EEA Report | No 27/2016

Monitoring CO_2 emissions from new passenger cars and vans in 2015

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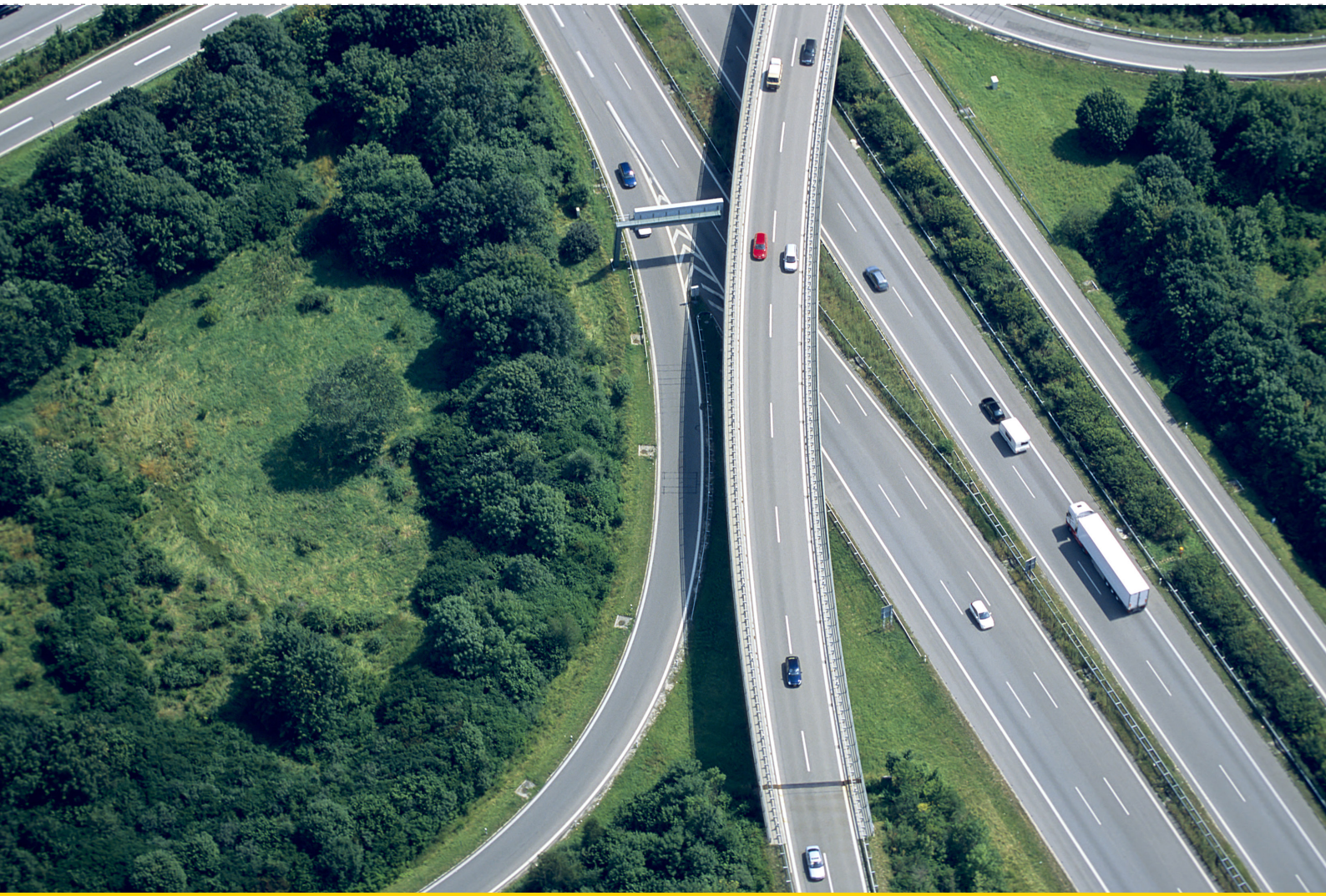

European Environment Agency

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European Environment Agency

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

Contents

Abbreviations

AFV	Alternative fuel vehicle
BDR	Business Data Repository
BEV	Battery electric vehicle
CDR	Central Data Repository
E85	Petrol containing 85 % ethanol
EEA	European Environment Agency
ETC/ACM	European Topic Centre on Air Pollution and Climate Change Mitigation
HDV	Heavy-duty vehicle
IVA	Individual vehicle approval
LPG	Liquefied petroleum gas
NEDC	New European Driving Cycle
NG	Natural gas
NO_X	Nitrogen oxide
NSS	National small series
PHEV	Plug-in hybrid electric vehicle
PM	Particulate matter
TCMV	Technical Committee — Motor Vehicles
UNECE	United Nations Economic Commission for Europe
VIN	Vehicle identification number
WLTP	World Harmonised Light Vehicle Test Procedure

Country groupings

Throughout this report, the following abbreviations are used to refer to specific country groupings:

- EU-13: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia;
- EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom;
- EU-27: EU-28 excluding Croatia;
- EU-28: EU-15 and EU-13;

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The authors were Cinzia Pastorello (EEA) and, for Chapter 5, Giorgos Mellios from the ETC/ACM. Diana Vedlugaite (EEA) is thanked for her assistance in the 2016 data compilation process, as well as other EEA colleagues for their support during the process of preparing this report.

Caveat

This report documents the latest official data submitted by Member States and vehicle manufacturers. It is not possible to assess the extent to which incorrect data from vehicle manufacturers may alter the analysis and conclusions. The final CO_2 performance for each manufacturer and pool is confirmed by Commission Decision.

It is important to mention as well that, for both passenger cars and vans, the reported CO_2 emissions are based upon measurements performed in the laboratory using a standard European vehicle test cycle. Such measurements may not reflect real-world driving performance.

Executive summary

This report provides a summary of CO_2 emission levels of new passenger cars and vans in the European Union in 2015. The report is based on the data collected by the European Environment Agency (EEA) concerning the CO_2 performance of passenger cars, in accordance with Regulation (EC) No 443/2009 (EU, 2009), and of light commercial vehicles (vans) in accordance with Regulation (EU) No 510/2011 (EU, 2011). The regulation for passenger cars sets the average CO_2 emissions for new passenger cars at 130 g CO_2/km by 2015 while the regulation for light commercial vehicles sets the average CO_2 emissions for new light commercial vehicles at 175 g CO_2/km by 2017. Stricter targets will apply under these regulations from 2020 (vans) and 2021 (cars). For each manufacturer, average specific emissions, defined as the average value for each manufacturer's fleet of newly registered vehicles in the EU that year, are compared with specific emission targets. Starting from 2013 for cars and 2014 for vans, a binding specific emission target has been calculated for each manufacturer based on a limit value curve according to the average mass of the new vehicles registered by that manufacturer.

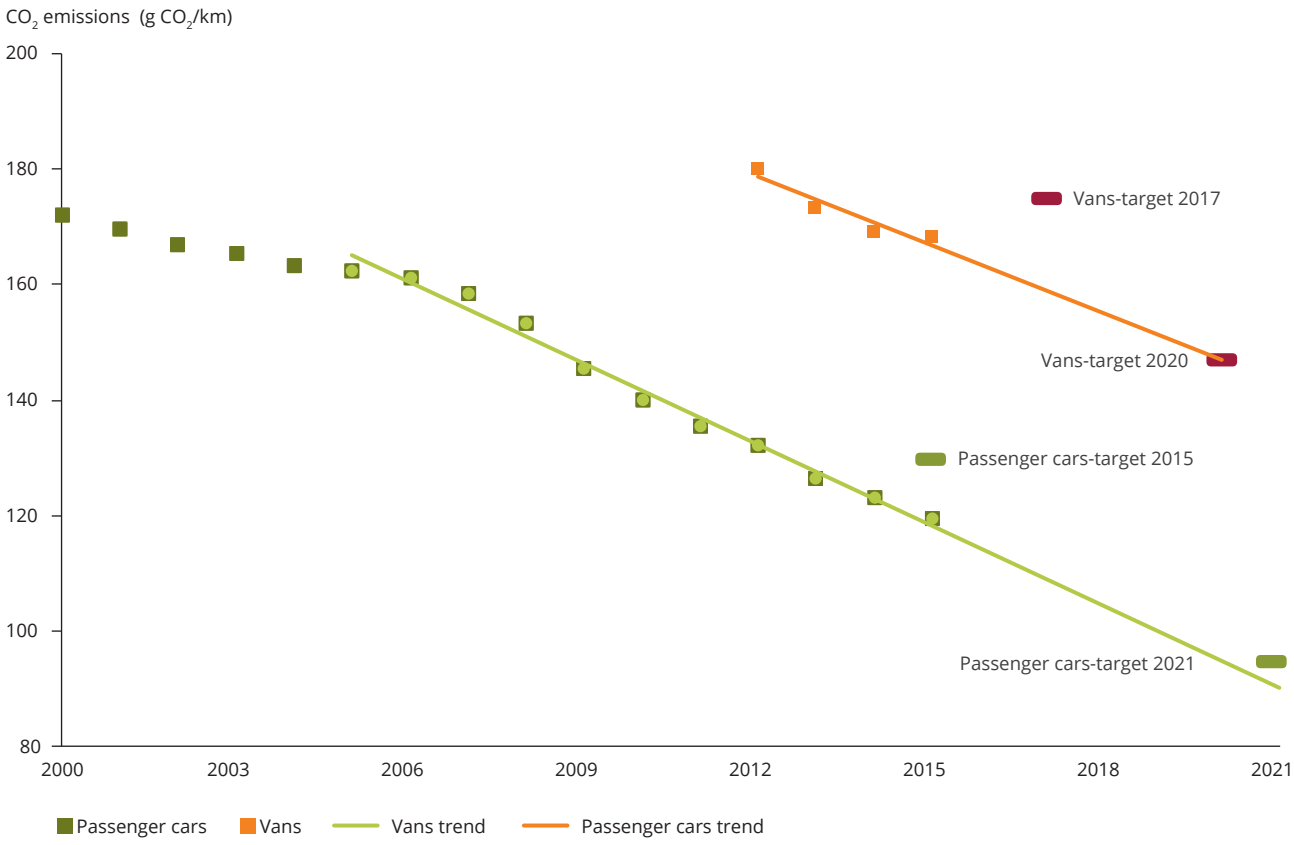
This report presents the main statistics by Member States, as well as the progress of the manufacturers towards their targets. The EEA has collected and quality-checked data on CO_2 emissions from passenger cars and vans registered in all EU Member States ([1]) since 2010. Using Member State data, as verified by manufacturers ([2]), this report provides an overview of the performance of car and van manufacturers in meeting their 2015 CO_2 emission targets.

The main findings are:

- New cars sold in the EU in 2015 had CO_2 average emissions ([3]) of 119.5 g CO_2/km, which was 8.0 % below the 2015 target, and 3.1 % lower than in 2014.
- The average emissions of new light commercial vehicles in 2015 were 168.3 g CO_2/km, below the 2017 target of 175 g CO_2/km and a reduction of 0.4 % compared with 2014.
- Average CO_2 emissions from new cars decreased by 27 % in the last 10 years, while the emissions of new vans decreased by more than 6.5 % in the last 4 years. In order to meet their EU 2020/21 targets, the average CO_2 emissions from new cars and vans will need to continue decreasing at a similar pace (Figure ES.1).
- The difference between provisional average specific emissions (the emission data reported earlier in 2015 by each of the Member States) and final average specific emission data (the emission data considering error notifications by manufacturers) was insignificant (< 0.1 g CO_2/km).
- As in 2014, conventional diesel and petrol cars accounted for the large majority of the fleet (97.2 % of new registrations), and diesel cars constituted the majority of the new registrations (51.8 %). The proportion of plug-in hybrid and battery electric vehicles increased from 0.8 % in 2014 to more than 1 % in 2015. Other alternative fuel vehicles such as liquefied petroleum gas (LPG) and compressed natural gas (NG-biomethane) vehicles covered the remaining registrations (1.6 %).
- As in 2014, the average diesel vehicle was more than 300 kg heavier than the average petrol vehicle.
- Diesel vehicles emitted on average 119.2 g CO_2/km, which is 3.3 g CO_2/km less than the average petrol vehicle, whereas in 2000 the emission difference between diesel and petrol vehicles was much larger (17.1 g CO_2/km).

([1]) The geographical scope of the data changes over time. See Annex 1 for details.
([2]) Relevant registration data are reported to the EEA and the European Commission by EU Member States. The provisional data and the provisional calculations are then notified to manufacturers, which have 3 months to notify any errors to the Commission. The Commission then considers any notifications from manufacturers and either confirms or amends the provisional calculations. These amended/confirmed data are referred to as final average specific emissions.
([3]) CO_2 average emissions are calculated as simple averages, without taking into account any adjustments.

Figure ES.1 Average CO_2 emissions historical development and targets for new passenger cars and vans in the EU-28



- Significantly more efficient models were bought in the pre-2004 EU Member States than in the newer EU Member States. On average, the most efficient cars were bought in the Netherlands (101 g CO_2/km), Portugal, Denmark and Greece (106 g CO_2/km for the three Member States). For new vans, average emission levels were lowest among those sold in Portugal (142 g CO_2/km) and Cyprus (143 g CO_2/km).

- The majority of car and van manufacturers met their CO_2 specific emission ([4]) targets in 2015, and some are well on their way to reaching the 2020/2021 target. While certain manufacturers would have exceeded their specific emission target, they met the specific emission target as part of pools or because of derogations. Two manufacturers, Aston Martin Lagonda and Ferrari, exceeded their specific emission targets and therefore are required to pay excess emission premiums.

The downward trend in CO_2 emissions of new cars registered in the EU has been the result of the combined effect of technical and non-technical measures. On the technical side, fuel efficiency of new car models is steadily improving as a result of a number of relevant technologies, such as direct fuel injection, variable valve timing and lift, cylinder deactivation, turbocharging and start–stop systems. On the non-technical side, several policies and measures have been adopted by an increasing number of Member State to further reduce emissions at the vehicle fleet level. The effects of the different measures on the CO_2 emissions from new vehicles are analysed and discussed for a few Member States.

([4]) CO_2 specific emissions is, in relation to a manufacturer, the average of the specific emissions of CO_2 of all new passenger cars of which it is the manufacturer; it is calculated using all the adjustments described in Section 2.2.

1 Introduction

To reduce CO_2 emissions in the road transport sector, the European Parliament and the Council adopted two regulations: Regulation (EC) No 443/2009, which introduced mandatory CO_2 emission performance standards for new passenger cars, and Regulation (EU) No 510/2011, which introduced mandatory CO_2 emission performance standards for new vans.

For new passenger cars, the regulation sets the average CO_2 specific emissions at 130 g CO_2/km by 2015, defined as the average value for the fleet of newly registered passenger cars in the EU. A target of 95 g CO_2/km has been set for 2021 (phase-in from 2020). The modalities for compliance with those targets are presented in the following chapter.

For new light commercial vehicles, Regulation (EU) No 510/2011 sets the average CO_2 emissions at 175 g CO_2/km by 2017, defined as the average value for the fleet of newly registered vans in the EU. A medium-term target of 147 g CO_2/km has been set for 2020.

The modalities of compliance with the targets have been established for both regulations and are presented in the following chapter.

The progress of manufacturers in meeting these targets is evaluated on an annual basis by calculating the following three parameters:

- CO_2 average specific emissions;
- the specific CO_2 emission target for that year;
- the difference between the average specific emissions and the specific emission target.

For both cars and vans, the Commission has to review the legislation and if appropriate make proposals for CO_2 emission targets for the period beyond 2020, including possibly setting a 2025 target. A public consultation on the revision of the regulations was opened on 20 July 2016 and is running until 28 October 2016.

The 2016 strategy for low-emission mobility (EU, 2016) announced speeding up analytical work on design options for standards for heavy-duty vehicles (HDVs) as well. The European Commission has launched a public consultation to collect the views of stakeholders and citizens with regard to the preparation of legislation on monitoring and reporting of HDV fuel consumption and CO_2 emissions. Furthermore, a further consultation will be launched in due time to discuss the details of options for standards.

2 Overview of the monitoring system for passenger cars and vans

Since 2010 the EEA has collected data about passenger cars registered in all EU Member States. Since 2013 the EEA has been collecting data about vans as well. For both cars and vans, the same time schedule applies for the data monitoring:

- Member States shall record information for each new passenger car and van registered in its territory and transmit this information to the Commission by 28 February of each year. Data are submitted to the Central Data Repository (CDR ([5])), managed by the EEA.
- Only for vans, manufacturers submit the vehicle identification number for each new van sold in the EU-28 to the Commission by 28 February of each year. Data are submitted to the Business Data Repository (BDR ([6])), managed by the EEA.
- The EEA performs several quality checks in order to evaluate the accuracy and the quality of the data sets. On the basis of the checks and the feedback from Member States, the EEA finalises and publishes the provisional database. At the same time, notification letters are sent to manufacturers informing them of their provisional CO_2 performances.
- Manufacturers can, within 3 months of being notified of the provisional calculation, notify the Commission of any errors in the data.
- The EEA and the European Commission assess the manufacturers' corrections, and, where justified, take them into account for the calculation of the manufacturers' final average CO_2 emissions and specific emission targets. The final data and targets are to be published by 31 October each year.

In the remainder of this chapter the process is presented in further detail.

2.1 Data quality

The EEA performs several quality checks in order to evaluate the accuracy and the quality of the Member States' data. These checks cover various areas, listed in the bullet points below:

- The completeness rate. This comprises two main components. The first component concerns numerical data such as vehicle mass and emission values for each vehicle. The second component measures the extent to which more granular data — such as model type — are available for each vehicle that has been registered.
- Data plausibility and outliers ([7]).
- Assignment to a specific manufacturer using a harmonised denomination. Identical vehicles are often sold under different brand or model names in different countries. For the purposes of the monitoring, one naming system is used to ensure correct manufacturer attribution.
- Data variability (for the same vehicle, an estimate of the variability of the mass, emissions and engine capacity was developed).
- Fuel type classification.
- Handling of unknown individual vehicle approvals (IVAs) and national small series (NSS) vehicles ([8]).

([5]) The CDR is like a bookshelf, with data reports on the environment as submitted by Member States (more information available at http://cdr.eionet.europa.eu).
([6]) The BDR is an electronic online reporting system specifically developed for the handling of confidential company-based information (more information available at http://bdr.eionet.europa.eu).
([7]) An outlier observation is well outside the expected range of values in a study or experiment, and is often discarded from the data set.
([8]) 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.

- For vans, comparison between vehicle identification numbers (VINs) ([9]) provided by Member States and by manufacturers. Whenever VINs are matching but data are missing in a Member State's submission, the manufacturer data ([10]) will be used to complete the data set for the main parameters (emission- and mass-related entries).

After the quality checks the provisional database is finalised. Based on the provisional database the EEA calculates the provisional performance of car and van manufacturers in meeting their CO_2 emission targets. The performance is calculated as the difference between the CO_2 average specific emissions and the specific emission target for each manufacturer. The provisional calculations are notified by the Commission to each manufacturer (and pool) and the provisional data are published on the EEA website.

Manufacturers can notify the Commission of errors in the provisional CO_2 emission data set. The notification must be submitted within 3 months from the notification of the provisional calculations.

As it does for Members States' data, the EEA performs several quality checks in order to evaluate the accuracy and the quality of the data that have been corrected in the notification of errors. The verification process is very similar to the one performed for Member States' data presented in the previous paragraphs. After this additional quality check the database is finalised.

Based on the final data, the EEA calculates the performance of car and van manufacturers in meeting their CO_2 emission targets. The performance is calculated as the difference between the CO_2 average specific emissions and the specific emission target for each manufacturers. The final calculations are notified by the Commission to each manufacturer (and pool) and the provisional data are published on the EEA website.

2.2 Calculation of average specific emissions of CO_2

Average specific emissions of CO_2 are calculated as a weighted average of the manufacturer's fleet registered in a particular year. The average specific emissions for each manufacturer are subsequently adjusted to take into account the following modalities (summarised in Table 2.1):

- phase-in;
- super-credits;
- E85 extra credits;
- eco-innovations.

Phase-in

A phase-in schedule applies for calculating average specific emissions.

For passenger cars:

- During the 2012–2014 period, only a certain percentage (65 % in 2012, 75 % in 2013, and 80 % in 2014) of the best-performing registered cars had to be taken into account in determining the performance of manufacturers. For the 2015–2019 period, 100 % of the new cars of each manufacturer have to be taken into account.
- The 2021 specific emission targets are phased in from 2020 taking into account 95 % of the best-performing cars in that year. From 2021, 100 % of the new cars of each manufacturer will be taken into account (see also Table 2.2).

For vans:

- During the 2014–2016 period, only a certain percentage (70 % in 2014, 75 % in 2015, and 80˜% in 2016) of the best-performing registered vans have to be taken into account in determining the performance of manufacturers. From 2017, 100 % of the new cars of each manufacturer will have to be taken into account.

Super-credits

The regulation provides for the allocation of super-credits for new passenger cars and new vans with CO_2 emissions lower than 50 g CO_2/km. These vehicles are temporarily given a greater weight in calculating the average specific emissions, as they are considered to have the following equivalences:

([9]) The VIN is a unique code including a serial number, used by the automotive industry to identify individual motor vehicles as defined in ISO 3833.
([10]) In addition to VINs, manufacturers may submit detailed monitoring data for the vehicles registered.

- For passenger cars: 3.5 cars in 2012 and 2013, 2.5 cars in 2014 and 1.5 cars in 2015. For the 95 g/km target, the super-credit weight factor will become 2 cars in 2020, 1.67 cars in 2021 and 1.33 cars in 2022. In the 2020–2022 period, the use of super-credits is subject to a cap of 7.5 g CO_2/km for each manufacturer.

- For vans: 3.5 vans in 2014 and 2015, 2.5 vans in 2016 and 1.5 vans in 2017. For the duration of the super-credit scheme, the maximum number of vans per manufacturer to be taken into account for the application of the super-credit multipliers shall not exceed 25 000.

E85 extra credits

Additional reductions of average specific emissions are assigned for vehicles capable of running on a mixture of petrol with 85 % ethanol (E85). The last year in which the emissions of these vehicles were counted as being 5 % less than their actual emissions in recognition of their ability to reduce emissions when running on biofuels was 2015. This reduction could be applied only where at least 30 % of the filling stations in the Member State in which the vehicle is registered provide this type of alternative fuel. In 2015, as in the previous years, this applied only to Sweden.

Eco-innovations

Certain innovative technologies cannot demonstrate their CO_2-reducing effects under the current type-approval test procedure. In order to support technical development, a manufacturer or supplier can apply to the Commission for the approval of such innovative technologies. The approval conditions are set out in Commission Regulation (EU) No 725/2011. If a manufacturer fits its car fleet with an approved eco-innovation, the average emissions of that manufacturer may be reduced by a maximum of 7 g CO_2/km on account of emission savings from eco-innovations.

Specific emission targets

Under the regulations, each manufacturer has an individual annual target, calculated on the basis of the overall target and the average 'mass in running order' ([11]) of the registered cars/vans. The following formulae apply to passenger cars (1) and vans (2) till 2020:

Passenger cars:

(1) Specific emissions of $CO_2 = 130 + a \times (M - M_0)$

Vans:

(2) Specific emissions of $CO_2 = 175 + a \times (M - M_0)$

where:

M is the average mass of the manufacturer's fleet in kilograms;

M_0 is the reference mass (initially 1 372.0 kg for passenger cars, 1 706.0 kg for vans);

a is 0.0457 for passenger cars and 0.093 for vans.

This means that, for example, if the average mass of a manufacturer's car fleet in a given year is 1 372 kg, the target for that manufacturer is 130.0 g CO_2/km. If the average mass of the car fleet is 1 472 kg, the target for that manufacturer is 134.4 g CO_2/km. If the average mass of the car fleet is 1 272 kg, the target will be 125.43 g CO_2/km. These formulae aim to guarantee undistorted competition between manufacturers while taking into account their differences.

The manufacturer complies with its specific emission target if its average specific emissions (taking into account all the relevant modalities as described above) are lower than the target.

The reference mass (M_0) is adjusted every 3 years to reflect changes in the average mass of newly registered vehicles. For cars, the new M_0 was adjusted in 2014 and will be 1 392.35 kg as from 2016 (data to be reported in 2017). Since the average mass of the new fleet in the 2011–2013 period increased by almost 20 kg compared with the M_0 in formula (1), the target of a manufacturer that produces a fleet with average mass of 1 392.35 kg will become 130 g CO_2/km from 2016, while the target for that manufacturer was 130.9 g CO_2/km in 2015.

For vans, M_0 will be amended in 2016 and will be 1 766.35 kg as from 2018. Since the average mass of the new fleet in the 2013–2015 period increased by 60 kg compared with the M_0 in formula (2), the target of a manufacturer that produces a fleet with an average mass of 1 760.35 kg will become 175.0 g CO_2/km from 2018 on, while the target for that manufacturer was 180.6 g CO_2/km in 2015.

([11]) According to Regulation (EC) No 443/2009 mass in running order means the mass of the car with bodywork, coolant, oils, fuel, spare wheel, tools and driver as stated in the certificate of conformity and defined in Section 2.6 of Annex I to Directive 2007/46/EC.

Regulation (EU) No 333/2014 (EU, 2014) amended Regulation (EC) No 443/2009 with a view to defining the modalities for reaching the 2020 target to reduce CO_2 emissions from new passenger cars. The 95 g CO_2/km target, set in the previous regulation, was confirmed and the following formula applies to passenger cars from 2020:

(3) Specific emissions of $CO_2 = 95 + a \times (M - M_0)$

where:

M is the average mass of the manufacturer's fleet in kilograms;

M_0 is the reference mass (see above);

a is 0.0333.

