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# Monitoring $CO_2$ emissions from passenger cars and vans in 2018

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European Environment Agency

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# 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/ATNI | European Topic Centre on Air Pollution, Transport, Noise and Industrial pollution |
| EVs | Electric vehicles (BEV and PHEV) |
| FCEV | Fuel cell electric vehicle |
| GHG | Greenhouse gas |
| HEV | Hybrid electric vehicle |
| IVA | Individual vehicle approval |
| LPG | Liquefied petroleum gas |
| NEDC | New European Driving Cycle |
| NG | Natural gas |
| NSS | National Small Series |
| OEM | Original Equipment Manufacturer |
| PHEV | Plug-in hybrid electric vehicle |
| SUV | Sport utility vehicle |
| VIN | Vehicle identification number |
| WLTP | World Harmonised Light Vehicle Test Procedure |

# Acknowledgements

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# Data source

Unless otherwise specified, the graphs and tables in this report are based on two data sets for which the EEA is responsible:

- Monitoring of $CO_2$ emissions from passenger cars — Regulation (EC) No 443/2009: https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-17
- Monitoring of $CO_2$ emissions from vans — Regulation (EU) 510/2011 https://www.eea.europa.eu/data-and-maps/data/vans-13

**Disclaimer**

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 may alter the analysis and conclusions. The final $CO_2$ performance for each manufacturer and pool is confirmed by a European Commission Decision.

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 differ from emissions during real-world driving.

**Country groupings**

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

- EU-28: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland , France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Spain, Slovakia, Slovenia, Sweden, and the United Kingdom.
- EU-28 and Iceland.

# Executive summary

This report provides an overview of the $CO_2$ emission levels of new passenger cars and light commercial vehicles (vans) in the European Union and Iceland in 2018 and manufacturers' performance towards their 2018 $CO_2$ emission targets. The report is based on data reported by EU Member States (EU-28) and Iceland to the European Environment Agency (EEA) and verified by manufacturers (OEMs).

For passenger cars, Regulation (EC) No 443/2009 (EU, 2009) sets an EU fleet wide $CO_2$ target of 130 $gCO_2$ per kilometre ($gCO_2$ /km) for the period 2015 to 2019.

For light commercial vehicles, Regulation (EU) No 510/2011 (EU, 2011) sets an EU fleet wide $CO_2$ target of 175 $gCO_2$/km for the period 2017 to 2019.

Starting from 2012 for cars and 2014 for vans, a binding specific emission target has applied annually for each manufacturer. The target is set according to the average mass of the manufacturer's newly registered vehicles using a limit value curve. For each manufacturer, the average specific emissions of its fleet of newly registered vehicles in the EU that year, are compared with the manufacturer's specific emission target.

Stricter targets apply from 2020, as set out in the new Regulation (EU) 2019/631 setting $CO_2$ emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 from 1 January 2020.

## Average $CO_2$ emissions from new cars increased by more than 2 g $CO_2$/km in 2018

***Cars***

For the second consecutive year, the average $CO_2$ emissions ([1]) from new passenger cars increased in 2018 and reached 120.8 $gCO_2$/km. After a steady decline from 2010 to 2016 by almost 22 $gCO_2$/km, average emissions increased in 2017 by 0.4 $gCO_2$/km. The upward trend continued with an additional increase of 2.3 $gCO_2$ /km in 2018.

The main factors contributing to that increase include the growing share of petrol cars in new registrations, in particular in the sport utility vehicle (SUV) segment. Moreover, the market penetration of zero- and low-emission vehicles, including electric cars, remained low in 2018.

***Vans***

For the first time in 2018, average $CO_2$ emissions from new light commercial vehicles registered in the EU were higher than in the previous year: 157.9 $gCO_2$/km in 2018 against 156.1 $gCO_2$/km in 2017. Whereas between 2012-2017 average $CO_2$ emissions decreased by 24 $gCO_2$/km, in 2018 emissions have increased by almost 2 $gCO_2$/km compared to 2017. The EU average emissions are, however, still 10 % below the EU target of 175 $gCO_2$/km and only 7 % above the 2020 target.

Many factors affected the increase in $CO_2$ emissions from new vans in 2018, including an increase in the mass, engine capacity and size of the vehicles. The market share of petrol vehicles remains limited but has increased slightly, constituting 3.6 % of the new vans fleet (2.4% in 2017). The share of zero- and low-emission vans remained at the same level (1.7 %) as in 2017.

## The vast majority of new registrations in 2018 were for petrol cars

Petrol cars constituted the vast majority of new registrations (around 60 %), while diesel cars accounted for more than 36 %, marking a drop of 9 percentage points from 2017, and 19 percentage points from the peak year 2011 (55%). Together, conventional diesel and petrol cars accounted for 96.5 % of the new registrations.

([1]) Average $CO_2$ emissions are calculated as simple averages without taking into account any adjustments.

The average fuel efficiency of both diesel and petrol cars has worsened in the last year: diesel cars emitted on average 121.8 $gCO_2$/km (117.9 $gCO_2$/km in 2017), while the average petrol car emitted 123.5 $gCO_2$/km (121.6 $gCO_2$/km in 2017). In 2000 the emission difference between diesel and petrol cars was much larger (17.1 $gCO_2$/km).

## Rising sales of SUV

An increase in sales of Sport utility vehicles (SUVs) was observed in recent years. In Europe, one out of three cars newly registered in 2018 were SUVs. Compared to regular cars (as hatchback or sedan), SUVs are typically heavier and have more powerful engines and larger frontal areas – all features that increase fuel consumption.

According to the dataset, the majority of new SUVs sold were powered by petrol (53%), with average emissions of 133 $gCO_2$/km, which is around 14 $gCO_2$/km higher than the average emissions of other new petrol cars. Forty-five percent of SUVS were diesel vehicles with average emissions of 129 $gCO_2$/km, which is around 13 $gCO_2$/km higher than the average emissions of other new diesel car.

## Low market penetration of electric vehicles

The proportion of plug-in hybrid and battery electric cars doubled from 1.0 % in 2016 to 2.0 % in 2018.

The $CO_2$ emissions savings related to the deployment of electric vehicles have increased over the years, and reached 2.0 $gCO_2$/km in 2018. This concerns both battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV).

## One car manufacturer exceeded its specific emission targets

The majority of car manufacturers met their specific $CO_2$ emission targets in 2018 (Annex 3). Certain manufacturers would have exceeded their specific emission target, but they met the target as part of pools or because of derogations (see Annex 1). One manufacturer, Automobili Lamborghini SPA, exceeded its specific emission targets and therefore is required to pay excess emission premiums.

All van manufacturers met their $CO_2$ specific emission targets in 2018, taking into account pools and derogations.

## More efforts are needed in order for manufacturers to respect the 2020 targets

Because of the increase of the emissions in the last two years, in 2018 most car manufacturers were still far away from meeting their 2020/2021 targets. Toyota is the closest to reaching its future targets, but still had to reduce its average emissions by around 5 $gCO_2$/km by 2020.

For all other manufacturers the distance to the future targets is higher, up to 39 $gCO_2$/km in the case of Mazda Corporation.

Some of vans' manufacturers have already achieved average $CO_2$ specific emissions below their 2020 target: Automobile Peugeot, Automobile Citroën, Ford-Werke GmbH and Iveco. Manufacturers such as Nissan International, Volkswagen AG and Toyota Motor Europe are already very close to their 2020 targets; they still need to reduce their average emissions by less than 4 $gCO_2$/km in the next 2 years. Other manufacturers will have to make further progress to achieve their 2020 targets.

## Reducing the gap between type-approval and real world emissions

For both passenger cars and vans, the reported $CO_2$ emissions are based upon measurements performed in the laboratory using a standard vehicle test cycle. Over the past decade, the gap between the laboratory emissions based on the NEDC test cycle and the real-world emissions has grown. This has led to the development of a new measurement protocol, the Worldwide Harmonized Light Vehicle Test Procedure (WLTP), which is more representative of real-world driving.

Since 2018, countries have reported both $CO_2$ emissions based on the old (NEDC) and new test procedure (WLTP), the latter only for the newer models. Until 2020, compliance with the $CO_2$ emission targets will continue to be based on NEDC emission values. From 2021 onwards, the compliance will be based on WLTP values.

From 1 January 2021 onward, new vehicles sold in the EU will be equipped with standardised on-board fuel and/or energy consumption monitoring devices, which will monitor real-world data. These data will allow monitoring and assessing the real-world representativeness of emissions determined through the test procedure for type approval.

## The improvements in manufacturers performance were mostly driven by downsizing and electric vehicles

Since 2010, the officially reported $CO_2$ emissions of new passenger cars have reduced substantially. These reductions can be attributed to both the overall improvement of car energy efficiency as well as a change in the mix of car models sold in favour of more efficient powertrains/technologies.

However, the downward trend of average $CO_2$ emissions stopped in 2016 and these emissions have been increasing in the last two years. These trends were mainly affected by the following drivers:

- engine downsizing;
- de-dieselization; (shift to petrol)
- introduction of new models;
- electrification of the fleet;
- increase in the market share of SUVs.

While engine downsizing and the uptake of electric vehicles always have a positive effect on reducing $CO_2$ emissions, the increase of SUVs has systematically led to an increase of emissions.

Upgrading models, in case of complete overhaul of model (both engine and bodywork improvements) may reduce emissions. The effect of the de-dieselisation of the fleet on average $CO_2$ emissions depends on the fleet characteristic of the manufacturer.

**Figure ES.1 Average $CO_2$ emissions of new passenger cars and vans in the EU-28 and Iceland**

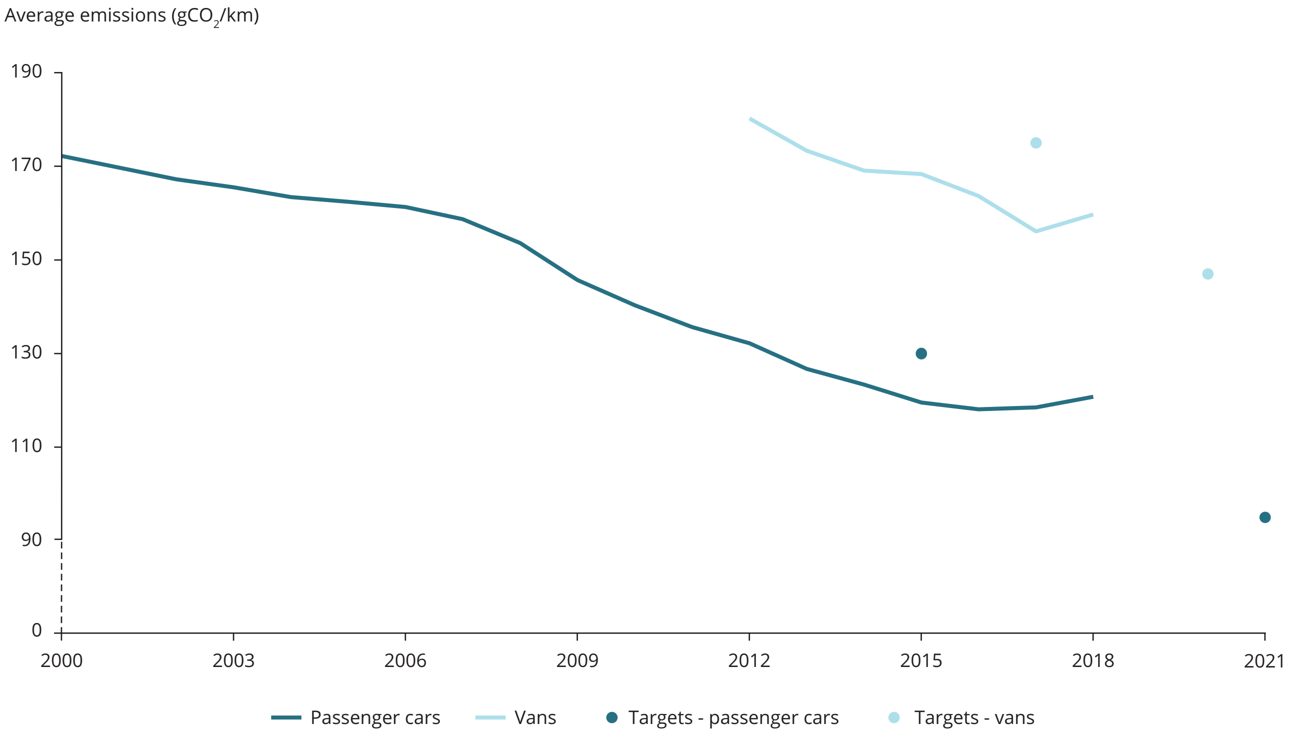
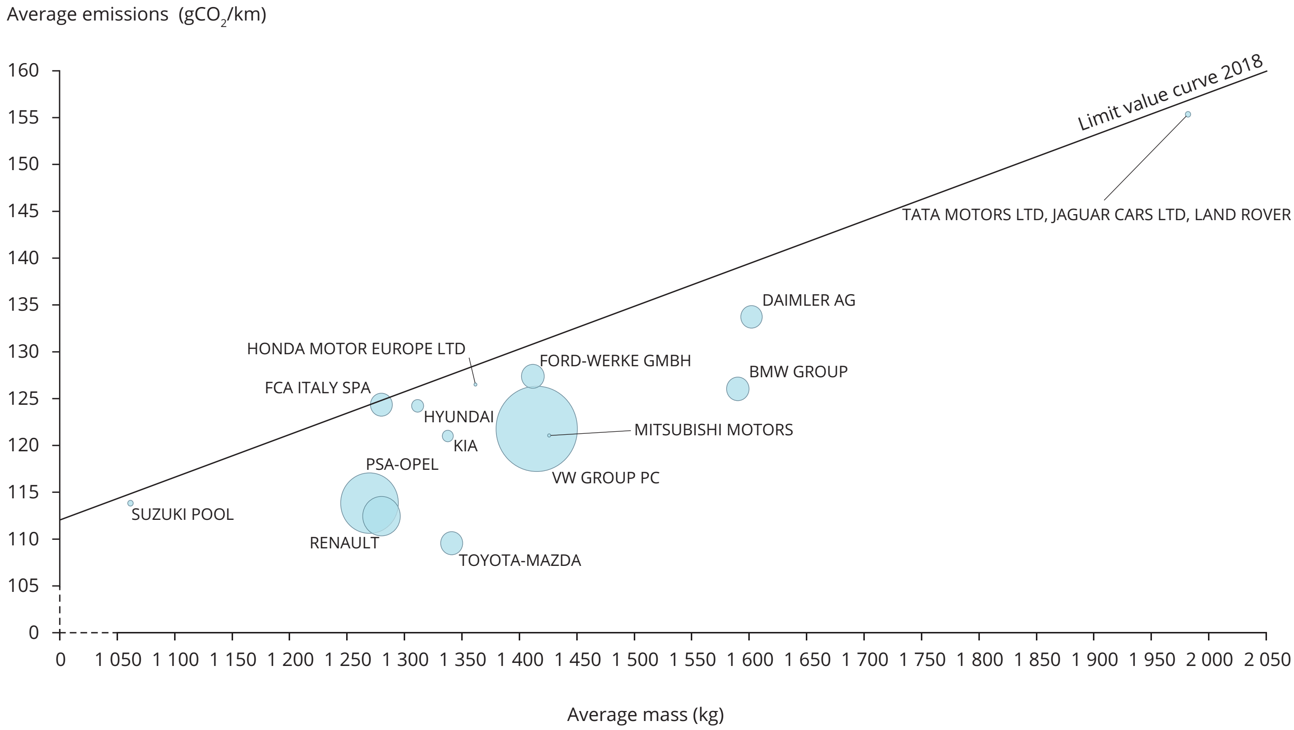


**Figure ES.2 Distance to 2018 target by cars pool**




**Note:** Bubble size represents the number of registrations.

# 1 Introduction

Reducing greenhouse gas emissions (GHG) from the transport sector is a key priority for the EU. The transport sector ([2]) is responsible for about 32 % of the total $CO_2$ emissions in the EU. Transport has not seen the same reduction in emissions as other sectors. $CO_2$ emissions from transport in 2017 were 29 % above 1990 levels despite a decline between 2008 and 2013. Road transport accounts for almost 72 % of all $CO_2$ emissions in the transport sector in 2017. Cars and light commercial vehicles (vans) are responsible respectively for 44 % and 9 % of the emissions of the transport sector.

To reduce $CO_2$ emissions in the road transport sector, the European Parliament and the Council adopted two regulations, which introduced mandatory $CO_2$ emission performance standards for new passenger cars, and new light commercial vehicles:

- For new passenger cars, Regulation (EC) No 443/2009 sets a target of 130 $gCO_2$/km for the EU fleet-wide average $CO_2$ emissions for the period 2015 to 2019. A target of 95 $gCO_2$/km has been set for 2021 with a phase-in starting in 2020.

- For new light commercial vehicles, Regulation (EU) No 510/2011 sets the target for the EU fleet-wide average $CO_2$ emissions to 175 $gCO_2$/km for the period 2017 to 2019. A target of 147 $gCO_2$/km has been set for 2020.

These two Regulations have been replaced since 1 January 2020 on by the new Regulation (EU) 2019/631 (EU, 2019) setting $CO_2$ targets for new passenger cars and for new light commercial vehicles also for the period after 2020. The EU fleet-wide targets for 2025 and 2030 are defined as a percentage reduction of the 2021 starting point:

- For new passenger cars, the Regulation requires a 15% reduction from 2025 on and a 37.5% reduction from 2030 on;

- For new light commercial vehicles, the Regulation requires a 15% reduction from 2025 on and a 31% reduction from 2030 on.

According to the Regulations, data on new registered passenger cars and vans, including their $CO_2$ emissions, shall be collected each year by Member States and submitted to the European Commission. Manufacturers can verify the data, and notify the Commission of any errors. The Commission assesses the manufacturers' corrections, and, where justified, takes them into account for the calculation of their average $CO_2$ emissions and specific emission targets. This report presents the data concerning the years 2010-2018.

For both cars and vans, the reported $CO_2$ emissions are based upon the New European Driving Cycle (NEDC). Since 2018, countries have reported both $CO_2$ emissions based on the old (NEDC) and new test procedure (WLTP), the latter only for the newer models. From 2021, compliance assessment will be based on the WLTP data.

**Type approval emissions versus real-world emissions**

According to EU legislation, vehicles must be tested to verify that they comply with the required environmental, climate, safety and security standards. To check that vehicles meet the official requirements for $CO_2$ emissions, standardised measurements in laboratories are used. The results of these tests are the so-called 'type approval' emissions.

Until September 2017, these tests were based on the New European Driving Cycle (NEDC). Since then, the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) applies as the new type approval test procedure. The WLTP was developed to be more representative of real world driving conditions. From 2021 onwards, the WLTP will replace fully the NEDC for the purpose of the $CO_2$ emission standards.

([2]) All figures are calculated including emissions from international aviation and international shipping.

# 2 Average $CO_2$ emissions from new passenger cars and vans

## 2.1 Passenger cars

The final data presented in this report replace the provisional data published by the EEA earlier in 2019, taking into account corrections proposed by the manufacturers.

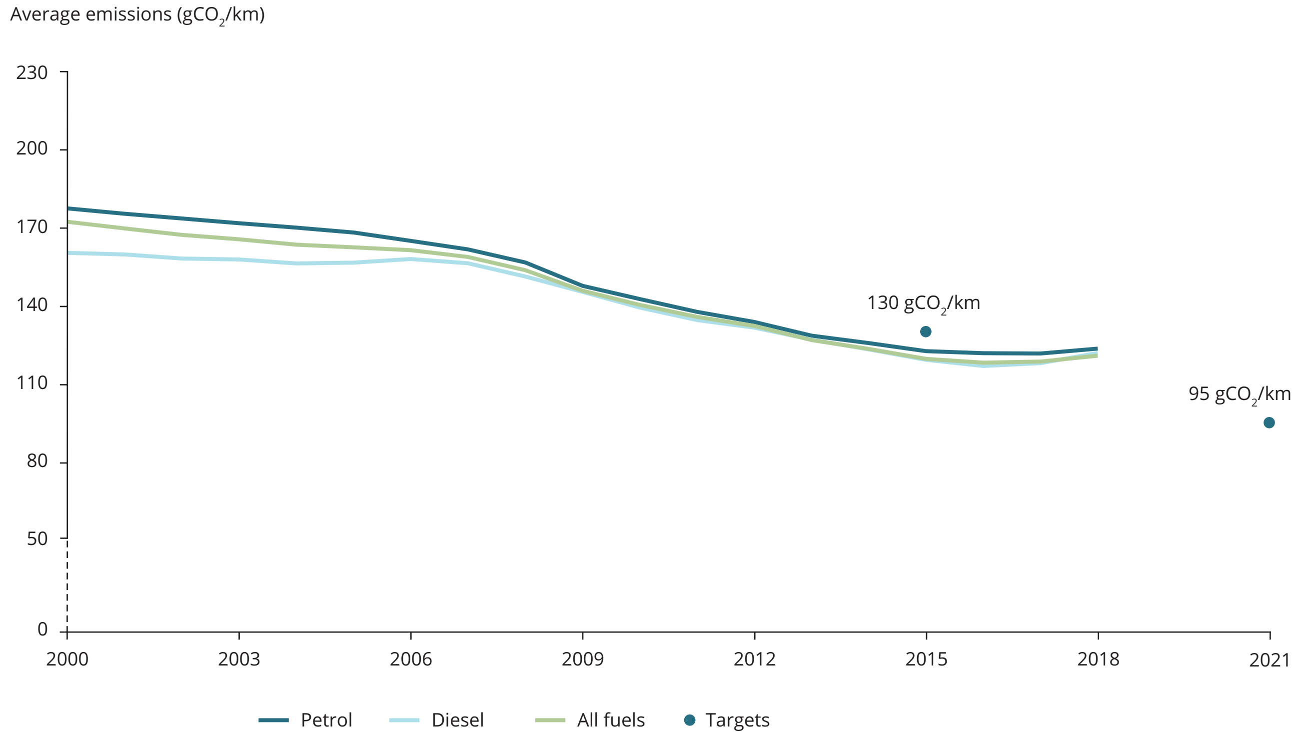
The average $CO_2$ emissions from the new passenger car fleet in the EU in 2018 were 120.8 $gCO_2$/km (Figure 2.1), which is an increase of 2.3 $gCO_2$/km compared to 2017.

After a steady decline from 2010 to 2016, by almost 22 $gCO_2$/km, average emissions from new passenger cars increased in 2017 by 0.4 $gCO_2$/km. This upward trend has continued in 2018 even though stricter targets will start to apply from 2020 on.

The main factors contributing to the increase of new passenger cars' emissions in 2018 include the growing share of petrol cars in new registrations (chapter 2.1.1), in particular in the sport utility vehicle (SUV) segment (chapter 2.2.2). Moreover, the market penetration of zero- and low-emission cars, including electric cars, remained low (chapter 2.2.1).

In order to identify the factors that have mostly influenced the increase in the $CO_2$ average emissions over the last two years, the results of a simple decomposition analysis is presented in Figure 2.2. The average $CO_2$ average emissions of the two years is calculated as the sum of the contributions coming from different car segments (small, medium, large regular

**Figure 2.1 Average $CO_2$ emissions ($gCO_2$/km) from new passenger cars, by fuel type (EU-28 and Iceland)**



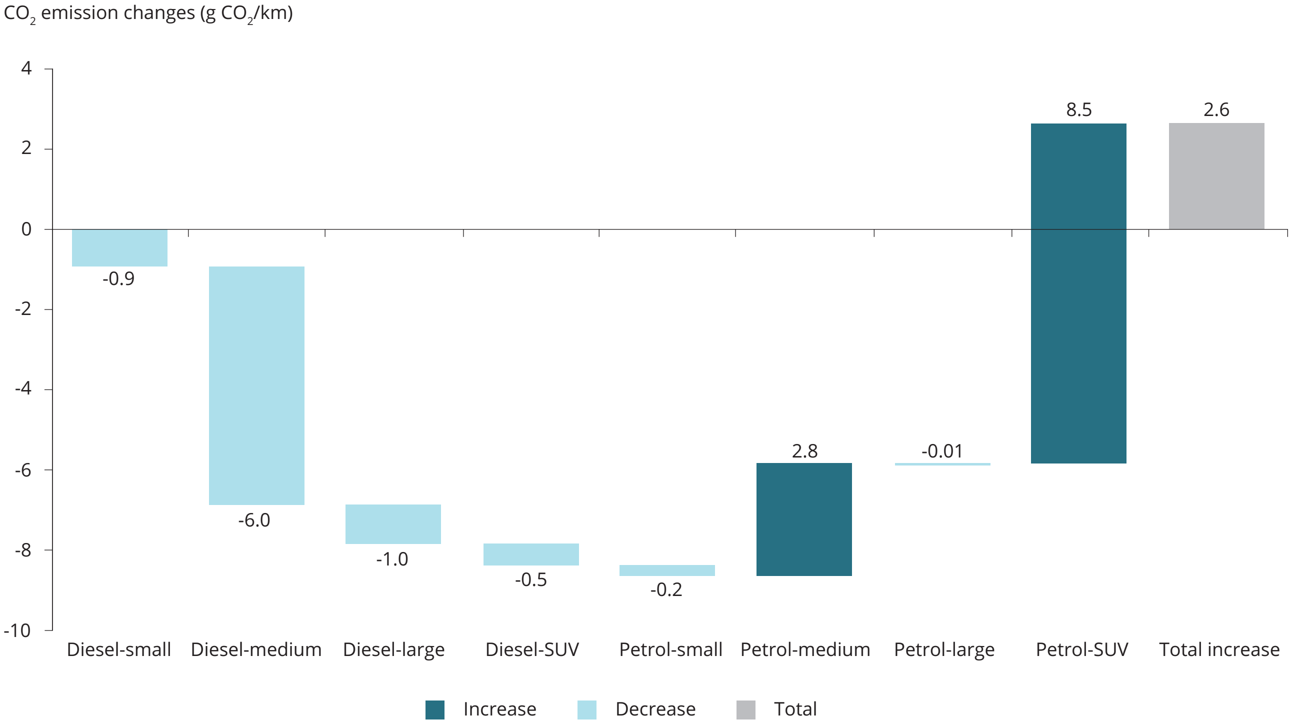
cars ([3]) and SUVs ([4])) and fuel types (petrol and diesel). The SUVs were identified using commercial names (Cn); the remaining cars were then classified according to their engine size in small, medium and large regular cars ([5]). The sum of the differences between each contribution is to the overall changes in average $CO_2$ emissions (Figure 2.2).

The decreasing share of new registrations of diesel car registrations in 2018 (-26 %) together with an increasing share of petrol cars with comparatively higher emissions contributed to an overall increase in the average $CO_2$ emissions. Amongst the petrol cars, SUVs had the highest increase of their contribution to the total average $CO_2$ emissions (+8.5 g$CO_2$/km).

On average (Figure 2.3) the highest-emitting cars were registered in Estonia (132.4 g$CO_2$/km), Luxemburg (131.4 g$CO_2$/km), and Poland (129.8 g$CO_2$/km). As in previous years, the Netherlands (105.5 g$CO_2$/km) registered the lowest emitting new passenger car fleet. Portugal, Malta and Denmark followed, with average emissions below 110 g$CO_2$/km (Figure 2.3).

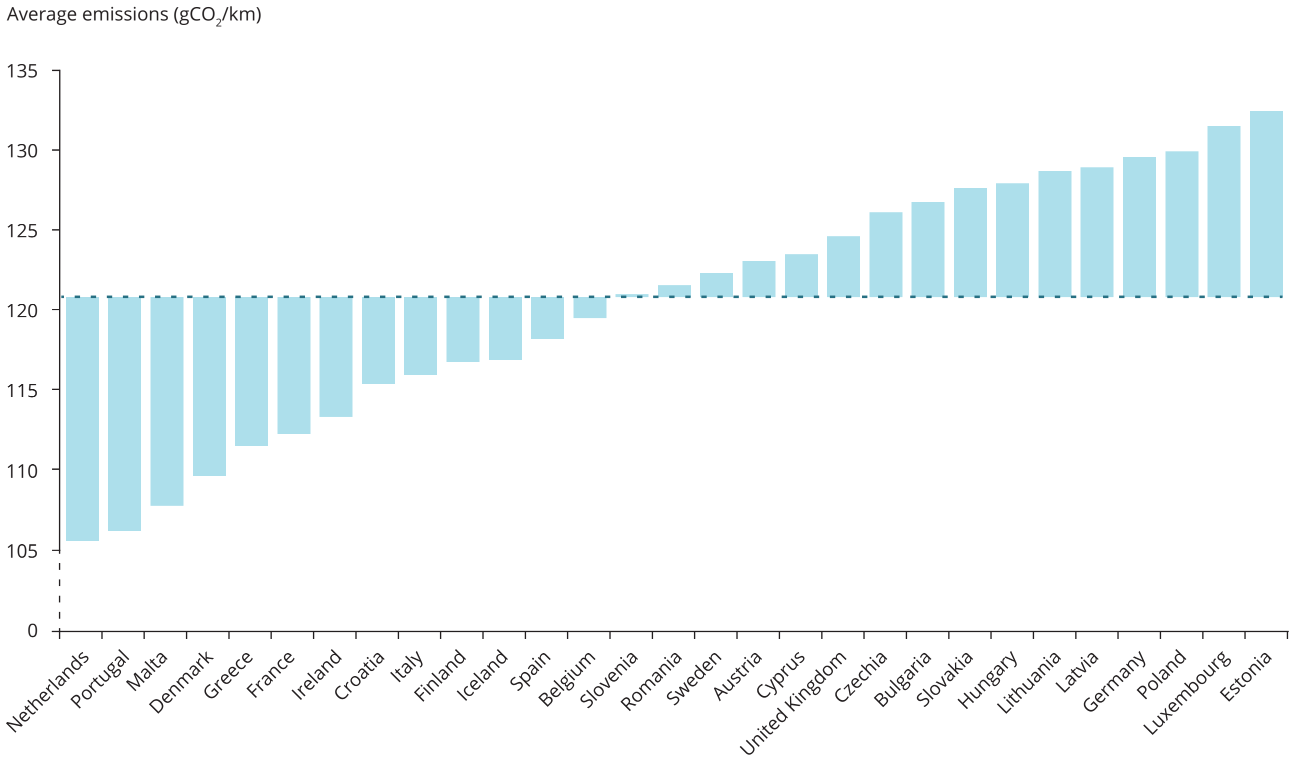
Compared with 2017, $CO_2$ emissions decreased in only five countries.

