

Monitoring CO₂ emissions from new passenger cars in the EU: summary of data for 2012



Abstract

For the third successive year, the European Environment Agency (EEA) has collected EU Member States' data on passenger car registrations, in accordance with Regulation (EC) No 443/2009. All Member States reported information on Carbon dioxide (CO₂) emissions and the mass of cars, together with other vehicle characteristics. This data was used to evaluate the performance in 2012 of the new vehicle fleet, and its progress toward meeting the CO₂ emissions target of 130 grams of CO₂ per kilometre (gCO₂/km) by 2015. For the first time, the 2012 specific emissions targets are mandatory: if the average CO₂ emissions of a manufacturer's fleet exceed its specific emissions target, the manufacturer has to pay an excess emissions premium for each new car registered.

The current dataset is provisional, and will now be sent for verification to all car manufacturers responsible for cars registered in the EU in 2012. The European Commission will take account of errors noted by manufacturers, and correct the dataset as appropriate, before setting the final specific emissions targets for each manufacturer in the second half of 2013.

The provisional dataset indicates that manufacturers have once more improved their performance in terms of CO₂ emissions from passenger cars: the average CO₂ emissions from the new car fleet in 2012 ⁽¹⁾ was 132.2 gCO₂/km. This was 3.5 gCO₂/km less than in the previous monitoring year (135.7 /km in 2011).

Some of the key changes observed in the fleet are:

- the dieselisation of the fleet is continuing (54.9 % of the vehicles registered in 2012 in Europe are diesel vehicles);
- the average mass is the highest of the last nine years;
- the average engine capacity has decreased by 5 % since 2007.

In spite of the increase in mass, dieselisation and improved vehicle technology have led to greater fuel efficiency and lower average CO₂ emissions per kilometre travelled.

⁽¹⁾ The average CO₂ emission is calculated considering all the vehicles submitted, excluding individual vehicle approvals (IVAs) and (national small series vehicles) NSS. IVAs are made on vehicles imported from third countries or on own-build vehicles that have to be individually approved. NSS vehicles are vehicles that are approved nationally in very small numbers, typically because they are made by smaller manufacturers.

1 Introduction

According to the latest available information ⁽²⁾, carbon dioxide (CO₂) emissions from road transport have increased by 21 % between 1990 and 2011, and they account for about 23% of the EU's total CO₂ emissions.

In order to ensure that the EU meets its greenhouse gas emission targets under the Kyoto Protocol, a comprehensive strategy to reduce CO₂ emissions from new cars and vans sold in the European Union was adopted in 2007.

As part of that strategy, Regulation (EC) No 443/2009 aims at reducing the average CO₂ emissions of new passenger cars. The Regulation sets a short-term target of 130 gCO₂/km by 2015, to be phased in from 2012, and a long term target of 95 gCO₂/km by 2020.

According to Article 8 of Regulation (EC) No 443/2009, Member States shall record and annually transmit to the Commission information for each new passenger car registered on their territory. In particular, the following details are required for each new passenger car registered:

- manufacturer name: the person or body responsible for all aspects of the EC type-approval procedure;
- type, variant, version: these entries allow the identification of the vehicles as registered in type approval documentation and certificates of conformity;
- specific emissions of CO₂: the CO₂ emissions of a passenger car in terms of grams of CO₂ emitted per kilometre, and measured in accordance with Regulation (EC) No 715/2007. The specific CO₂ emissions of a vehicle version are determined using a type approval test cycle (NEDC) in laboratory conditions;
- mass in running order: the mass of the car with bodywork in running order, i.e. including the driver (75 kg), fuel (90 % filled), liquids (for cooling), and standard equipment as foreseen in the Directive 2007/46/EC;

- wheel base (the distance between the centre of the front and rear wheels);
- track width (the distance between the centre of the wheel on one side of the vehicle and the centre of the wheel on the opposite side); and
- fuel type and fuel mode.

Additional information, such as type approval number (useful for the identification of the vehicles), engine capacity, and engine power were also submitted.

The data now published is provisional. As a first step, it must therefore be verified by manufacturers to prevent specific emission targets being calculated with incorrect data. Manufacturers have three months within which to notify the Commission of any errors. The Commission will correct the dataset as appropriate, and publish the final dataset and specific emission targets, including the distance between the average emissions and the target for each manufacturer, in the fourth quarter of 2013.

Some values included in the provisional dataset may therefore change following the verification by the manufacturers. Based on the experience from the verifications made of the 2010 and 2011 datasets, it is expected that the changes made will have limited impact on the analysis of the aggregate data given in this document.

The provisional database provides the detailed data without taking into account other factors required for the calculation of both the specific emissions and the manufacturer targets, such as phase-in percentages, super-credits or eco-innovation credits. Additional information on the calculation of the target by manufacturers is available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0657:FIN:EN:PDF> <http://www.eea.europa.eu/publications/co2-emissions-performance-of-car>.

⁽²⁾ This information is based on the draft EU Greenhouse Gas inventory submitted to UNFCCC in April 2013. The final EU values will be provided and analysed by EEA in the end of May, following the final 2013 submission of the EU GHG inventory and inventory report to UNFCCC.

2 2012 monitoring exercise

2.1 Data submission and processing

For the reporting year 2012, the majority of Member States submitted the data by the deadline of 28 February in accordance with Article 8 of Regulation (EC) No 443/2009. The remaining Member States delivered the data within two weeks after the deadline.

Data were submitted to the Central Data Repository (CDR) managed by the EEA. Several quality checks (automatic and manual) were performed in order to evaluate the accuracy and the quality of the dataset. These checks covered various areas.

- The completeness rate. This is comprised of two main components. The first component concerns numerical data such as vehicle mass and emissions rates for each vehicle. The second component measures the extent to which more granular data — such as data on very slight changes within a model type — are available for each vehicle that has been registered.
- Data plausibility and outliers.
- Assignment to manufacturer using harmonised denomination. Identical vehicles are often sold under different brand or model names in different countries. For the purposes of this study, one naming system was used to avoid confusion between identical vehicles.
- Data variability (for the same vehicle, an estimate of the variability of the mass, emission and engine capacity were developed).
- Handling of unknown, individual vehicle approvals (IVAs) and national small series vehicles ⁽³⁾.

These issues were addressed during the data evaluation process, and the majority of them were solved without significant data losses.

2.2 Monitoring and data quality

Member States have made significant efforts during the last few years to improve the monitoring and quality of the data. The use of official documents, such as type approval documentation (TAD) and Certificates of Conformity (CoC) has resulted in more accurate values being recorded and reported. Accuracy has also been improved through the continuous collaboration between manufacturers, Member States, the EEA and the Commission.

As regards the completeness of the data sets, Member States have, with very few exceptions, provided values for all mandatory parameters. The accuracy of those values will have to be analysed following the verification by the manufacturers.

The completeness rate (defined as the ratio between the number of registrations having a value for a specific entry and the total number of registrations) is a good indication of the improvements in the monitoring systems achieved over the years (Table A.5 of Annex 1). The completeness rate for the mandatory parameters is particularly high:

- The **entries for mass and CO₂ emissions** have been completed in 99.7 % of the total registrations.
- The **entries for type, variant and version** have been completed in 99.0 % of the total registrations.
- For other numerical entries: the **wheelbase values** have been completed in 99.8 % and the **steering axle values** in 98.9 % of total registrations respectively.

It is important to stress the need for Member States to provide accurate data and to ensure that the entries are correctly completed.

⁽³⁾ IVAs are made on vehicles imported from third countries or on own-build vehicles that have to be individually approved. NSS vehicles are vehicles that are approved nationally in very small numbers, typically because they are made by smaller manufacturers.

