How clean are Europe's cars?

An analysis of carmaker progress towards EU CO_2 targets in 2014

10th Edition

A report by TRANSPORT & ENVIRONMENT

Editeur responsible
Jos Dings, Director

This report was prepared by Malcolm Fergusson with the support of T&E's staff.
Cover image by Maggie Fearn.

T&E – European Federation for Transport and Environment AiSBL
Square de Meeûs, 18 | B-1050 Brussels | Belgium

www.transportenvironment.org

For more information, contact:

Greg Archer
Vehicles Programme Manager
Transport & Environment
greg.archer@transportenvironment.org
Tel: +32(0)490 400 447 / +44 (0)7970 371224

Summary

This is the 10th report T&E has published on carmakers' progress in reducing the CO_2 emissions of new cars. It is based on data from the official European Commission 'monitoring mechanism' on cars and CO_2[1] and is the first published examination of carmakers' progress in 2014.

Overall CO_2 emissions from new cars sold in 2014 averaged 123.4 grams per kilometre, a reduction of just 2.6% on 2013 – significantly below the average performance since regulations were proposed (3.6% reduction per year 2007-2014). Due to the ever widening gap between test results and real-world performance (due to carmakers exploiting flexibilities in the obsolete testing procedure), it is probable that little of the progress recorded delivered any real-world fuel economy improvement. It is therefore essential the new WLTP test is introduced from 2017 and is the basis for assessing compliance with the 95g/km target in 2020/21.

Based on the official figures, Peugeot-Citroën has become the lowest carbon carmaker (its average new car emitted 110g/km). Among major manufacturers Honda continues to produce the least fuel-efficient cars (133g/km). The most rapid progress in 2014 was made by Nissan, which reduced its emissions by a remarkable 12%. Exceptionally Ford and Hyundai increased their emissions in 2014 – a concerning development.

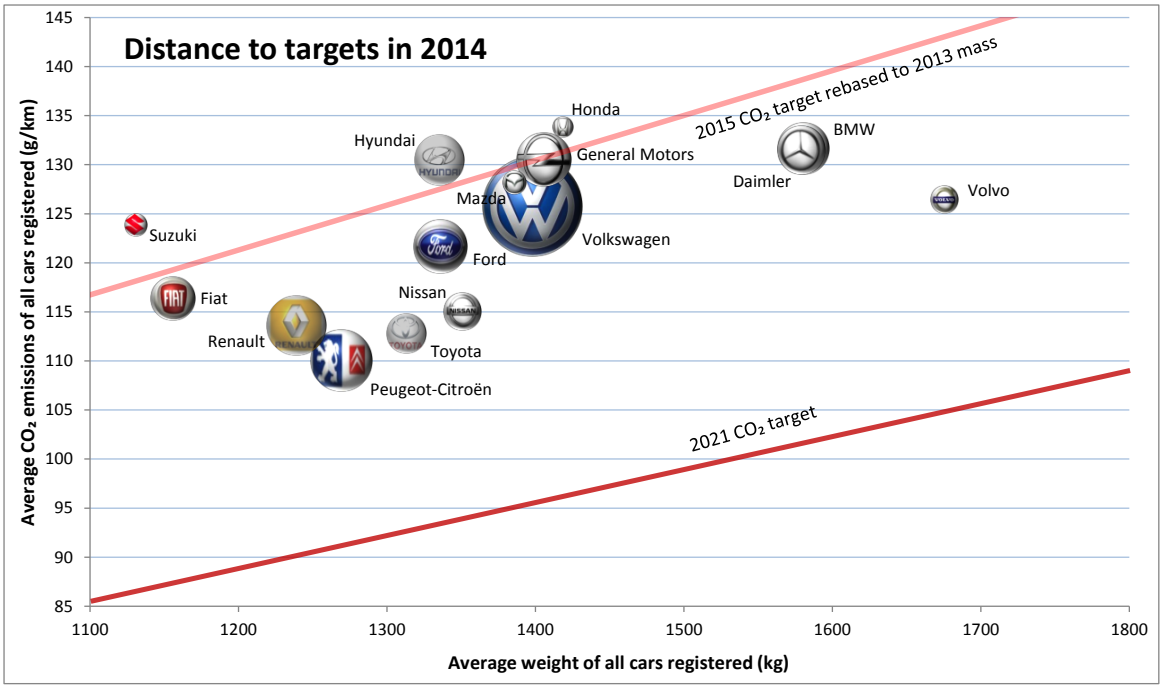
Overall, the 130g/km target for 2015 has already overachieved and just three companies (Honda, Suzuki and Hyundai) have still to meet this target. On average the 95g/km target is expected to be met by 2021 but performance varies widely between carmakers. Based upon past performance, the current projection is that four companies will achieve their targets early and a further three are broadly on schedule. However, seven companies need to accelerate progress in order to avoid fines.