**Figure 2.2 Decomposition analysis: average $CO_2$ emissions changes observed for different car segments (small, medium, large regular cars and SUVs) ([6]) and fuel type (petrol and diesel).**




([3]) The term 'regular cars' refers to passenger cars that are not SUV, as sedan or hatch back.
([4]) There is no universally accepted definition of the sport utility vehicle. Here SUVs were identified using commercial names (Cn) from the EEA database. The SUV's commercial names (or model name) were found in the websites of all car's manufacturers. See also Section 2.1.3.
([5]) SUVs could also be classified according to their engine size in small, medium and large.
([6]) The term 'regular cars' refers to passenger cars that are not SUV, as sedan or hatch back. SUVs could also be classified according to their engine size in small, medium and large.

**Figure 2.3 Average $CO_2$ emissions by country in 2018 compared with the EU average (120.8 $gCO_2$/km)**




### *2.1.1 Vehicles are further shifting from diesel to petrol*

In 2018, for the second year in a row more new petrol cars were registered than new diesel ones Table 2.1. Diesel cars represented 36 % of the newly registered car fleet, almost 19 percentage points less than in 2011, the year in which the percentage of diesel cars reached its maximum (55 %).

For the first year, the average $CO_2$ emissions increased both for petrol cars (from 121.6 to 123.5 $gCO_2$/km, i.e. by 1.5%) and for diesel cars (from 117.9 to 121.8 $gCO_2$/km, i.e. by 3.2%). The difference in average fuel efficiency between the diesel and petrol cars newly registered in 2018 was only 1.7 $gCO_2$/km, one of the lowest values observed since 2009 (Table 2.2).

The share of diesel cars in new registrations, however, still differs strongly amongst countries. For example, in Portugal, Italy and Ireland, the share of diesel was higher than 50% (Table 2.1), while in the Netherlands, Finland and Hungary, the share is lower than 25 %.

Even if the vast majority of Europe's new cars remain powered by petrol or diesel, the registration of alternative fuel vehicles (AFVs) has been increasing over the last two decades (Figure 2.4). This category included only a few dual-fuel cars in 2000, i.e. cars mostly able to operate on petrol and ethanol blends, but it exceeded half a million new vehicle registrations in 2009, due to scrappage schemes favouring the uptake of LPG and NG vehicles in Italy and France. In 2010/11 the registrations of AFVs decreased significantly (by 62 %), caused mainly by the end of the scrappage schemes in France and Italy.

In the recent years, the share of electric cars (both BEV and PHEV) has been growing quickly. In 2018, there were almost 150 000 registrations of BEVs and 150 000 registrations of PHEVs. Together, they represented 2 % of new registrations.

Figure 2.5 shows the average $CO_2$ emissions including and excluding electric cars (BEV and PHEV). The difference between the two lines increases over the years, and reached 2.0 $gCO_2$/km (or 1.6 %) in 2018.

There are major differences in the market shares of EVs among countries: countries with significant incentives for EVs generally had a higher share of EVs, while in countries without such incentives the sales of EVs remained low (EEA, 2018).

Iceland recorded high electric car market shares, 15%. Within the EU28, Sweden had the highest share of new electric cars in 2018: around 8 % of new cars were PHEVs or BEVs.

**Table 2.1 Share of new passenger cars per fuel type in 2018 (%)**

| | DIESEL | PETROL | BEV | LPG | NG | PHEV |
|---|---|---|---|---|---|---|
| EU-28 and Iceland | 36 | 60 | 1.0 | 1.0 | 0.4 | 1.0 |
| Austria | 41 | 56 | 2.0 | 0.0 | 0.2 | 0.7 |
| Belgium | 36 | 61 | 0.7 | 0.0 | 0.7 | 1.8 |
| Bulgaria | 37 | 60 | 0.7 | 1.2 | 0.9 | 0.3 |
| Cyprus | 39 | 61 | 0.0 | 0.0 | 0.0 | 0.3 |
| Czechia | 31 | 68 | 0.2 | 0.2 | 0.8 | 0.1 |
| Germany | 32 | 66 | 1.0 | 0.1 | 0.3 | 0.9 |
| Denmark | 33 | 65 | 0.7 | 0.0 | 0.0 | 1.3 |
| Estonia | 25 | 74 | 0.3 | 0.1 | 0.4 | 0.2 |
| Spain | 38 | 60 | 0.4 | 1.1 | 0.3 | 0.4 |
| Finland | 22 | 72 | 0.7 | 0.0 | 1.0 | 4.1 |
| France | 41 | 57 | 1.4 | 0.1 | 0.0 | 0.6 |
| United Kingdom | 32 | 66 | 0.7 | 0.0 | 0.0 | 1.9 |
| Greece | 36 | 63 | 0.1 | 0.0 | 1.0 | 0.2 |
| Croatia | 44 | 55 | 0.2 | 0.7 | 0.0 | 0.1 |
| Hungary | 23 | 75 | 1.0 | 0.0 | 0.0 | 0.5 |
| Ireland | 54 | 44 | 1.0 | 0.0 | 0.0 | 0.6 |
| Iceland | 37 | 47 | 3.9 | 0.0 | 0.8 | 11.0 |
| Italy | 52 | 39 | 0.3 | 6.6 | 2.0 | 0.2 |
| Lithuania | 23 | 76 | 0.4 | 0.0 | 0.0 | 0.1 |
| Luxembourg | 47 | 51 | 0.8 | 0.0 | 0.0 | 1.3 |
| Latvia | 36 | 63 | 0.5 | 0.2 | 0.0 | 0.1 |
| Malta | 29 | 66 | 3.3 | 0.0 | 0.0 | 1.1 |
| Netherlands | 12 | 81 | 5.9 | 0.2 | 0.2 | 0.9 |
| Poland | 26 | 73 | 0.1 | 0.5 | 0.0 | 0.1 |
| Portugal | 54 | 42 | 2.0 | 0.8 | 0.0 | 1.7 |
| Romania | 40 | 58 | 0.4 | 0.7 | 0.0 | 0.3 |
| Sweden | 36 | 54 | 2.1 | 0.0 | 0.7 | 6.3 |
| Slovenia | 31 | 68 | 0.7 | 0.2 | 0.0 | 0.3 |
| Slovakia | 30 | 69 | 0.3 | 0.7 | 0.2 | 0.2 |

**Note:** BEV are battery electric vehicles, LPG are liquefied petroleum gas vehicles, NG are natural gas vehicles, PHEV are plug-in hybrid electric vehicles

**Figure 2.4 Trends in total registrations of alternative fuel vehicles (AFVs), 2000-2018**

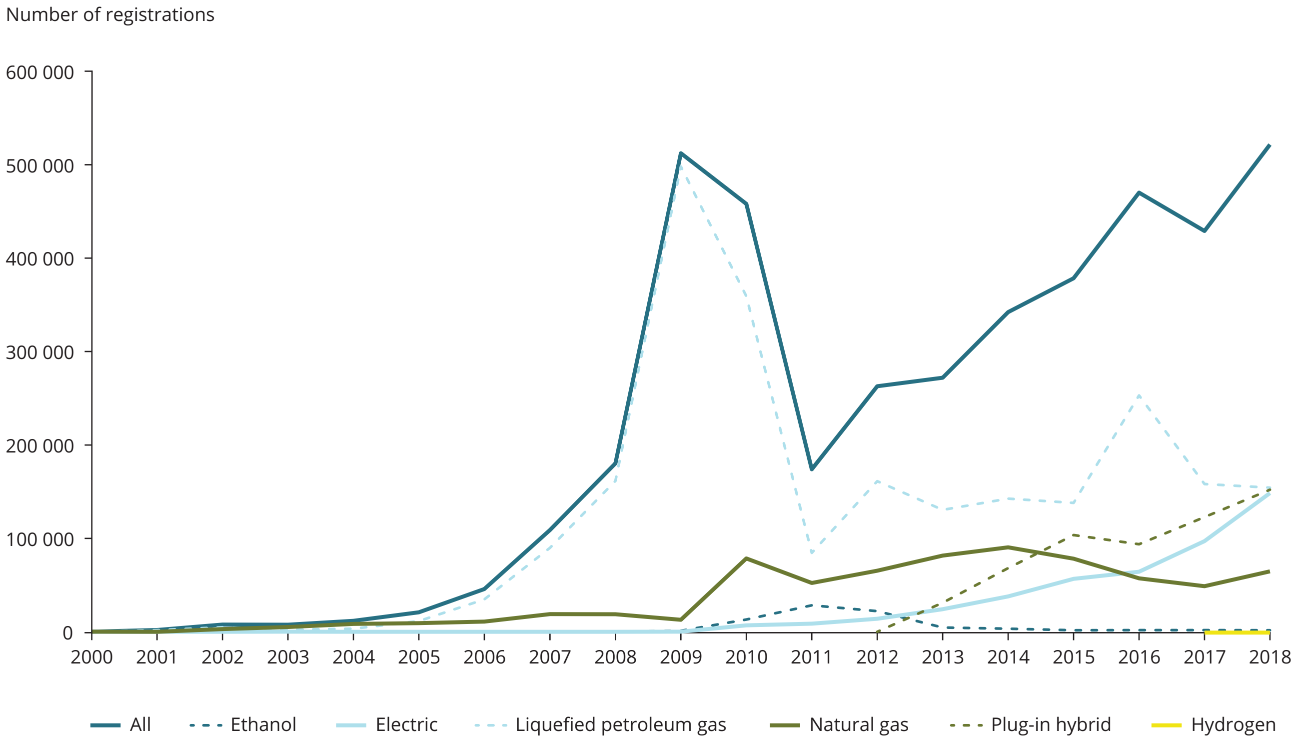



**Figure 2.5 Average $CO_2$ emissions with and without electric cars (BEV and PHEV)**

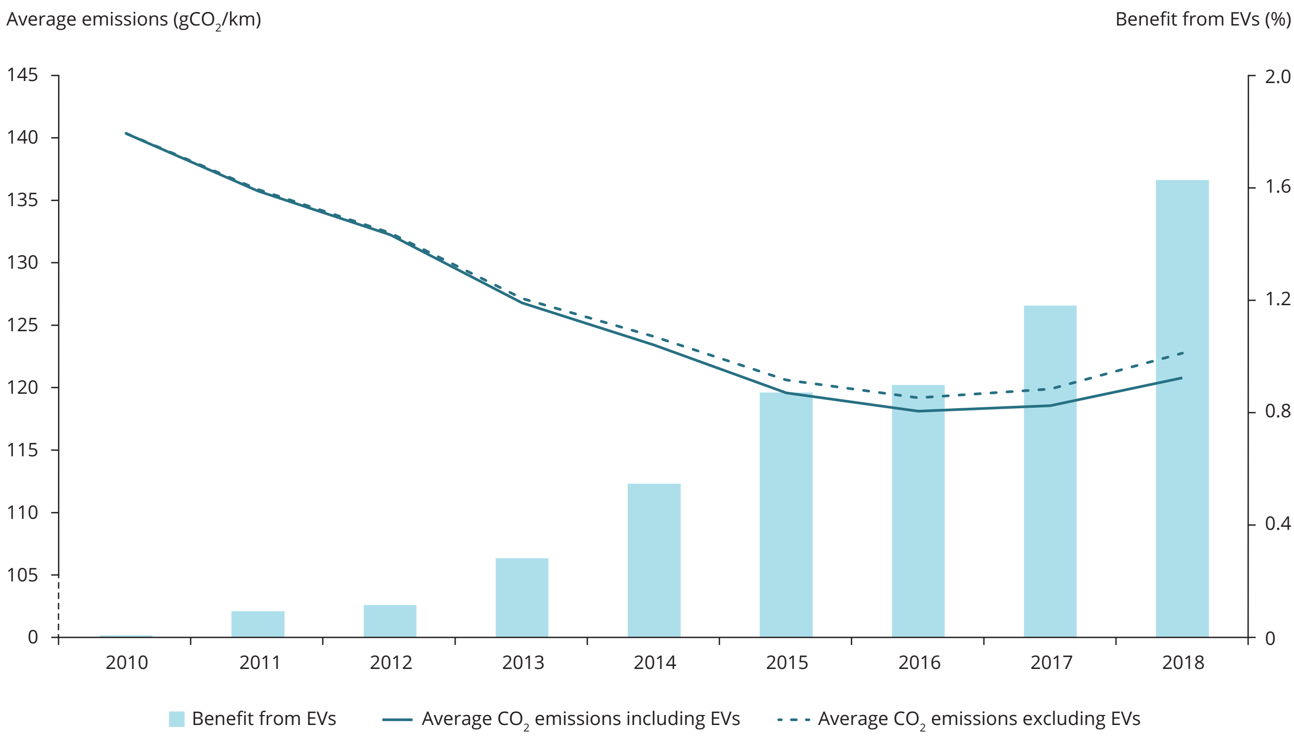


**Table 2.2 Number of registrations, average $CO_2$ emissions ($gCO_2/km$), average mass in running order (kg) by fuel type**

| Fuel | Registrations | Average $CO_2$ emissions ($gCO_2/km$) | Average mass (kg) |
|---|---|---|---|
| FCEV (Hydrogen) | 159 | 0 | 1 922 |
| E85 | 1 703 | 117.0 | 1 283 |
| PHEV (Diesel/Electric) | 3 247 | 48.9 | 2 255 |
| NG | 64 786 | 102.7 | 1 325 |
| LPG | 154 301 | 122.0 | 1 216 |
| PHEV (Petrol/Electric) | 148 823 | 46.4 | 1 880 |
| BEV | 148 488 | 0 | 1 628 |
| Diesel | 5 504 407 | 121.8 | 1 562 |
| Petrol | 9 075 727 | 123.5 | 1 277 |

**Swedish car policies favoured the uptake of electric cars**

In Sweden, sales of electric passenger cars have seen a much faster uptake than in the other EU countries.

Several factors affected the high uptake of EVs:

- Incentives on car purchase: a new bonus-malus system to incentivize low-emitting passenger cars has been introduced in Sweden on 1 July 2018. With the new system (called Klimatbonus), buyers of passenger cars newly registered from 1 July 2018 and with $CO_2$ emissions lower than 60 $gCO_2/km$ will receive a bonus depending on their $CO_2$ emission. For battery electric vehicles (BEV), the bonus is 60 000 SEK and for plug-in hybrid (PHEV) with $CO_2$-emission of 60g/km the bonus is 10 000 SEK. For PHEV emitting less than 60 $gCO_2/km$, the 60 000 SEK bonus decreases by 833 SEK per g/km emitted.
- Road tax: the annual road tax is calculated according to the $CO_2$-emission of the vehicle. The low-emitting cars are exempt from the road tax for the first five years after registration.
- Company cars: the private use of company cars in Sweden can be declared as a 'benefit in kind' in the tax declaration if the vehicle is electric. And therefore this reduces the amount of income taxes that needs to be paid on it. In November 2017, company cars accounted for approximately 70% of the new electric car sales.
- Other incentive as implementation of support scheme for private charging infrastructure. The Swedish government imposed as well the adoption of environment-friendly and electric cars in government fleets

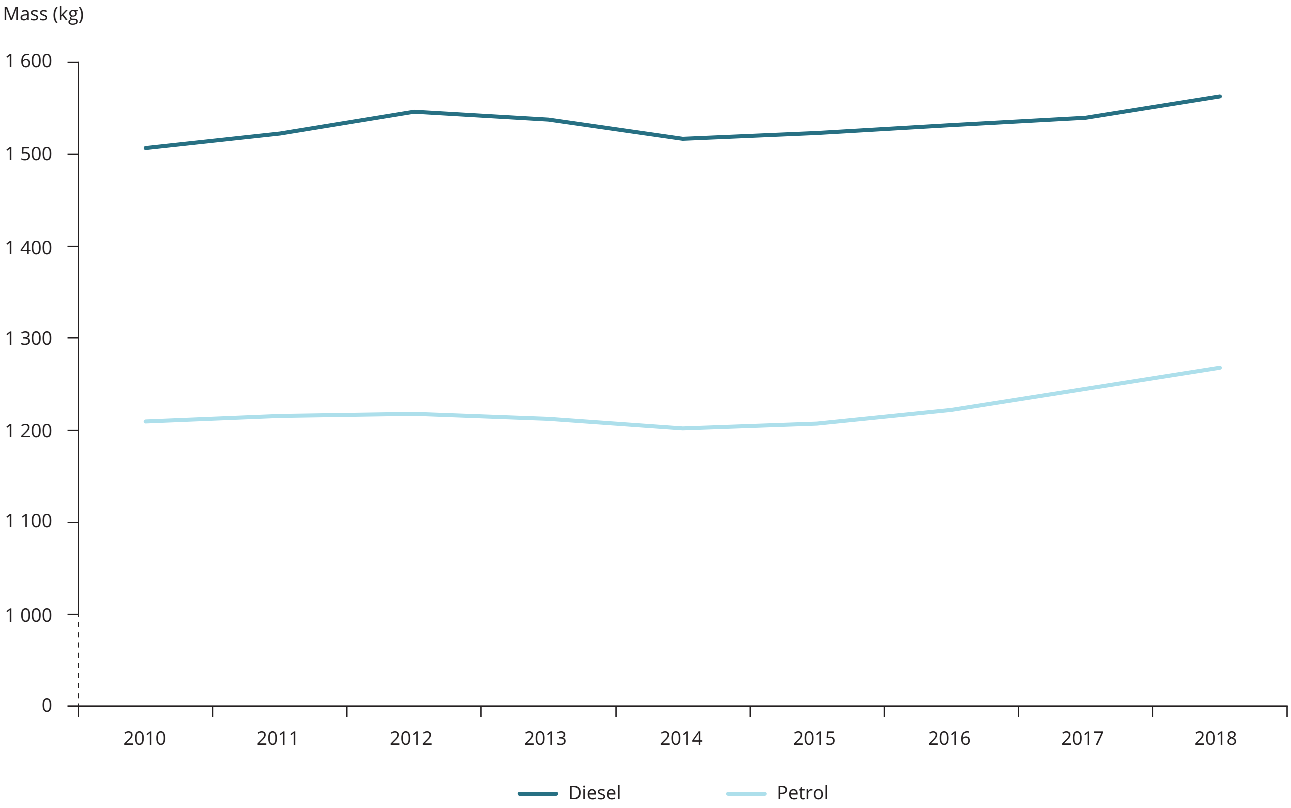
On the basis of the monitoring data, the average $CO_2$ emissions for vehicles using different fuel types can be calculated (Table 2.2). The tailpipe (7) emissions of battery electric cars are considered to be 0 $gCO_2/km$. The emissions from PHEVs – reported as diesel/electric or petrol/electric were generally below 70 $gCO_2/km$. Only a few FCEVs have been sold, showing that the uptake of this technology is still at an early stage.

### *2.1.2 The fleet is moving towards heavier and more powerful cars*

Over the past years, the average mass of new cars followed a slowly increasing trend. The average mass of petrol cars grew by around 5 % in 2018 compared to 2010 levels, while conventional diesel cars – despite the fluctuations –increased by about 4 % over the

(7) Tail-pipe emissions are the exhaust emissions of the vehicles. There are no end-of-pipe emissions for BEVs and low end of pipe emissions for PHEVs However, BEVs and PHEVs produce indirect emissions when they are plugged into the electricity grid. The indirect emissions are not taken into account in this report or in the regulation.

**Figure 2.6 Evolution of mass for petrol and diesel passenger cars**




same period. Figure 2.6, shows that diesel cars are on average about 300 kg heavier than their petrol counterparts.

Vehicle mass is a critical parameter in car design as it is linked closely to fuel consumption. Increasing the mass of the car leads to a rise in the energy needed to accelerate the car and an increase in the rolling resistance resulting in increased energy consumption (and thus, all other aspects remaining unchanged, $CO_2$ emissions). In order to examine the quantitative effect of weight, several studies have been carried out which demonstrate that for an additional vehicle mass of 50 – 200 kg, the increase of fuel consumption over various cycles and operating conditions ranges from 5 to 9% (Fontaras, et al., 2017).

Looking at the engine power trend, a substantial increase from 2011 to 2018 is observed (Figure 2.7). On average, petrol and diesel cars are about 17.5% and 11.5% respectively more powerful in 2018 than they were in 2011. In addition, it is worth stressing that the conventional diesel cars are generally more powerful than petrol counterparts.

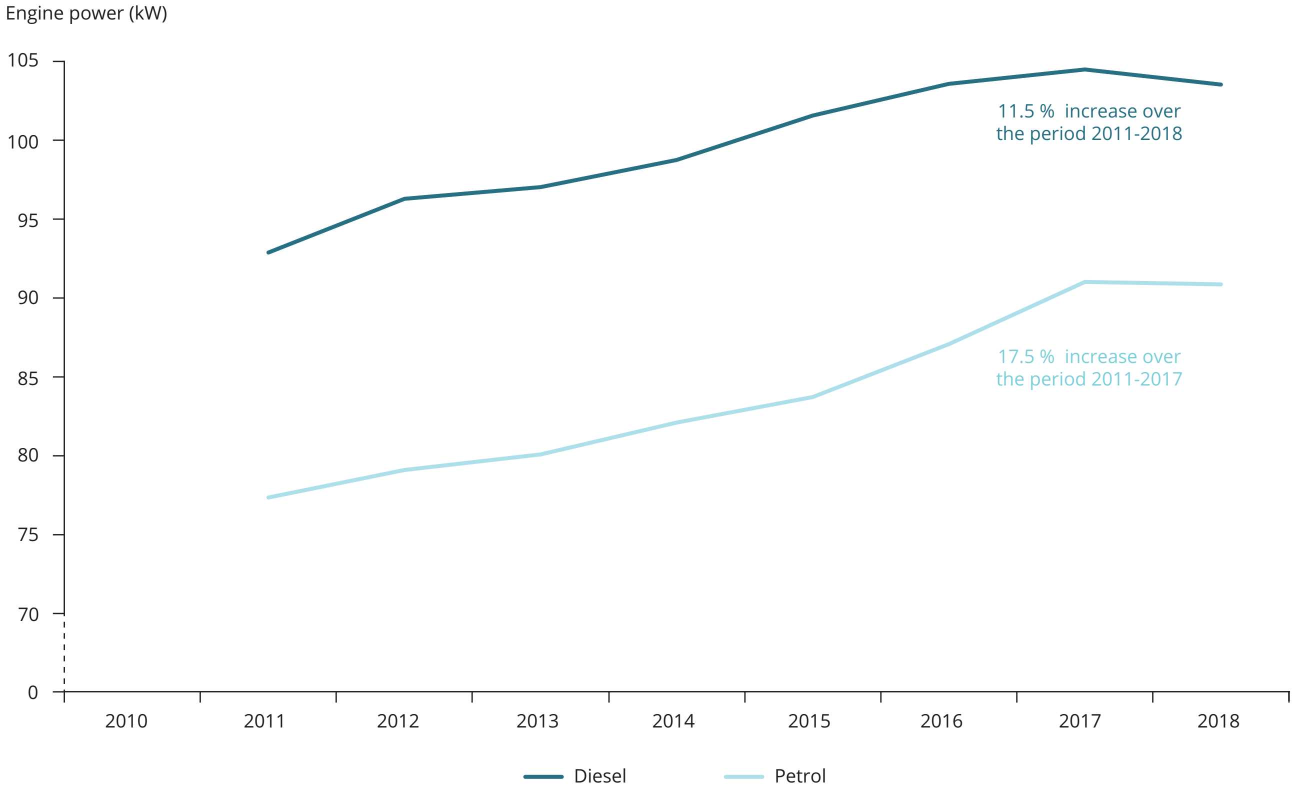
As discussed previously, the automotive industry has been able to reduce $CO_2$ emissions from new passenger cars and meet the 130g $CO_2$/km target, even when delivering more powerful passenger cars to the market. One factor that helped this decoupling of emissions from engine power was the petrol engine downsizing that has taken place in recent years. Engine downsizing can be defined as the use of a smaller engine able to deliver the power of a larger engine by apply technologies increasing the engine's efficiency, such as supercharging or turbocharging (see chapter 5).

Diesel and petrol cars exhibit different trends as regards engine capacity. In general, the average engine capacity of diesel remained stable during the eight-year period (2010-2018), slightly above 1800 cc, whereas the average engine capacity of petrol cars decreased by 90 cc over the same period. As shown in Figure 2.7 the engine displacement of diesel cars is much larger compared to petrol cars.

### *2.1.3 Rise in registrations of Sport utility vehicles (SUVs)*

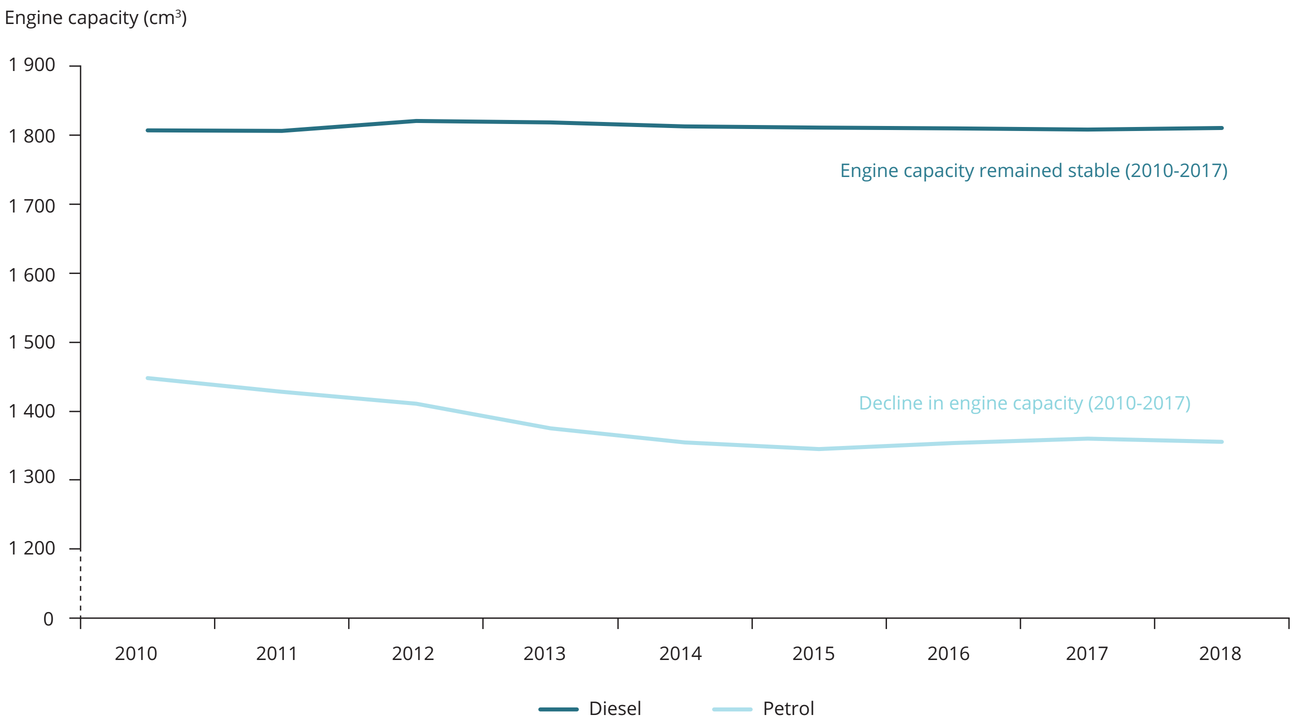
An increase in sales of Sport utility vehicles (SUVs) was observed in recent years. In Europe, SUVs accounted for about one-third (35 %) of all passenger car sales in 2018 (Figure 2.3), up from 26 % percent in 2016, while

**Figure 2.7 Evolution of engine power for petrol and diesel passenger cars**




**Note:** In 2010 engine power was not a mandatory parameter for the monitoring.

**Figure 2.8 Evolution of engine capacity for petrol and diesel passenger cars**



in 2007 they held only 8 % of the new passenger car market, according to JATO (JATO, 2019a).

This recent surge in SUV sales is one of the key factors that contributed to the rise of new passenger car emissions in 2018. In fact, in comparison with other cars within a given segment, SUVs have larger frontal areas and higher drag coefficients that have a negative impact on fuel consumption and can weaken efforts to reduce $CO_2$ emissions.

In the database, SUVs were identified using the commercial name. The remaining vehicles were then classified according to the segment definition in Annex 2.