3 Trends in new passenger cars

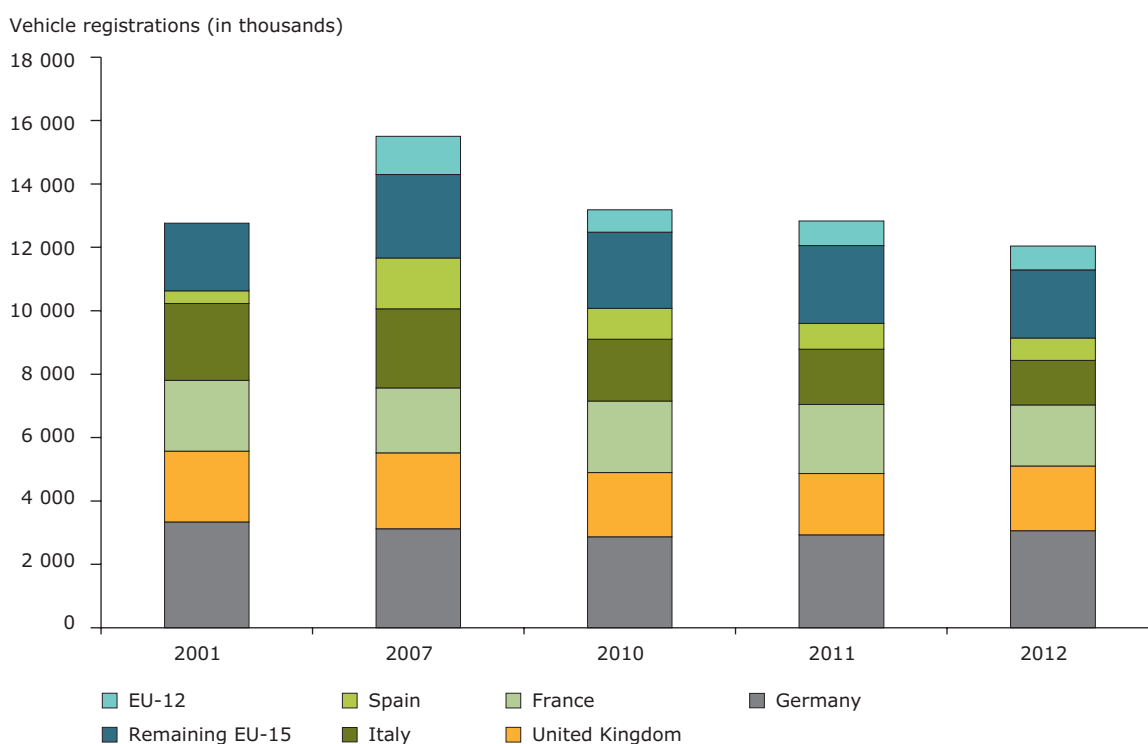
3.1 Average CO₂ emissions from new passenger cars

The provisional 2012 EU database contains about 375 500 records with technical data relating to around 12 million individual vehicles (i.e. one record relates to a specific vehicle version and is valid for several individual vehicles). This includes 4 200 IVAs, 573 vehicles approved under national small series rules (NSS), around 17 700 unknown vehicles and around 37 000 unidentified vehicles. Unknown vehicles are vehicles where the entries for the manufacturer name are missing in the database for unknown reasons. Those vehicles cannot be attributed to a manufacturer and are therefore not included in the provisional calculation of targets. If identified by the manufacturers, they may be included for the final target calculation. Unidentified vehicles are vehicles where the entries for the mass in running order or the CO₂ emissions are missing in the database for unknown reasons. Unidentified vehicles will not be considered for the calculation of the average specific emissions or

the specific emissions targets for manufacturers, unless these vehicles are identified and noted by the manufacturer as part of their verification of the data.

The number of registrations in the EU-27 has increased constantly between 2001 and 2007 (calculated on the basis of available Member States' data, see Table A.1 in Annex 1) and decreased since 2007 (when 15.5 million vehicles registered). In 2012 there were 12.0 million registrations compared to 12.8 million registrations in 2011. Compared to 2011, registrations decreased in 2012 in Greece (– 41 %), Portugal (– 38 %), Cyprus (– 25 %), Italy (– 20 %), Ireland (– 19 %), Romania (– 19 %), Belgium (– 15 %), Spain (– 13 %), Finland (– 12 %), France (– 11 %), Slovenia (– 10 %), Netherlands (– 10 %), Sweden (– 8 %), Malta (– 8 %), Austria (– 6 %). Lithuania, Bulgaria, Latvia, Poland also had a slight decrease in registrations (– 1 to – 6 %). Estonia and Hungary had an increase in registration of more than 12 %. The remaining Member States saw a slight increase in registrations (less than 5 %).

Figure 3.1 Number of vehicles registered in EU-27 in 2001, 2007, 2010, 2011 and 2012



Note: Only from 2007 onwards, data on all EU-12 Member States are available.

The EU-15 ⁽⁴⁾ still accounts for the vast majority of registrations of new passenger cars in the Union, with a share of almost 94 % in total registrations. It is important to note that only new cars are covered, i.e. second-hand vehicles are not included in the database. Among the EU-15, France, Germany, Italy, Spain and the United Kingdom account for 81 % of the registrations in EU-15. Compared to 2011, the number of vehicles registered in the EU-12 ⁽⁵⁾ has decreased by 2 %, while the number of newly registered vehicles in the EU-15 has decreased by 6 %.

According to the provisional data, the average CO₂ emissions from the new car fleet in the EU in 2012 were 132.2 gCO₂/km (Figure 3.2). Average specific emissions of CO₂ have decreased by some 3.5 gCO₂/km, or 2.6 %, compared to the previous year (135.7 gCO₂/km in 2011).

Diesel vehicles represent 54.9 % of the newly registered vehicle fleet as against 55.2 % in 2011. The average CO₂ emissions of diesel and petrol vehicles decreased by 2.8 gCO₂/km and 3.9 gCO₂/km respectively, compared to 2011. The difference between average CO₂ emissions of new diesel and new petrol vehicles is continuously decreasing over the last years (3.3 gCO₂/km in 2010, 3.1 gCO₂/km in 2011 and 2.1 gCO₂/km in 2012).

Compared to 2011, the share of alternative fuel vehicles (AFVs) has again increased, on top of the considerable decrease that was observed in 2011. In addition, specific emissions of CO₂ from AFVs have decreased by 6.5 gCO₂/km, or 5.2 %.

On the basis of the monitoring data, it is possible to report CO₂ emissions for different fuel types used by AFVs (Table 3.3). It is noteworthy that the mix of vehicles considered in the AFV categories has changed over the years (natural gas vehicles, liquefying petroleum gas vehicles, biodiesel vehicles, E85 vehicles and electric vehicles are included in the category). This helps explain the high variability in the trend of emissions and other characteristics of the vehicle (see Chapter 3.2).

Pure electric vehicles are propelled by electric motors, using electrical energy stored in batteries or another energy storage device. The emission of this kind of vehicle is considered to be 0 gCO₂/km. It is important to mention that only end-of-pipe ⁽⁶⁾ emissions are included in the dataset. Plug-in hybrid vehicles are also included in the database. These vehicles have both an internal combustion engine and an electric motor, but the power to the wheels is only provided by the electric motor. The combustion engine is only used to power a generator that drives the electric motor. The emissions of those vehicles

Table 3.1 Average CO₂ emissions from new passenger cars by fuel (EU-27 *)

gCO ₂ /km	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010 ^a	2011 ^a	2012 ^a
All fuels	172.2	169.7	167.2	165.5	163.4	162.4	161.3	158.7	153.6	145.7	140.3	135.7	132.2
Petrol	177.4	175.3	173.5	171.7	170	168.1	164.9	161.6	156.6	147.6	142.5	137.6	133.7
Diesel	160.3	159.7	158.1	157.7	156.2	156.5	157.9	156.3	151.2	145.3	139.3	134.5	131.6
AFV ^b	208	207.4	179.2	164.7	147.9	149.4	151.1	140	137	125.8	126.0	124.7	118.1

Note: ^a The calculation for the years 2010, 2011 and 2012 was done without considering IVAs and NSS.

^b For the calculation of the average CO₂ emissions of AFVs, pure electric, LPG, NG-biomethane, E85, biodiesel vehicles are included. Note that 2012 data are provisional.

* The geographical scope of the data changes over time from EU-15 to EU-25 and EU-27, see Annex 1 for details.

⁽⁴⁾ EU-15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

⁽⁵⁾ EU-12 includes Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

⁽⁶⁾ End-of-pipe emissions are the exhaust emissions of the vehicles. Pure electric vehicles do not produce any end-of-pipe emissions. However, pure electric vehicles produce indirect emissions when they are plugged in into the electricity grid. The indirect emissions are not taken into account in this report and in the regulation.

