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[1] 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[2].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[3] 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[4] 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[5]. 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 license and almost one fifth of those over 16 have a motorcycle license, while two thirds of the population over 18 have a car driving license. Taken as a whole, 67% of the population over 14 have some kind of driving license, meaning that the remaining 33% have no kind of license.

However, if two thirds of those over 14 have some form of driving license, 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 license, 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 activites 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 corrrespond 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 connurbation 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[1].

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.

Although it may seem so, as it is one of the daily movements with the greatest and most predictable degree of recurrence, occupational mobility is not the reason for the largest number of journeys (although the number of individuals moving is something else again) and it lies visibly below personal mobility, with 46.6% of journeys, also counting returns home from occupational journeys.

Meanwhile, personal mobility accounts for 53.4% of movements, distributed widely among the various reasons motivating them. Without taking into account returns home, however, the outstanding ones include mobility for shopping, particularly everyday shopping (7.1%), which almost equals that for study. Another important group is mobility for "leisure/going for a walk/visiting friends or family" which, taken as a whole, amounts to 10.7% of journeys on working days. Finally, the heading "accompanying people" also achieves a percentage worth highlighting —4.2% of flows— which would largely be related to the dependence of the school movements that occur.

But the time when personal mobility reaches its highest percentages is, of course, at weekends and on public holidays, with an overwhelming 89.8% of the total, compared to 10.2% for employment-related movements. On these days, going out for "leisure/going for a walk/visiting friends and family" accounts for 30% and shopping of any kind, amounts to 9.3%. In absolute figures this means, for example, that the volume of movements for leisure and fun or for going out for a walk double compared to working days.

Outward journeys for the various reasons largely return to the place of origin. This fact marks the pendulum effect of movements: returning home accounts for more than 47% of all journeys, both on working days and weekends/public holidays. In the case of personal reasons, returns represent 87.2% of journeys on working days and 91.5% at weekends and on public holidays. In the case of occupational reasons, they represent 89.3% and 92.6%, depending on the type of day. This indicates the high level of returns for all journeys that take place, with a rather greater incidence with those generated for occupational reasons and at weekends or on public holidays.

1.2. Where do journeys occur? Municipal and regional self-containment

That municipalities have ceased to be basic functional units where the main relationships of everyday life occur has been known and analysed for some time. However, the level of acceleration this phenomenon has undergone in the last decade, with all its causes and implications, is something else entirely. For the Comarques Gironines it can be said that this is the first time information has been made available which, as has been said, allows quantification of this phenomenon beyond mobility for working or studying.

So, according to the Survey of Daily Mobility 2006, of the total journeys made by the population of the Girona region, 1,372,826 start and end in the same municipality, that is, are made without going outside the boundary.

If a criterion is included that the municipality of origin of the journey should coincide with that of residence, we obtain the level of municipal self-containment. This parameter, with its opposite, the level of openness, has been used as an indicator of inter-municipal relationships and of functional crossing of administrative boundaries. In the case of the Comarques Gironines, the average municipal self-containment on working days is 65.8%, while at weekends and on public holidays it falls to 55.7%, figures representing a considerable volume of inter-municipal relationship flows. This is a phenomenon that has not ceased to grow over the past few years as homes, workplaces and services spread out over the region[2].

Meanwhile, in absolute terms, for the entire Girona region almost as many journeys are made outside the municipality of residence on working days as at weekends and on public holidays: 701,767 and 640,883 respectively. A consequence of this fact would be similar pressure on the inter-urban road network regardless of the day of the week.

As for overall self-containment in the region, 96% of movements made on working days by the resident population take place within the Comarques Gironines, with small variations depending on whether it is occupational or personal mobility. Despite this, it must be noted that personal journeys have a greater tendency to be made within the region than those for working or studying. Therefore, only a small percentage of journeys made by residents of the Girona region —3.7%— are journeys for connection with another Catalan region and an almost symbolic percentage in relation to the total —0.3%— are movements made by the Girona population entirely outside the region. This aspect, concerning the relationships of the Comarques Gironines with other regions, is analysed further in a subsequent section.

1.3. How and when are these journeys made?

A key element in mobility analysis is knowing the means of transport the journeys are made on, as a main indicator of the patterns and behaviour of the population and the existing transport infrastructures. So, in the Comarques Gironines, 41.6% of journeys by local people on working days are made on non-motorised modes, which basically means on foot or, almost insignificantly, by bicycle. This percentage can be considered low —the Catalan average is 45.1%— and even more so taking into account, as has been said before, that 65.8% of journeys (1,347,417) are made within the municipality of residence, which would lead one to think more of a non-motorised type of mobility, especially in small or medium-sized towns like those in the Girona region, where the possibility of walking or cycling journeys is more viable because of the distances to be covered. The problems generated by this fact —urban congestion, shortage of parking spaces, accident rates, and concern to reduce CO_2 emissions— mean that many towns and villages are gradually introducing specific mobility plans and measures to encourage non-motorised urban journeys which have been reducing.

As opposed to the journeys on foot or by bicycle there are the 58.4% of journeys made on motorised modes, with the absolutely overwhelming majority made in private transport, standing at 54%. Compared to this, public transport accounts for only 4.4%, when the Catalan average for the two types of transport is distributed as 40.6% and 14.3%. At weekends and on public holidays the values are even further from one another, and private transport accounts for almost 61% of all journeys by the people in the Girona region, while public transport is reduced to a tiny 2.2%.

In this sense, the data from the Survey of Daily Mobility of the Comarques Gironines, according to which 76.4% of the population of an age to have some kind of driving licence have one and 62.1% of the total population say they have their own vehicle, is significant. To this information can be added the average level of occupation of a car —1.2 people on working days and 1.35 at weekends and on public holidays— highlighting the low efficiency of the use of private vehicles.

It is clear that towns and villages have expanded and extended over the territory, with outskirts that have been established as simple extensions and other forms of low-density urban development, as well as industrial estates and all kinds of activities and services. Everyday actions —working, studying, shopping, having fun, doing errands— are carried out regardless of the place of residence and by making longer and longer journeys.

These movements are supported by an inter-urban and urban road network designed, as a priority, for cars. All this penalises non-motorised journeys, and it is clear that the vast majority of journeys no longer being made on foot are being captured by private vehicles. There are many studies showing that low-density urban development generates great problems for public transport, which is incapable of serving such widely spread

regions with dispersed population, something that generally also happens with public services, which always need a considerable critical mass in order to achieve efficiency.

As can be seen in the previous table, of the 90,151 journeys made on public services on working days, school transport is the most important, with 27.8% of the total. Urban buses contribute with 19.9% and inter-urban ones with 15.9%. Local and regional trains represent 18.9% and 3.3% respectively (clearly the group of journeys made by metro, tram and FGC —3.3% all together— correspond exclusively to journeys the people of Girona make outside the region).

But an assessment of the importance of mobility on public transport can be biased if the existing range is not also considered. And, from this point of view, the Comarques Gironines has a public transport network of urban and inter-urban buses and regional and local railways which is territorially uneven and which would find it difficult to meet daily mobility needs. So, the surveyed population of the Girona region declares that the main reason for using private transport is the lack of any alternative public transport to travel on. It is therefore unlikely that the greater cost of private transport for its users (the average monthly expenditure given is 96 euros for a car and 20 euros for public transport) or the lack of parking and congestion, could dissuade many drivers from using it.

Inter-urban public transport on the roads of the Comarques Gironines largely functions radially, based on two main centres —Girona and Figueres (which, in addition, are the only ones that are efficiently connected by rail, as the line to Blanes is almost insignificant). Based on this radial logic, only the urban system established between Palafrugell and Sant Feliu de Guíxols has its own significant range of public transport.

But the main problem with public transport is rooted not so much in the existence of routes but basically in frequencies, making the majority of bus connections totally inefficient for the everyday journeys of most of the population. In this sense it will be necessary to wait for the next Survey of Daily Mobility in the Girona region to see the effect the creation of the Girona Area Public Transport Consortium could have, as it affects the area where there is the greatest concentration of journeys in the Comarques Gironines. The purpose of the Consortium, established in the summer of 2006, is to co-ordinate the public transport system for travellers in the area of influence closest to Girona, made up of a considerable number of municipalities in the counties of Gironès, Pla de l'Estany and la Selva. Its establishment has meant an improvement in routes and frequencies for existing urban and inter-urban routes and the implementation of some new routes. The area has been divided into a central zone and six concentric zones, now covering a total of 46 municipalities. The body, however, is still working to draw up a common fare system and on co-ordination proposals concerning the integration of rail services into the collective public transport system.

Concerning urban transport, there are few towns with urban bus routes: Girona and the municipalities immediately surrounding it, as has been mentioned, plus Blanes, Lloret de Mar, Figueres, Olot, Sant Feliu de Guíxols and Calonge. Other than the Girona metropolitan service, their effect on total mobility is rather insignificant.

Meanwhile, there are three railway lines affecting the Comarques Gironines: Barcelona-Puigcerdà and Barcelona-Portbou, which function with a regional or State/international logic, and the final part of the line running from Barcelona through Maresme to Maçanet-Massanes. Their function is largely to cover journeys connecting with other parts of the country, particularly the metropolitan area. The non-existence of local trains providing services means that the regional one performs a double function, although there are only four stations benefiting from a stop by the Catalunya Exprés, which is the most frequent type of train.

It is the railway which therefore provides much higher percentages of public transport use on journeys connecting with other regions. These relationship flows with other regions use public transport on 21.6% of journeys, compared to 3.7% on internal journeys, as can be seen in the following table. Clearly, the highest percentage —28.7% outside the region (in absolute figures that are irrelevant in relation to the total) basically corresponds to movements allowed by the entire Barcelona transport network.

The lack of available public transport contributes to the fact that 95.2% of journeys by people in the Girona region are characterised by being unimodal, that is, using a single means of transport, while only 3.9% are bimodal and 0.9% trimodal or more. And, within the multimodal journeys made in more than one stage, the most frequent are those combining private transport with a non-motorised mode.

On working days, occupational mobility makes most use of motorised modes, as can be seen on the following graphs. 63.1% of journeys to work or study are made in private transport and 6.2% on public transport, compared to 46% and 2.8% of personal journeys. So, more than half of journeys for personal reasons are made on foot.

It can be said that mobility for personal reason largely corresponds to a local logic —65.6% of non-motorised journeys are for personal reasons, while journeys for occupational reasons represent the longest trips— it is basically the workplace that has undergone the greatest dissociation from the place of residence.

1.4. The time dimension of journeys

If we begin to analyse the time dimension, journeys on working days for everyday shopping —one of the personal reasons which, as we have seen, covers the largest number of trips— are those which are, on average, the shortest: 12.3 minutes. By contrast, access to health services (doctor/hospital) requires journeys that take longer, an average of 22.5 minutes. Going to work would be in an intermediate position, with an average journey of 15.9 minutes.

The average duration of journeys as a whole varies considerably depending on whether they are movements within the municipality of residence or whether the destination is another municipality. For inter-municipal movements, the average on working days is almost 25 minutes, while for intra-municipal movements this average is reduced by half —about 12 minutes. At weekends and on public holidays, the population allows itself longer journeys and the figures move to 31.5 and 15.7 minutes, depending on whether they are inter- or intra-municipal movements. The increase in inter-municipal flows clearly involves spending more time, a cost added to the other negative consequences of the phenomenon.

Another temporal consideration refers to the time band when the journeys start. On working days, flows for occupational reasons are those generating the sharpest peaks, which cause the most problems with the use of private transport. The following graphs show that 7 to 9 a.m. are the point of maximum concentration of occupational movements, coinciding with people going to work or study. This is when almost half the journeys made during the day for this reason occur (235,000 journeys). Between 2 and 4 p.m., but to a much lesser extent (108,000 journeys), is the other peak time for going to work or study. Returning home from the place of occupation is less concentrated and is extended throughout the afternoon, although there are peaks between 1 and 2 p.m. and 5 and 6 p.m.

For its part, journeys for personal reasons do not generate such sharp peaks. The start of these movements is later than occupational ones and marks a first maximum between 9 and 11 a.m. (with around 114,000 journeys). In the afternoon comes the most important time in terms of total volume of these flows, with a maximum of 5 and 7 p.m. (137,000 journeys). It can be said that returning home from personal journeys uses the least-occupied time bands and these are journeys that go on later, with a maximum between 7 and 9 p.m..

All occupational and personal outward and return journeys together mark the

band between 7 a.m. and 9 p.m., with concentrations always around or above 100,000 movements. 8 to 9 a.m., 1 to 2 p.m. and 5 to 6 p.m. are the times with the greatest volumes, especially last period in the afternoon, which goes on until 8 p.m. These are also the most significant and most problematic times for private vehicle usage.

It must be said, however, that this behaviour, viewed generally, is repeated throughout Catalonia, given the coincidence of working, school or commercial hours throughout the country.

1.5. Who makes the journeys?

The characteristics of the population that is moving, their gender, their age or their professional position, are other variables which, in principle should not show different behaviour in the Comarques Gironines than in the rest of Catalonia. However, compared to some regions there can be small variations depending, for example, on activity rates among the population.

All segments of the population, taking into account both mobile and non-mobile sectors, are above the average of 3 journeys a day, except for the population aged 65 and over —the population of pensioners and retired people. The other groups range between 3 and 3.49 journeys/day. As those with greatest mobility, we should highlight women aged 30-64 and children aged 4-15. But, viewed overall, the average number of journeys/day depending on sex does not vary very much between men and women: 3.16 and 3.20 respectively. Meanwhile, and depending on the professional situation, active employed people and students are those who, on average, make the most movements.

Men are those who move most for occupational reasons, and 53.1% of their journeys are for this reason. By contrast, 60% of women's movements are devoted to personal reasons, reaching 65.2% in the 30-64 age group, making clear the sex differences in activity rates and greater female devotion to tasks associated with children. Meanwhile, school or retirement age are those when occupational or personal reasons, respectively, are most important, regardless of sex, as happens with the professional situation in terms of the employed and unemployed.

The differences are really significant when it comes to analysing who uses one form of transport or another. Men use private transport on 60% of their journeys, while women do so on only 48.1%. In any of the age groups established, men outstrip women in use of this form of transport. By contrast, women travel more on non-motorised modes and on public transport. The only female age group outstripping the male average for the use of private vehicles is 16-20 (60.1% of their movements). Women aged over 65 are those making most journeys on foot (78.8%) —the segment of the population which has had least access to driving licences and to their own vehicles. At the other extreme is the male group aged 30 to 64, which uses non-motorised means for only 28.6% of its journeys. The use of public transport has its highest percentages among schoolchildren and students, particularly those aged from 4-15 and also among women aged 16-29.

2. Journeys and regional relationships

The information analysed in this section refers, on one hand, to the volume and nature of journeys relating the Comarques Gironines with the other regions of Catalonia and, on the other, to movements made within the region itself at the level of breakdown permitted by the sample —the county.

The total number of journeys occurring in the region as a whole, regardless of the place of residence of the people making them, is 2,143,938 on working days —4.6% more than those made exclusively by residents of the Girona region. At weekends and on public holidays, the number of journeys falls to 1,764,649 —21.9% more than the total journeys of the Girona region population. In this case the difference is much greater, and is associated with the attraction of the region as a tourism and leisure area in Catalonia.

Of all the flows based in the Comarques Gironines, 7.6% are to connect with another region; that is, they start or end in a different region. This percentage rises to 17.6% at weekends and on public holidays for the reason mentioned above. But beyond these general figures, a more specific analysis of where these movements go and where they come from could be interesting, and this is carried out below.

2.1. The relationships between the Comarques Gironines and the rest of Catalonia

The regions with a major relationship with the Comarques Gironines are absolutely predictable based on the way modern Catalonia works. So, as can be seen in the following maps and table, the metropolitan area is by far the most important, with 90% of the external vehicle movements linked to the Girona region centred on it. Far below this come the Comarques Centrals, which, however, stand well above the other regions of Catalonia. Relationships with this area, encouraged by the transversal trunk road, are predicted to become more significant in the next few years, with the opening of the Bracons tunnel between Garrotxa and Osona.

The metropolitan region and Comarques Centrals are outstanding both on working days and at weekends/on public holidays, but the number of journeys practically doubles for the latter. For the other regions, only in the few journeys connecting Girona with the Ponent region is mobility on working days greater than at weekends/on public holidays. The relationship of the Comarques Gironines with regions outside Catalonia must also be highlighted, although only a small number of journeys is involved, ranging between 3% and 5% of the total on working days and at weekends/on public holidays respectively, figures that are even higher than for some areas of the country itself and are probably explained by cross-border links, which are strong in some of the counties involved.

As for the reasons for these journeys, on working days notable differences can be seen by regions. Greater numbers of journeys for work-related reasons appear in the areas physically or functionally furthest from the Comarques Gironines, that is, Terres de l'Ebre and Ponent. On the other hand, there is a larger proportion of movements due to personal reasons, or with a great balance, in the areas nearest to or best connected with Girona.

Meanwhile, although the same figures can be seen at weekends and on public holidays, the difference between regions is considerably affected by the vast majority of journeys for personal reasons. Only in the Comarques Gironines themselves (9.7%) and in Comarques Centrals (7.4%) do work-related reasons still maintain any kind of importance, but never exceeding 10% of the total.

2.2. County flows

Most of the journeys made by the people of the Girona region are within the same county, both on working days and at weekends/on public holidays. Although on working days self-containment is always above 80%, and in many cases close to 90%, at weekends and on public holidays all counties exceed 70% (the radius of leisure movements seems to be greater). The greatest self-containment is observed in Alt Empordà —probably because of some very well-defined job markets and because of the importance of the agricultural economy, as well as because of the good leisure opportunities— and the least in Pla de l'Estany, a county closely linked to the city of Girona and its dynamics.

Another piece of data from this map that may be quite interesting is the difference in county self-containment between working days and weekends/public holidays. Self-containment is always lower for the latter, when people travel more, and, in this sense, the difference should be highlighted in Gironès, which perhaps corresponds to dynamics characteristic of metropolitan areas.