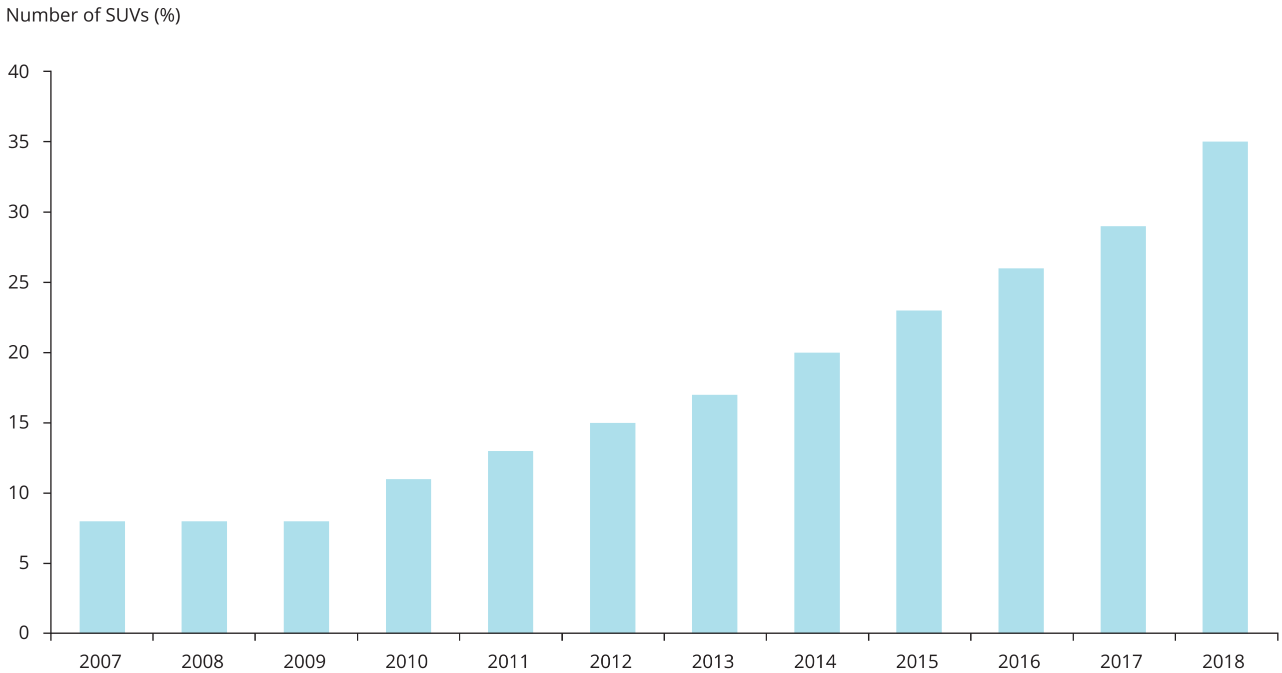
According to EEA analysis, the majority of new SUVs sold were powered by petrol (53%), with average emissions of 133 $gCO_2$/km, which is 14 $gCO_2$/km higher than the average emissions of other new petrol cars. Forty-five percent of SUVs were diesel cars with average emissions of 129 $gCO_2$/km, which is 13 $gCO_2$/km higher than the average emissions of other new diesel cars.

## 2.2 Vans

Since the start of the monitoring, and for the sixth year in a row, the number of new van registrations has increased (Annex 2). In 2018, 1.65 million new vans were registered in the EU-28 and Iceland, 2.6 % more than in 2017.

Those vans emitted on average 157.9 $gCO_2$/km, which is 1.7 $gCO_2$/km more than in 2017. Following a sharp decrease in 2017, this is the first increase in average $CO_2$ emissions from new vans since the Regulation came into force in 2011. Many factors affected the increase in $CO_2$ emissions from new vans in 2018, including an increase in the mass, engine capacity and size of the vehicle. The market share of petrol vans remained very remains limited but increased slightly

**Figure 2.9 SUVs market share for 2007-2018**




**Note:** 2007-2016 data from JATO (JATO, 2019b) , 2017-2018 EEA dataset.

**Table 2.3 Average $CO_2$ emissions ($gCO_2$/km) by segment and fuel type**

| | Small | Medium | SUV | Large |
|---|---|---|---|---|
| Diesel | 102.6 | 113.9 | 129.1 | 143.7 |
| Petrol | 113.3 | 126.2 | 133.1 | 203.9 |

to 3.5 % (from 2.4% in 2017). The share of zero- and low-emission vans remained at the same level (1.7 %) as in 2017.

The average $CO_2$ emissions from vans increased between 2017 and 2018 in all countries, but six. The decrease varied from 0.3 $gCO_2$/km in Ireland to 5.9 $gCO_2$/km in Romania, while the increases varied from 0.1 $gCO_2$/km in Croatia to 10.4 $gCO_2$/km in Latvia. No major changes were observed in fleet composition or average mass in these countries.

All countries had average specific $CO_2$ emissions from newly registered vans in 2018 below 175 $gCO_2$/km, which is the EU target since 2017 (Figure 5.3). Seven had emission values below 147 $gCO_2$/km, which is the EU target for 2020.

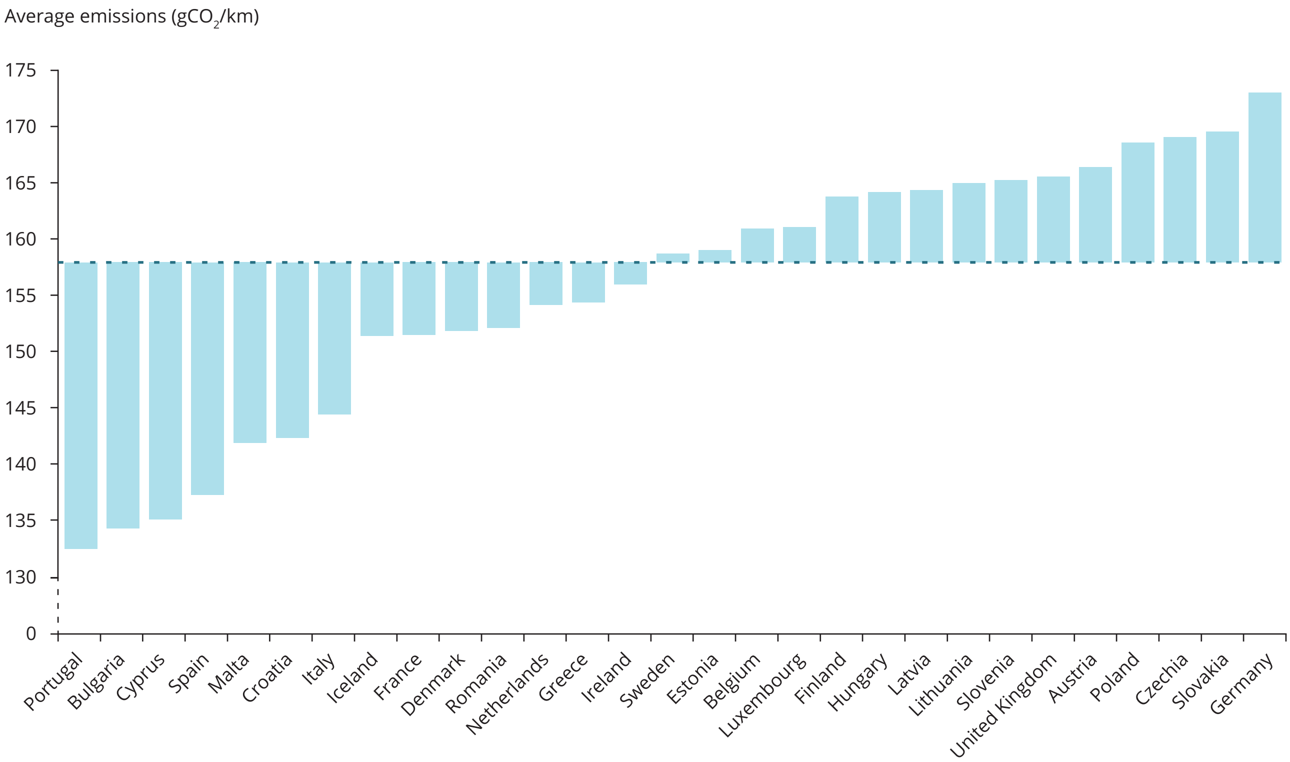
Five countries with the highest number of new van registrations — France, Germany, Italy, Spain and the United Kingdom — are the largest influencers of average $CO_2$ emissions in EU-28 plus Iceland. Amongst them, only Spain has decreased the average $CO_2$ emissions in 2018, if compared with 2017. In Spain, the van fleet has decreased the average mass the most between EU-28 and is relatively light (average mass of 1 619 kg) with the one of the lowest average engine power (78 kW) and engine capacity (1 680 $cm^3$). France had a relatively high percentage of battery electric vans (2 %), however, average $CO_2$ emissions still increased by 0.5 $gCO_2$/km because of increased amount of petrol vehicles of lower efficiency. In Italy, the average engine capacity was low (1 727 $cm^3$) and the fleet had a high share of NG vans (average emissions of 135.7 $gCO_2$/km), and LPG vans (average emissions of 136.6 $gCO_2$/km), however due to the slightly heavier vans of lower efficiency the average $CO_2$ emissions of Italy went up by 2.6 $gCO_2$/km.

### 2.2.1 *The vast majority of registered vans are powered by diesel*

The vast majority of registered vans are powered by diesel (Table 2.4). In the majority of countries, the proportion of diesel vehicles is above 90 %. For some countries (Ireland, Malta and Portugal), this proportion is even above 99 %.

The share of petrol vans is only 3.5 %, but it has increased in the last years (from 1.9 % in 2016 and 2.4 % in 2017). Gas fuelled vans constituted 1.1% of the new fleet. The share of newly registered BEVs remained stable in 2018 at 0.8% while PHEV constituted less than 0.1% of the new van fleet. France registered the majority of BEVs (6 610), followed by Germany (1 443) and Spain (1 343).

**Figure 2.10 Average $CO_2$ emissions ($gCO_2$/km) from new vans by country in 2018**



The average $CO_2$ emissions of diesel vans increased by 1.9 $gCO_2$/km compared with 2017, while the average emissions of petrol vans increased by more than 3.7 $gCO_2$/km. In 2018, the average diesel van emitted 160.0 $gCO_2$/km, about 15 $gCO_2$/km more than the average petrol van.

In the last years, the contribution of petrol vehicles has increased from 1.9 % in 2016 to 2.4 % in 2017 and 3.5 % in 2018, while the contribution of AFVs has remained constant (1.7 %). The number of newly registered BEVs has not increased compared to 2018 (13 360 in 2017 and 13 740 in 2018), but it is still the highest contributor to AFVs. France registered the majority of BEVs (6 610), followed by Germany (1 443) and Spain (1 343).

### *2.2.2 Heavier, more powerful and bigger engines*

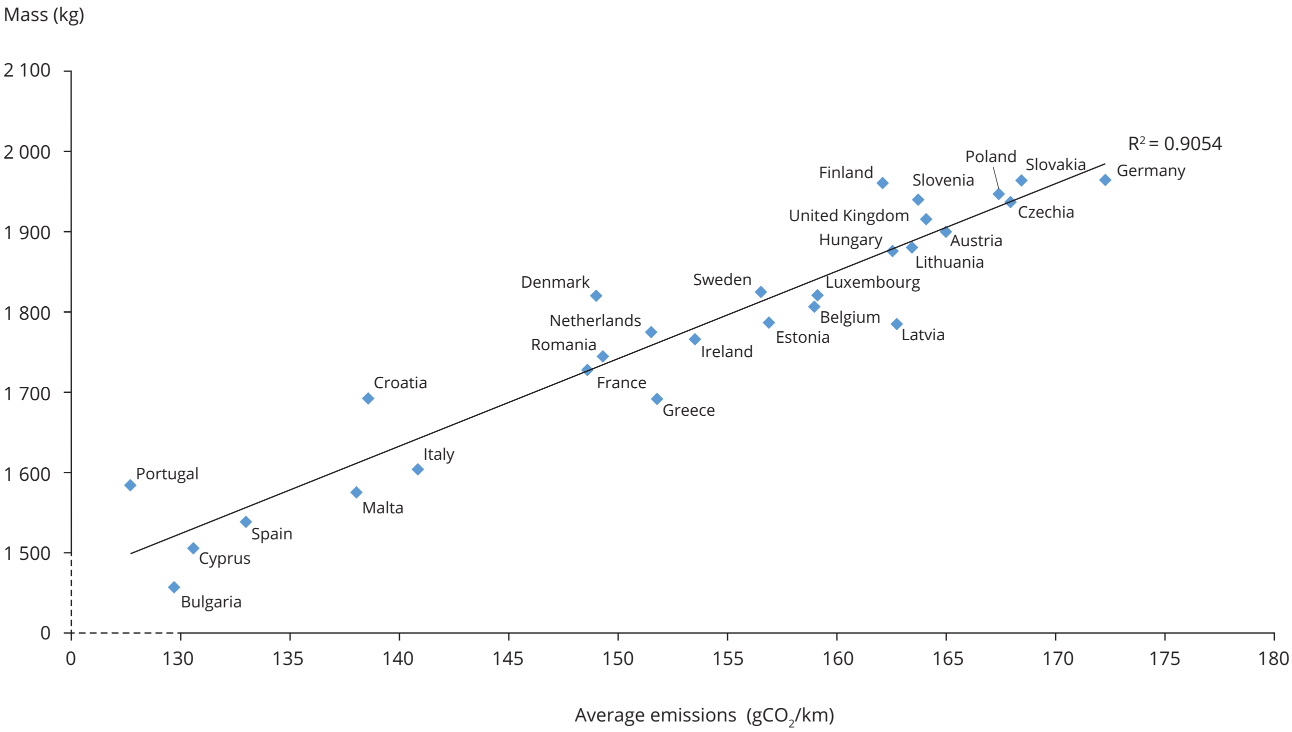
The data show that the average mass in running order of new vans registered in EU-28 plus Iceland increased by 4.7 % between years 2013 (1 764 kg) and 2018 (1 846 kg). This is higher than the previous peak observed in 2012 (1 834 kg). Over the last year, the average mass of diesel vans increased by 33 kg, while the mass of petrol vans increased by 12 kg. The mass of a vehicle directly affects its fuel consumption, as it determines the energy needed to move the vehicle.

Since the monitoring started, average engine capacity decreased from 1 927 $cm^3$ in 2012 to 1 884 $cm^3$ in 2018. Average engine capacity of petrol van was

**Table 2.4 Share of fuel type in new vans (%)**

| | Diesel | Petrol | BEV | LPG | NG | PHEV |
|---|---|---|---|---|---|---|
| EU-28 and Iceland | 95 | 3.5 | 0.8 | 0.5 | 0.6 | 0.0 |
| Austria | 94 | 4.7 | 1.0 | 0.0 | 0.2 | 0.0 |
| Belgium | 89 | 9.1 | 0.3 | 0.0 | 1.1 | 0.0 |
| Bulgaria | 76 | 16.8 | 0.0 | 6.2 | 0.6 | 0.0 |
| Cyprus | 92 | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| Czechia | 90 | 8.0 | 0.1 | 0.6 | 1.7 | 0.0 |
| Germany | 94 | 4.8 | 0.6 | 0.2 | 0.2 | 0.0 |
| Denmark | 94 | 5.9 | 0.4 | 0.0 | 0.0 | 0.1 |
| Estonia | 89 | 10.6 | 0.0 | 0.1 | 0.0 | 0.0 |
| Spain | 92 | 3.5 | 1.2 | 1.6 | 1.8 | 0.0 |
| Finland | 99 | 0.6 | 0.3 | 0.0 | 0.2 | 0.0 |
| France | 95 | 2.4 | 2.1 | 0.0 | 0.1 | 0.0 |
| United Kingdom | 99 | 1.1 | 0.3 | 0.0 | 0.0 | 0.0 |
| Greece | 96 | 2.0 | 0.2 | 0.0 | 1.3 | 0.0 |
| Croatia | 99 | 0.7 | 0.2 | 0.5 | 0.0 | 0.0 |
| Hungary | 97 | 2.6 | 0.4 | 0.0 | 0.1 | 0.0 |
| Ireland | 99.5 | 0.1 | 0.4 | 0.0 | 0.0 | 0.0 |
| Iceland | 88 | 8.9 | 2.7 | 0.0 | 0.1 | 0.0% |
| Italy | 91 | 3.8 | 0.4 | 2.1% | 3.1 | 0.0 |
| Lithuania | 95 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Luxembourg | 97 | 1.9 | 1.1 | 0.0 | 0.0 | 0.0 |
| Latvia | 94 | 5.7 | 0.0 | 0.2 | 0.1 | 0.0 |
| Malta | 99.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| Netherlands | 98 % | 1.1 | 0.7 | 0.0 | 0.7 | 0.0 |
| Poland | 88 % | 9.3 | 0.1 | 2.2 | 0.0 | 0.0 |
| Portugal | 99 % | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 |
| Romania | 97 % | 3.2 | 0.2 | 0.0 | 0.0 | 0.0 |
| Sweden | 95 % | 1.6 | 1.4 | 0.0 | 1.5 | 0.0 |
| Slovenia | 93 % | 6.2 | 0.3 | 0.2 | 0.1 | 0.0 |
| Slovakia | 87 % | 11.4 | 0.2 | 0.6 | 1.0 | 0.0 |

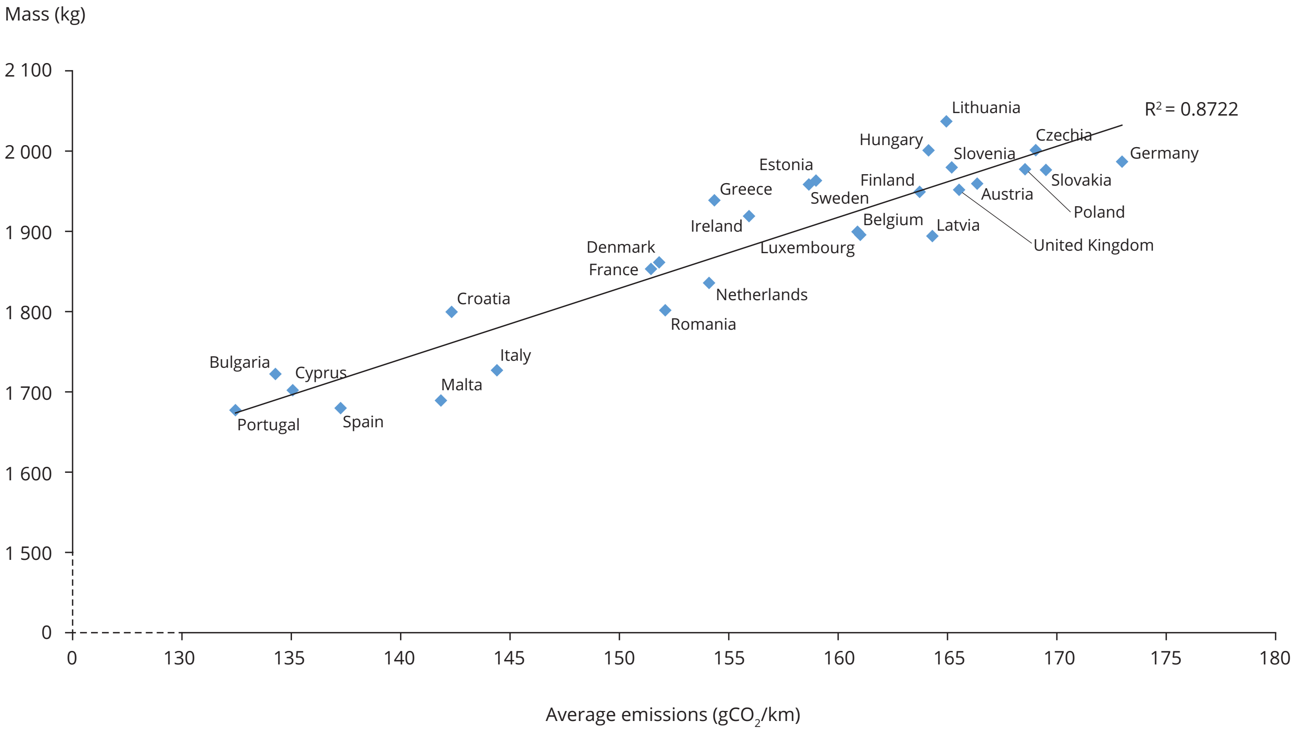
**Figure 2.11 Correlation between mass (kg) and average $CO_2$ emissions ($gCO_2$/km) by country**




1 347 cm³, while the one of diesel van was 1 908 cm³. The observed difference between engine capacities of petrol and diesel vans (560 cm³) came back to the 2012 levels (529 cm³). In recent years Portugal, Spain, Malta, Cyprus, Italy prefer smaller engines (less or around 1 700 cm³) and these countries are among the lowest emitters in Europe accordingly, while Lithuania, Czechia, Hungary prefer more powerful (>2 000 cm³) engines.

There is a clear correlation between the average $CO_2$ emissions and the average mass and engine capacity by countries: higher average mass or higher engine capacity correspond to higher average emissions (Figure 2.11 and Figure 2.12). For some countries (Bulgaria, Cyprus, Spain, Malta and Portugal), the low average emissions are mainly related to the registration of relatively small vehicles: the average mass of the new fleet in these countries was below 1 660 kg. Portugal had registered vans with the lowest average engine capacity in Europe, followed by Spain and Malta. Only three countries had average $CO_2$ emissions around 170 $gCO_2$/km: Czechia, Slovakia and Germany. Their fleets also had high average mass (> 1 960 kg), engine size (> 1 976 cm³) and power (around 99 kW).

**Figure 2.12 Correlation between engine capacity ($cm^3$) and average $CO_2$ emissions ($gCO_2/km$) by country**



# 3 Manufacturers' performance in 2018

## 3.1 Passenger cars

A manufacturer's performance in meeting its specific emission target is expressed as the distance between the average specific emissions of its fleet of newly registered vehicles, calculated taking into account the modalities listed in Annex 1, and its specific emission target. Where applicable, exemptions and derogations from that target need to be considered. In the case of pooling, all members of the pool shall be considered together as a single manufacturer for the purpose of assessing compliance.

Based on their average specific $CO_2$ emissions in 2018, 55 manufacturers achieved the specific emission targets, individually or as part of a pool. Additional 13 manufacturers respected their derogation targets (small volume or niche derogations).

Twenty five manufacturers fall within the scope of the de minimis threshold, according to which manufacturers with less than 1 000 registrations are exempt from achieving a specific emission target. These 25 manufacturers registered in total 3 800 cars in 2018, i.e. around 0.03 % of all registrations. The data are available in Annex 4.

Figure 3.1 presents data (number of registrations, average mass and average emissions) for 2018 for all manufacturers that individually registered more than 100 000 cars in 2018. In total, these manufacturers registered 14.3 million new cars in the EU-28 and Iceland in 2018, i.e. 95 % of the total number of new registrations.

In 2018, for the second year in a row, Toyota Motor Europe had the lowest average $CO_2$ emissions (102 $gCO_2$/km) of all those manufacturers and managed to reduce average $CO_2$ emissions by 1 $gCO_2$/km compared to 2017. It continued to produce some of the lowest-emitting cars. More than half of its fleet had emissions below 95 $gCO_2$/km. The Toyota Motor Europe fleet comprised 96 % petrol cars, with a high proportion of hybrids.

Automobiles Citroën and Automobiles Peugeot also had average emissions below 110 $gCO_2$/km, mainly due to having one of the lightest fleets (1 265 kg and 1 200 kg, resp.). However, compared to 2017, their emissions increased by 2.5 and 3.6 ([8]) $gCO_2$/km respectively, both for their diesel and gasoline cars.

For Automobiles Citroën, both the average $CO_2$ emissions of diesel and petrol cars increased by 1.5-2.0 $gCO_2$/km. The number of diesel cars, which, on average, emit almost 6.5 $gCO_2$/km less than the petrol ones, decreased from 44 % to 34 % of their new fleet. The electric cars increased by 36 % limiting the increase of the emission to 2.5 $gCO_2$/km.

For Automobiles Peugeot, both the average $CO_2$ emissions of diesel and petrol cars increased by more than 3 $gCO_2$/km. Compared to previous years the number of diesel cars, which on average emit 6.5 $gCO_2$/km less than petrol ones, decreased from 51 % to 45 % of their fleet. The number of electric cars increased by 20 %.

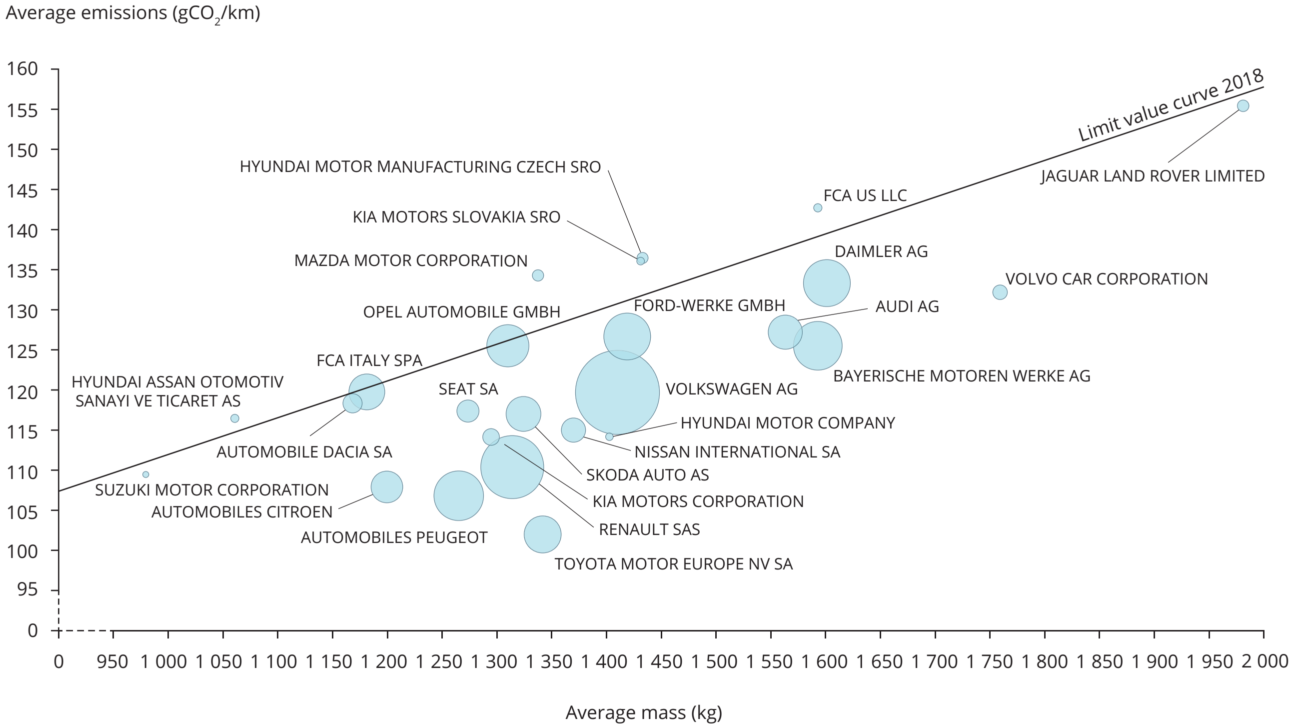
More significant emission reductions were achieved by Suzuki Motor Corporations (-4.9 $gCO_2$/km) and Nissan International SA (-1.8 $gCO_2$/km). For Suzuki Motor Corporations, this is mainly related to improved efficiency of petrol vehicles, which are ones of the lighter car registered in EU-28 and Iceland (< 1000 kg).

For Nissan international SA, this was mainly due to the considerable increase of registrations of electric cars, which doubled from 2017 and reached 6 % in 2018. Without considering the electric cars, the average emissions would have increased by 2.5 $gCO_2$/km over the same period due to the increased number of petrol cars (from 48 % in 2017 to 53 % in 2018), which emit 15 $gCO_2$/km more than the diesel ones.

For the second year in a row, the average specific emissions of the majority of large manufacturers increased in 2018 compared to the previous year. The largest increase was observed for Volvo

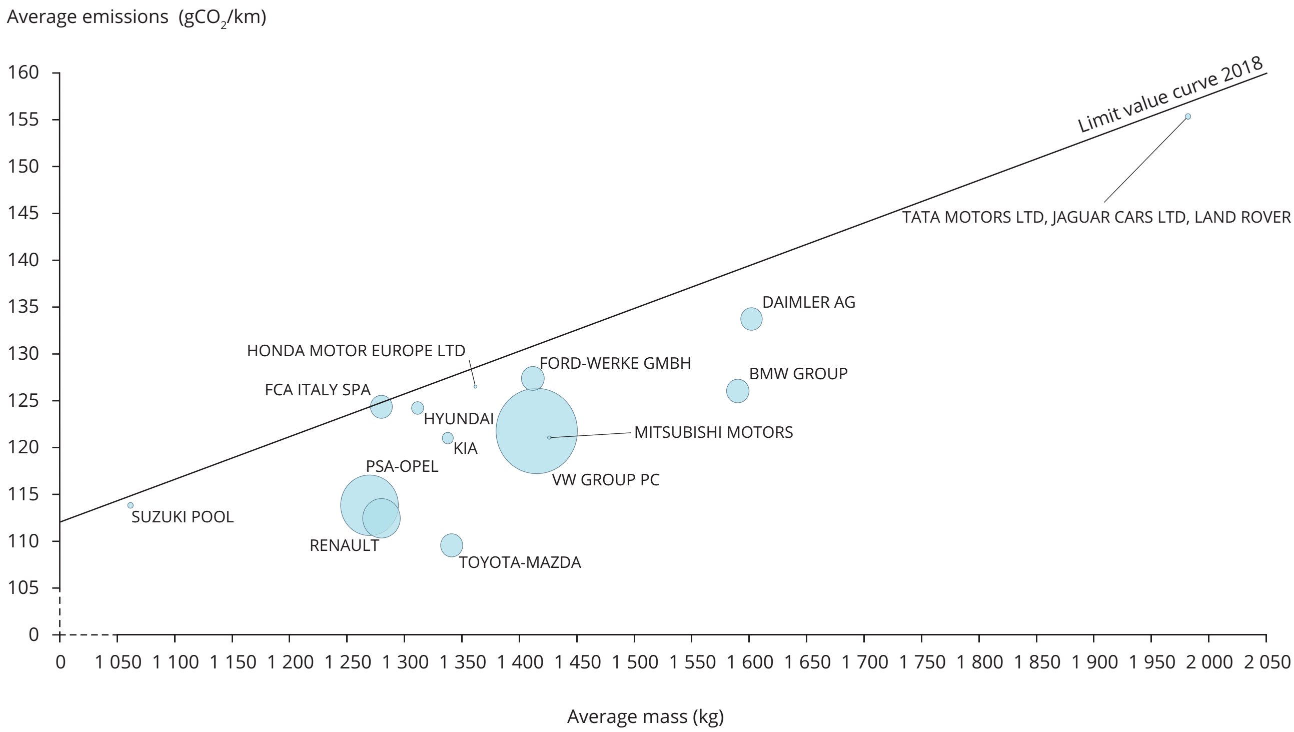
([8]) Without considering the correction factor (Annex 1 and Annex 4).