Table 3.2 Share of fuel type in new passenger cars (EU-27 *)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010 ^a	2011 ^a	2012 ^a
Petrol	68.9	64.0	59.2	55.5	51.9	50.7	49.4	47.3	47.4	51.1	45.3	43.4	42.9
Diesel	31.0	35.9	40.7	44.4	47.9	49.1	50.3	51.9	51.3	45.1	51.3	55.2	54.9
AFV incl. electric	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.7	1.3	3.8	3.5	1.4	2.2

Note: ^a The calculation for the years 2010, 2011 and 2012 was done without considering IVAs and NSS. Note that 2012 data are provisional.

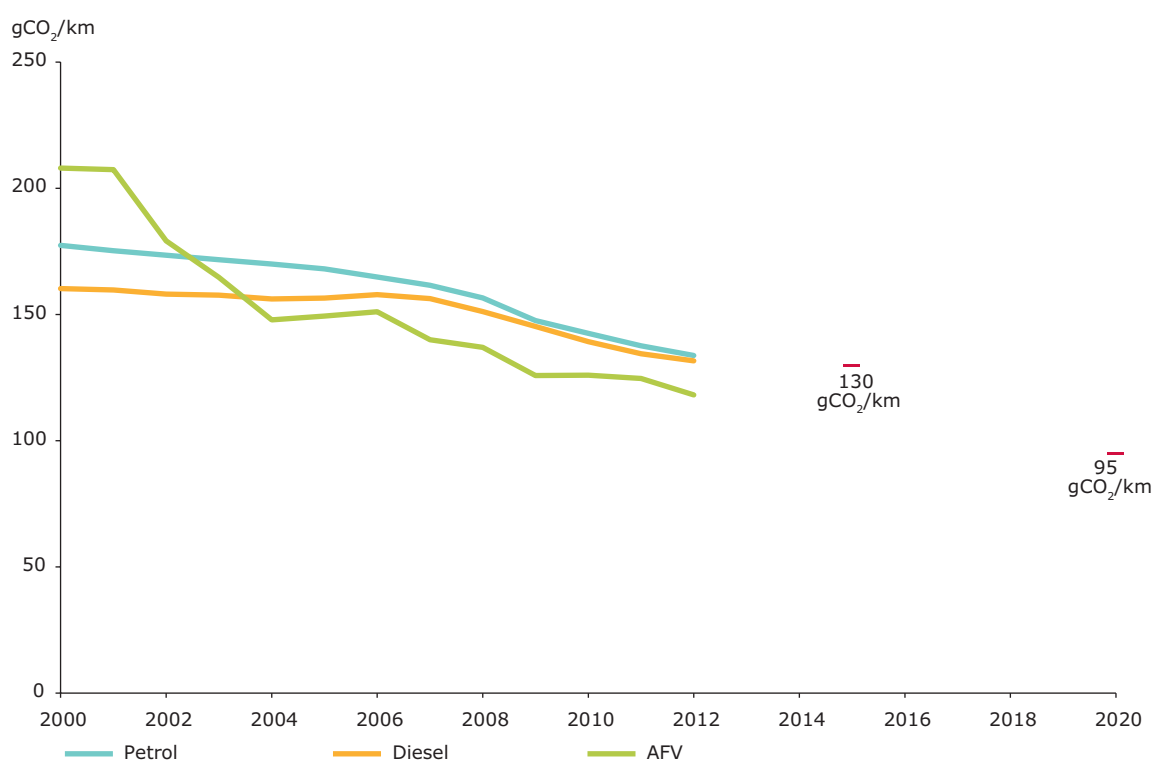
* The geographical scope of the data changes over time from EU-15 to EU-25 and EU-27, see Annex 1 for details.

Table 3.3 AFV data *: registration, CO₂ emission (gCO₂/km), mass (kg) and engine capacity (cm³)

	Registration (#)	Average CO ₂ emission (gCO ₂ /km)	Average mass (kg)	Average engine capacity (cm ³)
E85	21 635	165.3	1 389	1 690
Electric ^a	13 970	0	1 316	–
LPG	162 236	123.2	1 184	1 346
NG-biomethane	65 445	115.4	1 347	1 397
Biodiesel	30	132.5	1 240	1 508

Note: ^a Electric vehicles are vehicles for which end-of-pipe emission is 0 gCO₂/km

* Only exhaust emissions are considered. For electric monofuel vehicles the emission is null. For Petrol-E85, the petrol CO₂ emission is reported, for Biodiesel, the diesel CO₂ emission is reported, for LPG and NG (natural gas) the respective LPG and CNG CO₂ emissions are reported.

Figure 3.2 Evolution of CO₂ emissions from new passenger cars by fuel (EU-27 *)

Note: * The geographical scope of the data changes over time from the EU-15 to the EU-25 and the EU-27, see Annex 1 for details.

Table 3.4 Average CO₂ emissions (gCO₂/km) from new passenger cars by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
EU-27								158.7	153.6	145.7	140.3	135.7	132.2
EU-15	172.2	169.7	167.2	165.5	163.7	162.6	161.5	158.8	153.3	145.2	139.9	135.1	131.6
EU-12								157.8	156.8	154.2	148.2	144.1	141.5

Note: EU-15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

EU-12 includes Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

EU-27 includes EU-15 and EU-12.

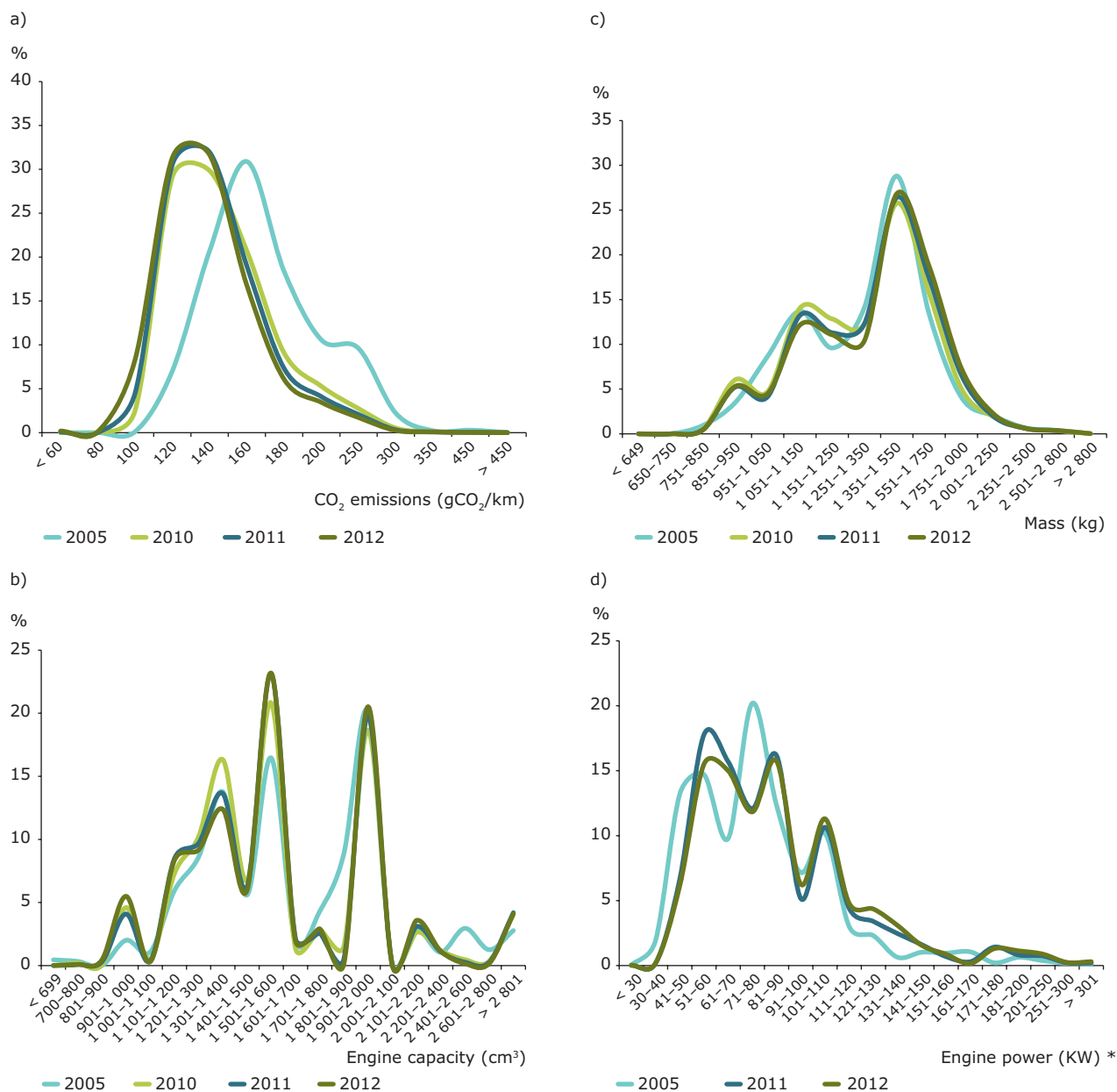
are in general below 50 gCO₂/km. Hybrid vehicles are also included in the dataset as petrol or diesel vehicle. Of the other types of AFVs, natural gas vehicles (NG-biomethane), liquefying petroleum gas vehicles (LPG vehicles), and biodiesel vehicles have the lowest CO₂ emissions (below 133 gCO₂/km), whereas ethanol-fuelled vehicles (E85) have the highest specific emissions (165 gCO₂/km).