Electric vehicle sales, defined as pure battery electric vehicles and plug-in hybrids, continue to grow strongly (67,000 sales in 2014) but still only represents 0.5% of the market. The Mitsubishi Outlander (a plug-in hybrid) was the top-selling model; Nissan Leaf the best-selling battery electric car. Several manufacturers remain entirely absent from the market including Ford and Fiat, highlighting the need for a future regulation to include a sub-target for supply of ultralow carbon vehicles to increase consumer choice and encourage the development of new business models such as electric car sharing. Supercredits (additional allowances for selling electric cars) only conferred a significant benefit on Mitsubishi and Nissan and these had already exceeded their 2015 targets without the additional credits.

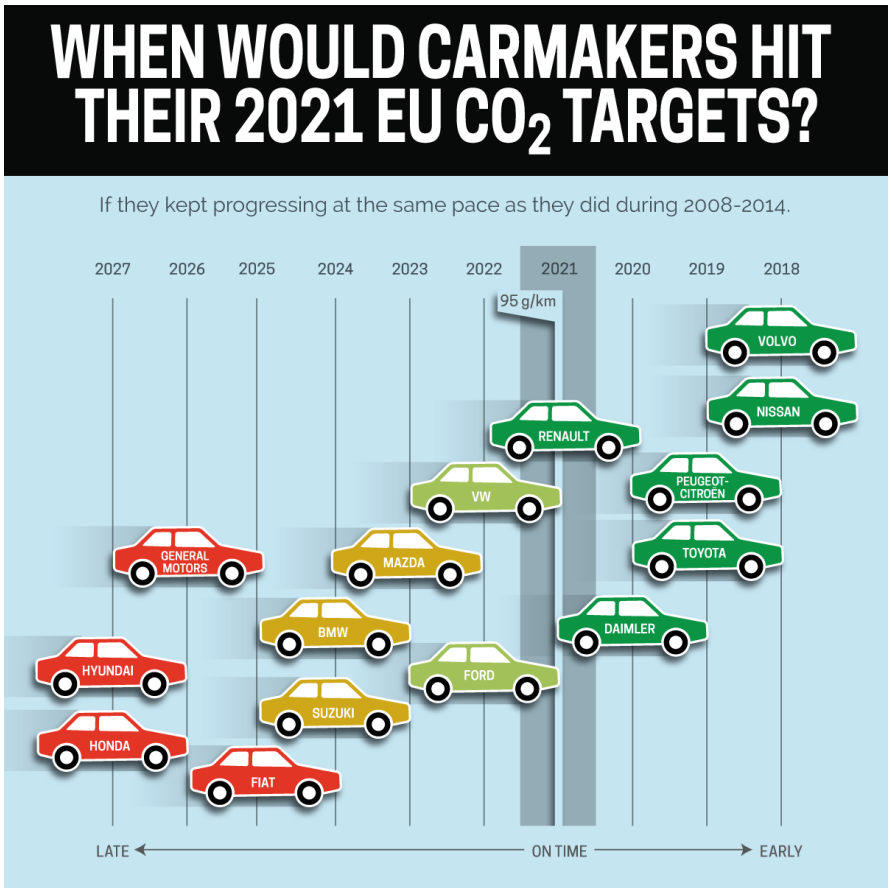
The overall progress highlights the value of car CO_2 regulations in driving the efficiency of the vehicle fleet. Stretching targets and long lead times are providing the incentive to significantly improve vehicle efficiency and reduce emissions. The European Commission therefore needs to propose a 2025 target based on the WLTP test. The announcement should be made in 2016 as part of the package of proposals on the 2030 effort sharing decision for the non-ETS emissions and it would significantly assist EU member states in reducing their emissions.