Municipal self-containment —that is, taking the municipality and not the county

as the self-containment sphere— is always, as might be expected, lower than the county figure. All values for working days are lower than 70%, with the exception of la Selva (71%). Meanwhile, at weekends and on public holidays, 60% self-containment is never exceeded except in Ripollès (61.6%), with the figure falling to 46% in Pla de l'Estany.

Taking into account all the journeys identified within the Comarques Gironines, whether or not by residents, it can also be seen that the vast majority of journeys are made within the boundaries of the region —always above 80% of the total movements on working days. However, the differences between them are qualitatively significant, making it possible to deduce the importance of a central urban area which is being consolidated between Gironès, Pla de l'Estany and la Selva and, because of this, their internal journeys are relatively few.

This analysis is strengthened if it is observed that connection displacements of the first two with other counties are also high in percentage terms. As for la Selva, more care needs to be taken with this comment, and the data highlights the dual nature of this county, with part of the plain and coast having solid links with the Regió Metropolitana de Barcelona and another part of the plain and interior linked, instead, to Girona. The first part of this statement also serves for Ripollès, which is outstanding for its significant percentage of journeys outside the Comarques Gironines, because of a well-known trend to follow the axis opened up by the Ter southwards.

The hypothesis of the urban area as a consolidated phenomenon is also valid if the importance of Gironès in all journeys from the seven counties is observed on the following graph, taking into account only inter-county journeys. Although the county represents little more than one in four of the first type of journey (26.3%) —a similar proportion to the importance of its population— it accounts for considerably more than a third of the second type (38.7%). The same happens with Pla de l'Estany, although a much smaller number of journeys is involved. In the other counties, either these percentages do not change very much or they change in the opposite direction to Girones, falling considerably short of the percentage of inter-county journeys.

At weekends and on public holidays, the number of flows is considerably reduced, but the features do not change very much compared to working days. Although the average number of intra-county journeys —internal ones— falls, from 85% to 79.3%, the behaviour of the different counties remains quite similar. The urban area of Girona continues to emerge, as well as the links of la Selva and Ripollès to other regions. But in these two counties there is a subtle difference from working days, which is that, among connection journeys, the ones linking with other Girona counties are now more important than those to or from other regions. In other words, the relative data seems to say that at weekends and on public holidays, the people of la Selva and Ripollès are those who have the greatest tendency to move around within the Girona region, while the other counties "take advantage" of these days to visit other regions.

The data in table 8, which crosses all counties with all counties, also consolidates the idea of the importance of the urban area of Girona. Without going into detail in the figures, what can broadly be seen is the significance of the relationship between the counties involved in the area and the importance of the occupational link ahead of the personal one. But the attraction exercised by Gironès over all counties is also made clear, and is always far greater than any relationship they may have with any other county.

Outside the Girona region, the main counties of origin of journeys to it are also absolutely predictable: as can be seen in table 9, the importance of the Regió Metropolitana de Barcelona and the logic of proximity cannot be avoided. Barcelonès, Maresme and Vallès Oriental confirm this. Only the flows from Vallès Occidental and Osona seem to partially alter this logic as the former, which is further away, gives rise to more journeys than the latter. Undoubtedly the differences in population and accessibility, which probably penalise Osona, give a reason for these figures.

2.3. County journeys and means of transport

Finally, a last perspective for analysis involves the means of transport used. From the graphs that can be seen below, the outstanding feature is the almost absolute predominance of private transport. Despite all this, there are important differences between counties, largely deriving from their urban and employment structure.

In the case of inter-county journeys and on working days, mobility is overwhelmingly private —above 80% everywhere— and non-motorised transport is, as might be expected, insignificant. Public transport only reaches significant figures in Alt Empordà and Gironès, where the importance of an urban centre with a major public transport network is clearest. Probably the decisive differential fact compared with other counties is the rail service and, because of this, the highest percentage use of public transport between two counties appears between Gironès and Alt Empordà.

But perhaps the most interesting information offered by these figures in the indication of the insufficiency of public transport with a metropolitan logic. If this type of service was not unsatisfactory, it would be impossible to understand why the strong relationships between Gironès, Pla de l'Estany and la Selva do not give considerably higher percentages of mobility on public transport. Table 10 makes it possible to confirm this statement: movements between other counties have higher percentages for public transport use: Alt Empordà-Selva, Baix Empordà-Gironès (which have better public transport coverage and frequency), Gironès-Garrotxa,...

Meanwhile, as is to be expected, intra-county journeys show a much more balanced relationship between the different means of transport. Or, rather, non-motorised journeys —basically walking— take on greater importance. These are movements often within the same municipality, and walking or cycling therefore remain a possible, efficient way of getting about. In this case, the mode that is most insignificant is public transport, given that there are very few networks —and no rail network— that are county-based or correspond to a county logic.

On the other hand, at weekends and on public holidays, the most outstanding change is precisely the fall in non-motorised mobility, probably another indicator that intra-municipal weekend journeys are made with a greater radius. And, it would seem that in these cases public transport loses practically all its efficiency.

3. Conclusion

Extrapolation from the Survey of Daily Mobility 2006 sample has made it possible to quantify the total number of journeys made by the people of the Girona region, exceeding 2 million on working days and 1.4 million at weekends and on public holidays. An average of 3.18 journeys/person/day —below the Catalan average (3.38), which is strongly marked by the high mobility of the metropolitan region. But the number of journeys taking place in the Comarques Gironines is considerably greater if those made by non-residents are also counted. At weekends and on public holidays this means an increase of almost 22%, a fact explained by the attraction of the area for tourism and leisure throughout the country.

Personal mobility is what motivates the greatest number of journeys, but it is flows for occupational reasons that generate the sharpest and most problematic peaks because of their greater concentration at particular times of day and because of their greater use of private transport. As a whole, more than 58% of journeys on working days made by the people of the Girona region are made on motorised modes, with the car showing an absolute pre-eminence. Public transport achieves only 4.4% of the total,

10 points below the average for Catalonia. At weekends and on public holidays the values are still more extreme.

This pre-eminence of private transport to the detriment of journeys on foot and on public transport is a fact related to growing urban dispersion, very clear in the last decade in the Comarques Gironines, and to a public transport or urban and inter-urban buses, regional and local railways which is territorially uneven and which does not meet everyday mobility needs. Public transport only achieves more significant usage percentages in journeys to other regions.

The metropolitan region centralises 90% of external journeys linked to the Girona region. The second region with an outstanding role compared to the others is Comarques Centrals. Among these links, the number of journeys at weekends and on public holidays is particularly outstanding, doubling compared to working days.

Finally, a county analysis of flows makes clear the attraction exercised by Gironès on all counties in the region, and reflects the reach of a central urban area becoming established between Gironès, Pla de l'Estany and one end of la Selva. In relation to the latter county, flows reflect the dual nature of this area, with part of the plain and coast having solid links with the metropolitan region of Barcelona and another part of the plain and the interior linked directly to Girona. Ripollès would be the other county that escapes this direct attraction and also maintains a significant percentage of journeys outside the region, following the axis opened up by the Ter southwards.

Meanwhile, a significant piece of information offered by the data is the indication of the insufficiency of public transport with a metropolitan logic, given some very low percentages for use of this mode in an area with strong relationships. In inter-county journeys, mobility is basically private everywhere —above 80%. Only in Alt Empordà and Gironès does public transport achieve significant figures, probably because of the differential fact of the rail service, which also means that the highest percentage for public transport use between two counties occurs between Alt Empordà and Gironès.

1 "Low-cost" flights are certainly not a new phenomenon as they have an obvious precedent in the charter flights which began in the 1960s.

2 For the spreading of residences in cities and urban areas and on the economic and territorial structure of the Comarques Gironines, see Vicente i Gutiérrez (2004), Vicente (2003), Olives (2000) and the Girona Chamber of Commerce (2003).

DAILY MOBILITY IN CAMP DE TARRAGONA

Joan Alberich González

1. Camp de Tarragona: the territory and demographic processes

The first official record we have of this territory being referred to as Camp de Tarragona dates back to 1315, however it was not until 1995, when the Pla territorial general de Catalunya (DPTOP, 1995)[1] was approved, that it was legally recognised as one of the seven territorial areas of Catalonia, in turn the beginning of its further division into geo-political administrative regions.

The territory covered by the Camp de Tarragona comprises a total of six regions: three regions which make up the "Camp" in the strictest sense (Alt Camp, Baix Camp and Tarragonès), and the three bordering regions (Baix Penedès, Priorat and the Conca de Barberà —see figure 1). It covers a total of 2,997.7 km^2 (9.45% of the total territorial area comprising the autonomous Catalan territory), with a resident population, as of January 1st 2007, of 575,333 (8.0% of the total population of Catalonia).

Leaving aside more detailed analysis, which is not the focus of this study, the demographic evolution of the Camp de Tarragona can be seen in terms of two processes: one which we could call "quantitative" (population growth), and one of a "qualitative" nature (how towns and cities have developed and their functional integration within this territory).

From the quantitative perspective, one outstanding feature is the very significant population growth in recent years, making it the most dynamic of the seven territorial areas of Catalonia: if we take the year 2000 as a starting point, the population has grown by 30.1%, double the overall figure for Catalonia (15.1%), and significantly higher than its closest rival, the Girona regions, (24.9%). It is also worth noting that the population growth rate for the territory's metropolitan area is the lowest (only 12.1%).

These population growth figures for Camp de Tarragona reflect general demographic tendencies in Catalonia which, since the beginning of the 21st century, have been due to three complementary factors. First, the upturn in the birth rate after the lowest recorded rates at the end of the 20th century, above all due to the arrival of a sizeable generation from the baby boom who are now at the reproductive age. Secondly, the increase in migratory flows from outside the Spanish state, which has accounted for the considerable increase in foreign residents: in 2000 they represented 4.1% of the total population, but by 2007 this figure had risen to 16.1%. Third and finally, the decentralising tendency of population distribution moving from the Metropolitan Area of Barcelona to the metropolitan belts and neighbouring municipalities.

But from my point of view, when analysing the mobility of the residents of Camp de Tarragona, what is even more interesting than this quantitative development in terms of population growth, is the qualitative perspective, which allows us to see a developing process of urban growth and cohesion. Camp de Tarragona is increasingly becoming a growing metropolitan area characterised by a high degree of interrelations between its municipalities resulting from mobility flows. These dynamics are sustained by the traditional urban triangle comprising the cities of Tarragona, Reus and Valls which favour polycentric urban structures; and the coastal tourist area, Costa Daurada, which generates the internal tourist-residence mobility characteristics of this area.

These are the findings of various studies on this region (González, 2003, 2004), including a recent doctoral thesis on the living spaces of the Catalan population and the functional spaces they generate, based in part on data from the 2001 census (Alberich, 2007). The way is now open to pursue more in-depth studies, and so this analysis of the territorial distribution of mobility flows is made from the perspective of functional interrelations between territories (see section 4).

2. Mobility in camp de Tarragona

In an attempt to broach the widest range of aspects related to mobility covered by this survey, the information presented in this section covers the following aspects: overview of the data, motives for making journeys, principal means of transport used, average time taken and which hours of the day, territorial distances travelled and, finally, the mobility differential according to the socio-demographic features of the population.

2.1. Overview

The 4+ resident population in the Camp de Tarragona in 2006 (527,531) made a total of 11,867,435 weekly journeys: a daily average of 1,849,355 on weekdays and 1,310,330 on weekends. Here, a journey is understood as the trajectory from home to a given destination for whatever reason, making use of one or a combination of transport means.

If one considers these figures bearing in mind the percentage of the population of Camp de Tarragona compared to Catalonia as a whole, a certain degree of "over-mobility" can be seen for inhabitants of this region: the figure for weekly journeys (8.0%) is slightly higher than Catalonia as a whole (7.7%)[2].This level of mobility (also found in the Metropolitan Area) can be explained from the perspective

of two factors. Firstly, due to the small percentage of the population who claim that they made no journeys on the survey's reference dates (7.0% on weekdays and 20.4% on weekends). Secondly, due to the high averages for journeys made by the mobile population: 3.77 and 3.12 on weekdays and weekends, respectively, which are above the averages for Catalonia as a whole (3.51 and 2.48, respectively) with Alt Pirineu i Aran being the only other region with figures above this average for Catalonia.

The reason behind this high level of mobility in Camp de Tarragona is unlikely to be determined by one single cause; possible causes could be factors such as the different characteristics of the mobile population or the distinctive characteristics of the coastal front which facilitate a high degree of mobility among its residents. The data given below, which breaks mobility down according to very basic categories, should help to shed light on these questions.

2.2. Motives behind mobility

The data given below in figure 2 show how the reasons for making journeys vary significantly between weekdays and weekends. It shows that mobility is more evenly distributed among the four fundamental motives given on weekdays, to the degree that all four are close to a quarter of the total, allowing for the slight predominance of personal mobility (and the subsequent journey home) over occupational mobility.

Table 2 provides a more detailed breakdown of the motives behind mobility: in the occupational category the predominant motive is access to the work / study place, while in the case of personal mobility, most journeys cover short distances and less time is spent travelling (e.g. daily shopping, accompanying children or elderly persons and leisure activities).

However, on weekends the panorama changes radically. Occupational mobility accounts for less than 10% of the total (including the return trips), while the rest are journeys for personal motives. We also find considerable variations in the breakdown of personal mobility for, as, in this case, there is not such a clear-cut restriction to the time/ space dimension of mobility: the predominant activities are leisure pursuits, going for a walk or visiting friends or family, for which time and space considerations are not so critical.

Finally, comparing the impact of personal and occupational journeys with the subsequent return trips, we obtain an approximate measurement of the pendular dimension of mobility: figures close to 50% indicate a high rates of swing, and as we move below this figure there is a higher rate of combining journeys (and the motives behind them). The results from the data show a marked rate of swing (in the order of 47%), which shows that people take advantage of journeys to combine motives for travelling (daily shopping trips, pick up the children from school, etc.) before returning home.

2.3. Principal means of transport

As can be seen in figure 3 below, in Camp de Tarragona the principal means of transport is a car, for both weekdays (47.7%) and especially on weekends (56.3%). The majority of the remaining journeys are made by non-motorised means (46.4% and 40.3%, for weekdays and weekends, respectively), to the degree that figures for public transport use are, unfortunately, nominal (5.9% on weekdays and only 3.4% on weekends). Needless to say these figures are cause for concern considering the impact on the environment, cost in terms of financial outlay and other related issues such as safety (road accidents) and road congestion. This is even more worrying if one takes into consideration that the average number of people travelling in a car / motorcycle is very low: 1.21 for cars / 1.09 for motorcycles on weekdays, and 1.41 / 1.07, respectively, on weekends. These data illustrate the direction future territorial planning and transport measures must follow to provide sustainable mobility.

Identifying and distinguishing the main factors which citizens take into account when they choose one transport mode or another is a complex task, as a wide range of personal motives overlap, although the SDM does allow for a synthetic approach. The main argument given for using a privately-owned vehicle is not the comparative advantages over other transport means (convenience, comfort and savings in time), but rather the lack of public transport alternatives or the infrequent runs of existing services.

So, according to these data, the main reasons limiting the role of public transport in Camp de Tarragona are effectively the lack of service routes and the infrequent runs of existing services. As regards this issue, the Consorci del Transport del Camp de Tarragona[3] was set up in 2003 and has to establish itself as a key figure in the integrated planning, extension and management of the public transport infrastructures for this area. This Consortium is one of the Consells Territorials de la Mobilitat[4] set out in the Llei de mobilitat of 2004,[5] and comprises the Generalitat's[6] Department for Public Works and Territorial Policies, along with the town councils of Tarragona, Reus and Valls. So, we shall have to wait until the measures adopted by this Consortium allow public transport to play a more leading role in the daily mobility of the resident population of Camp de Tarragona. These measures include services such as setting up their own local train network, with train-trams linking the main urban areas, rationalising public transport services along major roads and an integrated fare for these services.

Coming back to the comparative analysis between weekdays and weekends, what are the reasons behind this exodus towards private transport means on weekends? The answer clearly lies in existing associations between the transport means used and journey motives. A simple cross reference between these two variables illustrates how public transport only has a minor bearing on occupational mobility (7.8%), and so the lower figures for work-related journeys on weekends can only mean that it plays an even smaller role (figure 4).

In the case of personal mobility we find a similar tendency where the figures for journeys made on foot or by bicycle fall (from 55.8% to 42.5%) in favour of using a car (rising from 39.9% to 54,2%). One needs to view this fact from the perspective of those types of journey which make up the majority for each case: as stated earlier, journeys on weekdays usually tend to be shorter in terms of time taken as destinations are close to the home (daily shopping, etc.), and can be made walking or via public transport; however, at weekends this time-space constraint is less rigid and so the increase in distances covered and time needed for journeys means greater use of the car.

A more detailed breakdown of transport means (see table 3) shows that, from among the available public transport options, the bus (urban, inter-urban or school busses) is the main mode, with rail services following a long way behind. The lack of other public transport means in Camp de Tarragona (such as the tram and the CGR local train network) is explained by the fact that all the journeys made by residents in the study area are taken into consideration, even if the trajectory goes beyond this area. By way of contrast, the car is by far the principal private mode for journeys, accounting for close to 94% of the total for this category on weekdays and 96% on weekends, with motorcycles playing a very minor role.

2.4. The time dimension of mobility

The time dimension of mobility breaks down into two facets: the average duration and the hourly distribution of journeys during the day. I would now like to take a look at these individually.

Average duration
The average journey time allows us to approximate the time people spend travelling on a daily basis.

As we have seen for many aspects of mobility, weekdays and weekends are important variables, and the average time spent travelling is governed likewise: 16.63 minutes on weekdays, but which

increases to as much as 22.83 minutes on weekends. The main factors behind this significant disparity are linked to the type of journey undertaken according to weekday or weekend and the motive for the journey, so at this point I would like to look at these in more detail.

The first factor which explains the longer travel time averages on weekends is distance: distances travelled on weekdays are much shorter than on weekends. Unfortunately, specific data regarding distances travelled are not available at the moment, so to illustrate this I have divided journeys as follows: intra-municipal (origin/destination within the same municipality, regardless of whether this municipality is the place of residence of the individual under study[7]), or inter-municipal (origin/destination correspond to different Catalan municipalities, meaning travelling longer distances which take longer). Here, the data provide a very clear picture: while on working days nearly three quarters of the journeys are intra-municipal (72.5%), this percentage falls to almost two out of every three on weekends (62.6%).

