VEHICLE FLEET CHARACTERIZATION STUDY OF THE CITY OF MADRID

Year 2013

General Direction of Sustainability and Mobility Planning

¡MADRID! ÁREA DE GOBIERNO DE MEDIO AMBIENTE Y MOVILIDAD

VEHICLE FLEET CHARACTERIZATION STUDY OF THE CITY OF MADRID

Year 2013

General Direction of Sustainability and Mobility Planning

June 2014

Work carried out by:

Fundación para el Fomento de la Investigación Industrial (F^2I^2)

Escuela Técnica Superior de Ingenieros Industriales

Technical University of Madrid

TABLE OF CONTENTS

1 INTRODUCTION

Road traffic is the activity that contributes most to air-polluting emissions in the city of Madrid, as is the case in most of the world's major metropolitan areas. Its emissions are relevant for the pollutants that affect local air quality and for greenhouse gases (GHG).

Madrid City Council's Department for the Environment and Mobility, in line with its proposal to use the most appropriate instruments for developing its competences in the field of air quality protection, energy efficiency and climate change prevention, annually completes the Air Pollutant Emissions Inventory of the city of Madrid through the General Direction of Sustainability and Mobility Planning. According to data from the latest available version of the abovementioned inventory, road traffic in 2011 was responsible for 56% of NO_X emissions, 38% of CO emissions, 65% of $PM_{2.5}$ emissions and 41% of CO_2 emissions. As may be seen in Figure 1, this sector totalled the main contribution to emissions of these compounds in the period 1999-2011.

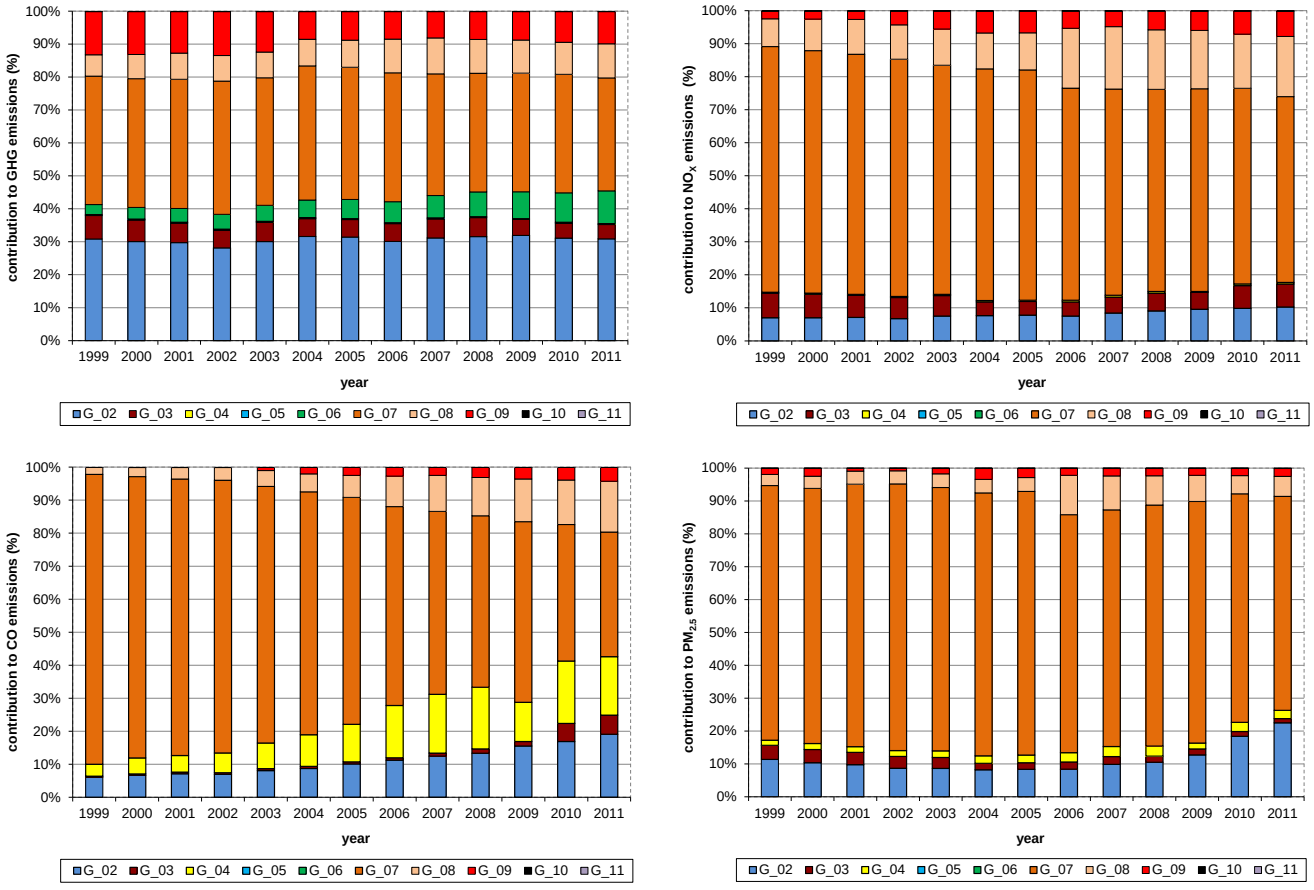


Figure 1. Road traffic's contribution (G_07= SNAP 07 group, road traffic) to GHG and air pollutants emissions

In the development of on-road mobile source emission inventories, reliable data on the vehicle fleet characteristics such as age or fuel type distribution are as important as accurate data concerning vehicle activity and emission rates. This involves an appropriate characterisation of the vehicles that are actually moving around the municipality (unlike what would be an exploitation of available vehicle registration databases), making it possible to estimate the mileage per type of vehicle (e.g. passenger

car, light commercial vehicle, …), type of fuel consumed (e.g. gasoline, diesel, …) and age distribution (which is related to the emission standards applied).

The data from the national traffic authority (Dirección General de Tráfico, DGT) can vary significantly from Madrid-specific moving vehicle fleet data. Accordingly, the General Direction of Sustainability and Mobility Planning contracted the Technical University of Madrid to conduct a field campaign to characterize the Madrid-specific moving vehicle fleet. This study updates a previous one completed in 2009.

The main result of this study is establishing what is known as a "standard vehicle", defined as the representative mileage distribution per type of vehicle in a specific area. The concept of standard vehicle is used for calculating aggregated emissions in the area under study, the city of Madrid.

This report includes the main methodological issues considered to design and complete the field campaign carried out in 2013 and the main results obtained.

2 BACKGROUND

The previous study consisted of:

- Field campaigns in different areas within the M30 ring-road
- discontinuous manual sampling at 30 points, from June to December 2008, registering a total of 104,335 vehicles
- complementary sampling with cameras at a subset of 9 points, carried out in March 2009
- weighting of readings gathered in the different studies with data on average daily traffic (ADT), provided by Madrid City Council
- relative mileage distribution for a "standard vehicle".

The importance of the road traffic sector in air pollutant emissions and the continuous adoption of policies and measures to improve air quality require to update the information of the vehicle fleet characteristics currently moving around the municipality. Nevertheless, the comparison between the results included in this report and those obtained in the 2009 study should take into account that both studies have relevant methodological differences.

3 METHODOLOGY

The study was designed to satisfy the information requirements specified by the EMEP/EEA methodology for calculating road traffic emissions, taking the most of the available municipal resources.

The field campaigns have been designed to count the number of each vehicle type according to the three hierarchical levels of COPERT 4 (*COmputer Programme to calculate emissions from Road Transport, version 4*), software that integrates the EMEP/EEA methodology. In this respect, the registration numbers of vehicles are captured, enabling characterisation of vehicle type, its fuel and its emissions standard (EURO standard). The three hierarchical levels of COPERT are sector, subsector and technology, as described in the following sections of this report.

The municipal resources consisted of video cameras to capture licence plate numbers (such as red-light traffic cameras), data from traffic count stations and data provided by the municipal traffic model. Furthermore, the results of the previous study were used for comparison purposes.

3.1 Zoning

The municipality of Madrid has been geographically divided into five areas (called A, B, C, D and E), according to their relevance in terms of mileage and to possible differences in the composition of traffic circulating in them. Accordingly, it was decided to group the previous 9 administrative areas considered by the municipal traffic model, into just these 5 areas (Table 1 and Figure 2).

Table 1. Zoning for the Vehicle Fleet Characterization Study (VFCS, year 2013)

Zone	Description	Correspondence with traffic model
A	Inside M30/Calle 30	1-5
B	M30/Calle 30 (inner ring road)	6
C	Between M30/Calle 30 and M40	7
D	M40 (outer ring road)	8
E	Outside M40	9

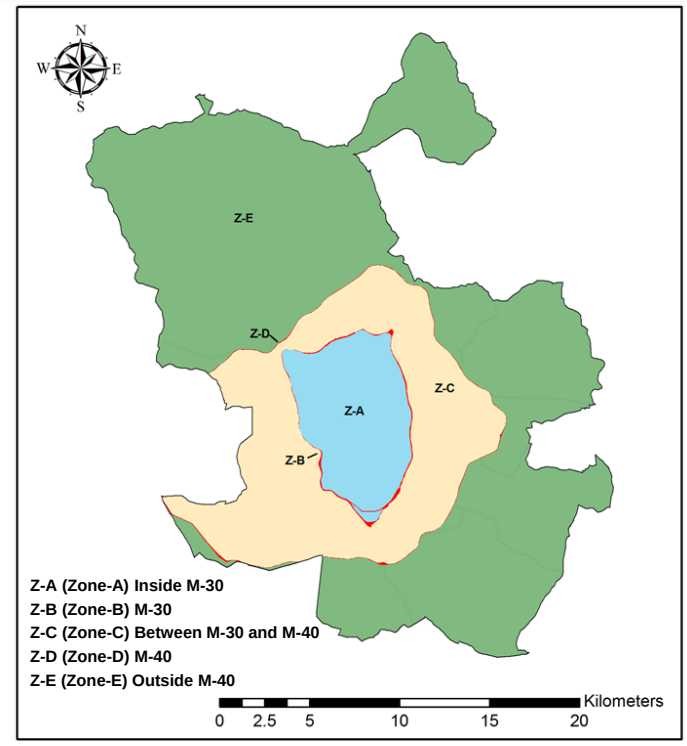


Figure 2. Zoning for the Vehicle Fleet Characterization Study (VFCS, 2013)

3.2 Sampling period

The field campaing to capture licence plates was carried out from Monday 20 to Monday 27 May 2013, both inclusive. The campaign lasted more than seven days in order to gather representative information for every day of the week and, therefore, avoid possible deviations in the results, arising from possible differences in the composition of traffic between working day and the weekend.