[1] http://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-8

Carmakers' progress to targets



Projected compliance with 2021 goal



Introduction

About this report

This is the 10th report T&E has published on carmakers' progress in reducing the CO_2 emissions and fuel consumption of their new cars. It shows the relative position of each manufacturer, the speed of their progress year-on-year, and how close they are to meeting their statutory targets for 2015 and 2021. It also includes analysis on electric vehicles. For this 10th edition we also examine progress over the last decade and look forward another 10 years.

T&E began this annual series of reports to highlight the failure of carmakers to deliver CO_2 reductions promised by a voluntary commitment agreed in 1998/9.[2] The report was instrumental in leading to the binding EU CO_2 Regulations of 2009 and the 2014 revision. The series of reports have tracked annual progress and have been extended to consider the effect of carmakers manipulating the obsolete testing system;[3] sales of electric cars;[4] and the way national taxation policies have influenced national progress.[5] This report includes a section on the growing sales of electric vehicles, which make an important and increasing contribution to the attainment of car CO_2 targets. Future parts of this report, to be published later in 2015, will update the gap analysis with real-world fuel economy and examine progress made by vans.

The cars and CO_2 legislation – how it works

Cars emit around 12% of the EU's CO_2 emissions. The 2009 Regulation (443/2009) and its recent update (333/2014) to improve new car CO_2 emissions are therefore crucial components of the EU's strategy to tackle climate change. The Regulations are designed to reduce the average CO_2 emissions from new cars to 130g/km by 2015 (approximately equivalent to 5.6 litres per 100 kilometres (l/100km) for petrol or 4.9 l/100km for diesel), around 18% below the average in 2007, and then to 95g/km (4.1 and 3.6 l/100km respectively) in 2021, or about 40% reduction from 2007.

Carmakers pool the emissions across their brands to produce a sales-weighted average emissions figure. Individual manufacturers have differentiated targets, with those making heavier and higher-emitting cars receiving a higher target. For example, if a manufacturer's cars by 2015 are 100kg heavier than the industry average, they are allowed a 4.57g/km higher CO_2 target (134.57 instead of 130g/km CO_2 on average). Conversely, if their cars are lighter than average they get a tougher target.

Enforcement is through a system of fines. For every g/km by which a manufacturer exceeds its company target, it has to pay a €95 fine per vehicle sold. However, the law also includes several flexibilities including:

- Up to 7g/km credits for 'eco-innovations', off-cycle credits for CO_2 reductions not reflected in the official test cycle, that can be exchanged for measured reductions on the test cycle;
- 'Supercredits' for very low-emission cars (including electric vehicles), which allow manufacturers to count each low emission vehicle (with emissions below 50g/km) more than once and therefore water down the overall CO_2 reductions based on fleet averages;
- Much lower penalties for missing the target by a few grams up until 2018. The penalties for the first, second and third g/km over the target are only €5, €15 and €25 per g/km respectively instead of the full penalty of €95.

[2] http://www.transportenvironment.org/publications/reducing-co2-emissions-new-cars-te-0501
[3] *Mind the Gap! Why official car fuel economy figures don't match up to reality*, T&E, March 2013 and updates
[4] http://www.transportenvironment.org/publications/electric-vehicles-2013-progress-report
[5] http://www.transportenvironment.org/publications/co2-emissions-new-cars-europe-country-ranking-2013

All these flexibilities together in practice mean that the target for 2015 is closer to 140g/km, and already had been met by 2012 on average and for most of the major manufacturers. Even in nominal terms, all the main European manufacturers have met their targets by now (2014).

The main changes and updates since agreed in the 2014 Regulation are:

- The 95g/km target for 2020 has been confirmed, but with a one year phase-in that effectively postpones the target to 2021;
- The 'slope of the curve' for the target line, i.e. the CO_2 credit for producing heavier cars, is reduced from 4.57g per 100kg, to 3.33g per 100kg. In relative terms the advantage of heavier over lighter cars remains the same, at 60% of the natural correlation between weight and CO_2;
- Supercredits, which were to be phased out by 2016, are now reintroduced for 2020 through to 2022, with a supercredit ratio of 2.0 in 2020 falling back to 1 in 2023. The aggregate level of supercredits for any one manufacturer is capped at 7.5g/km over the three years;
- The current test cycle is to be replaced by the World Light Duty Test Cycle (WLTC) "as soon as practicable", with suitable adjustments to the emissions targets if appropriate.