Obviously, this difference is determined by the panorama of travel motives. To begin with, journeys on weekdays are governed by strict time constraints, to the degree that there is a ceiling beyond which journeys are no longer feasible on a daily basis. This goes a long way to explaining why the majority of journeys are intra-municipal, both in the case of travelling to work / place of study as well as travelling for personal motives. Another factor we need to bear in mind regarding the different motives for travelling, is that longer journey times are likewise determined by the characteristics of personal mobility on weekdays or weekends, which, as we know accounts for the majority. While the majority of weekday journeys are governed by space-time proximity (daily shopping or accompanying others —children or elderly), on weekends the predominant motives are much more flexible in terms of time: leisure, taking a walk or visiting friends or family (see table 2).

Hourly distribution of journeys
The hourly distribution of journeys differs significantly depending on the day of the week: on weekdays this is closely bound by start/finish times for work and school/college, while on weekends we can see a more even and homogenous pattern throughout the day.

As can be seen in the first graph of figure 5, mobility on weekdays is governed by three peak hour blocks or moments of maximum concentration of journeys. First, we have work/study start times, concentrated between 7:00 and 10:00 a.m., which account for close to 350,000 journeys (18.9% of the daily total). Work/study finish times, however, are more staggered: we have the first peak at midday (from 1:00 to 3:00 p.m. – 14.2% of journeys) and a second in the late afternoon-early evening, which is more spread out as it covers a wider range of hours (from 5:00 to 8:00 p.m. —23.6% of daily journeys).

As stated earlier, the hourly distribution of journeys throughout the day is closely governed by work-related mobility. In fact, if we focus on commuting alone, we can see that almost half (approximately 200,000 —46.2%) take place between 7:00 and 9:00 a.m., while the second peak, related to starting alternative work shifts, takes place around 2:00-4:00 p.m. (20.3%).

In contrast, personal mobility reveals a completely different distribution throughout the day, and is, generally speaking, more flexible. Here, we can see two time peaks of greater intensity: mid-morning (between 9:00 and 12:00 a.m. —27.2% of the journeys) and in the afternoon (between 4:00 and 8:00 p.m. —39.7%). As one might imagine, this time distribution is closely regulated by opening hours for commercial centres and services.

As regards weekends (second graph of figure 5), the significantly higher number of trips made for personal reasons (and subsequent journey home) provide us with a very different hourly distribution compared to weekdays. This means that we cannot speak of peak hours in the strictest sense, but rather two wide time blocks which include the mid-morning (10:00 a.m.-2:00 p.m.) and the afternoon (5:00-9:00 p.m.), accounting for 32.6% and 29.3% of journeys, respectively. Another difference regarding mobility on weekdays is the importance of journeys made during the late evening / night / early morning (between 11:00 p.m. and 5:00 a.m.): which on weekdays account for 2.1% of the total compared to 5.6% on weekends. This clearly reflects hourly patterns related to leisure activities, and the majority of these are return journeys related to personal motives.

If we focus on the hourly distribution of mobility according the transport mode used on weekdays (first graph in figure 6), two very different behaviour patterns can be seen. On the one hand, use of public and private transport follows a very similar pattern, governed by the time for starting work / study and the corresponding journey home (with the corresponding peak hours in the morning and in the early evening). On the other hand, the hourly distribution of journeys made walking confirm that this is the majority mode for personal mobility, and there is a peak between 8:00 and 9:00 in the morning related to school start time.

As regards weekends (second graph in figure 6), if we leave aside the relative figures for each mode, we can see that there is no difference in their hourly distribution when it comes to journey start time: the low and peak hours for each of the modes are the same.

2.5. Differential mobility according to socio-demographic characteristics of the population

The data used so far refer to the population as a homogenous group, without allowing for socio-demographic considerations. Nevertheless, mobility patterns vary according to social group, which is why I would like to include a short section here which briefly outlines this dimension. By way of illustration, the data given below refer to two different aspects: firstly, the concentration of mobility (given as the average number of daily journeys —table 9), and, secondly, the distribution of mobility according the motive for the journey and the transport mode (tables 10 and 11).

In more specific terms, the population has been broken down according to three variables: gender; age, in four groups (4-15, 16-29, 30-64 and 65 +); the combination of these two variables; and professional standing according to six categories (student, non-remunerated domestic work, retired, pensioner, employed and unemployed). Based on these socio-demographic variables, the main results were as follows:

Gender. There is no clear mobility pattern governed by this variable, since the results vary according to day of the week: on weekdays the average number of journeys for the male population (3.48) is slightly lower than for the female population (3.53), with the inverse situation on weekends (2.68 and 2.28, respectively).

If we focus on the distribution of mobility according to motives, the figure for occupational mobility for the male population is higher than that for women (49.4% and 35.4%, respectively). This is mainly explained by the fact that more men are formally employed while women are responsible for domestic tasks and taking care of the children. As regards mode of transport used, the motivation for female mobility (very often shorter distances) means that they mainly resort to non-motorised or public transport means.

Differences between male-female mobility patterns are significantly minimised on weekends since occupational mobility practically disappears, while other reasons for mobility are generally attributable to family-oriented journeys.

Age. Generally speaking, the average number of daily journeys on weekdays decreases as we move up through the age groups. The explanation for this lies with the relationship between age and occupational mobility, which is illustrated by the two age groups at either end of the scale: while practically the entire population below 16 need to make at least one journey to school etc.,

the figures for obligatory daily mobility for the 65 + population are negligible, mainly because they are no longer active in the formal employment market.

Turning to the modes of transport used, the young/adult age group (16-64) is the one which makes most use of a privately-owned vehicle. This tendency is lower in two cases: the youngest age group, because the majority of those who are 16 or younger do not hold a driving licence; and the oldest age group who have a lower incidence of car ownership due to the generation they were born into.

Professional standing. What has been observed regarding the age variable is also applicable to professional standing, given the particularly close correlation between these two variables: generally speaking, the population actively employed or studying are much more mobile than the population who are not actively employed in the job market. The one exception to this tendency is the case for those whose main daily task is taking care of the home. Their level of mobility is close to that of the actively employed population, since they are responsible in the main part for reconciling the demands of domestic tasks and taking care of the children which, by nature, demand a high level of personal mobility.

As regards professional standing, the mobility pattern for the population formally employed is very different from the rest, in that they are the only social group whose main transport mode is a privately owned vehicle to the detriment of walking.

3. Territorial dynamics

Finally, with an eye to the implementation of town and country planning policies, one of the most interesting findings in this study on mobility is the analysis of mobility flows based on the matrices of origins and destinations. Therefore, the reason for including this short section is to offer some brief observations concerning the territorial dynamics of Camp de Tarragona. Knowing what use the population make of this territory beyond the home is fundamental when it comes to implementing policies, not only to cover transport needs but also housing, accessibility and locating businesses.

3.1. Overview of Camp de Tarragona

Regardless of where they live, the resident population of Camp de Tarragona make a daily average of 1,915,632 journeys on weekdays and 1,559,470 on weekends. But beyond this overall fall in the number of weekend journeys, what is even more interesting is to see that on weekdays the percentage for internal journeys in the study area is 92.4% compared to weekends, 79.7% (see figure 7). This further proves the point made earlier that mobility on weekdays covers shorter distances (getting to an from work etc.), while on weekends most mobility is linked to leisure and implies travelling longer distances. The clearest example of this are journeys to a second home, where their location is not determined by criteria such as proximity or accessibility, but rather by the natural setting or cultural considerations.

Focusing on journeys beginning within or from outside Camp de Tarragona, one can see that the most important mobility flow is to and from the Metropolitan Area: on both weekdays and weekends, this is the origin and destination of close to 70% of inter-county journeys. Clearly, work and study related mobility on the one hand, and cultural / leisure options on the other, are the main factors behind this major mobility flow. This explains why 53.4% inter-county journeys on weekdays are work-related, compared to 42.0% for intra-county flows. In contrast, on weekends figures fall to 8.9% for intra-county flows compared to a mere 2.9% for inter-county flows.

As regards remaining origins / destinations, once again these are determined by proximity: the second highest inter-county flow is with the Terres de l'Ebre, followed by journeys to / from the Terres de Ponent and the Comarques Centrals (Central Regions), with only minor flows to / from the Alt Pirineu i Aran and the Comarques Gironines (Girona Regions). However, the slight increase in importance of the latter on weekends, seen alongside figures for journeys beginning / ending outside Catalonia (3.78%) indicate that these territories are used primarily for leisure pursuits.

Finally, there is an apparent paradox when we turn to the modes of transport used according to the type of journey undertaken: for inter-county journeys (by default, longer distances), public transport use is higher (21.4% on weekdays) compared to intra-county journeys (4.9%). I say a paradox because, as we know, this is the slowest transport mode and the least efficient in terms of time. So, what is the reason behind this apparent contradiction? The answer once again lies in the provision of public transport services in the study area: routes connecting with the rest of Catalonia (particularly with the Metropolitan Area, the main origin / destination point) are well serviced by a rail network (the local train service from Baix Penedès and the regional train services from the majority of the rest of the area), so they are an attractive alternative to using a car, a fact which cannot be said for intra-county journeys in Camp de Tarragona.

In short, and at the risk of oversimplifying mobility patterns for Camp de Tarragona as a whole, one can say that on weekdays those commuting beyond or from outside Camp de Tarragona mainly use public transport. The opposite is the case on weekends: those who stay do so because of work, much higher in number than those who make inter-county journeys, where there is a higher degree of personal mobility (tables 8 and 9).

3.2. Analysis by region

The self-containment average for Camp de Tarragona is 85.9% on weekdays. However, this overall figure does not let us see that in fact there are two different territorial patterns which derive from two quite different situations, mainly governed by the Tarragonès region because of its relatively dense population.

First we have Tarragonès, the most self-contained region (89.3%) as here there is a large and concentrated job market, which explains why the majority of its population do not commute beyond its boundaries and also why it is the destination of a significant number of residents from other regions with lower levels of self-containment (the closer they are to the city of Tarragona, the lower their level of self-containment).

Secondly, the other regions also show high levels of self-containment, due to a self-contained labour market at a municipal level with no important inter-county relationships. This is particularly evident in the Priorat region, with a self-containment level of 81.1%, clearly influenced by its predominantly rural population.

The territorial pattern is, however, the opposite on weekends and public holidays: on these days it is the Priorat region which has the highest level of self-containment, practically identical to weekdays (82.1%), followed by Tarragonès (81.2%). Accordingly, in figure 8 we can see a general decrease in self-containment levels (79.2% for Camp de Tarragona as a whole) which clearly illustrates the major spread of mobility flows on weekends.

Table 10 shows the internal points of origin / destination for Camp de Tarragona at a regional level. In addition to the fact that internal mobility ranks first for the majority of the journeys here (as seen by its level of self-containment), we can see a general tendency whereby on weekdays the Tarragonès region ranks second as a destination point, obviously due to the role of its capital city, Tarragona, as an important job market and place to study. This, however, is not the case for Conca de Barberà and Priorat, the two regions furthest from Tarragonès, where the corresponding regions that rank second as destination points are, Alt Camp and Baix Camp, respectively. When it comes to weekends, Tarragonès ranks as the second destination in order of importance for all journeys recorded throughout the regions covered by this study.

As regards reasons travelling and transport mode used, two conclusions can be drawn: first, for inter-municipal journeys figures for personal motives are higher than for those for intra-municipal journeys, and, second, the latter are mainly made on foot or by bicycle, while a privately-owned vehicle is clearly the majority choice for inter-county journeys. The only other noteworthy comment here concerns the degree of public transport use for journeys with Alt Camp as the point of origin / destination.

3.3. Analysis by municipality

Before beginning my analysis of patterns at a municipal level, it should be noted that the limitations of the sample do not allow for a breakdown of the determining factors at a municipal level, so by necessity the data given below have had to be added at a regional scale.

As might be expected, general figures for municipal self-containment are lower than those for regional self-containment, following, and sometimes highlighting the territorial patterns explained earlier. Accordingly, for Camp de Tarragona as a whole, figures for municipal self-containment are 71.3% on weekdays and 61.1% on weekends.

At a regional level, Tarragonès is the area with the highest level of municipal self-containment, influenced by the capital city, Tarragona, even higher than the most rural regions (Conca de Barberà or Priorat) which tend to be quite dependent on their respective capitals as they are the focal points for a significant number of jobs and cultural / leisure activities.

4. Conclusion

As stated at the outset, this study is intended to be descriptive, determined by the fact that this is the first time data about habitual mobility patterns for Camp de Tarragona has been available.

Nevertheless, this analysis has made it possible to identify certain tendencies, behaviour, characteristics and territorial distribution related to mobility. In turn, these have major implications for planning, drawing up and managing mobility policies as well as for new communication infrastructures. I would like to underline the two which, in my view, prove to be the most relevant.

First, regarding the daily mobility of the resident population of Camp de Tarragona, one can observe a clear and manifest dependence on privately-owned vehicles, which from the perspective of sustainability is excessive, and to the detriment of the meagre availability of public transport. The lack of public transport services and infrastructure would appear to be the key factor, since citizens claim that the main reasons for using their own vehicle are the shortcomings of public transport alternatives. If we also add the low averages for numbers of people travelling in privately-owned vehicles, the consequences for the environment, society and the economy are easy to see. Therefore, the implementation of certain awaited measures, such as creating a network of trains-trams taking advantage of existing rail infrastructures and complementing them with new services, integrated management of urban and inter-urban busses networks, and integrating fares for all these services, can only improve the present poor state of public transport.

Second, the distribution of mobility, combined with the analysis of the underlying reasons, allows us to see the territorial associations of Camp de Tarragona from a functional perspective. In effect, according to the patterns and tendencies that have been identified here, we could say that Camp de Tarragona demonstrates characteristics very similar to those of a consolidated metropolitan region. One of the main characteristics of mobility is proximity, and could not be otherwise if one takes into account that travel time has to be short for it to be feasible on a daily basis. However, one can see certain territorial dynamics which clearly show the territorial associations around the central city (Tarragona) and an inter-urban polycentric network (in essence, Reus and Valls).

But, this metropolitan phenomenon cannot be said for the entire Camp de Tarragona territory, and so in the strictest sense the "hard core" would only comprise the Tarragonès, Baix Camp and Alt Camp regions. By comparison, we first have the rural characteristics of Priorat and Conca de Barberà: in addition to being further away and less accessible to regarding the capital city means that they are more self-contained and autonomous. By way of further contrast, the unique features of the Baix Penedès appear to make it a kind of "frontier region" between the metropolitan areas of Barcelona and Tarragona. Clearly the existing provision of a connecting local train services with the Metropolitan Area is one of the key determining factors for its ambivalent role: for example, closer to that of Garraf than Conca de Barberà.

It is clear that the SDM is an invaluable source of information which will contribute to proper adequate territorial management and planning for Camp de Tarragona and the rest of Catalonia.

1 *General Town and Country Planning Project for Catalonia.*
2 Although this study focuses on Camp de Tarragona, in order to provide a comparison and broader context, I have made some short references to mobility models for Catalonia as a whole. For this purpose statistical data has been used which are available from the following web page: http://www10.gencat.net/ptop/AppJava/cat/arees/mobilitat/observatorimobilitat/emq2006/emq_2006.jsp.
3 Transport Consortium for Camp de Tarragona.
4 Mobility Territorial Councils.
5 Mobility Bill, passed by the Catalan Parliament.
6 Catalan Autonomous Government.
7 Precisely not being able to consider here whether journeys have their origin in the municipality where the traveller lives, means that we cannot call this muncipal self-containment, as the coincidence between the municipality where a person's journey begins and the municipality where they live is a precondition.

DAILY MOBILITY IN TERRES DE L'EBRE

Daniel Polo

The following text is a brief draft of the mobility in Terres de l'Ebre nowadays, that is, the amount of trips made for any reason and with any mean of transport, on the basis of the information offered, for the first time, by the Survey of Daily Mobility 2006.

Thus, this text not only describes the Survey of Daily Mobility's main results, but it also notes some practical conclusions on the transportation planning of this region, which is our final aim when talking about mobility. It can happen that, by providing different readings from the ones traditionally used, thanks to the Survey of Daily Mobility, we will also have a different point of view. In the last section, these last suggestions will be noted in accordance to the objectives stipulated in Act 9/2003 on mobility, an instrument that shares with the Survey of Daily Mobility the fact of being relatively new and also pioneer in some of its approaches.

1. Basic characteristics of mobility in Terres de l'Ebre

Residents inhabiting in the municipalities of Terres de l'Ebre travel an average of 581,128 trips on a working day and 411,687 on a bank holiday or weekend. Taking into account that the number of inhabitants in the region was 171,248 the year the survey was made, these data gives an average result of 3.39 and 2.40 journeys per person and day, respectively.

With the aforementioned data, two comparative questions may arise and they will help structure the analysis of all the data that the Survey of Daily Mobility provides. Firstly, how can the significant difference between the amount of trips made on a working day and on a weekend/bank holiday be explained? And secondly, referring specifically to mobility in Terres de l'Ebre, is it very different from the mobility in the rest of Catalonia?

Taking the first issue into account, it can be observed that mobility on a weekend/bank holiday is nearly 30% less than on a working day. However, this decrease is not homogeneous, it flows in relation to the mean of transport used (depending on the

reason and type of vehicle), as shown in tables 1 and 2, that can be summarised in two main characteristics:

a. Resasons: on weekends, occupational mobility nearly disappears, that is, the one linked to paid jobs and official studies.

b. Means of transport: on weekends, the number of trips made walking decreases.

According to the reasons, during weekends, there is a net increase of 28,000 trips of a personal matter, that is, a 20% more than during a working day. However, this growth is due to the significant increase in leisure activities (+46,000 trips, +124%), as in weekends/ bank holidays there is also a fall of some of the complementary reasons that take place mostly in working days: daily shopping, accompanying people (includes taking kids to school), doctor/hospital appointments and non-official studies. As it can be seen, the growth of leisure compensates the reduction of these other reasons.