For vans, Regulation (EU) No 253/2014 (EU, 2014) amended Regulation (EU) No 510/2011 with a view to defining the modalities for reaching the 2020 target to reduce CO_2 emissions from new vans. The target of 147 g CO_2/km, set in the previous regulation, was confirmed and the following formula applies from 2020:

(4) Specific emissions of $CO_2 = 147 + a \times (M - M_0)$

where:

M is the average mass of the manufacturer's fleet in kilograms;

M_0 is the reference mass (see above);

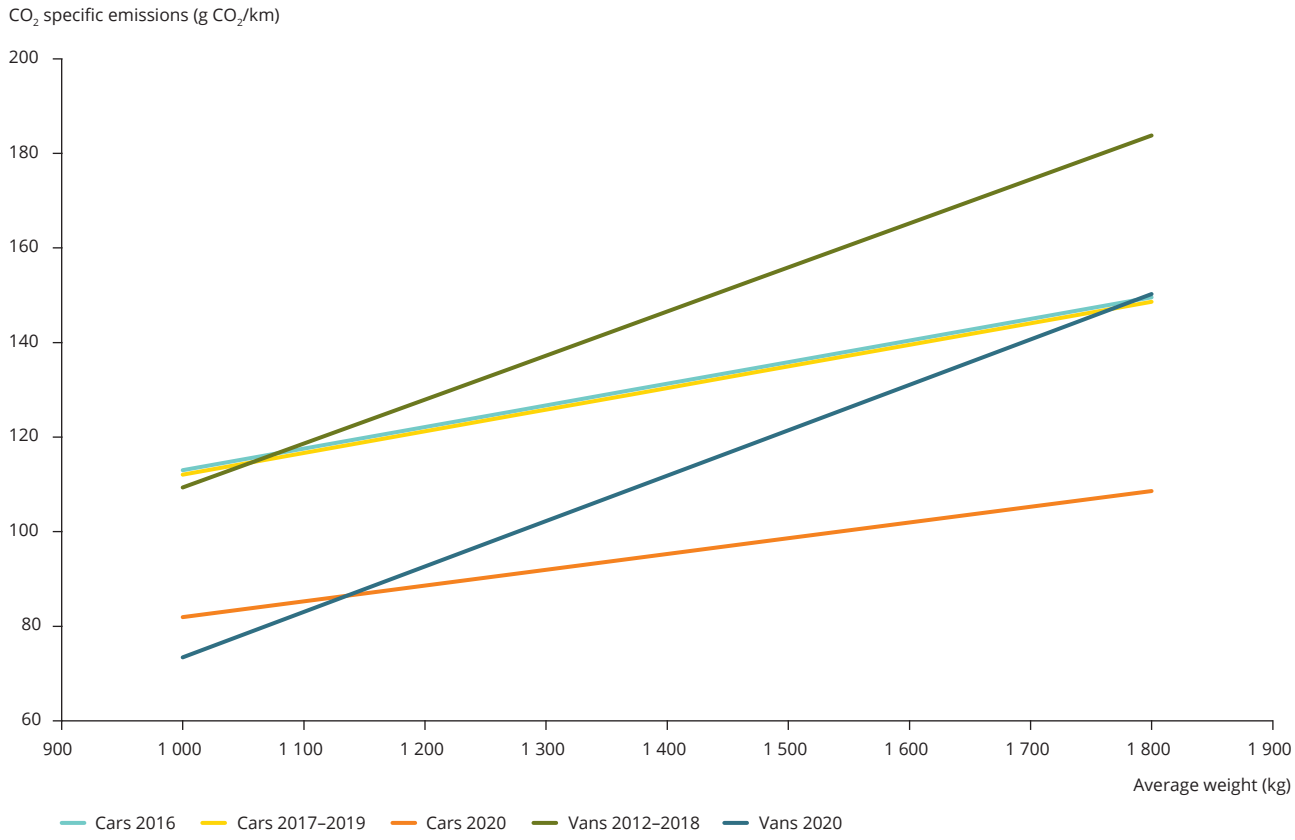
a is 0.096.

Figure 2.1 shows the four target lines: for passenger cars till 2016, for the 2017–2019 period and after 2020, and for vans till 2020.

Pools

Manufacturers may form a pool with other manufacturers in order to have a common target. In this case, the binding target will be the pool target (calculated on the basis of the whole fleet of the pool registered that year). In 2015, 13 pools for passenger cars (Table 2.3) and 8 pools for vans (Table 2.4) were declared.

Figure 2.1 Limit value curves for cars and vans



Note: 2020 limit curve for vans is calculated using M_0 = 1 766.35 kg.

Derogations

For passenger cars, manufacturers selling fewer than 10 000 vehicles per year can apply for a small-volume derogation. In this case, a specific emission target consistent with the manufacturer's economic and technological potential to reduce specific CO_2 emissions can be granted. In 2015, 32 manufacturers benefited from a small-volume derogation target (Table 2.5).

Niche derogations are provided for manufacturers responsible for between 10 000 and 300 000 new vehicle registrations. In this case, a special target is established, corresponding to a 25 % reduction from the average specific emissions of that manufacturer in 2007 for the 2012–2019 period and a 45 % reduction from the 2007 level as of 2020. In 2015, four niche derogations were granted for passenger cars (Table 2.6).

For vans, five manufacturers benefited from a derogation target (Table 2.7)

De minimis exemptions

A manufacturer which, together with all of its connected undertakings, is responsible for fewer than 1 000 new registered cars may be exempt from meeting a specific emission target pursuant to Regulation (EC) No 443/2009 and Regulation (EU) No 510/2011, as amended by Regulation (EU) No 333/2014 and Regulation (EU) No 253/2014. In 2015, 33 manufacturers, responsible for a total of around 5 500 registrations, benefited from an exemption (24 for passenger cars and 9 for vans).

Table 2.1 Summary of the modalities applying to the calculation of manufacturer performance from 2015 to 2019

Modality	Vehicles	2015	2016	2017	2018–2019
Phase-in	Passenger cars	100 %	100 %	100 %	100 %
	Vans	75 %	80 %	100 %	100 %
Super-credit for vehicle emitting less than 50 g CO_2/km	Passenger cars	1.5	1.0	1.0	1.0
	Vans	3.5	2.5	1.5	1.0
Emission reduction for E85 vehicles (a)	Passenger cars/vans	5 %	0 %	0 %	0 %

Note: (a) Applies only where at least 30 % of the filling stations in the Member State in which the vehicle is registered provide this type of alternative fuel.

Table 2.2 Summary of the parameters applying to the calculation of passenger cars manufacturer performance from 2020

Modality	2020	2021	2022	2023
Phase-in	95 %	100 %	100 %	10 %
Super-credit for vehicle emitting less than 50 g CO_2/km	2.0	1.67	1.33	1.0

Table 2.3 Manufacturers' pools in 2015 (passenger cars)

Pool	Manufacturer
BMW Group	Bayerische Motoren Werke AG
	BMW M GmbH
	Rolls-Royce Motor Cars Ltd
Daimler AG	Daimler AG
	Mercedes-AMG GmbH
FCA Italy SPA	Alfa Romeo SPA
	FCA US LLC
	FCA Italy SPA
Ford-Werke GmbH	CNG-Technik GmbH
	Ford India Private Limited
	Ford Motor Company
	Ford-Werke GmbH
General Motors	Chevrolet Italia SPA
	General Motors Company
	GM Korea Company
	Adam Opel AG
Honda Motor Europe Ltd	Honda Automobile China Co Ltd
	Honda Motor Co Ltd
	Honda Turkiye AS
	Honda of the UK Manufacturing Ltd
Hyundai	Hyundai Motor Company
	Hyundai Assan Otomotiv Sanayi ve Ticaret AS
	Hyundai Motor Manufacturing Czech SRO
	Hyundai Motor Europe GmbH
	Hyundai Motor India Ltd
Kia	Kia Motors Corporation
	Kia Motors Slovakia SRO
Mitsubishi Motors	Mitsubishi Motors Corporation MMC
	Mitsubishi Motors Europe BV MME
	Mitsubishi Motors Thailand Co Ltd MMTH
Pool Renault	Avtovaz JSC
	Automobile Dacia SA
	Lada France SAS
	Renault SAS
Suzuki	Magyar Suzuki Corporation Ltd
	Maruti Suzuki India Ltd
	Suzuki Motor Corporation
	Suzuki Motor Thailand Co Ltd
Tata Motors Ltd, Jaguar Cars Ltd, Land Rover	Jaguar Land Rover Limited
	Tata Motors Limited
Toyota-Dahaitsu Group	Daihatsu Motor Co Ltd
	Toyota Motor Europe NV SA
VW Group Pc	Audi AG
	Audi Hungaria Motor KFT
	Bugatti Automobiles SAS
	Dr Ing HCF Porsche AG
	Quattro GmbH
	Seat SA
	Skoda Auto AS
	Volkswagen AG

Table 2.4 Manufacturers' pools in 2015 (vans)

Pool	Manufacturer
Daimler	Daimler AG
	Mitsubishi Fuso Truck & Bus Corporation
	Mitsubishi Fuso Truck Europe SA
	MFTBC
FCA Italy SPA	FCA US LLC
	FCA Italy SPA
Ford-Werke GmbH	CNG-Technik GmbH
	Ford India Private Limited
	Ford Motor Company of Australia Limited
	Ford Motor Company
	Ford-Werke GmbH
General Motors	Chevrolet Italia SPA
	General Motors Company
	GM Korea Company
	Adam Opel AG
Kia	Kia Motors Corporation
	Kia Motors Slovakia SRO
Mitsubishi Motors	Mitsubishi Motors Corporation MMC
	Mitsubishi Motors Europe BV MME
	Mitsubishi Motors Thailand Co Ltd MMTH
Renault	Avtovaz JSC
	Automobile Dacia SA
	Lada France SAS
	Renault SAS
Volkswagen Group LCV	Audi AG
	Audi Hungaria Motor KFT
	Bentley Motors Ltd
	Bugatti Automobiles SAS
	Automobili Lamborghini SPA
	Dr Ing HCF Porsche AG
	Quattro GmbH
	Seat SA
	Skoda Auto AS
	Volkswagen AG

Table 2.5 Manufacturers with low volume derogations granted for 2015 (passenger cars)

Manufacturer	Specific emissions targets in g CO_2/km
Alpina Burkard Bovensiepen GmbH e Co KG	225.00
Artega Automobil GmbH e Co KG	286.00
Aston Martin Lagonda Ltd	310.00
Automobili Lamborghini SPA	325.00
Bentley Motors Ltd	298.00
Caterham Cars Limited	210.00
Donkervoort Automobielen BV	178.00
DR Motor Company SRL	135.00
Ferrari SPA	295.00
Great Wall Motor Company Limited	188.00
Koenigsegg Automotive AB	275.00
KTM-Sportmotorcycle AG	190.00
Litex Motors AD	156.00
Lotus Cars Limited	280.00
Mahindra & Mahindra Ltd	162.00
Marussia Motors LLC	270.00
Maserati SPA	255.00
Mclaren Automotive Limited	275.00
MG Motor UK Limited	146.00
Morgan Technologies Ltd	170.00
Noble Automotive Ltd	360.00
Pagani Automobili SPA	340.00
PGO Automobiles	175.00
Potenza Sports Cars	205.00
Perusahaan Otomobil Nasional SDN BHD	176.00
Radical Motosport Ltd	200.00
Secma SAS	131.00
Spyker Automobielen BV	380.00
Ssangyong Motor Company	180.00
Wiesmann GmbH	274.00
Zejiang Zoyte Automobile Manufacturing Co Ltd	162.00

Note: This table includes all manufacturers that benefitted from a small volume derogation target even if they did not sell any vehicles in 2015.

Table 2.6 Niche derogations granted for 2015 (passenger cars)

Manufacturer/pool	Specific emission targets in g CO_2/km
Fuji Heavy Industries Ltd	164.616
Tata Motors Ltd, Jaguar Cars Land Rover	178.025
Mazda Motor Corporation	129.426
Suzuki Pool	123.114

Table 2.7 Manufacturers with derogations granted for 2015 (vans)

Manufacturer	Specific emission targets in g CO_2/km
Gonow Auto Co Ltd	175.00
Jaguar Land Rover Limited	276.93
Mitsubishi Motors Pool	210.00
Piaggio & C SPA	155.00
Ssangyong Motor Company	210.00

Note: This table includes all manufacturers that benefitted from a small volume derogation target even if they did not sell any vehicles in 2015.

Box 2.1 New legislative driving cycle

In June 2016, the European Commission proposed to adopt the World Harmonised Light Vehicle Test Procedure (WLTP), a globally harmonised test procedure developed within the United Nations Economic Commission for Europe (UNECE). The Technical Committee — Motor Vehicles (TCMV) has approved the draft legislative proposal, and the draft implementing act was sent to the European Parliament and the Council for regulatory scrutiny. If the current text is endorsed, the new WLTP test will be mandatory for all new vehicle types from September 2017 and for all new vehicles from September 2018. The WLTP will provide stricter test conditions and more realistic CO_2/fuel consumption values, to the benefit of consumers and regulators at both EU and national levels. As the existing EU CO_2 regulations for cars and vans are based on emissions measured using the New European Driving Cycle (NEDC) and as many Member States have taxation systems in place based on NEDC-based CO_2 figures, it will be necessary to determine NEDC-based CO_2 emission figures for some time after the WLTP has been introduced. Therefore, a specific computer simulation programme called CO_2MPAS ([12]) has been developed to calculate NEDC-based CO_2 emission figures.

([12]) https://co2mpas.io.

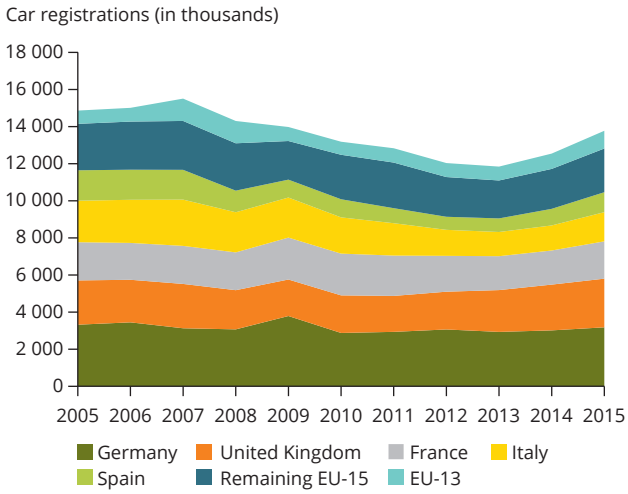
3 Passenger cars

3.1 Number of new registrations

Since 2007, when 15.5 million passenger cars were registered in the EU-27 (see Figure 3.1 and Table A1.1), the number of new registrations continuously decreased till 2013 (11.9 million). In 2015, for the second year in a row, the number of new passenger car registrations again increased, reaching 13.8 million, which is 1.2 million more than in 2014. This trend seems to continue in 2016. According to ACEA statistics (ACEA, 2016), over the first half of 2016, new passenger car registrations increased by 9.4 % in the EU compared with the same period in 2015. The number of registrations increased in 26 out of the 28 Member States, with the biggest increases observed in Ireland (+ 28 %), the Czech Republic (+ 27 %) and Portugal (+ 26 %). The largest decrease was seen in Luxembourg (– 6 %).

The EU new passenger car market is centred on a few countries, as 76 % of all registrations occur in Germany, the United Kingdom, France, Italy and Spain. Germany is the largest new vehicle market in Europe, with 23 % in 2015, followed by the United Kingdom (19 %) and France (15 %). Together these countries represent almost 60 % of the EU fleet. Italy and Spain registered 11 % and 8 % respectively of the EU fleet in 2015. In these countries, the number of new car registrations has fallen by 37 % and 33 % since 2007, but vehicle sales have been sharply rising again in the last few years: in 2015 registrations in Spain and in Italy were about 20 % and 16 % above 2014 levels.

Figure 3.1 Number of vehicles registered in EU-28 between 2005 and 2015



Note: Remaining EU-15 includes Austria, Belgium, Denmark, Finland, Greece, Ireland, Luxembourg, the Netherlands, Portugal and Sweden.

3.2 Average CO_2 emissions from new passenger cars

The final data presented here confirm the provisional data published by the EEA earlier in 2016. The average CO_2 emissions from the new passenger car fleet in the EU in 2015 were 119.5 g CO_2/km (Table 3.1), which is 3.8 g CO_2/km lower than in 2014 (3.1 %). Since the entry into force of the legislation, in 2009, the average CO_2 emissions have decreased by 26.2 g CO_2/km, i.e. by an average of 4.4 g CO_2/km per year.

The average CO_2 emissions have dropped for all engine technologies. Compared with 2014, the emissions decreased by 4.0 g and 3.1 g CO_2/km respectively for diesel and petrol vehicles. Whereas the efficiency gap between diesel and petrol fleet had remained stable for a few years, in 2015 it increased to 3.3 g/km, the same level as in 2010 (Table 3.1 and Figure 3.2).

Table 3.1 Average CO_2 emissions (g CO_2/km) from new passenger cars by fuel (EU)

g CO_2/km	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010 (a)	2011 (a)	2012 (a)	2013 (a)	2014 (a)	2015 (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	126.7	123.4	119.5
Petrol	177.4	175.3	173.5	171.7	170.0	168.1	164.9	161.6	156.6	147.6	142.5	137.6	133.7	128.5	125.6	122.5
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	131.5	126.9	123.2	119.2
AFV (b)	208.0	207.4	179.2	164.7	147.9	149.4	151.1	140.0	137.0	125.8	126.0	124.7	118.5	98.3	90.8	79.2

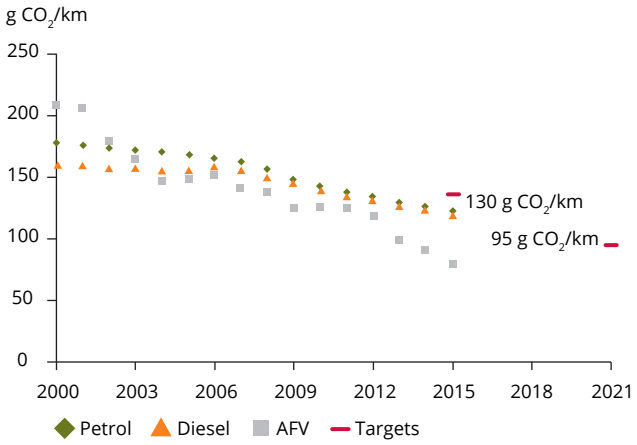
Note: (a) The calculation for the years 2010–2014 was done without considering out of scope vehicles.

(b) For the calculation of the average CO_2 emissions of AFVs, pure electric, liquefied petroleum gas vehicles (LPGs), natural gas vehicles (NG), ethanol (E85), biodiesel, and plug-in hybrid vehicles are all included.

(c) Fuel type is available for 95 % of the vehicle registrations in 2013.

The geographical scope of the data changes over time from EU-15 through EU-25 and EU-27 to EU-28; see Annex 1 for details.

Figure 3.2 Average CO_2 emissions (g CO_2/km) from new passenger cars by fuel (EU)



Notes: For the calculation of the average CO_2 emissions of alternative fuel vehicles, battery electric, liquefied petroleum gas, natural gas, E85, biodiesel and plug-in hybrid vehicles are all included.

The geographical scope of the data changes over time from EU-15 through EU-25 and EU-27 to EU-28; see Annex 1 for details.

The distribution of emissions and mass across the fleet in five selected years (2005, 2010 and 2013–2015) are shown in Figure 3.3. The emission distribution of newly registered cars did not change significantly in the last 2 years. In this period, the largest group of cars emitted between 100 and 120 g CO_2/km (38.4 % in 2014 and 39.3 % in 2015). In 2010, the largest group emitted between 120 and 140 g CO_2/km. In 2015, more than 20 % of newly registered vehicles emitted less than 100 g CO_2/km (2.5 % more than in 2014). While there has been a big difference in terms of emission performance of vehicles between 2005 and 2014, the mass distribution has changed little in the same period.

As in 2014, the average new passenger car in the EU-15 emitted 8.2 g CO_2/km less than the average newly registered vehicle in the EU-13 (Table 3.2). In the 2007–2009 period the emissions in the EU-13 dropped by only 3.6 g CO_2/km while in the EU-15 the reduction observed was more than 13.6 g CO_2/km. The last 3 years (2012–2015) were the first years in which the progress made in the EU-13 was comparable to the progress made in the EU-15. Over this period the average emissions in the EU-13 decreased by 13.7 g CO_2/km, which is an average yearly reduction of 4.6 g CO_2/km. For the EU-15, the reduction in average CO_2 emissions over the same period was 12.7 g CO_2/km.

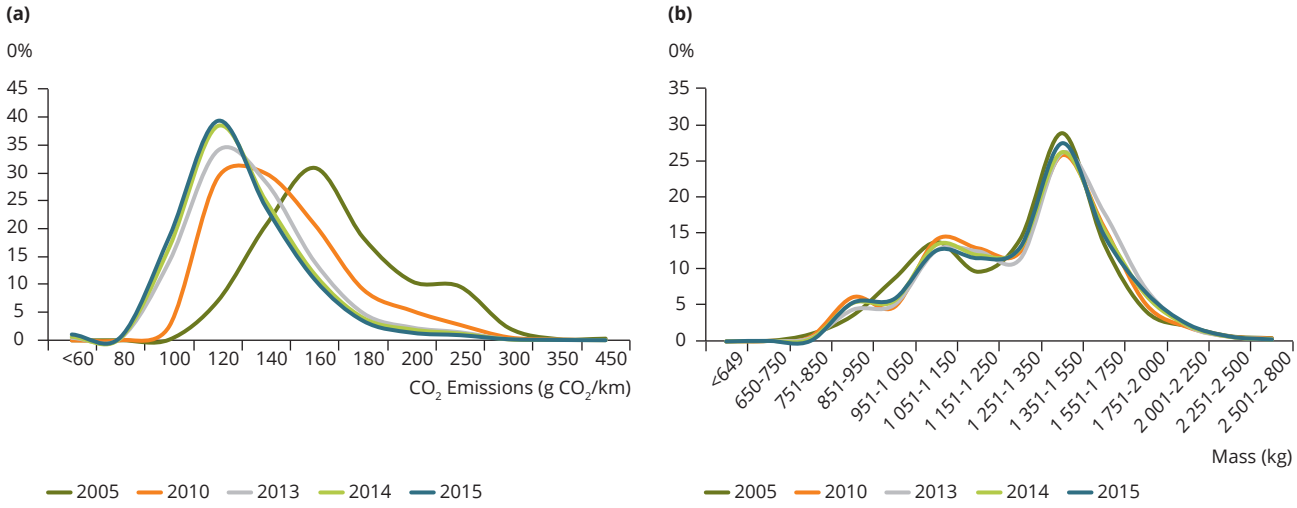
In all EU Member States, the CO_2 emissions from newly registered passenger cars fell in 2015 compared with 2014. Figure 3.4 shows the absolute and percentage reductions by Member State between 2014 and 2015.

In 24 Member States, the 2015 average CO_2 specific emissions from newly registered cars were below the EU's 130 g CO_2/km target (Figure 3.5).

On average, the highest-emitting cars were sold in Estonia and Latvia (137 g CO_2/km), followed by Bulgaria (130 g CO_2/km). As in 2014, the Netherlands (101 g CO_2/km) registered the lowest-emitting fleet. Denmark, Greece and Portugal follow, with average emissions of around 106 g CO_2/km.

In the Netherlands, the proportion of cars emitting less than 50 g CO_2/km (mainly battery electric and plug-in hybrid vehicles) is the highest in Europe (9 %). This has an important impact on the average emissions. Without the contribution of these low-emitting vehicles the average CO_2 emissions in the Netherlands would be 107.5 g CO_2/km.

Figure 3.3 **Frequency distributions of (a) emissions and (b) mass of the vehicles registered in the EU-28 in 2005, 2010, and 2013–2015**



Note: 2005 data: data based on Decision 1753/2000 (EU, 2000).
2013–2015 data: data based on Regulation (EC) No 443/2009.

Table 3.2 **Average CO_2 emissions (g CO_2/km) from new passenger cars in the EU-13 and EU-15**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
EU-13								157.8	156.8	154.2	148.2	144.1	140.9	135.8	131.0	127.2
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	126.1	122.8	119
EU-28								158.7	153.6	145.7	140.3	135.7	132.2	126.7	123.4	119.5

Figure 3.4 **Absolute reduction and relative reduction (%) in specific emissions by Member State between 2014 and 2015**

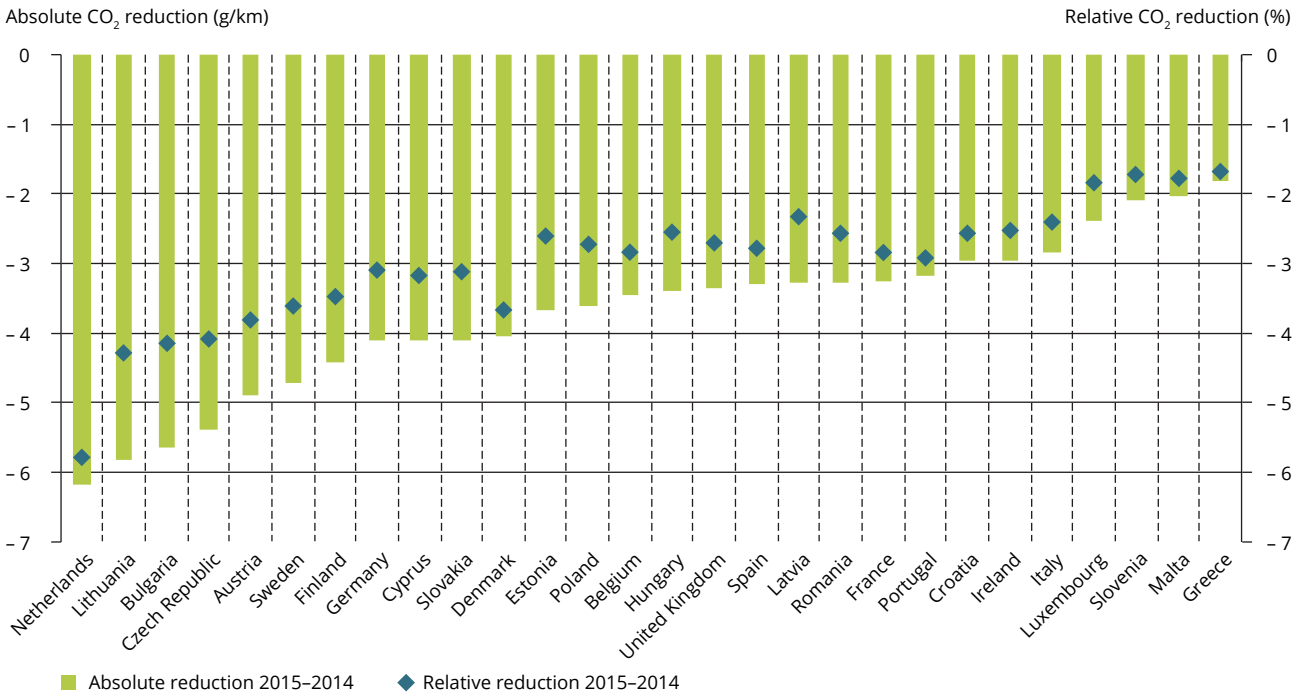
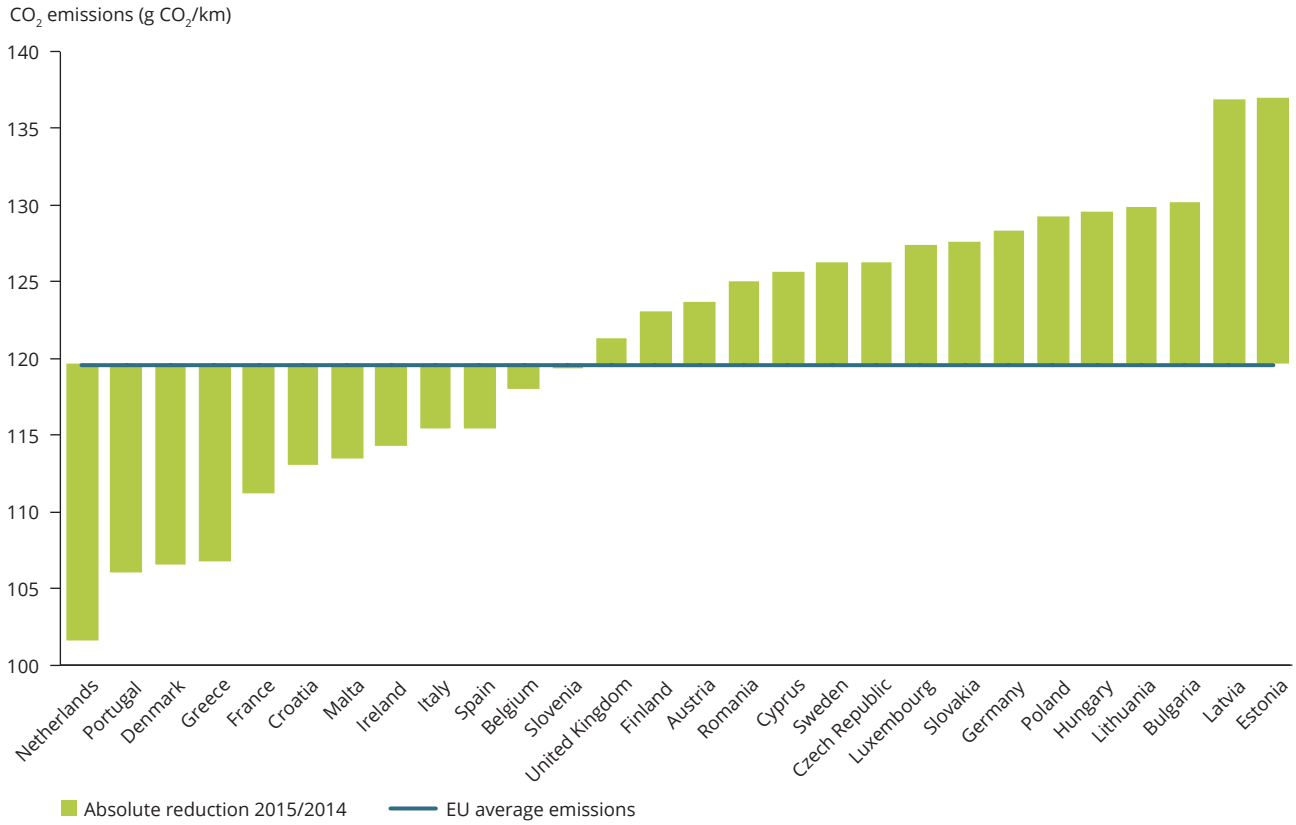


Figure 3.5 Average CO_2 emissions by EU Member State in 2015 compared with the EU average (119.5 g CO_2/km)



In Greece and Denmark, the low average emissions are mainly related to the registration of relatively small cars: the average mass of the new fleet of these countries is below 1 250 kg. In addition to this, the new fleets of Denmark and Greece have the lowest engine capacities and powers in Europe.