In 2012, the average new passenger car in the EU-15 emitted 9.9 gCO₂/km less than the average newly registered vehicle in the EU-12 (Table 3.4). The last three years (2010, 2011 and 2012) were the first years in which significant progress was made in the EU-12. This can be seen by comparing the period 2007–2009, when emissions in the EU-12 dropped by 3.6 gCO₂/km, to the previous three years when average emissions decreased by 12.7 gCO₂/km. For the EU-15, the average reduction of CO₂ emissions (– 21.7 gCO₂/km) in the last four years is a bit higher compared to the reduction of the previous eight years (– 18.9 gCO₂/km for the period 2000–2008).

In comparison to 2011, the percentage of newly registered vehicles with emissions lower than 100 gCO₂/km is now nearly twice as high (Figure 3.3). The number of new passenger cars emitting 101–120 gCO₂/km has remained stable compared to the previous year, representing 31.3 % of the total registrations. The number of vehicles emitting less than 140 gCO₂/km represents 71.6 % of the registrations in 2012 (67.1 % in 2011).

The distributions of emissions, mass, engine capacity and power for four years (2005, 2010, 2011 and 2012) are shown in Figure 3.3. While there has been a big difference in terms of emissions performance of the vehicles between 2005 and 2012, there have been few changes for the other vehicle characteristics in the same period.

Figure 3.3 Frequency distributions of emissions (a), mass (b), engine capacity (c), and power (d) of the vehicles registered in Europe in the years 2005 (data based on decision 1753/2000), 2010, 2011 and 2012 (data based on Regulation (EC) No 443/2009)



Note: * Engine power data were not collected in 2010. In 2011 and in 2012, few Member States' data are available (see Annex 1, Table A.4).

With the exception of Belgium and Hungary, for which the CO₂ emissions increased, in all other countries CO₂ emissions from newly registered passenger cars fell in 2012 (Figure 3.4). The blue bars in the figure show the absolute reduction by Member State between 2011 and 2012, while the blue diamonds represent the percentage variation between the same two years.

Belgium, Denmark, France, Greece, Ireland, Italy, Malta, the Netherlands, Portugal and Spain have average CO₂ specific emissions from newly registered cars already below the 130 gCO₂/km EU target set for 2015 (Figure 3.5). Denmark and Portugal have the lowest average CO₂ specific

emissions, 117.0 gCO₂/km and 117.6 gCO₂/km respectively, which is mainly due to the registration of relatively small cars. Denmark has the second lowest average mass value (with Greece having the lowest), and Portugal the sixth lowest among the 27 EU Member States. Denmark also has the lowest average engine power value, and Portugal the fourth lowest value among the 17 EU Member States reporting engine power (the remaining 10 countries do not submit engine power data). Further to this downsizing effect, Portugal also has the fourth highest diesel share among the EU Member States, which also contributes significantly to lowering average CO₂ specific emissions. The economic crisis is most probably the main driving force for the shift

Figure 3.4 Absolute reduction (bar) and the percentage reduction (diamond) by Member State between 2011 and 2012