Regarding the use of the means of transport shown in table 2, it is worth mentioning that there are means that are not present in Terres de l'Ebre, but that could be used by the residents of this region who, during the days that the survey took place, travelled to the metropolitan region of Barcelona. However, this is a very small fraction and does not alter the analysis studied here. Comparing the data to a working day, on the weekends the use of all transports is reduced, but the biggest fall is with the non-motorised vehicles (-94,000 trips, -37%). In fact, there are only two means of transport that do not suffer a decrease in the number of users during the week: the car as a passenger and the coach (discretionary service). These are the two ways of travelling closely linked to leisure activities that, as it has just been metioned in the previous paragraph, is the reason that shows an outstanding growth during weekends. The use of the car on working days is almost unipersonal and strongly linked to travelling due to work, with an average of 1.27 persons/car. On the other hand, on weekends, these trips are mainly substituted by other ones linked to leisure and prone to be done in group, as the average of 1.56 persons/car shows.

There are still two more issues that can be discussed to illustrate the differences betweend working days and weekends which are also linked to the reasons and means of transport. The first one indicates the type of destination of the trips, according to whether or not they take place within the same town. On a working day, leaving the town of origin happens less than on weekends. As it can be seen in table 3, the fraction of intramunicipal trips is of 77.3% on a working day and this number is reduced up to 69.4% on weekends and bank holidays. This happens, of course, due to the non-occupational reasons: many of the personal travels on a working day (daily shopping, accompanying people, doctor appointments, etc.), that normally take place is a close area (same neighbourhood or town), are substituted by another sort of trips, closely linked to leisure and with a higher predisposition to travel furhter (table 1).

This trend to travel a longer distance on weekends is, precisely, the second issue to be taken into account. Even though the Survey of Daily Mobility, due to its methodology, cannot provide direct information about the distance of the trips, this can be deduced through the time that a journey takes. Table 4 shows how the average time of trips increases in 6 minutes on weekends, that is, grows a 46% more. Thus, it can be established that the distances travelled also increase in a proportional manner or even more, if we take into account that on weekends, non-motorised vehicles, which are the slowest, also have a more remarkable decrease than the rest of the means (table 2).

To answer the first question, a synthesis needs to be made. The visible difference between the amount of trips on a working day and on a weekend is due to the change of activities, as it can be deducted from the distribution of the reasons that mobility originates. When changing the reasons, during the weekend, this is what occurs:

a. A global reduction on mobility, due to a balance of the reasons that decrease (occupational) and the ones that increase (personal, specially those linked to leisure)

b. A change in the destination of the trips, since the type of activities described tend to happen further or closer to home.

c. A change in the quota of use of the means of transport, linked to the type of activity that causes the trip and the distance required for each activity.

d. An increase in the travelled distances, already described in table 3 with inter/ intracity trips and the average time that they take.

An opposite reading can also be done, that is, suggesting that a change in the availability of the means of transport could be the actual reason for the differences according to the day of the week and, consequently, also part of the change in the reasons. At the same time, this hypothesis can only be supported because on weekends there tends to be a decrease in the trip frequency. However, there is no reason why the availability of private vehicles and walking would also be minor. But when checking the nearly non-existent quota of use of public transport in the trips within the Ebre region (2.8% on a working day and 1.7% on a weekend/bank holiday), it can be quickly stated that mobility trends are explained through the reasons and not the means of transport.

This first issue that has been developed so far will be very useful to give an understandable explanation of the second question posed at the beginning of this section: how is the mobility in Terres de l'Ebre in relation to the mobility in Catalonia? It has already been stated that the residents in the Ebre region make 581,128 trips on a working day and 411,687 on a weekend or bank holiday. Comparing it to the 23.1 millions on a working day and 16.2 on a weekend that amount the whole of the Catalans, Terres de l'Ebre represent a 2.5% of the mobility in Catalonia. In fact, the average of trips per person and day in the Ebre region (3.39 on a working day and 2.40 on a weekend day) is almost identical to the average in Catalonia (3.38 and 2.39 respectively) and, in fact, also to any region, even the metropolitan area of Barcelona (3.41 and 2.39 respectively). The conclusion is that all over Catalonia, people travels in similar standards. And why is that? If we compare the distribution of the reasons that move the trips of the residents in Terres de l'Ebre with that in other regions, it can be observed that they are almost the same.

It has already been stressed that the reasons are the key element to explain the mobility trends and, in such a small geographical area as it is Catalonia, the cultural, social and economic factors that determine people's activities are very homogeneous from a territorial point of view.

On the contrary, noticeable differences between Terres de l'Ebre and the whole of Catalonia, or to be more precise, between the metropolitan area of Barcelona and the other Catalan regions, may be observed in one particular issue: the use of means of transport. In the six non-metropolitan areas we find very similar quotas of use amongst these means (public, private and non-motorised), but in the metropolitan area, the use of public transport increases up to 18.6% of quota on a working day and 11.1% on a weekend day (on the Ebre region this represents 2.8% and 1.7% respectively). This fact stems from the uneven distribution of public transport that still exists in Catalonia and that allows a classification in two groups: the metropolitan distribution and the one in the rest of Catalonia. In this context, Terres de l'Ebre stands out for not having an urban transport (apart from the city of Tortosa, that offers three bus lines running every thirty minutes) and for an intercity transport that depends exclusively on the bus, because the train, available only in two districts (Baix Ebre and Ribera d'Ebre) does not meet the needs of internal mobility in Terres de l'Ebre, but plays an economic role for the metropolitan areas of Barcelona and Tarragona.

However, it should also be stated that despite having a major amount of public transport services, the volume of mobility

of the inhabitans of the metropolitan region is exactly the same as that of the rest of Catalonia. This is a trend that calls for special attention for its implication in the planning of transportation and it will be further discussed on the last section of this text.

2. Territorial relationships

Once reviewed the more general characteristics that define mobility, it would be interesting to describe the territorial relationships created by people's trips. Table 5 shows the flow matrix amongst the districts in Ebre, on a working day as well as on a weekend day. To start with, it should be advised that in this table, as in all this section, the total amount of trips with an origin or a destination in these districts is mentioned, inedependently of whether or not the traveler resides in the same area[1].The data shows that only 5% on a working day (28,407) and 8% on a weekend day (30,217) of the trips within the area are between different districts, thus obtaining an accurate estimate of the small fraction that represent those journeys that imply a certain distance.

But obviously, from a territorial perspective the most significant data that table 5 offers is the relative dimension of the different combinations of connection between districts: there are more than 20,000 connections between Baix Ebre and Montsià on a working day as well as on a weekend day; and the rest of combinations hardly reach 2,000. This shows a picture of a region built upon three blocks: the pair Baix Ebre + Montsià, Terra Alta and Ribera d'Ebre. This can be explained by the intersection of the following factors:

e. The demographic weight, mainly located in the axis Tortosa - Amposta - Sant Carles, that is, in the districts of Baix Ebre and Montsià.

f. Strongly linked to the aforementioned factor, the concentration of economic activity and services around these cities and their spheres of influence.

g. Orography and the distribution of means of communication, that sharply increase distances between the block formed by the southern district on the one hand and Terra Alta and Ribera d'Ebre on the other.

Following this territorial perspective, the second element of interest that the Survey of Daily Mobility brings are the connections established between Terres de l´Ebre and the neighbouring regions, described in table 6. Apart from stating again the major volume of long-distance journeys on weekends, it must also be pointed out that the total amount of flows with other areas is bigger than the total amount of flows between the districts that form Terres de l'Ebre. It can also be observed, in table 6, two different levels in the dimension of connections with the other regions: on the one hand, with Camp de Tarragona, the metropolitan area and the areas outside Catalonia, where flows always rise above 10,000 daily trips. On the other hand, with the other areas of Catalonia, where the flow hardly reaches 3,000 daily trips. This means that there is not a direct link between the flow dimension and the geographical proximity and, therefore, other factors will be needed to explain this issue.

The first flow in dimension takes place with Camp de Tarragona, since there are two basic connections: between Ribera d'Ebre and Priorat and between Baix Ebre and Baix Camp. In both cases, there is a motorway (N-420 and N-340) and, moreover they are the two only links of Terres de l'Ebre with a rail connection (always with Camp de Tarragona). But on top of these infrastructures that improve communications, the amount of population and the economical activity that concentrates around the cluster Tarragona – Reus have to be taken into account.

Secondly, there is the flow with the metropolitan area of Barcelona, which shows that on a weekend there is the same amount of trips than the flow with outside Catalonia, but on a working day the amount is clearly bigger. Unlike the above mentioned flow, in this one there is no geographical continuity, that is, where communication between neighbouring towns but in different districts is important, but here, it relies on the commercial and services potential that the capital and its metropolitan surroundings exert.

Closing the flows' block of major importance, we find the connection with the areas outside Catalonia, basically with Comunitat Valenciana and Aragón. Suposedly, the major part of this flow goes to the north of Castelló, since in the first case the two districts that concentrate more people and activities in Terres de l'Ebre (Baix Ebre and Montsià) are closer and better communicated. Moreover, Vinaròs, Benicarló and Peníscola are a very important focus of attraction. The contrary happens with areas neighbouring Teruel and Saragossa, that do not concentrate that many inhabitants nor have similar communication means.

Finally, amongst the flows with the rest of Catalonia, stands out the low dimension of the connection with Terres de Ponent, despite the physical neighbouring from Ribera d'Ebre with Segrià and les Garrigues and also the fact that there is an important communication facility (C-12 or *Eix de l'Ebre*). In this case, it can be clearly noticed the scarce population in both sides of the division that the Survey of Daily Mobility establishes between Terres de Ponent and Terres de l'Ebre.

3. Notes on transportation planning

This approach on mobility in Terres de l'Ebre cannot be ended without taking advantage of the potential that the Survey of Daily Mobility offers for the future. The study of the means of transportation and the territorial relationships existing currently are an excellent basis to plan new services and infrastructures of transport and also, to assess the policies that have been developed lately.

The sample of the Survey of Daily Mobility in Terres de l'Ebre (8,020 interviews on a working day) is big enough to allow a more in-depth hypothesis than this study, however, we will draft some interesting ideas.

From the analysis undertaken in the first section, we can extract a very relevant assumption: in a relatively homogeneous socioeconomic context, differences in the distribution of the means of transport has a feeble impact on the type of activity that people do throughout the day, that is, on our daily life and the social and economic functions that we develop. However, they are decisive when it comes to the way we choose to travel and carry out the necessary or desired activities. It shows that a same amount of inversion oriented, for example, to motorways or rails alternatively does not vary the amount and type of social and economic activities carried out. It is obvious that influence can indeed be exerted in the dynamics of territorial relationships, as long as it implies a relative increase of the capacity of some links of communication against others.

If we take into account the aforementioned explanation and the fact that Catalonia has a legislation like Act 9/2003 on mobility, that explicitly aims the planning of transport towards an improvement of accessibility and the reduction of its negative impacts, it seems fairly obvious that the investment in the coming years will need to be focused on the improvement and enlargement of public transport. This assumption seems to be clearly rooted when talking about the metropolitan area of Barcelona, but it vanishes when applied to Terres de l'Ebre, implying that there is not enough demand to economically sustain the services of public transport. About this issue, the Survey of Daily Mobility also gives an important information: the reasons stated by the people that do not use the public transport that already exists in these districts. Thus, the major reason why travelling by private vehicle is the lack of alternatives in the public transport (table 7), above other reasons such as comfort or travel time, shows the existence of a latent demand of more services of public transport.

It stands out that the most mentioned reason for people to use public transport is the low cost that this option implies (table 8), a fact that stresses the function of inclusion and social redistribution that this mean of transport offers.

This socially oriented element has been stressed, together with the

aforementioned issues of accessibilty and sustainabilty that inspired Act 9/2003, because it is surprising that the Transport Infrastructure Plan of Catalonia concentrates its funds from these districts basically in the addition of a carriageway to the C-12 (*Eix de l'Ebre*, from Tortosa to Lleida through Móra, Flix and Maials) and to the N-340 (Barcelona-València). These will turn into the free alternative to the Mediterranean highway, which will run in parallel. In other words, two infrastructures: the first one (C-12) will be totally overvalued (as it will be explained in the next paragraph) and the second one does not answer to the will of structuring the territorial relationships in Terres de l'Ebre. Also, both would make the use of a private vehicle more attractive against the existing public transport.

The case of C-12 deserves special attention as, thanks to the characteristics of the Survey of Daily Mobility, a very interesting study can be done. Mobility surveys are known to bring a very complete description of the studied phenomenon as long as there is not an excessive territorial segmentation of the results. That is, they are very precise when explaining globally a country, a region or even a district; however, they cannot provide feasible information between two small towns or what concerns a specific infrastructure, since the sample becomes insufficient and the error linked to the results unacceptable. Except when coincidences like the following occur: C-12 is practically the only way of communication between Terres de Ponent and Terres de l'Ebre[2], which are, in fact, two regions for which the Survey of Daily Mobility quantifies the flow that relates them on the basis of the sample obtained in the whole of Catalonia (more than 100,000 interviews with a margin of error of ±0,31%). Thus, the traffic flow[3] on the crossing between C-12 and the border of the two regions can be deduced with high precision, which is a very central spot of this highway (located between Flix and Maials).

It has been a long while since the Ebre river ceased to be the most important route of communications for these districts, the ones that Jesús Moncada describes so well in *Camí de sirga*. Table 6 shows how the highest flow between Terres de l'Ebre and Terres de Ponent on a weekend day is of 3,299 daily trips (both ways), very inferior to those that take place with other areas of Ebre. Letting the bus aside and assuming that all these trips are done by car through the C-12 (thus, adding the traffic flow of C-233), and adding the average occupation of 1.56 person/car,[4] a traffic flow of 43.1 vehicles/hour, each way, at the C-12 crossing point (between Maials and Flix) can be obtained. In other words, nearly one vehicle every minute and a half, which does not announce an imminent threat of traffic congestion and, therefore, makes the plan of adding a carriageway to the highway unnecessary.

This sort of calculation can be done in other locations according to the results of the Survey of Daily Mobility and satisfactory results will also be obtained. In order to prove this, this study can be compared to the C-12: the daily average according to working/weekend day that has been taken from the Survey of Daily Mobility is of 1,999 vehicles/day, almost identical to the average daily flow of 1,807 vehicles/day from 2001, obtained through the traffic directly registered on the road[5].

What proposals can be made on new infrastructures on the basis of Survey of Daily Mobility and according to the aims of the Act on mobility? Firstly, the differential existent in the use of public transport in the area of Barcelona and in the rest of Catalonia indicates that citizens would be willing to use more services, should they exist. Therefore, regarding long distance journeys, improvements should be studied in the services offered by trains connecting the regions of Tarragona and Barcelona, which are the ones that nowadays show a major volume of trips. Secondly, time may have come to propose a railway service connecting Tortosa-Amposta-Sant Carles, which are the cities that gather the population of Baix Ebre and Montsià, two districts with a connection above 20,000 trips on a working day as well as on a weekend day (table 5).

Along these lines, it should also be analysed the possibilty of extending this new railway service to the towns north of Castelló, which is still non-existent despite having a good part of the infrastructures (Mediterranean rail corridor) and showing a trips' flow equivalent to the one that connects it with the metropolitan region of Barcelona.

Finally, it also has to be stated that the Survey of Daily Mobility provides a very useful information to diagnose intercity mobility which is typically 77.3% of all trips on a working day and 69.4% on a weekend. Even though with the results used here concise data about these trips has not been shown, together with the Survey of Daily Mobility, it could illustrate some of the pending duties and could offer corresponding proposals.

1 But they have to reside in Catalonia, which is the area of study of the Survey of Daily Mobility. This factor of residence explains the imbalance between the number of trips in table 5 and the number in tables 1, 2 and 3.

2 With the exception of C-233 between Flix and les Borges Blanques.

3 Obtained in the sample of the Survey of Daily Mobility and therefore it includes inhabitants of every town in Catalonia.

4 Average number of travelers by car amongst the residents in Terres de l'Ebre on a weekend day. This average shows an almost identical number in all the regions of Catalonia, on a working day as well as on a weekend day.

5 Departament de Política Territorial i Obres Públiques. *Anuari DPTOP 2005. Carreteres (trànsit)* [on-line]. Generalitat de Catalunya <http://www10.gencat.net/ptop/binaris/52_tcm32-35968.pdf>.

DAILY MOBILITY IN THE COMARQUES CENTRALS

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Pilar Riera

Introduction

Mobility studies play a fundamental role in knowledge of regional structures. Firstly, they make it possible to identify existing areas of relationships and the role of towns and cities in the organisation of the region and, on the other, they highlight the social mobility structures and the role of the different types of transport used by citizens. Despite this importance, the difficulty of obtaining this information is well enough known, and, beyond census data, there are hardly any studies offering sufficient data about territorial and social areas and structures. The Survey of Daily Mobility for Catalonia (2006) is, in this sense, a unique source of information as, for the first time, we have a large quantity of mobility data for the whole of Catalonia, allowing us a reasonably in-depth analysis of regional structures.

The Comarques Centrals region shows features determining the structures that generate mobility. On one hand, the towns and cities in this area are places with strong, diversified economic activity largely, but not exclusively, located in their immediate surroundings, configuring complex urban systems with consolidated social structures —one of the keys to the country's regional structures. On the other hand, although each of these towns and cities clearly articulates an area around it, communications between them are difficult. The lack of transversal infrastructures linking them together has been one of the outstanding challenges for the country, which is beginning to be resolved based on the construction of the transversal trunk road. In this area, the main road and rail infrastructures are those linking each of these towns and cities and their surroundings to the Regió Metropolitana de Barcelona. These two features mark and determine mobility structures, both in the sense of predominant areas of relationships and in the type of transport used.

1. Initial approach to mobility in the Comarques Centrals

An analysis of the basic features of the mobility of residents aged over four in the Comarques Centrals shows a dichotomy between mobility on working days and that at weekends and on public holidays, and this will be a constant throughout the different variables making up mobility as a whole. In general terms, mobility on working days is more complex, with a greater volume of people involved, more journeys made, a wider variety of reasons for them and greater appropriation of

the zone near the area of residence. By contrast, mobility at weekends and on public holidays shows fewer journeys and individuals involved, closely linked to personal reasons and with a stronger relationship with the nearby surroundings.