**Figure 3.1 Distance to 2018 target by individual car's manufacturers registering more than 100 000 cars per year**




**Note:** Average specific emissions are for individual manufacturers, not considering pooling. The limit value curve is not applicable in case of derogations.

**Figure 3.2 Distance to 2018 target by cars' pool**




**Note:** The limit value curve is not applicable in case of derogations.

(+7.8 $gCO_2$/km) and Daimler (+7.0 $gCO_2$/km). For both manufacturers the fleet composition shifted towards petrol cars, which represented 79 % for Volvo and 61 % for Daimler (in 2017, 64 % and 55 % respectively). In addition, the average emissions of their petrol and diesel cars increased between 6.1 and 9.0 $gCO_2$/km in the last two years.

Some individual manufacturers for which Figure 3.1 shows that their average specific emissions were higher than the limit value curve, are actually part of a pool, which has met its specific emissions target (Figure 3.2). This was the case for Kia Motors Slovakia (Kia pool), FCA US LLC (FCA ITALY SPA pool), Mazda Motor Corporation (Toyota-Mazda pool), Magyar Suzuki Corporation (Suzuki pool), Hyundai Assan and Hyundai Czech (Hyundai pool). Furthermore, the Suzuki pool and the Tata/Jaguar Land Rover pool benefitted from a niche derogation (see Annex 1).

As explained in Annex 1, the limit value curve implies that manufacturers of heavier cars are on average allowed higher emissions than manufacturers of lighter cars.

For individual manufacturers, the distance to the target varies between 6.8 $gCO_2$/km above target for Mazda and 25.6 $gCO_2$/km below target for Totota. All relevant data are included in Annex 4.

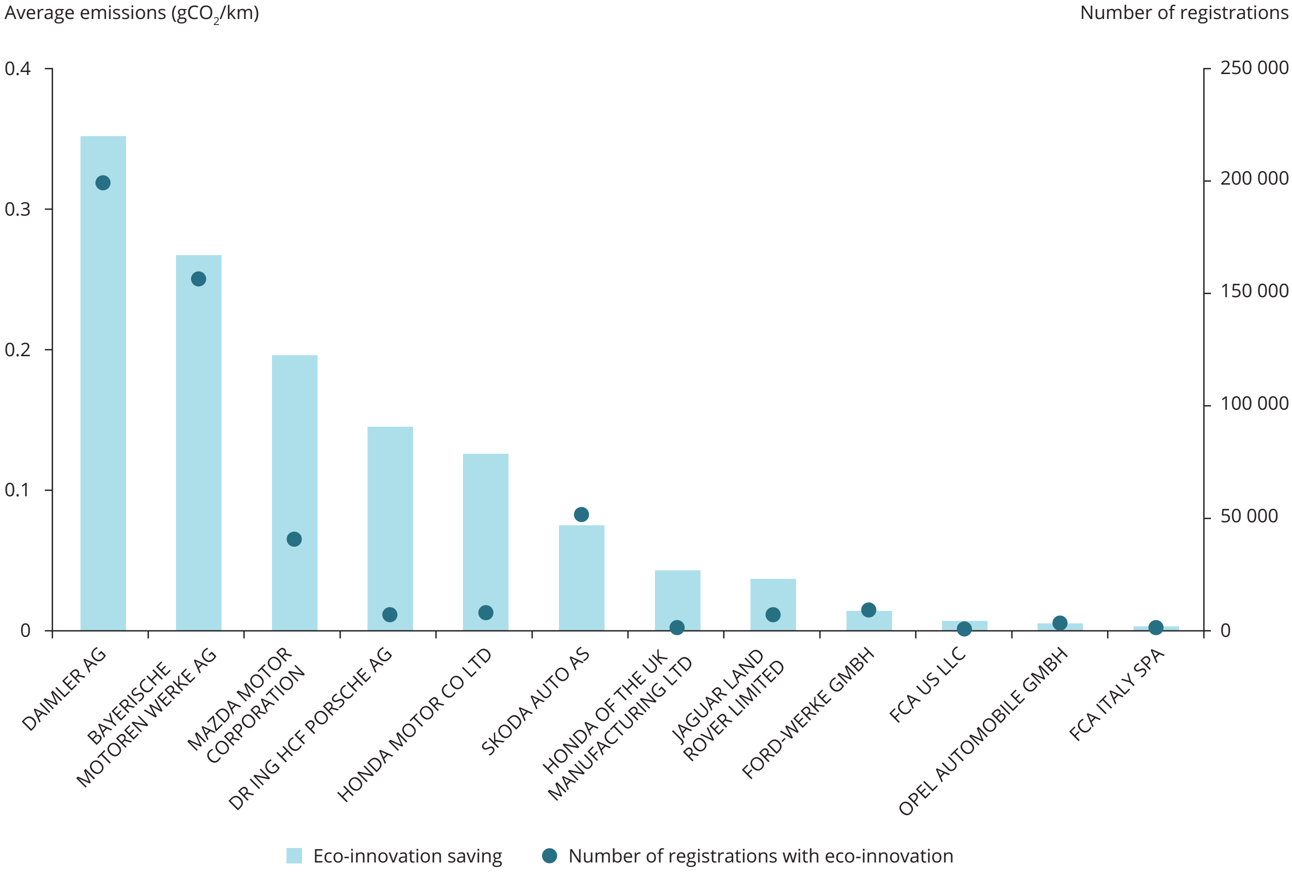
The performance of the pools against their specific emissions targets is presented in Figure 3.2.

### *3.1.1 Eco-innovation savings were lower than 0.5 $gCO_2$/km per car manufacturer*

Regulation (EU) 2019/631 gives an incentive to manufacturers that implement certain innovative technologies that help to cut emissions in real world conditions, but for which it is not possible to demonstrate their effectiveness during the test procedure used for type approval.

Eco-innovations require approval by the Commission. $CO_2$ savings from eco-innovations are certified during type-approval and recorded on the certificate of conformity.

**Figure 3.3 Statistics for manufacturers that registered eco-innovation in 2018: eco-innovation saving on average $CO_2$ emissions and number of registrations equipped with eco-innovation**



Until the end of 2019, the Commission had approved 28 eco-innovations. It concerns technologies such as efficient 12V alternators, efficient exterior lighting systems, and coasting.

Manufacturers can reduce their average specific emissions through savings from eco-innovations up to a maximum of 7 $gCO_2$/km per year.

In 2018 only a few manufacturers equipped their new cars with such eco-innovations and benefited from the savings (Figure 3.3). Only a few of the approved eco-innovations have actually been installed in a significant number of cars. However, it might be that eco-innovations savings have not been systematically reported so that the reported data may underestimate the actual number of installed eco-innovation technologies and their $CO_2$ savings.

## 3.2 Vans

Based on their average specific $CO_2$ emissions in 2018, 37 manufacturers achieved the specific emission targets, as individual manufacturer or as part of a pool. Additional 7 manufacturers respected their derogation targets. Twenty two manufacturers fall within the scope of the de minimis threshold, according to which manufacturers with less than 1 000 registrations are exempt from achieving a specific emission target.

Figure 3.3 presents data (number of registrations, average mass and average emissions) for van manufacturers that registered more than 10 000 vehicles in 2018. In total they account for 97.5 % of the new van fleet.

In 2018 the most popular brand manufacturer was Ford-Werke GmbH, with 16 % of the vans registered in the EU-28 and Iceland. Renault SAS and Volkswagen AG followed with 14 % and 13 % each.

The average emissions for the large van manufacturers are between 119 and 216 $gCO_2$/km. Average mass values per manufacturer range from 1 270 to 2 424 kg.

Eleven manufacturers, representing almost 84 % of the European new van fleet, had average emissions lower than 175 $gCO_2$/km. Four of these manufacturers, the ones that have emissions below 147 $gCO_2$/km, also had the lowest average mass in the group. The average emissions for the large van manufacturers are between 11– and 216 $gCO_2$/km. Average mass values per manufacturer are in the range from 1 270– to 2 424 kg.

For the fifth year in a row, Automobile Dacia SA, which on average has the lightest vehicles, achieved the lowest average $CO_2$ emissions. In 2018 however, an increase of the average emission by 1.4 $gCO_2$/km was observed for this manufacturer.

The next two lowest emitting manufacturers are Automobile Citroen and Automobile Peugeot, with average emissions of 132.2 and 135 $gCO_2$/km respectively. However, for both of them, emissions increased by 1-2 $gCO_2$/km in the last year, and the average mass increased by 15-30 kg.

Until 2015, average $CO_2$ emissions of Fiat Group have been stable, however, it has experienced a significant drop of average $CO_2$ emissions from 158 to 149 $gCO_2$/km until 2017. Since the beginning of the monitoring of $CO_2$ emissions from new vans, year 2018 was the first year for Fiat Group when its average emissions increased (by 0.7 $gCO_2$/km).

Average emissions of all the larger manufacturers, with the exception of Opel, Toyota, Renault, Nissan, Opel Automobile, increased in 2018 compared with 2017. The largest increases in average emissions were observed for Ford-Werke GmbH (+4.9 $gCO_2$/km), Volkswagen (+4.2 $gCO_2$/km) and Mitsubishi Motors Thailand (+2.0 $gCO_2$/km). The performance of the pools against their specifi emissions targets is presented in Figure 3.5.

**Figure 3.4 Distance to 2018 target by individual vans manufacturers registering more than 10 000 vehicles per year**

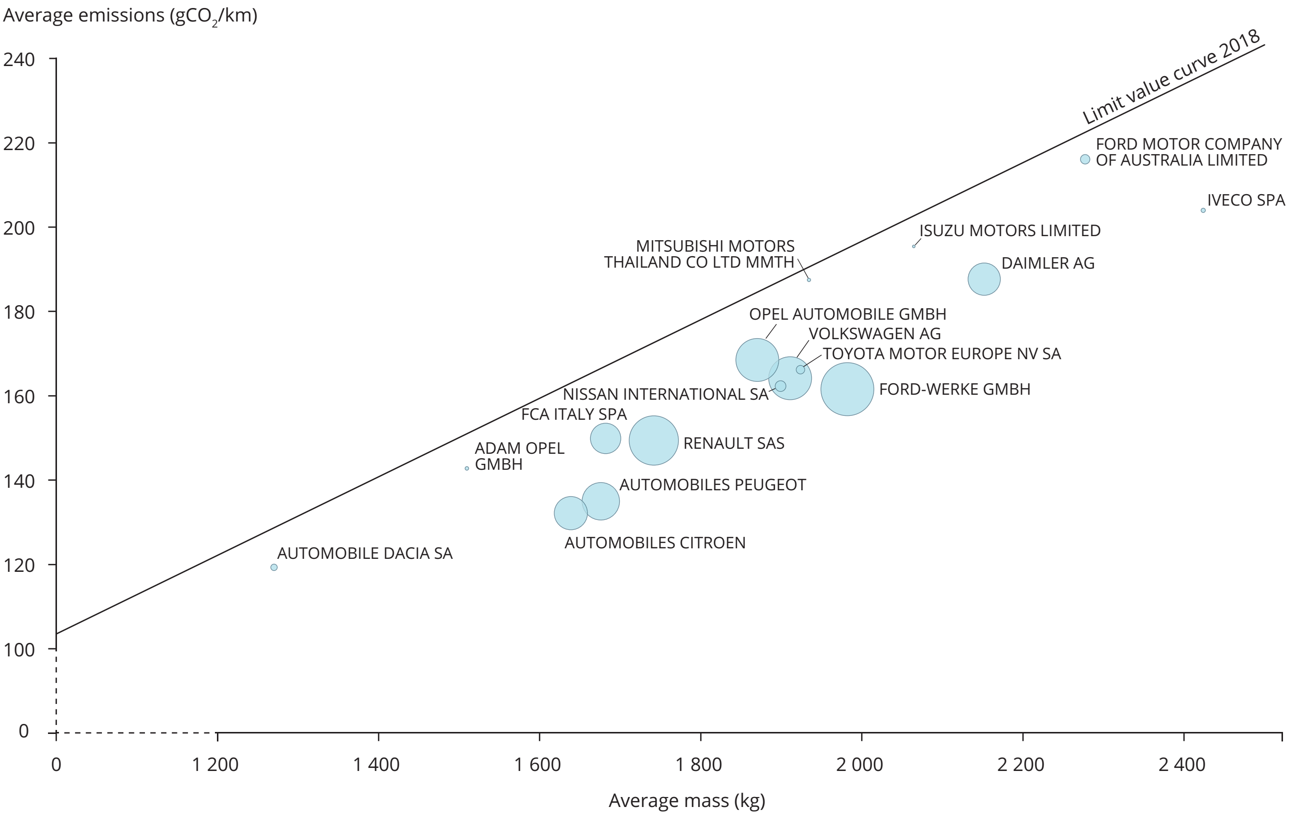
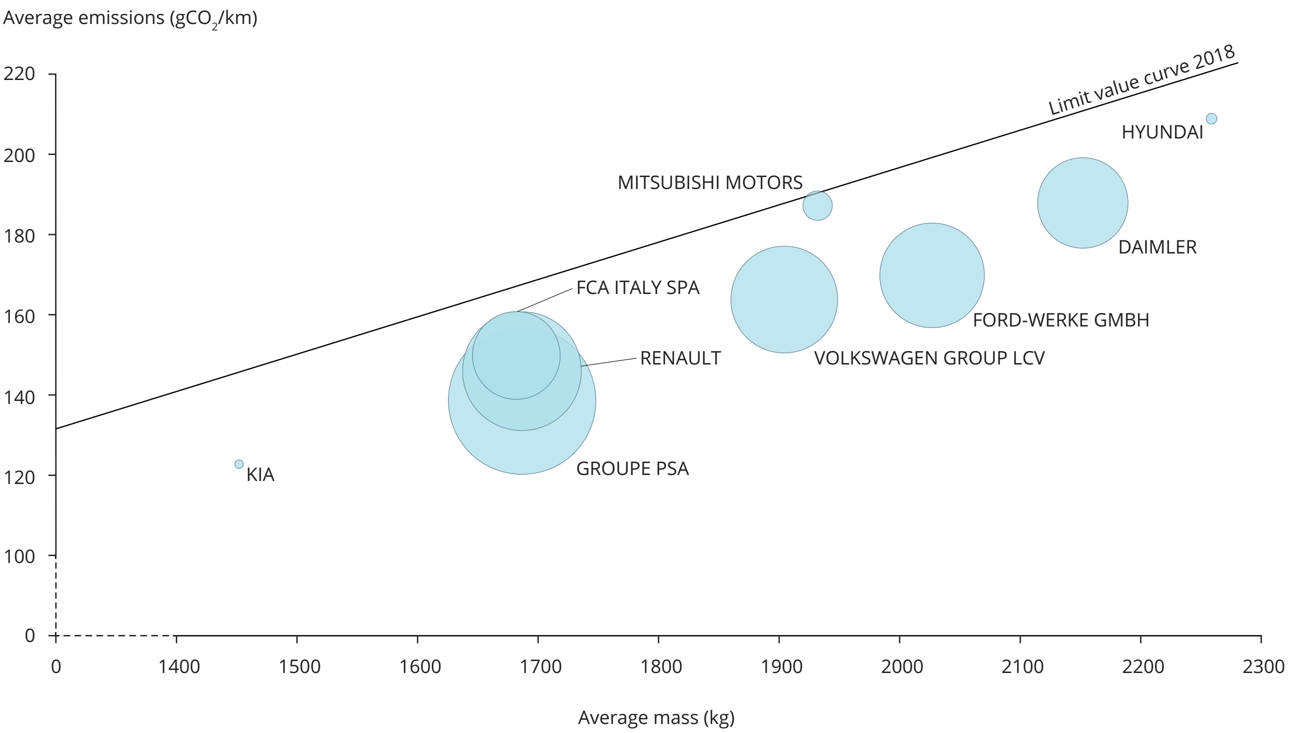



**Figure 3.5 Distance to 2018 target by pools registering more than 10 000 vans per year**

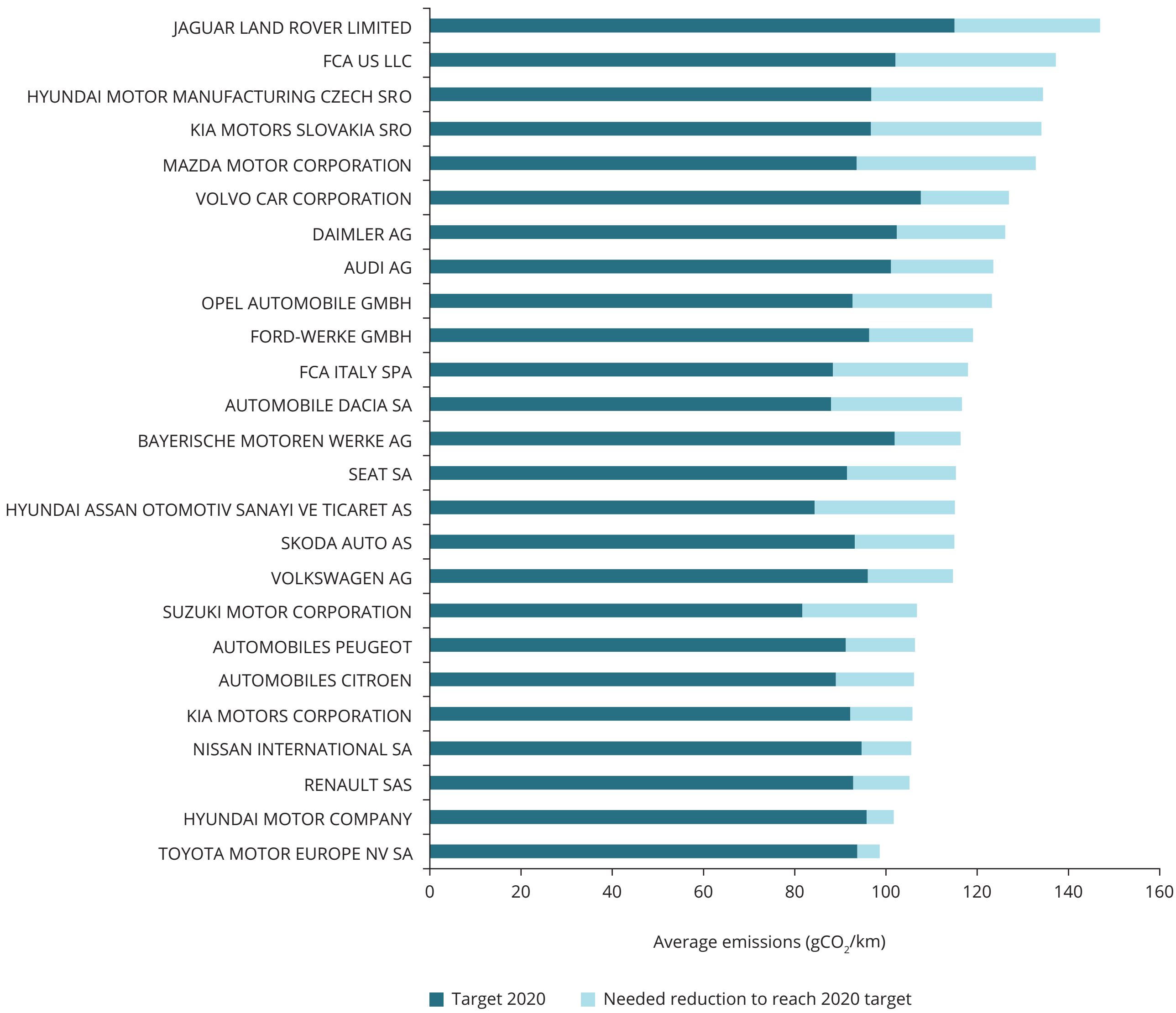


# 4 Towards 2020

Based on the composition and average mass of the 2018 vehicle fleet and taking into account the provisions of Regulation (EU) 2019/631, in particular regarding eco-innovations, super credits and the phase-In of the target (only for cars), an estimate can be made of the distance between the 2018 situation and the 2020 targets for individual manufacturers.

Because of the increase of the emissions in the last two years, in 2018 most car manufacturers were still far away from their 2020 target. Toyota came closest, but still would have to reduce its average emissions by around 5 $gCO_2$/km (Figure 4.1). Hyundai Motor Company would be 7.3 $gCO_2$/km away from its target. For all other manufacturers the distance to the 2020

**Figure 4.1 Distance to 2020 targets for car manufacturers based on their 2018 fleet and emissions**

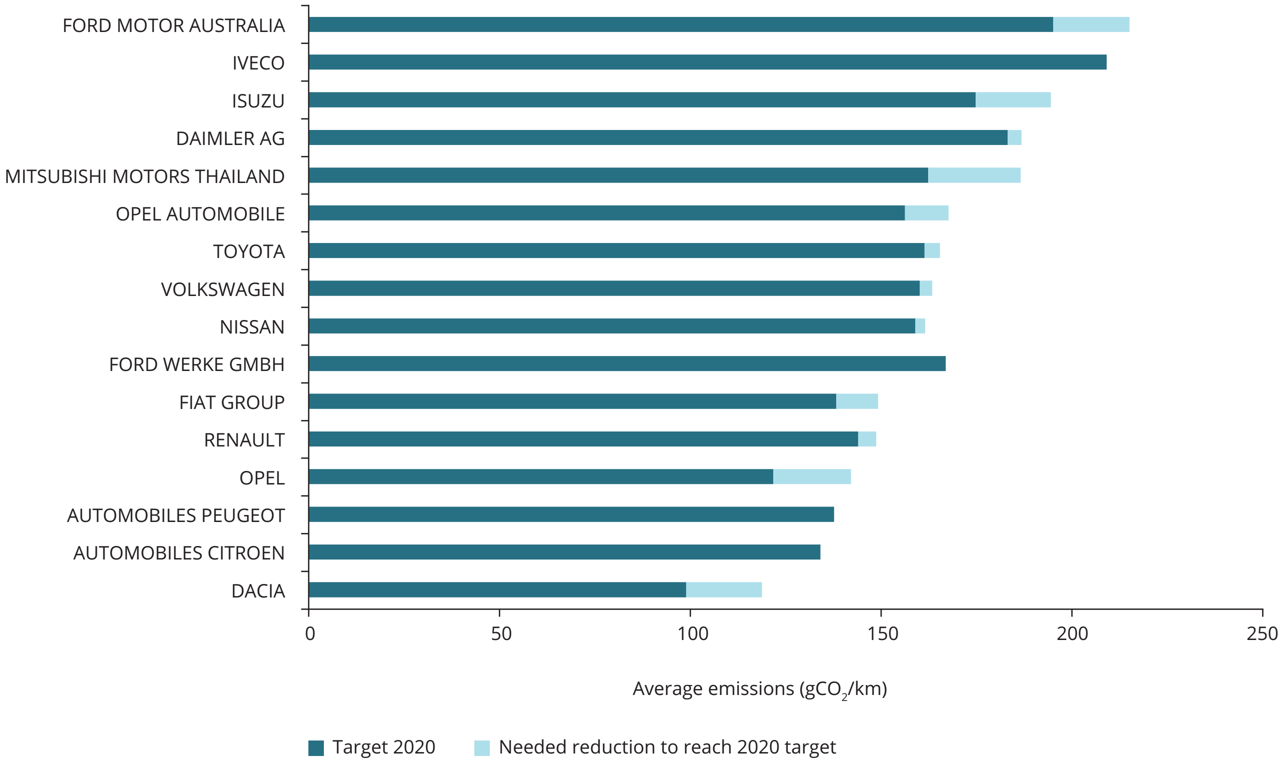



**Note:** Derogations are not taken into account.

target would be higher, up to 39 $gCO_2$/km in the case of Mazda Corporation.

Vans manufacturers are generally much closer to their 2020 targets (Figure 4.2). Some of them had already met their 2020 target in 2018: Automobiles Peugeot, Automobiles Citroën, Ford-Werke GmbH and Iveco. Others, such as Nissan International, Volkswagen AG and Toyota Motor Europe were already very close to their 2020 targets and had to reduce their average emissions by less than 4 $gCO_2$/km.

**Figure 4.2 Progress needed to meet the 2020 targets for vans manufacturers**




**Note:** Derogations are not taken into account

**Effect of super-credits on 2020 $CO_2$ average emissions**

From 2020, manufacturers are given additional incentives to put on the market cars emitting less than 50 $gCO_2$/km. These cars are given a greater weight in calculating the average specific emissions. The super-credit weight factor will be 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 $gCO_2$/km for each manufacturer or pool.

In order to calculate the distance to 2020 target, super credit savings have also been included in the calculation of the average emissions (Table 4.1).

For some of the manufacturers, the actual share of zero or low emitting vehicles (<50 $gCO_2$/km) could already provide savings above 7.5 $gCO_2$/km. The majority will need to increase the sales of low emitting cars in order to fully use the super credit cap.

**Table 4.1 Performance of manufacturers that registered low emitting cars (<50 $gCO_2$/km) in 2020 including and excluding super-credits adjustments**

| Manufacturer | $CO_2$ specific emissions | $CO_2$ specific emissions — no super credit | Super credit effect |
|---|---|---|---|
| MITSUBISHI MOTORS CORPORATION | 123.2 | 108.7 | -14.5 |
| HYUNDAI | 110.5 | 101.7 | -8.8 |
| NISSAN | 112.2 | 105.5 | -6.6 |
| BMW AG | 121.6 | 116.4 | -5.3 |
| KIA | 110.7 | 105.8 | -4.9 |
| JAGUAR LAND ROVER LIMITED | 150.4 | 146.9 | -3.5 |
| RENAULT | 108.4 | 105.2 | -3.2 |
| VOLVO | 129.8 | 126.9 | -2.8 |
| DAIMLER AG | 128.2 | 126.1 | -2.1 |
| VOLKSWAGEN | 116.7 | 114.7 | -2.0 |
| AUDI AG | 124.0 | 123.5 | -0.5 |
| AUTOMOBILES CITROEN | 106.4 | 106.1 | -0.3 |
| TOYOTA | 98.9 | 98.6 | -0.3 |
| AUTOMOBILES PEUGEOT | 106.6 | 106.4 | -0.2 |
| OPEL AUTOMOBILE | 123.4 | 123.2 | -0.2 |
| HYUNDAI ASSAN | 115.2 | 115.1 | -0.1 |

## 4.1 Introduction of new testing procedure (WLTP)

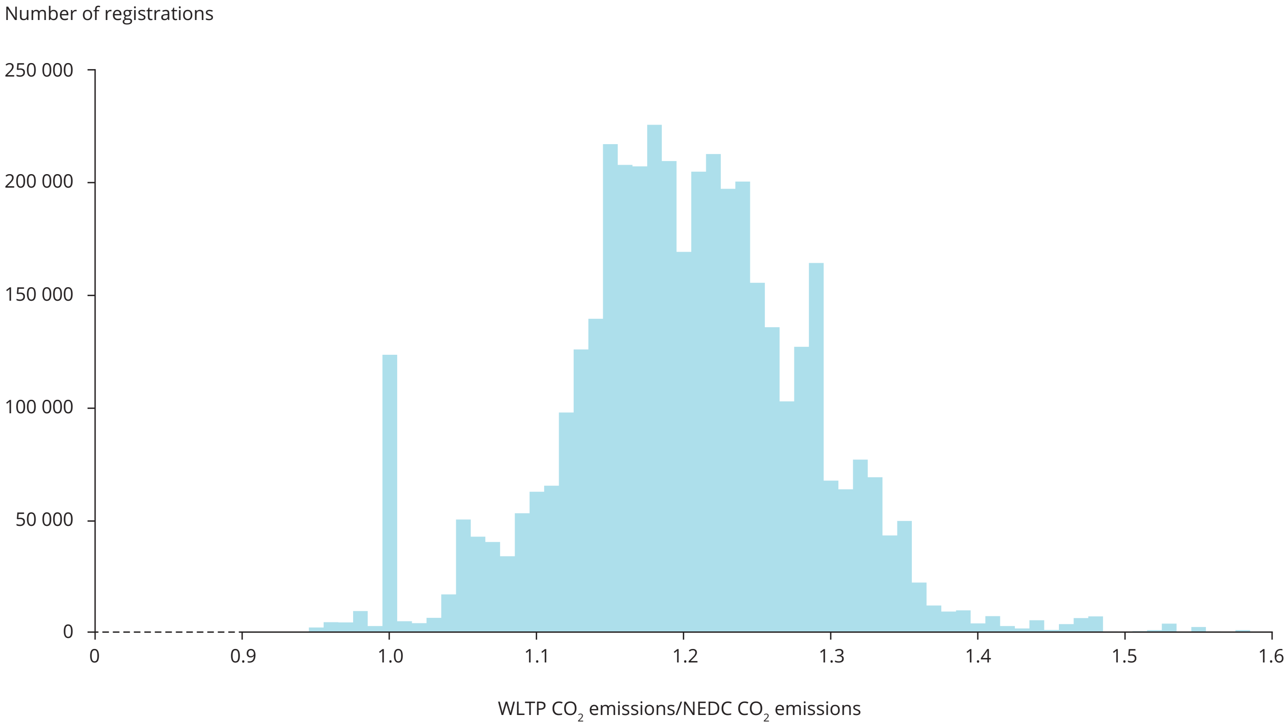
Since September 2017, the World Harmonised Light Vehicle Test Procedure (WLTP) has been introduced as the emission testing procedure for all new vehicle types replacing the New European Driving Cycle (NEDC) test procedure. It has become mandatory for all new passenger cars since September 2018 and for all new vans from September 2019.