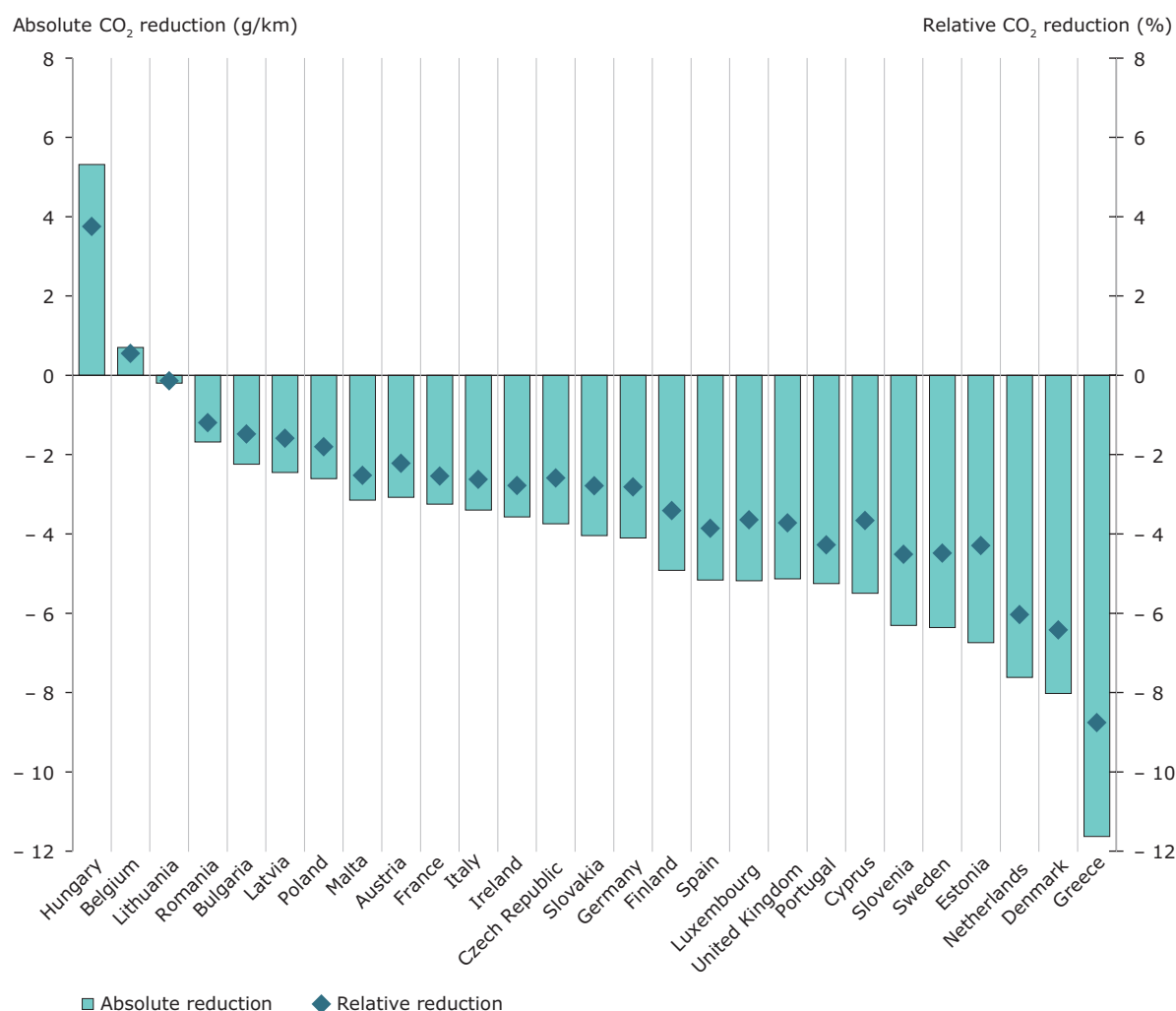
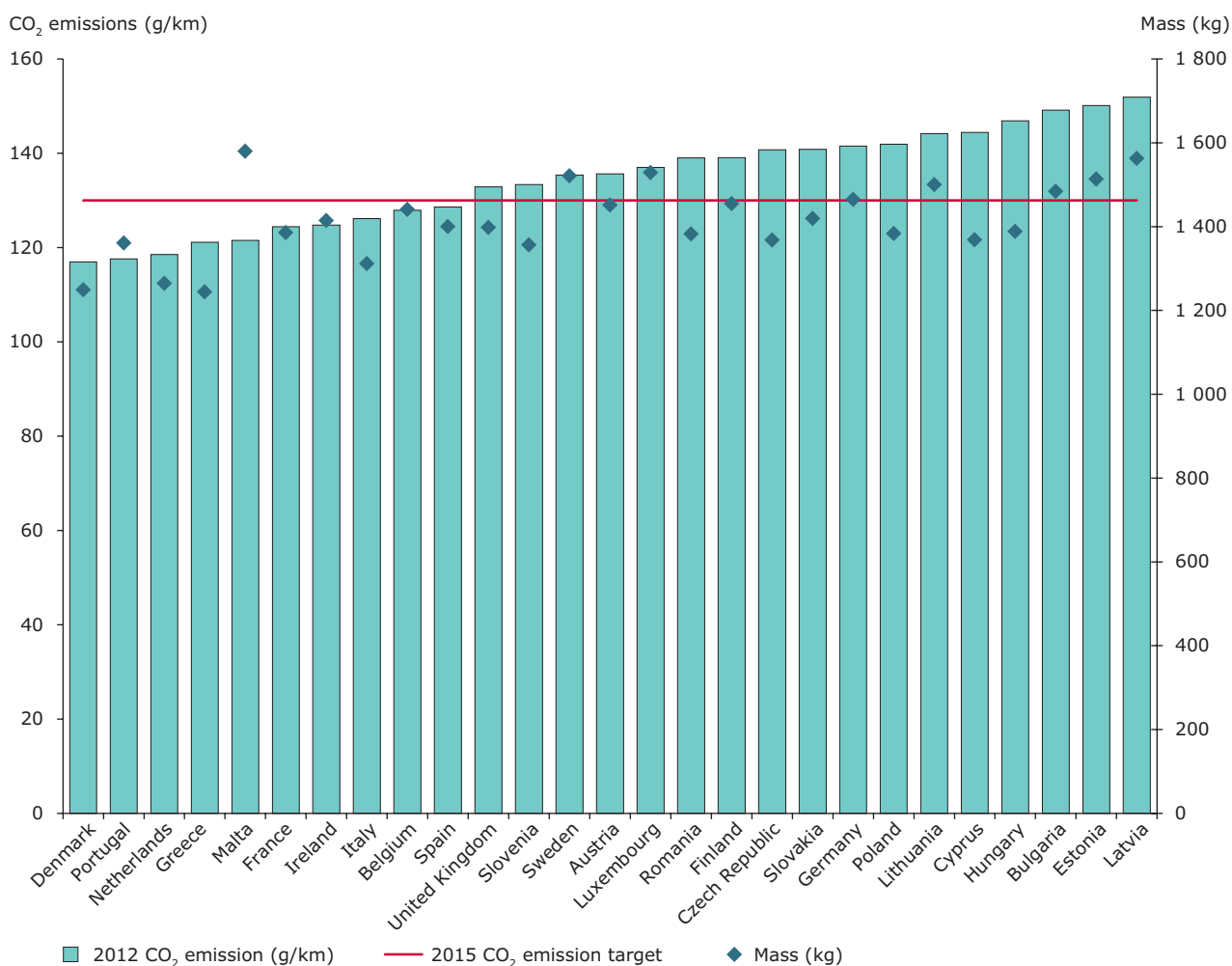


Figure 3.5 Average CO₂ emission and average mass by EU Member States – 2012 data

to smaller, less powerful, and hence cheaper cars in Portugal. In Denmark, however, the above trend is most probably attributed to the high taxation, which is the highest in the EU.

Greece and Denmark recorded the largest annual relative CO₂ emission reductions in newly registered cars, about 9 % and 6 % respectively on average compared to the previous year. Similarly to Portugal, the economic crisis is the most probable cause for this drop in Greece.

Due to their size, the Member States with higher vehicle registrations — France, Germany, Italy, Spain and the United Kingdom — are the major drivers of the total reductions in EU-27 CO₂ emissions from newly registered cars. Of these five, France and Italy have the lowest average CO₂ specific emissions,

while Spain and United Kingdom have the highest percentage decreases compared to the previous year (3.9 % and 3.7 %). For Italy, this is due to a combination of reasons. Italy, similar to Denmark and Portugal, has one of the lowest average mass (the fourth lowest among the EU Member States) and engine power (second lowest value among those Member States reporting engine power) values. In addition to this, Italy has a high share of diesel cars (53 %) and by far the highest share of AFVs (13 %). The latter are mainly LPG cars (9 % of all new registrations) with an average CO₂ value of 119.6 g/km. For France it seems that dieselisation is the main reason for the low CO₂ specific emissions, with the third highest share of new diesel cars (73 %) among the EU Member States. France also has a relatively high share of pure electric cars (0.3 %) with zero emissions.

3.2 Other car characteristics: mass, engine capacity, engine power and footprint (7)

The average mass of new passenger cars registered in the EU-27 in 2012 increased by 13 kg compared to the previous year (Table 3.5), but this is less of an increase than between the years 2010 and 2011. The difference in mass between petrol and diesel vehicles has been increasing slowly but constantly between 2004 (226 kg) and 2012 (325 kg). While the mass of petrol vehicles has been stable in the last nine years, the mass of diesel vehicles has consistently increased.

There was a slight increase in average engine capacity compared to 2011 for diesel vehicles

(Table 3.6). The average engine capacity of new diesel passenger cars in 2012 increased by 15.3 cm³, while the capacity of petrol cars decreased by 14.8 cm³. The difference between new diesel and petrol vehicles decreased to around 402 cm³ while in 2001 there was 421 cm³ of difference between new diesel and petrol vehicles. The engine capacity for AFVs increased in 2012 by 46.2 cm³ (3.2 %) compared to 2011.

Reporting of data on engine power is optional, and hence the corresponding dataset is incomplete. In addition, no data were collected in 2010. Average engine power in newly registered cars has been increasing steadily over the 2002–2008 period. There was a sudden drop in engine power in 2009, possibly due to the economic and financial crisis.

Table 3.5 Average mass of new passenger cars by fuel *

Kg	2004	2005	2006	2007	2008	2009	2010	2011	2012 ^a
All fuels	1 347	1 356	1 372	1 379	1 373	1 337	1 364	1 388	1 401
Petrol	1 237	1 235	1 238	1 235	1 228	1 206	1 214	1 220	1 222
Diesel	1 463	1 479	1 501	1 510	1 508	1 498	1 507	1 523	1 547
AFV	1 415	1 404	1 392	1 271	1 237	1 169	1 202	1 270	1 247

Note: * Data before 2004 are not shown due to incomplete dataset.

^a For the calculation of the average mass of AFVs, pure electric, LPG, NG-biomethane, E85, biodiesel vehicles are included. Note that 2012 data are provisional.

Table 3.6 Average engine capacity of new passenger cars by fuel

Cm ³	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 ^a
All fuels	1 714	1 731	1 743	1 730	1 726	1 724	1 729	1 703	1 620	1 633	1 641	1 640
Petrol	1 560	1 570	1 572	1 571	1 573	1 561	1 556	1 531	1 454	1 454	1 434	1 419
Diesel	1 981	1 961	1 948	1 904	1 886	1 885	1 892	1 869	1 832	1 807	1 806	1 821
AFV	1 602	1 672	1 628	1 581	1 561	1 562	1 424	1 387	1 328	1 349	1 432	1 386

Note: * The geographical scope of the data changes over time from EU-15 to EU-25 and EU-27, see Annex 1 for details.

^a For the calculation of the average engine capacity of AFVs, pure electric, LPG, NG-biomethane, E85, biodiesel vehicles are included. Note that 2012 data are provisional.