The features mentioned here follow the general mobility pattern for Catalonia as a whole. However, compared to the country as a whole, the Comarques Centrals show some slight differences, as there are fewer mobile individuals making, by contrast, more daily journeys.

The journeys made on working days divide almost equally between personal and employment reasons[1].Despite the greater importance of the former compared to the latter: 53.2% as against 46.8%. Personal mobility shows greater complexity, in that it consists of a range of reasons: the most important of these concerns leisure[2] followed by shopping and, finally, personal errands.[3] Despite the diversity of reasons generating journeys on working days (both personal and occupational), the Comarques Centrals show a big pendulum effect, as outward journeys for an activity do not show very great differences (53.2 as against 46.8%). It is a slightly greater pendulum effect than for Catalonia as a whole. The data indicates that the pendulum effect in our region is due equally to occupational and personal journeys.

Concerning whether the journey is internal or connecting, the residents of the Comarques Centrals make 91.6% of journeys with origin and destination within the region, while 7.5% of journeys are connecting and a marginal 0.9% are outside the area. Among the connecting journeys, occupational ones are more important. As will be seen in subsequent sections in more detail, occupational mobility generates the majority of journeys to other territorial areas and, therefore, largely marks flows and relationships between areas.

Weekend and public holiday mobility is different from that on other days of the week for two main reasons, firstly because longer journeys are more numerous in percentage terms. In fact, the number of intra-municipal journeys made by residents is significantly lower (53.4%), journeys within the same municipality made by non-residents are slightly higher and journeys outside the area are more important, not only in percentage terms but also in absolute terms.

Secondly, the balance between the different reasons for travelling disappears. Mobility for personal reasons plays the leading role at weekends and on public holidays, as it includes 92.1% of the total. Also, within the range of reasons included under the label of personal mobility, we find a clear majority, excluding returns home, of leisure-related journeys (up to 30.7% of the total). Mobility on these days is, then, less complex.

2. The patterns of daily mobility

The analysis of mobility patterns in the Comarques Centrals cannot be separated from the regional structure and the existing range of transport. These elements combined give us mobility patterns that are firmly focused on the use of private vehicles, a notable permanence of journeys on foot and very low rates of public transport use.

As has just been mentioned, the majority means of transport during the entire week is the private vehicle. But it is interesting to analyse car use in greater detail depending on the day of the week. It can be seen that, despite the higher percentage use of cars at weekends and on public holidays, use of the private vehicle as driver is, in percentage terms, slightly lower, while the percentage of car use as a passenger is double compared to working days. So, during weekends and public holidays, cars are "fuller" than they are the rest of the week. This statement is confirmed with the vehicle occupation rate: 1.3 passengers/vehicle and journey on working days compared to 1.6 for weekends and public holidays. This differential use of the car depending on the day is not a unique feature of our region, in fact, it is reproduced throughout Catalonia.

The so-called non-motorised means of transport occupy second position in the usage share, representing 42.4% and 36.0% of journeys on working days, and at weekends and on public holidays, respectively. Within this group, journeys on food show a lower rate at weekends and on public holidays, from which it can be deduced that walking is not associated with being a valid means of transport for leisure-associated personal mobility, which is the majority reason for journeys on those days. By contrast, bicycle use, although with very low values, shows greater use at weekends and on public holidays both in percentage and absolute terms, than on working days. In contrast to walking, cycling is used more as a form of leisure and relaxation at weekends and on public holidays than as a means of transport on working days. The lack of infrastructures allowing safe bicycle use and greater congestion of the road network during the week reduce the potential use of this form of transport.

Public transport is the means least used by residents of the Comarques Centrals and shows very low levels of use (4.9% on working days and a marginal 2.5% for weekends and public holidays), corresponding to the fact that the range of public transport in our region is clearly insufficient. This leads to a high level of mono-modality and a stages/journeys ratio close to 1. The three main means of public transport used are: the suburban rail service, the urban bus and the school bus. The first case includes both the Renfe suburban service and Catalan Government Railways (CGR). Between the two of them, they reach a usage share of 1.3%, of which 0.8% corresponds to Rodalies-Renfe and the remaining 0.4% to CGR. As is already well known, the range of suburban rail services in our region follows a radial structure with respect to Barcelona and shows a reduction in services as we move away from the metropolitan centre. No suburban railway line links the counties within our region to one another and they are therefore mainly used for journeys to the Regió Metropolitana de Barcelona.

The most important form of public transport is the urban bus, which has a usage share of 1.1% on working days. In this case, it is a use very much focused on the territory, given the municipal nature of the service. In the Comarques Centrals, as well as Manresa (with five lines) where, because of the size of the population, local regulations establish the provision of collective urban transport for travellers; Vic and Igualada (with three routes for each town) also have their own urban transport. Concerning inter-urban bus transport, in the Comarques Centrals, routes linking the county capitals with their surroundings predominate, largely in Manresa and Vic and, to a lesser degree in Igualada. Finally there are Solsona and Berga, plus other long-distance routes linking the Pyrenees with Barcelona and strengthening these county connections. However, most of these routes have low daily frequencies and therefore absorb a lower percentage of mobility. Along the same lines, there is the almost non-existent transversal inter-county connection, which is reduced to a few routes with still lower frequency between Osona and Berguedà, between Bages and Osona and between Bages and Anoia. All this paints a picture of public transport communications very much based on the railways and with clear orientation towards the metropolis of Barcelona, encouraging the use of private transport, as the figures tell us. The current policy of increasing the range of public transport by buses to areas of economic activity will certainly, in the long or medium term, result in an increase in public transport for occupational mobility and a reduction in private transport. Still with a usage share of more than 1% is the school bus. In this case, unlike the previous one, usage is dispersed throughout the region and occurs in rural areas, aimed at a captive audience and connecting the small population centres of our region which do not have a big enough population of young people to offer secondary education (and probably in some cases note even primary) with council centres and sub-centres where school facilities are located.

Focusing on the means of transport used and the type of journeys on working days, general mobility patterns are observed depending on the area and the adaptations made in each case. Firstly it is in internal journeys within the Comarques Centrals region, that non-motorised modes show

higher rates than the general average (up to 45.7%), although not catching up with journeys made in private transport, which still exceed a 50% usage share. It is in these internal journeys in the area where public transport has the lowest usage rates (3.3%), a figure denoting the already mentioned scarce range of internal connections with this form of transport. Mobility at weekends and on public holidays generally follows the same patterns as the rest of the week, despite the greater importance of private vehicles and the absolutely marginal use (1%) of public transport.

Secondly, on connection journeys, non-motorised means practically disappear and, of course, use is concentrated on mechanical means of transport, which show higher usage rates: while private transport use on working days reaches 75%, public transport use reaches 21.8%. The latter figure is significant: in absolute figures, more connection journeys are made than internal ones. Given the insignificance of public transport by bus, as we have already mentioned, this figure basically reflects the range of railway services connecting our area with the Regió Metropolitana. These figures should, predictably, increase over the next few years, taking into account the widening of the range which is occurring (and which it is planned to increase further) and which has not been included in the survey: the increase in frequency on the Igualada-Barcelona line and the improvements making the Montcada-Vic and Vic-Ripoll railway lines double-track ones, planned in the PITC 2006-2026, are two examples of this. Concerning mobility patterns for weekends and public holidays, once again the patterns described here are repeated, always following the trend that car use is even more overwhelmingly dominant (up to 88%), to the detriment of other forms.

Thirdly, on journeys outside the area on working days, the modal division is much more balanced: although private transport continues to be more commonly used, with 48.4%, both journeys on foot and on public transport increase to 24.8% and 26.8% respectively. These, then, are mobility patterns more typical of metropolitan areas, which are, in fact, where they mostly take place; so, mobility patterns are established more by the opportunities to use the different means of transport rather than by the personal choice of individuals. These patterns, however, change notably at weekends and on public holidays. Firstly, car use is lower, in percentage terms, than it is the rest of the week, and its usage share is the same as for non-motorised forms. By contrast, public transport is much less important (7%) than during the week. As will be seen in subsequent sections, these patterns correspond to the change in travellers' motives which, at weekends and on public holidays, are mostly personal. The use of non-motorised means is, then, clearly related to leisure.

In addition, mobility shows clearly differentiated patterns depending on the reason for the journey. In journeys to work or to study, on working days, mechanical means of transport are the ones that show higher than average rates: private transport exceeds a 64% usage share, while public transport reaches 7.0%. By contrast, personal mobility is made up of more local journeys where non-motorised modes predominate: the sum of walking and cycling accounts for more than half of it, with 54.1% of the total, while private transport is used on 42.9% of journeys and public transport on 3%.

3. The temporal dimension of mobility

The temporal dimension of mobility varies notably during the week depending on the main reasons for it on different days. While on working days journeys are marked by activities with a pre-established and rather inflexible temporal dimension, at weekends and on public holidays they enjoy the "free" timetable made possible, for the most part, by leisure activities. So, on working days, the mobility timetable is wider and, despite the existence of peak times and trough times, it is more constant throughout the day. By contrast, at weekends and on public holidays, journeys are concentrated into fewer hours and the differences between peak times and trough times are more notable.

Figure 1 shows how mobility on working days is divided into three peak times. Trough times, however, still show a high volume of journeys, because sixty-six thousand journeys still begin at the lowest point (between 4 and 5 p.m.). The peak times for total mobility are: between 8 and 9 a.m.; between 1 and 3 p.m. and between 5 and 8 p.m. These times correspond to different motives in each case: the first two to occupational mobility, while the last one of the day, lasting much longer than the others, corresponds to personal mobility. The complementary nature of the various mobility times, depending on the main reason for it, should be highlighted, as the peak times for both motives succeed one another, with occupational mobility coming first in time. This chronological succession explains why trough times do not mean the absence of journeys and why there are more than seventy thousand journeys beginning every hour in mid-morning.

The chronogram for weekends and public holidays (see figure 2) shows clearly differentiated features compared to the rest of the week and gives a totally different rhythm. The lack of occupational mobility means mobility times are marked by personal journey patterns.

If we distinguish between journeys to go and do an activity (occupational or personal) and returning home on weekdays (figure 3), we see that the morning peak time (between 8 and 9 a.m.) corresponds entirely to going to do an activity, largely occupational. The midday peak time corresponds to returning home —a combination of returning from work and the school population coming out. Finally, the evening peak time is the sum of outward and return journeys. If journeys to do an activity are analysed, we find there is a clear peak already mentioned between 8 and 9am linked to occupational mobility and a secondary, longer one running from 2 to 7 p.m., a confluence of significant volumes of occupational and personal journeys. Meanwhile, returning home has two outstanding peaks: the first and most accentuated one is from 1 to 2 p.m. and the second, not so accentuated but lasting longer, runs from 5 to 9 o'clock. Therefore, as has been indicated, mobility in the afternoon appears more complex, as it is made up of a mixture of all kinds of journeys: occupational, personal and returning home.

The distinction between movements to do an activity and returning home at weekends and on public holidays shows less complex time patterns than on other days of the week (figure 4). In this case, we can see how outward and return peak times succeed each other during the day, with clear, sharp peaks.

The average duration of journeys made by residents of the Comarques Centrals is not very great (almost 17 minutes). Occupational journeys last, on average, 16.25 minutes, with those made in order to go to work being slightly longer (16.95) than those to go and study (14.87). Personal journeys, by contrast, last longer on average: 17.26 minutes. However, this label conceals journeys with very different durations. The shortest, in terms of time, are the most everyday ones related to greatest proximity, while the longer ones are less everyday and involve greater distances.

The duration of journeys made at weekends and on public holidays is longer than on working days: 22.48 minutes. The reason can be found in the duration of leisure-related journeys, as the time of journeys to work is, on average, less than that on working days. These figures seem to indicate that leisure activities are associated with areas far from the everyday surroundings of the rest of the week.

4. The social structure of mobility

Gender is a variable that largely determines people's mobility. Women and men show different mobility patterns. While the former make more journeys for personal reasons, make greater use of the local area and move about more on foot, men are characterised by greater use of the car, for travelling further afield than their immediate surroundings and by the predominance of journeys to work.

Although the total number of journeys made by residents of the Comarques Centrals on working days is divided almost

equally between men and women, the reasons generating them are different (see figure 5). While the greater number of journeys to work is made by men (58.9%), women are responsible for the majority of personal journeys (57.1%).

As a general average, both men and women make the same number of journeys a day: the former 3.22 and the latter 3.19. But, if we also look at the age structure, significant gender differences appear. So, women in the "central" age groups, aged between 16 and 64, make more journeys a day than men, who move around more at the extreme ages, between 4 and 15 years and at over 65 years of age. The fact that women in the central age groups take on a "double working day" involves them carrying out a large number of journeys every day, both connected with paid work and personally.

Despite these general analyses, a more detailed view by age and motives provides clearer knowledge of this situation. In fact, notably different gender divisions in terms of going to work or to study can be observed, depending on age. Among young adults (aged between 16 and 29), the significance of journeys for each gender approaches the proportions shown by the structure of the population of the Comarques Centrals. But this "egalitarian" behaviour of occupational mobility reduces with age; between 30 and 64, almost two thirds of occupational journeys are made by men. Subsequent surveys should look at whether the behaviour of young adults is a change of trend, with this behaviour maintained as they get older, or whether, on the other hand, it is a division determined by age.

The use of means of transport is another feature which is, broadly, gender-related. Women make the majority of journeys on foot and by public transport.

This differentiated use of means of transport is related to a private use of areas that are further away, in the case of men, and nearer to the home surroundings, by women. Both the greater percentages of self-containment and the lower number of inter-municipal movements per person per day made by women confirm this situation.

Modal division also varies substantially depending on the age of the person involved: in the central age groups, greater use is made of cars, while walking is dominant at the "extreme" age ranges of the personal life cycle. However, gender-related behaviours go alongside these age-related ones. Analysing the mobility of residents of the Comarques Centrals on working days by age and gender, still more exaggerated behaviour patterns can be observed in the case of men (see figure 8). This behaviour can be summarised in:

– Majority use of the car by men in the central age groups (with percentages higher than 60%)
– A more concentrated and not so high peak in car use by women. The also maintain higher movement rates on foot throughout all age groups.
– Public transport use by women with highs and lows depending on age while men maintain descending use as the years go by.

Ultimately, in the Comarques Centrals mobility patterns reflect gender differences, which, as a general rule, show a more balanced division between modes in women.

5. Regional relationships

The area of study is in a central geographical position in Catalonia. This aspect promotes its role as a pivot, with the centre in Bages, between the different Catalan regions (apart from the Terres de l'Ebre) and it becomes a crossroads between the different axes of communication (the Llobregat, the Congost-Ter, Transversal and the future Diagonal trunk road). All this helps to define some features configuring the types and strengths of relationships with other regions. At the same time, the Comarques Centrals forms a region with internal development that is still incomplete, with the existence of three poles —Manresa, Vic and Igualada— that are important but which have weak relationships with one another. Barcelona's capacity for attraction, and relationships with its Regió Metropolitana as a whole, are, therefore, the predominant element of mobility in the Comarques Centrals.

In the Comarques Centrals there are one and a half million journeys on working days. These journeys are largely (92.6%) made by residents themselves, and the importance of non-residents is marginal. By contrast, in terms of connection journeys, importance is divided equally between residents of the Comarques Centrals and residents of other areas.

Concerning journeys at weekends and on public holidays, the overall daily number is lower but, for this kind of journey, the importance of non-residents is greater (both in absolute and percentage terms).

All these figures make it possible to show that the flows establishing regional relationships are two-way ones; residents and non-residents are equally important on working days and there is a greater presence of non-residents at weekends and on public holidays. They also indicate to us that the Comarques Centrals is an "open" permeable region, used by residents of other regions. However, this use does not mean non-residents experience the area very strongly because, as is shown in the table, their mobility basically involves connections; internal journeys, which would be an indicator of a stronger experience, are very much residual.

The territorial relationships of the Comarques Centrals are very largely focused on the Regió Metropolitana de Barcelona. The relationship with all the other regions is much weaker; only mobility involving the Comarques Gironines and the Terres de Ponent is at all important.

Journeys for occupational reasons are largely responsible for regional relationships on weekdays, particularly those established with the Metropolitan Area, which account for two thirds of trips. It is also in relationships with this area on working days where public transport is greater (21%) due to the greater existing range.

In relationships with other regions, the importance of journeys for work and for studies stands at around half of the total. The situation is turned on its head at weekends and on public holidays, when the importance of journeys for personal reasons is overwhelming.

County by county analysis makes it possible to see how the regional relationships of the Comarques Centrals are articulated along the various major routes crossing the country. On working days, these relationships decline in strength as the distance from our area of study increases. By contrast, at weekends and on public holidays the distance variable does not play such a decisive role and, as well as there being more journeys in absolute terms, trips are longer. Only the strength of flows involving Barcelona defies this logic, as its demographic importance leads to a bias in the analysis. Except for this region, it is with the neighbouring metropolitan counties: Ripollès, la Selva, Conca de Barberà, and with Garraf, Gironès and Tarragonès, where the closest relationships exist during the week. Concerning weekends and public holidays, relationships with counties with high populations and with tourist ones, such as Alt and Baix Empordà, Tarragonès and Baix Penedès are strengthened, while those with Ripollès, la Segarra and Conca de Barberà weaken. These figures indicate the double role of the Comarques Centrals: on one hand it is a leisure destination for residents of metropolitan counties (and this is why the more populated ones are more important) but it also generates flows to "tourist" regions, such as the coastal counties and, to a lesser extent, the mountain ones such as Ripollès.

5.1. Internal relationships

Inter-county relationships largely pivot on Bages, which is most important in a majority of connection flows and is the main origin and destination of journeys from other counties in the region. This fact can be explained both by the demographic importance of Bages and by its central position in the study area. Specifically, the strongest county flow on working days takes place between the counties of

Bages and Berguedà, with 9000 journeys, denoting the strong link between the two counties on the Llobregat axis. In this flow, almost 2/3 trips are for occupational reasons. The second largest flow in terms of number of journeys is between Bages and Osona, with more than 6000 journeys, and 2/3 of these are also for occupational reasons. The third largest flow involves Bages and Anoia, with around 4800, 60% of which are for occupational reasons. With Solsonès, it maintains a flow of more than 2800 journeys, 58% of which are for occupational reasons. This county is, in fact, the pivot of inter-county relationships.