Manual sampling was completed from 24 May to 2 June 2013.

3.3 Sampling points

The sampling points were selected to be representative of each of the five areas defined, also considering the municipal resources available. These resources are:

- Red light cameras of Madrid City Council located at 17 points of areas A, B, C and E (Table 2). They collected a total of 1,180,653 records during the campaign

Table 2. Location of red-light cameras used in the study

Red light No.	Address	Zone
1	C/ Paseo de la Castellana 167	A
2	Avda. Cardenal Herrera Oria 83	C
3	C/ Hermanos García Noblejas 123	C
4	C/ Paseo de la Castellana 105	A
5	Avda. Poblados - Aluche Station	C
6	Avda. de las Filipinas 18	A
7	Avda. Ventisquero de la Condesa 42	C
8	Avda. Logroño corner C/ Joaquín Ibarra	E
9	Avda. Ilustración corner C/ Betanzos	B
10	Avda. Andalucía metro San Cristóbal	E
11	C/ Camino de los Vinateros 47	C
12	Avda. Mediterráneo 32	A
13	C/ Menéndez Pelayo - Hospital Niño Jesús	A
14	C/ Francisco Silvela 62	A
15	Avda. Cardenal Herrera Oria esquina C/ la Masó	C
16	C/ Fuente Carrantona esquina C/ Hacienda de Pavones	C
17	Avda. Andalucía esquina C/ Alcocer	E

- Calle 30 cameras located at 34 sites (area B). They registered 2,987,076 licence plates.
- M30 cameras at 2 sites (surface). Two cameras: one located in the Ventas neighbourhood and another at the exit from Calle Costa Rica (area B). They captured a total of 476,290 licence plates.
- Fernández Ladreda square field campaign (2 sampling points, area C -Figure 3-). From 22 to 27 May 2013, two cameras captured a total of 267,723 licence plates.

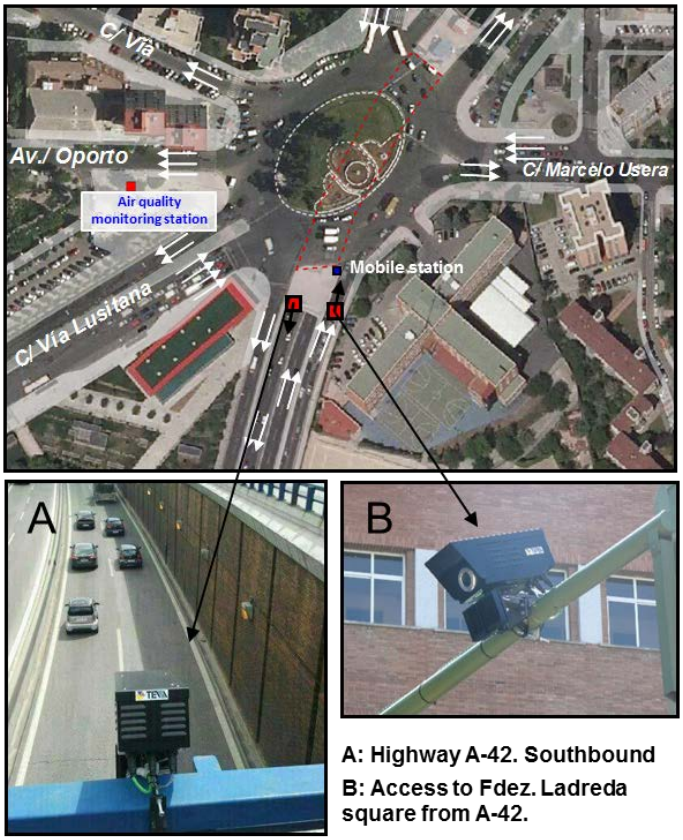


Figure 3. Cameras in Plaza Fernández Ladreda square

The field campaing was completed with manual samples in locations where further data were considered necessary. These sampling points were located in places where traffic count data were available. Accordingly, it was decided to take manual samples at 8 additional sites (Figure 4 and Table 3), corresponding to zones C and E. At each sampling point, two operators registered the licence plate in both directions of traffic flow and in every lane. The measurements were carried out on a working day (Friday, 24 May 2013) and a Sunday (2 June 2013), both in the morning and in the afternoon, for a period of approximately half an hour, producing a total of 17,799 records. The manual sampling is especially relevant to capture certain vehicle types, such as mopeds and motorcycles.

Table 3. Location of manual sampling points

Sampling point	Address	Zone
1	Avda. de Oporto 35	C
2	C/ Alcocer 31-33	E
3	C/ San Cipriano 32	E
4	C/ Ayacucho esquina C/ Arequipa	C
5	Avda. de Logroño 192	E
6	Ada. de la Albufera 260	C
7	Avda. de Pablo Neruda 30	C
8	Avda. de la Gavia 40	E

The geographical location of all sampling points is shown in Figure 4.

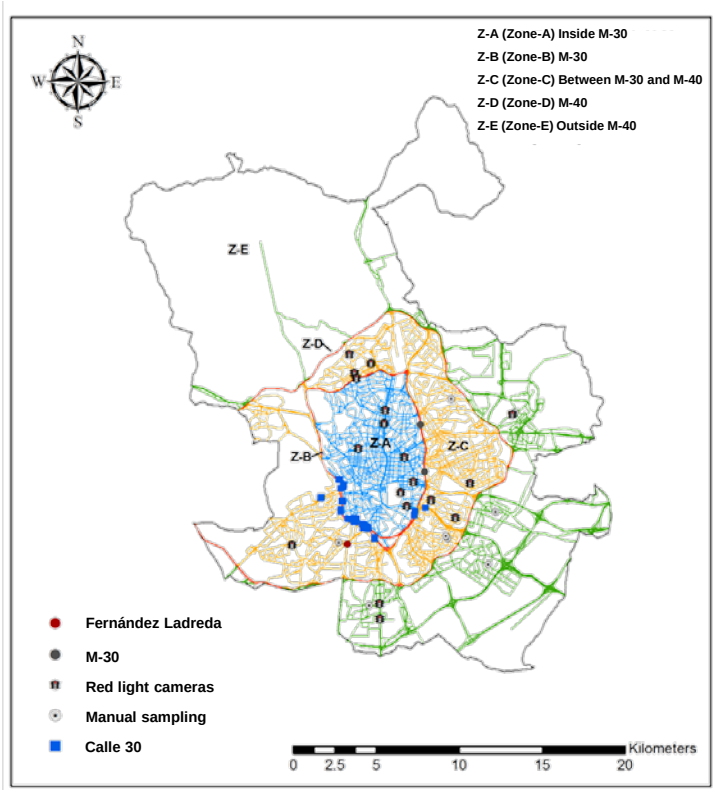


Figure 4. Geographical location of sampling points

Table 4 summarises the data captured for the study.

Table 4. Summary of data captures

Survey	Number of sampling points	Zone	Number of records
Red light cameras	17	A, B, C y E	1,180,653
Calle 30 cameras	34	B	2,987,076
M30 cameras	2	B	476,290
Fernández Ladreda Sq cameras	2	C	267,723
Manual sampling	8	C y E	17,799
TOTAL	**63**	**A, B, C y E**	**4,920,868**

Additionally, and after entering and processing the data, it was necessary to take manual readings at certain points where sampling was done with cameras, as it was detected that these devices were not registering licence plates from certain lanes and/or type of vehicles properly:

- the existence of bus-taxi lanes or side lanes where there is no registration of licence numbers and the composition of the traffic is characteristic and different from central lanes where licence numbers were registered without difficulty (taxis, buses, motorcycles and mopeds)
- cameras unable to register licence plates on mopeds
- difficulty when registering licence plates on motorcycles, depending on the lane and part of the lane they are circulating on, and traffic conditions.

In this respect, manual sampling completed data obtained from the red light cameras in 5 locations (see Table 5). Operators counted vehicles by type (COPERT sector).

Table 5. Manual counting at red lights

Red light No.	Address	Zone
1	C/ Paseo de la Castellana 167	A
4	C/ Paseo de la Castellana 105	A
6	Avda. de las Filipinas 18	A
14	C/ Francisco Silvela 62	A
17	Avda. Andalucía esquina C/ Alcocer	E

3.4 Data cleaning and information provided from DGT

During the field campaign, a total of 4,920,868 licence numbers were captured. To obtain data associated with these licence numbers, the vehicle registration database managed by the national traffic authority (Dirección General de Tráfico, DGT) was consulted. Before requesting this information, data were checked and cleaned:

- to eliminate incorrect or incomplete readings
- to eliminate duplicates

After data cleaning, the sample consisted of 1,304,112 registers. The following attributes were obtained from each licence number:

- date of first registration
- brand
- model
- vehicle type
- service
- number of seats
- propulsion technology
- hybrid indicator (yes/no)
- engine displacement
- maximum weight
- ZIP code of the vehicle
- ZIP code of the owner

It should be noted that the exclusion of duplicate records was only carried out in order to reduce the volume of information requested to DGT. All records, including duplicates, were considered in the study.