Table 3.7 Average engine power of new passenger cars by fuel

kW	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 ^a
All fuels	104	70	73	76	77	79	80	83	71	-	86	89
Petrol	115	63	67	70	70	71	70	76	62	-	77	80
Diesel	86	79	80	82	83	87	88	89	81	-	93	97
AFV	75	74	73	68	68	69	61	61	58	-	64	67

Note: ^a For the calculation of the average engine power of AFV, pure electric, LPG, NG-biomethane, E85, biodiesel vehicles are included. Note that 2012 data are provisional.

(7) Footprint is defined as the wheelbase (the distance from the front axle to the rear axle) times the average track width (the distance between the centre lines of the tires) of the vehicle.

Table 3.8 Average footprint of new passenger cars by fuel

m ²	2010	2011	2012 ^a
All fuels	3.95	3.97	3.98
Petrol	3.77	3.77	3.77
Diesel	4.11	4.14	4.16
AFV	3.80	3.74	3.71

Note: ^a For the calculation of the average footprint of AFV pure electric, LPG, NG-biomethane, E85, biodiesel vehicles are included. Note that 2012 data are provisional.

Compared to 2011, the engine power for all fuel types increased by 2.9 kW. The largest increase was observed for AFVs and diesel vehicles, namely 3.7 kW and 3.9 kW, while the lowest was reported for new petrol vehicles, by 2.2 kW.

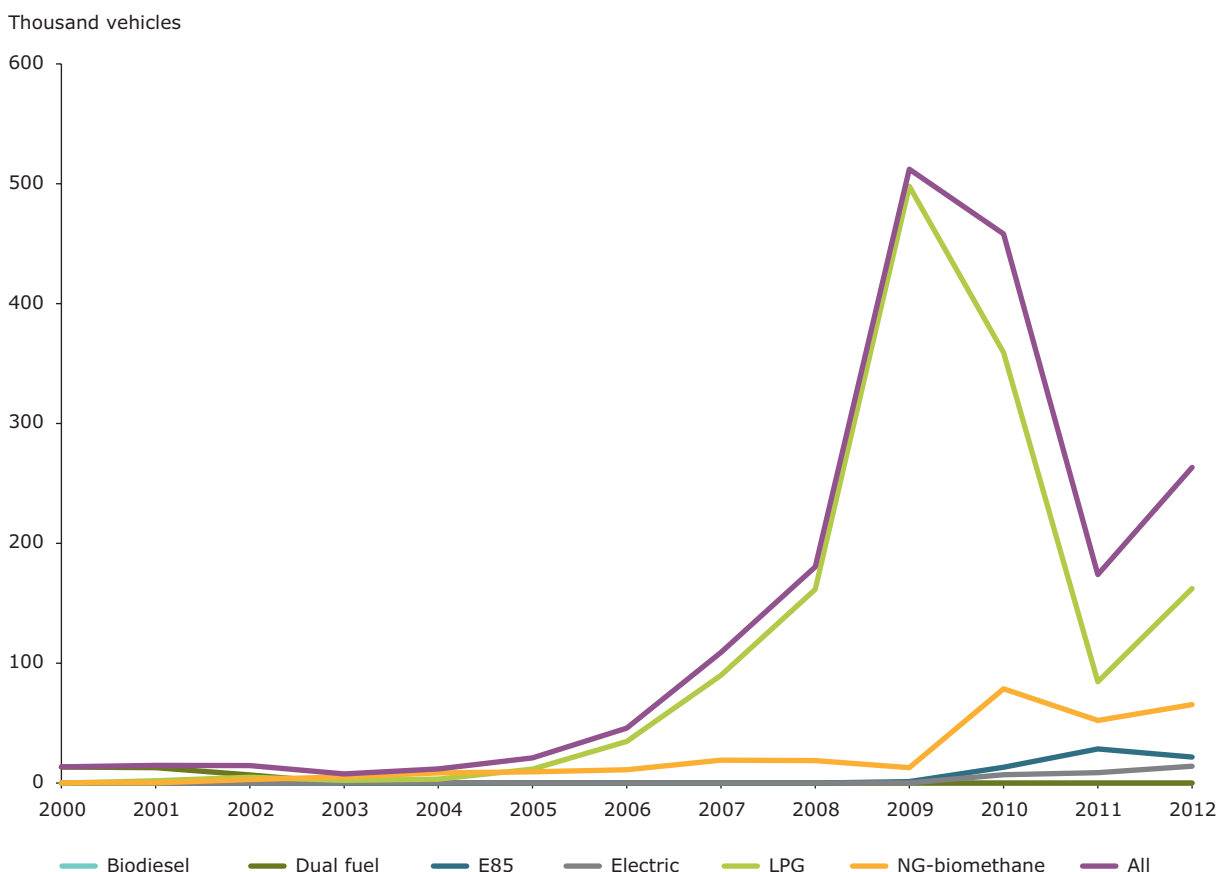
Statistical data for the average footprint of new passenger cars exist only for the years 2010, 2011 and 2012 (Table 3.8). The average footprint is calculated

as the product of wheelbase and the average of the axle tracks. There were no major changes in 2012. New diesel cars are generally bigger than petrol ones; the difference in footprint is about 0.39 m².

3.3 Alternative Fuel Vehicles (AFV)

The main analysis of the database shows that alternative fuel vehicles (AFVs) exhibit significant reductions in their CO₂ emissions over the years, falling from 208.0 gCO₂/km in 2000 to about 118.1 gCO₂/km in 2012. The comparative drop in petrol CO₂ emissions is from 177 gCO₂/km in 2000 to 134 gCO₂/km in 2012.

The registration of AFVs has been increasing substantially over the years. This category was dominated by a few special vehicles in 2000, but it exceeded half a million new vehicle registrations in 2009, before dropping to slightly less than half a million in 2010. The registration of AFVs increased considerably by 51 % between 2011 and 2012, after a significant drop between 2010 and 2011.

Figure 3.6 Evolution of total registrations of AFVs over the years

(by 62 %). Italy is the country for which the increase of AFV (mainly LPG and NG) in the last year is higher (+ 85 % compared to 2011). The number of pure electric vehicles has increase in the last three years from around 700 in 2010 till around 14 000 in 2012. The main drivers of this increase are France (more than 5 500 vehicles) and Germany (almost 3 000 vehicles).