As has already been mentioned, the other counties have smaller flows, a figure not merely corresponding to their lesser demographic importance. So, Osona has very much lower flows with other counties and only the flow with Berguedà is at all significant, with almost three thousand journeys.

As for Anoia, it also has a peripheral location in this region and its strongest relationships, as we have mentioned, are with Bages. It has very low flows with the other counties.

The regional structure of inter-county relationships of the counties in the Comarques Centrals is not so much different at weekends and on public holidays, but the strength of them and the reasons for them are. In fact, although the number of journeys originating in one county and remaining within it is greater on working days than at weekends and on public holidays, the total number of inter-county journeys is higher in the latter case than in the former. In all cases, the reasons for the vast majority of journeys are personal rather than occupational. The use of the region at weekends and on public holidays is therefore greater and leisure, for mobile individuals, is an activity carried out far from home and not in the nearby surroundings. In any case, with detailed observation, some changes in territorial relationships can be seen. One of these is the reduction (the only one in the entire region) of journeys between Anoia and Bages as, at weekends and on public holidays, journeys between the two counties fall by almost half. By contrast, at weekends and on public holidays, the flow between Bages and Osona appears strongly, with almost fifteen thousand journeys, coming to be the strongest flow in the whole region, to the detriment of Bages-Berguedà which, although it does increase compared to working days, involves only twelve thousand seven hundred daily journeys at weekends and on public holidays.

5.2. County dynamics

As has been made clear throughout the analysis of the figures, lower capacity to retain internal flows at weekends and on public holidays and the increase in connection journeys is translated into lower self-containment indices (both in terms of counties and municipalities) on these days than on working days. However, there is no direct correlation between county self-containment and municipal self-containment: the internal structure of the county, the delimitation of urban systems and their relationship with the municipal boundaries are some of the variables explaining the different levels of flow retention in municipal territories.

Concerning county self-containment, this is around 90%, with the minimum figure in the county of Anoia (84.9%) and the maximum in Bages (91.7%). These figures fall by ten percentage points at weekends and on public holidays, with the minimum in Solsonès (75.3%) and the maximum of 85.3% in Berguedà.

Municipal self-containment shows very much lower indices than county ones and, for the Comarques Centrals as a whole, stands at 64.2% on working days and at 53.4% at weekends and on public holidays —the lowest in Catalonia.

The county of Osona shows high county self-containment, above the average for the region both on working days and at weekends, but, by contrast, one of the lowest rates of municipal self-containment. It is, therefore, a county with strong internal cohesion and, at the same time, shows the existence of some powerful urban systems revolving around large municipalities such as Vic, Torelló and Manlleu, which have the capacity to attract and generate flows of occupational mobility between one another.

By contrast, the county of Anoia shows low rates of both county and municipal self-containment. It is a county in which only Igualada represents a strong centre of attraction to structure the region (Calaf's role is clearly at another level). The low level of county self-containment is basically due to this county's strong relationships with the Regió Metropolitana de Barcelona and the weakness of journey flows to other counties in the same region. This situation can be explained by various factors: firstly, there is the gradual incorporation of southern Anoia into the MRM and, secondly, the considerable crisis of productivity of the county, with the destruction of the textile industry that has traditionally been the main economic activity. Internal crisis is therefore combined with greater integration with the surrounding areas, particularly with the Regió Metropolitana. Concerning the low level of municipal self-containment, the small size of the municipality of Igualada explains the fact that a large number of that town's areas of activity are actually in neighbouring municipalities. In this way, inter-municipal flows are generated which, in the majority of cases, involve short journeys in terms of time and space but which, because of the municipal map, are classified as inter-municipal flows.

Bages shows high levels of county and municipal self-containment. In this case, the strong articulation of the territory of the county around its capital, Manresa, and, at the same time, its importance, should be highlighted, along with the resulting high levels of municipal self-containment.

Solsonès shows high levels of self-containment —the second highest county rate and highest municipal rate. It is, therefore, a county with few inter-county or inter-municipal territorial relationships because of dominant economic activities related to its immediate surroundings, such as the primary sector or the tertiary sector based on rural leisure.

Berguedà shows a slightly lower county self-containment rate than the average for the region and notably higher municipal self-containment than the average for the Comarques Centrals. In the first case, relationships articulated around the Llobregat axis maintain strong flows with Bages and, to a less degree, with Osona, but, at the same time, the importance of Berga in the county as a whole gives it high levels of municipal self-containment.

6. Conclusion

The general mobility patterns in the Comarques Centrals show features similar to those of non-metropolitan Catalonia as a whole, such as the use of the private vehicle for around half of all journeys, a slightly lower percentage of journeys on foot and an almost marginal use of public transport. In addition, mobility patterns by gender maintain the differences in habits of the country as a whole, according to which women have more balanced mobility patterns than men, whose habits are strongly focused on car use.

However, as a characteristic feature, the Comarques Centrals are the region with the lowest municipal self-containment rates of all Catalan regions. Here we have a region which, *a priori*, shows considerable openness encouraged by an administrative structure dominated on one hand by small municipalities and by the existence of quite cohesive urban systems covering more than one municipality.

In addition, our area of study has a central geographical position in Catalonia and serves as a pivot, the centre of which is Bages. Based on this positioning, the Comarques Centrals establish territorial relationships with the surrounding regions weakening as the physical distance increases. However, different strengths of relationships can be established which, in decreasing order, would be: the Regió Metropolitana de Barcelona, the counties bordering our area of study, Gironès and Segrià, and the rest of the region.

However, it must be borne in mind that territorial relationships change in strength

and even territorial depending on the day of the week in question; at weekends and on public holidays it is a stronger relationship caused by leisure-generated mobility and in which the distance factor is a less decisive element when it comes to establishing relationships.

As for internal relationships, we find they are centralised on Bages and, probably, on Manresa, while the other counties in the region have very weak and sometimes non-existent relationships with one another. The lack of central axes for the whole region and the fact that various transport systems have stronger communications with other areas, especially the Regió Metropolitana, certainly have something to do with this situation.

1 Homeward journeys have been added to each of the main reasons.
2 Under these labels we find leisure/fun, going for a walk and visiting friends.
3 Here we find errands, visits to the doctor, unregulated education and eating other than as a leisure activity.

DAILY MOBILITY IN THE TERRES DE PONENT

Carme Bellet
Josep M. Llop

1. General daily mobility characteristics of the population

According to the data provided by the Survey of Daily Mobility (2006), during 2006 the 323,323 residents of the Terres de Ponent (Western Regional Area) made a total of 6,830,078 weekly journeys which averages out to 21.13 journeys per person per week. Although average individual mobility is very similar across the different regional areas under study, it varies in terms of concentrations of journeys.

These figures show that, in general, mobility in the Terres de Ponent is less intense than in other territories, together with the Comarques Centrals (Central Regions) and the Comarques Gironines (Girona Regions). We can see that in the Terres de Ponent the average number of journeys made on weekdays is 3.33, while on weekends the daily average falls to 2.24 journeys per person.

On weekdays the average number of journeys per person[1] is close to averages for Catalonia as a whole (3.38 per person per week), but on weekends the population of the Terres de Ponent, together with the Comarques Centrals, make the least journeys.

2. Motives for travelling

Throughout all the regional areas, figures for mobility linked to personal motives (shopping, accompanying another person —children or elderly—, leisure, etc.) are higher than those for work or study related mobility (occupational mobility). In the Terres de Ponent, however, it should be noted that the journeys made to and from work / place of study account for 47.4% of all journeys, a percentage which is slightly higher than that recorded for other areas, and in any case significantly higher than the figure for Catalonia as a whole (45%).

So, figures for journeys undertaken for personal motives are quite moderate compared to those for other areas. Shopping (7%), leisure activities (5%) and accompanying other people (4%) are the main motives for journeys on weekdays. In the Terres de Ponent figures are considerably lower for journeys related to leisure, going for a walk or taking advantage of free time compared to other regions. Accordingly, while the average for journeys related to personal reasons (leisure, taking a walk, visiting friends or family) in Catalonia account for 32.1% of all journeys, the corresponding figure for the Terres de Ponent is only 10.8%. In contrast, however, the motives which are more relevant are: accompanying other persons, personal business, doctor/ hospital and attending informal training courses (i.e. those offered in community centres etc., with no official qualification).

The significant proportion of elderly people in the Terres de Ponent, compared to the age structure in other territories, the lower level of mobility for part of the population, and the limited public transport services in the region, offer a likely explanation for the higher percentages for these motives.

In the Terres de Ponent, the reasons for making journeys at the weekend are of a more leisure-oriented nature. Leisure pursuits (which alone cover 16%), going for a walk or visiting family together, account for 34.5% of journeys made on weekends.

The significant figures for journeys home (more than 46.5%) in the Terres de Ponent, confirms the pendular nature of mobility: that is, citizens do not combine their journeys, but rather, for example, leave home to go to work and then return home; or go out shopping and then return home[2].

3. Use of transport modes

The evident inadequacy of public transport (lack of services and networks or the limitations of existing services) in the Terres de Ponent explains why a car is the prevalent mode of transport, accounting for 48.6% of journeys on weekdays and 59.1% on weekends. Furthermore, figures for the number of people travelling in a car are very low: 1.20 on weekdays and 1.34 on weekends.

However, journeys are also undertaken via non-motorised modes of transport with notably higher figures than for other areas. Walking or using a bicycle in the Terres de Ponent account for 46.4% of journeys on weekdays, while figures for Catalonia as a whole are 45.1%. Walking accounts for 45% of all journeys. These are significant differential features of this area.

On weekends figures for non-motorised transport means fall to 41%, a tendency which can also be seen for public transport use, which drops from the already marginal 6% on weekdays to 2.2% on weekends.

On weekdays privately owned vehicles are the most common means for getting to and from work, while journeys for personal motives are mainly resolved via non-motorised means (on foot/by bicycle). On weekends the figures for private transport use increase significantly whatever the reason for the journey, which, as already stated, are related to longer journeys which go beyond municipal boundaries.

Journeys in the Terres de Ponent are usually undertaken by only one transport mode, single-modal. If we define a stage as each of the trip trajectories which require changing from one transport mode to another, then journey-stage relationships are 1.02 (for weekdays), and 1.01 (for weekends).

4. Journey times and concentrations

The hourly breakdown of journeys shows the rhythm and concentrations of journeys according to motives for the journey. Thus, work-related journeys (work and study) on weekdays are generally concentrated in two time zones: 7:00-10:00 a.m. and from 5:00-8:00 p.m. Rhythm and concentration, however, change outside the metropolitan area. For example, in the Terres de Ponent, a significant feature is the volume of journeys at midday (from 1:00 p.m. to 4:00 p.m.), for the main part people returning home from work or place of study. However, a further interesting aspect here is that occupational mobility (work or study) not only governs individuals' personal agendas but also those of others and how they make use of the territorial space. One example of this is the motive "accompanying another person" which, as stated earlier, is a significant feature of the Terres de Ponent. The concentrated volumes accordingly generated are mainly found in time zones related to class and work schedules (8:00-9:00 a.m. and 4:00-6:00 p.m.).

Mobility governed by personal motives, as opposed to occupational mobility, is much more even throughout the day, generating more continued use of public space. This is particularly evident on weekends when journeys are much more even and more concentrated than on work days. One of the findings of this survey has been to reveal the numbers and relative importance of personal mobility, but another important aspect that needs

to be underlined is the corresponding spatial area travelled which means a more continued use of public space.

5. Mobility according to gender and age

The different mobility patterns and motives for travelling, in the case of the Terres de Ponent, illustrate gender-related differences. While these differences are marginal for overall mobility figures on weekdays, these differences increase considerably on weekends. Figures for weekdays are 3.31 journeys for women as opposed to 3.35 for men, a slight difference which increases significantly on weekends to 2.07 and 2.41, respectively. This situation is explained by the different motives for journeys and the main transport means used by each of these social groups.

This breakdown by gender and age also illustrates that, logically, the least mobile of the population are elderly women. This comparatively lower degree of mobility is repeated throughout the different age ranges for females with the notable exception of the 30-64 age range, where there is a greater degree of mobility than for men in the same age group. This fact is clearly related to the role of women in the various types of family (motherhood related tasks and taking care of the family and home, taking the children to school and accompanying grandparents, etc.). Similarly, this can be seen when analysing the reasons behind mobility: for young and mature men (working age) mobility is mainly work related, while for women personal motives are the main cause and this is a major feature of women's mobility in the 30 to 63 age range.

The most mobile group is comprised of males between 4 and 15, who make an average of 3.66 daily journeys on weekdays. But this is closely followed by women aged between 30 and 63, who make an average of 3.63 journeys on a weekday. In addition, women in this age group combine their journeys more (multi-purpose) than the rest of the age ranges and groups.

Students and those who are actively employed are the social groups that generate greater mobility. Pensioners and those who undertake unpaid domestic work (in essence, women) are the social groups with least mobility, lower even than for figures for retired persons. The lower age groups are more mobile (occupational mobility), while from 16 onwards mobility generated by personal motives increases, and finally becomes the major motive for mobility among the elderly.

Women, youths up to the age of 16 and the elderly are the social groups who make most use of public transport. The social advantages derived from promoting this mobility behaviour is self-evident, in addition to the environmental and economic benefits derived from more sustainable means of mobility. Two out of every three journeys in the Terres de Ponent correspond to these age groups. They account for almost half the figures for private transport use, but this figure increases to more than 75% for public transport and non-motorised means.

6. Territorial analysis of mobility flows

6.1. The importance of self-containment and mobility relationships within the area

Another feature of mobility in Catalonia is self-containment, or intra-municipal mobility (journeys within the municipality), where the major mobility flows are within the same municipality. Municipal self-containment here is understood as the percentage of intra-municipal journeys over the total journeys made in each of the territorial areas, and for Catalonia as a whole the figure is 71.3% on weekdays, falling on weekends. The Terres de l'Ebre and the Terres de Ponent have the highest indices of self-containment in Catalonia, the figure for the Terres de Ponent being 75.4%. This figure is significantly higher than the average for Catalonia and has various implications concerning time spent travelling, distances travelled and the transport modes used, as will be seen later. But it is also related to the socio-economic characteristics of this territory: the distribution of the population and where jobs are located. On the one hand, generally speaking the predominance of agriculture in the Terres de Ponent tends to establish very short distances between the home and the work place, explaining the high levels of self-containment. On the other hand, other significant reasons behind this high level of self-containment are likely the concentration of services and work places, generally speaking in region capitals. The data also reflects the high degree of self-containment generated by the capital city Lleida, and, in contrast, the limited capacity of other capitals and urban nuclei in neighbouring regions to generate self-containment.

On weekends, however, inter-municipal journeys, although less significant numerically, mean travelling longer distances producing what we could call "crossover mobility": a higher level of mobility on work days but which involves much shorter distances compared to Catalonia as a whole, while on weekends fewer journeys but which involve covering longer distances (inter-municipal).

The relationship between journeys made within the same municipality over total journeys gives us a measurement for self-containment. These figures confirm this idea of crossover mobility. Self-containment in the Terres de Ponent on weekdays is 75.4%, compared to 71.3% for Catalonia as a whole, while on Saturdays and Sundays this figure falls to 64.4%, slightly above the average for Catalonia (64.2%).

The largest number of inter-county journeys is between Segrià and Noguera, followed by Segrià-Pla d'Urgell, for both weekdays and weekends. Other inter-county figures are of minor importance.

6.2. The territorial scope of journeys between different areas

The relationship revealed by journeys between the Terres de Ponent and the Regió Metropolitana de Barcelona is far less concentrated than those established between the metropolis and other regions, especially the most immediate: Comarques Gironines, Comarques Centrals and the Camp de Tarragona. The figures for the Terres de Ponent and the Regió Metropolitana de Barcelona, some 20,000 on weekdays in both directions, are one fifth of the averages recorded for nearby regions. This ranking with the metropolis is close to that for the Terres de l'Ebre and the Alt Pirineu i Aran, which are the furthest from the metropolis and the most inland areas in Catalonia.

In contrast, another feature which needs to be underlined is the significant number of journeys from the Terres de Ponent running outside Catalonia, some 7,000 on weekdays. This figure is comparable to the number of journeys between the Terres de Ponent and the Alt Pirineu, but double that with the Terres de l'Ebre.

One possible explanation for this high number of people travelling outside Catalonia on a daily basis is the frontier position of the Terres de Ponent and the strong traditional links with the Aragonese strip. In fact a noteworthy feature is that figures for travelling outside Catalonia from the Terres de Ponent are significantly higher than for the rest of Catalonia on weekends, double those for weekdays.

As already stated in section 2, the bearing of occupational mobility on weekdays is more important compared to figures for other regions, although personal mobility continues to the dominant factor. Mobility for personal motives becomes more important with regard to internal flows; that is, within the Terres de Ponent and curiously accounts for an important part of the mobility flows with the metropolis Barcelona. There is a clear functional relationship between motives for travelling between Terres de Ponent and the metropolitan areas which combine occupational journeys with other journeys for personal motives, to the degree that the percentage returning home for personal motives is significantly higher than the out-going occupational journeys.

In contrast, also on weekdays the mobility relationships between the Terres de Ponent, Comarques Gironines and the Camp de Tarragona are more work-related, all in all accounting for more than 55% of all journeys. The same can be said for mobility relationships extending beyond Catalonia.

6.3. Distribution by transport mode of internal and inter-county journeys

74.8% of all journeys made by the Terres de Ponent population on weekdays and 64.2% on weekends begin and end in the same region. The region with the highest level of self-containment is Segrià, for both weekdays as well as weekends. In contrast, the region with the lowest level of self-containment is the Pla d'Urgell which establishes a good number of mobility links with neighbouring regions, especially Urgell and Segrià.