Compared to the NEDC, WLTP is more representative of real driving conditions. The new test includes a greater range of driving situations, more dynamic and representative accelerations and decelerations, more realistic driving behaviour more realistic vehicle test mass, and stricter test conditions that better represent real-world driving conditions (EEA 2016).

The average $CO_2$ emissions and the targets until 2020 will be calculated using the NEDC values. For vehicles that are type approved in accordance with the WLTP, a technology-based vehicle simulation model, CO2MPAS (JRC, 2018), has been developed and put in place to correlate the WLTP $CO_2$ values into the corresponding NEDC values. From 2021 onwards the $CO_2$ emission targets will be expressed in WLTP values and compliance will be checked using WLTP values only.

For the first time, in 2018, a significant amount of WLTP emission data was reported for passenger cars (around 27 % of the fleet). Figure 4.3 presents the distribution of the ratio between WLTP and NEDC emissions reported. The average ratio was 1.2.

**Figure 4.3 Ratio WLTP emissions/NEDEC emissions for new passenger cars in 2018**




**Note:** The ratio is equal to 1 for all zero-emission vehicles.

# 5 Factors affecting the performance of cars manufacturers

Since 2010 ([9]), the officially reported $CO_2$ emissions of new passenger cars have reduced substantially. These reductions can be attributed to measures and technologies improving the cars' energy efficiency as well as a change in the mix of car models registered towards more efficient powertrains and technologies. However, average $CO_2$ emissions reached a low around 2016 and have since then been increasing in both 2017 and 2018.

This section summarises, with few examples, the results of a study performed by the European Topic Centre on Air pollution, Transport, Noise and Industrial Pollution for the European Environment Agency (EEA), assessing the main strategies and technologies manufacturers have used in the past 8 years and which have affected the average fuel efficiency of their fleet. Five large manufacturers ([10]) were analysed, taking into account aspects such as average yearly reported $CO_2$ emissions, total new registrations in the EU, the uptake of low or zero emission vehicles and technological developments.

The main technologies and fleet-wide trends identified in the passenger car sector in the recent past which may have influenced $CO_2$ emissions either positively or negatively are the following:

- downsizing;
- de-dieselization;
- introduction of new models;
- electrification;
- SUVs market.

## 5.1 Downsizing

One of the most important strategies followed by manufacturers to comply with the $CO_2$ emission regulations was the replacement of bigger engines with compact ones or, in other words, engine downsizing. These compact engines provide the needed power, while reducing, at the same time, the fuel consumption (Patil, et al., 2017).

The increased performance in a downsized engine is achieved by adding a forced aspiration device (turbocharger or supercharger) accompanied by other engine technologies such as direct injection technology or variable valve timing (VVT). The major advantages of a direct injection engine are increased fuel efficiency and high-power output. VVT is the process of optimising the timing of a valve lift event, and is often used to improve performance, fuel economy and to reduce emissions.

As a cost-effective technique, engine downsizing has been implemented by the majority of cars manufactures (Leduc, et al., 2003; Tartakovsky, and Gutman, 2012).

To examine how the engine downsizing has influenced passenger cars over the years, the example of Ford is presented in Figure 5.1.

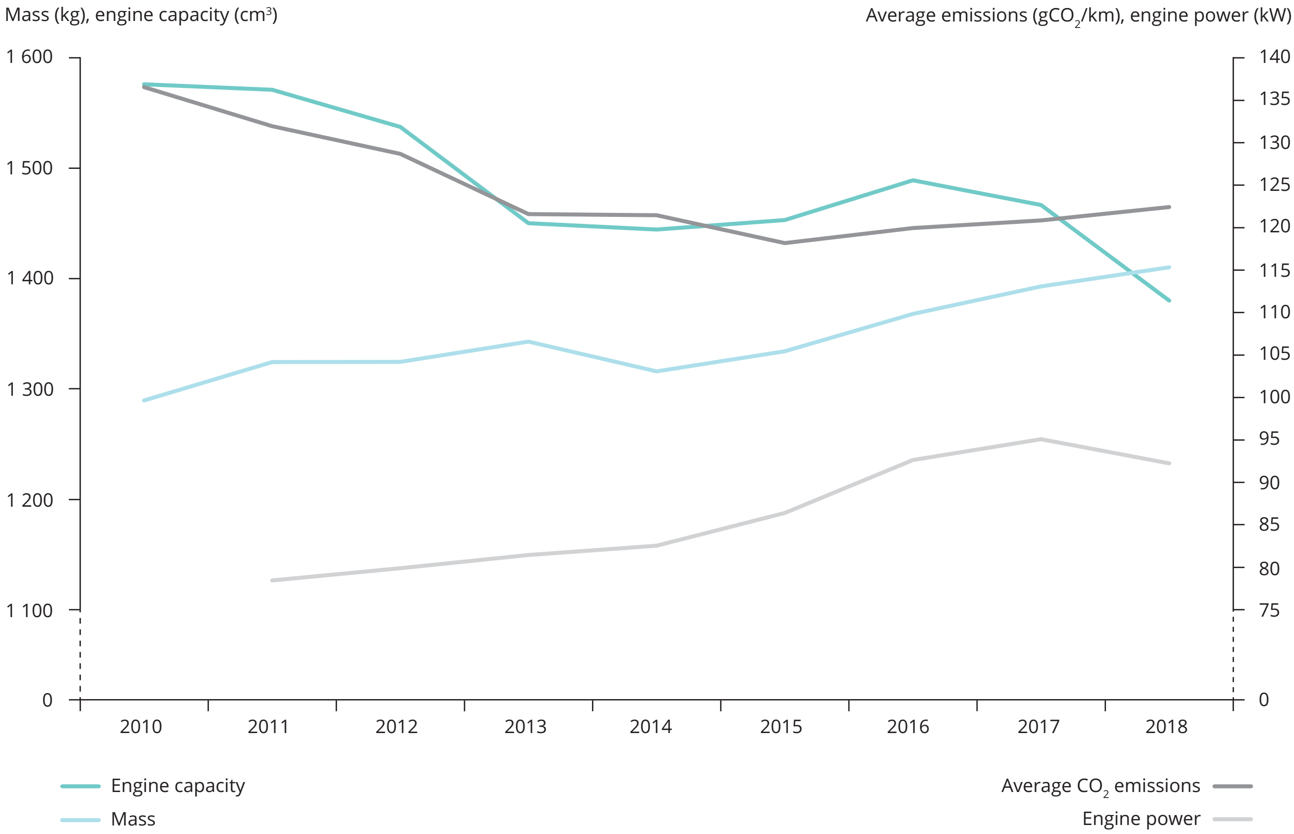
Ford relied heavily on the downsizing of the engines, especially for petrol cars. In fact, the average engine capacity decreased by 17 % between 2010-2018, while average engine power increased by 28 % compared to 2011 levels. This downsizing effect largely contributed to the reduction of the average $CO_2$ emissions, up until 2015 (by 16 % compared to 2010 data).

## 5.2 De-dieselisation

In general, diesel cars emit less $CO_2$ than equivalent petrol cars with similar characteristics. Therefore, supported by policies in many Member States, diesel vehicles have dominated the EU market reaching a 55 % of the total share in 2011. By 2015, despite a small drop in the share of diesel cars (52 %), they remained

([9]) 2018 data used for the analysis are provisional data.
([10]) Volkswagen (VW), Toyota, BMW Group, Ford Group and Renault.

**Figure 5.1** **Overall average trends in $CO_2$ emissions, vehicle mass and engine characteristics for Ford new passenger cars over the period 2010-2018**




the predominant choice of EU consumers. Since September 2015, following the 'Diesel scandal', the share of diesel cars started to drop, and this trend was stronger in the last two years, with the diesel car share in the new fleet reaching about 36 % in 2018. Instead, petrol vehicles are now dominating the new car market.

This shift from diesel to petrol cars is one of the reasons why the average $CO_2$ emissions in the EU have increased in 2017 and 2018.

To examine how de-dieselisation has influenced passenger cars over the years, the BMW example is presented in Figure 5.2.

For both diesel and petrol cars, BMW has, compared to the other large car manufacturers, one of the highest average mass, engine capacity and engine power by a sizable margin. This is expected as BMW historically produces larger, more luxurious, and high-performance cars (such as the X series) rather than smaller cars. As effect, their average $CO_2$ emissions is one of the highest among the larger cars manufactures, during the period 2010-2018.

The average $CO_2$ emissions decreased significantly (almost 15 %) from 2010 to 2017. For the larger part, this can be directly attributed to powertrain efficiency and vehicle design improvements, most notably smaller, turbocharged, more efficient engines (downsizing).

Nevertheless, in 2018 there was an increase in the average emissions, by almost 5 %, compared to 2017. This is mainly related to the increased share of petrol cars: compared to 2017, in 2018, BMW diesel new registrations decreased by about 20 % while petrol new registrations increased by about 27 %, representing 45 % of the fleet in 2018 (35 % in 2017). On average, BMW petrol cars emit 8 $gCO_2$/km more than diesel cars.

Even if it is true that, in general, a diesel car emits less than an equivalent petrol version, the effect of dieselisation on cars manufacturers depends as well on the type of petrol and diesel cars that the manufacturer produces.

Although one would expect that the decline in diesel share would negatively affect the overall $CO_2$ emissions, this is not the case for Volkswagen. Between the years

**Figure 5.2 Average $CO_2$ emissions ($gCO_2$/km) by fuel for BMW passenger cars**

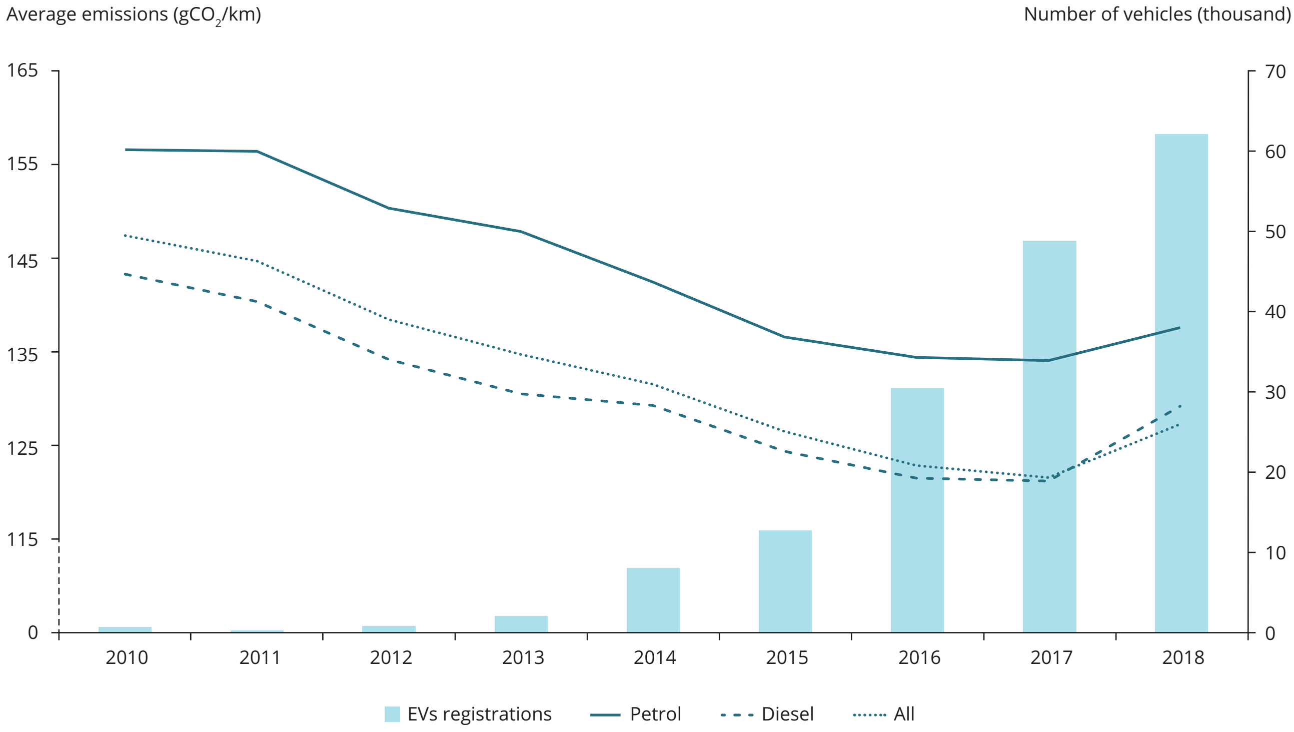
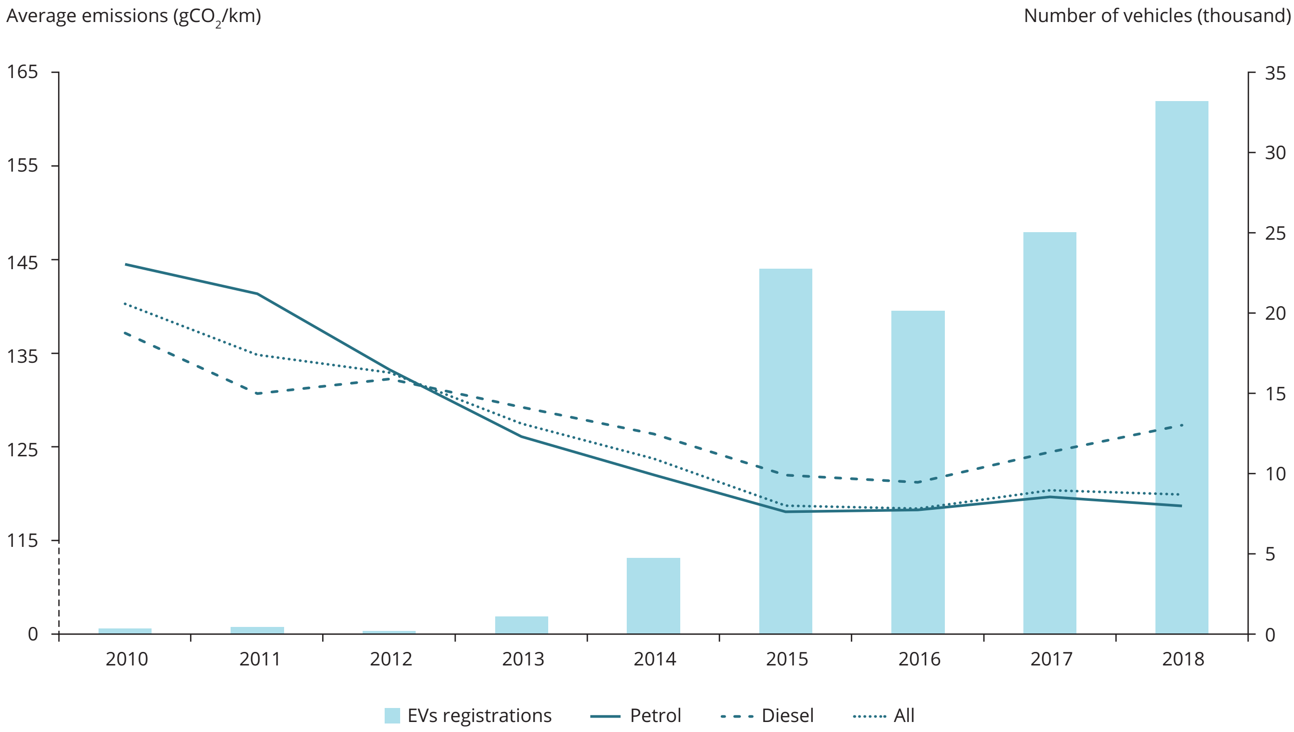



**Figure 5.3 Average $CO_2$ emissions ($gCO_2$/km) by fuel for Volkswagen AG**



2010 and 2018, diesel new registrations decreased by about 22 % while petrol car market share increased by about 55 %. On average, emissions of new petrol cars decreased by 18 %, while the emissions of new diesel cars decreased only by 7 %. So that, since 2012, average diesel cars, on average, emit more than average new petrol cars (Figure 5.3). In 2018, diesel cars are 24 % heavier and have 48 % bigger engine capacity, compared to their petrol counterparts, resulting in higher average $CO_2$ emissions. Hence, the smaller diesel share of new sales has a positive effect on the overall average $CO_2$ emissions.

## 5.3 Upgrades to the most sold models in recent year

The study looked into the most sold vehicles for the 5 manufacturers analysed.

As example, Renault Clio is the most sold Renault car. It accounted for over 2 % of all new passenger car sales in the EU in 2017 (ICCT, 2018). In 2013, the introduction of the new Renault IV model led to a noticeable drop in average $CO_2$ emissions (10 %) (Figure 5.4). The Renault Clio IV was equipped with a new generation of downsized petrol engines (such as the Energy TCe 90) and diesel engines (such as the Energy dCI 90), which were introduced around the same time period and were designed to offer better fuel efficiency.

After 2014, the $CO_2$ emissions of the petrol version stabilized, while the emissions of the diesel version slightly decreased until 2016 then rising in the last two years to the same level of 2013. This may be due to their increasing average mass, as average engine capacity remained constant throughout the years.

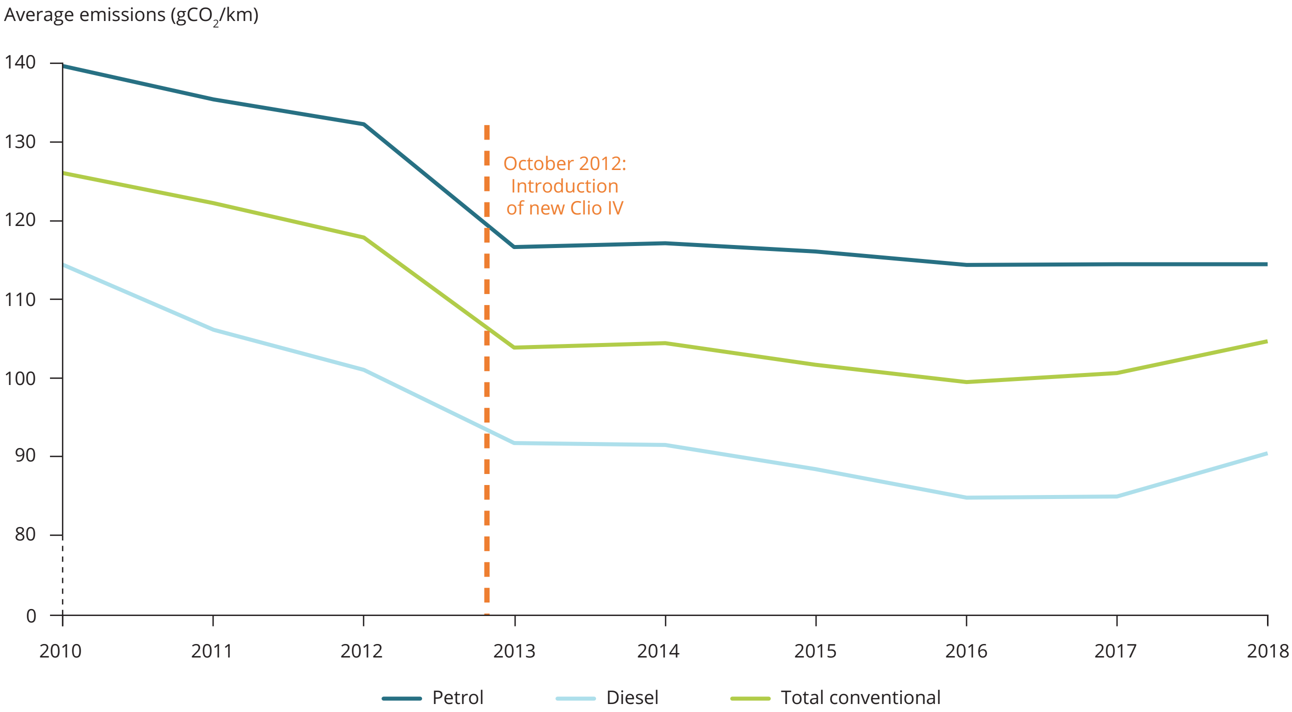
## 5.4 Penetration of electric vehicles

Electrified cars are gradually increasing their share in new passenger car sales nowadays. This is triggered in particular by the need to reduce emissions of $CO_2$ and, particularly in urban areas, air pollutants such as $NO_x$ and PM. In the ETC report, HEV have been as well identified and included in the analysis

More than other manufacturers, Toyota moved away from conventional cars, especially diesel, and promoted more hybridised powertrains. As a matter of fact Toyota announced its plans to completely phase out diesel cars by the end of 2018, due to limited demand and widespread uptake of hybrid alternatives (HEV) (Toyota, 2018).

In 2018 despite the abrupt rise in $CO_2$ emissions of diesel cars, the overall $CO_2$ emissions are significantly lower than in 2010 (- 20 %). This is related to the fact that the diesel share is rather small (5 %) and the HEV registrations, with an average emissions of 93 $gCO_2$/km,

**Figure 5.4 Average $CO_2$ emissions ($gCO_2$ /km) of Renault Clio**



represents more than 56 % of the new registrations in 2018 (Figure 5.5).

## 5.5 Increase in sport utility vehicle sales offsets technological improvement

Manufacturers are heavily promoting new SUV and so-called crossover models, available in a range of sizes and power output. As a result, the share of SUV surged in recent years, as illustrated in Figure 5.6. This tendency is closely related to the increase in average mass, in the 2015-2018 timeframe, which applies to all selected manufacturers.

Because SUVs are typically larger, heavier and less aerodynamic than medium sized passenger cars, they consume more fuel and hence they emit more $CO_2$. One may argue that the surge in SUV demand is, at least partially, cancelling out the environmental benefit from $CO_2$ reduction technologies already employed in modern cars, as well as the benefit from the increasing market share of the so-called zero and low-emission passenger cars (i.e. HEV, PHEV, BEV).

As an example, the average $CO_2$ emissions of Volkswagen SUVs (Figure 5.7) follow a downward trend (20 % reduction since 2010). Nevertheless, in absolute numbers the average emissions (135 $gCO_2$/km in 2018) remain higher than small and medium sized cars (Figure 5.3). This downward trend is related to the technological development in modern powertrains and vehicle design. In more recent years, this trend can be also attributed to the introduction of smaller (both in vehicle and engine size) and more aerodynamically efficient SUV (often characterized as Crossovers). Examples of such models are the newer T-Roc and T-Cross models, compared to the bulkier Tuareg and Tiguan models.

**Figure 5.5 Average $CO_2$ emissions ($gCO_2$/km) by fuel for Toyota**

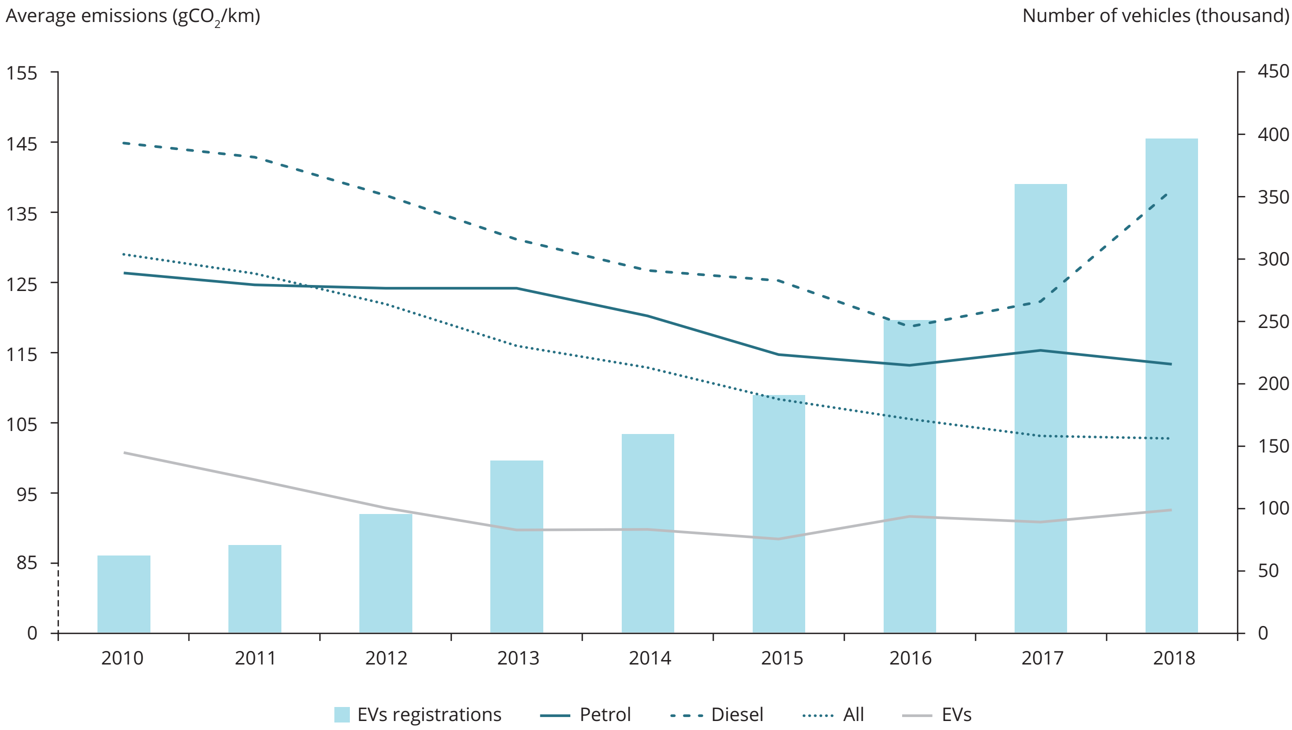


**Figure 5.6: Market share of new SUV compared to total new registrations (2018)**

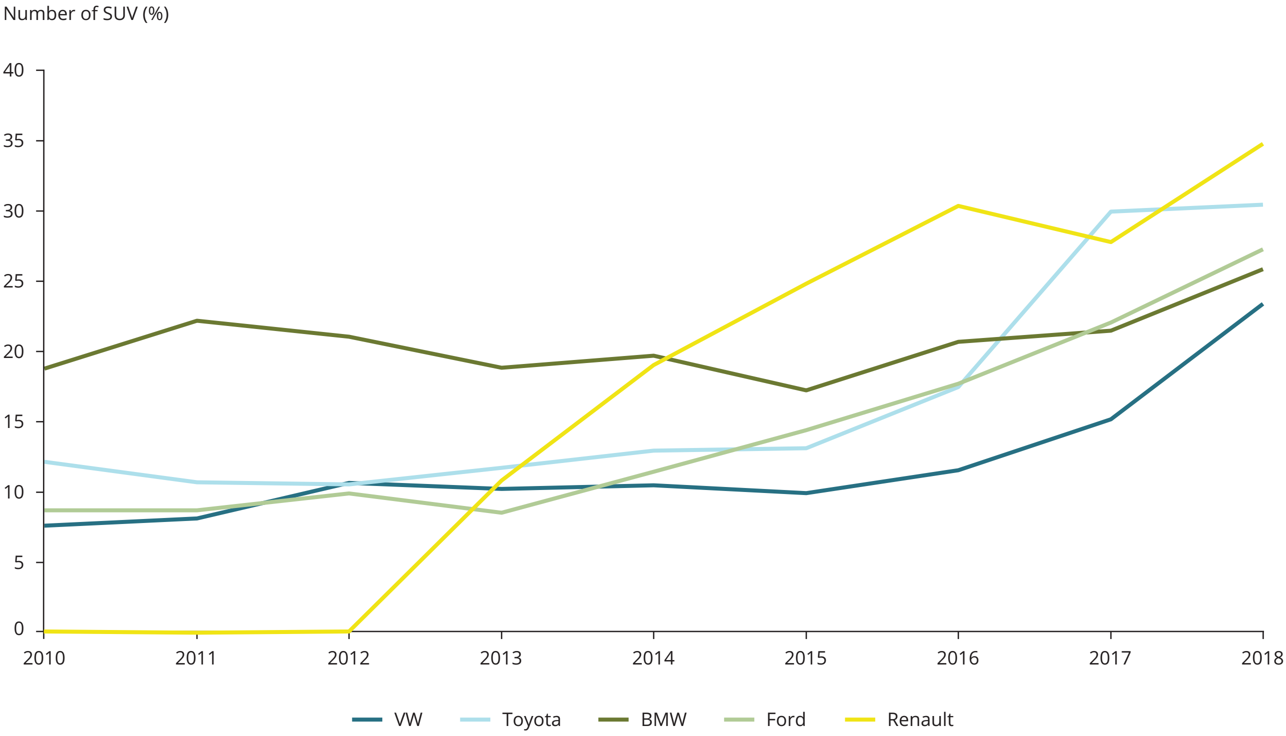
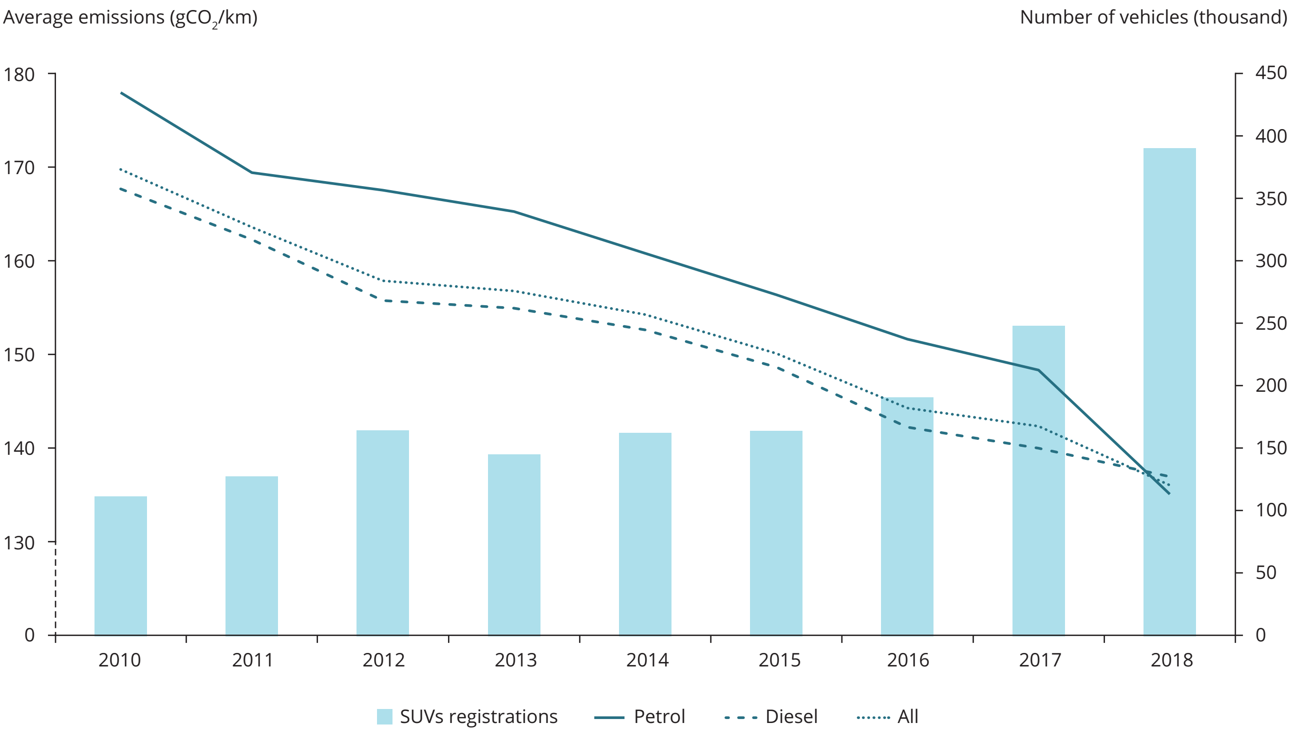



**Figure 5.7 Volkswagen SUVs: Average $CO_2$ emissions by fuels ($gCO_2/km$)**



# References


EEA, 2016, *Explaining road transport emissions — a non-technical guide*, European Environment Agency (https://www.eea.europa.eu/publications/explaining-road-transport-emissions).