Methodology and data

The data presented in this report are based on sales and CO_2 information in the European Environment Agency (EEA) database that forms the basis of the official European Commission 'monitoring mechanism' on cars and CO_2.[6]

This database includes figures for all cars sold in the EU28 for the years 2010 to 2014 including weight, footprint, and CO_2 emissions. Only the volume car manufacturing groups (those that sold over 150,000 vehicles in the EU in 2012) are included in this study. Although sales volumes vary from year to year, we have maintained the same 15 manufacturers that were included in our previous reports in order to maintain consistency and useful time-series information.

Note on data quality

It is important to note that the database for 2014 contains preliminary data (provided by the administrations responsible for car registrations in each of the 28 member states), which are currently under review by the carmakers. The preliminary data are of significantly better quality than the data previously collected under the voluntary commitment and are improving each year.

For our analyses we restricted the calculations to points where data were present and reliable (e.g. excluding cars with zero weight from weight calculations). The results presented here for electric vehicle (EV) sales are calculated on a similar basis. The preliminary data are now of high quality, but there can be errors or omissions in specific batches of data. While for the total car sales figures this rarely has much impact, for EVs there are much fewer data points and sales vary enormously from one member state to another, so a single error or omission is more likely to influence the results significantly. Hence some numbers may change in the final analysis for individual models or manufacturers, but the overall conclusions and key findings of this chapter are not anticipated to change significantly as a result.

Also we have not accounted for the effect of special allowances such as supercredits in the main analysis but have addressed these separately.

[6] http://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-8

The EEA published a summary analysis of the provisional data earlier in the year. The EEA focuses on overall trends and data per member state. This report adds value to the EEA's report by focusing on the position of each of the main manufacturers, distance to future regulatory targets, the role of electric vehicles and the effect of supercredits.

Car sales and CO_2 in 2014

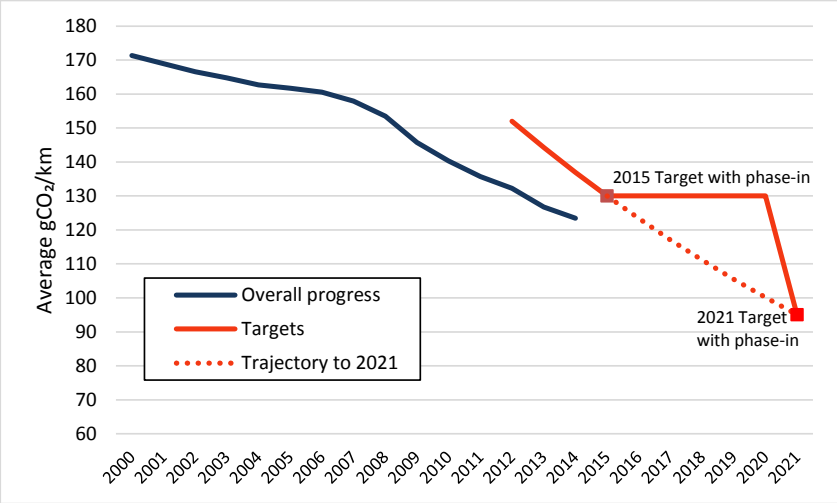
Overall developments in CO_2 emissions

In this chapter we present the progress of the industry as a whole in cutting average CO_2. Figure 1 below depicts historical progress of the industry and future targets[7] as set by the EU's regulation on CO_2 from cars.

The car industry as a whole reduced CO_2 emissions from 126.8g/km in 2013 to 123.4g/km in 2014. This is a rate of progress of 2.6%, less than the previous year that recorded progress of 4.1%. Overall progress over the 2007-2014 period was 3.6% per year, three times faster than the period of the voluntary agreement (1.2% per year) highlighting the value of regulation for driving innovation.

As a result of the more rapid progress in recent years, the 130g target for 2015 has already been overachieved across the new car fleet as a whole. The original legislation allowed for a phase-in of the target, whereby an increasing percentage of new car sales would be required to meet the target in the years 2012 to 2014, but as demonstrated in Figure 1, for most manufacturers the rate of progress has already rendered this provision irrelevant.