3.5 Entering and processing the information

The next step consisted of establishing correspondence between each of the licence numbers registered and each of the vehicle types collected in the EMEP/EEA methodology. This methodology, implemented in the software COPERT 4 (version 4.10), classifies vehicles according to three hierarchical levels:

- Sector: passenger cars, light commercial vehicles, heavy duty trucks, buses, motorcycles and mopeds

- Subsector: disaggregation of each sector by fuel, cylinder capacity and/or authorised maximum weight. Accordingly,
    - passenger cars are disaggregated by fuel and cylinder capacity,
    - light commercial and heavy duty vehicles by fuel and weight
    - buses by weight
    - motorcycles and mopeds by engine displacement

  The subsector "electric" has been established for certain sectors, in order to include this propulsion technology, which, due to its lack of exhaust emissions, does not appear as such in COPERT.
- Technology: each subsector is separated according to emission standards.

To assign sector, subsector and technology to each licence number, a series of attributes provided by DGT was used for each of the licence numbers registered. Accordingly, in general:

- to define the sector, the attributes "vehicle type", "number of seats" and "maximum weight" were used;
- to establish the subsector, the attributes "propulsion", " engine displacement ", "maximum weight" and "hybrid indicator" were used (the attributes "brand" and "model" were also used to identify hybrids);
- to establish "technology", the attribute used is "date of first registration", thus determining the emission standards, as shown in Table 6.

Table 6. Classification of vehicles (EMEP/EEA-COPERT methodology)

COPERT Sector	Fuel/ Propulsion	Emission standards	European Emission Standard time frame		
Passenger cars	**Gasoline**		**< 1.4l**	**>=1.4l y <=2.0l**	**> 2.0l**
		PRE ECE	- 1971	- 1971	- 1971
		ECE 15/00-01	1972 – 1977	1972 - 1977	1972 - 1977
		ECE 15/02	1978 – 1979	1978 - 1979	1978 - 1979
		ECE 15/03	1980 – 1984	1980 - 1984	1980 - 1984
		ECE 15/04	1985 – 1992	1985 - 1992	1985 - 1989
		Euro 1 - 91/441/EEC	1993 – 1996	1993 - 1996	1990 - 1996
		Euro 2 - 94/12/EC	1997 – 1999	1997 - 1999	1997 - 1999
		Euro 3 - 98/69/EC S 2000	2000 – 2004	2000 - 2004	2000 - 2004
		Euro 4 - 98/69/EC S 2005	2005 – 2010	2005 – 2010	2005 – 2010
		Euro 5- 715/2007/EC S 2011	2011 – 2014	2011 – 2014	2011 – 2014
		Euro 6 - 715/2007/EC S 2015	2015 -	2015 -	2015 -
		2-stroke engine			
	Diesel		**<=2.0l**		**> 2.0l**
		Conventional	- 1992		- 1992
		Euro 1 - 91/441/EEC	1993 – 1996		1993 – 1996
		Euro 2 - 94/12/EC	1997 – 1999		1997 – 1999
		Euro 3 - 98/69/EC S 2000	2000 – 2004		2000 – 2004
		Euro 4 - 98/69/EC S 2005	2005 – 2010		2005 – 2010
		Euro 5 - 715/2007/EC S 2011	2011 – 2014		2011 – 2014
		Euro 6 - 715/2007/EC S 2015	2015 -		2015 -
	LPG	Conventional	- 1992		
		Euro 1 - 91/441/EEC	1993 - 1996		
		Euro 2 - 94/12/EC	1997 - 1999		
		Euro 3 - 98/69/EC S 2000	2000 - 2004		
		Euro 4 - 98/69/EC S 2005	2005 -		
	Hybrid	**Euro 4 -** 98/69/EC S 2005	2005 -		

COPERT Sector	Fuel/ Propulsion	Emission standards	European Emission Standard time frame			
Light commercial vehicles < 3.5t	**Gasoline**	Conventional	- 1992			
		Euro 1 - 93/59/EEC	1993 – 1996			
		Euro 2 - 96/69/EC	1997 – 1999			
		Euro 3 - 98/69/EC S 2000	2000 – 2004			
		Euro 4 - 98/69/EC S 2005	2005 – 2010			
		Euro 5 - 715/2007/EC S 2011	2011 – 2014			
		Euro 6 - 715/2007/EC S 2015	2015 -			
	Diesel	Conventional	- 1992			
		Euro 1 - 93/59/EEC	1993 – 1996			
		Euro 2 - 96/69/EC	1997 – 1999			
		Euro 3 - 98/69/EC S 2000	2000 – 2004			
		Euro 4 - 98/69/EC S 2005	2005 – 2010			
		Euro 5 - 715/2007/EC S 2011	2011 – 2014			
		Euro 6 - 715/2007/EC S 2015	2015 -			
Heavy-duty trucks > 3.5t	**Gasoline**	Conventional				
	Diesel		**<=7.5t**	**7.5t- 16t**	**16t - 32t**	**>32t**
		Conventional	- 1991	- 1991	- 1991	- 1991
		Euro I - 91/542/EEC S I	1992 - 1994	1992 - 1994	1992 - 1994	1992 - 1994
		Euro II - 91/542/EEC S II	1995 - 1999	1995 - 1999	1995 - 1999	1995 - 1999
		Euro III - 1999/96/EC S I	2000 - 2004	2000 - 2004	2000 - 2004	2000 - 2004
		Euro IV - 1999/96/EC S II	2005 – 2007	2005 – 2007	2005 – 2007	2005 – 2007
		Euro V - 1999/96/EC S III	2008 -	2008 -	2008 -	2008 -
		Euro VI – not proposed				
Buses	**Diesel**		**Urban**		**Coaches**	
		Conventional	- 1991		- 1991	
		Euro I - 91/542/EEC S I	1992 – 1994		1992 - 1994	
		Euro II - 91/542/EEC S II	1995 – 1999		1995 - 1999	
		Euro III - 1999/96/EC S I	2000 – 2004		2000 - 2004	
		Euro IV - 1999/96/EC S II	2005 – 2007		2005 – 2007	
		Euro V - 1999/96/EC S III	2008		2008	
		Euro VI – not proposed				
	Gas natural	**Euro I -** 91/542/EEC S I	1992 – 1994			
		Euro II - 91/542/EEC S II	1995 – 1999			
		Euro III - 1999/96/EC S I	2000 – 2004			
		Euro IV - 1999/96/EC S II	2006 -			
		Euro V - 1999/96/EC S III	2009 -			
		EEV – 1999/96/EC	2000 -			
Mopeds < 50cm³	**Gasoline**	Conventional	- 1998			
		Euro 1 - 97/24/EC S I	1999 - 2001			
		Euro 2 - 97/24/EC S II	2002 -			
		Euro 3 - Proposed				
Motorcycles	**Gasoline**		**2-stroke > 50cm³**	**4-stroke 50–250cm³**	**4-stroke 250–750cm³**	**4-stroke > 750cm³**
		Conventional	- 1998	- 1998	- 1998	- 1998
		Euro 1 - 97/24/EC	1999 - 2002	1999 – 2002	1999 – 2002	1999 - 2002
		Euro 2 - 2002/51/EC S I	2003 - 2005	2003 – 2005	2003 – 2005	2003 - 2005
		Euro 3 - 2002/51/EC S II	2006 -	2006 -	2006 -	2006 -

3.5.1 Processing data from taxis

The special relevance of the taxi sector requires establishing an additional COPERT sector, called TAXI, in order to separate this type of vehicle from the "Passenger cars" group. To do so, the attribute "service" was used. Nevertheless, due to certain inconsistencies detected in the baseline information provided by the DGT relating to this attribute, it was also necessary to use the attributes "date of first registration", "brand", "model" and "hybrid indicator" and contrast the results obtained with the specific information on the sector provided by the Taxi Department (Madrid City Council).

3.5.2 Processing data from buses (Municipal Transport Company)

A close collaboration with the Municipal Transport Company (EMT) has provided detailed information about:

- number of buses on each line and mileage
- routes of the different lines
- licence number, fuel and European emission standard of each vehicle operating on each line.

This information allowed us to complete the data obtained at the sampling points where certain lanes (bus-taxi or side lanes) are not registered by red-light cameras. It also allows EMT buses to be disaggregated within the COPERT sector "buses" and therefore differentiate emissions from a segment of vehicles dependent on Madrid City Council, for which specific measures can be adopted.

Figure 5 shows the different EMT bus lines.

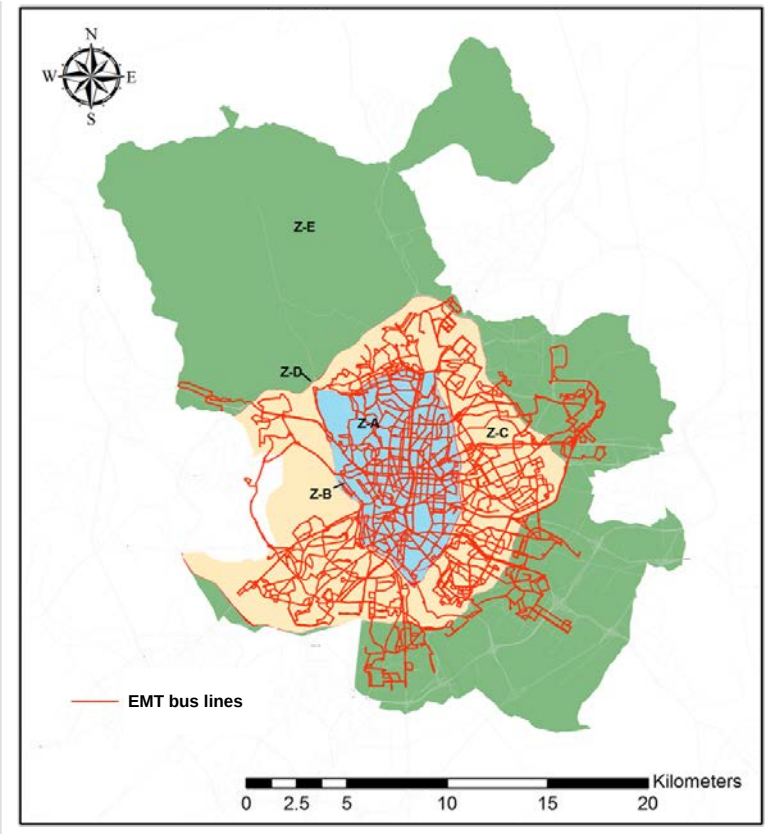


Figure 5. EMT bus lines

3.5.3 Integration of manual sampling data results

Manual sampling data, together with detailed information of buses, were used to complete a redistribution of traffic by sector at a sampling point level. Each sector maintained the distribution by subsector and technology obtained by records from cameras at each sampling point.