EU, 2009, Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles, OJ L 140, 5.6.2009, p. 1-15.

EEA, 2018, *Appropriate taxes and incentives do affect purchases of new cars*, EEA Briefing, European Environment Agency (https://www.eea.europa.eu/themes/transport/vehicles-taxation/appropriate-taxes-and incentives-do).

EU, 2011, Regulation (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO2 emissions from light-duty vehicles, OJ L 145, 31.5.2011, pp. 1-18.

EU, 2019, Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011.

Fontaras, G., Zacharof, N. and Cuiffo, B., 2017, 'Fuel consumption and CO2 emissions from passenger cars in Europe — Laboratory versus real-world emissions', *Progress in Energy and Combustion Science* 60, 97-131.

ICCT, 2018, European vehicle market statistics, pocketbook 2017/2018, International Council on Clean Transportation, Berlin, Germany (https://theicct.org/publications/european-vehicle-market-statistics-20172018) accessed 26 September 2018.

JATO, 2019a, 'Global SUV boom continues in 2018 but growth moderates' (https://www.jato.com/global-suv-boom-continues-in-2018-but-growth-moderates/) accessed 27 November 2019.

JATO, 2019b, 'Global SUV boom continues in 2018 but growth moderates'.

JRC, 2018, 'CO2MPAS: Vehicle simulator predicting NEDC CO2 emissions from WLTP — CO2MPAS 2.0.0+9.g5b3144d documentation' (https://co2mpas.io/) accessed 26 September 2018.

Leduc, P., Dubar, B., Ranini, A. and Monnier, G., 2003, 'Downsizing of gasoline engine: An efficient way to reduce CO2 emissions'.

Patil, C., Varade, S. and Wadkar, S., 2017, 'A review of engine downsizing and its effects', *International Journal of Current Engineering and Technology* Special Issue 7, pp. 319-324.

Tartakovsky, L. and Gutman, M., 2012, *Energy efficiency of road vehicles - trends and challenges*, E.F. Santos Cavalcanti and M. Ribeiro Barbosa.

Toyota, 2018, 'Toyota enters the next phase of its European powertrain strategy' (https://newsroom.toyota.eu/toyota-enters-the-next-phase-of-its-european-powertrain-strategy/ (accessed 12.3.19).) accessed 3 December 2019.

# Annex 1 Monitoring system for passenger cars and vans

Since 2010 the EEA is collecting data about new passenger cars registered in the EU. Since 2013 the EEA has also collected data about new vans. For both cars and vans, the following time scale applies for the data monitoring process:

- Countries record information for each new passenger car and van registered in their territory and transmit this information to the Commission by 28 February of each year. Data are submitted to the Central Data Repository (CDR ([11])), managed by the EEA.

- For vans only, manufacturers submit the vehicle identification number for each new van sold in the EU-28 and Iceland to the Commission by 28 February of each year. Data are submitted to the Business Data Repository (BDR ([12])), managed by the EEA.

- The EEA performs several quality checks to evaluate the accuracy and quality of the data sets. On the basis of the checks and the feedback from countries, 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 may, 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 annex, the process is described in further detail.

## Data quality

The EEA performs several quality checks to evaluate the accuracy and quality of countries' data. These checks cover the following:

- The completeness rate. This has two main components. The first concerns numerical data such as vehicle mass and emission values for each vehicle. The second 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 ([13]).

- 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 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 ([14]).

- For vans, a comparison between the vehicle identification number (VIN) ([15]) provided by countries and that provided by manufacturers.

([11]) The CDR is like a bookshelf, with data reports on the environment as submitted by countries (more information is available at http://cdr.eionet.europa.eu/).
([12]) The BDR is an electronic online reporting system specifically developed for handling confidential company-based information (more information is available at http://bdr.eionet.europa.eu/).
([13]) An outlier observation is well outside the expected range of values in a study or experiment, and is often discarded from the data set.
([14]) 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.
([15]) 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.

Whenever VINs are matching but data are missing in a country's submission, the manufacturer's data ([16]) will be used to complete the data set for the main parameters (emission- and mass-related entries).

After these 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 average $CO_2$ specific emissions and the specific emission target for each manufacturer. The Commission notifies each manufacturer (and pool) of the provisional calculations 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 countries' data, the EEA performs several quality checks 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 countries' 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 average $CO_2$ specific emissions and the specific emission target for each manufacturer. The Commission notifies each manufacturer (and pool) of the final calculations and the provisional data are published on the EEA website.

## Calculation of average $CO_2$ specific emissions

Average specific $CO_2$ emissions 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 A1. 1):

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

***Phase-in***

A phase-in provision applies for calculating the average specific emissions for cars in 2020: for assessing compliance against the specific emission targets in that year, only the 95 % best-performing cars of each manufacturer or pool will be taken into account. From 2021, 100 % of the new cars from each manufacturer will be taken into account.

***Super-credits***

The regulation provides for the allocation of super-credits for new passenger cars with $CO_2$ emissions lower than 50 $gCO_2$/km. These vehicles are temporarily given a greater weight when calculating the average specific emissions of a manufacturer, as follows: each such car is counted as 2 cars in 2020, 1.67 cars in 2021 and 1.33 cars in 2022. Over the period 2020-2022, the use of super-credits will be subject to a cap of 7.5 $gCO_2$/km for each manufacturer. For vans, no super-credit scheme exists from 2018 on.

***Eco-innovations***

For certain innovative technologies which produce real-world $CO_2$ savings, those cannot be demonstrated under the applicable type-approval test procedure. 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 Regulation (EU) No 725/2011 for cars and Regulation (EU) No 427/2014 for vans. If a manufacturer fits its vehicle (car or vans) fleet with an approved eco-innovation, the average emissions of that manufacturer may be reduced by a maximum of 7 $gCO_2$/km.

## Calculation of specific emission targets

For each manufacturer annual specific emissions target is defined, calculated on the basis of the fleet-wide target and the average 'mass in running order' ([17]) of the registered vehicles.

([16]) In addition to VINs, manufacturers may submit detailed monitoring data for the vehicles registered.

([17]) 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.

The following formulae applied for calculating the specific emission targets for passenger cars (1) and vans (2) until 2019 (included):

Passenger cars: $130 + a \times (M - M_0)$ (1)

Vans: $175 + a \times (M - M_0)$ (2)

where:

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

$M_0$ is the reference mass (1 392.4 kg);

$a$ is 0.0457 for passenger cars and 0.093 for vans.

This means that, for example, if the average mass of a manufacturer's newly registered passenger car fleet in a given year is 1 392.4 kg, the target for that manufacturer is 130.0 $gCO_2$/km.

If the average mass of the newly registered passenger car fleet is 1 492.4 kg, the target for that manufacturer is 134.57 $gCO_2$/km. If the average mass of the newly registered passenger car fleet is 1 292.4 kg, the target will be 125.43 $gCO_2$/km.

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.

From 2020, the following formula for calculating the specific emissions target will apply for passenger cars (3) and for vans (4):

Passenger cars: $95 + a \times (M - M_0)$ (3)

Vans: $147 + a \times (M - M_0)$ (4)

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.

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.

## Pooling

Several manufacturers may form a pool and will then be considered as a single manufacturer, with one common target (calculated on the basis of the whole fleet of the pool registered that year). The pools are listed in Annex 4.

## 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 can be granted consistent with the manufacturer's economic and technological potential to reduce specific $CO_2$ emissions.

Niche derogations are provided for manufacturers responsible for between 10 000 and 300 000 new car 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 period 2012-2019 and a 45 % reduction from the 2007 level as of 2020.

A manufacturer who, 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.

Derogations and niche derogations are indicated in Annex 4.

## Correction factor of NEDC values

During the correlation phase, starting from the calendar year 2017 until 2020 inclusive, the average specific $CO_2$ emissions of a manufacturer shall be calculated using the NEDC $CO_2$ values determined on the basis of either physical measurement or the correlated WLTP values. For a WLTP interpolation family two parameters are defined in this respect:

- deviation factor, De: it is the relative difference between the result of a random physical test to be performed by a selection of vehicles and the manufacturer declared value;
- verification factor, Vf: When performing physical tests the correctness of the correlation input data should be verified. If one of them is incorrect: a verification factor of 1 is recorded in the type approval certificate.

**Table A1.1 Summary of the modalities applying to the calculation of car manufacturer performance for the period 2019-2024 (not applicable for vans)**

| Modality | Vehicles | 2019 | 2020 | 2021 | 2022 | 2023-2024 |
|---|---|---|---|---|---|---|
| Phase-in (%) | Passenger cars | 100 | 95 | 100 | 100 | 100 |
| Super-credits for vehicle emitting less than 50 $gCO_2$/km | Passenger cars | 1 | 2 | 1.67 | 1.33 | 1 |

When for one or more WLTP interpolation families the deviation factor exceeds the value 0.04, or in the presence of a verification factor '1', the average specific NEDC $CO_2$ emissions of the manufacturer concerned shall be multiplied by the following correction factor:

$$\textit{correction factor} = 1 + \frac{\sum_{i=1}^{N} De_i * r_i}{\sum_{i=1}^{N} \delta_i * r_i}$$

Where:

$De_i$ is the deviation factor for a WLTP interpolation family;

$R_i$ is the number of annual registrations of vehicles belonging to the respective WLTP interpolation family i concerned;

$\delta_i$ is equal to 0 if $De_i$ is missing and equal to 1 otherwise;

N is the number of WLTP interpolation families for which a manufacturer is responsible.

## Excess emission premiums

If a manufacturer's or a pool's average specific $CO_2$ emissions exceed the specific emission target, the manufacturer will be required to pay 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 $gCO_2$/km), i.e. the excess emissions;
- the number of vehicles registered by the manufacturer during that year;
- the premium level,

From 2019 on, the premium level amounts to EUR 95 from the first g/km of exceedance onwards.

# Annex 2 Car segments

Passenger cars can be classified by fuel and by segment based on their engine capacity, as follows:

- Mini: < 0.8 l (800 cm³)
- Small: 0.8-1.4 l (800-1 400 cm³)
- Medium: 1.4-2.0 l (1 400-2 000 cm³)
- Large: > 2.0 l (2 000cm³)

The data presented in rest of this Annex will adhere to these classifications. It should be noted that mini cars recorded a very small market share that was negligible towards the end of the time series for both petrol and diesel cars.

The market share of conventional petrol cars is shown in Figure A2.1. Small cars constitute most of the sales, followed by medium-sized cars. Large cars constitute only a minor share, in the order of 4 %. Over the period 2010-2015, small cars have significantly strengthened their share: whereas in 2010 they represented 68 % of the market, in 2015 they increased their share by 9 percentage points, constituting 77 % of all petrol cars. In the last 3 years, however, the percentage of small cars has significantly decreased to the 2010 level (67 %) in favour of medium and large cars.

As for diesel cars (Figure A2.2), the highest share of the market belongs to medium cars. Small and large cars hold minor shares. The trend observed in recent years is that the share of mid-range cars has grown mainly at the expense of small size cars.

**Figure A2.1 Market share per segment for petrol passenger cars**

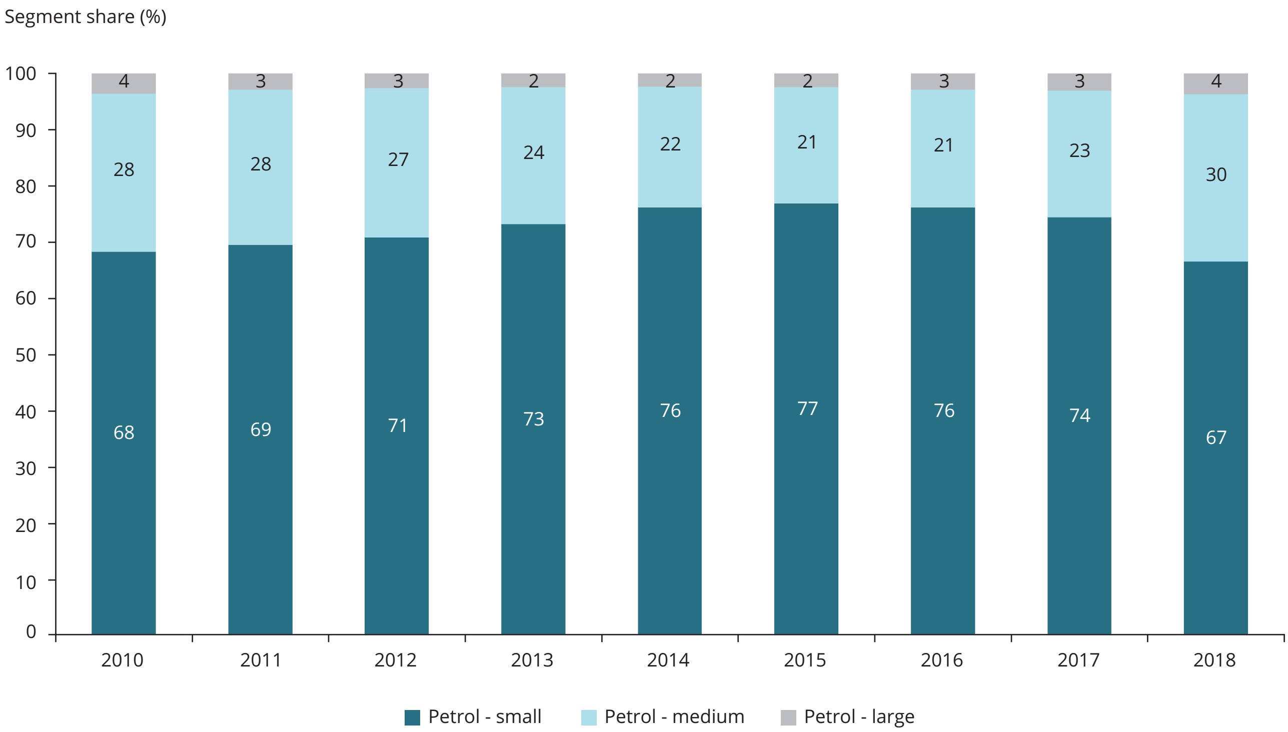
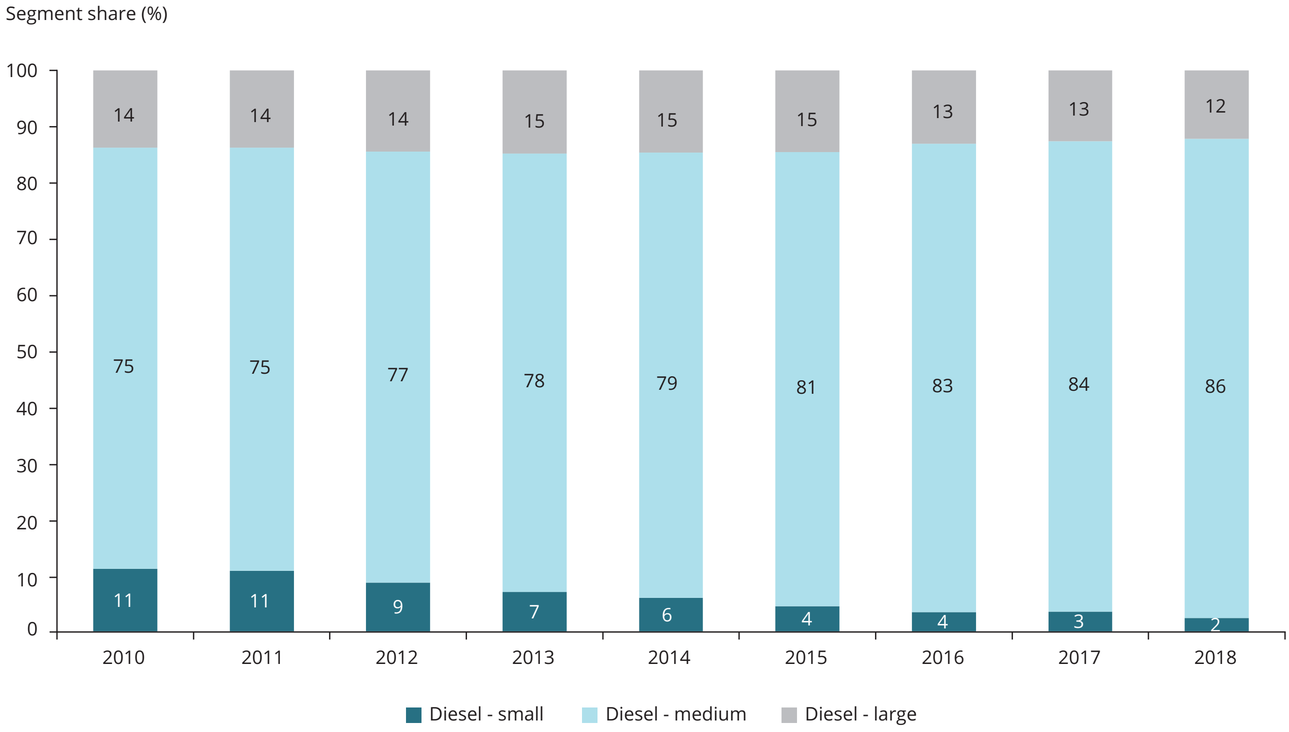


**Figure A2.2 Market share per segment for diesel passenger cars**




As expected, larger cars generally had higher $CO_2$ emissions (Figure A2.3 and Figure A2.4). However, a decreasing trend in $CO_2$ emissions is observed for all segments. The $CO_2$ emissions reductions are highest for larger cars and rather marginal for smaller ones.

Remarkable is the difference in the $CO_2$ emissions of the large size between petrol and diesel conventional cars. Specifically, Large-petrol had extra emissions of up to 68 g/km compared to Large-diesel. Though, their difference has fallen towards the end of the time series to 52.4 $gCO_2$/km in 2017.

For diesel cars segment an increase of emissions is observed between 2018 and 2017from 0.2 $gCO_2$/km for the small size car to almost 7 $gCO_2$/km for the big ones. For conventional petrol cars, large saw a small reduction in $CO_2$ emissions of around 2 $gCO_2$/km, medium and small cars slightly increased their $CO_2$ emissions by about 0.5 and 1.0 $gCO_2$/km, respectively, in the last year.

The peculiar behaviour of mini-petrol cars, which for several years had higher $CO_2$ emissions than small-petrol cars, is attributed to the fact that mini cars recorded a very small market share, which was negligible towards the end of the time series.

Almost all size categories have seen an increase in the mass of the car since 2010, except large-diesel cars, for which the mass had reduced by about 10 kg in 2018 compared with 2010 ( Figure A2.5 and Figure A2.6). However, it should be noted that the changes in mass were generally quite mild (from 40 kg to 100kg for the period 2010-2018), with the most intense occurring in the small segment, in which the mass of petrol cars increased by 6 % and the mass of diesel cars increased by 8.5 % in the period 2010-2018.

Cars have become more powerful over the past 8 years, and this applies to all size classes and to both petrol and diesel engines (Figure A2.7 and Figure A2.8). The large petrol cars sold were much more powerful than the large diesel ones.

Regarding the other size categories (medium and small), petrol powertrains are slightly more powerful than the corresponding diesel ones. This is because in similar engine sizes, a petrol engine will have greater power than a diesel engine because it can run at higher rotational speeds and power is directly proportional to the speed. However, at lower speeds a diesel engine can produce higher torque than a petrol engine.