The four best-performing Member States had different fleet compositions: in the Netherlands and Denmark the majority of the fleet is fuelled with petrol (61 % and 64 % respectively) while in Greece and Portugal it is diesel based (63 % and 69 % respectively). The percentage of diesel vehicles in the fleet is even higher (more than 70 %) in Ireland and Luxembourg. On the opposite side, fewer than 30 % of vehicles registered in the Netherlands and Denmark in 2015 were diesel vehicles.

The Netherlands, Lithuania, Bulgaria and the Czech Republic recorded the largest relative CO_2 emission reductions compared with 2014, about 4–6 % on average.

Logically, the Member States with the highest numbers of vehicle registrations — France, Germany, Italy, Spain and the United Kingdom — are the major contributors to the absolute reductions of CO_2 emissions from newly registered passenger cars in EU-28. Of these five, France, Italy and Spain have the lowest average CO_2 specific emissions. In Italy, for example, this is for a combination of reasons. Cars registered in Italy have on average the fourth lowest mass among the EU Member States and the second lowest engine power. In addition to this, Italy has a high proportion of small diesel cars (56 % of the vehicles are diesel cars and these have an average mass of 1 441 kg and average emissions of 115.5 g CO_2/km) and the highest proportion of alternative fuel vehicles (AFVs) (12 %). The latter are mainly LPG cars (8 % of all new registrations) with average CO_2 emissions of 119.0 g CO_2/km, and NG cars (4 % of all new registrations) with average CO_2 emissions of 98.4 g CO_2/km.

In France, the large number of small diesel vehicles (average mass 1 420 kg) seems to be the main reason for the relatively low CO_2 emissions. France also has a relatively high proportion of battery electric cars (0.9 %) with zero emissions, which reduced the average emissions by less than 1 g CO_2/km. On the other side of the scale, Germany has one of the highest average CO_2 emissions: its fleet is significantly heavier, bigger and more powerful than the EU average (1 447 versus 1 380 kg, 1 716 versus 1 596 cm^3 and 106 versus 93 kW).

3.3 Vehicle technologies

As in the previous 5 years, in 2015 more diesel vehicles were sold than petrol ones. Diesel vehicles represent almost 51.8 % of the newly registered vehicle fleet as against 55.2 % in 2011, the year in which the percentage of diesel vehicle reached the maximum (Table 3.3). The percentage of AFVs has increased in the last 4 years, reaching 2.8 %. Hybrid electric vehicles have been available in Europe since 2000, but registration numbers for these types of vehicle are not available in the officially reported statistics. Such vehicles are reported by Member States as petrol or diesel vehicles. According to the ICCT (2015), in 2014 the market share of hybrid vehicles in the EU was 1.4 % of all new car sales.

The registration of AFVs has been increasing substantially in recent years (Figure 3.11). This category was only a few vehicles in 2000, but it exceeded half a million new vehicle registrations in 2009, before dropping to slightly below half a million in 2010. The registration of AFVs increased considerably in the last 2 years, by 36.4 %, after a significant drop between 2010 and 2011 (when registrations fell by 62 %).

On the basis of the monitoring data, it is possible to report CO_2 emissions for different fuel types used by AFVs (Table 3.4). It is noteworthy that the mix of vehicles in this category has changed over the years (natural gas (NG), liquefied petroleum gas (LPG), biodiesel, E85, battery electric and plug-in hybrid vehicles are included in this category). This helps explain the high variability in the trend of emissions and other characteristics of the AFV fleet (Figure 3.2). 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 because of the introduction of LPG vehicles and NG vehicles, which have greatly outnumbered ethanol cars.

Table 3.3 Share of fuel type in new passenger cars (EU-28)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010 [a]	2011 [a]	2012 [a]	2013 [a]	2014 [a]	2015 [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	43.0	45.1	44.3	45.4
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	52.5	53.0	51.8
AFV	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	2.4	2.7	2.8

Note: [a] The calculation for the 2010–2015 period was done considering vehicles in the scope of the regulation.

The geographical scope of the data changes over time from EU-15 through EU-25 and EU-27 to EU-28. See Annex 1 for details.

Table 3.4 AFV data: number of registrations, CO_2 emissions, mass and engine capacity

	Registration	Average CO_2 emissions (g CO_2/km)	Average mass (kg)	Average engine capacity (cm^3)
E85	1 704	142.7	1 480	1 794
Electric	56 756	0.0	1 588	-
LPG	138 065	120.0	1 220	1 329
NG-biomethane	78 278	98.9	1 287	1 183
Petrol-electric	89 364 [b]	48.7	1 743	1 709
Diesel-electric	14 189 [b]	74.8	1 605	1 966

Note: [a] Electric vehicles are vehicles for which tail-pipe emissions are 0 g CO_2/km.

[b] Some countries reported hybrids as plug-in hybrids. The overestimate is around 10 %.

Only exhaust emissions are considered. For electric monofuel vehicles the emission is null. For E85, only the petrol CO_2 emissions are reported; for LPG and NG-biomethane the respective LPG and compressed NG CO_2 emissions are reported.

Figure 3.6 Trends in total registrations of AFVs, 2000–2015

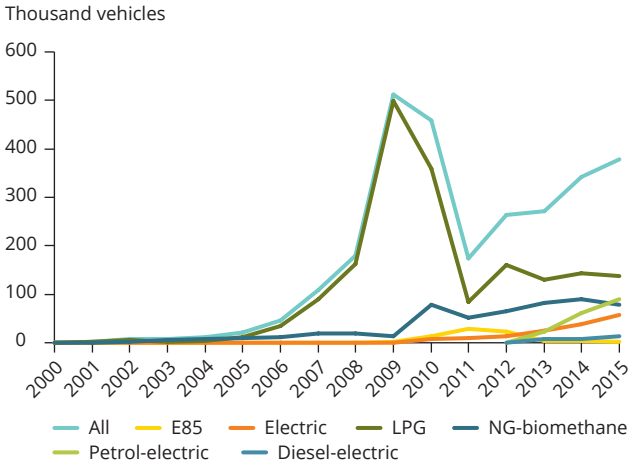
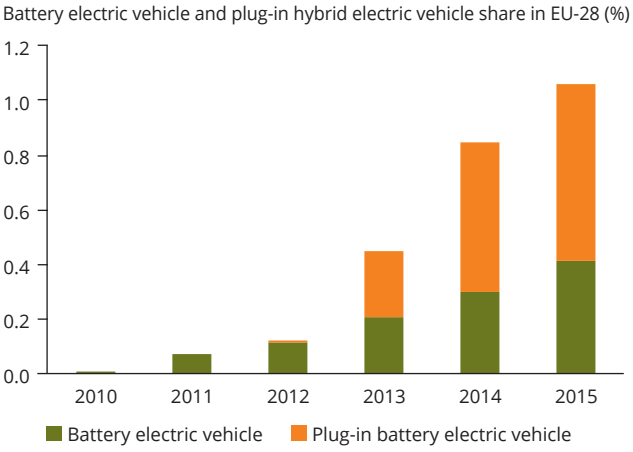


Figure 3.7 Percentages of BEV and PHEV registrations in the EU-28



The significant reduction in average CO_2 emissions from AFVs over the past few years (Figure 3.2) is not mainly the result of shifts in fuel composition and in engine type. In recent years, the increase in the number of battery electric vehicles (BEVs) and plug-in hybrid vehicles (PHEVs) contributed to the declining emission levels (Figure 3.7). BEVs are propelled by electric motors, using electrical energy stored in batteries or another energy storage device. The tail-pipe emissions of this kind of vehicle are considered to be 0 g CO_2/km. It is important to mention that only tail-pipe emissions ([13]) are included in the data set.

In 2015, there were almost 19 000 more registrations of BEVs than in 2014, representing 0.41 % of the fleet. PHEVs are also identified in the database. The average emissions of PHEVs are in general below 70 g CO_2/km. Registrations of PHEVs have increased greatly in recent years: in 2015 approximately 90 000 ([14]) PHEVs were registered in Europe. Together with battery electric vehicles, they represent 1.1 % of the fleet.

Registrations of BEVs in the EU-28 have increased in the last 6 years from around 700 in 2010 to around 57 000 in 2015. France (more than 17 600 vehicles), Germany (around 12 400 vehicles) and the United Kingdom (almost 10 000 vehicles) are the countries in which the increase in absolute numbers has been the highest over the last years (Figure 3.8). The registration of BEVs in Scandinavia is growing as well and those countries contributed 4–5 % of the total registrations of BEVs in the EU-28. Denmark has the highest proportion of BEVs, at 1.2 % of the fleet. It is important to notice that Denmark has put in place a taxation system to favour the uptake of BEVs in the last years: electric cars are exempted from the 150 % car registration tax applied to new vehicle purchases ([15]) (EEA, 2016a).

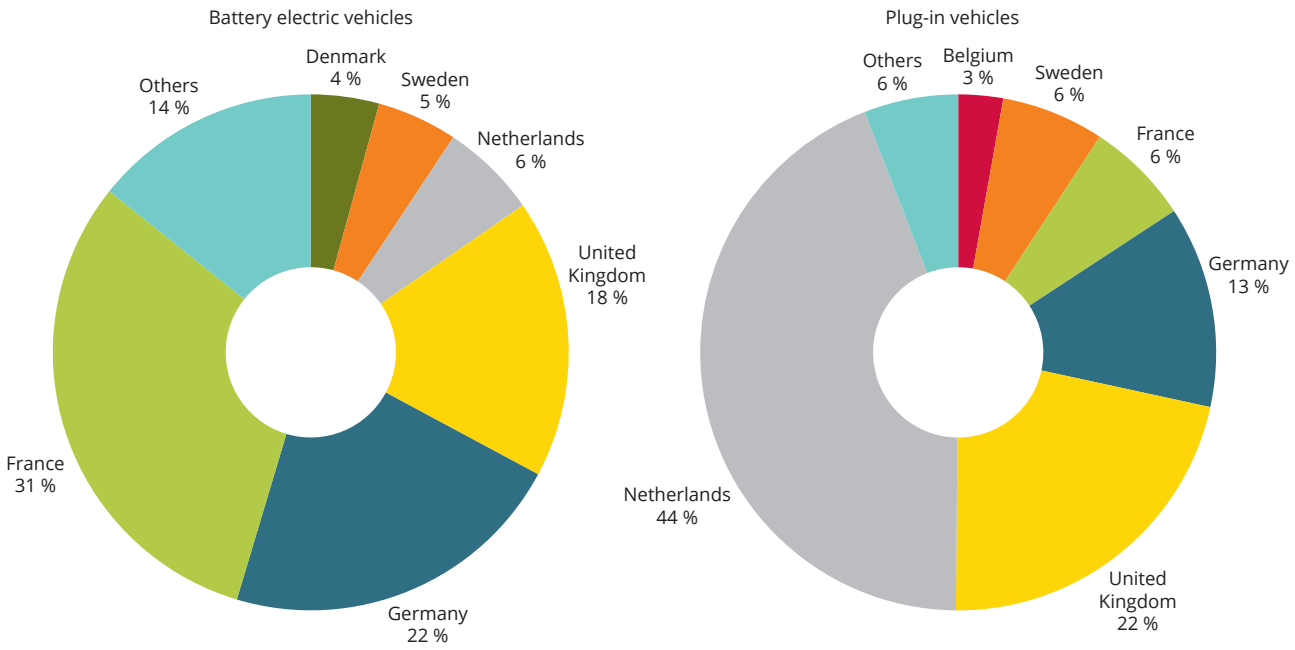
The number of PHEVs has considerably increased in the Netherlands, where they represent almost 9 % of the fleet. Significant numbers of PHEVs have been registered in the United Kingdom (around 19 400 vehicles) and Germany (around 11 200 vehicles) as well.

In 2015, 10 % of vehicles in the Netherlands were electric. The underlying reason for this relatively high proportions is the Netherlands' CO_2-based vehicle taxation scheme, which focuses mainly on stimulating zero-emission vehicles and plug-in vehicles (EAFO, 2016; EEA, 2016a).

Of the other types of AFVs, NG and LPG vehicles have the lowest CO_2 emissions (120.0 g and 98.9 g CO_2/km respectively), but these have not been improving since 2014. Ethanol-fuelled vehicles (E85) have the highest

([13]) Tail-pipe emissions are the exhaust emissions of the vehicles. There are no end-of-pipe emissions for BEVs. However, BEVs produce indirect emissions when they are plugged into the electricity grid. The indirect emissions are not taken into account in this report and in the regulation.
([14]) This figure includes only vehicles correctly reported as plug-in vehicles.
([15]) Starting from 1 January 2016, the exemption is being phased out in annual increments over the next 5 years, increasing the purchase price of most models.

Figure 3.8 BEVs (left) and plug-in vehicles (right) by Member States (% of EU-28 total)



specific emissions (142.7 g CO_2/km). The improvement in these technologies is marginal compared with the previous year and the other technologies: in 2014, NG and LPG vehicles emitted respectively 120.3 and 97.8 g CO_2/km. Emissions from LPG cars are, on average, higher than from diesel vehicles, even though their mass is significantly lower (1 220 kg for LPG cars, 1 524 kg for diesel cars).

Italy has the highest number of LPG and NG vehicles, almost 12 % of its total number of vehicles. In the other countries the proportion of LPG and NG vehicles is below 2 %.

3.4 Other car characteristics: mass and engine capacity

The average mass of new passenger cars registered in the EU-28 has slightly increased since 2014 (Table 3.5). While the mass of petrol vehicles has been stable over the last 10 years, the mass of diesel vehicles increased consistently until a slight decrease in the last 2 years (1 524 kg in 2015). As a result, the difference in mass between petrol and diesel vehicles has been increasing slowly but constantly between 2004 (226 kg) and 2015 (310 kg). The mass of AFVs varies over the years in relation to the composition of the fleet.

Table 3.5 Average mass (kg) of new passenger cars sold in 2015 by fuel

	2004	2005	2006	2007	2008	2009	2010	2011	2012 [a]	2013 [a]	2014 [a]	2015 [a]
All fuels	1 347	1 356	1 372	1 379	1 373	1 337	1 364	1 388	1 402	1 390	1 375	1 380
Petrol	1 237	1 235	1 238	1 235	1 228	1 206	1 214	1 220	1 224	1 218	1 207	1 214
Diesel	1 463	1 479	1 501	1 510	1 508	1 498	1 507	1 523	1 547	1 539	1 518	1 524
AFV	1 415	1 404	1 392	1 271	1 237	1 169	1 202	1 270	1 247	1 294	1 343	1 428

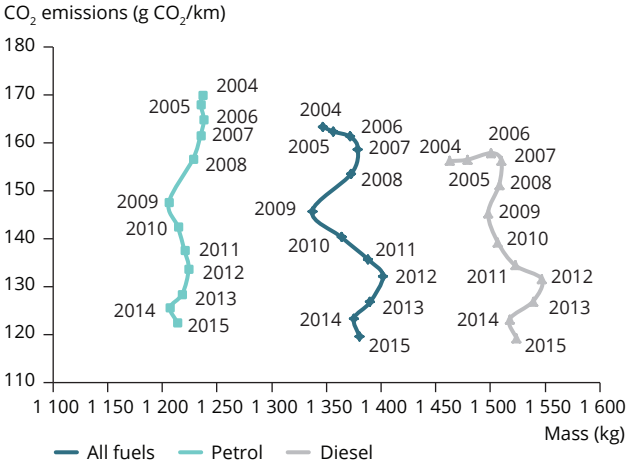
Note: [a] For the calculation of the average mass of AFVs, battery electric, LPGs, NG, E85, biodiesel and plug-in hybrid vehicles are all included. Data before 2004 are not shown because the data set is incomplete.

The new car fleets of Sweden and Luxembourg were the heaviest, at 1 526 and 1 495 kg respectively (Annex 1). The lightest new cars were sold in Malta, Denmark and Greece (1 206, 1 227 and 1 250 kg respectively). Among the five largest Member States, Germany has the heaviest fleet (1 447 kg) and Italy the lightest (1 305 kg).

During the 2004–2015 period the average mass has been quite stable while CO_2 emissions have decreased significantly (43.9 g CO_2/km). Figure 3.9 shows the relation between average emissions and average mass changes according to fuel type. The average mass of petrol vehicles overall decreased together with emissions, whereas the average mass of diesel vehicles increased while emissions decreased over the same period. The average mass of the fleet has increased for all fuel types between 2009 and 2012 (more for diesel cars than for petrol cars), but has decreased again in the last 3 years and it is now again similar to the 2010 level.

There was a slight decrease in average engine capacity in the last 4 years: the average engine capacity of new passenger cars in 2015 was 45 cm^3 less than in 2011. The difference between new diesel and petrol vehicles is around 453 cm^3, whereas in 2011 it was 372 cm^3. In the same period, the engine power has increased from 86 to 93 kW. For both petrol and diesel vehicles, an increase in engine power has been observed: in 2015 diesel vehicles had average engine power greater than 100 kW, while for petrol vehicles it was below 85 kW. This means that manufacturers are producing more powerful cars (higher engine power in terms of kW) even if they are using smaller engine capacities.

Figure 3.9 CO_2 emissions versus vehicles' mass in the EU-28



3.5 Average specific CO_2 emissions per manufacturer in 2015

Table 3.6 presents data (number of registrations, average mass and average emissions) for 2015 for all large manufacturers ([16]) individually, i.e. those that registered more than 100 000 vehicles in 2015. Manufacturers are ranked according to their 2015 average specific emissions (low to high). In total, these manufacturers sold 13.2 million new cars in the EU-28 in 2015, equivalent to 96 % of the total new registrations. The average emissions of each of those manufacturers in previous years (2009–2014) are also included in the table.

The EU fleet is quite stable over the years. As in 2014, the most popular brand is Volkswagen, with 13 % of the cars registered in the EU, followed by Ford (8 %) and Renault, Adam Opel and BMW (7 % each).

The average CO_2 emissions of the large manufacturers were 118.5 g CO_2/km, i.e. 1.0 g CO_2/km lower than the average of the total new registrations.

In 2015, 20 large manufacturers had average emissions below 130 g CO_2/km, whereas in 2014 only 16 manufacturers were below this value. Eleven of these 20 manufacturers had average emissions below 120 g CO_2/km and 4 of them had average emissions below 110 g CO_2/km. The average emissions of these large manufacturers varied from 103.7 g to 164.0 g CO_2/km.

Automobiles Peugeot and Automobiles Citroën had significantly improved their performance from the previous year by 5.8 and 5.0 g CO_2/km respectively,

([16]) In this report large manufacturers are those that are responsible for more than 100 000 registrations a year, while in Regulation (EC) No 443/2009 large manufacturers are those responsible for more than 300 000 registrations a year.

Table 3.6 Main statistics for large car manufacturers (more than 100 000 vehicle registrations per year)

Manufacturer	Registrations [a]	Average mass (kg) 2015	Average CO_2 emissions (g CO_2 /km)					
			2015	2014	2013	2012	2011	2010
Automobiles Peugeot	857 467	1 260	104	110	115	121	128	131
Automobiles Citröen	618 627	1 244	106	111	116	123	126	131
Renault SAS	984 981	1 263	106	108	110	121	129	134
Toyota Motor Europe NV SA	585 335	1 315	108	113	116	122	126	129
Hyundai Assan Otomotiv Sanayi ve Ticaret AS [b]	155 201	1 079	114	113	112	-	-	-
Nissan International SA	548 778	1 366	115	115	131	137	142	147
Skoda Auto AS	585 559	1 275	116	121	125	132	135	139
Fiat Group Automobiles SPA	703 654	1 159	116	116	116	117	118	125
Seat SA	332 988	1 248	117	117	119	127	125	131
Ford-Werke GmbH	993 383	1 333	118	121	122	129	132	137
Volkswagen AG	1 655 413	1 391	119	124	127	133	135	140
Magyar Suzuki Corporation Ltd	125 532	1 161	120	123	126	128	128	137
Kia Motors Corporation [c]	228 179	1 309	122	125	128	129	137	143
Volvo Car Corporation	266 351	1 703	122	126	131	142	151	157
Automobile Dacia SA	378 487	1 204	123	125	127	137	143	145
Daimler AG	800 325	1 561	125	131	137	143	153	160
Bayerische Motoren Werke AG	887 020	1 569	126	131	134	138	144	146
Mazda Motor Corporation	194 754	1 362	127	128	134	142	147	149
Adam Opel AG	915 125	1 387	127	130	132	133	134	140
Audi AG	717 955	1 590	127	131	133	138	145	152
Honda of the UK Manufacturing Ltd	104 595	1 453	133	134	145	156	161	162
Hyundai Motor Manufacturing Czech SRO [b]	236 932	1 454	135	140	138	-	-	-
Kia Motors Slovakia SRO [c]	151 884	1 438	138	141	140	-	-	-
Jaguar Land Rover Limited	172 792	1 997	164	178	182	-	-	-

Note: [a] These are total number of registrations in the EU-28, not the registrations used for the calculation of the target and of the average emissions (see Annex 1).

[b] In previous years Hyundai appeared as a single manufacturer.

[c] In previous years Kia appeared as a single manufacturer (Kia Motors Corporation).

[d] In previous years Jaguar and Land Rover appeared as two separate manufacturers.

reaching the two lowest average CO_2 emissions (104 and 106 g CO_2/km respectively) among the large manufacturers. This is mainly related to the improved performances of the conventional vehicles. The percentages of vehicles emitting less than 95 g CO_2/km were 18 % and 12 % in 2014 and increased to 28 % and 22 % in 2015 respectively for Automobiles Peugeot and Automobiles Citroën. For both manufacturers, diesel vehicles represented around 60 % of their fleet. These diesel vehicles had low emissions (102 and 105 g CO_2/km) and were small in mass (1 360 and 1 349 kg) compared with the average diesel fleet in EU-28 (Tables 3.1 and 3.5). Their petrol cars are also smaller in mass than the European average (around 1 100 kg). The increased number of electric cars had an additional small effect on the decrease in the average emission level (< 0.2 g CO_2/km).

Over the last 3 years, Renault's average emissions decreased by almost 15 g CO_2/km. In 2015, 94 % of Renault vehicles emitted less than 130 g CO_2/km and 36 % of those vehicles emitted less than 95 g CO_2/km (Figure 3.12). Almost 2 % of the Renault fleet were BEVs; they contributed to reduce the average CO_2 emissions by 2 g CO_2/km. Diesel vehicles were almost 60 % of the Renault fleet, with average emissions of 102.2 g CO_2/km, one of the lowest among all cars manufacturers.

Toyota Motor Europe continued to produce some of the lowest-emitting cars, as one third of its fleet had emissions below 95 g CO_2/km (41 %). The Toyota Motor Europe fleet comprised 76.8 % petrol vehicles, with the lowest average emissions (104.4 g CO_2/km) of the large manufacturers. This was mainly related to the high proportion of hybrid vehicles emitting between 75 and 100 g CO_2/km.

As in 2014, Hyundai Assan had the lowest mass among the group (1 079 kg) and the highest percentage of petrol vehicles (almost 90 %). However, the average emissions increased compared with the previous 2 years.

Nissan made significant improvements in CO_2 emissions in 2013 and 2014 (almost 16 g CO_2/km), but was stable in 2015. The good performance of recent years is related to the increased number of electric vehicles (which corresponds to a CO_2 saving of almost 3 g CO_2/km), to the downsizing of the fleet (30–40 kg lighter than in 2013) and to the improved performances of the conventional vehicles (the percentage of the vehicles emitting less than 130 g CO_2/km was 82 % in 2015, 86 % in 2014 and only 56 % in 2013).

For both Skoda and Fiat, the average emission is 116 g CO_2/km. Skoda improved by 5 g CO_2/km improvement in 2015. Fiat reported the same emission level as observed in 2013. Skoda's fleet has had a stable average mass over the last few years (fifth lightest in the group of large manufacturers), but the proportion of vehicles emitting less than 130 g CO_2/km increased from 76 % to 84 %. As in previous years, in 2015 Fiat had one of the lowest average masses among the large manufacturers (1 159 kg), but was eighth in terms of emissions. The proportion of AFVs in Fiat's fleet is quite high (11 %), but mainly composed of those vehicles that run on LPG and NG. On average, NG vehicles registered in Italy emitted 96.8 g CO_2/km while LPG vehicles emitted 113.7 g CO_2/km, around 6.4 g CO_2/km less than petrol vehicles and slightly more than diesel vehicles (113.2 g CO_2/km). Since the emissions of NG and LPG vehicles are becoming comparable to those of conventional vehicles, Fiat performances did not improve in 2015: its vehicles emitted on average 116 g CO_2/km, as in 2014 and 2013, and only 1 g CO_2/km less than in 2012.