3.6 Data aggregation

3.6.1 Aggregation at zone level

The data obtained at zone level were aggregated to get the composition of the road traffic in each of the five zones. This process of aggregation considered the following hypotheses:

- assuming a homogeneous composition of road traffic within each of the five zones studied;
- not weighting between sampling points or between type of vehicles within a zone, that is, assuming that the distance travelled by a vehicle whose licence number has been registered is the same within each zone;
- considering that the mileage by vehicle type within each zone are directly proportional to the number of records of that vehicle type in that zone;

3.6.2 Aggregation at municipality level

Obtaining a single "standard vehicle" for the whole municipality requires a procedure of weighting among the 5 different zones. The municipal traffic model was used for this. Accordingly, the composition in each zone have been weighted with the percentage distribution of total mileage by zone in the year 2013 (Table 7).

Table 7. Percentage distribution of mileage by zone according to the traffic model. Year 2013

A	B	C	D	E	TOTAL
21.1%	11.7%	28.6%	14.1%	24.5%	100.0%

The macroscopic traffic simulation model is capable of providing information in GIS format (Geographic Information System). It comprises the city of Madrid's road network divided into more than 11,000 sections (in its 2013 version), which are characterised by a set of parameters, including hourly traffic flow and average speed.

4 RESULTS

This study establishes what is known as a "standard vehicle", defined as the representative mileage distribution of journeys by type of vehicle in a specific area.

4.1 The ‘standard vehicle’

Table 8 includes the composition of the standard vehicle at sector level for each studied zone. Figure 6 shows this same information for the whole municipality and for zone A (inside the M30).

Table 8. Composition of the 'standard vehicle' at sector level and by zone

Sector	ZONES					
	A	B	C	D	E	TOTAL Municipality
Passenger cars	**72.57%**	**84.79%**	**81.82%**	**84.79%**	**82.08%**	**80.70%**
Light commercial vehicles	**4.73%**	**8.49%**	**8.63%**	**8.49%**	**8.41%**	**7.72%**
Heavy duty trucks	**0.95%**	**2.03%**	**1.77%**	**2.03%**	**1.89%**	**1.69%**
Buses	**1.96%**	**0.97%**	**1.64%**	**0.97%**	**3.12%**	**1.90%**
EMT	1.76%	0.10%	1.37%	0.01%	0.44%	0.88%
Non-EMT	0.20%	0.87%	0.28%	0.96%	2.68%	1.02%
Mopeds	**0.52%**	**0.00%**	**0.67%**	**0.00%**	**0.20%**	**0.35%**
Motorcycles	**8.33%**	**0.52%**	**1.15%**	**0.52%**	**1.51%**	**2.59%**
Taxis	**10.93%**	**3.21%**	**4.32%**	**3.21%**	**2.79%**	**5.05%**
TOTAL	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

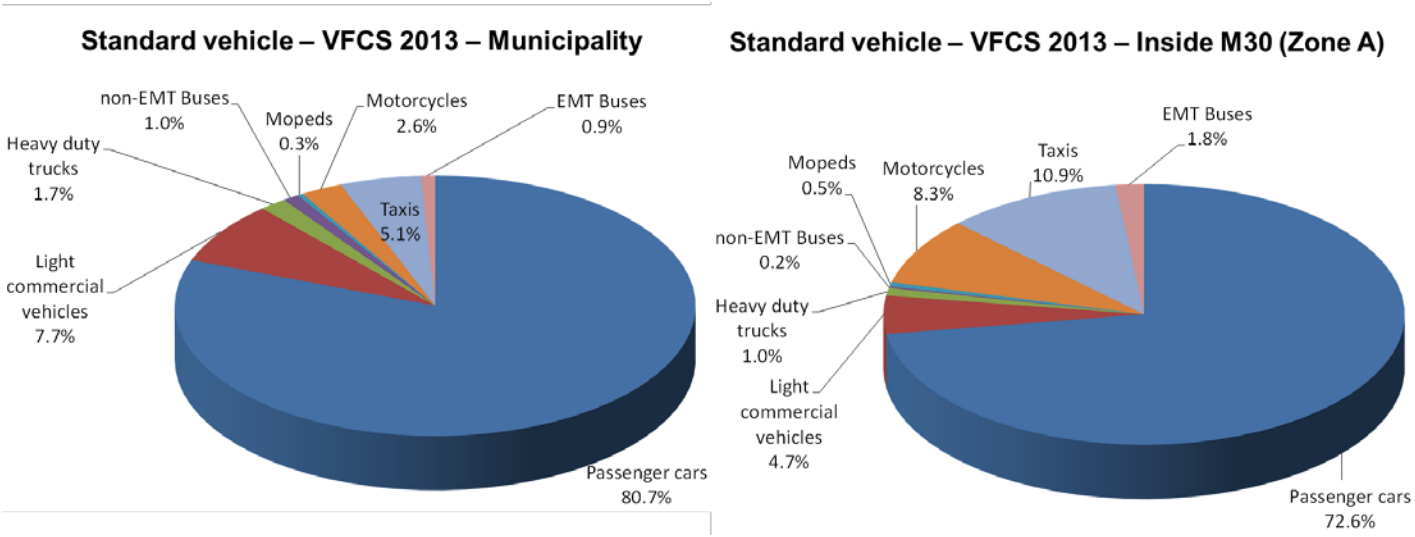


Figure 6. Composition of the 'standard vehicle' at sector level

Table 9 shows the same information disaggregated by fuel for each sector.

Table 9. Disaggregation of 'standard vehicle' by type of fuel for each sector and zone

Sector	ZONES					
	A	B	C	D	E	TOTAL Municipality
Passenger cars	**72.57%**	**84.79%**	**81.82%**	**84.79%**	**82.08%**	**80.70%**
Gasoline	25.21%	25.79%	25.10%	25.79%	26.21%	25.57%
Diesel	47.29%	58.94%	56.67%	58.94%	55.83%	55.08%
Others (LPG, CNG, hybrids. electric)	0.07%	0.06%	0.05%	0.06%	0.04%	0.05%
Light commercial vehicles	**4.73%**	**8.49%**	**8.63%**	**8.49%**	**8.41%**	**7.72%**
Gasoline	0.15%	0.33%	0.23%	0.33%	0.22%	0.24%
Diesel	4.58%	8.15%	8.40%	8.15%	8.19%	7.48%
Others (LPG, CNG, hybrids, electric)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy-duty trucks	**0.95%**	**2.03%**	**1.77%**	**2.03%**	**1.89%**	**1.69%**
Gasoline	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Diesel	0.94%	2.01%	1.76%	2.01%	1.88%	1.68%
Others (LPG, CNG, hybrids, electric)	-	-	-	-	-	-

Sector	ZONES					
	A	B	C	D	E	TOTAL Municipality
Buses	**1.96%**	**0.97%**	**1.64%**	**0.97%**	**3.12%**	**1.90%**
EMT Buses	**1.76%**	**0.10%**	**1.37%**	**0.01%**	**0.44%**	**0.88%**
Diesel	0.96%	0.08%	1.02%	0.01%	0.41%	0.60%
Others (LPG, CNG, hybrids, electric)	0.80%	0.02%	0.35%	0.00%	0.02%	0.28%
non–EMT Buses	**0.20%**	**0.87%**	**0.28%**	**0.96%**	**2.68%**	**1.02%**
Diesel	0.18%	0.87%	0.28%	0.95%	2.56%	0.99%
Others (LPG, CNG, hybrids, electric)	0.02%	0.00%	0.00%	0.01%	0.12%	0.03%
Mopeds	**0.52%**	**0.00%**	**0.67%**	**0.00%**	**0.20%**	**0.35%**
Gasoline	0.52%	0.00%	0.67%	0.00%	0.20%	0.35%
Motorcycles	**8.33%**	**0.52%**	**1.15%**	**0.52%**	**1.51%**	**2.59%**
Gasoline	8.33%	0.52%	1.15%	0.52%	1.51%	2.59%
Taxis	**10.93%**	**3.21%**	**4.32%**	**3.21%**	**2.79%**	**5.05%**
Gasoline[1]	-	-	-	-	-	-
Diesel	8.48%	2.47%	3.37%	2.47%	2.22%	3.93%
Others (LPG, CNG, hybrids, electric)	2.46%	0.74%	0.95%	0.74%	0.57%	1.12%
TOTAL	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
Gasoline	**34.22%**	**26.65%**	**27.16%**	**26.65%**	**28.15%**	**28.76%**
Diesel	**62.43%**	**72.53%**	**71.49%**	**72.54%**	**71.10%**	**69.76%**
Others (LPG, CNG, hybrids, electric)	**3.35%**	**0.82%**	**1.35%**	**0.81%**	**0.76%**	**1.48%**

The Attachment of this report includes a detailed breakdown of the 'standard vehicle' by sector, subsector and technology.

The 'passenger cars' sector (excluding taxis) is responsible for 80.7% of total mileage made in the municipality and 72.6% inside Calle30/M30. Figure 7 shows the mileage distribution by fuel. Most passenger cars (excluding taxis) circulating around the municipality of Madrid consume diesel, representing 68.2% of total mileage, compared with 31.7% of gasoline-fuelled cars. Electric, hybrid and alternative fuelled passenger cars (compressed natural gas, CNG or liquefied petroleum gas, LPG), only represent 0.1%.

