Modelling of consumption and demand

A more accurate picture of the distribution of consumption in the residential sector is made using the modelling of thermal demand and consumption in different types of buildings (simulations carried out using the TRNSYS application in the types defined in the PMEB and PECQ), and by means of calibrating the real energy consumption of the city.

The analysis shows that the consumption is highly distributed between hot water consumption, heating and appliances. The data relating to hot water include the energy from solar panels, which since the approval of the solar Ordinance are compulsory in newly constructed buildings.

**FIGURE 130 | DISTRIBUTION OF RESIDENTIAL ENERGY CONSUMPTION, BY USE (MODELLING)**

- SHW (including solar SHW): 28%
- Heating: 25%
- Other: 13%
- Facilities: 26%
- Lighting: 7%
- Cooling: 1%

**FIGURE 131 | DISTRIBUTION OF RESIDENTIAL ENERGY CONSUMPTION BY BUILDING TYPE (MODELLING)**

- H6: 49.54%
- H7: 15.48%
- H8: 3.98%
- H9: 0.0%
- H10: 0.0%
- H1: 11.32%
- H2: 1.06%
- H3: 10.27%
- H4: 0.20%
- H5: 8.16%

**FIGURE 132 | EVOLUTION OF THE DEMAND AND CONSUMPTION OF HOT WATER, BY TYPE (MODELLING)**

- Consumption
- Demand
The changes in construction use and methods signify that new buildings have different demands and consumption from the existing types of building in the city.
Refurbishment in the residential sector

The evolution of land space in Barcelona has not ceased to grow over recent years, with an increase of 1.4 million m$^2$ between the years 1999 and 2007. Notwithstanding this, the built up land space in those eight years accounts for only 2% of the total residential land space in the city.

If we analyse the current housing stock by age, according to the type of building to which it belongs, we find it is quite old, as a large number of buildings were built prior to 1900 (13%). These data coincide with those furnished by the Department of Statistics of Barcelona City Council, formulated using the Population and Housing Census. The average age of the building stock, as mentioned earlier, is 63 years.

In order to detect the most usual reforms carried out in the city, an exhaustive study was made of the works licences processed between the years 1999 and 2009 in the three districts with the largest number of refurbishments according to the land register data (Ciutat Vella, Eixample and Nou Barris). During the ten years analysed, 11,600 refurbishment licences were issued in these three districts: 84% were minor works with improvements to facades which affected the envelope – interior or exterior - 13% refer to the roof and 3% to minor works.

Based on this information, the various energy improvements were analysed which were carried out during the most usual refurbishment work, evaluating the impact, economic cost and saving on energy bills.

Priorities for action in the sector

The analysis of the sector shows a great potential for action in energy efficiency in three specific areas:

- Action in current buildings
  Barcelona has a large stock of old buildings which could be refurbished, to a greater or lesser extent, in line with their age and degree of repair so as to reduce their energy demand. The actions proposed are related to the following elements:
    - Facades: By improving the conditions of thermal transmission to reach the values set forth in the Technical Building Code (TBC) and in the Eco-efficiency Decree, energy savings of between 9 and 14% can be achieved, together with a reduction in GHG emissions of between 10 and 15%, depending on the construction type.
    - Woodwork, windows and shutters: By improving the condition of these elements and achieving the values set forth in the TBC and Decree 21/2006, savings of between 7 and 12% of final energy are obtained, which result in reductions of greenhouse gases of between 4.5% and 7%.
- Refurbishment of buildings: By complying with the levels provided in the TBC and the Eco-efficiency Degree, both in the facades, roof, floor structure and openings, achieving the TBC levels, savings of between 14 and 19% of final energy can be reached and between 15.4 and 21.5% reduction of GHG emissions.

- Action in future buildings
  Barcelona plans to carry out major urban transformations which will, to a large extent, define the city of the future and the buildings of the coming decade. They therefore not only have to include energy efficiency criteria, thus reducing the energy demand of new buildings, but also take into account alternatives for utilising sustainable resources and analyse new, more efficient production alternatives.
  The City Council will not only monitor the application of the TBC in future buildings, but will also study the feasibility of drawing up a new building energy Ordinance. This ordinance, amongst others, will offer an overview of the territory’s resources and the technological options depending on the use of each building. Likewise, it will require a justification of the chosen alternative, in line with the global criteria for GHG emission reduction and primary energy using fossil fuels.