As mentioned earlier in section 3, the Terres de Ponent generates a significant degree of ambivalence regarding the mode of transport used for undertaking journeys: on the one hand, non-motorised modes represent a significant percentage, yet on the other hand one can see a parallel importance in the use of a privately-owned vehicle. Non-motorised forms of transport take on a leading role in intra-municipal and short-distance journeys (47.9%). Use of public transport is close to negligible, especially within this area; however, public transport takes on a major role in inter-county journeys and long distance trips. For example, in the case of mobility relationships with the Regió Metropolitana de Barcelona use of public transport accounts for 23% all journeys between these two areas. There is also a significant use of public transport in mobility flows with the Comarques Gironines (almost 15%) and Camp de Tarragona (12%). The reason behind these two cases is the very good current public transport service. In contrast, there is far less use of public transport linking the Comarques Centrals, the Alt Pirineu i Aran and for travelling outside Catalonia.

7. The subjective dimension of mobility

7.1. General characteristics

41.3% of those living in Terres de Ponent do not have a driving licence. This figure is particularly significant and has further social implications when one recalls that this area does not have an efficient public transport system.

7.2. Evaluation of the modes of transport

Evaluations of mobility in the Terres de Ponent need to be seen in the light of its territorial context and, as we have already seen, the use of private transport by the majority, although this needs to be weighed against the shortcomings or lack of public transport services. Bearing this in mind will help in understanding the following evaluations:

a. Private transport: Reasons for using private transport are more wide-ranging in Catalonia than in the Terres de Ponent, although one significant feature is that the reasons given and ranking are not the same. In the Terres de Ponent the main reasons, bearing in mind the starting premise here, relate to the lack of public transport or the shortcomings of the present inadequate service. In more specific terms, reasons given were: there is no public transport alternative (5.99), comfort and convenience of private transport (5.63), or the time-saving factor in journeys (5.62), being those which rated highest. But for Catalonia as a whole the reasons are quite different: the time-saving factor in journeys (5.96) ranks first; there is no public transport alternative (5.81) second; followed by the need to make trips for various motives consecutively (5,74). It should be noted that the comfort criterion, which is cited in the case of the Terres de Ponent, does not even figure in the responses from the rest of Catalonia. Comfort is a particularly important consideration in the Terres de Ponent when one allows for the more continental climatic conditions and the shortcomings of the inter-urban public transport.

b. As regards evaluating public transport, the main differences for Catalonia are "difficulty finding parking or traffic congestion", rated first with a score of 5.89%, which in contrast is rated third in the Terres de Ponent. Another significant finding is that in Terres de Ponent hardly any consideration is given to "shorter travel time", rated lowest. This is no doubt closely linked to "accessible stops / stations in terms of distance". For Catalonia "shorter travel time" rates third (5.33); while in the Terres de Ponent this rates last (3.99), a difference of almost two points. Another point that should be noted is the distances covered by the public transport networks: almost non-existent in the majority of the municipalities because there are less than 20,000 inhabitants, and where they do exist they are inter-urban services with very long distances between stops. The fact remains that the lack of appropriate distances between stops and reliability / running on time are the main reasons for the low scores obtained concerning public transport in Terres de Ponent, rated 4.97 and 4.87% respectively.

c. So, the evaluations of private and public transport are not simply related but have crossover conditioning factors. By way of a general and comparative view between these two transport modes, it should be noted that maximum and minimum scores for motives for using public transport (not forgetting its minor role in the Terres de Ponent), oscillate between only one point. This is a clear evaluation which we could call "compact" and in keeping with the shortcomings of public transport services mentioned earlier. For the rest of Catalonia this differential value increases to two points. This is also coherent with a correspondingly better public transport services. But we must also point out that, in contrast, the evaluations in favour of using private transport are more wide-ranging and fluctuate between 6 and 2.36, that is, more than 3 points. It is as if having no alternative than a car generates less consensus of reasons given compared to the more "compact" range of reasons in the case of evaluating public transport. Consequently, one possible conclusion that we can draw here is that public transport services have a clear idea of the path they need to follow and the improvements they need to make.

8. Declared mobility-related expenses

The monthly expenses declared by users of different transport means for Catalonia as a whole is 473.7 million euros, which breaks down into 108.2 million euros on public transport and 365.5 million euros on private transport. This means that the average monthly travel costs declared by users is 25 euros on public transport and more than 100 euros on private transport. It should be noted that these costs are calculated over the user population of this transport means and therefore is a ratio between total expenses and the user population and not a simple addition of the different entries.

In the Terres de Ponent declared average month travel expenses are 18.65 euros on public transport, a figure which rises to 91.84 euros for private transport. As can be seen, this imbalance once again illustrates the types of mobility and transport modes used in different areas. It is also clear that the functional areas of Catalonia, where monthly outlay on public transport is lowest, are Terres de Ponent and Terres de l'Ebre, areas where public transport services are either non-existent of inadequate.

9. Some points for consideration concerning the data from the survey of daily mobility in the Terres de Ponent

Differential mobilities for cities and town in Terres de Ponent

As is the case for Catalonia as a whole, the personal mobility profile is quite different from the occupational mobility profile. The latter is determined by the mobility flows of workers and students. occupational mobility has two peaks during the day: the highest of the two being in the morning, and the other, almost half, in the afternoon. However, we could say that personal mobility is much more "even", that it is "slower" and, above all, we could also say that it involves more "time", to which we can surely add that it covers a wider spatial area in our towns and cities. What this means is that less tension is generated throughout the urban stretch compared to occupational mobility flows, with lower

costs in terms of congestion and the effects of tense traffic conditions such as accidents and stress. In addition, this mobility is continual, steady and extends over longer periods of time (graphically illustrated by two gentle curves) and translates as more presence on the streets and a greater degree of safety in public spaces. It should be noted that the occupational mobility group is smaller. Revealing this more daily and calm form of mobility which has less impact than occupational mobility, is one of the lessons learned from this survey, and offers a whole range of clues as to mobility policies in Catalan cities linked to managing time in the city / territory.

The strong presence of private transport. A significant feature of this survey is that the data reveals the low level use of public transport in the functional areas of the Terres de Ponent. This deficit corresponds to the area of public transport networks and services, which is also related to the population layout of the territory and the lack of larger urban nuclei.

Another question illustrated by this survey is the major importance of non-motorised mobility, even in worker or student itineraries, and a significantly higher use of bicycles than in the rest of Catalonia. Although their numbers are small compared to total mobility figures, they differ significantly from Catalonia as a whole and are a significant feature in the Terres de Ponent. This form of mobility, in numbers a little lower than for the rest of Catalonia, is concentrated but "shorter" on weekdays and implies longer distances on weekends. It is as if the strong presence of non-motorised proximity mobility, evident on weekdays, either walking or using a bicycle, is juxtaposed against longer distance mobility on weekends. We must once again insist on the fact that the lack of an extensive general public transport system in the functional area of the Terres de Ponent, shapes its mobility. Along these lines we would like to cite by way of an example of good mobility practice, the creation of the Consorci del Transport Públic de Lleida (Lleida Public Transport Consortium), set up between the DPTOP of the Generalitat de Catalunya (Catalan Autonomous Government) and the town councils in the Lleida area, which has provided solutions to some of the mobility problems discussed earlier and provides a measure of cohesion in the space/time mobility of the citizens living in and around the city of Lleida. This Consortium is an exemplary instrument for improving public transport mobility in the functional areas of the Terres de Ponent.

1 These figures applicable to 95.8% of the journeys made by those who do not drive as an integral part of their job (i.e. lorry drivers, taxi drivers, public transport drivers, etc.), given that those who do represent 4.2% of the journeys in the Terres de Ponent who make an average of 16.43 journeys per day.

2 This relationship of combining journeys, one of them being returning home from a journey motivated by personal reasons, is a very relevant feature in the comparative relationships between the Regió Metropolitana de Barcelona and the Terres de Ponent, as is explained later on.

DAILY MOBILITY IN ALT PIRINEU I ARAN

Antoni F. Tulla
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Introduction

Alt Pirineu i Aran show some extreme characteristics compared to the other Catalan regions. Covering 5,775.6 km^2, it represents 17.99% of the area of Catalonia, while the population of 69,325 inhabitants of Alt Pirineu i Aran, in 2006, corresponds to only 1.01% of the total for the country. When it comes to the subject of mobility, this situation establishes a strong contrast between a very extensive mountainous region and a population that is dispersed throughout it but at the same time concentrated in small towns and villages along the main valleys and the communication routes that run along them. The volume of weekly journeys (1.8 million), although small in absolute terms, is more than 15% higher than it would be if it corresponded to the region's total population compared to Catalonia as a whole. The situation is the same with the number of journeys per person per week. The average for Catalonia is 22.62 journeys pers./week, while in Alt Pirineu i Aran it rises to 25.45 (23.70/21.64 without mobility professionals), representing 12.5% more.

We therefore find a very extensive territorial area with low population density (12 in./km^2) where settlement is concentrated on the county capitals and larger towns and villages. Of the 77 municipalities in the region, in 2006 only one had more than 10,000 in. (la Seu d'Urgell, 12,533 in.) representing 18.08% of the total, and three had between 5 and 10 thousand inhabitants, containing 28.13% of the population. There are 3 municipalities of 2 to 5 thousand (10.98%), 8 of 1 to 2 thousand (16.73 %) and 10 of 500 to 1,000 in.(11.43 %). These 25 municipalities of more than 500 in., with a total of 59,154 in., together currently represent 85.33% of the total population. The trend towards the concentration of the population has particularly increased since the second half of the 20th century. So, 50 years ago, the 25 municipalities with more than 500 inhabitants in Alt Pirineu i Aran —without the aggregations of the decade 1970-79— represented 50% of the population (Tulla, 1993). In the same way, the 52 municipalities with less than 500 in. currently only concentrate 14.67% of the total population. We can see the distribution on figure 1.

So, in this part of the Pyrenees we find some very large municipalities, as is the case of Tremp (302.8 km^2), and other very small ones, such as la Seu d'Urgell (15.4 km^2). Given this territorial diversity it is difficult to establish comparisons. Considering everything, two general characteristics must be taken into account in these mountainous areas with very closed valleys: (a) regardless of whether the municipal area is very large, almost all the population is concentrated into the main centre, and (b) when the municipality is very small, part of the population of contiguous municipalities is located on the edge of the more populated municipality. These facts corroborate the concentrated structure of the population in the main valleys.

1. Daily mobility in Alt Pirineu i Aran within Catalonia

Mobility in Alt Pirineu i Aran is the highest, in a relative sense, of any of the seven regions of Catalonia, together with Camp de Tarragona, despite the high rate of aging of the population and the fact that the activity rate is one of the lowest in Catalonia. Although the population of Alt Pirineu i Aran represents only 1.01% of Catalonia, it accounts for 1.11% of the daily mobility —1.08% on working days and 1.19% at weekends and on public holidays. This means the percentage of journeys in relation to the total for Catalonia is 9% higher than would correspond to its percentage of the population.

The activity rate in 2001 in Alt Pirineu i Aran was only 55.71%, while in Catalonia it was 58.38%. However, in 2006 the unemployment rate was 8.32% in Catalonia and only 4.44% in Alt Pirineu i Aran. The female activity rate for the same year in Alt Pirineu i Aran was 45.68% and in Catalonia 48.33%. The population aged over 65 in Catalonia in 2005 was 16.57%, while in Alt Pirineu i Aran it rises to 19.49%. The female population aged over 65 in Catalonia in the same year, compared to the entire female population, increases to 19.04% but is still higher in Alt Pirineu i Aran, with 21.98%.

The *percentage of intra-municipal journeys (self-containment)* in Alt Pirineu i Aran (73.5%) is slightly greater than the average for Catalonia (71.3%), both on working days and at weekends/on public holidays (70.4% and 64.2% respectively). This greater self-containment in Alt Pirineu i Aran is explained by the strong concentration of the population into few municipalities, which, in turn, determines lower average times for intra-municipal journeys in Alt Pirineu i Aran compared to the average times for intra-municipal journeys in Catalonia as a whole, both on working days (11.94 and 15 minutes respectively) and at weekends and on public holidays (16.60 and 17.87 minutes). By contrast, the times for inter-municipal

journeys are greater for Alt Pirineu i Aran than for Catalonia (33.58 and 31.53 minutes on working days; and 40.96 and 37.70 minutes at weekends and on public holidays). The reason can be jobs or tourist attractions being further away, as in many cases there are long distances between the small centres and the county capitals.

The *usage structure of means of transport* in Alt Pirineu i Aran is very different to that for Catalonia as a whole:

a. While in Catalonia multi-modal journeys reach 6.2% on working days, in Alt Pirineu i Aran they amount to only 2.4%. At weekends and on public holidays the difference is also maintained, with percentages of 4.4% and 2.4%, respectively.

b. Use of non-motorised means of transport —walking or cycling— is very high in Alt Pirineu i Aran (49.9%), while it is only 45.5% in Catalonia, and 42.7% in the Comarques Gironines. The weekly distribution of motorised transport is more homogeneous in Alt Pirineu i Aran (49.8% working days and 50.5% weekends/holidays) than in Catalonia (45.9% and 43.9% respectively). Bicycle use is slightly higher in Alt Pirineu i Aran (1 %) than in Catalonia (0.9 %).

c. By contrast, public transport use is much lower in Alt Pirineu i Aran (3.8% working days, 1.9% weekends/holidays and 3.4 % for the whole week) than in Catalonia (15.6%, 9.0% and 14.2%, respectively). The Regió Metropolitana de Barcelona (RMB), with the 20.3% on working days and 11.9 % at weekends and on public holidays, is the region with the highest use of public transport as well as for multimodal journeys (7.3% on working days and 4.6% at weekends and on public holidays).

d..Private transport is used in Alt Pirineu i Aran on 46.7% of weekly journeys, while in Catalonia the figure is 40.3 %, only reaching 35.6% in the RMB. The situation on working days is still more extreme —46.4% in Alt Pirineu i Aran, 38.4% in Catalonia and 33.6% in the RMB. By contrast, at weekends and on public holidays behaviour is more similar: 47.6% in Alt Pirineu i Aran, 47.2% in Catalonia and 42.9% in the RMB.

e. The occupation of private vehicles is lower in Alt Pirineu i Aran (1.20 passengers on working days and 1.35 at weekends and on public holidays) than in Catalonia (1.22 and 1.40, respectively).

The features of mobility in Alt Pirineu i Aran described here confirm greater atomisation of routes because of the low population density, but also the lack of an effective public transport system, requiring greater use of private transport. On the other hand, the smaller size of population centres and their concentration in the main valleys facilitates mobility with non-motorised means of transport.

The *reason for journeys* also shows some different features in Alt Pirineu:

a. Occupational mobility is 21.7% for weekly journeys in Alt Pirineu i Aran, while in Catalonia it is 20.1%. However, on working days it is 25.9% and 24.6% and at weekends/on public holidays it is 7.9 % and 4.1 %, respectively, a situation showing greater working activity in Alt Pirineu i Aran at weekends. This situation contrasts to that in the RMB where the 20.1% of weekly journeys for employment reasons rises to 24.7% on working days and falls to 3.7% at weekends and on public holidays.

b. Personal mobility is more homogeneous between working days and weekends/ holidays. In Alt Pirineu i Aran, 33.1% of weekly journeys are for this reason, falling to 29.1% on working days and rising to 46.1% at weekends and on public holidays, basically for leisure/fun, going for a walk, everyday shopping or to visit friends and family. In Catalonia this reason accounts for 34.0% of weekly journeys, falling to 29.9% on working days and rising to 48.7% at weekends and on public holidays. Overall, then, personal mobility is lower than in Catalonia as a whole.

c. Returning home is almost exactly the same. In Alt Pirineu i Aran it represents 45.3% of weekly journeys and in Catalonia 45.9%. The difference is that returns home in Alt Pirineu for occupational reasons are higher (17.6 %) than in Catalonia (16.7 %).

The *time distribution of journeys* is very similar to that in Catalonia as a whole. However, it shows some rural peculiarities, such as a greater concentration in time of leaving work. It must be remembered that the average intra-municipal journey time —the majority type of journey on working days— is lower in Alt Pirineu i Aran (11.9 minutes) than in Catalonia as a whole (15 minutes) and in the RMB (16.3 minutes), and people have lunch at home more often, among other significant features.

Mobility depending on gender and means of transport shows us greater use of non-motorised modes by women in Alt Pirineu both on working days (57.06% of journeys) and at weekends/on public holidays (54.03%), above the Catalan average (50.9% and 44.8%, respectively). The same thing happens with public transport on working days, on which women in Alt Pirineu i Aran make 3.83% of journeys while men make only 3.62%. In Catalonia the figures are 16.3% and 12.2%, respectively. By contrast, the pattern is different at weekends and on public holidays in Alt Pirineu i Aran, when women make only 1.79% of journeys on public transport and men 2.13%. This situation contrasts with that in Catalonia as a whole (9.6% women and 7.3% men). The private vehicle is used more by men in Alt Pirineu, both on working days (54.54 %) and at weekends/on public holidays (52.49 %), than by women (39.10% and 44.19%, respectively). However, it must be noted that women use it more at weekends and on public holidays than on working days. In Catalonia as a whole, by contrast, although men also use it more, the difference is the same both on working days and at weekends/on public holidays.

Reasons for mobility in relation to gender show a similar structure in Alt Pirineu to that in Catalonia as a whole. On working days, Pyrenean women make 20.93% of journeys for employment reasons compared to a figure of 20.6% for Catalonia. Men make 30.43% and 28.7% of journeys, respectively, for occupational mobility reasons. Personal mobility is even more similar; in Alt Pirineu i Aran it accounts for 33.85% of women's journeys and 24.71% of men's. In Catalonia the figures are 33.9% and 25.7%, respectively. It is only different at weekends and on public holidays, when journeys for work in the Pyrenees make up 6.75% of the total for women and 8.87% for men, while in Catalonia the figure falls to 3.5 % and 4.6 %, respectively. This corroborates greater daily mobility for employment reasons at weekends and on public holidays in Alt Pirineu i Aran than in Catalonia as a whole.

Municipal self-containment depending on place of residence. We will first deal with the situation in Alt Pirineu i Aran in relation to the other regions (figure 2) and then the situation in the various counties in the Pyrenean region (figure 3).