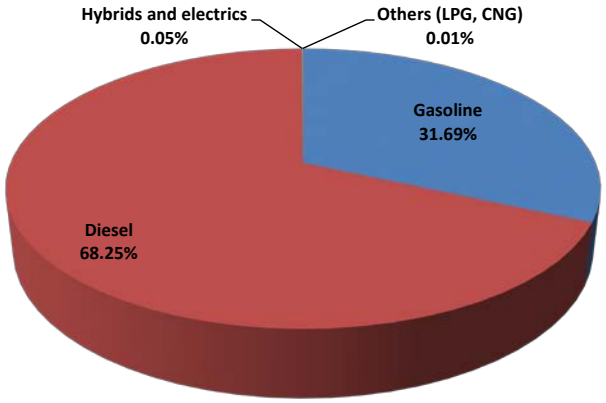


Figure 7. Distribution of the passenger cars (exc. taxis) by fuel (total municipality)

[1] Dual Gasoline-LPG taxis are considered to be LPG.

4.2 Total mileage in 2013

Table 10 shows the total mileage carried out by each sector in each zone.

Table 10. Total mileage made in 2013 for each sector and zone (veh*km)

Sector	ZONES					
	A	B	C	D	E	TOTAL Municipality
Passenger cars	**1,829,464,517**	**1,191,146,383**	**2,801,850,544**	**1,426,181,181**	**2,409,592,151**	**9,658,234,776**
Gasoline	635,613,971	362,298,328	859,480,922	433,786,363	769,406,416	3,060,586,000
Diesel	1,192,133,616	828,033,470	1,940,681,133	991,419,500	1,639,051,730	6,591,319,450
Others (LPG, CNG, hybrids, electric)	1,716,931	814,585	1,688,489	975,317	1,134,005	6,329,326
Light commercial vehicles	**119,150,301**	**119,254,196**	**295,545,632**	**142,785,214**	**246,926,650**	**923,661,993**
Heavy-duty trucks	**23,976,775**	**28,453,363**	**60,545,343**	**34,067,728**	**55,516,247**	**202,559,457**
Buses	**49,406,397**	**13,634,184**	**56,285,367**	**16,324,456**	**91,534,724**	**227,185,127**
EMT	44,296,385	1,386,162	46,753,757	195,166	12,793,762	105,425,233
Non-EMT	5,110,012	12,248,022	9,531,609	16,129,289	78,740,962	121,759,894
Mopeds	**13,162,785**	**0**	**22,862,230**	**0**	**5,733,657**	**41,758,672**
Motorcycles	**210,098,577**	**7,269,793**	**39,382,503**	**8,704,256**	**44,350,234**	**309,805,363**
Taxis	**275,595,163**	**45,079,382**	**147,919,641**	**53,974,362**	**81,978,730**	**604,547,278**
TOTAL	**2,520,854,517**	**1,404,837,302**	**3,424,391,260**	**1,682,037,195**	**2,935,632,393**	**11,967,752,667**

4.3 Age of the vehicle fleet

Table 11 shows the average age of all vehicles in each sector (results referred to the whole municipality).

Table 11. Average age by sector level

	Average age (years)
Passenger cars	9.3
Light commercial vehicles	10.0
Heavy-duty trucks	10.8
Buses	8.1
Motorcycles	9.8
Taxis	4.4

The average age of passenger cars moving in the whole municipality stands at 9.3 years (the age distribution is shown in Figure 8).

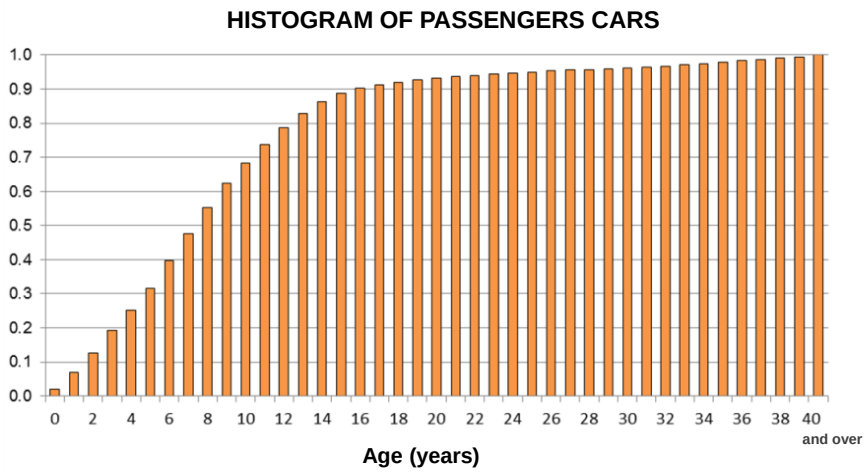


Figure 8. Age distribution of passenger cars

4.4 Results by ZIP code

The data obtained from DGT provides information about the vehicle's origin, using the ZIP code of the vehicle's owner attribute. Table 12 and Figure 9 show the results distinguishing municipality of Madrid, other municipalities in the Madrid's region and other provinces. Figure 10 shows the results by zone.

Table 12. Distribution of licence number records according to the vehicle owner's ZIP code

Origin	%
Municipality of Madrid	53.4
Other municipalities in the Madrid's region	28.5
Other provinces	17.4
Unknown	0.7
TOTAL	**100**

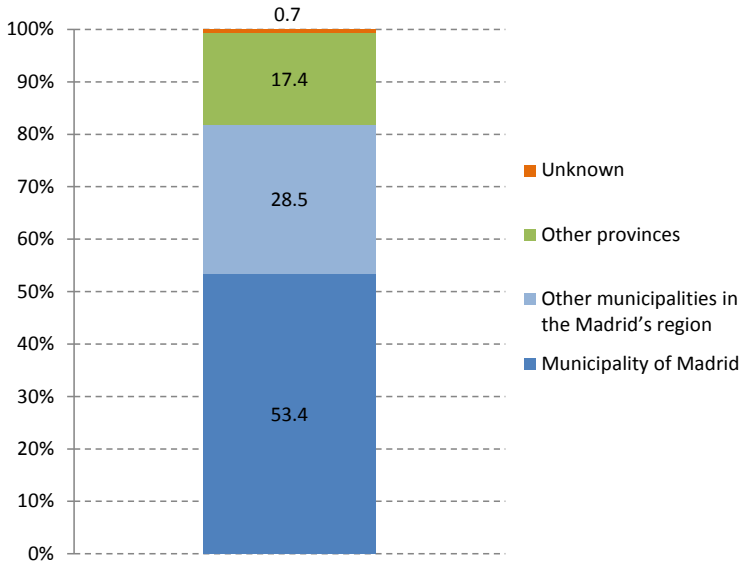


Figure 9. Breakdown of passenger cars by ZIP code

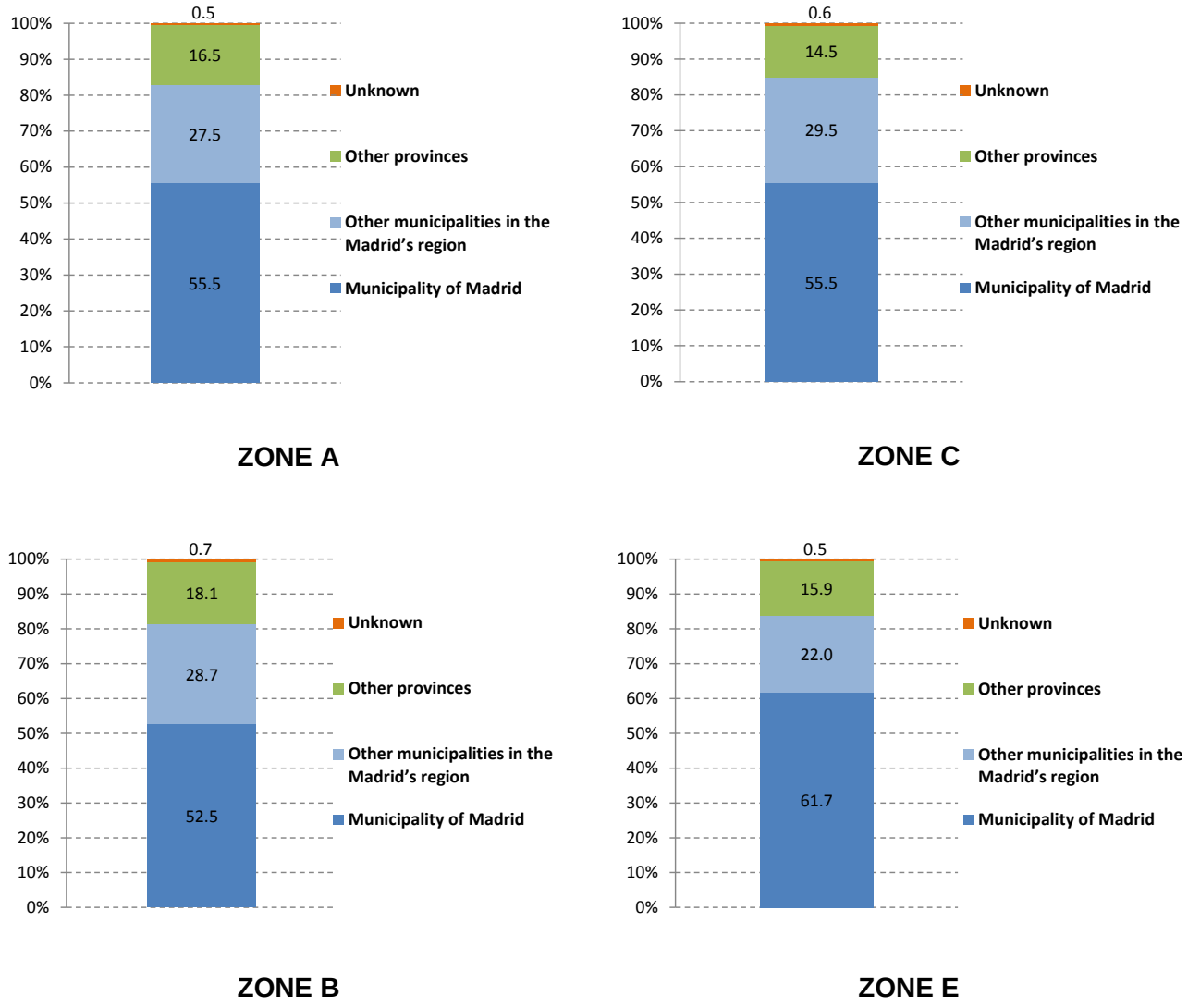


Figure 10. Breakdown of passenger cars by ZIP code in each zone

4.5 Comparison with the previous study

This section compares the results obtained in this study with the previous study conducted in 2009 (VFCS, 2009). Nevertheless, it should be noted that the study conducted in 2009 have significant methodological differences.