- Actions in social behaviour with regard to energy
  As important as improving efficiency in buildings and home appliances to reduce energy consumption is to foster rational use of energy resources and renewable energy production facilities among the public (see section 2.1.6. Social behaviour).
  In this respect, one of the aspects underlined by the PECQ is to influence the management of energy demand using projects which also involve the general public.

### 2.8.2 - COMMERCE AND SERVICES

Consumption of final energy in 2008 by the business and services sector was 5,083.79 GWh, of which 81.6% was electricity consumption. Despite the growth rate between the years 1999 and 2008 being 2.56% a year, two stages can be differentiated: the first, between 1999 and 2004, characterised by a sharp increase of 4.08%, and the second, between 2004 and 2008, with weaker growth but more sustained, of 0.69%. It is precisely as from 2004 that the energy intensity of the sector also fell in a sustained manner, revealing the greater energy efficiency of the sector.

The commercial and services sector in 2007 had a stock of built-up land space of 20,141,305 m² (1,012,689 m² in municipal buildings), which accounted for 16% of the total land space in the city. By use, 25.4% of the built-up land space was used for offices with a surface area of over 500 m², located in 1,994 buildings (of the total 70,825 in the city) and therefore have an average surface area of 2,566 m²/buildings.

The next largest type in built/up surface area were businesses with over 500 m² which accounted for 21.2% of the land space of the sector; they were located in 3,220 buildings and had an average surface area of 1,325 m² business/building. Businesses smaller than 500 m² which accounted for 19.5% of the land space were located in 23,429 buildings and had an average surface area of 168 m² business/building.

The remaining types were sports centres without swimming pools (6.66% of the total land space of the sector), healthcare buildings and clinics (6.54%) and municipal buildings (5.03%).

An analysis of the land space area by use of buildings shows that hospitals and four and five star hotels are those with the largest ratio, although they account for only 1.43% and 0.35% respectively of the total surface area. The types with the highest consumption are offices (29.66%) and businesses (38.85%).
FIGURE 139 | EVOLUTION OF FINAL ENERGY CONSUMPTION BY THE BUSINESS SECTOR IN BARCELONA (1992-2008)

Energy intensity within the commerce and service sector [Wh/EUR_commerce]

Source: ICAEN


Source: Land Register

FIGURE 141 | ACCUMULATED DISTRIBUTION BY AGE OF THE BUILT-UP LAND SPACE OF THE BUSINESS AND SERVICES SECTOR IN BARCELONA (1901-2007)

Source: Land Register
**FIGURE 142 | AVERAGE SURFACE AREA PER BUILDING ACCORDING TO THE BUSINESS AND SERVICES SECTOR IN BARCELONA (2007)**

- Municipal buildings: 4,582.3 m²
- Libraries and museums: 1,546.9 m²
- Hotels: 1,476.8 m²
- Sanatoriums and clinics: 1,310.6 m²
- Sports centres: 171.5 m²
- Restaurants <500m: 1,027.5 m²
- Restaurants >500m: 8,410.7 m²
- Hotels (1 and 2*): 1,441.2 m²
- Hotels (3*): 243.1 m²
- Hotels (4 and 5*): 167.8 m²
- Hotels (5*): 3,177.1 m²
- Hotels (6 and 7*): 1,324.9 m²
- Offsets <500m: 204.9 m²
- Offsets >500m: 2,566.3 m²

Source: Land Register

**FIGURE 143 | ESTIMATION OF ENERGY CONSUMPTION BY TYPE OF THE BUSINESS AND SERVICES SECTOR OF BARCELONA (2008)**

- Other uses: 5.27%
- Municipal buildings and services: 6.96%
- Libraries and museums: 1.19%
- Hospitals: 4.90%
- Sanatoriums and clinics: 4.19%
- Sports centres: 3.55%
- Restaurants <500m: 8.52%
- Restaurants >500m: 3.31%
- Hotels (1 and 2*): 2.87%
- Hotels (3*): 0.84%
- Hotels (4 and 5*): 0.06%
- Hotels (6 and 7*): 1.84%
- Offsets <500m: 8.79%
- Offsets >500m: 22.76%

Source: Land Register
2.8.3 - INDUSTRY

Consumption data

The consumption of final energy by the industrial sector in 2008 was 2,929.76 GWh, 74.8% natural gas, 24.3% electricity and 0.9% LPG. The evolution of energy consumption between 1999 and 2008 was a negative rate of -0.24% a year, as in 1999 2,993 GWh were consumed.