The majority of large manufacturers reduced their average emission levels in 2015 from 2014. The largest reductions were achieved by Jaguar Land Rover Limited (14.4 g CO_2/km) and Daimler AG (6.9 g CO_2/km). These decreases enabled Daimler AG to get below the 130 g CO_2/km threshold (125 g CO_2/km). Thanks to the decreases observed in recent years, BMW AG, Opel and Audi AG were below the 130 g CO_2/km threshold (126 g and 127 g CO_2/km). Since 2009, when the car emission legislation came into force, the greatest decreases among the largest manufacturers have been recorded for Volvo, Daimler AG and Nissan (51.2 g, 42.2 g and 39.2 g CO_2/km respectively).

As a general observation, dieselisation ([17]) (the introduction of more diesel vehicles) of the total fleet was still continuing in 2015. For only 5 out of the 12 large manufacturers, the proportion of diesel vehicles in 2015 was lower than 50 %: Ford Werke (46.4 %), Skoda (46.1 %), Opel (35.1 %), Fiat (30.7 %) and Toyota (21.4 %) (Figure 3.10).

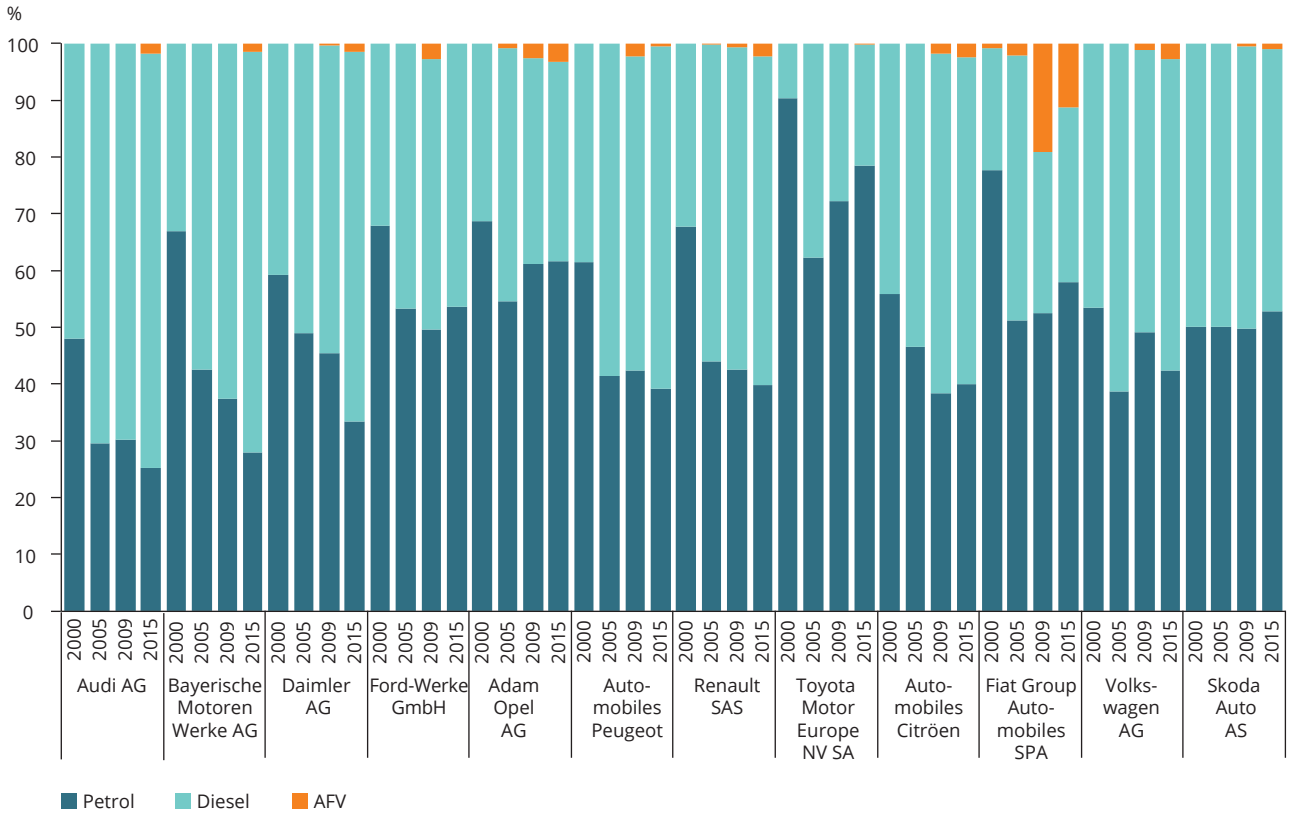
Despite the increasing trend, the proportion of AFVs remains low in absolute terms, and hence has not contributed significantly to the observed emission reductions. However, in 2015, the contribution of AFVs became important for some manufacturers, accounting for more than 5 % of registrations for Dacia, Kia and Fiat (Figure 3.11). The majority of electric vehicles registered in the EU are produced by Renault (almost 16 600), Nissan (almost 12 900) and Tesla (almost 9 300).

The distribution of registrations over different emission classes (Figure 3.12) shows that for some manufacturers (Volvo, Nissan, Renault and BMW AG) the market for cars emitting less than 50 g CO_2/km is increasing. However, for each of those manufacturers the percentage of electric vehicles is lower than 3.2 %. For Toyota and Renault the percentages of vehicles

([17]) Diesel vehicles generally emit more air pollutants per kilometre than their conventional petrol equivalents. This is particularly true for emissions of black carbon, which has impacts on health and the climate, but also for particulate matter (PM) and nitrogen oxide (NO_x). See EMEP/EEA air pollutant emission inventory guidebook 2016 (http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

emitting less than 95 g/km are relatively high, being 41 % and 32 % respectively. Vehicles with emissions below 130 g CO_2/km account for the largest proportion of registrations for all the large manufacturers (76 % on average). Only for a few manufacturers of this group (Hyundai Motor Manufacturing Czech SRO, Kia Motors Slovakia SRO and Jaguar Land Rover Limited) did the large majority of the vehicles sold emit more than 130 g CO_2/km.

Figure 3.10 Fuel type for the largest manufacturers (more than 500 000 vehicle registrations per year)



Note: Data for the time series 2001–2009 were gathered by the monitoring regulated by Decision 1753/2000/EC, which was repealed by Regulation (EC) No 443/2009. These data do not include all Member States in all years. Manufacturers' names and groups may have changed. Moreover, because of changes in methodology and monitoring improvements, breaks in trends may occur.

Figure 3.11 Registrations of alternative fuel vehicles (AFVs)

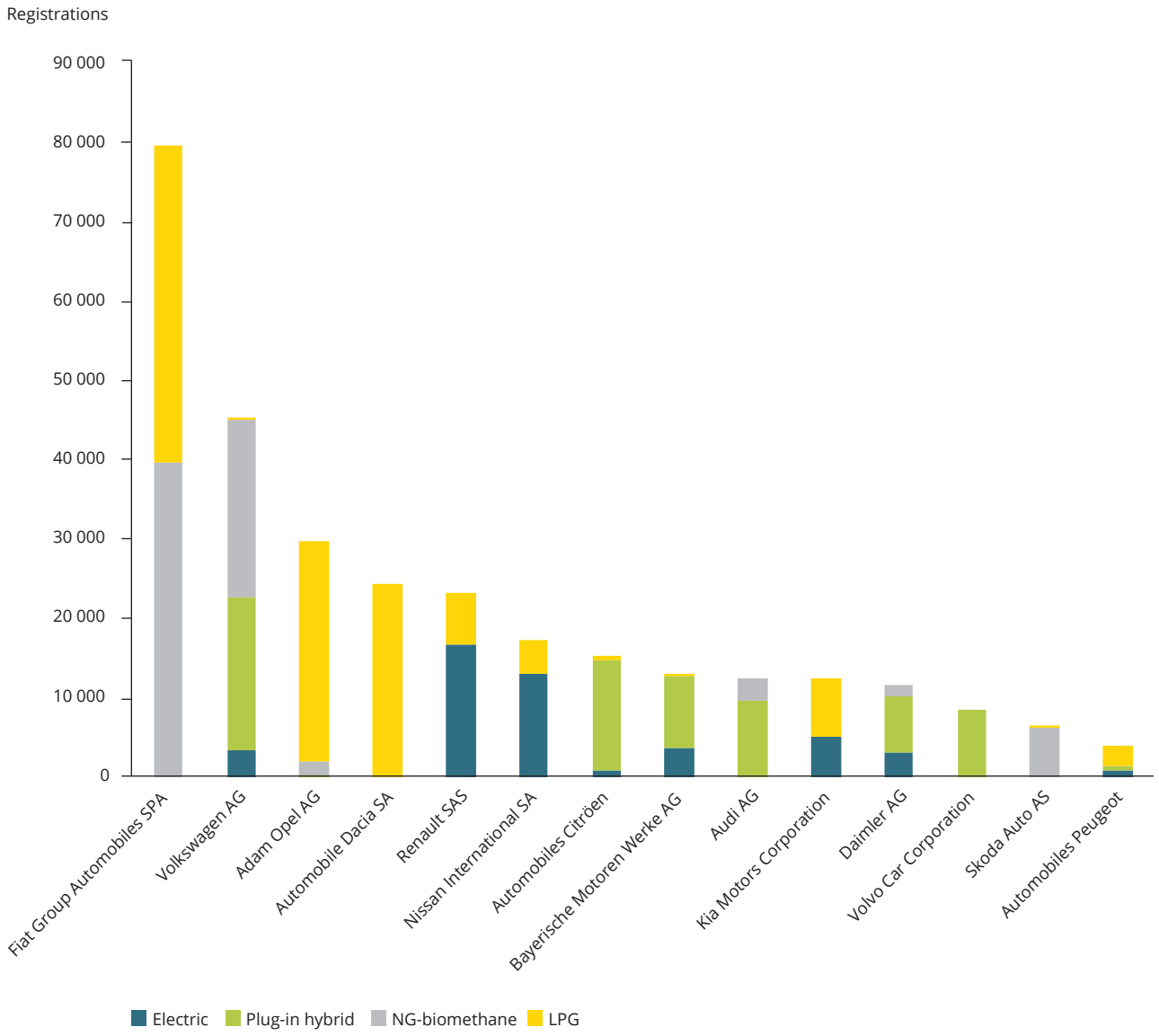
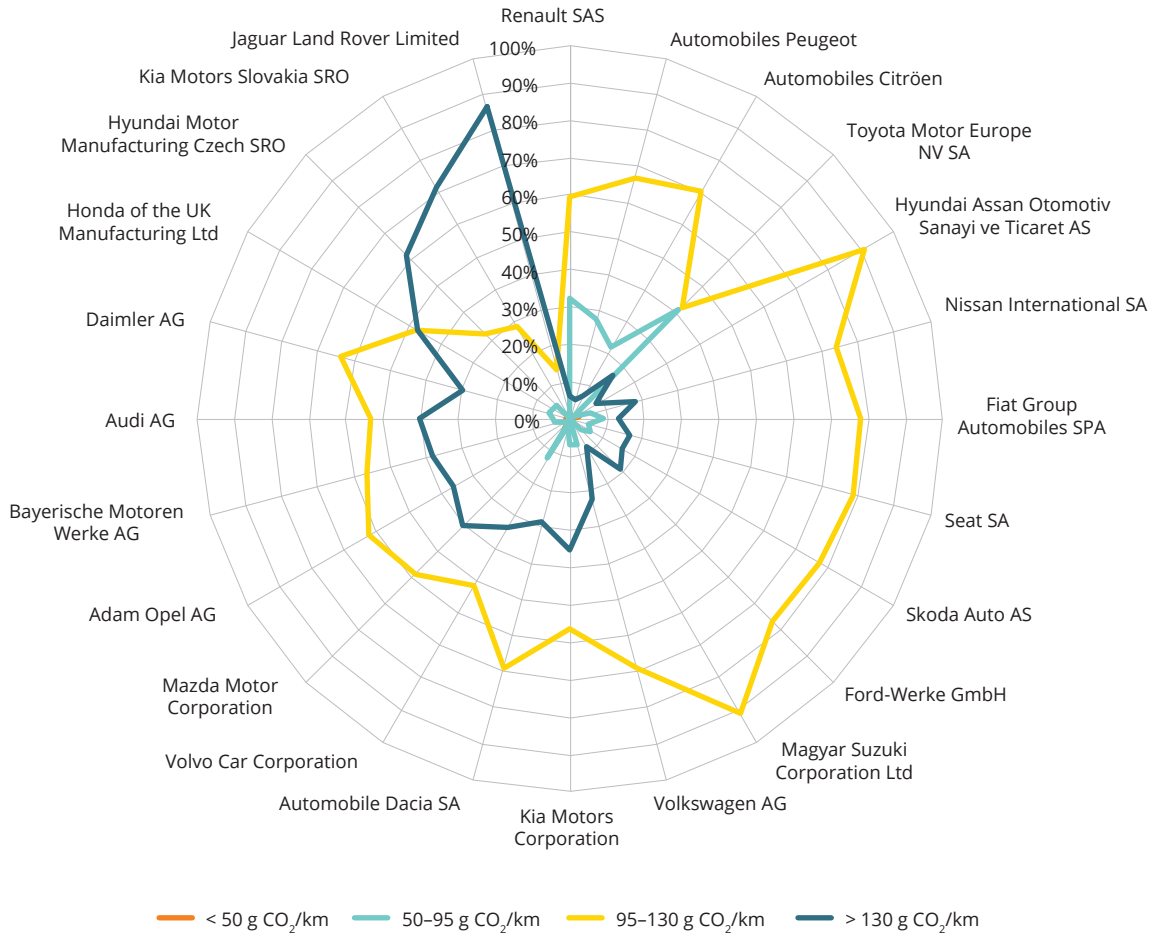


Figure 3.12 Percentage of registrations in different specific emission classes



3.6 Distance to the 2015 target

The distance of manufacturers to their specific emission targets is calculated by considering the average emissions of their entire new car fleet (no phase-in any more in 2015), while taking into account the modalities listed in Chapter 2 (super-credits, E85 credits and eco-innovations), as well as applicable derogations.

Based on their average CO_2 emissions in 2015, 49 manufacturers out of 92, representing 93 % of the total registrations in the EU, achieved their specific emission targets for the year 2015. Taking into account the pools, 71 manufacturers out of 92 achieved their targets.

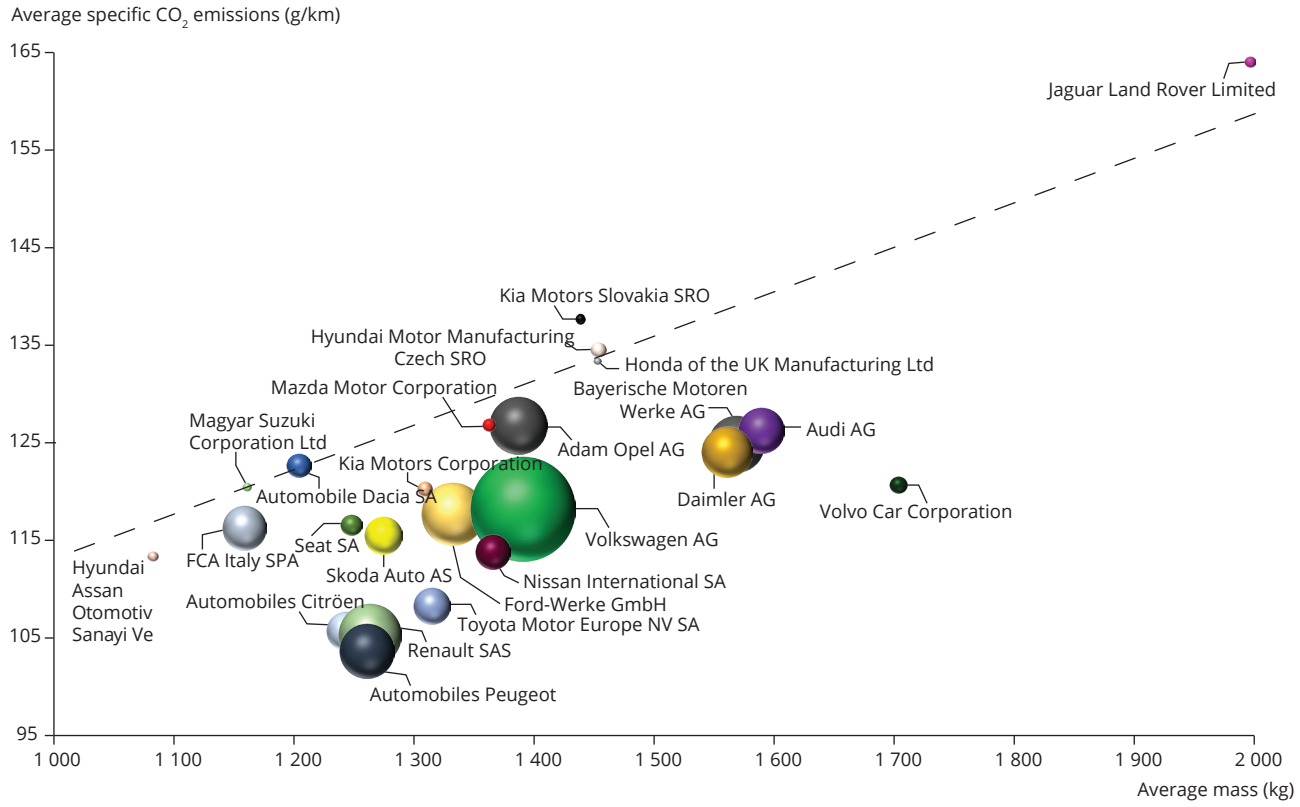
Some manufacturers fall within the scope of the de minimis threshold, according to which manufacturers with fewer than 1 000 registrations are exempt from achieving a specific emission target. In total, 24 manufacturers with fewer than 4 030 vehicles registered in 2015, i.e. fewer than 0.01 % of all registrations, benefited from the de minimis exemption. The data are available in Annex 2.

Figure 3.13 shows the distance to target for the manufacturers that registered more than 100 000 vehicles in 2015. Some manufacturers that may have missed their specific emission targets have met their obligations as members of a pool (see above for further details). This was the case for Kia Motors Slovakia (Kia pool), Hyundai Motor Manufacturing Czech SRO (Hyundai pool) and Dacia (Renault pool), which would not have met their specific emission targets, as their average specific emissions would have been 4.7, 0.79 and 0.36 g CO_2/km above the target. This also applies to Magyar Suzuki Corporation and Jaguar Land Rover. In addition to a pooling arrangement, the Suzuki pool and the Tata and Jaguar Land Rover pool benefited from niche derogations (see Chapter 2). For 2015 Mazda was also granted a niche derogation.

The distance to the target varies between 4.7 g CO_2/km above target for Kia Motors Slovakia and 24.5 g CO_2/km below target for Volvo. All relevant data are included in Annex 1.

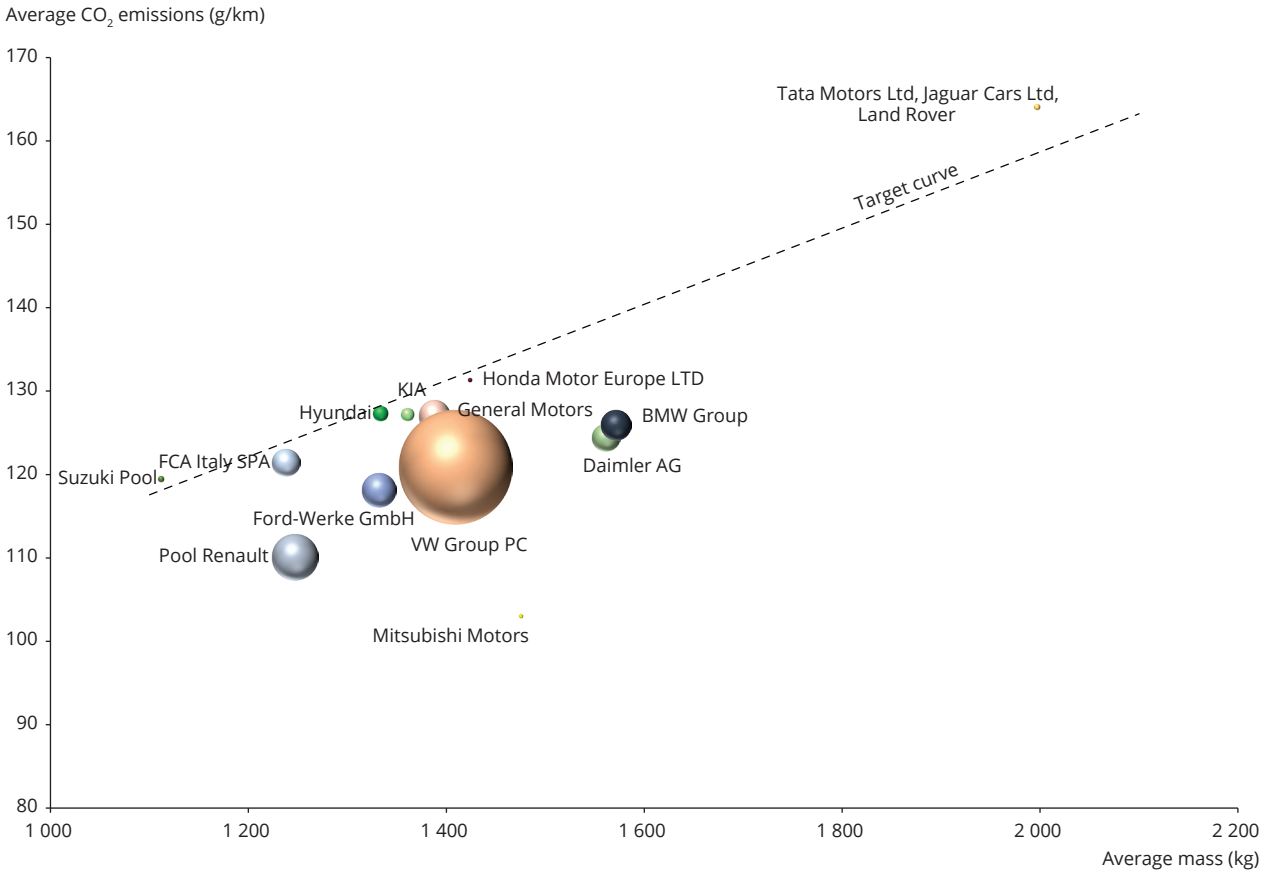
As explained in Chapter 2, the limit value curve implies that heavier cars are allowed higher emissions than lighter cars. As a result, the specific CO_2 emission targets range from 117 to 178 g CO_2/km.

Figure 3.13 Distance to 2015 target by individual manufacturers registering more than 100 000 vehicles per year



Note: The size of the bubble is proportional to the number of vehicles registered in the EU-28.

Figure 3.14 Distance to 2015 target by pools



Note: The size of the bubble is proportional to the number of vehicles registered in the EU-28.

The distance to target for pools of manufacturers is presented in Table 3.7. In 2015, all the pools respected their specific emission targets. However, the distributions of emissions are different in the different pools.

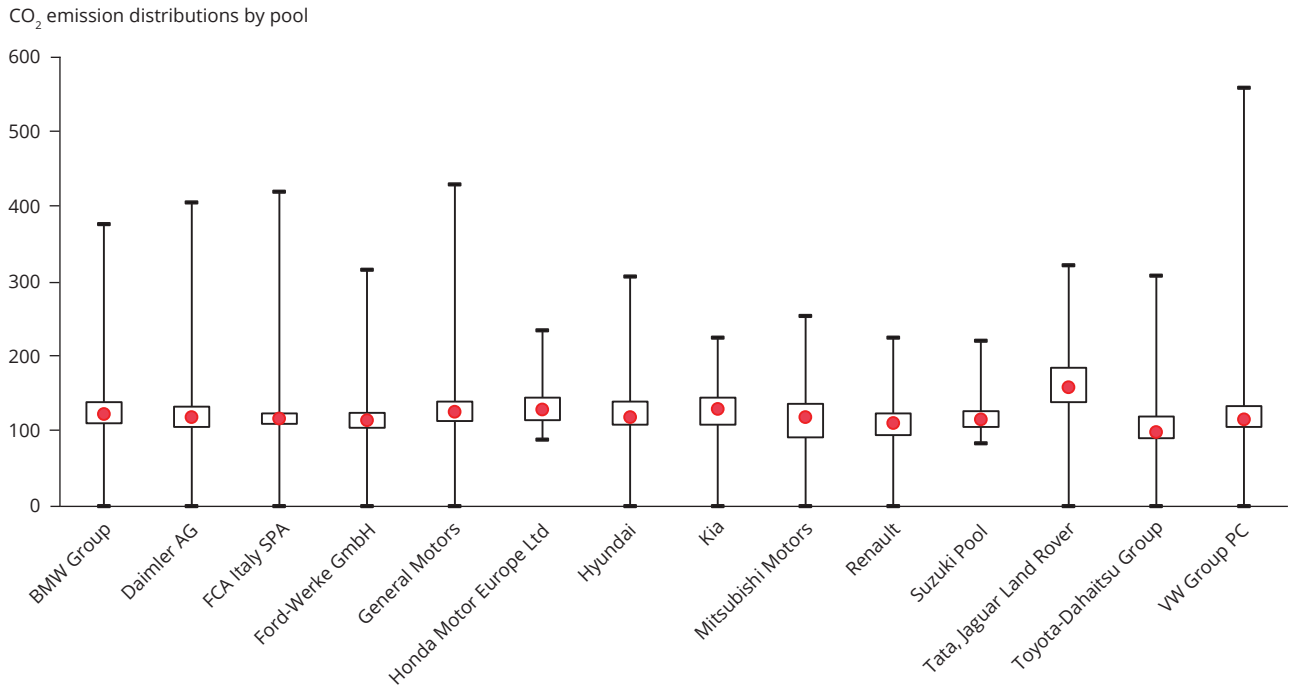
Figure 3.15 shows the emission distributions for all the pools: the lowest and highest CO_2 emissions (represented by the whiskers in the graph), the median emissions and the lower and upper quartiles (represented by the boxes in the graph) ([18]). Regarding pool data, the main findings are:

- FCA Italy SPA has a small interquartile range (14 g CO_2/km). This suggests that 50 % of the emission factors are included in a narrow range.
- Mitsubishi Motors and Tata Motors Ltd, Jaguar Cars Ltd, Land Rover have high interquartile ranges (45–46 g CO_2/km). This suggests a high variability of CO_2 emission factors inside the pool.
- Tata Motors Ltd, Jaguar Cars Ltd, Land Rover has high quartile values. This suggests that this pool has in general higher emissions than the other pools.

([18]) The lower quartile splits off the lowest 25 % of the data and the upper quartile splits off the highest 25 % of the data. Quartiles give an indication of the distribution of the values around the average. If the first quartile is far away from the median while the third quartile is closer to it, for example, it means that the data points that are smaller than the median are spread far apart while the data points that are greater than the median are closely packed together.