Figure 1: Progress of fleet average CO_2 emissions of new cars in the EU against regulatory targets



The 22% reduction in CO_2 emissions between 2007 (when the EU regulation was proposed) and 2014 – from 158 to 123g/km – should equate to a reduction in fuel consumption of around 1.35 litres for every 100 kilometres driven. Over the lifetime of a car – roughly 200,000 km – this should represents around 2,700 litres of fuel, which at today's prices should equate to about €3,600 in fuel savings for every car sold. The actual fuel saving is approximately half of this amount due to the widening gap between test and real-world emissions.[8]

[7] Note that the sloping red target lines indicating the phase-in of targets are purely indicative: for technical reasons, the impact of phase-ins cannot be accurately represented in a chart such as this.

[8] *Mind the Gap! Why official car fuel economy figures don't match up to reality*, T&E, March 2013 and updates

Progress and position of carmakers in 2014

This section presents two rankings of the 15 largest carmakers, based on performance in 2013 and 2014 for the lowest average CO_2 and the greatest reduction year on year.

From Table 1, the following conclusions can be drawn regarding the progress of the 15 largest carmakers in the EU in 2014:

- Peugeot-Citroën has taken the lead as the manufacturer with the lowest average emissions at 110g/km, but Toyota and Renault are still close behind.

- Daimler moved up to 13th after another year of significant improvement. BMW fell to 14th place, and Honda remains at the bottom of the ranking.

- Nissan appears to have achieved more than 12% improvement in a single year in 2014 – by far the largest gains by any major manufacturer in recent years, and the high-point of several years of substantial progress that have moved it into fourth place. Mazda and Volvo both registered further improvements from 2013, and PSA, Daimler and Toyota also performed well. Fiat again registered one of the smallest improvements in 2014.

- The Asian carmakers remain scattered throughout the table in terms of both average emissions and rate of improvement. Toyota remains by far the highest in the ranking and continued to make good progress in 2014. Mazda and Nissan are also making significant improvements now. In contrast, Honda is firmly set at the foot of the table.

- If the provisional data are correct, Ford and Hyundai are notable for actually going backwards in 2014 – something which has not happened to any major carmaker in recent years.

	2014 CO_2 Ranking		Registrations 2014	Average CO_2 2014	Average CO_2 2013	Improvement Ranking		2013-14 % change
↑	1	Peugeot-Citroën	1,360,773	110.1	115.7	1	Nissan	-12.1%
↑	2	Toyota	538,732	112.8	116.5	2	Peugeot-Citroën	-4.8%
↓	3	Renault	1,246,046	113.6	114.6	3	Mazda	-4.4%
↑	4	Nissan	469,203	115.0	130.9	4	Daimler	-3.9%
↓	5	Fiat	671,767	116.4	116.6	5	Volvo	-3.3%
↓	6	Ford	941,009	121.7	121.6	6	Toyota	-3.2%
↓	7	Suzuki	153,500	123.8	126.9	7	Honda	-2.8%
↓	8	Volkswagen	3,159,286	125.8	128.8	8	Suzuki	-2.4%
→	9	Volvo	231,915	126.5	130.8	9	Volkswagen	-2.3%
↑	10	Mazda	159,729	128.2	134.1	10	BMW	-2.2%
↓	11	Hyundai	756,435	130.5	130.0	11	General Motors	-1.7%
↓	12	General Motors	897,024	130.5	132.8	12	Renault	-0.9%
↑	13	Daimler	686,590	131.5	136.8	13	Fiat	-0.2%
↓	14	BMW	798,543	131.7	134.6	14	Ford	0.1%
→	15	Honda	126,106	133.9	137.8	15	Hyundai	0.4%
		All Manufacturers	12,546,165	123.4	126.8		All Manufacturers	-2.6%

Progress at Nissan

As noted, Nissan achieved a remarkable degree of progress in 2014, with a 12.1% reduction from nearly 131g/km to 115g/km in a single year. This level of progress is not completely unprecedented, but very unusual in a major manufacturer.