As with other sectors, 2005 saw a maximum peak in natural gas consumption, but subsequently this fell to levels below those of 1999. Energy intensity – the energy efficiency ratio of the necessary energy to produce one unit of GDP – also saw sustained growth until 2005 at which time it started to decreed to levels well below those of 1999.

The number of subscribers to the industrial electricity rate was 6,137 in 2007 (no data are available for 2008), a figure similar to previous years.
Potential energy saving

When evaluating the potential energy saving in the industrial sector as a whole, the diversity of the existing companies and variety of subsectors must be taken into account, for which reason when drafting the PECQ the analysis was focused on a specific set of industries which account for 31% of the sector’s consumption.

Of the selected industries – medium/large size with data available on energy consumption and an audit conducted by the company itself – an analysis was performed of the audits of the three preceding years and the measures proposed, both those implemented and those pending implementation. Visits are also made to the industries to ascertain their production processes and conduct personalised interviews with the heads of maintenance and/or managers of the processes of each one. After gathering all the information, a set of feasible, practical and realistic measures to be applied was proposed to enhance the efficiency of the various production activities studied.

This set of proposals shows that the potential for final energy consumption reduction is 57.18 GWh/year (77% in natural gas and 23% in electricity), a saving which accounts for 1.95% of consumption by the industrial sector in 2008.

The analysis also includes other electricity production measures using renewable energies and more efficiency systems. Total production would be 32.26 GWh/year (4.5% of the electricity consumption in 2008), distributed as follows: photovoltaic technology (13%), cogeneration (86%) and small-scale hydraulics (1%). With regard to thermal energy production, the proposals would represent the production of 35.45 GWh/year of useful heat (1.8% of the equivalent consumption of natural gas in 2008); cogeneration (99%) and sludge to energy recovery (1%).

This reduction in final energy and electricity production using renewable or more efficient systems would lead to a saving of 173.86 GWh of primary energy consumption and the non-emissions of 15,572 t of GHG (2.8% of GHG emissions from the industrial sector in 2008). Yet as this is only a part of the total industries in the city, the potential saving would be greater although no direct extrapolation is possible given the lack of uniformity of the sector.

FIGURE 146 | ENERGY CONSUMPTION BY THE SET OF INDUSTRIES ANALYSED COMPARED TO TOTAL CONSUMPTION BY THE INDUSTRIAL SECTOR (2008)
Priorities for action in the sector

Based on the study of the potential energy saving of the industrial sector conducted as part of the PECQ, different proposals have been put forward:

- **Implementation of energy efficiency management systems**
  It is proposed to create a project to promote these management systems, provided they are associated with specific energy reduction objectives and with the strategic plan of the company itself. The management system would need to contain the necessary measurement methods to define, in terms of energy, the various stages of the processes.

- **Introduction of heat recovery systems**
  One proposal is to achieve energy saving by means of recovering the heat from combustion fumes.

- **Pinch analysis for certain processes**
  The integration of industrial processes can generate major improvements in energy efficiency. Pinch analysis – the Pinch method for designing processes or technology –, allows the optimization of energy recovery in industrial processes, minimising investment as it establishes a thermodynamic link between the cold and hot flows.

- **Outsourcing of energy services with cogeneration systems between others**
  Together with the Service Platform of the Zona Franca, it is proposed to support the companies with technical advice, encouraging contacts between energy service companies and energy consuming companies.