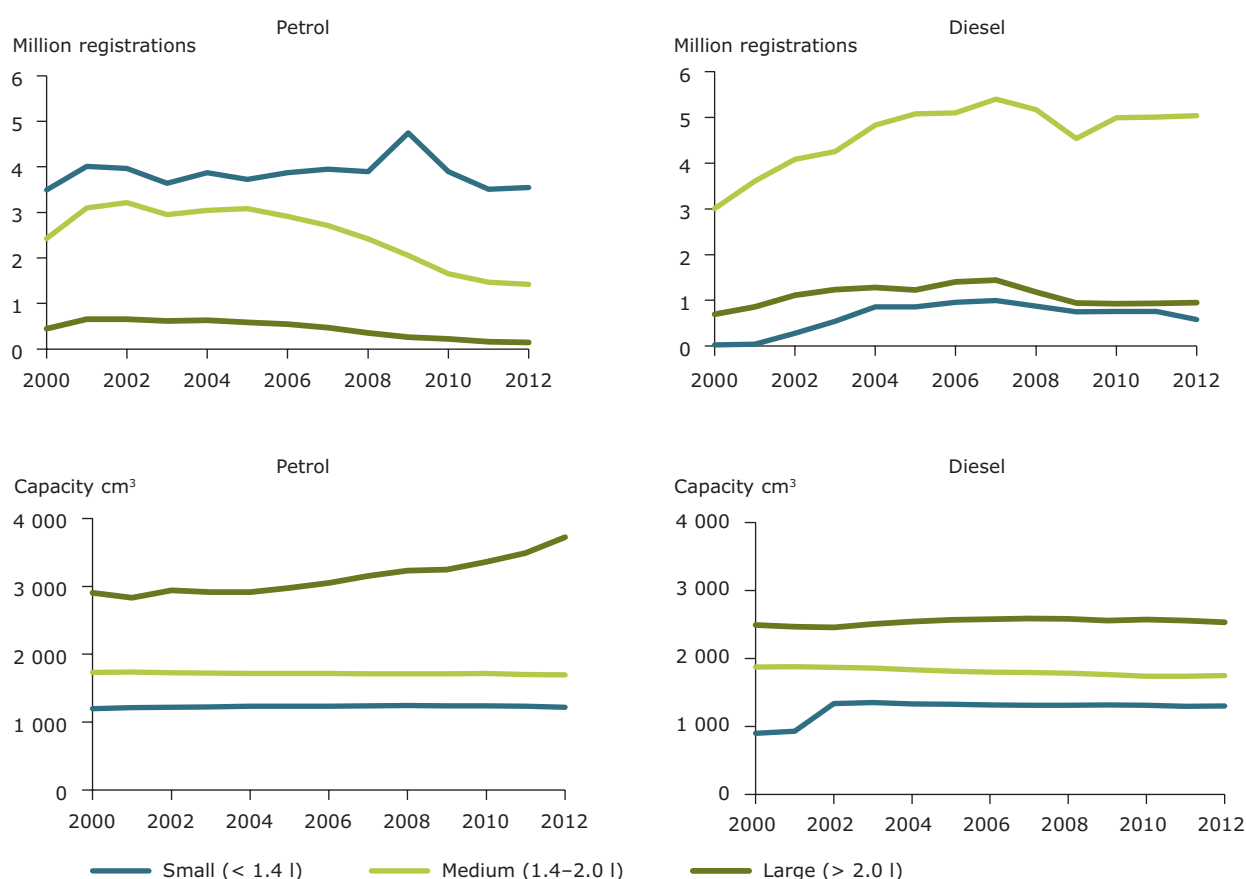
In the early 2000s, AFVs were dominated by dual-fuel vehicles, i.e. vehicles mostly able to operate on petrol and ethanol blends. This trend gradually changed due to the introduction of LPG-petrol and natural gas-petrol (NG-petrol) cars, which have greatly outnumbered the ethanol cars. LPG cars are particularly popular in Italy and France. Thus the significant reduction in CO₂ emissions from AFVs over the past few years is not necessarily the result of improvements in technology, but is also due to shifts in fuel composition and in engine type.

3.4 Trends within individual capacity classes

Cars are generally grouped into capacity classes (traditionally three categories: smaller than 1.4 l, between 1.4 l and 2.0 l, and larger than 2.0 l) in order to better analyse vehicles with similar characteristics. It is therefore interesting to explore whether the average characteristics of these classes have changed over the years. Figure 3.7 shows the number of registrations and the mean capacity per capacity class.

As observed in previous years, the petrol registrations are dominated by small cars, i.e. with engine capacity of less than 1.4 l, followed closely by medium-sized cars. There are far fewer registrations of large cars. The registrations of medium and large petrol cars exhibit a significant and continuous drop after 2005.

Figure 3.7 Evolution of capacity classes over the years



In terms of their capacity, large petrol cars exhibit a notable increase over the years, rising from 2.9 l in 2000 to 3.7 l in 2012. It is worth mentioning that the number of vehicles in this category has consistently decreased over the same period. The small petrol car class also seems to continuously increase in average capacity from 1 197 cm³ in 2000 to 1 243 cm³ in 2008. Only over the four last years, i.e. 2009, 2010, 2011 and 2012, has there been a slight decrease, with capacity dropping to 1 217 cm³ in 2012.

Although registrations of new petrol cars are dominated by small-sized vehicles, diesel registrations are dominated by medium-sized vehicles. The capacity in the medium-sized diesel class has continuously fallen over time from 1.9 l to 1.74 l. The large diesel category exhibited a small increase during the years 2007–2008, reaching ~ 2.6 l (less than the equivalent petrol one), but it has stabilised or marginally dropped since then.

Annex 1

Data for the time series 2001–2009 were gathered via the monitoring regulated by Decision 1753/2000/EC which was repealed by Regulation 443/2009 in 2009. These data do not include all Member States in

all years, as can be seen from the tables in Annex 1. Moreover, due to changes in methodology and monitoring improvements, breaks in trends may occur.

Table A.1 Registration of new passenger cars by Member State (in thousands)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 *
Austria	295	280	300	311	308	309	298	294	319	328	356	336
Belgium	497	468	459	485	480	526	525	536	475	551	577	490
Bulgaria							86	91	21	14	14	14
Cyprus				20	18	20	25	24	16	15	15	11
Czech Republic				115	105	107	126	134	159	165	169	170
Denmark	97	113	102	124	147	154	160	148	111	151	170	171
Estonia				17	20	25	31	24	10	10	17	19
Finland	106	113	145	141	146	143	123	137	89	109	122	108
France	2 228	2 120	1 988	1 996	2 059	1 986	2 050	2 037	2 259	2 250	2 174	1 932
Germany	3 342	3 122	3 237	3 267	3 319	3 445	3 126	3 067	3 786	2 873	2 933	3 063
Greece	245	242	203	264	274	279	294	279	221	140	97	58
Hungary				230	199	193	167	163	66	43	47	52
Ireland	117	152	146	154	171	177	186	151	56	89	90	73
Italy	2 430	2 278	2 244	2 264	2 237	2 325	2 494	2 163	2 160	1 954	1 745	1 404
Latvia				11	16	25	31	19	5	6	10	10
Lithuania				9	11	15	21	22	7	7	12	12
Luxembourg	22	44	44	48	49	51	51	52	47	50	50	50
Malta				4	7	6	6	5	6	4	6	6
Netherlands	526	507	487	479	452	478	494	493	396	480	554	500
Poland				297	230	223	264	305	221	219	275	274
Portugal		232	194	202	208	199	204	215	159	223	154	96
Romania							313	286	115	94	82	66
Slovakia					45	65	65	57	70	65	69	70
Slovenia				37	64	62	69	72	60	60	55	50
Spain	400	969	1 319	1 606	1 640	1 622	1 606	1 165	964	976	810	704
Sweden	223	249	257	260	269	278	300	248	209	277	289	265
United Kingdom	2 232	2 611	2 558	2 512	2 386	2 295	2 390	2 112	1 968	2 026	1 937	2 037

Note: * Data for 2012 are provisional.

Table A.2 Average mass (kg) of new passenger cars by Member State (in kg)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 *
Austria	1 314	1 335	1 426	1 432	1 435	1 449	1 445	1 431	1 385	1 409	1 442	1 451
Belgium	1 288	1 319	1 361	1 375	1 396	1 407	1 423	1 425	1 406	1 406	1 416	1 441
Bulgaria										1 454	1 462	1 484
Cyprus				1 205	1 277	1 316	1 354	1 372	1 367	1 388	1 377	1 369
Czech Republic				1 704	1 242	1 247	1 261	1 275	1 335	1 380	1 368	1 368
Denmark		1 306	1 325	1 327	1 324	1 328	1 370	1 320	1 313	1 335	1 312	1 249
Estonia				1 349	1 408	1 433	1 465	1 456	1 471	1 473	1 502	1 514
Finland	1 752	1 759	1 336	1 355	1 381	1 401	1 437	1 442	1 447	1 426	1 452	1 455
France	1 254	1 280	1 305	1 327	1 341	1 349	1 375	1 387	1 326	1 326	1 343	1 386
Germany	1 332	1 352	1 381	1 408	1 412	1 424	1 433	1 425	1 347	1 433	1 460	1 465
Greece	1 172	1 223	1 262	1 277	1 287	1 304	1 314	1 311	1 423	1 252	1 231	1 244
Hungary				1 182	1 203	1 237	1 264	1 288	1 330	1 370	1 396	1 388
Ireland	1 248	1 276	1 265	1 314	1 341	1 372	1 441	1 440	1 440	1 380	1 378	1 415
Italy	1 604	1 632	1 649	1 259	1 277	1 294	1 287	1 285	1 255	1 269	1 306	1 311
Latvia				1 452	1 445	1 468	1 502	1 498	1 535	1 522	1 543	1 563
Lithuania				1 433	1 448	1 483	1 481	1 467	1 486	1 481	1 498	1 500
Luxembourg	1 834	1 851	1 442	1 471	1 487	1 504	1 498	1 490	1 462	1 473	1 519	1 529
Malta								1 317	1 182	1 200	1 216	1 580
Netherlands	1 260	1 264	1 301	1 314	1 337	1 332	1 350	1 324	1 295	1 254	1 249	1 265
Poland				1 181	1 242	1 271	1 304	1 260	1 261	1 317	1 378	1 383
Portugal		1 229	1 254	1 295	1 329	1 352	1 365	1 352	1 344	1 333	1 354	1 361
Romania							1 268	1 286	1 291	1 281	1 325	1 382
Slovakia					1 174					1 386	1 418	1 419
Slovenia				1 246	1 305	1 316	1 340	1 350	1 346	1 332	1 355	1 357
Spain	1 266	1 725	1 317	1 335	1 374	1 395	1 416	1 400	1 394	1 399	1 413	1 400
Sweden	1 448	1 454	1 472	1 467	1 470	1 488	1 503	1 488	1 490	1 497	1 510	1 521
United Kingdom	1 347	1 356	1 392	1 387	1 374	1 390	1 394	1 380	1 358	1 384	1 410	1 398

Note: * Data for 2012 are provisional.