**Figure A2.3 Trends in $CO_2$ emissions of petrol passenger cars per segment**

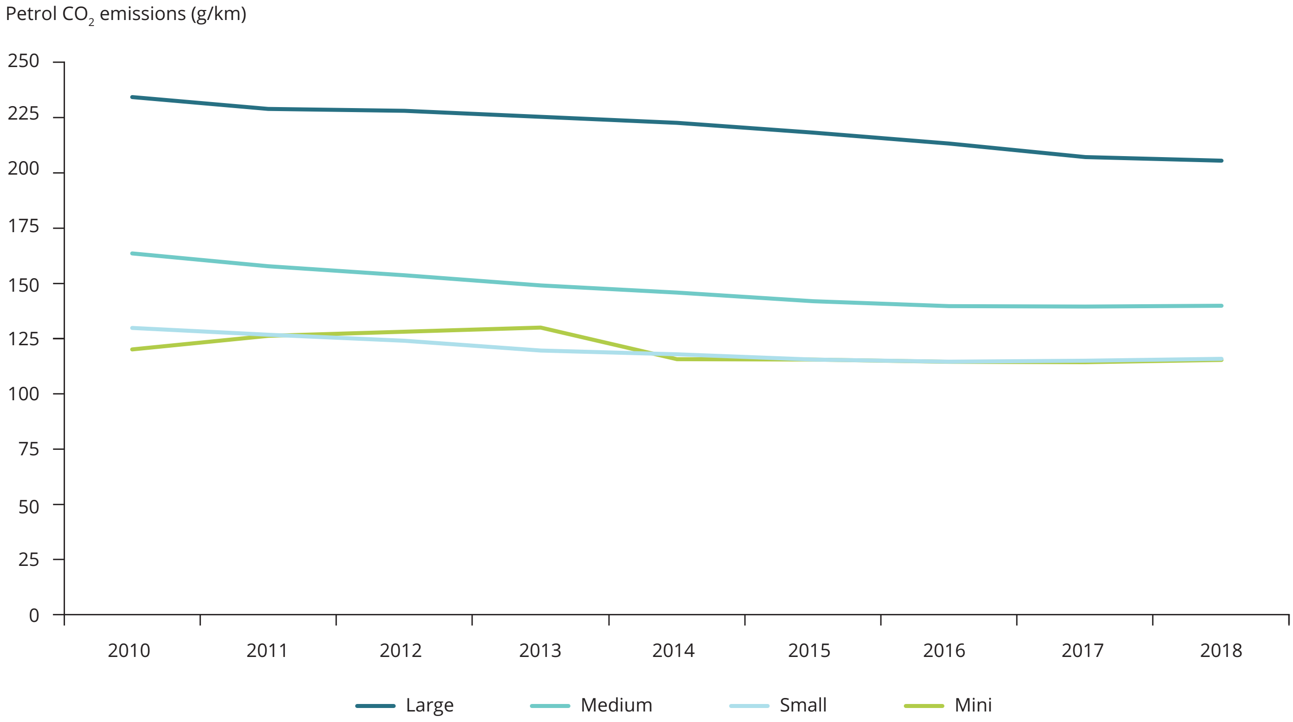



**Figure A2.4 Trends in $CO_2$ emissions of diesel passenger cars per segment**

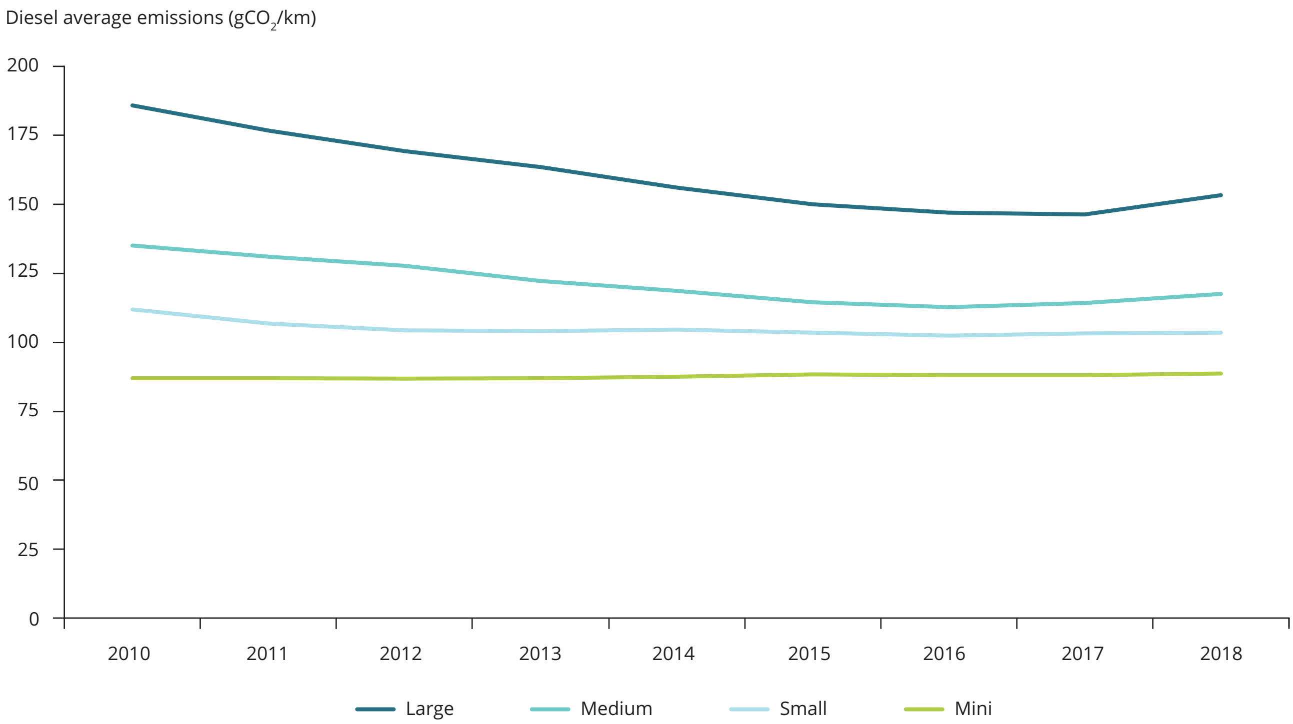


**Figure A2.5 Trends in mass of petrol passenger cars per segment**

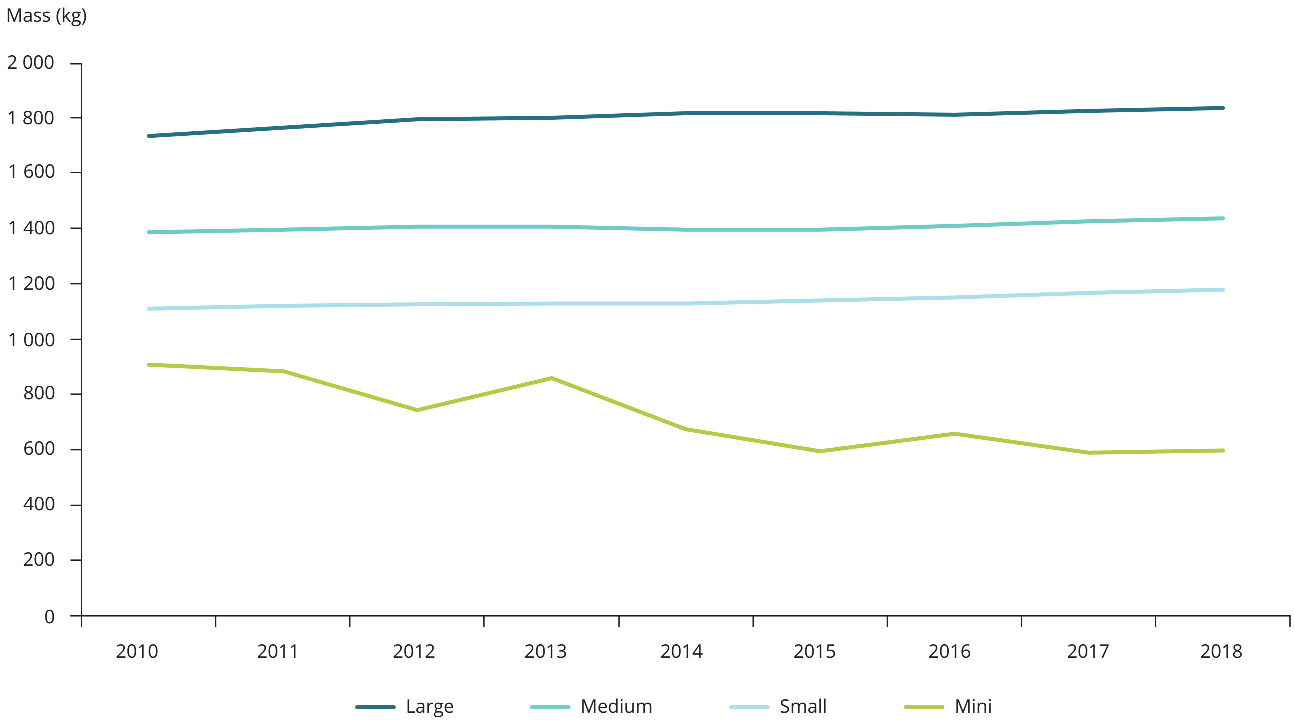



**Figure A2.6 Trends in mass of diesel passenger cars per segment**

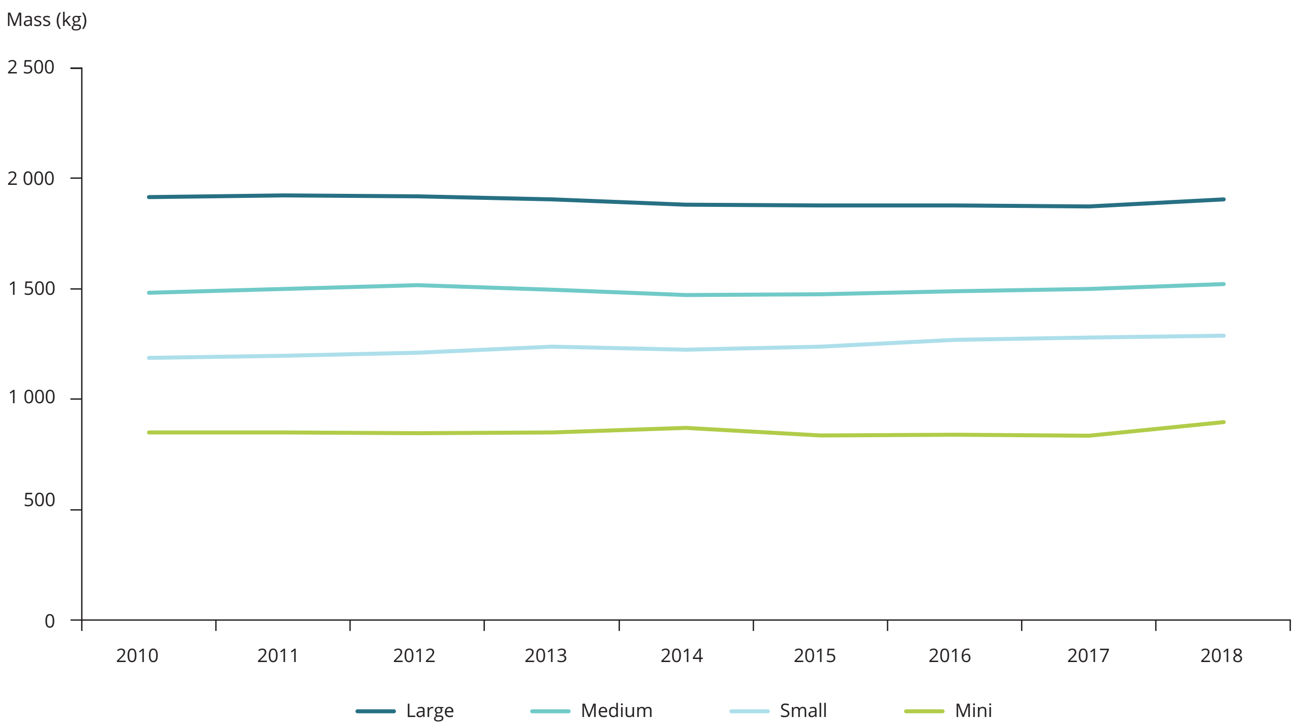


**Figure A2.7 Trends in engine power of petrol passenger cars per segment**

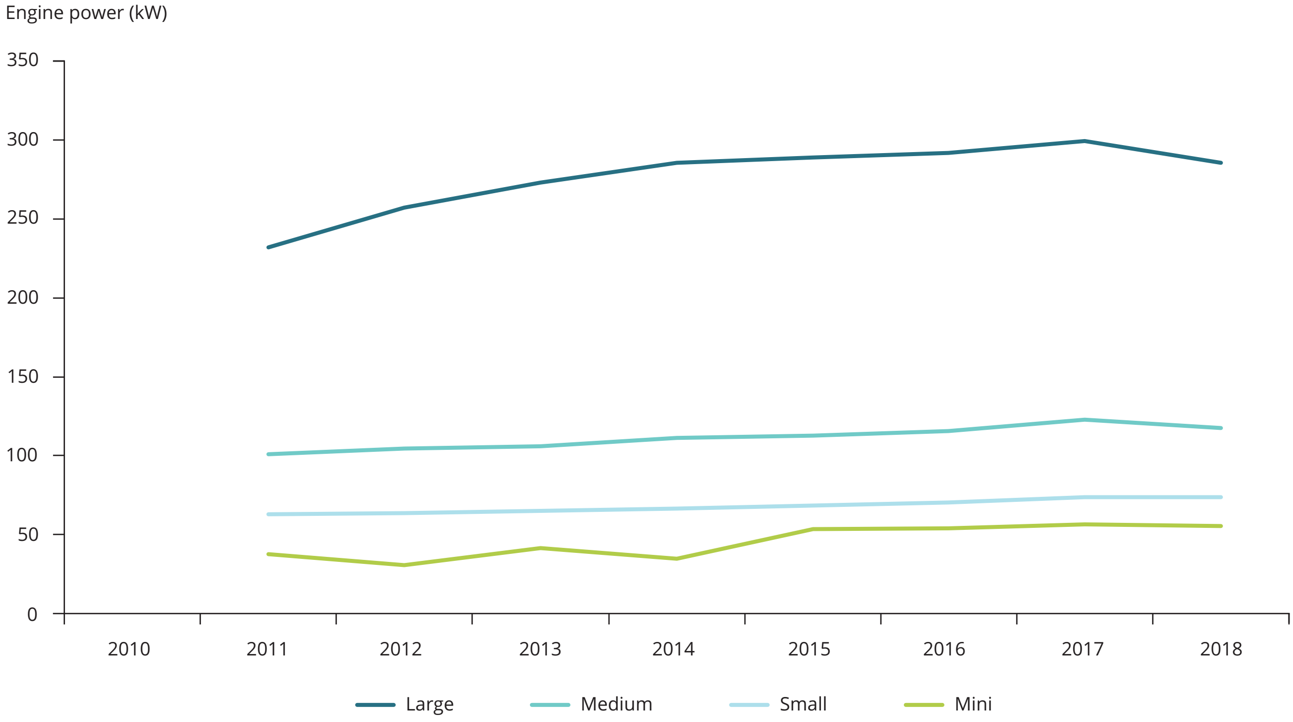



**Figure A2.8 Trends in engine power of diesel passenger cars per segment**

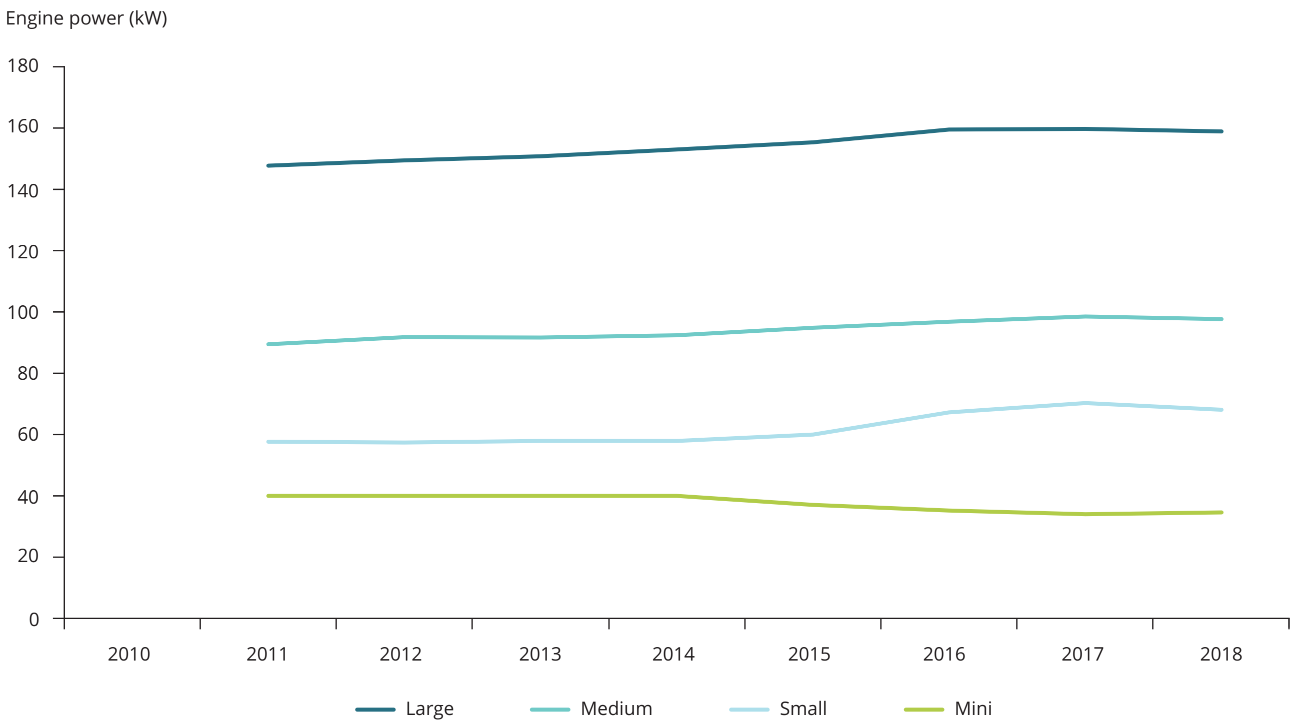


**Figure A2.9 Trends in engine capacity of petrol passenger cars per segment**

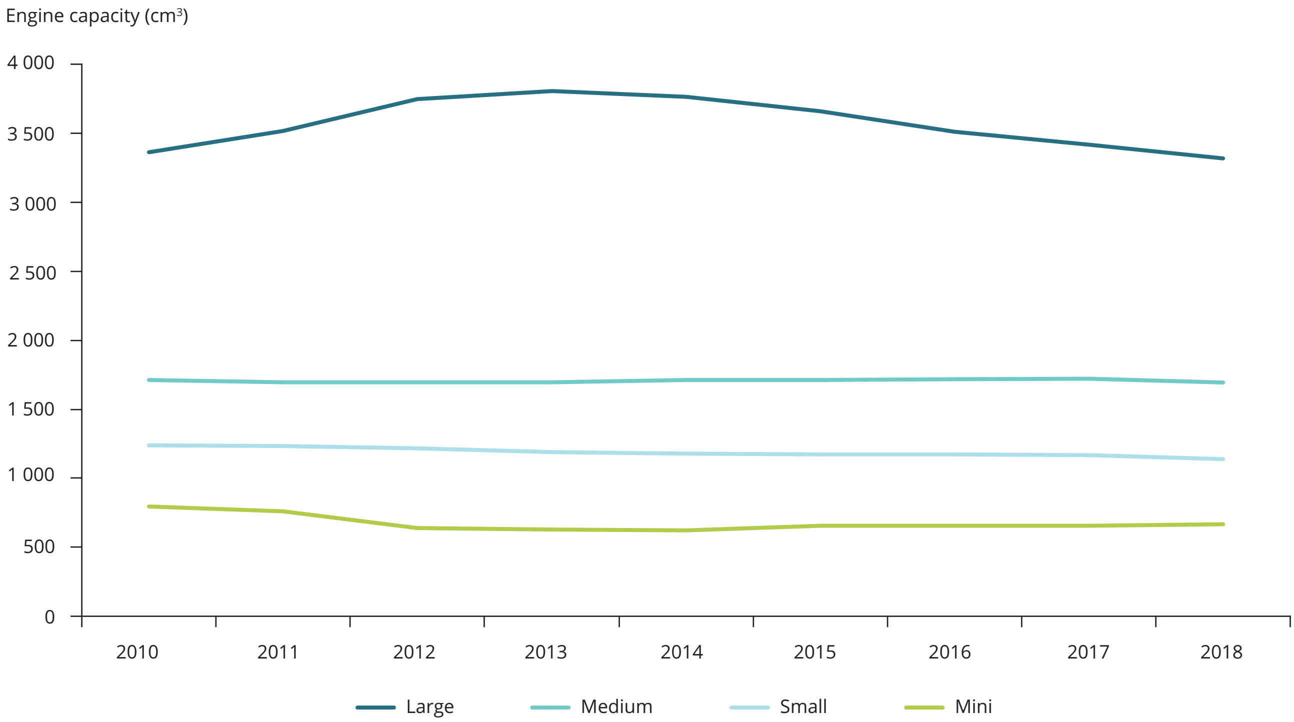
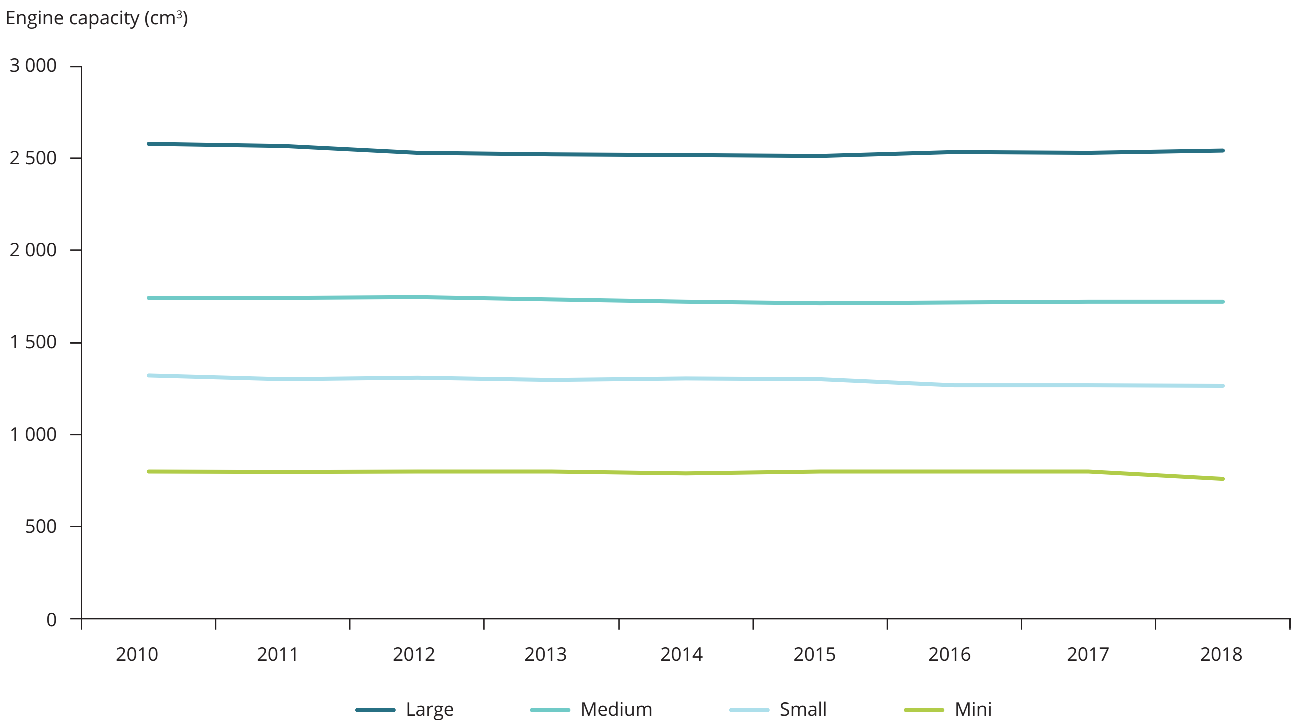



**Figure A2.10 Trends in engine capacity of diesel passenger cars per segment**



Regarding engine capacity, a small decreasing engine displacement trend was observed over the period for almost all segments (Figure A2.9 and Figure A2.10).

Medium-sized cars' capacity remained almost stable for both petrol and diesel powertrains over the period 2010-2018. In addition, their values ranged around the same level, just above 1 700 $cm^3$.

In the small cars category there was a significant downwards trend for both petrol and diesel powertrains. More specifically, petrol cars recorded an overall absolute reduction of about 99 $cm^3$ (8 % in relative terms) and diesel cars fell about 56 $cm^3$ (4 % in relative terms). It is also worth noting that the petrol powertrains of this category are generally smaller than the diesel ones, with an average of 1 138 $cm^3$ in 2017, while the diesel powertrains were about 1 265 $cm^3$.

# Annex 3 Country statistics

**Table A3.1 Registrations of new passenger cars by country (in thousands)**

| Country | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Austria | 328 | 356 | 335 | 319 | 303 | 308 | 329 | 353 | 340 |
| Belgium | 551 | 577 | 490 | 490 | 485 | 503 | 541 | 548 | 545 |
| Bulgaria | 14 | 14 | 14 | 15 | 16 | 17 | 20 | 26 | 28 |
| Croatia | | | | 28 | 35 | 36 | 45 | 48 | 60 |
| Cyprus | 15 | 15 | 11 | 7 | 8 | 9 | 12 | 13 | 13 |
| Czechia | 165 | 169 | 170 | 162 | 179 | 227 | 214 | 221 | 236 |
| Denmark | 151 | 170 | 171 | 184 | 188 | 204 | 221 | 220 | 214 |
| Estonia | 10 | 17 | 19 | 20 | 21 | 21 | 23 | 26 | 26 |
| Finland | 109 | 122 | 107 | 100 | 103 | 106 | 115 | 114 | 116 |
| France | 2 250 | 2 174 | 1 932 | 1 827 | 1 838 | 2 011 | 2 167 | 2 256 | 2 309 |
| Germany | 2 873 | 2 933 | 3 062 | 2 930 | 3 012 | 3 177 | 3 316 | 3 377 | 3 343 |
| Greece | 140 | 97 | 57 | 58 | 71 | 76 | 79 | 88 | 103 |
| Hungary | 43 | 47 | 52 | 55 | 68 | 77 | 95 | 107 | 127 |
| Iceland | | | | | | | | | 18 |
| Ireland | 89 | 90 | 73 | 74 | 96 | 123 | 146 | 129 | 126 |
| Italy | 1 954 | 1 745 | 1 402 | 1 304 | 1 351 | 1 573 | 1 823 | 1 965 | 1 905 |
| Latvia | 6 | 10 | 10 | 10 | 12 | 14 | 15 | 15 | 15 |
| Lithuania | 7 | 12 | 12 | 12 | 14 | 17 | 20 | 25 | 32 |
| Luxembourg | 50 | 50 | 49 | 46 | 49 | 46 | 49 | 52 | 52 |
| Malta | 4 | 6 | 6 | 6 | 6 | 7 | 7 | 8 | 8 |
| Netherlands | 480 | 554 | 500 | 416 | 384 | 438 | 378 | 412 | 411 |
| Poland | 219 | 275 | 274 | 288 | 304 | 354 | 417 | 430 | 508 |
| Portugal | 223 | 154 | 96 | 105 | 142 | 179 | 207 | 222 | 225 |
| Romania | 94 | 82 | 66 | 57 | 70 | 81 | 95 | 107 | 126 |
| Slovakia | 65 | 69 | 70 | 66 | 74 | 78 | 89 | 97 | 98 |
| Slovenia | 60 | 55 | 50 | 51 | 54 | 53 | 53 | 60 | 63 |
| Spain | 976 | 810 | 704 | 732 | 895 | 1 076 | 1 185 | 1 286 | 1 379 |
| Sweden | 277 | 289 | 263 | 252 | 297 | 338 | 364 | 369 | 343 |
| United Kingdom | 2 026 | 1 937 | 2 036 | 2 254 | 2 467 | 2 623 | 2 687 | 2 533 | 2 354 |
| EU-28 + Iceland | 13 181 | 12 830 | 12 031 | 11 869 | 12 542 | 13 771 | 14 714 | 15 105 | 15 125 |

**Table A3.2 Average mass of new passenger cars by country (kg)**

| Country | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Austria | 1 409 | 1 442 | 1 453 | 1 448 | 1 446 | 1 459 | 1 467 | 1 431 | 1 431 |
| Belgium | 1 406 | 1 416 | 1 439 | 1 421 | 1 415 | 1 418 | 1 413 | 1 419 | 1 410 |
| Bulgaria | 1 454 | 1 462 | 1 485 | 1 475 | 1 424 | 1 408 | 1 402 | 1 410 | 1 415 |
| Croatia | | | | 1 309 | 1 307 | 1 326 | 1 336 | 1 333 | 1 330 |
| Cyprus | 1 388 | 1 377 | 1 370 | 1 367 | 1 391 | 1 395 | 1 408 | 1 417 | 1 431 |
| Czechia | 1 380 | 1 368 | 1 368 | 1 370 | 1 364 | 1 374 | 1 352 | 1 385 | 1 380 |
| Denmark | 1 335 | 1 312 | 1 248 | 1 227 | 1 216 | 1 227 | 1 261 | 1 274 | 1 321 |
| Estonia | 1 473 | 1 502 | 1 514 | 1 508 | 1 474 | 1 456 | 1 463 | 1 464 | 1 465 |
| Finland | 1 426 | 1 452 | 1 455 | 1 445 | 1 440 | 1 421 | 1 422 | 1 434 | 1 433 |
| France | 1 326 | 1 343 | 1 385 | 1 350 | 1 310 | 1 315 | 1 322 | 1 323 | 1 315 |
| Germany | 1 433 | 1 460 | 1 466 | 1 448 | 1 443 | 1 447 | 1 453 | 1 454 | 1 455 |
| Greece | 1 252 | 1 231 | 1 242 | 1 243 | 1 240 | 1 250 | 1 250 | 1 242 | 1 244 |
| Hungary | 1 370 | 1 396 | 1 390 | 1 401 | 1 398 | 1 394 | 1 369 | 1 370 | 1 380 |
| Iceland | | | | | | | | | 1 523 |
| Ireland | 1 380 | 1 378 | 1 420 | 1 397 | 1 410 | 1 393 | 1 385 | 1 378 | 1 394 |
| Italy | 1 269 | 1 306 | 1 311 | 1 314 | 1 307 | 1 305 | 1 307 | 1 312 | 1 326 |
| Latvia | 1 522 | 1 543 | 1 563 | 1 552 | 1 519 | 1 491 | 1 438 | 1 474 | 1 465 |
| Lithuania | 1 481 | 1 498 | 1 497 | 1 486 | 1 435 | 1 423 | 1 412 | 1 406 | 1 378 |
| Luxembourg | 1 473 | 1 519 | 1 528 | 1 505 | 1 488 | 1 495 | 1 497 | 1 503 | 1 516 |
| Malta | 1 200 | 1 216 | 1 465 | 1 212 | 1 199 | 1 206 | 1 216 | 1 213 | 1 231 |
| Netherlands | 1 254 | 1 249 | 1 266 | 1 288 | 1 285 | 1 323 | 1 300 | 1 284 | 1 320 |
| Poland | 1 317 | 1 378 | 1 383 | 1 376 | 1 356 | 1 383 | 1 393 | 1 409 | 1 394 |
| Portugal | 1 333 | 1 354 | 1 361 | 1 350 | 1 345 | 1 343 | 1 339 | 1 344 | 1 351 |
| Romania | 1 281 | 1 325 | 1 381 | 1 365 | 1 347 | 1 333 | 1 341 | 1 351 | 1 342 |
| Slovakia | 1 386 | 1 418 | 1 421 | 1 410 | 1 410 | 1 420 | 1 426 | 1 434 | 1 407 |
| Slovenia | 1 332 | 1 355 | 1 358 | 1 344 | 1 333 | 1 335 | 1 361 | 1 379 | 1 357 |
| Spain | 1 399 | 1 413 | 1 410 | 1 396 | 1 355 | 1 357 | 1 363 | 1 366 | 1 363 |
| Sweden | 1 497 | 1 510 | 1 522 | 1 520 | 1 513 | 1 526 | 1 515 | 1 540 | 1 552 |
| United Kingdom | 1 384 | 1 410 | 1 398 | 1 394 | 1 381 | 1 393 | 1 411 | 1 424 | 1 429 |
| EU-28 + Iceland | 1 364 | 1 388 | 1 402 | 1 390 | 1 375 | 1 380 | 1 385 | 1 388 | 1 390 |

**Table A3.3 Average $CO_2$ emissions from new passenger cars by country ($gCO_2/km$)**

| Country | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Austria | 144.0 | 138.7 | 135.7 | 131.6 | 128.5 | 123.7 | 120.4 | 120.7 | 123.0 |
| Belgium | 133.4 | 127.2 | 128.0 | 124.0 | 121.3 | 117.9 | 115.9 | 115.9 | 119.4 |
| Bulgaria | 158.9 | 151.4 | 149.2 | 141.7 | 135.9 | 130.3 | 125.8 | 126.2 | 126.7 |
| Croatia | | | | 127.1 | 115.8 | 112.8 | 111.5 | 113.1 | 115.3 |
| Cyprus | 155.8 | 149.9 | 144.3 | 139.2 | 129.8 | 125.7 | 123.5 | 122.2 | 123.4 |
| Czechia | 148.9 | 144.5 | 140.8 | 134.6 | 131.6 | 126.3 | 121.2 | 124.1 | 126.0 |
| Denmark | 126.6 | 125.0 | 117.0 | 112.7 | 110.2 | 106.2 | 106.0 | 107.1 | 109.6 |
| Estonia | 162.0 | 156.9 | 150.3 | 147.0 | 140.9 | 137.2 | 133.9 | 132.8 | 132.4 |
| Finland | 149.0 | 144.0 | 139.1 | 131.8 | 127.4 | 123.0 | 120.0 | 118.2 | 116.7 |
| France | 130.5 | 127.7 | 124.4 | 117.4 | 114.2 | 111.0 | 109.8 | 110.4 | 112.2 |
| Germany | 151.1 | 145.6 | 141.6 | 136.1 | 132.5 | 128.3 | 126.9 | 127.2 | 129.5 |
| Greece | 143.7 | 132.7 | 121.1 | 111.9 | 108.2 | 106.4 | 106.3 | 108.8 | 111.4 |
| Hungary | 147.4 | 141.6 | 140.8 | 134.4 | 133.0 | 129.6 | 125.9 | 125.6 | 127.9 |
| Iceland | | | | | | | | | 116.8 |
| Ireland | 133.2 | 128.3 | 125.1 | 120.7 | 117.1 | 114.1 | 112.0 | 111.6 | 113.3 |
| Italy | 132.7 | 129.6 | 126.2 | 121.1 | 118.1 | 115.2 | 113.3 | 113.3 | 115.9 |
| Latvia | 162.0 | 154.4 | 152.0 | 147.1 | 140.4 | 137.1 | 128.9 | 128.8 | 128.8 |
| Lithuania | 150.9 | 144.4 | 144.2 | 139.8 | 135.8 | 130.0 | 126.2 | 127.4 | 128.6 |
| Luxembourg | 146.0 | 142.2 | 137.0 | 133.4 | 129.9 | 127.5 | 126.1 | 127.0 | 131.4 |
| Malta | 131.2 | 124.7 | 121.5 | 118.7 | 115.3 | 113.3 | 111.8 | 111.0 | 107.7 |
| Netherlands | 135.8 | 126.1 | 118.6 | 109.1 | 107.3 | 101.2 | 105.9 | 108.3 | 105.5 |
| Poland | 146.2 | 144.5 | 141.3 | 138.1 | 132.9 | 129.3 | 125.8 | 127.6 | 129.8 |
| Portugal | 127.2 | 122.8 | 117.6 | 112.2 | 108.8 | 105.7 | 104.7 | 104.7 | 106.1 |
| Romania | 148.5 | 140.7 | 139.0 | 132.1 | 128.2 | 125.0 | 122.0 | 120.6 | 121.5 |
| Slovakia | 149.0 | 144.9 | 141.0 | 135.1 | 131.7 | 127.6 | 124.8 | 126.1 | 127.6 |
| Slovenia | 144.4 | 139.7 | 133.4 | 125.6 | 121.3 | 119.2 | 119.0 | 119.6 | 120.9 |
| Spain | 137.9 | 133.8 | 128.7 | 122.4 | 118.6 | 115.3 | 114.4 | 115.0 | 118.1 |
| Sweden | 151.3 | 141.8 | 135.9 | 133.2 | 131.0 | 126.3 | 123.1 | 122.3 | 122.2 |
| United Kingdom | 144.2 | 138.0 | 132.9 | 128.3 | 124.6 | 121.3 | 120.1 | 121.1 | 124.6 |
| EU-28 + Iceland | 140.3 | 135.7 | 132.2 | 126.7 | 123.4 | 119.5 | 118.1 | 118.5 | 120.8 |