- The Renault and Suzuki pools have similar data distributions: the medians are all at the same level, the interquartile range is narrow, the minimum emissions (lower whisker ([19])) are very close to the first quartile and the maximum emissions (upper whisker) are relatively high. This suggests that 75 % of the emission factors are included in a narrow range.
- BMW, Daimler, FCA Italy, General Motors and Volkswagen Group have small interquartile ranges, but very high maximum emissions. This suggests that the variability of emission factors in these pools is particularly high and biased towards very high emission values (> 350 g CO_2/km).

Figure 3.15 CO_2 emission distributions by pool



Note: The graph is based on the CO_2 emission values. The diagram indicates the minimum, the maximum, the median and the lower and upper quartiles. The lower quartile splits the lowest 25 % of the emission data and the upper quartile splits the highest 25 % of the emission data.

([19]) The ends of the whiskers represent the minimum and the maximum of the distributions.

Table 3.7 Distance to target for the pools in 2015

Pool	Manufacturer	Average emissions (gCO_2/km)	Target (CO_2/km)	Distance to target (gCO_2/km)
	Bayerische Motoren Werke AG	125	139	– 14.1
	BMW M GmbH	198	148	49.6
	Rolls-Royce Motor Cars Ltd	331	181	150.1
BMW Group		126	139	– 13.2
	Daimler AG	124	139	– 14.5
	Mercedes-Amg GmbH	209	145	63.8
Daimler AG		124	139	– 14.2
	FCA US LLC	159	149	10.2
	FCA Italy SPA	116	120	– 3.9
	Alfa Romeo SPA	116	128	– 12.1
FCA Italy Spa		121	124	– 2.4
	Ford-Werke GmbH	118	128	– 10.5
	Ford Motor Company	252	146	105.9
	CNG-Technik GmbH	116	122	– 6.4
Ford-Werke GmbH		118	128	– 10.0
	Mitsubishi Motors Corporation MMC	105	142	– 37.4
	Mitsubishi Motors Europe BV MME	125	113	11.5
	Mitsubishi Motors Thailand Co Ltd Mmth	97	110	– 13.0
Mitsubishi Motors		103	135	– 31.7
	Chevrolet Italia SPA	132	131	0.9
	General Motors Company	282	154	127.5
	GM Korea Company	126	125	1.3
	Adam Opel AG	127	131	– 3.9
General Motors		127	131	– 3.7
	Honda Automobile China Co Ltd	125	119	5.2
	Honda Motor Co Ltd	120	126	– 5.9
	Honda of the UK Manufacturing Ltd	133	134	– 0.3
	Honda Turkiye AS	155	126	28.7
Honda Motor Europe Ltd		131	132	– 1.0
	Hyundai Motor Company	134	136	– 2.1
	Hyundai Assan Otomotiv Sanayi Ve Ticaret AS	114	117	– 3.1
	Hyundai Motor Manufacturing Czech SRO	135	134	0.8
	Hyundai Motor Europe GmbH	98	119	– 20.7
Hyundai		127	128	– 0.9
	Kia Motors Corporation	120	127	– 6.8
	Kia Motors Slovakia SRO	138	133	4.7
Kia		127	129	– 2.3
	Avtovaz JSC	202	124	78.0
	Lada France SAS	179	129	49.5
	Automobile Dacia SA	123	122	0.4
	Renault SAS	105	125	– 19.7
Renault		110	124	– 14.1
	Suzuki Motor Corporation	164	123	41.3
	Maruti Suzuki India Ltd	98	123	– 25.2
	Magyar Suzuki Corporation Ltd	120	123	– 2.6
	Suzuki Motor Thailand Co Ltd	96	123	– 26.8
Suzuki Pool		119	123	– 3.7
	Jaguar Land Rover Limited	164	178	– 14.0
	Tata Motors Limited	185	178	7.2
Tata Motors Ltd, Jaguar Cars Ltd, Land Rover		164	178	– 14.0
	Audi AG	126	140	– 13.7
	Audi Hungaria Motor KFT	143	131	11.4
	Bentley Motors Ltd	291	298	– 7.1
	Bugatti Automobiles SAS	542	161	380.9
	Automobili Lamborghini SPA	317	325	– 7.8
	Dr Ing Hcf Porsche AG	184	154	30.1
	Quattro GmbH	225	150	74.8
	Seat SA	117	124	– 7.7
	Skoda Auto AS	116	126	– 10.0
	Volkswagen AG	118	131	– 12.6
VW Group PC		121	132	– 10.8

3.7 Effect of super-credits

Regulation (EC) No 443/2009 gives an incentive to car manufacturers to produce vehicles with emissions below 50 g CO_2/km. As explained in Chapter 2, each of those cars is counted as 1.5 cars in 2015 for the calculation of the fleet average. After 2015, super-credits will not be applied until 2020.

Table 3.8 summarises the average emissions calculated when including or excluding the super-credits for the large manufacturers. The number of vehicles with emissions of less than 50 g/km increased by 200 % in the last year. However, the effect of super-credits on the average CO_2 emissions was rather limited by the low weighting factor in 2015. It is noted that, even when excluding the super-credits, all the large manufacturers, which met the target when including super-credits, achieved their 2015 targets. The effect of the super-credits on the average fleet emissions per manufacturer was less than 1.3 g CO_2/km.

Table 3.8 Performance of the manufacturers that registered more than 100 000 vehicles in 2015 including and excluding super-credit adjustments

Manufacturer	CO_2 specific emissions	Target	Distance to target	CO_2 specific emissions — no super credit	Distance to target — no super credit	Difference with or without super credit
Adam Opel AG	126.775	130.695	– 3.92	126.785	– 3.91	0.01
Audi AG	126.245	139.941	– 13.696	126.834	– 13.107	0.589
Automobile Dacia SA	122.694	122.337	0.357	122.716	0.379	0.022
Automobiles Citröen	105.713	124.141	– 18.428	105.768	– 18.373	0.055
Automobiles Peugeot	103.659	124.904	– 21.245	103.713	– 21.191	0.054
Bayerische Motoren Werke AG	124.883	138.988	– 14.105	125.545	– 13.443	0.662
Daimler AG	124.079	138.62	– 14.541	124.565	– 14.055	0.486
FCA Italy SPA	116.3	120.249	– 3.949	116.3	– 3.949	0
Ford-Werke GmbH	117.701	128.204	– 10.503	117.701	– 10.503	0
Honda of the UK Manufacturing Ltd	133.387	133.699	– 0.312	133.388	– 0.311	0.001
Hyundai Assan Otomotiv Sanayi ve Ticaret AS	113.524	116.604	– 3.08	113.525	– 3.079	0.001
Hyundai Motor Manufacturing Czech SRO	134.525	133.738	0.787	134.525	0.787	0
Jaguar Land Rover Limited	164.029	178.025	– 13.996	164.029	– 13.996	0
Kia Motors Corporation	120.295	127.138	– 6.843	121.59	– 5.548	1.295
Kia Motors Slovakia SRO	137.69	133.038	4.652	137.691	4.653	0.001
Magyar Suzuki Corporation Ltd	120.485	123.114	– 2.629	120.486	– 2.628	0.001
Mazda Motor Corporation	126.779	129.426	– 2.647	126.786	– 2.64	0.007
Nissan International SA	113.778	129.73	– 15.952	115.108	– 14.622	1.33
Renault SAS	105.304	125.023	– 19.719	106.191	– 18.832	0.887
Seat SA	116.577	124.324	– 7.747	116.577	– 7.747	0
Skoda Auto AS	115.511	125.552	– 10.041	115.511	– 10.041	0
Toyota Motor Europe NV SA	108.264	127.386	– 19.122	108.309	– 19.077	0.045
Volkswagen AG	118.259	130.864	– 12.605	118.849	– 12.015	0.59
Volvo Car Corporation	120.67	145.148	– 24.478	121.828	– 23.32	1.158

Note: If the difference is 0.000, the manufacturer does not produce cars emitting < 50 g CO_2/km.

3.8 Distance to the 2021 targets

Regulation No 333/2014 defines the modalities for reaching the 95 g/km target. Taking into account those modalities, it is possible to make an estimate of the emission reduction that manufacturers would have to achieve from 2015 on in order to reach their respective targets in 2021.

Some manufacturers are well on track to reach the 2021 target. For instance, Automobiles Peugeot, Renault SAS, Automobiles Citroën and Toyota are already very close to their 2021 targets: they need to reduce their average emissions by less than 16 g CO_2/km in the next 6 years (Figure 3.16).

Other manufacturers still have to make considerable progress to achieve their 2021 targets.

Figure 3.17 presents the progress of the manufacturers responsible for more than 500 000 vehicles a year in terms of annual percentage changes for two periods: 2000–2009 and 2009–2015. These rates are compared with the expected reductions for respecting the 2021 target set by the regulation.

For these manufacturers the rate of progress required from now till 2021 is in general lower than or comparable to the rate that has been achieved in the last 4 years, since Regulation (EU) No 443/2009 came into force. There are only four manufacturers for which the progress rates required in the 2015–2021 period are greater than in the previous years. The figure also shows that the highest improvements were achieved over the 2009–2015 period.

Figure 3.16 Comparison of past and future progress towards meeting the 2021 target

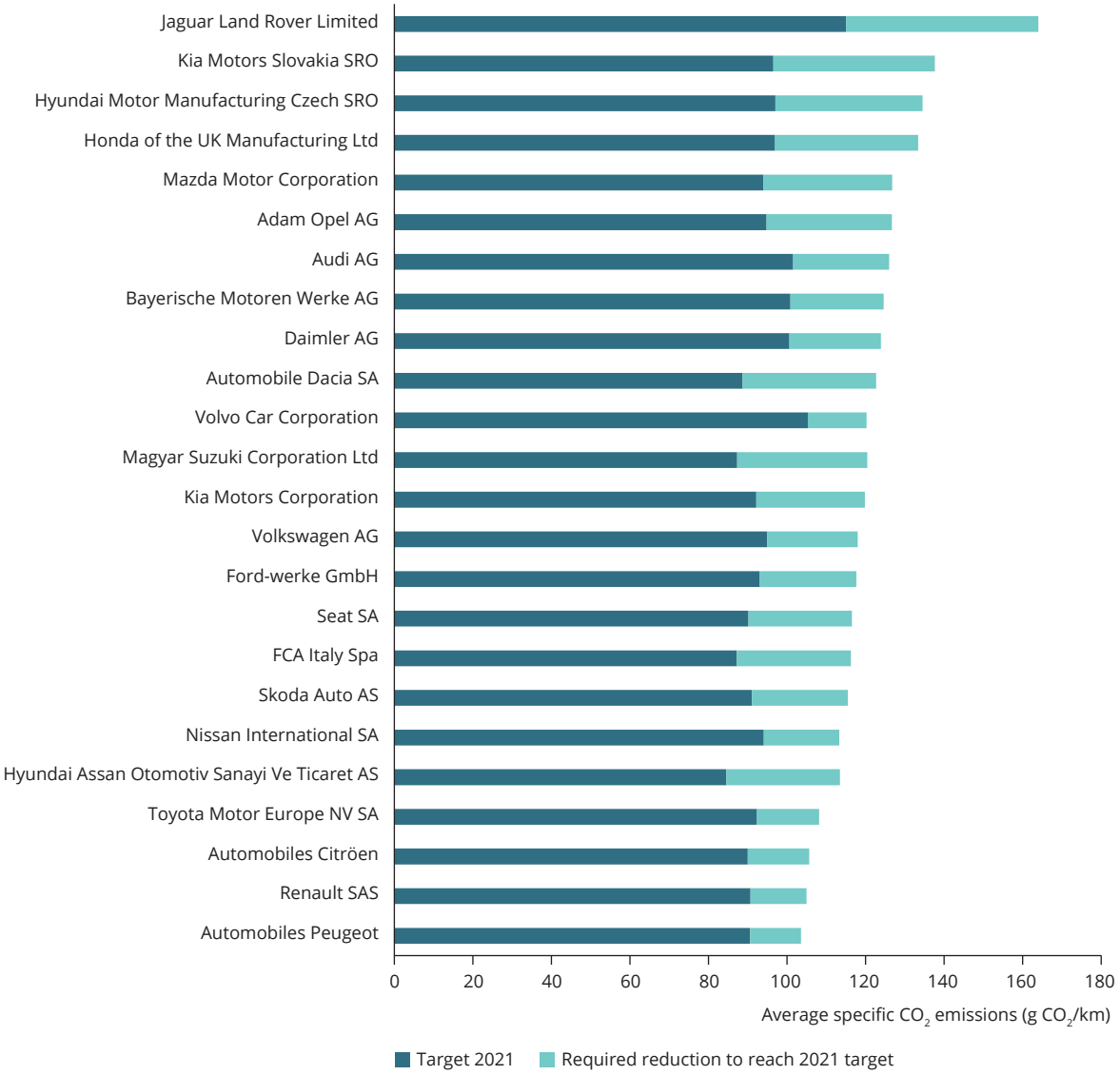
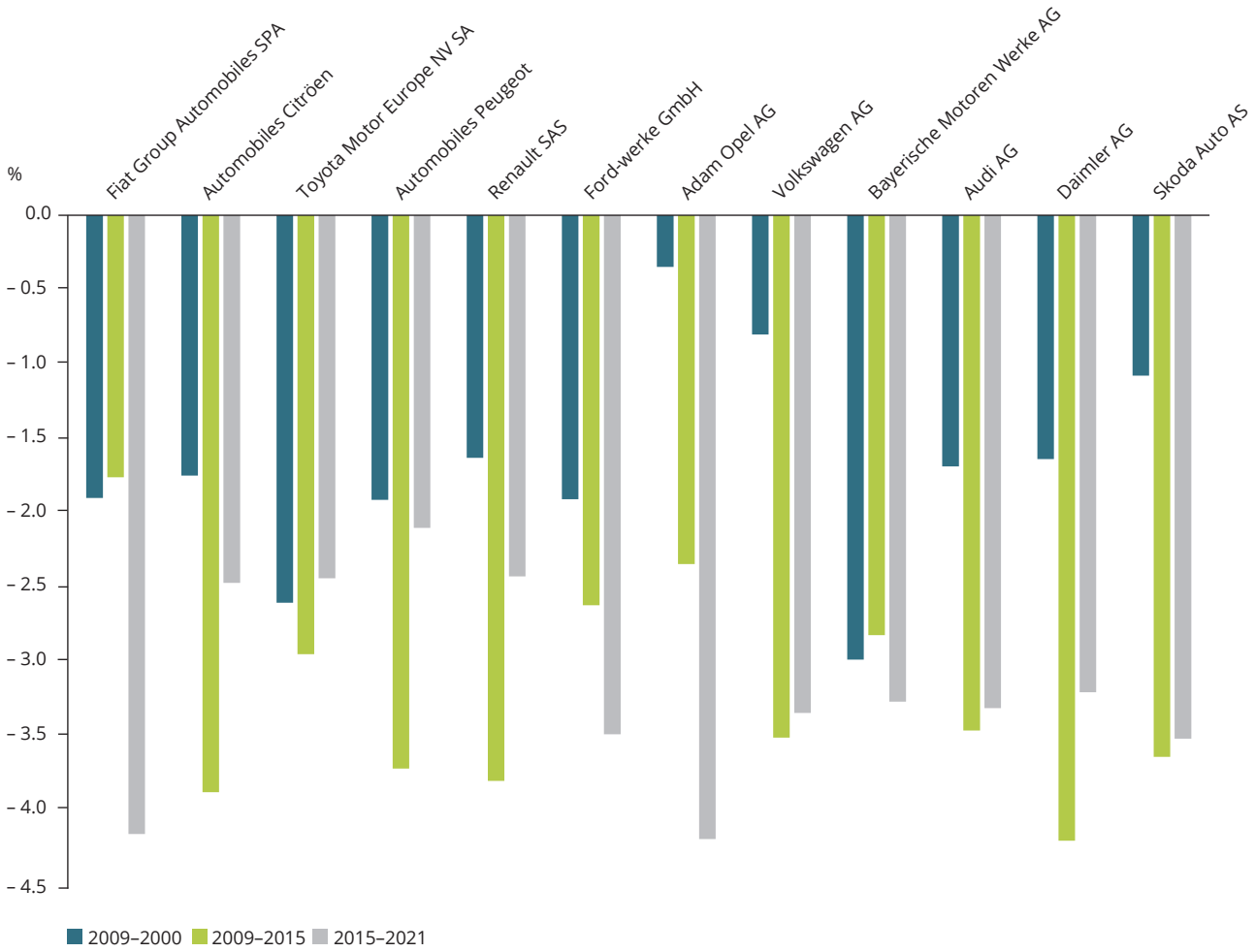


Figure 3.17 Comparison of past and future progress towards meeting the 2021 target



Note: Only manufacturers registering more than 500 000 vehicles per year in Europe.

3.9 Excess emission premiums

If a manufacturer's or a pool's average specific CO_2 emissions exceed the specific emission target, Regulation (EC) No 443/2009 requires the payment of an excess emission premium. This premium is calculated by multiplying the following three elements:

- the distance to the emission target in a given year (in g CO_2/km), i.e. the excess emissions;
- the number of vehicles registered by the manufacturer during that year;
- the premium level included in Table 3.9.

The premium amounts to EUR 5 for the first gram of CO_2/km of exceedance, EUR 15 for the second, EUR 25 for the third and EUR 95 for each subsequent gram. A higher distance to the target therefore implies a higher excess premium per gram of CO_2/km emitted.

For example, if a manufacturer registers 100 000 vehicles in the EU, the formula to be used for calculating the excess emission premium varies depending on the distance to the target as follows:

- if the distance to the target is 0.5 g CO_2/km, the first formula in Table 3.9 applies and the excess emission premium = 0.5 * 5 * 100 000 = EUR 250 000;

- if the distance to the target is 1.5 g CO_2/km, the second formula in Table 3.9 applies and the excess emission premium = (1 * 5 + (1.5 – 1) * 15) * 100 000 = EUR 1 250 000;
- if the distance to the target is 2.5 g CO_2/km, the third formula in Table 3.9 applies and the excess emission premium = (1 * 5 + 1 * 15 + (2.5 – 2) * 25) * 100 000 = EUR 3 250 000;
- if the distance to the target is 3.5 g CO_2/km, the fourth formula in Table 3.9 applies and the excess emission premium = (1 * 5 + 1 * 15 + 1 * 25 + (3.5 – 3) * 95) * 100 000 = EUR 9 250 000.

In 2015 only two manufacturers will be required to pay the excess emission premium: Aston Martin Lagonda and Ferrari (see Annex 2).

Table 3.9 Coefficients to be used in the formula for calculating excess emissions premium

Excess emissions (g CO_2/km)	Fine (EUR)				Number of vehicles	Formula for calculating excess emission premium (EUR)
	5	15	25	95		
0–1	(EE)	-	-	-	NV	((EE) * 5)*NV
1–2	1	(EE — 1)	-	-	NV	(1*5 + (EE-1)*15)*NV
2–3	1	1	(EE — 2)	-	NV	(1*5 + 1*15 + (EE-2)*25)*NV
> 3	1	1	1	(EE — 3)	NV	(1*5 + 1*15 + 1*25 + (EE-3)*95)*NV

Note: EE, distance to target or excess emission; NV, number of vehicles registered.

4 Light commercial vehicles (vans)

4.1 Number of new registrations

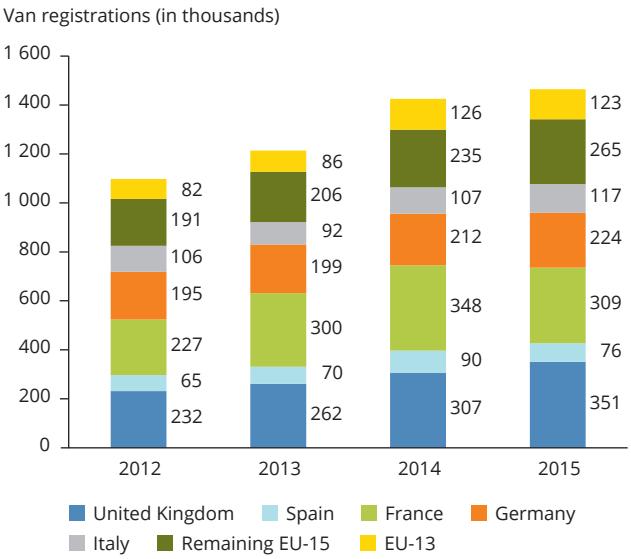
In 2015, there were around 1.5 million new light commercial vehicle registrations in the EU-28 (around 10 % of the total light-duty vehicles ([20])). This includes around 4 900 IVAs ([21]), 9 300 vehicles approved under NSS rules, 2 300 unknown ([22]) vehicles and 3 660 unidentified ([23]) vehicles.

It should be noted that there are uncertainties in both the 2012 and 2013 data sets mainly due to the difficulty experienced by Member States in the monitoring of multi-stage vans ([24]). These uncertainties were reduced by the new monitoring system, based on vehicle identification numbers, in place from 2015 with effect for the 2014 data collection.

For almost all Member States, the number of registrations increased in 2015 from 2014, except for Poland (– 23 %), Spain (– 6 %), France (– 11 %) and Latvia (– 6 %). The biggest increases in new vehicle registrations were observed in Croatia (+ 54 %), Ireland (+ 41 %) and Estonia (+ 36 %).

The largest markets in Europe with regard to the new registrations of vans are the United Kingdom (24 %), France (21 %) and Germany (15 %) (Figure 4.1). The EU-15 still accounts for the vast majority of registrations of new light commercial vehicles in the EU, with 91.6 % of the total registrations. Compared with 2014, the number of vehicles registered in the EU-13 has decreased by 4.5 %, while the number of newly registered vehicles in the EU-15 has increased by 2.6 %.

Figure 4.1 Number of light commercial vehicles registered in the EU-28 between 2012 and 2015



Note: In 2012, France did not provide information on its entire fleet of vans because of an update of the registration system.

4.2 EU statistics

The average CO_2 emissions from the new light commercial vehicle fleet in the EU-28 in 2015 were 168.3 g CO_2/km, a reduction of 0.8 g CO_2/km from the previous year (169.1 g CO_2/km in 2014).

([20]) Light-duty vehicles include cars and vans.
([21]) IVAs are applicable to vehicles imported from third countries or 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.
([22]) Unknown vehicles are vehicles for which the entries for the manufacturer's name are missing in the database. Those vehicles cannot be attributed to a manufacturer and are therefore not included in the provisional calculation of targets.
([23]) Unidentified vehicles are vehicles for which the entries for the mass in running order or the CO_2 emissions are missing in the database. Unidentified vehicles were not considered for the calculation of the average specific emissions or the specific emission targets for manufacturers.
([24]) Multi-stage vans are vehicles built in two or more stages. An incomplete vehicle, such as a chassis-cab or a cut-away chassis, built by one manufacturer, is completed by another manufacturer, which adds work-performing or cargo-carrying components to the vehicle (e.g. box truck, dump truck).

Table 4.1 **Average CO_2 emissions (g CO_2/km) from light commercial vehicles by region**

	2012	2013	2014	2015
EU-28	180.2	173.3	169.1	168.3
EU-15	180.0	172.9	168.8	167.9
EU-13	182.5	178.5	172.2	172.8

Note: Croatia provided data from 2014, whereas for 2012 and 2013, data for Croatia were not included in the calculations.

Table 4.2 **Percentage of fuel type in light commercial vehicles (EU)**

	2012	2013	2014	2015
Diesel	96.5	96.5	96.8	96.7
Petrol	1.8	2.0	2.0	1.8
AFV	1.7	1.5	1.2	1.5

Note: The geographical scope of the data changes over time from EU-27 to EU-28; see Annex 1 for details.

In 2015, the average new light commercial vehicle in the EU-15 emitted 4.9 g CO_2/km less than the average newly registered vehicle in the EU-13, a difference greater by 1.5 g CO_2/km than in 2014. In fact, while the average new light commercial vehicle in the EU-15 emitted 0.84 g CO_2/km less than the average newly registered vehicle in 2014 (Table 4.1), in the EU-13 it emitted 0.58 g CO_2/km more.

Diesel vehicles accounted for more than 96.7 % of the total new van registrations in 2015 (Table 4.2). The average CO_2 emissions of diesel vehicles decreased by 0.7 g CO_2/km, while the average emissions of petrol vehicles increased by 3.2 g CO_2/km, compared with 2014 (Table 4.2 and Figure 4.2). In 2015 the average diesel vehicle emitted 169.8 g CO_2/km, about 17.6 g CO_2/km more than the average petrol vehicle (in 2014 the difference between diesel and petrol vehicles was 21.5 g CO_2/km). It should be noted that this difference in the average CO_2 emissions between diesel and petrol vehicles is due to the difference in their average mass. Diesel vehicles are generally bigger, and hence heavier (1 794 kg on average), than petrol vehicles (1 289 kg on average). There are also differences in terms of engine capacity and engine power: 1 907 cm^3 and 85.9 kWh for diesel, 1 505 cm^3 and 77.6 KWh for petrol vehicles. It has also to be noted that the proportion of petrol vehicles is particularly small: less than 2 %.

There were about 7 850 newly registered electric vehicles, compared with 6 700 registered in 2014 (6 000 in 2013). Of the other types of AFVs, LPG and NG are the most sold vehicles (around 3 500 and 8 000 vehicles registered respectively).

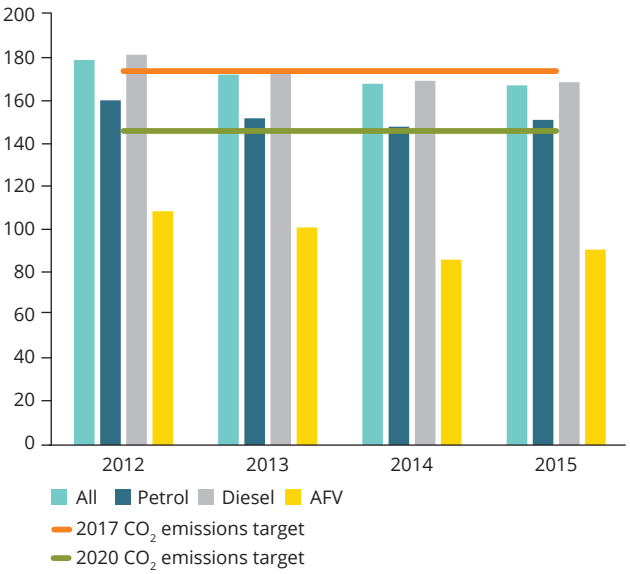
Table 4.3 **Average CO_2 emissions (g CO_2/km) from light commercial vehicles by fuel (EU)**

	2012	2013	2014	2015
All fuels	180.2	173.3	169.1	168.3
Petrol	161.3	153.0	149.0	152.2
Diesel	182.7	175.2	170.5	169.8
AFV	109.4	101.8	86.8	91.4

Note: [a] For the calculation of the average CO_2 emissions of AFVs, battery electric, LPG, NG, E85, biodiesel and plug-in vehicles are included.

The geographical scope of the data changes over time from EU-27 to EU-28; see Annex 1 for details.