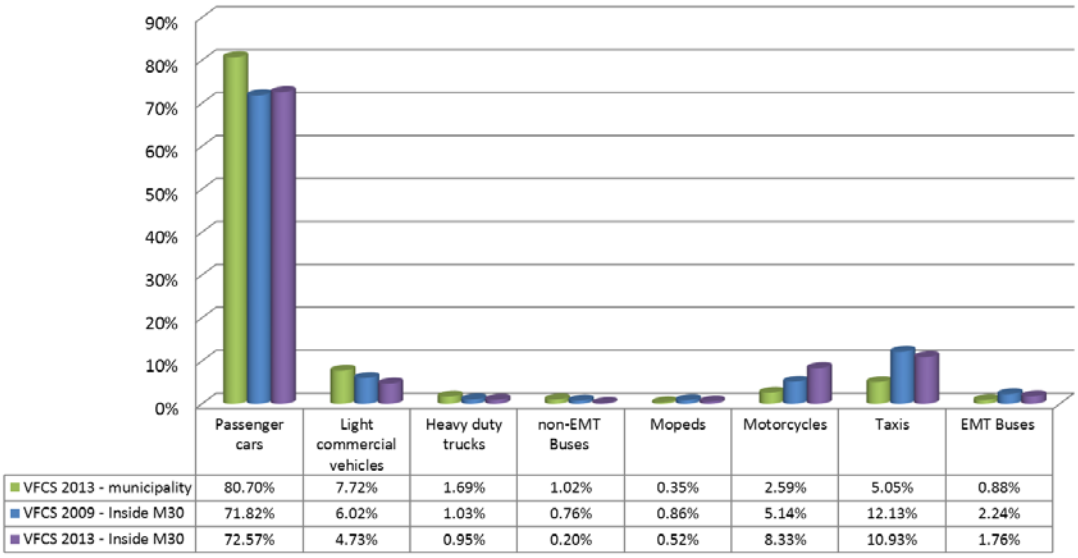
Table 13 compares the results from these studies, showing results by sector and fuel for zone A (the 2009 study was restricted to this zone).

Table 13. Comparison of results from the 2009 and 2013 studies for Zone A

	VFCS, 2013	VFCS, 2009
Passenger cars	**72.573%**	**71.817%**
Gasoline	25.214%	26.141%
Diesel	47.291%	45.675%
Others (LPG, CNG, hybrids, electric)	0.068%	0.001%
Light commercial vehicles	**4.727%**	**6.016%**
Gasoline	0.147%	0.071%
Diesel	4.578%	5.945%
Others (LPG, CNG, hybrids, electric)	0.002%	-
Heavy-duty trucks	**0.951%**	**1.034%**
Gasoline	0.007%	0.004%
Diesel	0.944%	1.029%
Others (LPG, CNG, hybrids, electric)	0.000%	0.001%
Buses	**1.960%**	**3.000%**
EMT Buses	**1.757%**	**2.244%**
Gasoline	-	-
Diesel	0.959%	1.777%
Others (LPG, CNG, hybrids, electric)	0.798%	0.467%
non–EMT Buses	**0.203%**	**0.756%**
Gasoline	-	0.006%
Diesel	0.183%	0.738%
Others (LPG, CNG, hybrids, electric)	0.020%	0.012%
Mopeds	**0.522%**	**0.857%**
Gasoline	0.522%	0.857%
Diesel	-	**-**
Others (LPG, CNG, hybrids, electric)	-	**-**
Motorcycles	**8.334%**	**5.143%**
Gasoline	8.326%	5.140%
Diesel	-	0.003%
Others (LPG, CNG, hybrids, electric)	0.009%	-
Taxis	**10.933%**	**12.133%**
Gasoline	-	-
Diesel	8.477%	12.015%
Others (LPG, CNG, hybrids, electric)	2.455%	0.118%
TOTAL	**100.000%**	**100.000%**
Gasoline	34.217%	32.219%
Diesel	62.432%	67.181%
Others (LPG, CNG, hybrids, electric)	3.352%	0.599%

The results show that the use of motorcycles has increased while the contribution of taxis and municipal buses (EMT buses) has decreased.

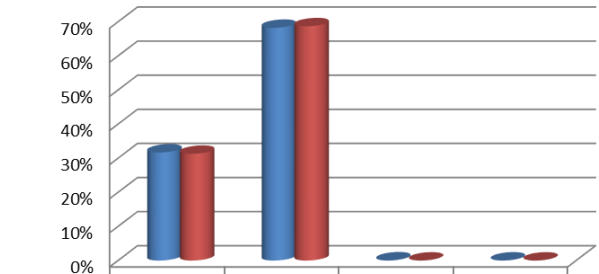
Figure 11 illustrate this comparison, including results for the whole municipality.



	Passenger cars	Light commercial vehicles	Heavy duty trucks	non-EMT Buses	Mopeds	Motorcycles	Taxis	EMT Buses
VFCS 2013 - municipality	80.70%	7.72%	1.69%	1.02%	0.35%	2.59%	5.05%	0.88%
VFCS 2009 - Inside M30	71.82%	6.02%	1.03%	0.76%	0.86%	5.14%	12.13%	2.24%
VFCS 2013 - Inside M30	72.57%	4.73%	0.95%	0.20%	0.52%	8.33%	10.93%	1.76%

Figure 11. Comparison of results from the 2009 and 2013 studies for Zone A and the municipality

Figure 11 shows that the contribution from passenger cars to total mileage remains at values around 72% for Zone A. Regarding fuel type distribution, Figure 12 shows minimum changes between the two studies.



	Gasoline	Diesel	Hybrids and electrics	Others (LPG, CNG)
VFCS 2013	31.7%	68.2%	0.1%	0.0%
VFCS 2009	31.3%	68.7%	0.0%	0.0%

Figure 12. Fuel type distribution for passenger cars

Table 14 compares the average age of passenger cars obtained in the two studies. According to these results, passenger cars circulating in the city of Madrid has aged significantly.

This effect was also observed in other sectors: the average age of light commercial vehicles and motorcycles have also increased.

Table 14. Average age of road traffic by sector

	VFCS, 2013	VFCS, 2009
Passenger cars	9.3	5.7
Light-duty vehicles	10.0	5.1
Heavy-duty trucks	10.8	6.8
Buses	8.1	6.0
Motorcycles	9.8	3.1
Taxis	4.4	-

5 ACKNOWLEDGEMENTS

This study was possible thanks to the collaboration of the national traffic authority (Dirección General de Tráfico, DGT), the Municipal Transport Company (EMT, S.A.), Madrid Calle 30, S.A. and the General Direction of Traffic Management (Environment and Mobility Area, Madrid City Council).