- **Photovoltaic solar energy on industrial roofing**
  It is proposed to take advantage of the potential of solar roofing by means of the advice and administrative support so as to facilitate the implementation of photovoltaic energy on certain industrial roofs – either owned or rented – by contributing solutions to possible barriers, such as the temporary nature of the rental of industrial land and the depreciation period of the photovoltaic system.

- **Sludge drying for energy use**
  It is proposed to analyse the real possibility of introducing sludge drying systems which could be used energetically such as biomass in certain industries.

- **Increase energy efficiency in production processes**
  In conjunction with the Catalan Energy Institute (ICAEN) and the Services Platform of the Consortium of the Zona Franca, it is proposed to design support strategies for these industries to improve their energy efficiency and make them more competitive.

- **Energy saving in paint booths of vehicle workshops**
  Energy efficiency in car paint booths can be improved by using a new technology applicable to paint booths. This new system can be adapted to any conventional or newly built paint booth and consists of equipment which speeds up the evaporation of the water in the paint, considerably reducing the energy consumption and emissions of CO₂.
2.8.4 - MOBILITY (I): CHARACTERISATION OF MOBILITY AND TRANSPORT

The demand for mobility and modal distribution

In Barcelona, six million trips are made every day, according to data from 2008: 4.3 million are internal trips and 1.7 million internal-external.

In 2008, 32.7% of the internal trips were by public transport, 51.5% on foot and bicycle and only 15.8%, in private vehicles. As regards external-internal trips (1.7 million), private vehicles account for 47.5%, public transport 49.5%, and journeys on foot or bicycle 3%. Public transport, however, has grown in importance over recent years instead of private vehicles for this type of journey.

Mobility in Barcelona must be interpreted by considering the city and its metropolitan area. Although inter-municipal journeys account for just a third of the total, over half of the private vehicles in circulation on working days come from other municipalities.

When analysing the data, however, we must differentiate between journeys and stages of journeys. The first refer to a direct journey between the point of origin and final destination, while the latter consider the pauses during the journey to carry out other activities (shopping, collecting children from school, accompanying relatives...).

In non-motorised journeys, the public in Barcelona mostly travel on foot, which is the most common form of transport in the city. The bicycle is the only private means of transport which has seen an increase over recent years, especially as a result of the Bicing system which has been a major success.

As regards collective public transport, the most common in staged journeys, the Metro is the most highly used transport for internal travel such as entering and leaving Barcelona. Buses, on the other hand, which are the most common form of transport for internal journeys, have lost users to the local rail network for internal-external travel. Lastly, trams are the public transport which have gained the most passengers, even though this is linked to the fact that they were introduced relatively recently.

Cars are by far the most common means of transport in private vehicles, especially for internal-external travel, as they usually cover large distances. Motorcycles have also seen a significant increase to the extent they now account for 32.2% of the internal journeys in Barcelona. Both means of transport have a similar occupancy ratio, of approximately 1.18 persons, for which reason most journeys are made with a sole occupant. Vans and lorries also account for a percentage of journeys in private vehicles -15% of the internal and 26.6% of the internal-external, although they transport not passengers but freight.

In general, private means of transport, except the bicycle, have decreased in the total number of journeys in favour of collective public transport and mobility on foot.
### TABLE 35 | NUMBER AND MODAL DISTRIBUTION OF JOURNEYS IN BARCELONA (2008)

<table>
<thead>
<tr>
<th>Journeys</th>
<th>Internal</th>
<th>Connection (Internal – External)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transport</td>
<td>1,428,856</td>
<td>822,984</td>
<td>2,251,840</td>
</tr>
<tr>
<td>Private vehicle</td>
<td>691,993</td>
<td>789,780</td>
<td>1,481,773</td>
</tr>
<tr>
<td>On foot and by bicycle</td>
<td>2,253,024</td>
<td>50,346</td>
<td>2,303,370</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,373,873</strong></td>
<td></td>
<td><strong>6,036,983</strong></td>
</tr>
</tbody>
</table>

Source: Mobility Services Dept. Barcelona City Council (2008)