Table A.3 Average CO₂ emissions (gCO₂/km) from new passenger cars by Member State

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 *
Austria	165.6	164.4	163.8	161.9	162.1	163.7	162.9	158.1	150.2	144.0	138.7	135.6
Belgium	163.7	161.1	158.1	156.5	155.2	153.9	152.8	147.8	142.1	133.4	127.2	127.9
Bulgaria							171.6	171.5	172.1	158.9	151.4	149.2
Cyprus				173.4	173	170.1	170.3	165.6	160.7	155.8	149.9	144.5
Czech Republic				154	155.3	154.2	154.2	154.4	155.5	148.9	144.5	140.8
Denmark	172.9	170.0	169.0	165.9	163.7	162.5	159.8	146.4	139.1	126.6	125.0	117.0
Estonia				179	183.7	182.7	181.6	177.4	170.3	162.0	156.9	150.1
Finland	178.1	177.2	178.3	179.8	179.5	179.2	177.3	162.9	157.0	149.0	144.0	139.1
France	159.8	156.8	155	153.1	152.3	149.9	149.4	140.1	133.5	130.5	127.7	124.4
Germany	179.5	177.4	175.9	174.9	173.4	172.5	169.5	164.8	154.0	151.1	145.6	141.5
Greece	166.5	167.8	168.9	168.8	167.4	166.5	165.3	160.8	157.4	143.7	132.7	121.1
Hungary				158.5	156.3	154.6	155	153.4	153.4	147.4	141.6	146.9
Ireland	166.6	164.3	166.7	167.6	166.8	166.3	161.6	156.8	144.4	133.2	128.3	124.8
Italy	158.3	156.6	152.9	150	149.5	149.2	146.5	144.7	136.3	132.7	129.6	126.2
Latvia				192.4	187.2	183.1	183.5	180.6	176.9	162.0	154.4	151.9
Lithuania				187.5	186.3	163.4	176.5	170.1	166.0	150.9	144.4	144.2
Luxembourg	177	173.8	173.5	169.7	168.6	168.2	165.8	159.5	152.5	146.0	142.2	137.0
Malta				148.8	150.5	145.9	147.8	146.9	135.7	131.2	124.7	121.5
Netherlands	174	172.4	173.5	171	169.9	166.7	164.8	156.7	146.9	135.8	126.1	118.5
Poland				154.1	155.2	155.9	153.7	153.1	151.6	146.2	144.5	141.9
Portugal		154.0	149.9	147.1	144.9	145	144.2	138.2	133.8	127.2	122.8	117.6
Romania							154.8	156	157.0	148.5	140.7	139.0
Slovakia					157.4	152	152.7	150.4	146.6	149.0	144.9	140.9
Slovenia				152.7	157.2	155.3	156.3	155.9	152.0	144.4	139.7	133.4
Spain	156.8	156.4	157	155.3	155.3	155.6	153.2	148.2	142.2	137.9	133.8	128.6
Sweden	200.2	198.2	198.5	197.2	193.8	188.6	181.4	173.9	164.5	151.3	141.8	135.4
United Kingdom	177.9	174.8	172.7	171.4	169.7	167.7	164.7	158.2	149.7	144.2	138.0	132.9

Note: * Data for 2012 are provisional.

Table A.4 Average engine power (Wh) from new passenger cars by Member State

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 *
Austria	76	77	78	79	80	83	85	84	81			86
Belgium	73	74	74	76	77	78	81	82	80		82	84
Bulgaria												
Cyprus												
Czech Republic											85	86
Denmark		78	79	79	79	81	82	79	78		78	73
Estonia									98			99
Finland	82										96	96
France	71	73	74	76	77	78	80	76	73		79	81
Germany	84	85	87	90	91	93	96	96	87		99	101
Greece	70											
Hungary				65	68	70	74	76	81			89
Ireland	70	68	68	75	75	78	83	82	80			
Italy	65	68	68	70	72	74	74	75	72		78	77
Latvia											99	103
Lithuania												
Luxembourg	87	89	92	93	96	100	103	102	101		107	108
Malta				61	64	65						
Netherlands	76										78	79
Poland				65	69	73	76	79			86	88
Portugal		66	67	70	73						80	81
Romania							68	72	74			
Slovakia					65	69	66		70			
Slovenia												82
Spain	71				80	83	84	85	83			
Sweden												100
United Kingdom			89	93	86	90	88					

Note: * Data for 2012 are provisional.

Table A.5 Average footprint (m²) from new passenger cars by Member State

	2010	2011	2012 *
Austria	3.975	4.008	4.023
Belgium	3.964	3.988	4.037
Bulgaria	4.017	4.028	4.065
Cyprus	3.991	3.966	3.978
Czech Republic	4.055	4.098	4.108
Denmark	3.856	3.853	3.777
Estonia	4.128	4.140	4.147
Finland	4.079	4.103	4.103
France	3.858	3.913	3.939
Germany	4.028	4.070	4.081
Greece	3.821	3.914	3.810
Hungary	3.983	4.055	4.018
Ireland	3.953	4.715	4.052
Italy	3.857	3.816	3.830
Latvia	4.118	4.112	4.162
Lithuania	4.069	4.106	4.076
Luxembourg	4.000	4.066	4.085
Malta	3.944		3.724
Netherlands	3.825	3.822	3.871
Poland	3.919	4.089	4.007
Portugal	3.996	3.908	4.078
Romania	3.922	3.960	4.017
Slovakia	4.046	4.002	4.015
Slovenia	3.941	3.976	3.985
Spain	3.962	3.980	3.995
Sweden	4.102	4.120	4.132
United Kingdom	3.934	3.966	3.964

Note: * Data for 2012 are provisional.

Table A.6 Completeness rates of the main entries of the 2012 submission

	Type	Variant	Version	Emission	Mass	Wheelbase	Steering axle
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Austria	100	100	100	100	100	100	100
Belgium	100	100	100	100	100	99	99
Bulgaria	100	100	100	100	100	100	100
Cyprus	100	100	100	100	100	100	100
Czech Republic	100	100	99	100	100	100	100
Germany	100	100	100	100	100	99	99
Denmark	100	100	100	100	100	100	100
Estonia	100	100	100	100	100	100	100
Greece	100	100	100	100	100	100	100
Spain	100	100	97	96	99	100	100
Finland	100	100	100	100	100	100	100
France	100	100	100	100	100	100	100
Hungary	100	100	100	100	100	100	100
Ireland	99	99	99	100	100	100	97
Italy	99	99	96	100	100	100	99
Lithuania	100	100	100	100	100	100	100
Luxembourg	100	100	99	100	100	100	100
Latvia	100	100	100	100	100	100	100
Malta	100	100	100	100	100	100	100
Netherlands	100	100	100	100	100	100	100
Poland	99	99	99	100	100	100	100
Portugal	100	100	100	100	100	100	9
Romania	100	100	100	100	100	100	100
Sweden	100	100	100	100	100	100	100
Slovenia	100	100	63	100	100	100	100
Slovakia	100	100	89	100	100	100	94
United Kingdom	100	100	100	100	100	100	100

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