ATTACHMENT

Sector	Subsector	Technology	Zone A	Zone B	Zone C	Zone D	Zone E	Total
Passenger Cars	Gasoline <0.8 l	PRE ECE	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline <0.8 l	ECE 15/00-01	0.01%	0.05%	0.03%	0.05%	0.02%	0.03%
Passenger Cars	Gasoline <0.8 l	ECE 15/02	0.00%	0.01%	0.00%	0.01%	0.00%	0.01%
Passenger Cars	Gasoline <0.8 l	ECE 15/03	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%
Passenger Cars	Gasoline <0.8 l	ECE 15/04	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline <0.8 l	PC Euro 1 - 91/441/EEC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline <0.8 l	PC Euro 2 - 94/12/EEC	0.03%	0.02%	0.03%	0.02%	0.02%	0.02%
Passenger Cars	Gasoline <0.8 l	PC Euro 3 - 98/69/EC Stage2000	0.14%	0.10%	0.10%	0.10%	0.11%	0.11%
Passenger Cars	Gasoline <0.8 l	PC Euro 4 - 98/69/EC Stage2005	0.10%	0.07%	0.06%	0.07%	0.07%	0.07%
Passenger Cars	Gasoline <0.8 l	PC Euro 5 - EC 715/2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline 0.8 - 1.4 l	PRE ECE	0.00%	0.01%	0.01%	0.01%	0.00%	0.00%
Passenger Cars	Gasoline 0.8 - 1.4 l	ECE 15/00-01	0.13%	0.64%	0.36%	0.64%	0.23%	0.35%
Passenger Cars	Gasoline 0.8 - 1.4 l	ECE 15/02	0.01%	0.24%	0.03%	0.24%	0.01%	0.08%
Passenger Cars	Gasoline 0.8 - 1.4 l	ECE 15/03	0.02%	0.33%	0.04%	0.33%	0.02%	0.11%
Passenger Cars	Gasoline 0.8 - 1.4 l	ECE 15/04	0.11%	0.46%	0.20%	0.46%	0.20%	0.25%
Passenger Cars	Gasoline 0.8 - 1.4 l	PC Euro 1 - 91/441/EEC	0.26%	0.46%	0.45%	0.46%	0.46%	0.42%
Passenger Cars	Gasoline 0.8 - 1.4 l	PC Euro 2 - 94/12/EEC	0.66%	0.86%	0.98%	0.86%	1.03%	0.89%
Passenger Cars	Gasoline 0.8 - 1.4 l	PC Euro 3 - 98/69/EC Stage2000	2.26%	2.64%	2.82%	2.64%	2.90%	2.68%
Passenger Cars	Gasoline 0.8 - 1.4 l	PC Euro 4 - 98/69/EC Stage2005	3.66%	3.72%	3.74%	3.72%	3.91%	3.76%
Passenger Cars	Gasoline 0.8 - 1.4 l	PC Euro 5 - EC 715/2007	1.63%	1.53%	1.45%	1.53%	1.45%	1.51%
Passenger Cars	Gasoline 1.4 - 2.0 l	PRE ECE	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline 1.4 - 2.0 l	ECE 15/00-01	0.03%	0.12%	0.07%	0.12%	0.06%	0.07%
Passenger Cars	Gasoline 1.4 - 2.0 l	ECE 15/02	0.00%	0.08%	0.01%	0.08%	0.00%	0.02%
Passenger Cars	Gasoline 1.4 - 2.0 l	ECE 15/03	0.01%	0.12%	0.02%	0.12%	0.01%	0.04%
Passenger Cars	Gasoline 1.4 - 2.0 l	ECE 15/04	0.26%	0.55%	0.39%	0.55%	0.36%	0.40%
Passenger Cars	Gasoline 1.4 - 2.0 l	PC Euro 1 - 91/441/EEC	0.66%	0.81%	0.87%	0.81%	0.87%	0.81%
Passenger Cars	Gasoline 1.4 - 2.0 l	PC Euro 2 - 94/12/EEC	1.43%	1.58%	1.93%	1.58%	1.84%	1.71%
Passenger Cars	Gasoline 1.4 - 2.0 l	PC Euro 3 - 98/69/EC Stage2000	4.04%	4.31%	4.54%	4.31%	4.88%	4.46%
Passenger Cars	Gasoline 1.4 - 2.0 l	PC Euro 4 - 98/69/EC Stage2005	4.51%	4.00%	4.01%	4.00%	4.32%	4.19%
Passenger Cars	Gasoline 1.4 - 2.0 l	PC Euro 5 - EC 715/2007	1.19%	0.95%	0.91%	0.95%	0.91%	0.98%
Passenger Cars	Gasoline >2.0 l	PRE ECE	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline >2.0 l	ECE 15/00-01	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%
Passenger Cars	Gasoline >2.0 l	ECE 15/02	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Gasoline >2.0 l	ECE 15/03	0.01%	0.01%	0.00%	0.01%	0.00%	0.01%
Passenger Cars	Gasoline >2.0 l	ECE 15/04	0.03%	0.03%	0.02%	0.03%	0.02%	0.02%
Passenger Cars	Gasoline >2.0 l	PC Euro 1 - 91/441/EEC	0.31%	0.22%	0.21%	0.22%	0.21%	0.23%
Passenger Cars	Gasoline >2.0 l	PC Euro 2 - 94/12/EEC	0.46%	0.28%	0.32%	0.28%	0.37%	0.35%
Passenger Cars	Gasoline >2.0 l	PC Euro 3 - 98/69/EC Stage2000	1.45%	0.82%	0.79%	0.82%	1.01%	0.99%
Passenger Cars	Gasoline >2.0 l	PC Euro 4 - 98/69/EC Stage2005	1.55%	0.65%	0.64%	0.65%	0.81%	0.87%
Passenger Cars	Gasoline >2.0 l	PC Euro 5 - EC 715/2007	0.24%	0.07%	0.07%	0.07%	0.09%	0.11%
Passenger Cars	Diesel <1.4 l	Conventional	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%
Passenger Cars	Diesel <1.4 l	PC Euro 1 - 91/441/EEC	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%
Passenger Cars	Diesel <1.4 l	PC Euro 2 - 94/12/EEC	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%
Passenger Cars	Diesel <1.4 l	PC Euro 3 - 98/69/EC Stage2000	0.57%	0.83%	0.89%	0.83%	0.79%	0.78%
Passenger Cars	Diesel <1.4 l	PC Euro 4 - 98/69/EC Stage2005	1.85%	2.46%	2.48%	2.46%	2.24%	2.28%

Sector	Subsector	Technology	Zone A	Zone B	Zone C	Zone D	Zone E	Total
Passenger Cars	Diesel <1.4 l	PC Euro 5 - EC 715/2007	0.58%	0.80%	0.73%	0.80%	0.77%	0.73%
Passenger Cars	Diesel 1.4 - 2.0 l	Conventional	0.04%	0.18%	0.06%	0.18%	0.07%	0.09%
Passenger Cars	Diesel 1.4 - 2.0 l	PC Euro 1 - 91/441/EEC	0.25%	0.53%	0.55%	0.53%	0.53%	0.48%
Passenger Cars	Diesel 1.4 - 2.0 l	PC Euro 2 - 94/12/EEC	1.53%	2.74%	3.05%	2.74%	2.81%	2.59%
Passenger Cars	Diesel 1.4 - 2.0 l	PC Euro 3 - 98/69/EC Stage2000	8.31%	13.21%	13.27%	13.21%	12.69%	12.07%
Passenger Cars	Diesel 1.4 - 2.0 l	PC Euro 4 - 98/69/EC Stage2005	17.96%	23.01%	21.93%	23.01%	21.00%	21.15%
Passenger Cars	Diesel 1.4 - 2.0 l	PC Euro 5 - EC 715/2007	7.17%	7.64%	6.87%	7.64%	6.98%	7.16%
Passenger Cars	Diesel >2.0 l	Conventional	0.03%	0.10%	0.05%	0.10%	0.04%	0.06%
Passenger Cars	Diesel >2.0 l	PC Euro 1 - 91/441/EEC	0.09%	0.14%	0.13%	0.14%	0.13%	0.13%
Passenger Cars	Diesel >2.0 l	PC Euro 2 - 94/12/EEC	0.31%	0.36%	0.41%	0.36%	0.43%	0.38%
Passenger Cars	Diesel >2.0 l	PC Euro 3 - 98/69/EC Stage2000	1.88%	2.03%	1.84%	2.03%	2.06%	1.95%
Passenger Cars	Diesel >2.0 l	PC Euro 4 - 98/69/EC Stage2005	4.98%	3.90%	3.53%	3.90%	4.15%	4.08%
Passenger Cars	Diesel >2.0 l	PC Euro 5 - EC 715/2007	1.71%	0.99%	0.85%	0.99%	1.15%	1.14%
Passenger Cars	LPG	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	LPG	PC Euro 2 - 94/12/EEC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	LPG	PC Euro 3 - 98/69/EC Stage2000	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
Passenger Cars	LPG	PC Euro 4 - 98/69/EC Stage2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	LPG	PC Euro 5 - EC 715/2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	E85	PC Euro 5 - EC 715/2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	CNG	PC Euro 4 - 98/69/EC Stage2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	CNG	PC Euro 5 - EC 715/2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Passenger Cars	Hybrid Gasoline <1.4 l	PC Euro 4 - 98/69/EC Stage2005	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%
Passenger Cars	Hybrid Gasoline 1.4 - 2.0 l	PC Euro 4 - 98/69/EC Stage2005	0.02%	0.02%	0.02%	0.02%	0.01%	0.02%
Passenger Cars	Hybrid Gasoline >2.0 l	PC Euro 4 - 98/69/EC Stage2005	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
Light Commercial Vehicles	Gasoline <3.5t	Conventional	0.02%	0.18%	0.06%	0.18%	0.04%	0.08%
Light Commercial Vehicles	Gasoline <3.5t	LD Euro 1 - 93/59/EEC	0.01%	0.01%	0.01%	0.01%	0.02%	0.01%
Light Commercial Vehicles	Gasoline <3.5t	LD Euro 2 - 96/69/EEC	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Light Commercial Vehicles	Gasoline <3.5t	LD Euro 3 - 98/69/EC Stage2000	0.05%	0.06%	0.07%	0.06%	0.08%	0.07%
Light Commercial Vehicles	Gasoline <3.5t	LD Euro 4 - 98/69/EC Stage2005	0.05%	0.06%	0.07%	0.06%	0.06%	0.06%
Light Commercial Vehicles	Gasoline <3.5t	LD Euro 5 - 2008 Standards	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%
Light Commercial Vehicles	Diesel <3.5t	Conventional	0.03%	0.23%	0.08%	0.23%	0.07%	0.11%
Light Commercial Vehicles	Diesel <3.5t	LD Euro 1 - 93/59/EEC	0.05%	0.14%	0.14%	0.14%	0.13%	0.12%
Light Commercial Vehicles	Diesel <3.5t	LD Euro 2 - 96/69/EEC	0.18%	0.38%	0.45%	0.38%	0.45%	0.37%
Light Commercial Vehicles	Diesel <3.5t	LD Euro 3 - 98/69/EC Stage2000	1.06%	2.05%	2.24%	2.05%	2.20%	1.93%
Light Commercial Vehicles	Diesel <3.5t	LD Euro 4 - 98/69/EC Stage2005	2.53%	4.14%	4.31%	4.14%	4.15%	3.85%
Light Commercial Vehicles	Diesel <3.5t	LD Euro 5 - 2008 Standards	0.74%	1.22%	1.19%	1.22%	1.19%	1.10%
Heavy Duty Trucks	Gasoline >3.5 t	Conventional	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Heavy Duty Trucks	Rigid <=7.5 t	Conventional	0.01%	0.06%	0.02%	0.06%	0.01%	0.03%
Heavy Duty Trucks	Rigid <=7.5 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.02%	0.01%	0.02%	0.01%	0.01%
Heavy Duty Trucks	Rigid <=7.5 t	HD Euro II - 91/542/EEC Stage II	0.03%	0.10%	0.08%	0.10%	0.10%	0.08%
Heavy Duty Trucks	Rigid <=7.5 t	HD Euro III - 2000 Standards	0.19%	0.46%	0.41%	0.46%	0.38%	0.37%
Heavy Duty Trucks	Rigid <=7.5 t	HD Euro IV - 2005 Standards	0.24%	0.48%	0.46%	0.48%	0.46%	0.42%
Heavy Duty Trucks	Rigid <=7.5 t	HD Euro V - 2008 Standards	0.31%	0.57%	0.48%	0.57%	0.57%	0.49%
Heavy Duty Trucks	Rigid 7.5 - 12 t	Conventional	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%
Heavy Duty Trucks	Rigid 7.5 - 12 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Sector	Subsector	Technology	Zone A	Zone B	Zone C	Zone D	Zone E	Total
Heavy Duty Trucks	Rigid 7.5 - 12 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%
Heavy Duty Trucks	Rigid 7.5 - 12 t	HD Euro III - 2000 Standards	0.01%	0.03%	0.04%	0.03%	0.03%	0.03%
Heavy Duty Trucks	Rigid 7.5 - 12 t	HD Euro IV - 2005 Standards	0.01%	0.02%	0.02%	0.02%	0.03%	0.02%
Heavy Duty Trucks	Rigid 7.5 - 12 t	HD Euro V - 2008 Standards	0.02%	0.03%	0.04%	0.03%	0.04%	0.03%
Heavy Duty Trucks	Rigid 12 - 14 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 12 - 14 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 12 - 14 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 12 - 14 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 12 - 14 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 12 - 14 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 14 - 20 t	Conventional	0.00%	0.02%	0.01%	0.02%	0.01%	0.01%
Heavy Duty Trucks	Rigid 14 - 20 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 14 - 20 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.01%	0.01%	0.01%	0.02%	0.01%
Heavy Duty Trucks	Rigid 14 - 20 t	HD Euro III - 2000 Standards	0.02%	0.03%	0.03%	0.03%	0.04%	0.03%
Heavy Duty Trucks	Rigid 14 - 20 t	HD Euro IV - 2005 Standards	0.02%	0.03%	0.02%	0.03%	0.04%	0.03%
Heavy Duty Trucks	Rigid 14 - 20 t	HD Euro V - 2008 Standards	0.02%	0.03%	0.02%	0.03%	0.04%	0.03%
Heavy Duty Trucks	Rigid 20 - 26 t	Conventional	0.00%	0.01%	0.00%	0.01%	0.01%	0.01%
Heavy Duty Trucks	Rigid 20 - 26 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 20 - 26 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 20 - 26 t	HD Euro III - 2000 Standards	0.01%	0.01%	0.01%	0.01%	0.02%	0.01%
Heavy Duty Trucks	Rigid 20 - 26 t	HD Euro IV - 2005 Standards	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Heavy Duty Trucks	Rigid 20 - 26 t	HD Euro V - 2008 Standards	0.01%	0.00%	0.01%	0.00%	0.01%	0.01%
Heavy Duty Trucks	Rigid 26 - 28 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 26 - 28 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 26 - 28 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 26 - 28 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 26 - 28 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 28 - 32 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 28 - 32 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 28 - 32 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 28 - 32 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 28 - 32 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid 28 - 32 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid >32 t	Conventional	0.00%	0.02%	0.00%	0.02%	0.01%	0.01%
Heavy Duty Trucks	Rigid >32 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid >32 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid >32 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid >32 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks	Rigid >32 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 14 - 20 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 14 - 20 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 14 - 20 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 14 - 20 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 14 - 20 t	HD Euro IV - 2005 Standards	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%
Heavy Duty Trucks Articulated	Articulated 14 - 20 t	HD Euro V - 2008 Standards	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%