### TABLE 36 | NUMBER AND MODAL DISTRIBUTION OF STAGES OF JOURNEYS IN BARCELONA (2008)

<table>
<thead>
<tr>
<th>Journey stages</th>
<th>Internal</th>
<th>Connection (Internal – External)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transport</td>
<td>1,712,106</td>
<td>1,433,979</td>
<td>3,146,085</td>
</tr>
<tr>
<td>Private vehicle</td>
<td>930,764</td>
<td>1,296,639</td>
<td>2,227,403</td>
</tr>
<tr>
<td>On foot and by bicycle</td>
<td>2,226,268</td>
<td>251,217</td>
<td>2,477,485</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,869,139</strong></td>
<td></td>
<td><strong>7,850,973</strong></td>
</tr>
</tbody>
</table>

Source: Mobility Services Dept. Barcelona City Council (2008)
FIGURE 147 | MEANS OF TRANSPORT IN INTERNAL TRAVEL STAGES, WORKING DAYS (2008)

Stages of internal journeys 4,869,000

Motorised 2,642,871 (54.3%)

Non-motorised

On foot and by bicycle (public + private) 2,226,264 (45.8%)

Public transport 1,712,106 (64.8%)

Private transport 930,764 (32.2%)

Collective 1,568,406 (91.6%)

Individual 143,700 (8.4%)

Motorcycle 299,466 (32.2%)

Car 491,980 (52.9%)

TAXI 33,720 (4.5%)

Lorry + Van 139,319 (15%)

Bus TMB 606,008 (40.9%)

FGC 94,292 (6.4%)

RENFE 20,263 (1.4%)

TRAM 38,005 (2.6%)

Metro 722,452 (48.8%)

On foot and by bicycle

On foot 2,125,428 (95.5%)

Bicycle 67,120 (4.8%)

Bicing 33,720 (4.5%)

Stages of connection journeys

2,982,000

Motorised 2,730,618 (91.6%)

Non-motorised

On foot 251,217 (8.4%)

Stages of connection journeys

2,982,000

Motorised 2,730,618 (91.6%)

Non-motorised

On foot 251,217 (8.4%)
The reason for the journey and the distance travelled are characteristics of journeys which complete the characterisation study of mobility. According to the data of the Working Day Mobility Survey - EMEF 2008 (Metropolitan Transports of Barcelona), if we consider mobility according to the reason for travelling on working days, those which are compulsory (work or study) represented 24.7%, and non-compulsory (shopping, leisure, sport, dining, etc.) 30.2%; the rest are returns trips home (pendularity). As regards the number of journeys per person, the average was 3.31 on working days and 2.40 on holidays.

As regards journeys by bicycle, the average distance covered is some 1,600 m, in approximately twenty minutes assuming a speed of 5.14 km/h. On a bicycle, at an average speed of 20 km/h, the distance covered in ten minutes is 3.2 km. In public transport, the average distance is 3.3 km in the case of buses and 5.2 km in the case of the metro, with speeds of 11.7 km/h and 27.28 km/h respectively. For private vehicles, the usual distance is estimated to be up to 6 km, with average speeds of 56.3 km/h on the Ring roads and 21.3 km/h in the rest of the city.

**FIGURE 149 | AVERAGE DISTANCE COVERED BY DIFFERENT MEANS OF TRANSPORT (2008)**

<table>
<thead>
<tr>
<th>Average Journey (km)</th>
<th>On Foot</th>
<th>Private Vehicle</th>
<th>Bus</th>
<th>Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Barcelona City Council

**TRENDS IN MOBILITY IN EUROPE**

An efficient and flexible system—both for freight and passengers—is basic for the socio-economic growth of a territory and to ensure the standard of living of its inhabitants.

In Western Europe, transport has seen significant growth over the past forty years, especially by road and air. All the short-term forecasts point to mobility demands (travelers-km and t-km) will continue their sustained growth which will be locally affected by the usual fluctuation of economic cycles, but not as regards the global trend. This stems from mobility being a phenomenon associated with human behaviour and psychology, the cultural habits of society and the income level, among other factors.

Despite this, the transport sector is one of the main emitters of greenhouse gases - CO\(_2\), chiefly, and polluting compounds - nitrogen oxide, particles in suspension, volatile organic compounds—due to large-scale use of fossil fuels (see chapter 2.7. Air quality). For this reason, over recent years measures and initiatives have been fostered to minimise the environmental, social and economic impact of both passenger and freight transport.