Table 2: Nissan model sales in 2013 and 2014

Model	Ave g/km 2013	Ave g/km 2014	Sales in 2014
Juke	131.2	122.2	96,998
Micra	114.8	114.7	59,718
Qashqai	135.9	115.4	199,538
Note	121.2	104.1	64,679
Other models	132.8	114.3	48,282
All models	**130.9**	**115.0**	**469,215**

Table 2 presents a more detailed breakdown of Nissan sales. It illustrates that the Qashqai, by far their biggest seller, underwent a major upgrade for 2014, and this included a range of substantially more efficient engines – on average more than 20g/km better than the previous ones. This alone accounts for much of the improvement, but there were also significant improvements in the Juke, Note and some other models. Overall these changes made a far larger contribution to the reduction than sales of the zero-emission Leaf, which with sales around 10,000 are still too few to have a great impact on the company average. The Nissan improvement is therefore largely the result of improved efficiency not a change in sales. How much of the improvement will be delivered on the road remains to be assessed.

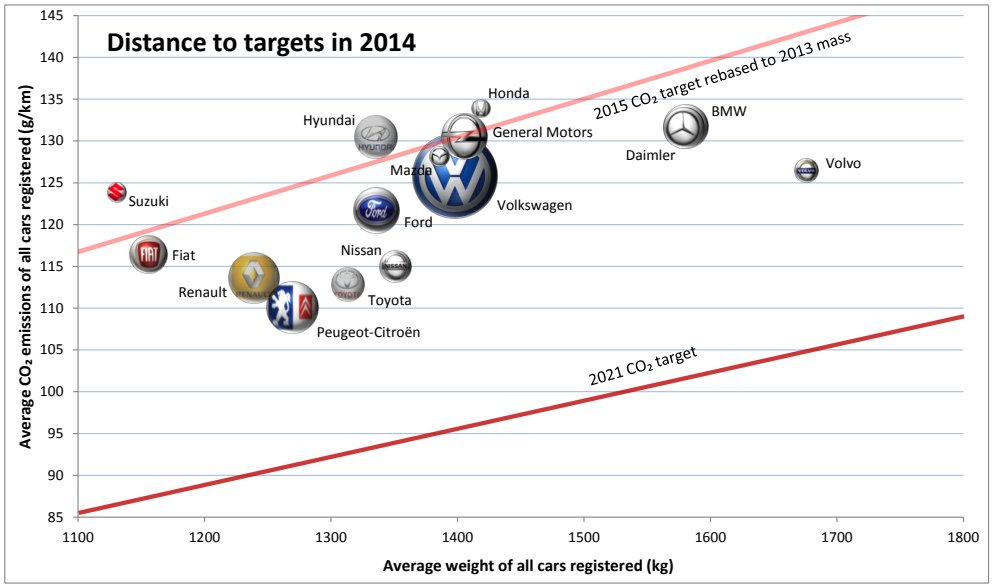
Distance to targets by manufacturer

2015, 130g/km target

This section assesses how far carmakers are away from their individual regulatory targets for 2015 and 2021.

The regulations on cars and CO_2 are designed to achieve a 130g/km average figure by 2015, and 95g/km by 2021. However, this average target does not apply to individual carmakers directly, and carmaker targets are determined on the basis of the weight of the vehicles they produce compared with the average weight of the vehicles the entire industry will produce over a specified period. The carmakers with the lowest emissions are not therefore necessarily the closest to their targets, as Figure 2 below illustrates.

Figure 2: Sales-average CO_2 emissions by manufacturer against targets



Note: size of bubble reflects the size of the CO_2 'footprint' of the total cars sold

For example, Suzuki, despite having average emissions of only 124g/km in 2014 (around the average for 2014, and already below the 2015 overall target), still has to reduce its emissions by nearly 10g/km further because it makes relatively light cars, and still has the furthest to go in both relative and absolute terms to reach its own 2015 target. In contrast, all the major European and American manufacturers, plus Toyota and Nissan, are all now safely over the 2015 target line. Most strikingly, Volvo is making excellent progress in spite of having slightly higher average emissions than Suzuki, simply because its cars are so much heavier (nearly half as heavy again, in fact).

As Figure 2 shows, only the Asian manufacturers Suzuki, Hyundai and Honda have yet to meet their 2015 targets, with one year left to go. Given the significant remaining gap to be closed it is likely that some or all of these manufacturers will be required to pay penalties – although the penalty level is significantly lower in 2015.

As most manufacturers have now reached or surpassed their 2015 targets, they are already focussing on the 2021 target. For some this is a long way off, but as Figure 2 also shows, several such as PSA, Toyota, Nissan and Volvo are already well on the way to this target as well.