Figure 4.2 **Average CO_2 emissions (g CO_2/km) from new vans by fuel (EU)**



4.3 Member States comparison

With the exception of Poland, Malta, France and Ireland, in which the average CO_2 emissions in 2015 increased from 2014, in all other countries CO_2 emissions from light commercial vehicles fell in 2015 (Figure 4.3). Twenty Member States had average CO_2 specific emissions from newly registered vans already below the 175 g CO_2/km EU target set for 2017 ([25]) (Figure 4.4). Ten of these had emission values below 160 g CO_2/km. There is a clear correlation between the average emissions and the average mass by Member States: higher average mass values correspond to higher average emissions. For some Member States (Bulgaria and Portugal), the low average emissions are mainly related to the registration of relatively small vehicles: the average mass of the new fleet of these countries was below 1 600 kg. Portugal had registered vans with the lowest average engine capacity in Europe and one of the lowest average engine powers (third position). Malta had the lowest average engine power value, followed by Spain, Portugal, Croatia and France. There were only three Member States with average CO_2 emissions higher than 180 g CO_2/km: the Czech Republic, Germany and Slovakia. Their fleets also had high average mass (> 1 890 kg), engine size (> 2 000 cm^3) and power (> 90 kW).

For light commercial vehicles, the percentage of diesel vehicles is very high. In some Member states more than 99.5 % of the fleet is fuelled with diesel: Ireland, Portugal and the United Kingdom. For the majority of Member States (exceptions are Bulgaria, Denmark, Estonia and Poland), the proportion of diesel vehicles is above 90 %.

Because of their market size, the Member States with higher numbers of vehicle registrations — France, Germany, Italy, Spain and the United Kingdom — are the major contributors to the total reductions in EU-28 CO_2 emissions from light commercial vehicles. Of these five, France, Italy and Spain have the lowest average CO_2 emissions. In Italy, this was for a combination of reasons. Italy, similar to Croatia, Spain and Portugal, had one of the lowest average engine capacity values (1 762 cm^3, the fourth lowest among the EU Member States). In addition to this, Italy had registered the most AFVs among EU-28 (6.3 % of all new registrations in Italy). The latter are mainly NG vehicles (70 % of all AFVs registrations in Italy) with an average value of 141.5 g CO_2/km and LPG vehicles (24 % of all AFVs registrations) with an average value of 145.1 g CO_2/km. In France, it seems that the small diesel fleet (156.8 g CO_2/km with an average mass of 1 681 kg) was the main reason for the low CO_2 emissions. In addition, France had a relatively high percentage of battery electric vans (1.3 % of vehicles registered in France), with zero emissions. Like France, Spain had a very small diesel fleet (1 662 kg) with very low CO_2 emissions (155.5 g CO_2/km).

4.4 Average specific CO_2 emissions per manufacturer in 2015

Table 4.4 presents data (number of registrations, average mass and average emissions) for large van manufacturers that registered more than 10 000 vehicles in 2015. In total they account for 98.1 % of the van fleet. The same table also presents the average emissions of those manufacturers in 2012–2015.

In 2015 the most popular brand was Renault, with 15 % of the vans registered in the EU-28. Ford-Werke GmbH and Volkswagen AG followed with 14 % and 12 % each.

Seven manufacturers, representing almost 65.3 % of the European new van fleet, had average emissions lower than 175 g CO_2/km: Automobile Dacia SA, Renault, Automobiles Citroën, Automobiles Peugeot, Fiat Group Automobiles SPA, Adam Opel AG and Ford-Werke GmbH. The first six of these manufacturers also had the lowest average mass in the group. The average emissions for the large manufacturers are in the range of 133–268 g CO_2/km. Average mass values are in the range of 1 281–2 293 kg.

For the third year in a row, Automobile Dacia SA achieved the lowest average CO_2 emissions (133 g CO_2/km), and like the previous year it had the lowest average mass (1 281 kg). However, the emission level of its fleet is comparable to that of the previous year.

The next three best-performing manufacturers had similar emission levels, around 150 g CO_2/km. Among them, Renault decreased emissions by 1.0 g CO_2/km in the last year, while for the others increases in emissions of 1.7 and 4.2 g CO_2/km were observed in the same period. For all of them an increase of average mass (50 kg on average) has been observed in the last year. The main market of these manufacturers is France (34–37 % of their registrations). Part of the reason for the emissions and mass variations of these manufacturers was the regulatory changes in France.

([25]) Regulation (EU) No 510/2011 sets an average emission target of 175 g CO_2/km by 2017 for the new light commercial vehicles registered in the EU as a whole.

Figure 4.3 **Absolute reduction and relative reduction in specific emissions by Member State between 2014 and 2015**

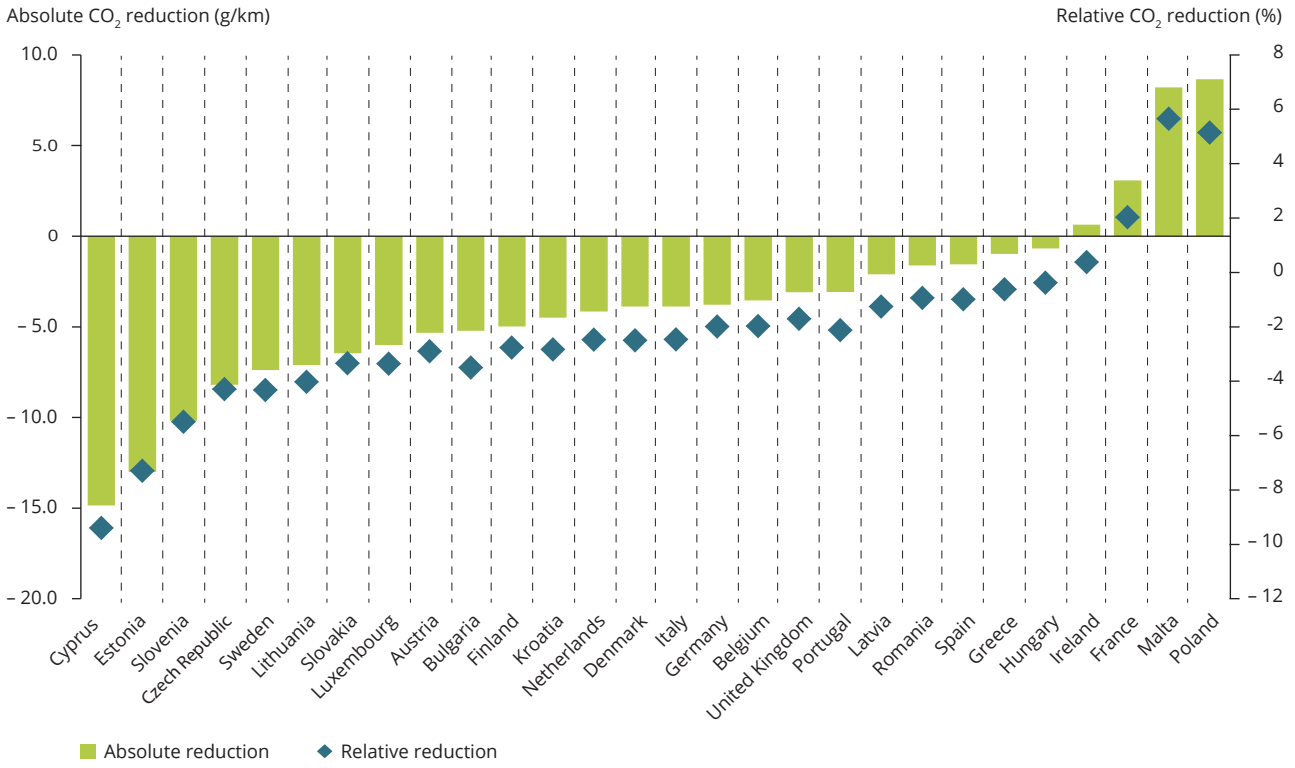
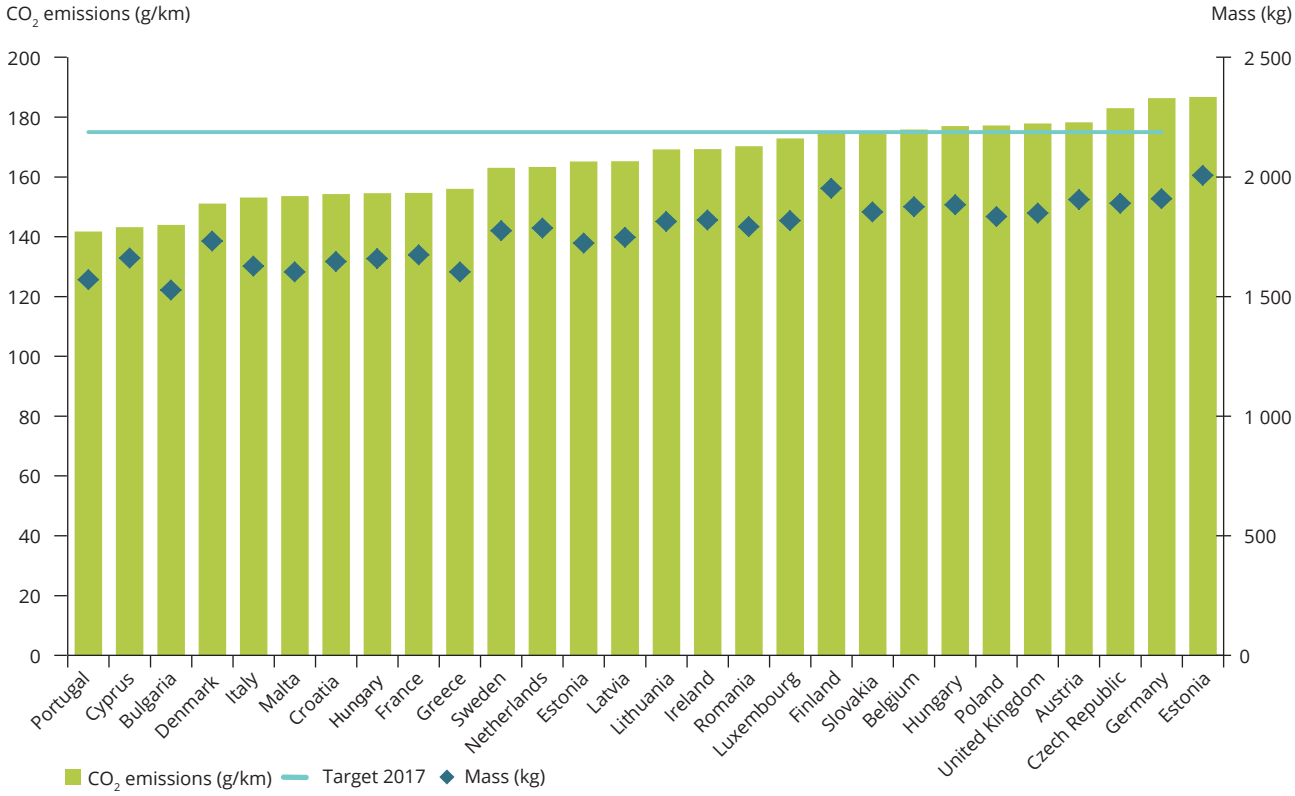


Figure 4.4 **Average CO_2 emissions and average mass by EU Member State in 2015**



Note: 2017 target is the target for the EU as a whole.

Companies can no longer register company cars as light commercial vehicles, as the technical classifications used for vehicle registrations were altered. As a result the percentage of lower-emitting vehicles with small masses in the total number of newly registered vans in France has decreased.

Over the last 4 years, the Fiat Group has not improved its performance: the average emissions have been constantly around 157–158 g CO_2/km.

Half of the manufacturers in this group reduced their average emission levels in 2015 compared with 2014. The largest reductions in average emissions were achieved by Mitsubishi Motors Thailand (– 11.8 g CO_2/km), Adam Opel (– 11.7 g CO_2/km) and Daimler (– 10.3 g CO_2/km). Over the 4 years following 2011, when the car emission legislation came into force, Daimler AG, Renault and Nissan recorded average decreases in emissions of 29.4 g, 22.8 g and 22.2 g CO_2/km respectively. These are the greatest decreases among the largest manufacturers.

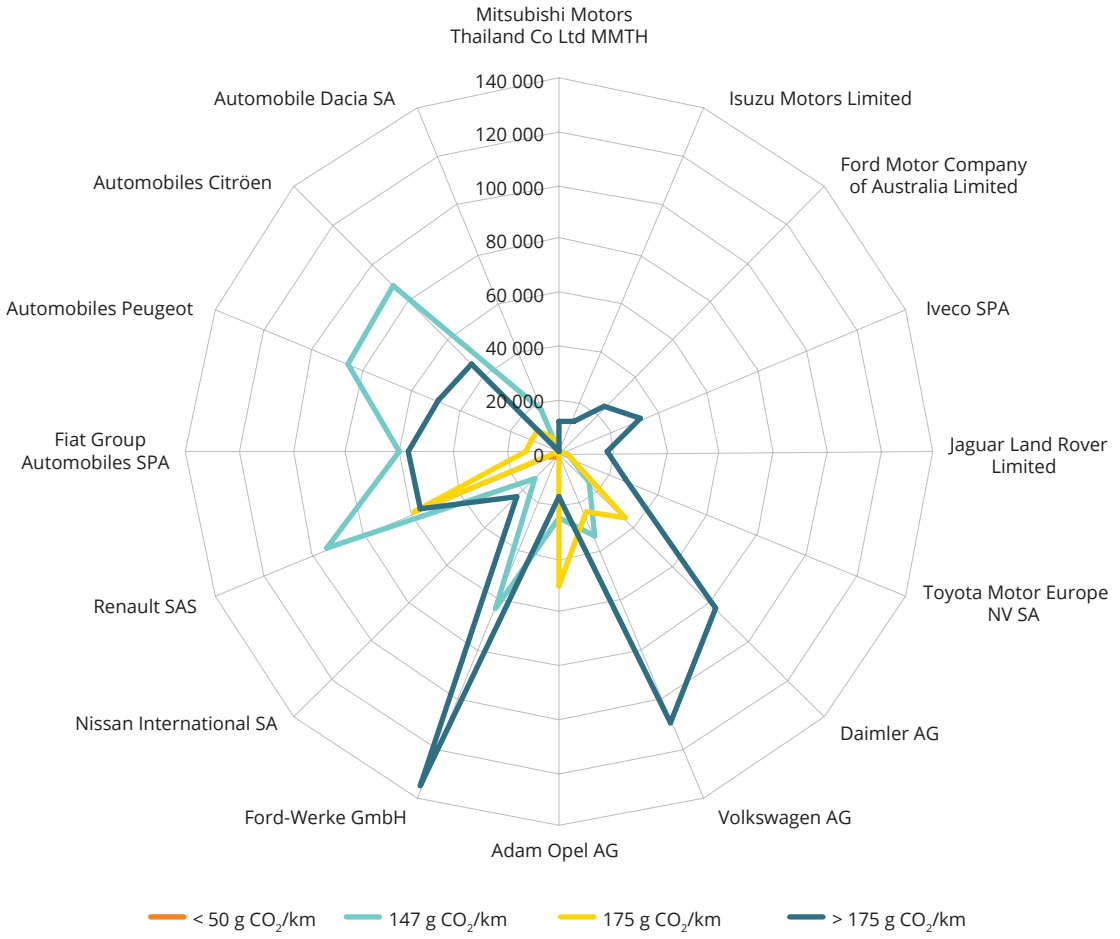
The distribution of registrations over different emission classes (Figure 4.5) shows that the fleet composition is very different among manufacturers. The low-emitting vehicles (< 50 g CO_2/km) represent a very small percentage for the large majority of the manufacturers: only for Renault and Nissan the proportions of these vehicles are around 2 % and 6 % respectively. For 3 manufacturers (Automobile Dacia SA, Automobiles Peugeot and Automobiles Citroën), the percentage of vehicles emitting less than 147 g CO_2/km is higher than 50 %. For Renault SAS and Fiat Group, the most frequent class is 50–147 g CO_2/km. For Adam Opel, vehicles emitting between 147 and 175 g CO_2/km are the most registered. For all the other manufacturers, most vehicle emit more than 175 g CO_2/km.

Table 4.4 Main statistics for large van manufacturers (more than 10 000 vehicle registrations per year)

Manufacturer	Registrations 2015	Average mass (kg) 2015	Average CO_2 emissions (g CO_2/km)			
			2015	2014	2013	2012
Automobile Dacia SA	23 348	1 281	133	132	132	145
Renault SAS	214 371	1 665	148	149	152	171
Automobiles Citröen	145 781	1 594	150	148	153	158
Automobiles Peugeot	147 245	1 609	151	147	154	159
Fiat Group Automobiles SPA	130 737	1 694	158	158	157	157
Adam Opel AG	91 914	1 748	161	173	178	178
Ford-Werke GmbH	199 794	1 880	171	175	189	188
Nissan International SA	39 779	1 838	176	184	192	199
Volkswagen AG	168 452	1 856	181	180	180	185
Toyota Motor Europe NV SA	32 767	1 910	188	193	191	202
Daimler AG	133 590	2 100	189	200	205	219
Mitsubishi Motors Thailand Co Ltd MMTH	15 226	1 949	195	207	207	210
Isuzu Motors Limited	12 765	2 072	201	200	203	212
Iveco SPA	32 711	2 293	219	228	224	230
Ford Motor Company of Australia Limited	23 786	2 207	236	228	227	228
Jaguar Land Rover Limited	18 466	2 044	268	267	276	

Note: In 2012, Jaguar and Land Rover appeared as two separate manufacturers.

Figure 4.5 Number of registrations over different specific emission classes



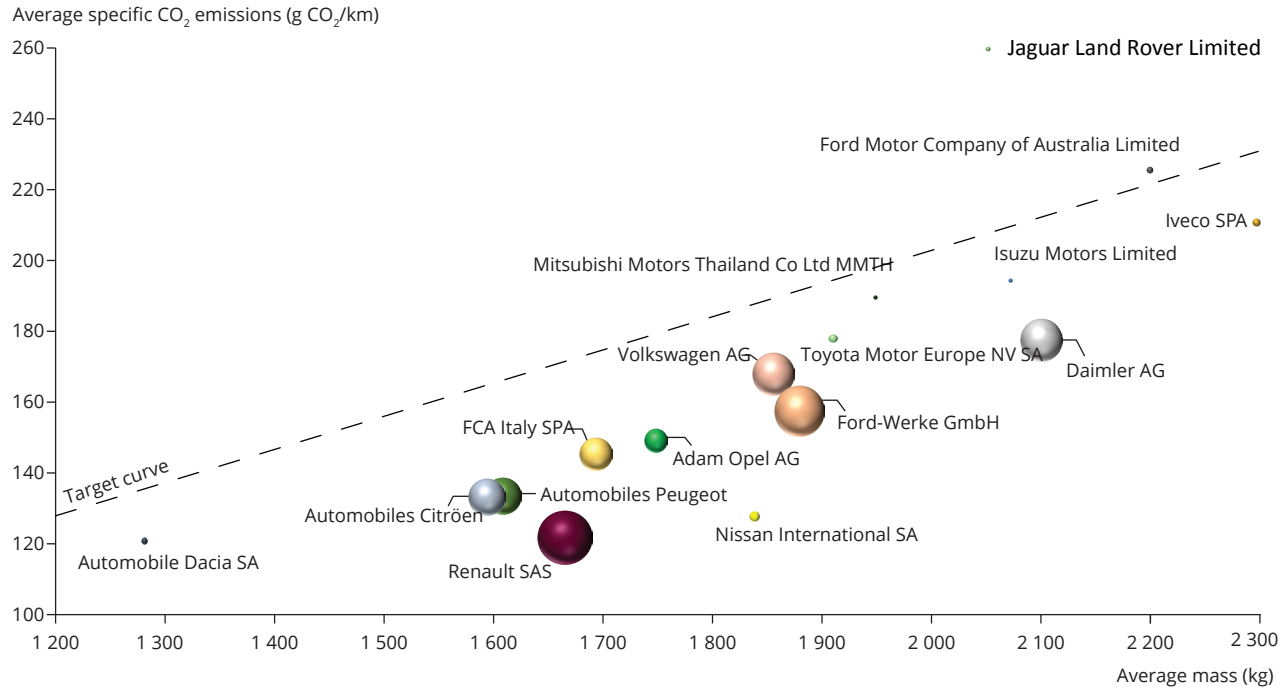
4.5 Distance to the 2015 target

The distance of the manufacturers to their specific emission targets is calculated by taking into account the modalities listed in Chapter 2 (i.e. phase in, super-credits, E85 extra credits and eco-innovations).

Based on their average CO_2 emissions in 2015, 15 out of the 16 larger manufacturers, representing about 98.1 % of the total registrations in the EU, achieved their specific emission targets for the year 2015. One manufacturers (Ford Motor Australia), which may have missed its specific emission target, has met its obligations as member of a pool (see above for further details). Jaguar Land Rover was granted a derogation target, which it met.

Only a small number of the remaining manufacturers did not meet their specific emission targets in 2015. These are all small-volume manufacturers with fewer than 1 000 registrations. Some of the companies concerned applied for a pool in 2015, or fall within the scope of the *de minimis* threshold, according to which manufacturers with fewer than 1 000 registrations will be exempt from achieving a specific emission target. In total, nine manufacturers with fewer than 1 560 vehicles registered in 2015 benefited from the *de minimis* exemption. The data are available in Annex 2. Figure 4.6 graphically illustrates the distance to target for the 15 manufacturers with more than 10 000 new registered vehicles in 2015.

Figure 4.6 Distance to 2015 target by individual manufacturers (only manufacturers registering > 10 000 vehicles per year in Europe)



Note: The size of the bubble is proportional to the number of vehicles registered in Europe.

The distance to target for the eight pools of manufacturers is presented in Table 4.5. In 2015, all the pools of manufacturers achieved their specific emission targets. A derogation target has been granted for Mitsubishi Motors.

4.6 Distance to the 2017 targets

The distance of the largest manufacturers (i.e. manufacturers registering more than 10 000 vehicles per year) to their 2017 targets is calculated based on the 2015 CO_2 emission data.

Progress towards the target for 2017 is calculated on the basis of the modalities summarised in Chapter 2. A different set of modalities is applied as follows: for 2017, the calculation includes 100 % of the vehicle fleet, and manufacturers receive super-credits of 1.5 for vehicles emitting less than 50 g CO_2/km. Manufacturers have 2 more years to further reduce CO_2 emissions and ensure compliance with their targets in 2017. In 2015, among the 16 large manufacturers, 15 already complied with their 2017 targets.

Some manufacturers appear well on their way to reaching the 2020 target. For instance, Daimler AG, Renault SAS, Ford Werke GmbH and Adam Opel are already very close to their 2020 targets: they need to reduce their average emissions by less than 15 g CO_2/km in the next 5 years. Other manufacturers still have to make significant progress to achieve their 2020 targets (Figure 4.7).

Figure 4.8 presents the progress of the manufacturers in terms of annual percentage changes for two periods: 2012–2015 and 2015–2020. These rates are compared with the expected reductions for respecting the 2020 target set by the regulation.

For these manufacturers the rate of progress required from now till 2021 is in general lower than or comparable to the rate that has been achieved in the last 4 years, since Regulation (EU) No 443/2009 came into force. There are only three manufacturers for which the progress rates in the 2015–2021 period are greater than in the previous years. The figure also shows that the highest improvements were achieved over the 2009–2015 period.