Thus, transport policies throughout the European Union acknowledge the need to impose limits on superfluous transport growth—without adversely affecting the mobility of the public and the transport needs of companies—by increasing the market shares of the most efficient, healthy means of transport. Efficient pricing, internalisation of the environmental and social costs, accurate selection of investments and integrated territorial planning, mobility and infrastructures are some of the tools which can help to overcome this challenge.
The collective public transport network

Barcelona and its area of influence have a collective public transport network comprising buses, metro, railways, local trains, trams and taxis. The chief collective public transport operators are: Transports Metropolitans de Barcelona - TMB (bus and metro), Ferrocarrils de la Generalitat (FGC), the Metropolitan Transport Authority (trans) and RENFE (local trains).

In 2008, metro travellers accounted for 48% of collective public transport and buses, 25%. Both means of transport are operated by TMB, making this company the most important transport operator in Barcelona and its Metropolitan area (73% of journeys).

The operators Autohos and Transports Lydia engage in their activity solely within the municipal boundary of Barcelona, and connect districts with a special orography such as Ciutat Meridiana and Carmel. On the other hand, of the twenty-two lines operated by Mohn only seven provide service inside the city of Barcelona, four of which reach Pl. Espanya, two the Rda.Universitat and one more to Pl. Reina Maria Cristina.

Of the twelve lines operated by Oliveres, only the L70 and the L72 enter Barcelona and reach Pl. Espanya, from L’Hospitalet de Llobregat. A similar situation occurs with the Rosanbus lines, which chiefly service L’Hospitalet but which as a municipality bordering on Barcelona, has five lines which also have a stop, with relatively short journeys. Tugsal is the company which operates the most journeys inside Barcelona: three stop at the periphery (B16, B19 and B23), five reach Pl. Catalunya (B20, B21, B24 and B25), and one more finalises in Hospital de Sant Pau (B22).

The services of Transport Ciutat Comtal link the chief landmarks of the city, such as Pl. Catalunya and Tibidabo (at 30-40 minute intervals), Paral·lel and ZAL-Barcelona, and Pl. Catalunya and the Airport. Soler i Sauret serves Esplugues de Llobregat, Sant Just and Sant Feliu de Llobregat, there is only one line which extends to the University Area (EP1).

Therefore, if we consider all the bus companies which serve the inner metropolitan ring, TMB is that which accounts for 71% of the users of this means of transport. This percentage is even greater if we consider only the travellers travelling from or to Barcelona, given that most of the lines of the other companies operate outside the municipality of Barcelona. The improved night bus service has also led to an increase in the number of users over recent years, by 42.4% since 2005 (5.9 million passengers), with a growth in the vehicle fleet of 62.5% (up to 130 units).

The local network of overground collective public transport also includes the Tram (inaugurated in 2004) and the metro network will be expanded in future with the coming into operation of line 9.

Individual public transport, taxis, use a fleet which remains constant at 10,400 vehicles; transports 107 million passengers a year and has 174 tax ranks.
### TABLE 37 | BASIC DETAILS OF COLLECTIVE PUBLIC TRANSPORT OPERATORS IN THE INNER METROPOLITAN RING (2008)

<table>
<thead>
<tr>
<th>PUBLIC TRANSPORT</th>
<th>Line length (km)</th>
<th>Lines</th>
<th>Passengers (millions)</th>
<th>∆08/07 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMB (Metro)</td>
<td>88.4</td>
<td>6</td>
<td>376.4</td>
<td>2.7%</td>
</tr>
<tr>
<td>FGC</td>
<td>143.3</td>
<td>4</td>
<td>81</td>
<td>2.5%</td>
</tr>
<tr>
<td>RENFE (Rodalies)</td>
<td>529.6</td>
<td>6</td>
<td>114.4</td>
<td>-2.3%</td>
</tr>
<tr>
<td>Tramvia</td>
<td>29.1</td>
<td>6</td>
<td>23.2</td>
<td>11.1%</td>
</tr>
<tr>
<td>TMB (Autobús)</td>
<td>915.2</td>
<td>108</td>
<td>194.9</td>
<td>-7.4%</td>
</tr>
<tr>
<td>Authosa</td>
<td>8.6</td>
<td>2</td>
<td>2.7</td>
<td>4.0%</td>
</tr>
<tr>
<td>Transports Lydia</td>
<td>20.5</td>
<td>4</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Mohn</td>
<td>380.8</td>
<td>22</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>Oliveras</td>
<td>112.7</td>
<td>12</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Rosanbus</td>
<td>89.6</td>
<td>9</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Tugsal</td>
<td>484.2</td>
<td>41</td>
<td>34.7</td>
<td></td>
</tr>
<tr>
<td>TCC</td>
<td>40.6</td>
<td>3</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Soler i Sauret</td>
<td>38.8</td>
<td>7</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