95g/km, 2021 target

The 2014 Regulation set a 95g/km overall target for the year 2021, using a weight-based target with a slope of 0.0333. This section briefly considers how, on the basis of recent progress and current positions, the major manufacturers seem likely to fare in meeting this target. Note that this analysis is quite conservative in that it does not take account of either supercredits or eco-innovation flexibilities that may be available.

In Table 3 below, progress in terms of percentage improvement per annum is shown both for the period to date of commitments for the 2015 target, and for the previous period when voluntary undertakings applied. These rates of progress are then compared with what is now required to meet the 2021 target from 2015 onwards. Note that, as above, individual targets are calculated on the assumption of no further change in average vehicle mass per manufacturer between now and 2021.

Table 3: Comparison of past and future progress to meet the 2021 target

		Progress as % year on year		
	Ranking	2000-2008	2008-2014	2014-2021
1	Peugeot-Citroën	1.9%	3.8%	2.7%
2	Volvo	n/a	5.1%	2.7%
3	Toyota	1.8%	4.3%	2.8%
4	Nissan	1.0%	5.5%	2.9%
5	Renault	1.5%	3.8%	3.3%
6	Daimler	1.5%	4.7%	3.7%
7	BMW	3.6%	2.6%	3.7%
8	Ford	2.4%	3.6%	3.7%
9	Volkswagen	0.6%	3.8%	3.9%
10	Fiat	1.6%	2.8%	4.0%
11	Mazda	2.1%	3.5%	4.2%
12	General Motors	0.8%	2.6%	4.4%
13	Honda	3.0%	2.3%	4.6%
14	Hyundai	2.8%	2.2%	4.7%
15	Suzuki	1.3%	3.8%	5.0%
	All Manufacturers	1.4%	3.6%	3.7%

This calculation illustrates that, across future EU car sales as a whole, the rate of progress required from now until 2021 is only slightly greater (at 3.7%pa) than the rate that has actually been achieved over the past seven years (3.6%pa). The following conclusions can be drawn from the table:

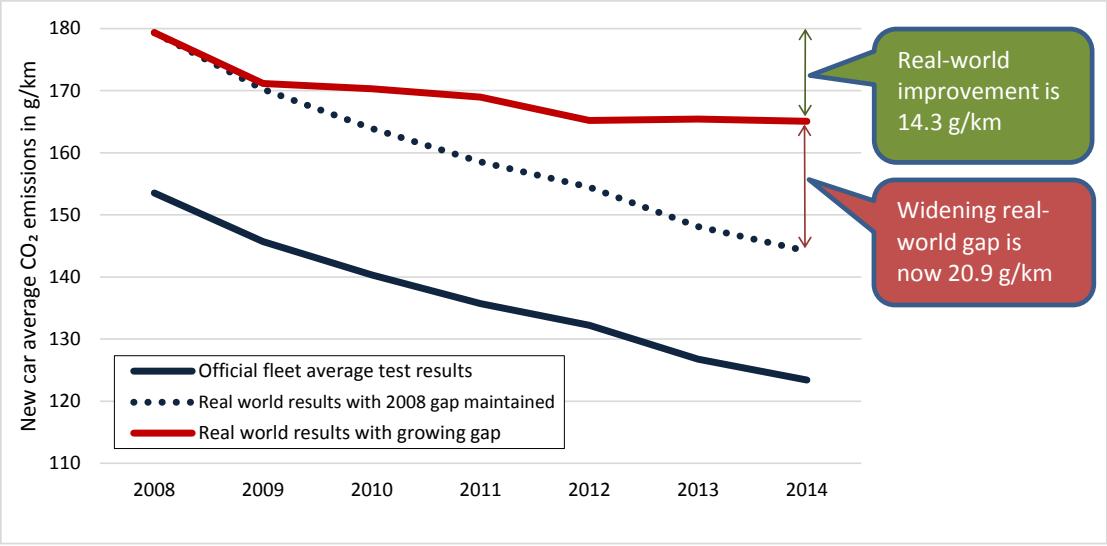
- PSA, Volvo, Toyota, Nissan, Renault and Daimler on the basis of past progress are ahead of schedule to achieve the 95g/km target before 2021. These companies now need a lower annual rate of future improvement than achieved in past performance.
- An additional three carmakers are on track to achieve the 2021 target: BMW, Ford and Volkswagen.
- Six carmakers need to significantly accelerate progress to achieve the 2021 targets: Fiat, Mazda, GM, Honda, Hyundai and Suzuki. As discussed above, the final three have yet to meet their 2015 targets and are at risk of incurring penalties based upon sales in 2015.