Table 4.5 Distance to target for the pools in 2015

Pool	Manufacturer	Specific CO_2 emissions (g CO_2/km)	Target (g CO_2/km)	Distance to target (g CO_2/km)
	Daimler AG	178	212	– 34
	Mitsubishi Fuso Truck & Bus Corporation	236	265	– 29
	Mitsubishi Fuso Truck Europe SA	235	276	– 41
	MFTBC	236	264	– 28
Daimler		178	212	– 34
	FCA US LLC	197	207	– 10
	FCA Italy SPA	145	174	– 28
FCA Italy SPA		146	174	– 28
	CNG-Technik GmbH	119	155	– 37
	Ford Motor Company of Australia Limited	225	222	3.2
	Ford Motor Company	187	216	– 29
	Ford-Werke GmbH	157	191	– 34
Ford-Werke GmbH		162	194	– 32
	General Motors Company	280	257	23
	Adam Opel AG	149	179	– 30
General Motors		149	179	– 30
	Kia Motors Corporation	111	142	– 31
	Kia Motors Slovakia SRO	117	152	– 34
Kia		113	146	– 32
	Mitsubishi Motors Corporation MMC	162	210	– 48
	Mitsubishi Motors Thailand Co Ltd MMTH	190	210	– 20
Mitsubishi Motors		188	210	– 22
	Avtovaz JSC	209	137	73
	Automobile Dacia SA	121	135	– 15
	Renault SAS	122	171	– 49
Renault		122	168	– 46
	Audi AG	128	178	– 50
	Dr Ing HCF Porsche AG	181	216	– 35
	Quattro GmbH	223	205	18
	Seat SA	99	127	– 28
	Skoda Auto AS	111	133	– 22
	Volkswagen AG	168	189	– 21
Volkswagen Group LCV		165	187	– 22

Figure 4.7 Van manufacturers' progress towards meeting the 2020 target

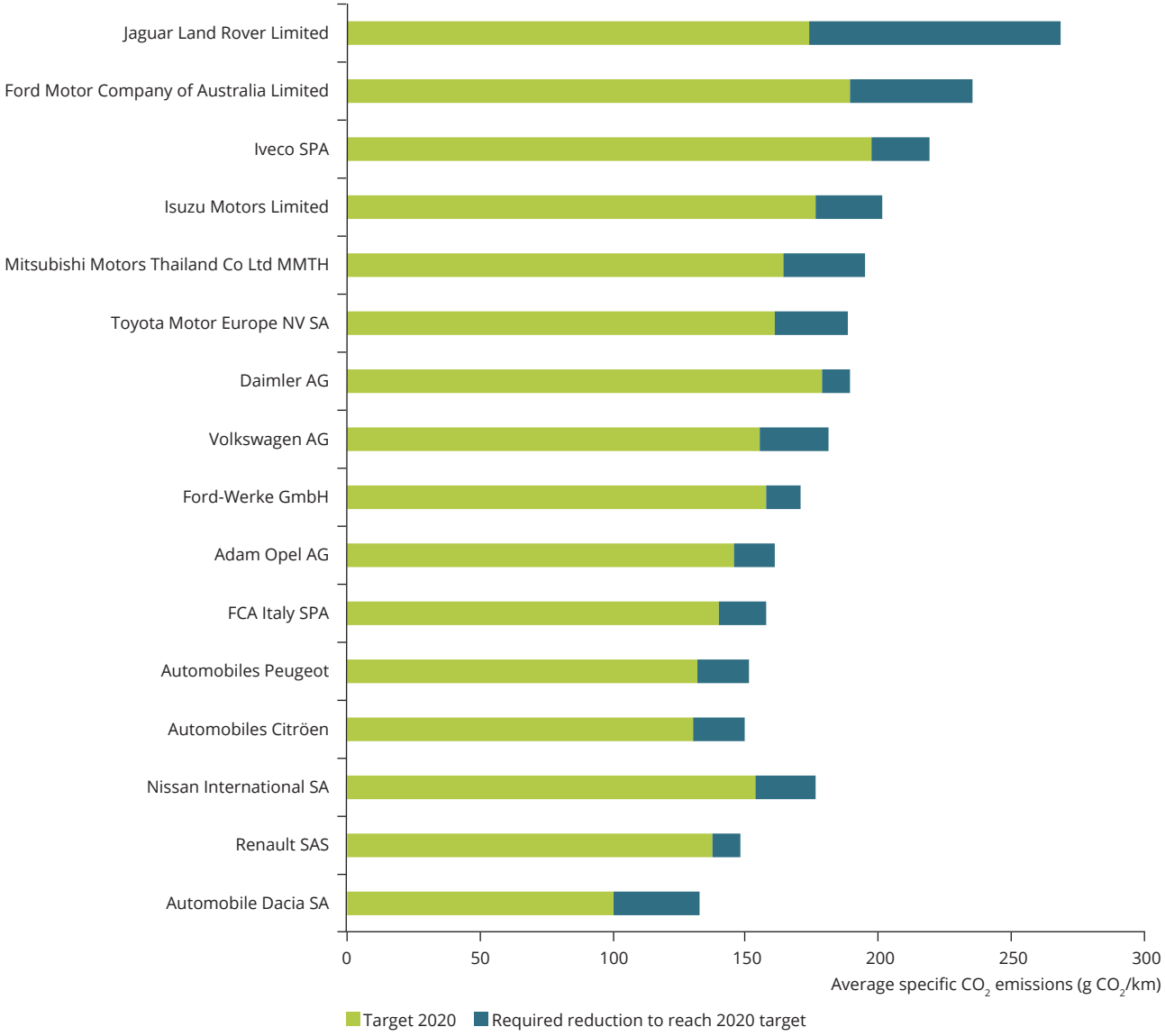
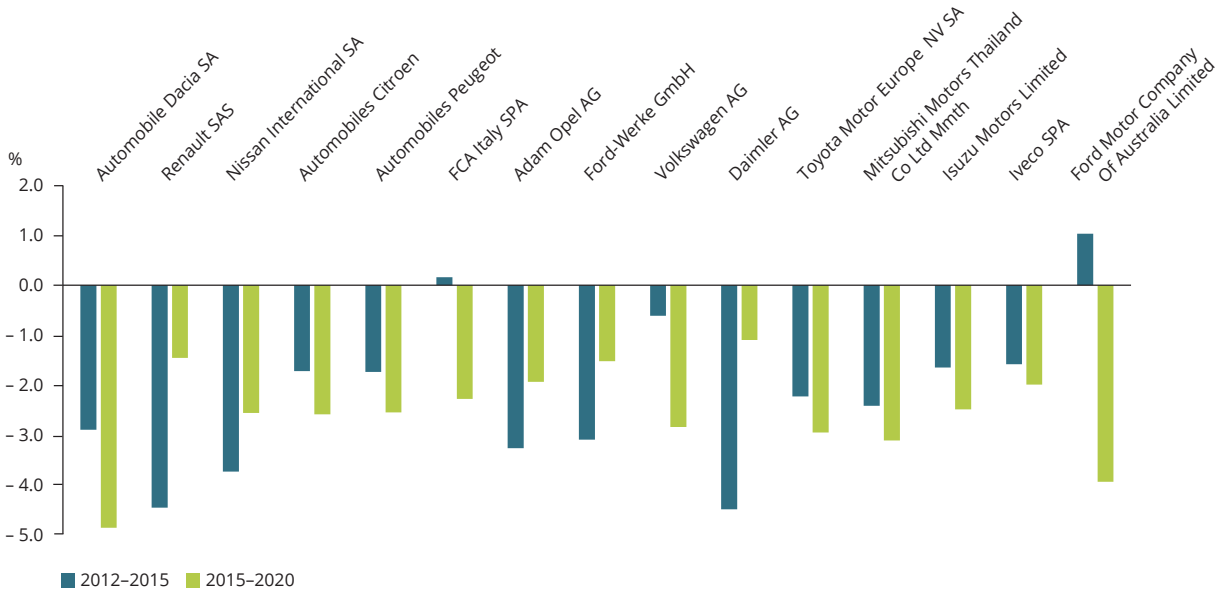


Figure 4.8 Comparison of past and future progress towards meeting the 2020 target



4.7 Excess emission premiums

Similarly to Regulation (EC) No 433/2009, if a manufacturer's or a pool's average specific CO_2 emissions exceed the specific average target, Regulation (EU) No 510/2011 requires the payment of an excess emission premium. The formulae for calculating the excess emission premium for failing to meet the specific CO_2 emission target is equivalent to the ones used for passenger cars (see Section 3.8).

The first year in which the target was binding for vans was 2015. No manufacturers exceeded their target.

5 Explanatory factors behind reducing emissions

The previous chapters of this report have documented the past trends in CO_2 emissions from passenger cars and vans officially reported by Member States and vehicle manufacturers. While these emission values are based on measurements performed in the laboratory using the standard European vehicle test cycle, it is nowadays widely accepted that such measurements may not reflect real-world driving performance. This chapter therefore complements the preceding analysis by also evaluating the impact that certain underpinning factors may have had in terms of their contribution to changes in the past real-world emission trends for cars in selected Member States. This helps provide a more integrated view of the evolution in past emissions than can be gained from official statistics alone.

The downward trend in official and real-world CO_2 emissions from new cars registered in the EU has been the result of the combined effect of technical and non-technical measures. On the technical side, the fuel efficiency of new car models has steadily improved over the years through the development of a number of relevant technologies, such as direct fuel injection, variable valve timing and lift, cylinder deactivation, turbocharging, start–stop systems, etc.

On the non-technical side, several policies and measures were adopted by an increasing number of Member States to further reduce emissions at the vehicle fleet level. Most countries, for example, currently apply some form of CO_2 taxation to the registration and/or ownership of passenger cars as well as providing fiscal incentives — mainly tax reductions and exemptions — for the purchase of low-emitting vehicles. As a result, in certain countries there is a clear trend in consumer preference towards the purchase of more fuel-efficient cars such as diesel and/or electric vehicles.

The trend of the real-world CO_2 emissions from new vehicles registered in several Member States is analysed and discussed in this chapter. The effect on nitrogen oxide (NO_x) emissions is also assessed, both because NO_x is an important air pollutant emitted by especially diesel-engined vehicles, and also in the light of the failures of late Euro vehicle technologies to deliver the originally anticipated on-road emission reductions. With this aim, the COPERT (EMISIA, 2016) model has been used to calculate real-world emissions of CO_2 (JRC, 2011) and NO_x for the illustrated Member States, chosen because over recent years their fleets have changed rapidly towards more efficient diesel cars and electric vehicles.

5.1 Methodology

The COPERT road transport emission software is a recognised and widely used tool for calculating road transport GHG and air pollutant emission inventories based on real-world emissions. It is supported by the EEA and the JRC, while it has been developed, maintained and updated through the activities of the EEA's European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM).

For estimating emissions, COPERT uses several types of input data:

- Emission factors (g/km). COPERT provides real-world emission factors for each vehicle category and fuel type. A correction factor was applied to adjust the in-use fuel consumption predicted by COPERT to the national stock characteristics (JRC, 2011).

- Number of vehicles. COPERT applies the Eurostat classification to define vehicle fleets, in which cars are distinguished into capacity classes (< 0.8 l, 0.8–1.4 l, 1.4–2.0 l and > 2.0 l for petrol and < 1.4 l, 1.4–2.0 l and > 2.0 l for diesel cars) as a method to group together vehicles with similar characteristics. As a first step for the COPERT implementation, the number of vehicle registrations was extracted from the final cars CO_2 database (EEA, 2016b) for the years 2010 to 2015 for the different fuels and they were allocated to the respective size classes (mini, small, medium, large).

- Activity levels (such as annual mileage and circulation data) for each vehicle category. These are taken from relevant data sets developed in the context of relevant activities funded by the European Commission, such as the DG Climate Action TRACCS project ([26]).

The vehicle categories considered for the analysis include:

- conventional petrol and diesel vehicles;

- electric vehicles, including (i) petrol hybrid, (ii) diesel hybrid, (iii) PHEVs and (iv) BEVs;

- other AFVs, including LPG and CNG vehicles.

In the CO_2 database there is no distinction between hybrid and plug-in hybrid vehicles. Therefore, a number of vehicle models were manually checked by their commercial name, emissions and other identification parameters to correctly allocate them to the relevant category (hybrid or plug-in hybrid).

Three Member States were selected (the Netherlands, Sweden and Greece), representing countries in which the percentage of low CO_2-emitting vehicles has increased considerably over the time period considered (from 2010 to 2015):

In the Netherlands, the number of AFVs — and in particular PHEVs — more than tripled from 2010 to 2015, reaching about 13 % of all new registrations in 2015 (including hybrid vehicles). Over the same period the number of petrol vehicles decreased by about one third. Low-emitting vehicles had significantly lower taxes than conventional vehicles (EEA, 2016a), with electric vehicles being excluded from taxation.

In Sweden, the already high proportion of diesel cars further increased from 50 % to about 58 %. The number of AFVs has doubled, thanks to the increase in the sales of petrol hybrids and plug-in hybrids. A reduced price is offered for the purchase of cars emitting below 50 g CO_2/km.

In Greece, the total number of car registrations significantly decreased following the economic crisis. However, there was a significant increase in the sales of diesel vehicles when the ban on diesel-powered cars in certain urban areas was lifted in 2012 ([27]). The diesel proportion of new sales exceeded 60 % in 2015, significantly higher than the 4 % in 2010. The penetration of electric vehicles still remains very low, despite the financial incentives given, such as exemption from circulation tax.

Table 5.1 summarises the registration data by vehicle category and by year for the above three Member States.

([26]) http://traccs.emisia.com.
([27]) Diesel engines were banned from central Athens and Thessaloniki, where 70 % of the Greek population live, in 1991 and the ban was lifted only in 2012.

Table 5.1 Registration data by vehicle category and by year for the Netherlands, Sweden and Greece

Netherlands	2010	2011	2012	2013	2014	2015
Petrol	364 790	376 076	323 589	268 902	246 672	254 067
Diesel	96 012	154 533	140 345	101 685	104 292	127 003
Battery electric	3	835	806	2 600	3 558	3 430
Petrol hybrid	15 970	14 409	17 688	16 037	12 289	12 612
Diesel hybrid	-	7	3 417	5 051	1 867	2 242
FCEV	-	-	-	-	-	-
LPG bifuel	690	6 430	8 439	1 939	908	307
CNG bifuel	140	513	590	481	3 239	626
Petrol PHEV	11	-	4 275	13 655	8 935	39 233
All passenger cars	**477 616**	**552 803**	**499 149**	**410 350**	**381 760**	**439 520**

Sweden	2010	2011	2012	2013	2014	2015
Petrol	124 753	91 358	76 995	89 671	104 978	121 519
Diesel	136 848	172 716	172 781	149 951	174 165	194 396
Battery electric	40	153	260	430	1 241	2 863
Petrol hybrid	3 433	2 829	2 593	4 575	6 721	7 807
Diesel hybrid	-	-	298	528	257	149
FCEV	-	-	-	-	-	-
LPG bifuel	-	-	37	-	-	-
CNG bifuel	7 517	6 634	5 461	3 841	4 935	5 061
Petrol PHEV	-	-	641	521	2 692	5 747
All passenger cars	**272 591**	**273 690**	**259 066**	**249 517**	**294 989**	**337 542**

Greece	2010	2011	2012	2013	2014	2015
Petrol	133 833	86 651	34 438	24 179	24 900	26 692
Diesel	5 488	9 302	22 636	33 478	44 911	47 103
Battery electric	-	-	-	-	38	31
Petrol hybrid	1 072	917	442	355	402	806
Diesel hybrid	-	-	3	23	24	175
FCEV	-	-	-	-	-	-
LPG bifuel	14	149	90	67	77	82
CNG bifuel	6	2	1	40	253	318
Petrol PHEV	-	-	1	1	19	36
All passenger cars	**140 413**	**97 021**	**57 611**	**58 143**	**70 624**	**75 243**

In order to quantify the impact upon emissions from the changing vehicle fleet registered over the last 6 years, a number of scenarios were assessed:

- The actual CO_2 and NO_X emissions calculated as described above form the **baseline scenario** against which the results from the other scenarios are compared.
- The **AFV scenario** quantifies the benefit in CO_2 and NO_X emissions from the penetration of AFVs in the national vehicle fleets.
- The **dieselisation scenario** quantifies the CO_2 benefit and NO_X damage from the increase in the sales of diesel at the expense of petrol vehicles.
- The **downsizing and efficiency improvement scenario** quantifies the additional CO_2 benefits from the reduction in vehicle size (weight and engine capacity) and overall improvements in fuel efficiency.
- The **no Euro 6 scenario** quantifies the NO_X emission benefits from the introduction of Euro 6 emission standards.

For the simulation of the above scenarios the following assumptions were made:

- For the **AFV scenario** the number of AFV registrations follows the overall passenger cars trend, i.e. their number is changed in proportion to the total number of registrations.
- In the **dieselisation scenario** the percentage of diesel vehicles remains constant over the years and is equal to the 2010 value.
- In the **downsizing and efficiency improvement scenario** the emissions of all vehicle categories remain constant over the years and are equal to the respective 2010 values.
- For the **no Euro 6 scenario** it is assumed that all vehicles registered in 2015 are Euro 5 instead of Euro 6, i.e. their emissions are not reduced.

5.2 Results and discussion

Calculated CO_2 emission factors and emissions for the above scenarios are presented for the selected Member States in Figure 5.1 and in Table 5.2 respectively.

The actual CO_2 emission factors correspond to the emission factors calculated on the basis of the actual fleet registered in each Member State every year.

Figure 5.1 also presents:

- the CO_2 saving due to the increase in AFV and the dieselisation of the fleet;
- the CO_2 saving due to the downsizing and efficiency improvements.

As can be seen for the Netherlands, the savings due to the downsizing and efficiency improvements of petrol and diesel cars have a much greater impact than those achieved because of the penetration of AFVs and the increase in diesel percentage over the entire period. This is despite the fact that AFVs reached the significant level of 13 % of new registrations (most of which are plug-in and hybrid vehicles) in 2015. The contribution of both effects is increasing over the years: in 2011 the CO_2 saving was 8 g CO_2/km, and in 2015 it increased to 27 g CO_2/km.

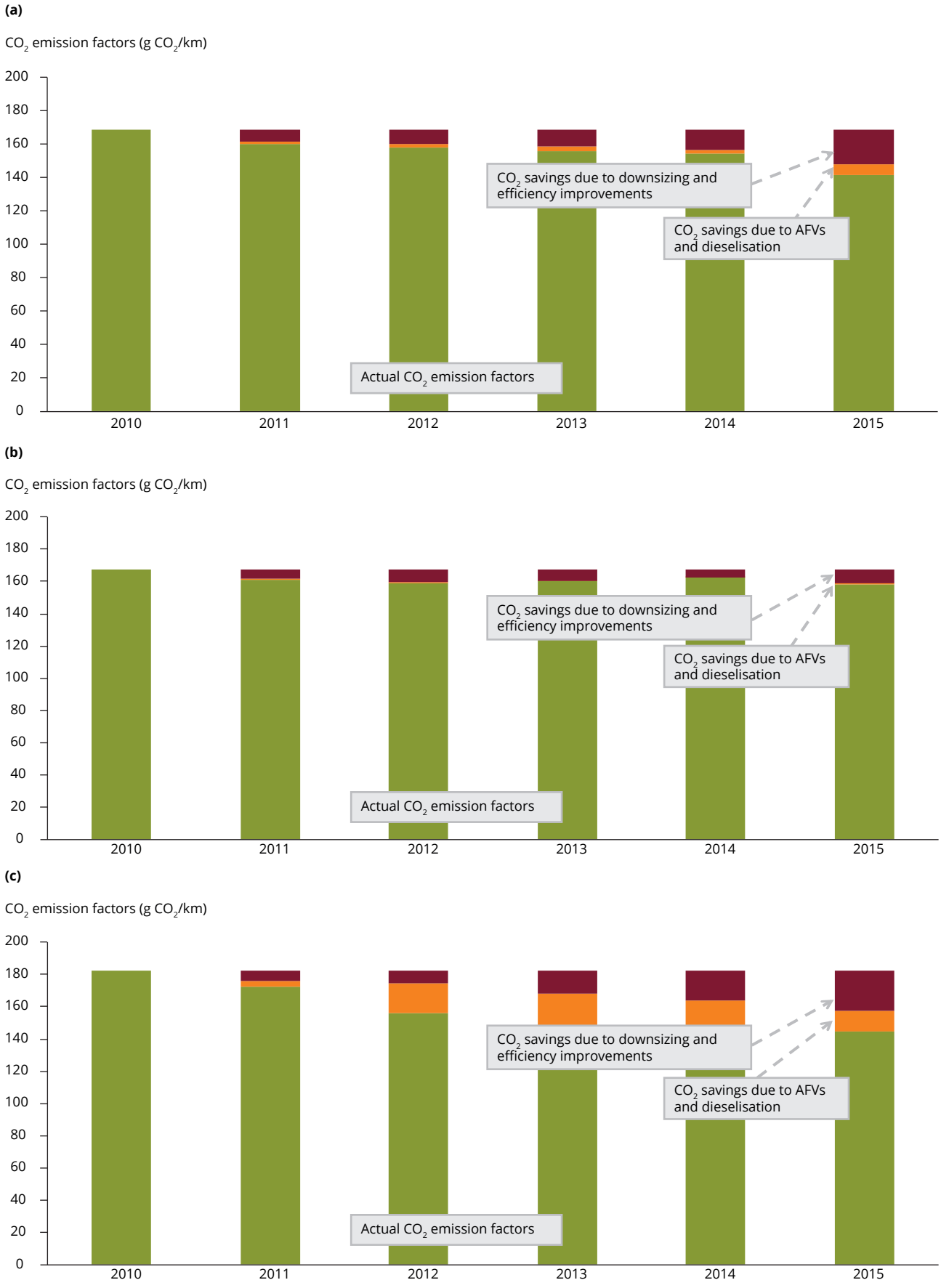
A similar effect can be also observed for Sweden: the contribution of the downsizing and the efficiency improvements is bigger than that due to AFVs and dieselisation. The first contributed a 9-g CO_2/km reduction in 2015. The latter, even lower than in the Netherlands, because of the lower AFV proportion (6 %), contributed only a 1-g CO_2/km reduction in 2015.

The effect of dieselisation in CO_2 emissions is more apparent in Greece, where the significant increase in the sales of diesel vehicles has resulted in CO_2 savings of a greater magnitude than the savings achieved by downsizing and efficiency improvements in the 2012–2014 period. In the last year, however, the CO_2 savings due to downsizing and efficiency improvements had a bigger impact on the emission factors.

It should be also noted that the relative efficiency advantage of diesel over petrol cars is gradually diminishing over the years as diesels are, on average, generally becoming heavier than their petrol counterparts.

In terms of emissions, Table 5.2 shows that the baseline emissions follow to a large extent the fluctuations in the number of registrations in each Member State. This underlines the relevance of the number of vehicles in reducing the emissions.

Figure 5.1 Calculated CO_2 emission factors for the Netherlands (a), Sweden (b) and Greece (c)



While the increase in diesel vehicle sales in the Member States considered had a limited effect on the reduction of CO_2 emissions, diesel vehicles emit significantly more NO_X than do conventional petrol-fuelled vehicles. Real-world NO_X emissions have increased considerably between 2010 and 2014, whereas they decreased in 2015 when the latest Euro 6 standards were introduced. The real-world NO_X emission performance of Euro 6 diesel vehicles has improved substantially compared to earlier generations of vehicles, with the average real-world emission factor being about one third that of a Euro 5 vehicle.

Calculated NO_X emission factors and emissions for the above scenarios are illustrated for the selected Member States in Figure 5.2 and in Table 5.2 respectively.

As for CO_2, the actual NO_X emission factors correspond to the emission factors calculated on the basis of the actual fleet registered in the three Member States every year.

Figure 5.2 also presents:

- the NO_X increase due to the dieselisation of the fleet;
- the NO_X saving due to the introduction of Euro 6.

The dieselisation effect in emission factors is evident in all Member States considered in the analysis. In the Netherlands, the increase in emission factors is estimated to be between 13 % and 18 %, and in Sweden between 4 % and 11 %. The increase is more apparent for Greece, which has seen the biggest increase in the sales of diesel vehicles (41–83 %). It is clear, however, that the introduction of the Euro 6 emission standards has decreased the average real-world NO_X emission factors in all Member States.

Figure 5.2 Calculated NO_x emission factors for the Netherlands (a), Sweden (b) and Greece (c)

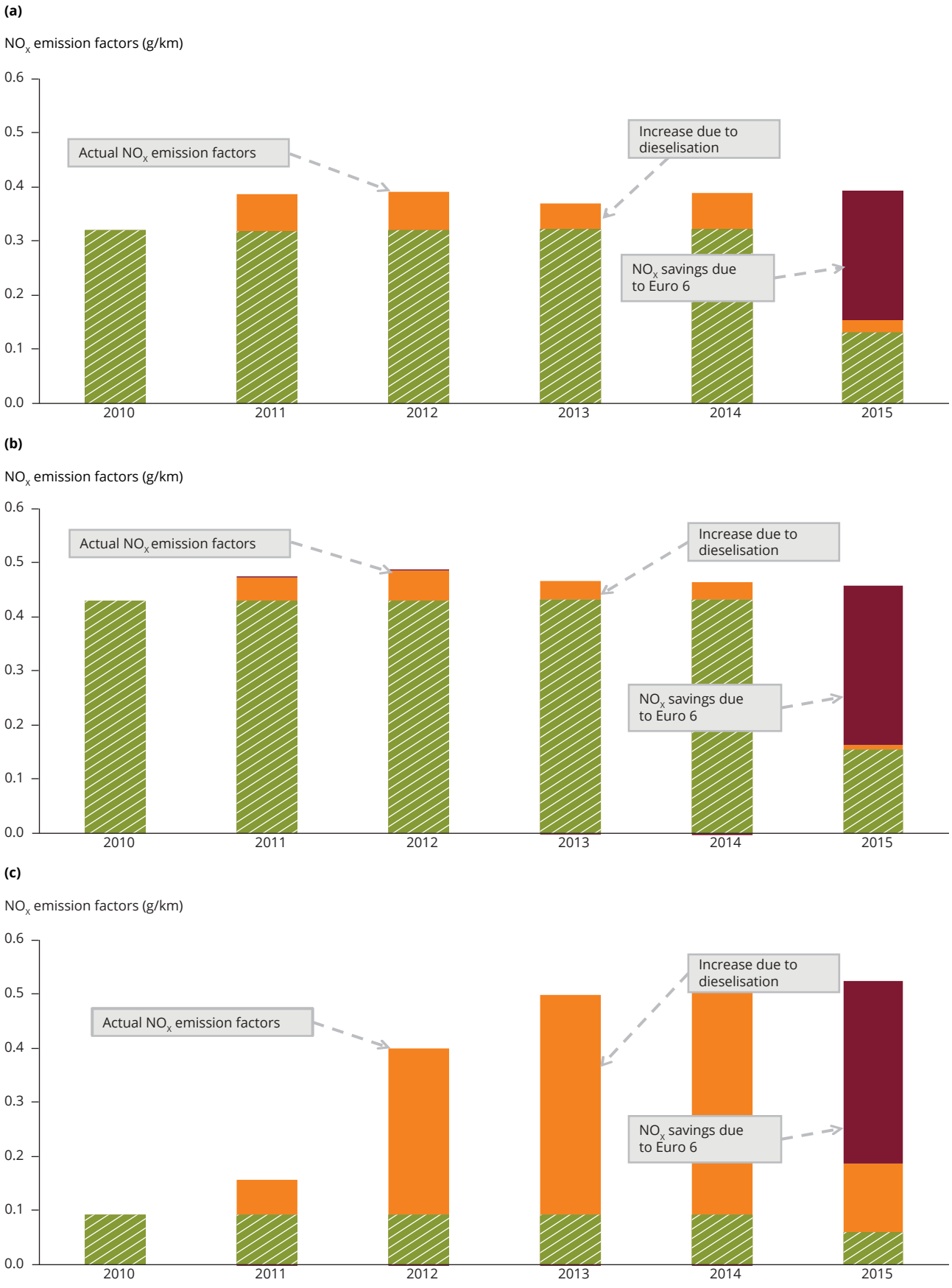


Table 5.2 Calculated CO_2 and NO_x emissions (tonnes) for the Netherlands, Sweden and Greece

Country	Scenario						
Netherlands		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
	CO_2 baseline	1 477 954	1 814 320	1 620 616	1 239 774	1 177 981	1 268 214
	CO_2 savings due to AFVs and dieselisation	-	14 213	19 248	24 937	15 890	58 142
	CO_2 savings due to downsizing and efficiency improvements	-	82 646	90 653	76 802	90 940	181 635
	NO_x baseline	2 796	4 384	4 005	2 939	2 969	1 390
	NO_x increase due to dieselisation	-	787	725	373	511	225
	NO_x savings due to EURO 6	-	0	0	0	0	2 199
Sweden		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
	CO_2 baseline	1 262 074	1 353 285	1 304 122	1 207 591	1 444 505	1 592 904
	CO_2 savings due to AFVs and dieselisation	-	4 772	3 700	632	1 583	5 873
	CO_2 savings due to downsizing and efficiency improvements	-	51 294	66 200	52 317	44 462	88 639
	NO_x baseline	3 233	3 982	3 973	3 501	4 126	1 638
	NO_x increase due to dieselisation	-	366	441	257	278	72
	NO_x savings due to EURO 6	-	1	1	1	1	2 990
Greece		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
	CO_2 baseline	274 437	191 563	135 959	148 599	185 640	195 319
	CO_2 savings due to AFVs and dieselisation	-	4 054	16 099	21 386	24 078	17 599
	CO_2 savings due to downsizing and efficiency improvements	0	6 638	6 775	14 099	22 912	32 814
	NO_x baseline	138	174	349	504	673	252
	NO_x increase due to dieselisation	-	72	269	412	556	170
	NO_x savings due to EURO 6	-	-0	0	0	0	460