Source: 2008 Annual Report (ATM, 2009)

### FIGURE 150 | DISTRIBUTION OF PASSENGERS OF THE MAIN COLLECTIVE PUBLIC TRANSPORT OPERATORS (2008)

- **TMB (Metro)**: 48%
- **RENFE (Rodalies)**: 14%
- **FGC**: 10%
- **Tramway**: 3%
- **Renfe (Rodalies)**: 14%

Source: TMB, FGC and RENFE

### FIGURE 151 | DISTRIBUTION OF PASSENGERS OF THE MAIN BUS AND COACH OPERATORS (2008)

- **TMB (Autobús)**: 72.4%
- **Rosanbus**: 3.5%
- **Oliveras**: 2.6%
- **Mohn**: 5.6%
- **Tugsal**: 12.9%
- **Authosa**: 1.0%
- **TCC**: 1.3%
- **Soler i Sauret**: 0.6%

TMB (Autobús): 72.4%
Journeys on foot and by bicycle

Barcelona occupies a surface area of 101 km², of which 17% are squares and streets. 0.7% (69 hectares) corresponds to the pedestrian priority areas of which 31% is located in the district of Ciutat Vella.

As regards the bicycle, the length of cycling lanes has increased progressively in the city, from 7.3 km in 1990 to the current 140 km (12.2 km are circuits and 17.5 km are cycling priority lanes). The building of car parks has evolved in parallel to the increase in cycling lanes and, in four years, has increased by 2.6 to 17,502 parking spaces.

The significant increase in this form of transport over recent years is shown in the increased number of journeys between 2007 and 2008; 27% of the internal journeys and 13.59% of connection journeys. As regards the number of bicycles, it saw an increase of 26.7% over the same period, with the Bicing service accounting for 46.56%.

The Bicing service, introduced in March 2007, completed its rollout in 2008, with 6,000 bicycles and 390 bicycle stations. The number of subscribers increased over the past year by 80%, to 181,962 and the number of bicycles by 30.1%. The average number of journeys on working days is 37,669, a figure which drops by approximately 30% on holiday.

Source: Mobility Services Dept. Barcelona City Council

▲ 33.5% of the 100,000 internal bicycle journey stages in 2008 used the Bicing service.
Road traffic

In 2008 in Barcelona, 13,234,210 veh-km/working day were covered, according to the Mobility Services Dept. of Barcelona City Council. When analysing the traffic on different days of the week at different points throughout the city, it can be concluded that the annual traffic in Barcelona in 2008 was 4,439.15m veh-km/year.

The evolution of road traffic over recent years shows signs of stability due to the road congestion at certain peak times. This is, however, a different trend to that detected as from 1992, when there was a rise in traffic due to the greater road capacity created by the Upper and Lower Ring roads (Dalt and Litoral).

Despite this trend towards stability over recent years, there has been a variation in the distribution of road traffic, which has led to a reduction in the percentage of private cars and an increase in light commercial vehicles (vans).

There are several causes for this change of vehicle mix: Action aimed at improving the competitiveness of public transport and other alternatives to private vehicles (via new infrastructures and improved service quality); the support for the bicycle and expansion of the bicycle lane network; and the implementation of measures to reduce the use of private cars in the city such as the enlargement of metered parking areas (Zones Blaves) and resident parking areas (Zona Verda).