On working days, of the seven regions in Catalonia, two (Comarques Centrals with 65.5% and Comarques Gironines with 67%) show the lowest level of self-containment. Two more, the RMB, with 71.7%, and the Camp de Tarragona, with 72.5% stand at around the Catalan average (71.2%). The other three, Alt Pirineu i Aran (73.5%), Ponent (75.4%) and Terres de l'Ebre (77.3%) show the highest level of containment. At weekends and on public holidays, municipal self-containment in Catalonia as a whole falls to 64.2%. By regions, Comarques Centrals (54.9%) and Comarques Gironines (57.3%) continue to show the lowest self-containment. By contrast, Alt Pirineu i Aran (70.4%) and Terres de l'Ebre (69.4%) show the highest self-containment. Two a degree, two extreme models of lower fluidity of mobility between municipalities are defined, located in the "most marginal" reasons —Alt Pirineu i Aran, and Terres de l'Ebre.

At county level in Alt Pirineu i Aran we see, on working days, that municipal self-containment is very high in the counties of Alta Ribagorça (78.1%) and Alt Urgell (78%). It is not clear whether cross-border

flows have been taken into account. Meanwhile, the least self-contained counties are Pallars Sobirà (60.2%) and Cerdanya (65.8%). Around the average (71.6 %), are Val d'Aran (71.1%) and Pallars Jussà (72.7%). At weekends and on public holidays the average is lower (57%) and the county self-containment structure changes. Pallars Sobirà (48.7%) and Cerdanya (52.4%) continue to be least self-contained, while Alt Urgell (60.6%) and Pallars Jussà (60%) show greatest self-containment. Around the average (58.9%), are Val d'Aran (58.9%) and Pallars Jussà (59.1%). It can be considered that this is the result of the combination of two main variables: on one hand, the concentration of the population into few municipalities, as is the case with la Seu d'Urgell, fragmenting self-containment, and, on the other hand, the importance of the tourist factor, which in counties like Cerdanya or Pallars Sobirà, particularly at weekends and on public holidays, would reduce self-containment.

2. The characteristics of daily mobility in Alt Pirineu i Aran

It must be borne in mind that the greater daily mobility in Alt Pirineu i Aran takes place on communications infrastructures with very different characteristics from urban ones and with very scarce public transport services. As for the characteristics of the infrastructures in Alt Pirineu i Aran, we can summarise them considering that the majority of the Pyrenean region has fewer urban communication routes and more rural and forest ones than the average for Catalan territory. In general, they are long-distance routes compared to the normal urban ones in towns and cities. Distances are large, not only compared to the country's big urban concentrations, but also between the towns and villages of Alt Pirineu i Aran itself. The communication network is less developed and is fundamentally structured depending on the conditions on the ground, with the main communication routes found along the bottoms of the main valleys, following the natural courses of rivers. In the case of communication between valleys, the roads cross mountain passes.

This regional structure, on one hand, and the dispersed urban network, in which there are no towns with more than 15,000 inhabitants, the fact that 2/3 of municipalities have fewer than 500 inhabitants, added to a situation where the big urban concentrations with services are more than two hours away from the majority of Pyrenean territory, are the main causes why greater mobility is generally recorded among the population of Alt Pirineu i Aran and also among mobility professionals.

Another important and significantly different factor from the country as a whole is that an important part of the employed population works in sectors linked to tourism (hotels, catering, commerce and construction). So, the services sector in Alt Pirineu i Aran employees more people than in Catalonia as a whole, as does construction. By contrast, the agricultural sector is much bigger in relative terms, but this is a sector that employees only a small part of the active population. It is therefore in the sector of tourism-related activities where we would find the greatest population mobility, which would be increased by the tendency for there to be long distances between population centres and from these to the main tourist facilities, particularly ski stations.

2.1. General features of the mobility of the general resident population

The 69,325 people resident in Alt Pirineu i Aran aged over 4 make 1.6 million journeys a week (1.8 including mobility professionals, see table 5), representing 23.70 journeys per person per week (25.45 including mobility professionals). On working days, the average journey per person and per day is 3.94 journeys per person and, at weekends/on public holidays, it is 2.87 journeys/person.

2.2. Number of journeys depending on sex, age and professional situation

The specific features involved in having mountains as the main socio-geographical feature of Alt Pirineu i Aran are particularly reflected in the mobility differences shown by the population depending on sex, age and professional situation. The low population densities and eminently rural nature of most of the Pyrenean region, as well as the broken relief and high altitudes, are aspects that determine more markedly differentiated behaviour between segments of the population than in more urban areas. The contradiction is that, although this is a region where the population has become increasingly concentrated in few centres, urban infrastructures and services have not been created. We might consider that the urban element —understood as a concentration of population, infrastructures and services— has much less of a presence than the natural element (areas used for forest and crops), so that it becomes peripheral with respect to the great urban centre of Catalonia. This condition would also determine a lower level of confidence by the population in its services, both public and private, and this would be experienced in different ways depending on socio-economic characteristics and, therefore, behaviour of each segment of the population, depending on sex, age and professional situation.

So, in Alt Pirineu i Aran, an important difference can be observed in the number of journeys depending on sex, with men having an above-average level: an average of 3.65 journeys on working days compared to 3.63 journeys as an overall average, and 2.82 journeys at weekends and on public holidays compared to 2.78 overall average journeys.

The comparison between sexes shows a greater difference in the number of journeys in the week and at weekends among women than among men. So, women's mobility is even lower, compared to men's, at weekends than it is during the week. At the same time, mobility behaviour is very different between the sexes depending on age. Despite the lower general mobility of women compared to men, during the week all age groups of women have an above-average number of journeys except the oldest group of women, which is the group with the lowest number of journeys of all. This fact would be explained by the lower availability of driving licences and cars to women aged 65 and over. In addition, the difference in ways of life according to gender roles, which are much more differentiated in older generations, must be borne in mind. By contrast, at weekends and on public holidays all age groups of women have a below-average total number of journeys a day except those aged between 16 and 19, which could correspond to paid work outside the home at weekends.

So, women make fewer journeys than men in the youngest age group; 4 to 15; women aged 16 to 19 make more journeys than men (4.01 compared to 3.90), as happens in the 30 to 64 age group (3.91 compared to 3.72). This fact would probably be explained firstly, concerning women aged from 16 to 19, by the greater tendency of women to go into higher education and secondly, and for the group of women between 30 and 64, by the general role of the female group in taking responsibility for bringing up children and managing the home, a fact that would require around three journeys a day more than men (trips to schools, shopping and various errands). By contrast, women of 65 and over have a notably lower number of journeys: 2.42 compared to men of the same age group with 3.02.

Concerning the different number of journeys depending on professional situation, the figures show rather predictable behaviour. The school pupil and student group is the one making the largest number of journeys: 3.93 during the week and 2.98 at weekends. In second place in terms of number of journeys a day comes the active employed group; 3.88 and 2.99 respectively; in third place is the group devoted to unpaid domestic work, with 3.22 and 2.34 respectively. Finally, pensioners and retired people make the lowest number of journeys a day; 2.76 in the week and 1.98 at weekends in the first case and 2.88 in the week and 2.41 at weekends in the second. Another outstanding feature of these professional situations is the fact that people devoted to unpaid domestic work make fewest journeys of all groups at weekends.

2.3. Reasons and principal means of transport

Table 5 shows the reasons and means of transport at weekends and on public holidays and indicates that: firstly, motorised transport is more important than non-motorised, as it is during the week. Secondly, personal reasons create more journeys: 46.1% and returns are personal; 39.3% than occupational ones; 7.9% and returns, occupational; 6.7%.

2.4. Territorial relationships

Alt Pirineu i Aran has the greatest mobility flows at regional level firstly with the RMB (9.200 in thousands of journeys on working days and 25,800 at weekends and on public holidays) and, secondly, with contiguous regions, like Ponent (7,400 and 12,400, respectively), Comarques Centrals (3,500 and 7,200) and, at weekends/on public holidays, with Comarques Gironines (2,900). This strong link with the RMB should be noted, particularly at weekends and on public holidays (figure 4).

County relationships in the Alt Pirineu i Aran region show the high level on county self-containment, on one hand, and the tendency to have little relationship with other Pyrenean counties, with only counties bordering the county of origin being the second destination for journeys.

If we now look at movements between counties in Alt Pirineu i Aran, a stronger link can be seen between pairs of counties. Alt Urgell and Cerdanya (1,800 journeys on working days and 1,700 at weekends and on public holidays), Pallars Jussà and Pallars Sobirà (1,800 and 2,400 respectively) and Alta Ribagorça and Val d'Aran (800 and 2,600). Other relationships are much less important, although the central position of La Seu d'Urgell is most notable, with journeys on working days from Pallars Jussà (200) and Pallars Sobirà (200) increasing to 1,400 journeys at weekends and on public holidays.

Mobility relationships with neighbouring counties, although slight, occur in all cases between pairs of counties. Except for Val d'Aran and Alta Ribagorça, connected by the Vielha Tunnel since 1959, the remaining pairs of counties are communicated by valleys, following the natural courses of rivers: Pallars Sobirà with Pallars Jussà and vice-versa, and Cerdanya with Alt Urgell and vice-versa. At weekends and on public holidays, journeys between counties increase and destinations broaden to second neighbouring counties, as is the case with Alt Urgell, which incorporates movements with Pallars Sobirà, with movements with Cerdanya having increased from during the week (tables 6 and 7).

On working days, the counties with greatest county self-containment, above the average - 89.9% - are Pallars Jussà, Val d'Aran and Cerdanya, which are the peripheral counties in the Alt Pirineu i Aran region, which broadly coincide with the counties that are most popular for tourism.

By contrast, at weekends and on public holidays, the greatest county self-containment is in the counties that are least popular with tourists.

Municipal self-containment (see tables 6 and 7) compared with county self-containment (see tables 8 and 9) shows a lower level of self-containment at municipal level and coincides, both on working days and at weekends/on public holidays, in the fact that the three counties with the lowest level of municipal self-containment are the most attractive to tourists; Cerdanya, Val d'Aran and Pallars Sobirà.

Inter-county journeys in Alt Pirineu i Aran occur, as has already been mentioned, basically in pairs of counties, with the strongest relationships between Alt Urgell and Cerdanya and Pallars Sobirà and Pallars Jussà. At weekends and on public holidays the number of inter-county journeys increases only on the big communication routes along which most tourists arrive: la Noguera Ribagorçana and la Noguera Pallaresa. The Llobregat route via the Cadí tunnel is excluded from the analysis because it arrives directly in Cerdanya. In addition, at weekends journeys are extended beyond the normal pairs of counties.

3. Measures to improve daily mobility in Alt Pirineu i Aran

The specific geographical features of this region largely condition the possibilities of making improvements for the daily mobility of people and to make better use of opportunities for regional development and, if they can be lasting ones, for this area of Catalonia. In order to improve the conditions of the current mobility model, the specific features of this mountain environment must firstly be recognised (Ganyet, 1993) and, secondly, the appropriate proposals must be applied there —measures often opposed to those of urban concentration (Dómbriz, 2007).

Alt Pirineu i Aran is a territorially fragmented region with considerable land relief barriers, which, in turn, has led to the concentration of facilities and services in a few centres (Aldomà, 2003). So, the physical environment divides Alt Pirineu i Aran into three core areas, with a dynamic independent force between one another: Val d'Aran and Alta Ribagorça, Pallars Sobirà and Pallars Jussà, and Cerdanya and Alt Urgell (Vilagrassa, 2003). At the same time, Alt Pirineu i Aran are in a position far from the main urban agglomerations and communication routes in Catalonia (Serratosa, 2005). This distance from the big urban centres determines that the access time to the most socio-economically dynamic axes and nodes is much greater than the average for Catalonia (Avellaneda, 2005). This last element is, as we understand it, the most important aspect of the specific features of mountain mobility in the sense that it is the one that most reinforces the regional imbalances of this area compared to better connected areas. In this way, the former economic specialisation in the agricultural sector, particularly in stock and milk production (Tulla, 1993) has been moving towards the services sector, without there having been a true previous industrialisation process in these counties. This increase in activities and, therefore, economic flows of the services sector has, therefore, had to be achieved without the existence of infrastructures and public communication services of societies and territories which are or which have been clearly industrial (Pallarès-Barberà et al, 2004a; Pallarès-Barberà et al, 2004b; Pallarès-Barberà et al, 2003a). This handicap acts as a brake on development and local innovation in Alt Pirineu i Aran, both in relation to other regions and in the Pyrenean region itself (Pallarès-Blanch et al 2007 and 2006).

In the area of territorial relationships, Alt Pirineu i Aran has some contiguous areas with special features. It is a border region, with three connections, two with France —the Val d'Aran and Cerdanya— and that of Alt Urgell with Andorra which increasingly generates an important cross-border flow (Tulla et al, 2008; Pallarès-White, 2005). In addition, the counties in the valleys of the Noguera Ribagorçana, the Garonne and the Noguera Pallaresa have a greater relationship with the Ponent region, while the counties crosses by the River Segre show a greater link with Comarques Centrals.

So, in Alt Pirineu i Aran, there are three mobility patterns superimposed in the same region. Firstly, mobility generated within the region itself; secondly, mobility at weekends and on public holidays with origin or destination outside the region and, thirdly, passing mobility characterised by the fact that the origin and destination are outside Alt Pirineu i Aran. This last type of mobility in Alt Pirineu i Aran would not be shown in the Survey of Daily Mobility, but can be extrapolated from traffic flows. The communications infrastructures of Alt Pirineu i Aran must, then, meet three objectives: (a) daily mobility within the region; (b) mobility to and from contiguous areas, particularly Andorra, the urban areas of Barcelona and the Catalan coast, where at weekends and on public holidays it is almost 35% of total journeys, while on working days it is 12%; to an extent the reverse of what happens in the Regió Metropolitana de Barcelona (RMB) and (c) passing flows, without origin or destination in Alt Pirineu i Aran, use the three big communication axes (Llobregat, Segre and Nogueres).

Advantage should therefore be taken, at an initial level, of these advantages of "passing mobility" to establish agreements with the neighbouring countries (France and Andorra) with two purposes: on one hand facilitating the extension and improvement of transport infrastructures and, on the other, encouraging economic, commercial, personal and service flows between European regions within the framework of the Pyrenean Employment Commission (Giménez, 2007a and 2007b; Pallarès-White, 2005). The priority actions that must be undertaken to move forward in this direction are: in the first place, the improvement of rail routes (achieving European gauge, incorporating technical improvements in communication infrastructures and transport services and facilitating the connection with France, complemented with the link between Pobla de Segur, la Seu d'Urgell and Puigcerdà, with a light rail branch to Andorra). Secondly, the construction of airports and heliports and an improvement in the basic north-south and east-west road links are also fundamental for improving inter-connectivity with other regions.

In addition, journeys with origin or destination in the region, apart from the use of inter-county infrastructures, should be complemented with good communication routes to the towns and facilities that mobilise most tourism. At this level of mobility there should be an easy, efficient "modal change" between means of transport. The only way of reducing the use of private transport is for the main routes by train, taxi or bus to be combined with other modes without great loss of time, facilitating door-to-door transport (Jiménez, 2007). So, for example, an improvement in public transport between the RMB and Alt Pirineu i Aran would reduce congestion on the C-1411 and E-9.

At a third level, internal journeys require a complete road infrastructure in good condition. However, an improvement in rail transport and heliports to link distant points within Alt Pirineu i Aran should not be left to one side. The use of private transport must be reduced and this will only be possible with good, sufficient and frequent public transport, as a greater range of public transport would incentivise demand, while the reverse is also true —an insufficient range inhibits demand. In this sense, it must also be borne in mind that an investment in public transport and other services for collective mobility requires a good information campaign, as the population has its journeys very well structured according to the means of transport available and, in the case of Alt Pirineu i Aran, these usually show very little change over time.

Distinction should be made between two spheres of mobility within the region: on one hand that carried out along the main communication routes which often coincide with those developed for the first and second levels; and, on the other hand, movements along the lateral valleys where there are a few important towns, basically involving a dispersed rural population.

The means of transport to be used need to facilitate daily mobility on working days, ensuring the existence of public transport at peak times with a frequency that makes it attractive. In the Seu d'Urgell area, for example, the area of greatest population concentration in the whole region, there is still no urban bus which could be used if a route was planned between contiguous towns related to mobility to and from Andorra.

Specific action must also be taken in the high mountain areas where, as with coastal areas, there are large flows of tourists very concentrated in space and time, but here in adverse climate and weather conditions. Various actions can be applied to prevent the formation of bottlenecks; as well as providing more specific services; limiting the entry and impact of private transport on population centres, limits on parking on the most fluid communication routes, distinguishing useful mobility from mobility for pleasure, among others, all taking other mountainous European areas as a reference (Varlet, 2007).

Often, the small mobility flows generated in the most rural areas are not sufficient to establish conventional public transport services there. So, in the more rural area for this third level of mobility, apart from the "modal change" already put forward, work must be done in two directions: firstly, amending the legislation to unify specific transport (school, post, milk lorry, etc.); and, secondly, on systems like "on-demand transport", which have shown their virtues in Alt Urgell (Gurrera, 1988). Along the same lines, bearing in mind the needs of the population depending on sex, age and professional situation, segments could contribute towards offering more efficient and economical solutions (Pallarès-Barberà et al, 2003).

Other systems such as car sharing or mobility exchanges should be explored. One of the objectives for improving the territorial distribution of the population in Alt Pirineu i Aran would be to strengthen the settlement of the small centres. The key element is improving the quality of life of the population and being able to access services and facilities often located in large and medium-sized towns. To make it possible, a necessary condition is a good public transport system, although this must be complemented with other economic and social measures. The "shadow zones" without any public transport services must also be resolved, as in the rural world this can be crucial for the existence of a regularly inhabited village.

In any case, for these proposals to be carried out the involvement of local bodies and greater awareness from the autonomous community, State or communication administrations will be required, as well as private initiatives, concerning the particular features shown by rural and peripheral regions. It is not enough to improve infrastructures if this is not combined with the economic and social development of this region and if this is not reflected in regional and sectorial planning and town planning directives.