**Table A3.4 New van registrations by country**

| Country | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Austria | 26 | 27 | 30 | 31 | 34 | 38 | 40 |
| Belgium | 53 | 51 | 52 | 59 | 65 | 73 | 71 |
| Bulgaria | 8 | 7 | 8 | 9 | 9 | 9 | 11 |
| Croatia | | | 4 | 6 | 7 | 5 | 6 |
| Cyprus | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Czechia | 10 | 10 | 12 | 13 | 11 | 14 | 17 |
| Denmark | 11 | 17 | 25 | 29 | 34 | 34 | 32 |
| Estonia | 2 | 3 | 3 | 4 | 4 | 4 | 5 |
| Finland | 10 | 10 | 10 | 10 | 12 | 14 | 14 |
| France | 227 | 300 | 348 | 309 | 283 | 303 | 319 |
| Germany | 195 | 199 | 212 | 224 | 245 | 243 | 254 |
| Greece | 2 | 3 | 5 | 5 | 6 | 6 | 7 |
| Hungary | 8 | 10 | 15 | 15 | 19 | 16 | 20 |
| Iceland | | | | | | | 2 |
| Ireland | 6 | 10 | 16 | 22 | 26 | 23 | 23 |
| Italy | 106 | 92 | 107 | 117 | 167 | 159 | 147 |
| Latvia | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Lithuania | 1 | 2 | 2 | 2 | 3 | 3 | 3 |
| Luxembourg | 3 | 3 | 3 | 3 | 4 | 4 | 4 |
| Malta | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Netherlands | 47 | 49 | 46 | 49 | 63 | 63 | 67 |
| Poland | 30 | 34 | 61 | 47 | 47 | 41 | 59 |
| Portugal | 13 | 17 | 24 | 27 | 29 | 31 | 34 |
| Romania | 8 | 6 | 8 | 9 | 10 | 12 | 11 |
| Slovakia | 5 | 5 | 5 | 7 | 7 | 7 | 8 |
| Slovenia | 5 | 6 | 5 | 6 | 7 | 9 | 10 |
| Spain | 65 | 70 | 90 | 76 | 113 | 121 | 110 |
| Sweden | 21 | 20 | 26 | 28 | 30 | 44 | 45 |
| United Kingdom | 232 | 262 | 307 | 351 | 350 | 328 | 327 |
| EU-28 + Iceland | 1 098 | 1 214 | 1 425 | 1 465 | 1 587 | 1 608 | 1 650 |

**Table A3.5 Average mass of new vans by country (kg)**

| Country | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Austria | 1 856 | 1 860 | 1 900 | 1 905 | 1 928 | 1 934 | 1 928 |
| Belgium | 1 842 | 1 861 | 1 883 | 1 875 | 1 861 | 1 876 | 1 849 |
| Bulgaria | 1 578 | 1 592 | 1 545 | 1 526 | 1 553 | 1 567 | 1 549 |
| Croatia | | | 1 668 | 1 646 | 1 708 | 1 805 | 1 750 |
| Cyprus | 1 605 | 1 734 | 1 674 | 1 661 | 1 665 | 1 550 | 1 590 |
| Czechia | 1 827 | 1 835 | 1 942 | 1 890 | 1 959 | 1 982 | 1 960 |
| Denmark | 1 854 | 1 793 | 1 736 | 1 731 | 1 777 | 1 830 | 1 860 |
| Estonia | 1 821 | 1 831 | 1 831 | 1 724 | 1 741 | 1 792 | 1 831 |
| Finland | 1 922 | 1 910 | 1 936 | 1 952 | 1 917 | 1 959 | 1 981 |
| France | 1 804 | 1 601 | 1 625 | 1 674 | 1 761 | 1 763 | 1 781 |
| Germany | 2 034 | 1 911 | 1 913 | 1 908 | 1 946 | 1 922 | 1 984 |
| Greece | 1 634 | 1 624 | 1 598 | 1 602 | 1 690 | 1 719 | 1 750 |
| Hungary | 1 828 | 1 845 | 1 843 | 1 884 | 1 850 | 1 876 | 1 908 |
| Iceland | | | | | | | 1 784 |
| Ireland | 1 762 | 1 785 | 1 778 | 1 820 | 1 799 | 1 798 | 1 814 |
| Italy | 1 713 | 1 707 | 1 674 | 1 626 | 1 631 | 1 652 | 1 675 |
| Latvia | 1 770 | 1 750 | 1 728 | 1 747 | 1 728 | 1 763 | 1 830 |
| Lithuania | 1 891 | 1 856 | 1 830 | 1 814 | 1 896 | 1 889 | 1 912 |
| Luxembourg | 1 902 | 1 857 | 1 845 | 1 817 | 1 830 | 1 834 | 1 861 |
| Malta | 1 507 | 1 518 | 1 520 | 1 602 | 1 598 | 1 584 | 1 650 |
| Netherlands | 1 777 | 1 774 | 1 778 | 1 785 | 1 763 | 1 803 | 1 821 |
| Poland | 1 778 | 1 796 | 1 779 | 1 834 | 1 872 | 1 911 | 1 969 |
| Portugal | 1 579 | 1 583 | 1 581 | 1 570 | 1 615 | 1 647 | 1 658 |
| Romania | 1 806 | 1 766 | 1 781 | 1 791 | 1 832 | 1 827 | 1 795 |
| Slovak Republic | 1 986 | 1 995 | 2 026 | 2 006 | 2 045 | 2 045 | 1 983 |
| Slovenia | 1 860 | 1 849 | 1 877 | 1 853 | 1 873 | 1 927 | 1 963 |
| Spain | 1 764 | 1 734 | 1 672 | 1 659 | 1 680 | 1 687 | 1 619 |
| Sweden | 1 724 | 1 760 | 1 811 | 1 775 | 1 763 | 1 827 | 1 864 |
| United Kingdom | 1 815 | 1 827 | 1 838 | 1 848 | 1 879 | 1 901 | 1 942 |
| EU-28 + Iceland | 1 834 | 1 764 | 1 764 | 1 781 | 1 810 | 1 821 | 1 846 |

**Table A3.6 Average $CO_2$ emissions of new vans by country (kg)**

| Country | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Austria | 186.6 | 185.8 | 183.6 | 178.3 | 171.6 | 164.9 | 166.4 |
| Belgium | 185.8 | 182.8 | 179.4 | 175.8 | 169.2 | 160.6 | 160.9 |
| Bulgaria | 160.8 | 156.3 | 149.2 | 144.0 | 141.1 | 134.7 | 134.3 |
| Croatia | | | 158.8 | 154.3 | 150.1 | 142.2 | 142.3 |
| Cyprus | 151.5 | 170.6 | 158.1 | 143.2 | 144.1 | 133.4 | 135.1 |
| Czechia | 196.0 | 189.1 | 191.2 | 183.0 | 183.2 | 173.0 | 169.0 |
| Denmark | 178.1 | 166.8 | 155.0 | 151.1 | 151.7 | 149.5 | 151.8 |
| Estonia | 184.4 | 182.0 | 178.1 | 165.1 | 161.9 | 155.9 | 159.0 |
| Finland | 193.5 | 182.0 | 179.7 | 174.7 | 167.0 | 161.5 | 163.7 |
| France | 170.2 | 152.8 | 151.6 | 154.7 | 158.9 | 150.9 | 151.4 |
| Germany | 195.5 | 192.9 | 190.1 | 186.3 | 178.7 | 169.2 | 173.0 |
| Greece | 170.3 | 161.3 | 157.0 | 156.0 | 155.2 | 152.3 | 154.3 |
| Hungary | 184.0 | 181.9 | 177.7 | 177.0 | 168.0 | 163.1 | 164.1 |
| Iceland | | | | | | | 151.4 |
| Ireland | 175.6 | 177.2 | 168.7 | 169.3 | 163.5 | 156.2 | 155.9 |
| Italy | 168.2 | 163.5 | 157.0 | 153.2 | 145.0 | 141.8 | 144.4 |
| Latvia | 176.9 | 171.6 | 167.4 | 165.3 | 156.6 | 153.9 | 164.3 |
| Lithuania | 190.8 | 180.3 | 176.3 | 169.2 | 168.8 | 160.1 | 164.9 |
| Luxembourg | 188.3 | 179.2 | 178.8 | 172.8 | 167.8 | 158.8 | 161.0 |
| Malta | 147.5 | 150.5 | 145.4 | 153.6 | 146.9 | 135.6 | 141.8 |
| Netherlands | 177.5 | 173.4 | 167.4 | 163.3 | 155.5 | 152.5 | 154.1 |
| Poland | 179.6 | 176.4 | 168.5 | 177.2 | 171.3 | 163.1 | 168.5 |
| Portugal | 154.2 | 150.9 | 144.8 | 141.7 | 140.1 | 132.1 | 132.4 |
| Romania | 183.1 | 171.8 | 171.9 | 170.3 | 170.1 | 158.0 | 152.1 |
| Slovak Republic | 200.8 | 196.3 | 193.2 | 186.8 | 185.6 | 170.1 | 169.5 |
| Slovenia | 191.2 | 188.0 | 185.1 | 174.9 | 168.2 | 161.4 | 165.2 |
| Spain | 167.4 | 162.9 | 156.1 | 154.6 | 148.0 | 142.4 | 137.3 |
| Sweden | 165.8 | 167.1 | 170.4 | 163.0 | 155.2 | 155.7 | 158.7 |
| United Kingdom | 186.3 | 185.2 | 181.0 | 177.9 | 172.9 | 163.4 | 165.5 |
| EU-28 + Iceland | 180.2 | 173.3 | 169.1 | 168.3 | 163.7 | 156.1 | 157.9 |

# Annex 4 Manufacturers' $CO_2$ emission performance

**Table A4.1 $CO_2$ emission performance of car manufacturers in 2018**

| MANUFACTURER | Pools and derogations | Number of registrations | Average $CO_2$ emissions | Specific emission target | Difference between average $CO_2$ emissions and specific emission target |
|---|---|---|---|---|---|
| ADIDOR VOITURES SAS | DMD | 100 | 155.900 | | |
| ALFA ROMEO SPA | P3 | 78 696 | 127.881 | 135.823 | -7.942 |
| ALPINA BURKARD BOVENSIEPEN GMBH E CO KG | D | 663 | 200.919 | 218.000 | -17.081 |
| SOCIETE DES AUTOMOBILES ALPINE | P10 | 1 533 | 139.738 | 119.534 | 20.204 |
| ANHUI JIANGHUAI AUTOMOBILE | DMD | 1 | 242.000 | | |
| ASTON MARTIN LAGONDA LTD | D | 2 096 | 262.180 | 297.000 | -34.820 |
| AUDI AG | P14 | 675 059 | 127.279 | 137.806 | -10.527 |
| AUDI HUNGARIA MOTOR KFT | P14 | 4 519 | 146.996 | 130.385 | 16.611 |
| AUDI SPORT GMBH | P14 | 13 361 | 195.848 | 143.972 | 51.876 |
| AUTOMOBILES CITROEN | P9 | 626 462 | 108.035 | 121.186 | -13.151 |
| AUTOMOBILES PEUGEOT | P9 | 982 942 | 106.936 | 124.186 | -17.250 |
| AVTOVAZ JSC | P10 | 3 874 | 181.385 | 124.322 | 57.063 |
| BEE BEE AUTOMOTIVE | DMD | 3 | 0.000 | | |
| BENTLEY MOTORS LTD | D | 2 859 | 271.047 | 286.000 | -14.953 |
| BLUECAR SAS | DMD | 415 | 0.000 | | |
| BAYERISCHE MOTOREN WERKE AG | P1 | 963 438 | 125.035 | 138.886 | -13.851 |
| BMW M GMBH | P1 | 14 599 | 189.521 | 145.561 | 43.960 |
| BEIJING BORGWARD AUTOMOTIVE CO LTD | DMD | 42 | 218.452 | | |
| BUGATTI AUTOMOBILES SAS | P14 | 19 | 516.000 | 160.966 | 355.034 |
| CATERHAM CARS LIMITED | DMD | 120 | 138.367 | | |
| CHEVROLET ITALIA SPA | | 2 | 96.500 | 126.874 | -30.374 |
| FCA US LLC | P3 | 162 851 | 142.728 | 139.162 | 3.566 |
| CNG-TECHNIK GMBH | P4 | 615 | 118.081 | 139.878 | -21.797 |
| AUTOMOBILE DACIA SA | P10 | 381 173 | 118.433 | 119.753 | -1.320 |
| DAIHATSU MOTOR CO LTD | DMD | 5 | 176.000 | | |
| DAIMLER AG | P2 | 929 187 | 133.376 | 139.540 | -6.164 |
| FABBRICA DALLARA SRL | DMD | 3 | 220.667 | | |
| DFSK MOTOR CO LTD | DMD | 18 | 211.556 | | |
| DONKERVOORT AUTOMOBIELEN BV | DMD | 6 | 178.000 | | |
| DR AUTOMOBILES SRL | DMD | 995 | 156.198 | | |
| DR MOTOR COMPANY SRL | DMD | 446 | 151.471 | | |
| FERRARI SPA | D | 2 899 | 281.353 | 289.000 | -7.647 |

**Table A4.1 $CO_2$ emission performance of car manufacturers in 2018 (cont.)**

| MANUFACTURER | Pools and derogations | Number of registrations | Average $CO_2$ emissions | Specific emission target | Difference between average $CO_2$ emissions and specific emission target |
|---|---|---|---|---|---|
| FCA ITALY SPA | P3 | 710 420 | 119.853 | 120.352 | -0.499 |
| FORD INDIA PRIVATE LIMITED | P4 | 37 257 | 115.107 | 116.081 | -0.974 |
| FORD MOTOR COMPANY OF AUSTRALIA LIMITED | P4 | 1 | 228.000 | 170.426 | 57.574 |
| FORD MOTOR COMPANY | P4 | 25 430 | 164.667 | 139.677 | 24.990 |
| FORD-WERKE GMBH | P4 | 926 639 | 126.733 | 131.212 | -4.479 |
| GENERAL MOTORS HOLDINGS LLC | D | 2 728 | 257.338 | 267.000 | -9.662 |
| GREAT WALL MOTOR COMPANY LIMITED | DMD | 19 | 197.895 | | |
| HONDA AUTOMOBILE CHINA CO LTD | P5 | 6 | 124.333 | 125.541 | -1.208 |
| HONDA MOTOR CO LTD | P5 | 87 718 | 122.757 | 125.427 | -2.670 |
| HONDA AUTOMOBILE THAILAND CO LTD | P5 | 12 | 125.417 | 127.030 | -1.613 |
| HONDA TURKIYE AS | P5 | 497 | 130.599 | 128.854 | 1.745 |
| HONDA OF THE UK MANUFACTURING LTD | P5 | 42 967 | 134.341 | 135.040 | -0.699 |
| HYUNDAI MOTOR COMPANY | P6 | 145 300 | 114.279 | 130.470 | -16.191 |
| HYUNDAI ASSAN OTOMOTIV SANAYI VE TICARET AS | P6 | 161 170 | 116.553 | 114.846 | 1.707 |
| HYUNDAI MOTOR MANUFACTURING CZECH SRO | P6 | 218 567 | 136.500 | 131.852 | 4.648 |
| HYUNDAI MOTOR EUROPE GMBH | P6 | 2 205 | 144.088 | 134.981 | 9.107 |
| ITALDESIGN GIUGIARO SPA | DMD | 1 | 287.000 | | |
| JAGUAR LAND ROVER LIMITED | P12/ND | 227 361 | 155.414 | 178.025 | -22.611 |
| KIA MOTORS CORPORATION | P7 | 331 126 | 114.242 | 125.534 | -11.292 |
| KIA MOTORS SLOVAKIA SRO | P7 | 151 023 | 136.109 | 131.771 | 4.338 |
| KOENIGSEGG AUTOMOTIVE AB | DMD | 1 | 381.000 | | |
| KTM-SPORTMOTORCYCLE AG | DMD | 60 | 197.200 | | |
| LADA AUTOMOBILE GMBH | DMD | 953 | 215.534 | | |
| AUTOMOBILI LAMBORGHINI SPA | D | 1 420 | 336.404 | 315.000 | 21.404 |
| LONDON EV COMPANY | DMD | 33 | 28.545 | | |
| LOTUS CARS LIMITED | D | 687 | 207.897 | 225.000 | -17.103 |
| MAGYAR SUZUKI CORPORATION LTD | P11/ND | 85 918 | 124.668 | 123.114 | 1.554 |
| MAHINDRA & MAHINDRA LTD | D | 1 043 | 158.123 | 171.000 | -12.877 |
| MARUTI SUZUKI INDIA LTD | P11/ND | 14 025 | 104.549 | 123.114 | -18.565 |
| MASERATI SPA | D | 7 192 | 218.326 | 239.000 | -20.674 |
| MAZDA MOTOR CORPORATION | P13 | 224 027 | 134.325 | 127.493 | 6.832 |
| MCLAREN AUTOMOTIVE LIMITED | D | 986 | 251.133 | 265.000 | -13.867 |
| MERCEDES-AMG GMBH | P2 | 3 382 | 252.533 | 144.178 | 108.355 |
| MG MOTOR UK LIMITED | D | 8 974 | 133.461 | 146.000 | -12.539 |
| MICRO-VETT SRL | DMD | 1 | 0.000 | | |
| MITSUBISHI MOTORS CORPORATION MMC | P8 | 93 803 | 128.699 | 139.756 | -11.057 |
| MITSUBISHI MOTORS EUROPE BV MME | P8 | 1 823 | 134.607 | 135.209 | -0.602 |
| MITSUBISHI MOTORS THAILAND CO LTD MMTH | P8 | 34 410 | 99.856 | 108.864 | -9.008 |
| MORGAN TECHNOLOGIES LTD | DMD | 427 | 194.419 | | |
| NISSAN INTERNATIONAL SA | | 478 323 | 115.098 | 128.971 | -13.873 |
| NOBLE AUTOMOTIVE LTD | D | 3 | 336.333 | 338.000 | -1.667 |

**Table A4.1 $CO_2$ emission performance of car manufacturers in 2018 (cont.)**

| MANUFACTURER | Pools and derogations | Number of registrations | Average $CO_2$ emissions | Specific emission target | Difference between average $CO_2$ emissions and specific emission target |
|---|---|---|---|---|---|
| ADAM OPEL GMBH | P9 | 28 237 | 122.002 | 127.636 | -5.634 |
| OPEL AUTOMOBILE GMBH | P9 | 834 250 | 125.586 | 126.234 | -0.648 |
| PAGANI AUTOMOBILI SPA | DMD | 2 | 343.000 | | |
| PGO AUTOMOBILES | DMD | 9 | 169.000 | | |
| DR ING HCF PORSCHE AG | P14 | 63 874 | 181.861 | 151.160 | 30.701 |
| PSA AUTOMOBILES SA | P9 | 46 177 | 120.427 | 136.121 | -15.694 |
| RENAULT SAS | P10 | 1 247 559 | 110.494 | 126.419 | -15.925 |
| RENAULT TRUCKS | DMD | 96 | 182.188 | | |
| ROLLS-ROYCE MOTOR CARS LTD | P1 | 606 | 327.853 | 183.842 | 144.011 |
| SEAT SA | P14 | 436 731 | 117.468 | 124.569 | -7.101 |
| SECMA SAS | DMD | 43 | 133.233 | | |
| SKODA AUTO AS | P14 | 688 387 | 117.110 | 126.884 | -9.774 |
| SSANGYONG MOTOR COMPANY | ND | 14 372 | 164.017 | 167.573 | -3.556 |
| SUBARU CORPORATION | ND | 32 371 | 160.843 | 164.616 | -3.773 |
| SUZUKI MOTOR CORPORATION | P11/ND | 120 434 | 109.573 | 123.114 | -13.541 |
| SUZUKI MOTOR THAILAND CO LTD | P11/ND | 17 534 | 98.545 | 123.114 | -24.569 |
| TECNO MECCANICA IMOLA SPA | DMD | 2 | 0.000 | | |
| TESLA MOTORS LTD | | 19 017 | 0.000 | 172.939 | -172.939 |
| TOYOTA MOTOR EUROPE NV SA | P13 | 734 897 | 102.128 | 127.686 | -25.558 |
| VOLKSWAGEN AG | P14 | 1 666 765 | 119.790 | 130.806 | -11.016 |
| VOLVO CAR CORPORATION | | 288 764 | 132.233 | 146.765 | -14.532 |

**Note:** The number of registrations represents the number of vehicles having both a mass and an emission value.

'D' indicates that a derogation as a small-volume manufacturer has been granted through a Commission implementing decision.

'DMD' means that a de minimis derogation applies, i.e. it concerns a manufacturer which, together with all its connected undertakings, was responsible for fewer than 1 000 new registered vehicles in 2018 and had not been granted a derogation from the targets.

'ND' indicates that a derogation for niche manufacturers has been granted through a Commission implementing decision.

'P' indicates that the manufacturer is member of a pool.

**Table A4.2 $CO_2$ emission performance of light commercial vehicle manufacturers in 2018**

| MANUFACTURER | Pools and Derogations | Number of registrations | Average $CO_2$ | Specific emission target | Distance to target |
|---|---|---|---|---|---|
| ALFA ROMEO SPA | | 3 | 122.667 | 161.013 | -38.346 |
| ALKE SRL | DMD | 34 | 0.000 | 112.713 | -112.713 |
| JIANGSU AOXIN NEW ENERGY AUTOMOBILE CO LTD | DMD | 3 | 0.000 | 119.690 | -119.690 |
| AUDI AG | P8 | 1237 | 132.193 | 168.862 | -36.669 |
| AUDI SPORT GMBH | P8 | 4 | 192.000 | 158.130 | 33.870 |
| AUTOMOBILES CITROEN | P10 | 156785 | 132.161 | 163.131 | -30.970 |
| AUTOMOBILES PEUGEOT | P10 | 176718 | 134.975 | 166.591 | -31.616 |
| AVTOVAZ JSC | P7 | 326 | 216.890 | 130.110 | 86.780 |
| BEE BEE AUTOMOTIVE | DMD | 1 | 0.000 | 80.940 | -80.940 |
| BLUECAR SAS | DMD | 5 | 0.000 | 133.950 | -133.950 |
| BAYERISCHE MOTOREN WERKE AG | DMD | 142 | 161.000 | 190.512 | -29.512 |
| BMW M GMBH | DMD | 163 | 167.742 | 202.895 | -35.153 |
| FCA US LLC | P2 | 4 | 147.250 | 167.104 | -19.854 |
| CNG-TECHNIK GMBH | P3 | 5 | 141.800 | 170.164 | -28.364 |
| AUTOMOBILE DACIA SA | P7 | 30544 | 119.307 | 128.859 | -9.552 |
| DAIMLER AG | P1 | 152530 | 187.662 | 210.858 | -23.196 |
| DFSK MOTOR CO LTD | DMD | 505 | 182.531 | 127.856 | 54.675 |
| ESAGONO ENERGIA SRL | DMD | 23 | 0.000 | 122.762 | -122.762 |
| FCA ITALY SPA | P2 | 143455 | 149.882 | 167.143 | -17.261 |
| FORD MOTOR COMPANY OF AUSTRALIA LIMITED | P3 | 44561 | 216.090 | 222.512 | -6.422 |
| FORD MOTOR COMPANY | P3 | 308 | 208.519 | 214.978 | -6.459 |
| FORD-WERKE GMBH | P3 | 250171 | 161.564 | 195.058 | -33.494 |
| MITSUBISHI FUSO TRUCK & BUS CORPORATION | P1 | 564 | 243.333 | 205.022 | 38.311 |
| GENERAL MOTORS HOLDINGS LLC | P4 | 364 | 176.225 | 186.008 | -9.783 |
| GONOW AUTO CO LTD | DMD | 12 | 160.167 | 175.000 | -14.833 |
| GOUPIL INDUSTRIE SA | DMD | 477 | 0.000 | 112.115 | -112.115 |
| GREAT WALL MOTOR COMPANY LIMITED | DMD | 193 | 243.202 | 189.000 | 54.202 |
| HONDA MOTOR CO LTD | DMD | 13 | 133.154 | 144.602 | -11.448 |
| HYUNDAI MOTOR COMPANY | P9 | 2061 | 212.560 | 224.326 | -11.766 |
| HYUNDAI ASSAN OTOMOTIV SANAYI VE | P9 | 30 | 112.800 | 103.694 | 9.106 |
| HYUNDAI MOTOR MANUFACTURING CZECH SRO | P9 | 48 | 111.229 | 142.248 | -31.019 |
| ISUZU MOTORS LIMITED | | 12572 | 195.424 | 202.724 | -7.300 |
| IVECO SPA | | 20117 | 203.975 | 236.145 | -32.170 |
| JAGUAR LAND ROVER LIMITED | | 1610 | 188.3 | 227.007 | -38.707 |
| KIA MOTORS CORPORATION | P5 | 1076 | 122.808 | 147.239 | -24.431 |
| KIA MOTORS SLOVAKIA SRO | P5 | 316 | 122.801 | 140.712 | -17.911 |
| LADA AUTOMOBILE GMBH | DMD | 5 | 214.200 | 127.031 | 87.169 |
| MAGYAR SUZUKI CORPORATION LTD | DMD | 2 | 111.000 | 151.123 | -40.123 |
| MAHINDRA & MAHINDRA LTD | DMD | 206 | 207.782 | 187.336 | 20.446 |
| MAN TRUCK & BUS AG | P8 | 4999 | 200.974 | 216.105 | -15.131 |
| MAZDA MOTOR CORPORATION | DMD | 60 | 142.800 | 150.995 | -8.195 |

**Table A4.2 $CO_2$ emission performance of light commercial vehicle manufacturers in 2018 (cont.)**

| MANUFACTURER | Pools and Derogations | Number of registrations | Average $CO_2$ | Specific emission target | Distance to target |
|---|---|---|---|---|---|
| MFTBC | P1 | 103 | 238.379 | 240.914 | -2.535 |
| MITSUBISHI MOTORS CORPORATION MMC | P6/D | 423 | 176.934 | 190.000 | -13.066 |
| MITSUBISHI MOTORS EUROPE BV MME | P6/D | 2 | 167.500 | 190.000 | -22.500 |
| MITSUBISHI MOTORS THAILAND CO LTD MMTH | P6/D | 15645 | 187.475 | 190.000 | -2.525 |
| NISSAN INTERNATIONAL SA | | 50758 | 162.292 | 187.344 | -25.052 |
| ADAM OPEL GMBH | | 16896 | 142.775 | 151.125 | -8.350 |
| OPEL AUTOMOBILE GMBH | P10 | 63580 | 168.492 | 184.659 | -16.167 |
| PIAGGIO & C SPA | D | 3528 | 150.196 | 155.000 | -4.804 |
| DR ING HCF PORSCHE AG | P8 | 35 | 179.886 | 188.421 | -8.535 |
| PSA AUTOMOBILES SA | P10 | 8675 | 112.147 | 143.579 | -31.432 |
| RENAULT SAS | P7 | 232645 | 149.397 | 172.710 | -23.313 |
| RENAULT TRUCKS | | 8439 | 208.896 | 227.108 | -18.212 |
| ROMANITAL SRL | DMD | 56 | 155.000 | 127.830 | 27.170 |
| SAIC MAXUS AUTOMOTIVE CO LTD | DMD | 171 | 246.988 | 213.340 | 33.648 |
| SEAT SA | P8 | 172 | 107.256 | 120.823 | -13.567 |
| SKODA AUTO AS | P8 | 3924 | 112.210 | 128.062 | -15.852 |
| SSANGYONG MOTOR COMPANY | D | 1088 | 202.024 | 210.000 | -7.976 |
| STREETSCOOTER GMBH | DMD | 14 | 0.000 | 158.489 | -158.489 |
| SUBARU CORPORATION | DMD | 28 | 156.714 | 160.432 | -3.718 |
| SUZUKI MOTOR CORPORATION | DMD | 9 | 131.000 | 111.474 | 19.526 |
| TOYOTA MOTOR EUROPE NV SA | | 40369 | 166.188 | 189.642 | -23.454 |
| UAZ | DMD | 1 | 287.000 | 203.235 | 83.765 |
| UNIVERS VE HELEM | DMD | 10 | 0.000 | 109.491 | -109.491 |
| VOLKSWAGEN AG | P8 | 202567 | 164.161 | 188.448 | -24.287 |
| VOLVO CAR CORPORATION | DMD | 394 | 118.863 | 166.034 | -47.171 |

**Notes:** '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 2018.

'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.

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