Sector	Subsector	Technology	Zone A	Zone B	Zone C	Zone D	Zone E	Total
Heavy Duty Trucks Articulated	Articulated 20 - 28 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 20 - 28 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 20 - 28 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 20 - 28 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 20 - 28 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 20 - 28 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 28 - 34 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 28 - 34 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 28 - 34 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 28 - 34 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heavy Duty Trucks Articulated	Articulated 34 - 40 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Midi <=15 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Midi <=15 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Midi <=15 t	HD Euro II - 91/542/EEC Stage II	0.01%	0.01%	0.02%	0.01%	0.02%	0.01%
Buses	Urban Buses Midi <=15 t	HD Euro III - 2000 Standards	0.02%	0.03%	0.04%	0.03%	0.05%	0.03%
Buses	Urban Buses Midi <=15 t	HD Euro IV - 2005 Standards	0.02%	0.03%	0.04%	0.03%	0.03%	0.03%
Buses	Urban Buses Midi <=15 t	HD Euro V - 2008 Standards	0.03%	0.07%	0.06%	0.07%	0.06%	0.06%
Buses	Urban Buses Standard 15 - 18 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Standard 15 - 18 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Standard 15 - 18 t	HD Euro II - 91/542/EEC Stage II	0.01%	0.02%	0.01%	0.02%	0.01%	0.01%
Buses	Urban Buses Standard 15 - 18 t	HD Euro III - 2000 Standards	0.03%	0.06%	0.06%	0.06%	0.12%	0.07%
Buses	Urban Buses Standard 15 - 18 t	HD Euro IV - 2005 Standards	0.03%	0.09%	0.06%	0.09%	0.14%	0.08%
Buses	Urban Buses Standard 15 - 18 t	HD Euro V - 2008 Standards	0.02%	0.19%	0.03%	0.19%	0.07%	0.08%
Buses	Urban Buses Articulated >18 t	Conventional	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Articulated >18 t	HD Euro I - 91/542/EEC Stage I	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban Buses Articulated >18 t	HD Euro II - 91/542/EEC Stage II	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
Buses	Urban Buses Articulated >18 t	HD Euro III - 2000 Standards	0.43%	0.08%	0.40%	0.08%	0.46%	0.34%
Buses	Urban Buses Articulated >18 t	HD Euro IV - 2005 Standards	0.23%	0.09%	0.32%	0.09%	0.28%	0.23%
Buses	Urban Buses Articulated >18 t	HD Euro V - 2008 Standards	0.32%	0.28%	0.26%	0.28%	1.73%	0.64%
Buses Coaches	Coaches Standard <=18 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses Coaches	Coaches Standard <=18 t	HD Euro V - 2008 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses Coaches	Coaches Articulated >18 t	HD Euro III - 2000 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses Coaches	Coaches Articulated >18 t	HD Euro IV - 2005 Standards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Urban CNG Buses	EEV	0.82%	0.01%	0.33%	0.01%	0.14%	0.30%
Motorcycles	4-stroke <250 cm³	Conventional	0.10%	0.10%	0.03%	0.10%	0.03%	0.06%
Motorcycles	4-stroke <250 cm³	Mot - Euro I	0.20%	0.02%	0.03%	0.02%	0.04%	0.06%
Motorcycles	4-stroke <250 cm³	Mot - Euro II	0.65%	0.04%	0.09%	0.04%	0.14%	0.21%
Motorcycles	4-stroke <250 cm³	Mot - Euro III	3.61%	0.16%	0.42%	0.16%	0.63%	1.08%
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0.09%	0.04%	0.02%	0.04%	0.02%	0.04%
Motorcycles	4-stroke 250 - 750 cm³	Mot - Euro I	0.13%	0.01%	0.02%	0.01%	0.02%	0.04%
Motorcycles	4-stroke 250 - 750 cm³	Mot - Euro II	0.33%	0.02%	0.06%	0.02%	0.07%	0.11%
Motorcycles	4-stroke 250 - 750 cm³	Mot - Euro III	1.97%	0.07%	0.31%	0.07%	0.35%	0.61%
Motorcycles	4-stroke >750 cm³	Conventional	0.03%	0.01%	0.01%	0.01%	0.01%	0.01%
Motorcycles	4-stroke >750 cm³	Mot - Euro I	0.05%	0.01%	0.01%	0.01%	0.02%	0.02%
Motorcycles	4-stroke >750 cm³	Mot - Euro II	0.11%	0.01%	0.01%	0.01%	0.01%	0.03%

Sector	Subsector	Technology	Zone A	Zone B	Zone C	Zone D	Zone E	Total
Motorcycles	4-stroke >750 cm³	Mot - Euro III	1.04%	0.03%	0.14%	0.03%	0.18%	0.31%
Passenger Cars	Electric	Electric	0.02%	0.01%	0.00%	0.01%	0.01%	0.01%
Passenger Cars	Solar	Solar	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Light Commercial Vehicles	Electric	Electric	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Motorcycles	Electric	Electric	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
Buses	Electric	Electric	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
Taxis	Diesel <1.4 l	PC Euro 4 - 98/69/EC Stage2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Taxis	Diesel <1.4 l	PC Euro 5 - EC 715/2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Taxis	Diesel 1.4 - 2.0 l	PC Euro 3 - 98/69/EC Stage2000	0.82%	0.22%	0.32%	0.22%	0.22%	0.38%
Taxis	Diesel 1.4 - 2.0 l	PC Euro 4 - 98/69/EC Stage2005	5.96%	1.62%	2.36%	1.62%	1.47%	2.71%
Taxis	Diesel 1.4 - 2.0 l	PC Euro 5 - EC 715/2007	1.53%	0.57%	0.64%	0.57%	0.44%	0.76%
Taxis	Diesel >2.0 l	PC Euro 3 - 98/69/EC Stage2000	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%
Taxis	Diesel >2.0 l	PC Euro 4 - 98/69/EC Stage2005	0.12%	0.04%	0.04%	0.04%	0.06%	0.06%
Taxis	Diesel >2.0 l	PC Euro 5 - EC 715/2007	0.04%	0.01%	0.01%	0.01%	0.02%	0.02%
Taxis	LPG	PC Euro 4 - 98/69/EC Stage2005	0.35%	0.13%	0.13%	0.13%	0.06%	0.16%
Taxis	LPG	PC Euro 5 - EC 715/2007	0.34%	0.13%	0.13%	0.13%	0.08%	0.16%
Taxis	CNG	PC Euro 4 - 98/69/EC Stage2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Taxis	Hybrid Gasoline 1.4 - 2.0 l	PC Euro 4 - 98/69/EC Stage2005	1.76%	0.48%	0.69%	0.48%	0.42%	0.80%
Mopeds	Gasoline		0.52%	0.00%	0.67%	0.00%	0.20%	0.35%
TOTAL			**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**