken by residents or non-residents in the area. With the exception of those cases that do not state the contrary, the article throughout makes no analysis of the journeys undertaken by the non-resident population of the metropolitan area, because of the fact that this represents an insignificant percentage of the total number of movements recorded for the area —around 1.1% of the whole.
- 2 The population data correspond to 2006; the data for business activity correspond to 2002 and refer to the sum total of business entities according to their legal status: natural persons, public limited companies, limited liability companies, co-ownership companies, co-operatives and others: *Source: IDESCAT [on-line]. <<http://www.idescat.net>> [2008].*
- 3 Apart from the Regió Metropolitana de Barcelona, the other territorial areas taken into consideration in undertaking the study are the Comarques Gironines, Comarques Centrals, the Camp de Tarragona, the Terres de l'Ebre, the Terres de Ponent and the Alt Pirineu i Aran.
- 4 The central Barcelona conurbation is made up of the municipalities of Badalona, Barcelona, l'Hospitalet de Llobregat, Santa Coloma de Gramenet and Sant Adrià de Besòs.
- 5 Reference is made here to real time, which as well as taking into account the speed that the means of transport may reach, includes each and every one of the times and distances intervening in the trajectory (Miralles-Guasch, Carme. *Usos del temps i mobilitat*. Barcelona: Ajuntament de Barcelona, 2006, p. 44).

## DAILY MOBILITY IN THE COMARQUES GIRONINES

Obdúlia Gutiérrez

### 1. The journeys of the people of the girona region

In the last few years, the Comarques Gironines has been one of the areas of Catalonia that has grown most in terms of population, moving from 567,552 inhabitants in 2001 to 673,351 in 2006, an increase of 18.6 % —more than 6 points above the average for Catalonia (12.16%). This population increase, together with the often quoted reasons for the increase in mobility of people in all areas of life and all age groups, has led to increasing mobility rates<sup>1</sup>.

Until now, mobility for working and studying has been analysed using data extracted from censuses and residential and housing registers of the National Statistical Institute, which includes only journeys for work and study of people aged over 16. Although there is now a

good series running from 1981 (the first time the question about the workplace or place of study was introduced in Catalonia) to 2001, mobility analysis has been reduced to only a part of all journeys, and not even the largest part, as will be seen later.

The extension of the Survey of Daily Mobility 2006 to the whole of Catalonia makes it possible, for the first time for the Comarques Gironines, to have a very large sample which, as well as updating the information, extends the field of analysis and gives important details of the type of movement going on, how and where it is happening and the characteristics of the population making it. The lack of comparable information reduces the analysis to an initial description of the starting situation, in the hope that future editions of the Survey of Daily Mobility will also consider the Comarques Gironines and that it may have more elements of study making it possible to mark developments within the same region and compare them with other regions.

A first extrapolation from the sample for the Comarques Gironines indicates that 91.5% of its population (aged 4 or over) leaves the house every working day and makes some sort of journey. With an analysis population of 643,963, this represents a volume of more than 588,000 people making journeys. The non-mobile population is therefore only 54,981 people.

Considering that each person makes more than one journey a day, the total number of journeys rises to 2,049,407, which means an average of 3.48 journeys per mobile individual on working days, and 3.18 if the whole population aged over 4 is taken into account. This is a figure below the Catalan average (3.38), which is strongly marked by the high level of the mobility of the Regió Metropolitana.

These figures fall at weekends and on public holidays, with 76.9% making journeys. In absolute figures, we are talking about 1,447,875 journeys, a reduction of 29.3% compared to working days. Although the number of journeys reduces notably, the number of mobile individuals does not fall by so much, moving to 495,451, only 15.9% fewer than on working days. All this means, therefore, a reduction in the average journey/person/day, which is 2.92 for mobile individuals and 2.25 considering the entire population.

#### 1.1. What motivates the journeys?

Mobility is differentiated into two broad categories: that motivated by occupation, which has for some time been known as essential daily mobility (to work or study); and a broader group, including all other reasons under the heading of personal mobility. The following table shows the distribution of the journeys of the people of the Girona region, depending on the various reasons.