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Annex 1

Table A1.1 Registration of new passenger cars by Member State (in thousands)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Austria	295	280	300	311	308	309	298	294	319	328	356	335	319	303	308
Belgium	497	468	459	485	480	526	525	536	475	551	577	490	490	485	503
Bulgaria	-	-	-	-	-	-	86	91	21	14	14	14	15	16	17
Croatia	-	-	-	-	-	-	-	-	-	-	-	-	28	35	36
Cyprus	-	-	-	20	18	20	25	24	16	15	15	11	7	8	9
Czech Republic	-	-	-	115	105	107	126	134	159	165	169	170	162	179	227
Denmark	97	113	102	124	147	154	160	148	111	151	170	171	184	188	204
Estonia	-	-	-	17	20	25	31	24	10	10	17	19	20	21	21
Finland	106	113	145	141	146	143	123	137	89	109	122	107	100	103	106
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	1 827	1 838	2 011
Germany	3 342	3 122	3 237	3 267	3 319	3 445	3 126	3 067	3 786	2 873	2 933	3 062	2 930	3 012	3 177
Greece	245	242	203	264	274	279	294	279	221	140	97	57	58	71	76
Hungary	-	-	-	230	199	193	167	163	66	43	47	52	55	68	77
Ireland	117	152	146	154	171	177	186	151	56	89	90	73	74	96	123
Italy	2 430	2 278	2 244	2 264	2 237	2 325	2 494	2 163	2 160	1 954	1 745	1 402	1 304	1 351	1 573
Latvia	-	-	-	11	16	25	31	19	5	6	10	10	10	12	14
Lithuania	-	-	-	9	11	15	21	22	7	7	12	12	12	14	17
Luxembourg	22	44	44	48	49	51	51	52	47	50	50	49	46	49	46
Malta	-	-	-	4	7	6	6	5	6	4	6	6	6	6	7
Netherlands	526	507	487	479	452	478	494	493	396	480	554	500	416	384	438
Poland	-	-	-	297	230	223	264	305	221	219	275	274	288	304	354
Portugal		232	194	202	208	199	204	215	159	223	154	96	105	142	179
Romania	-	-	-	-	-	-	313	286	115	94	82	66	57	70	81
Slovakia	-	-	-	-	45	65	65	57	70	65	69	70	66	74	78
Slovenia	-	-	-	37	64	62	69	72	60	60	55	50	51	54	53
Spain	400	969	1 319	1 606	1 640	1 622	1 606	1 165	964	976	810	704	732	895	1 076
Sweden	223	249	257	260	269	278	300	248	209	277	289	263	252	297	338
United Kingdom	2 232	2 611	2 558	2 512	2 386	2 295	2 390	2 112	1 968	2 026	1 937	2 036	2 254	2 467	2 623

Table A1.2 Average mass of new passenger cars by Member State (kg)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Austria	1 314	1 335	1 426	1 432	1 435	1 449	1 445	1 431	1 385	1 409	1 442	1 453	1 448	1 446	1 459
Belgium	1 288	1 319	1 361	1 375	1 396	1 407	1 423	1 425	1 406	1 406	1 416	1 439	1 421	1 415	1 418
Bulgaria	-	-	-	-	-	-	-	-	-	1 454	1 462	1 485	1 475	1 424	1 408
Croatia	-	-	-	-	-	-	-	-	-	-	-	-	1 309	1 307	1 326
Cyprus	-	-	-	1 205	1 277	1 316	1 354	1 372	1 367	1 388	1 377	1 370	1 367	1 391	1 395
Czech Republic	-	-	-	1 704	1 242	1 247	1 261	1 275	1 335	1 380	1 368	1 368	1 370	1 364	1 374
Denmark	-	1 306	1 325	1 327	1 324	1 328	1 370	1 320	1 313	1 335	1 312	1 248	1 227	1 216	1 227
Estonia	-	-	-	1 349	1 408	1 433	1 465	1 456	1 471	1 473	1 502	1 514	1 508	1 474	1 456
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	1 445	1 440	1 421
France	1 254	1 280	1 305	1 327	1 341	1 349	1 375	1 387	1 326	1 326	1 343	1 385	1 350	1 310	1 315
Germany	1 332	1 352	1 381	1 408	1 412	1 424	1 433	1 425	1 347	1 433	1 460	1 466	1 448	1 443	1 447
Greece	1 172	1 223	1 262	1 277	1 287	1 304	1 314	1 311	1 423	1 252	1 231	1 242	1 243	1 240	1 250
Hungary	-	-	-	1 182	1 203	1 237	1 264	1 288	1 330	1 370	1 396	1 390	1 401	1 398	1 394
Ireland	1 248	1 276	1 265	1 314	1 341	1 372	1 441	1 440	1 440	1 380	1 378	1 420	1 397	1 410	1 393
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	1 314	1 307	1 305
Latvia	-	-	-	1 452	1 445	1 468	1 502	1 498	1 535	1 522	1 543	1 563	1 552	1 519	1 491
Lithuania	-	-	-	1 433	1 448	1 483	1 481	1 467	1 486	1 481	1 498	1 497	1 486	1 435	1 423
Luxembourg	1 834	1 851	1 442	1 471	1 487	1 504	1 498	1 490	1 462	1 473	1 519	1 528	1 505	1 488	1 495
Malta	-	-	-	-	-	-	-	1 317	1 182	1 200	1 216	1 465	1 212	1 199	1 206
Netherlands	1 260	1 264	1 301	1 314	1 337	1 332	1 350	1 324	1 295	1 254	1 249	1 266	1 288	1 285	1 323
Poland	-	-	-	1 181	1 242	1 271	1 304	1 260	1 261	1 317	1 378	1 383	1 376	1 356	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	1 350	1 345	1 343
Romania	-	-	-	-	-	-	1 268	1 286	1 291	1 281	1 325	1 381	1 365	1 347	1 333
Slovakia	-	-	-	-	1 174	-	-	-	-	1 386	1 418	1 421	1 410	1 410	1 420
Slovenia	-	-	-	1 246	1 305	1 316	1 340	1 350	1 346	1 332	1 355	1 358	1 344	1 333	1 335
Spain	1 266	1 725	1 317	1 335	1 374	1 395	1 416	1 400	1 394	1 399	1 413	1 410	1 396	1 355	1 357
Sweden	1 448	1 454	1 472	1 467	1 470	1 488	1 503	1 488	1 490	1 497	1 510	1 522	1 520	1 513	1 526
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	1 394	1 381	1 393

Table A1.3 Average CO_2 emissions from new passenger cars by Member State (g CO_2/km)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Austria	165.6	164.4	163.8	161.9	162.1	163.7	162.9	158.1	150.2	144.0	138.7	135.7	131.6	128.5	123.7
Belgium	163.7	161.1	158.1	156.5	155.2	153.9	152.8	147.8	142.1	133.4	127.2	128.0	124.0	121.3	117.9
Bulgaria	-	-	-	-	-	-	171.6	171.5	172.1	158.9	151.4	149.2	141.7	135.9	130.3
Croatia	-	-	-	-	-	-	-	-	-	-	-	-	127.1	115.8	112.8
Cyprus	-	-	-	173.4	173.0	170.1	170.3	165.6	160.7	155.8	149.9	144.3	139.2	129.8	125.7
Czech Republic	-	-	-	154.0	155.3	154.2	154.2	154.4	155.5	148.9	144.5	140.8	134.6	131.6	126.3
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	112.7	110.2	106.2
Estonia	-	-	-	179.0	183.7	182.7	181.6	177.4	170.3	162.0	156.9	150.3	147.0	140.9	137.2
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	131.8	127.4	123.0
France	159.8	156.8	155.0	153.1	152.3	149.9	149.4	140.1	133.5	130.5	127.7	124.4	117.4	114.2	111.0
Germany	179.5	177.4	175.9	174.9	173.4	172.5	169.5	164.8	154.0	151.1	145.6	141.6	136.1	132.5	128.3
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	111.9	108.2	106.4
Hungary	-	-	-	158.5	156.3	154.6	155.0	153.4	153.4	147.4	141.6	140.8	134.4	133.0	129.6
Ireland	166.6	164.3	166.7	167.6	166.8	166.3	161.6	156.8	144.4	133.2	128.3	125.1	120.7	117.1	114.1
Italy	158.3	156.6	152.9	150.0	149.5	149.2	146.5	144.7	136.3	132.7	129.6	126.2	121.1	118.1	115.2
Latvia	-	-	-	192.4	187.2	183.1	183.5	180.6	176.9	162.0	154.4	152.0	147.1	140.4	137.1
Lithuania	-	-	-	187.5	186.3	163.4	176.5	170.1	166.0	150.9	144.4	144.2	139.8	135.8	130.0
Luxembourg	177.0	173.8	173.5	169.7	168.6	168.2	165.8	159.5	152.5	146.0	142.2	137.0	133.4	129.9	127.5
Malta	-	-	-	148.8	150.5	145.9	147.8	146.9	135.7	131.2	124.7	121.5	118.7	115.3	113.3
Netherlands	174.0	172.4	173.5	171.0	169.9	166.7	164.8	156.7	146.9	135.8	126.1	118.6	109.1	107.3	101.2
Poland	-	-	-	154.1	155.2	155.9	153.7	153.1	151.6	146.2	144.5	141.3	138.1	132.9	129.3
Portugal	-	154.0	149.9	147.1	144.9	145.0	144.2	138.2	133.8	127.2	122.8	117.6	112.2	108.8	105.7
Romania	-	-	-	-	-	-	154.8	156.0	157.0	148.5	140.7	139.0	132.1	128.2	125.0
Slovakia	-	-	-	-	157.4	152.0	152.7	150.4	146.6	149.0	144.9	141.0	135.1	131.7	127.6
Slovenia	-	-	-	152.7	157.2	155.3	156.3	155.9	152.0	144.4	139.7	133.4	125.6	121.3	119.2
Spain	156.8	156.4	157.0	155.3	155.3	155.6	153.2	148.2	142.2	137.9	133.8	128.7	122.4	118.6	115.3
Sweden	200.2	198.2	198.5	197.2	193.8	188.6	181.4	173.9	164.5	151.3	141.8	135.9	133.2	131.0	126.3
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	128.3	124.6	121.3

Table A1.4 New vans by Member State: registrations, mass and average emissions

	Registrations				Mass				Average emissions			
	2012	2013	2014	2015	2012	2013	2014	2015	2012	2013	2014	2015
Austria	26	27	30	31	1 856	1 860	1 900	1 905	186.6	185.8	183.6	178.3
Belgium	53	51	52	59	1 842	1 861	1 883	1 875	185.8	182.8	179.4	175.8
Bulgaria	8	7	8	9	1 578	1 592	1 545	1 526	160.8	156.3	149.2	144.0
Croatia			4	6			1 668	1 646			158.8	154.3
Cyprus	1	1	1	1	1 605	1 734	1 674	1 661	151.5	170.6	158.1	143.2
Czech Republic	10	10	12	13	1 827	1 835	1 942	1 890	196.0	189.1	191.2	183.0
Denmark	11	17	25	29	1 854	1 793	1 736	1 731	178.1	166.8	155.0	151.1
Estonia	2	3	3	4	1 821	1 831	1 831	1 724	184.4	182.0	178.1	165.1
Finland	10	10	10	10	1 922	1 910	1 936	1 952	193.5	182.0	179.7	174.7
France	227	300	348	309	1 804	1 601	1 625	1 674	170.2	152.8	151.6	154.7
Germany	195	199	212	224	2 034	1 911	1 913	1 908	195.5	192.9	190.1	186.3
Greece	2	3	5	5	1 634	1 624	1 598	1 602	170.3	161.3	157.0	156.0
Hungary	8	10	15	15	1 828	1 845	1 843	1 884	184.0	181.9	177.7	177.0
Ireland	6	10	16	22	1 762	1 785	1 778	1 820	175.6	177.2	168.7	169.3
Italy	106	92	107	117	1 713	1 707	1 674	1 626	168.2	163.5	157.0	153.2
Latvia	2	2	2	2	1 770	1 750	1 728	1 747	176.9	171.6	167.4	165.3
Lithuania	1	2	2	2	1 891	1 856	1 830	1 814	190.8	180.3	176.3	169.2
Luxembourg	3	3	3	3	1 902	1 857	1 845	1 817	188.3	179.2	178.8	172.8
Malta	0	0	0	1	1 507	1 518	1 520	1 602	147.5	150.5	145.4	153.6
Netherlands	47	49	46	49	1 777	1 774	1 778	1 785	177.5	173.4	167.4	163.3
Poland	30	34	61	47	1 778	1 796	1 779	1 834	179.6	176.4	168.5	177.2
Portugal	13	17	24	27	1 579	1 583	1 581	1 570	154.2	150.9	144.8	141.7
Romania	8	6	8	9	1 806	1 766	1 781	1 791	183.1	171.8	171.9	170.3
Slovakia	5	5	5	7	1 986	1 995	2 026	2 006	200.8	196.3	193.2	186.8
Slovenia	5	6	5	6	1 860	1 849	1 877	1 853	191.2	188.0	185.1	174.9
Spain	65	70	90	76	1 764	1 734	1 672	1 659	167.4	162.9	156.1	154.6
Sweden	21	20	26	28	1 724	1 760	1 811	1 775	165.8	167.1	170.4	163.0
United Kingdom	232	262	307	351	1 815	1 827	1 838	1 848	186.3	185.2	181.0	177.9

Annex 2

Table A2.1 Data used in calculating the CO_2 emission performance of car manufacturers in 2015

Manufacturer	Pools and derogations	Number of registrations	Average CO_2 corrected	Specific emission target	Distance to target
Alfa Romeo SPA	P3	18 961	116.269	128.395	– 12.126
Alpina Burkard Bovensiepen GmbH e Co KG	DMD	690	172.174	225	– 52.826
Aston Martin Lagonda Ltd	D	1 449	312.204	310	2.204
Audi AG	P14	717 933	126.245	139.941	– 13.696
Audi Hungaria Motor KFT	P14	11 710	142.77	131.387	11.383
Automobiles Citröen		618 570	105.713	124.141	– 18.428
Automobiles Peugeot		857 421	103.659	124.904	– 21.245
Avtovaz JSC	P10	905	202.287	124.3	77.987
Bentley Motors Ltd	D	2 251	290.891	298	– 7.109
Bluecar SAS		934	0	127.529	– 127.529
Bluecar Italy SRL		258	0	124.882	– 124.882
Bayerische Motoren Werke AG	P1	886 972	124.883	138.988	– 14.105
BMW M GmbH	P1	11 335	197.64	148.016	49.624
Bugatti Automobiles SAS	P14	7	541.857	160.959	380.898
BYD Auto Industry Company Limited		9	0	179.493	– 179.493
Caterham Cars Limited	DMD	103	149.282	210	– 60.718
Chevrolet Italia SPA	P5	3	131.667	130.731	0.936
FCA US LLC	P3	99 453	158.76	148.516	10.244
CNG-Technik GmbH	P4	18 375	115.794	122.176	– 6.382
Automobile Dacia SA	P10	378 487	122.694	122.337	0.357
Daimler AG	P2	800 292	124.079	138.62	– 14.541
DFSK Motor Co Ltd	DMD	3	184	124.485	59.515
Donkervoort Automobielen BV	DMD	5	178	178	0
DR Motor Company SRL	DMD	435	145.848	135	10.848
Ferrari SPA	D	2 250	299.448	295	4.448
FCA Italy SPA	P3	703 652	116.3	120.249	– 3.949
Ford Motor Company	P4	3 521	252.307	146.403	105.904
Ford-Werke GmbH	P4	993 383	117.701	128.204	– 10.503
Fuji Heavy Industries Ltd	ND	29 538	159.924	164.616	– 4.692
General Motors Company	P5	1 383	281.883	154.339	127.544
GM Korea Company	P5	1 391	126.398	125.077	1.321
Great Wall Motor Company Limited	DMD	62	184.113	188	– 3.887
Honda Automobile China Co Ltd	P6	380	124.718	119.495	5.223
Honda Motor Co Ltd	P6	19 845	119.878	125.749	– 5.871
Honda Turkiye AS	P6	691	155.174	126.494	28.68
Honda of the UK Manufacturing Ltd	P6	104 589	133.387	133.699	– 0.312

Table A2.1 Data used in calculating the CO_2 emission performance of car manufacturers in 2015 (cont.)

Manufacturer	Pools and derogations	Number of registrations	Average CO_2 corrected	Specific emission target	Distance to target
Hyundai Motor Company	P7	64 425	134.125	136.218	– 2.093
Hyundai Assan Otomotiv Sanayi ve Ticaret AS	P7	155 198	113.524	116.604	– 3.08
Hyundai Motor Manufacturing Czech SRO	P7	236 926	134.525	133.738	0.787
Hyundai Motor Europe GmbH	P7	5	97.8	118.529	– 20.729
Hyundai Motor India Ltd	P7	1 156	114.454	117.769	– 3.315
Isuzu Motors Ltd	DMD	13	209.462	161.171	48.291
Jaguar Land Rover Limited	P12	172 731	164.029	178.025	– 13.996
Jiangling Motor Holding Co Ltd	DMD	1	137	129.223	7.777
Kia Motors Corporation	P8	228 169	120.295	127.138	– 6.843
Kia Motors Slovakia SRO	P8	151 870	137.69	133.038	4.652
Koenigsegg Automotive AB	DMD	2	370.5	275	95.5
KTM-Sportmotorcycle AG	DMD	33	191.788	190	1.788
Lada Automobile GmbH	DMD	900	216.19	126.024	90.166
Lada France SAS	P10	1	179	129.452	49.548
Automobili Lamborghini SPA	D	693	317.201	325	– 7.799
Litex Motors AD	DMD	25	180.12	156	24.12
Lotus Cars Limited	DMD	694	203.032	280	– 76.968
Magyar Suzuki Corporation Ltd	P11	125 532	120.485	123.114	– 2.629
Mahindra & Mahindra Ltd	DMD	410	177.888	162	15.888
Maruti Suzuki India Ltd	P11	5 278	97.89	123.114	– 25.224
Maserati SPA	D	5 336	195.311	255	– 59.689
Mazda Motor Corporation	ND	194 752	126.779	129.426	– 2.647
Mclaren Automotive Limited	D	325	267.446	275	– 7.554
Mercedes-AMG GmbH	P2	3 832	208.663	144.858	63.805
MG Motor UK Limited	D	3 114	133.934	146	– 12.066
Micro-Vett SRL		1	0	128.263	– 128.263
Mitsubishi Motors Corporation MMC	P9	95 403	104.631	142.028	– 37.397
Mitsubishi Motors Europe BV MME	P9	1	125	113.457	11.543
Mitsubishi Motors Thailand Co Ltd MMTH	P9	27 831	96.744	109.703	– 12.959
Morgan Technologies Ltd	DMD	427	193.948	170	23.948
National Electric Vehicle Sweden	DMD	129	200	141.059	58.941
Nissan International SA		548 682	113.778	129.73	– 15.952
Adam Opel AG	P5	915 120	126.775	130.695	– 3.92
Pagani Automobili SPA	DMD	1	349	340	9
Perodua Manufacturing SDN BHD	DMD	2	137	113.457	23.543
PGO Automobiles	DMD	19	174.158	175	– 0.842
Dr Ing HCF Porsche AG	P14	64 611	184.395	154.253	30.142
Quattro GmbH	P14	6 313	224.593	149.793	74.8
Radical Motosport Ltd	DMD	4	314.5	200	114.5
Renault SAS	P10	984 980	105.304	125.023	– 19.719
Renault Trucks	DMD	22	183	168.282	14.718
Rolls-Royce Motor Cars Ltd	P1	553	331.461	181.335	150.126
Seat SA	P14	332 980	116.577	124.324	– 7.747
Secma SAS	DMD	35	132.6	131	1.6
Skoda Auto AS	P14	585 553	115.511	125.552	– 10.041

Table A2.1 Data used in calculating the CO_2 emission performance of car manufacturers in 2015 (cont.)

Manufacturer	Pools and derogations	Number of registrations	Average CO_2 corrected	Specific emission target	Distance to target
Ssangyong Motor Company	D	13 225	165.625	180	– 14.375
Suzuki Motor Corporation	P11	12 654	164.37	123.114	41.256
Suzuki Motor Thailand Co Ltd	P11	25 442	96.326	123.114	– 26.788
Tata Motors Limited	P12	315	185.238	178.025	7.213
Tazzari GL SPA		2	0	99.838	– 99.838
Tesla Motors Ltd		9 284	0	167.44	– 167.44
Toyota Motor Europe NV SA	P13	585 317	108.264	127.386	– 19.122
Volkswagen AG	P14	1 655 305	118.259	130.864	– 12.605
Volvo Car Corporation		266 318	120.67	145.148	– 24.478
Westfield Sports Cars	DMD	2	177.5	99.975	77.525
Wiesmann GmbH	DMD	5	281.8	274	7.8

Notes: The number of registrations represents the number of vehicles having both a mass and an emission value. The parameters used in calculating manufacturer performance for 2015 are set out in Table 2.1.

The Commission implementing decision confirming the 2015 CO_2 emissions assigns some manufacturers an uncertainty adjustment for 2015 data, which modifies the distance to their targets. Here the uncertainty is not reported. A detailed description of the uncertainty calculation is presented with the Commission implementing decision.

'D' indicates that a derogation for small-volume manufacturers has been granted in accordance with the Commission implementing decision.

'DMD' means that a *de minimis* derogation applies, i.e. a manufacturer which together with all its connected undertakings was responsible for fewer than 1 000 new registered vehicles in 2015. According to the Regulation (EU) No 333/2014, they do not have to meet a specific emission target. However the targets are reported in the above table for information purposes only.

'ND' indicates that a derogation for niche manufacturers has been granted in accordance with the Commission implementing decision.

'P' indicates that the manufacturer is member of a pool in accordance with Article 7 of Regulation (EC) No 443/2009.

Table A2.2 Data used in calculating the CO_2 emission performance of light commercial vehicle manufacturers in 2015

Manufacturer	Pools and derogations	Number of registrations	Average CO_2 (75 %) corrected	Specific emission target	Disatnce to target
Alfa Romeo SPA		9	111.833	147.482	– 35.649
Audi AG	P8	940	128.279	177.884	– 49.605
Automobiles Citröen		145 739	133.123	164.595	– 31.472
Automobiles Peugeot		147 199	133.424	165.947	– 32.523
Avtovaz JSC	P7	23	209.471	136.757	72.714
Bluecar SAS		236	0	137.697	– 137.697
Bayerische Motoren Werke AG		537	125.376	173.786	– 48.41
BMW M GmbH		348	133.253	185.755	– 52.502
FCA US LLC	P2	943	197.222	207.485	– 10.263
CNG-Technik GmbH	P3	659	118.526	155.176	– 36.65
Comarth Engineering SL		3	0	92.509	– 92.509
Automobile Dacia SA	P7	23 348	120.846	135.495	– 14.649
Daimler AG	P1	132 571	177.569	211.675	– 34.106
DFSK Motor Co Ltd	DMD	287	162.572	123.335	39.237
Esagono Energia SRL		14	0	133.987	– 133.987
FCA Italy SPA	P2	130 731	145.481	173.839	– 28.358
Ford Motor Company of Australia Limited	P3	23 786	224.791	221.618	3.173
Ford Motor Company	P3	48	186.639	215.917	– 29.278
Ford-Werke GmbH	P3	199 794	157.473	191.136	– 33.663
Fuji Heavy Industries Ltd		62	152.783	169.848	– 17.065
Mitsubishi Fuso Truck & Bus Corporation	P1	500	235.821	265.154	– 29.333
Mitsubishi Fuso Truck Europe SA	P1	3	235	276.432	– 41.432
LLC Automobile Plant Gaz	DMD	13	285	222.623	62.377
General Motors Company	P4	10	280	256.933	23.067
Gonow Auto Co Ltd	D	65	157.333	175	– 17.667
Great Wall Motor Company Limited	DMD	217	197.179	188.552	8.627
Honda Motor Co Ltd		4	145.333	161.376	– 16.043
Honda of the UK Manufacturing Ltd		97	120.722	166.185	– 45.463
Hyundai Motor Company		1 375	189.669	211.403	– 21.734
Hyundai Assan Otomotiv Sanayi ve Ticaret AS		118	109.693	111.275	– 1.582
Hyundai Motor Manufacturing Czech SRO		232	119.494	160.712	– 41.218
Isuzu Motors Limited		12 765	194.373	209.025	– 14.652
Iveco SPA		31 685	211.664	229.635	– 17.971
Jaguar Land Rover Limited	D	18 460	258.906	276.93	– 18.024
Kia Motors Corporation	P5	460	110.509	141.711	– 31.202
Kia Motors Slovakia SRO	P5	327	117.331	151.588	– 34.257
Lada Automobile GmbH	DMD	55	216	130.96	85.04
Magyar Suzuki Corporation Ltd		72	116.37	133.814	– 17.444
Mahindra & Mahindra Ltd	DMD	215	204.311	203.862	0.449
Mazda Motor Corporation	DMD	323	149.533	183.53	– 33.997
MFTBC	P1	33	236	264.418	– 28.418
Mitsubishi Motors Corporation MMC	P6	940	162.221	210	– 47.779
Mitsubishi Motors Thailand Co Ltd MMTH	P6	15 226	189.604	210	– 20.396
Nissan International SA		38 535	127.71	187.288	– 59.578

Table A2.2 Data used in calculating the CO_2 emission performance of light commercial vehicle manufacturers in 2015 (cont.)

Manufacturer	Pools and derogations	Number of registrations	Average CO_2 (75 %) corrected	Specific emission target	Disatnce to target
Adam Opel AG	P4	91 895	149.226	178.934	– 29.708
Piaggio & C SPA	D	2621	117.812	155	– 37.188
Dr Ing HCF Porsche AG	P8	115	181.209	215.896	– 34.687
Quattro GmbH	P8	5	223	204.667	18.333
Renault SAS	P7	214 368	121.899	171.206	– 49.307
Renault Trucks		7 334	198.444	226.246	– 27.802
Saic Motor Commercial Vehicle Co Ltd	DMD	63	250	219.259	30.741
Seat SA	P8	1 264	99.069	126.76	– 27.691
Skoda Auto AS	P8	5 458	110.886	133.291	– 22.405
Ssangyong Motor Company	D	711	196.533	210	– 13.467
Streetscooter GmbH		237	0	147.216	– 147.216
Suzuki Motor Corporation	DMD	337	136.849	128.108	8.741
Tata Motors Limited		53	196	202.176	– 6.176
Toyota Motor Europe NV SA		32 764	178.014	193.955	– 15.941
Toyota Caetano Portugal SA	DMD	42	245.839	190.267	55.572
Volkswagen AG	P8	168 339	167.921	188.905	– 20.984
Volvo Car Corporation		751	116.297	169.633	– 53.336

Notes: The number of registrations represents the number of vehicles having both a mass and an emission value. The parameters used in calculating manufacturer performance for 2015 are set out in Table 2.1.

The Commission implementing decision confirming the 2015 CO_2 emissions assigns some manufacturers an uncertainty adjustment for 2015 data, which modifies the distance to their targets. Here the uncertainty is not reported. A detailed description of the uncertainty calculation is presented with the Commission implementing decision.

'D' indicates that a derogation for small-volume manufacturers has been granted in accordance with the Commission implementing decision.

'DMD' means that a *de minimis* derogation applies, i.e. a manufacturer which together with all its connected undertakings was responsible for fewer than 1 000 new registered vehicles in 2015. According to the Regulation (EU) No 253/2014, they do not have to meet a specific emission target. However the targets are reported in the above table for information purposes only.

'ND' indicates that a derogation for niche manufacturers has been granted in accordance with the Commission implementing decision.

'P' indicates that the manufacturer is member of a pool in accordance with Article 7 of Regulation (EC) No 510/2011.

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

Publications Office

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