The table illustrates that the relative performance of different manufacturers has varied enormously over time. Most European manufacturers are well placed to deliver their targets; Asian and US companies (GM) have the greatest progress to make. The performance of Fiat (now joined to the Chrysler group) is a notable exception to the pattern.

Mind the Gap

While the official figures on new car CO_2 emissions show steady reduction, progress in reducing real-world emissions is considerably slower. This is because there is a considerable and growing gap between these test results and real-world performance of new cars on the road. Figure 3 below shows the scale of the problem such that if the gap between these official figures and real-world results had remained as it was in 2008 there would have been a corresponding improvement from over 180g/km to below 145g/km in real-world emissions as well (the dotted blue line in Figure 3).

Figure 3: Official CO_2 test results versus the real-world outcomes for private motorists – provisional calculation for 2014



Source: derived from ICCT, 2014

Our initial analysis suggests virtually none of the improvement measured in tests has been translated into real-world savings since 2012. This is because carmakers are increasingly exploiting weaknesses in procedures for the current NEDC test and deploying technology on vehicles that perform well in tests but offers much less real-world benefit.

ICCT has not yet published its analysis of the 2014 'gap', but we anticipate that in 2014 the gap between test and real world performance will have continued to increase. In the chart above we have assumed that the gap will continue to grow in 2014 at the average rate from the previous four years (just above 3% further widening of the gap). If this is so then more than half of the gains claimed to have been made since 2008 have been purely theoretical ones, with only 14.3g/km of real progress on the roads set against nearly 21g/km of 'hot air' caused by carmakers' manipulation of the test procedures. If this is correct then real-world improvements since 2012 have been negligible: in the worst case we may actually be going backwards. T&E will publish updated and more detailed analysis on this issue later in 2015.

To address the failings of the current test, the new WLTP test procedure must be introduced in 2017 and apply to every new registration by the beginning of 2020. This will enable the WLTP test results to be back-translated into NEDC equivalent values to assess compliance against the 95g/km targets in 2020 and 2021. Failing to introduce WLTP from 2017 significantly undermines the current regulation.

Electric vehicle sales in 2014

Electric vehicles and car CO_2

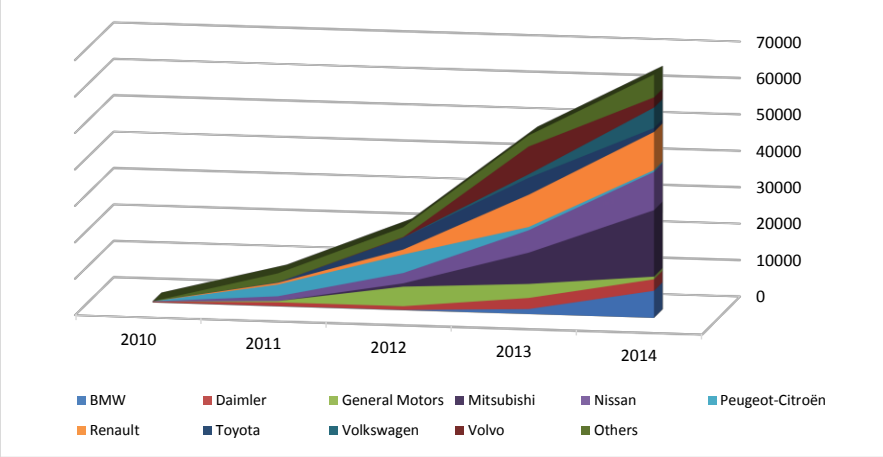
Most of the improvements in average new car CO_2 emissions reported in the previous chapter have been brought about by making technical improvements to conventional internal combustion-engined (ICE) vehicles, which still account for by far the largest share of all new vehicles sold. The shift to alternative low-carbon powertrains, particularly electric cars, is a growing trend that will deliver an increasing contribution to reducing carbon emissions.

ICEs have developed their current market dominance and technological sophistication over a period of more than a hundred years. The shift to electric vehicles will not happen overnight. Public acceptance, range of product offerings, and technical capabilities of alternatives are all improving but will take time to develop a significant market share.

Overview of electric vehicle sales in Europe in 2014

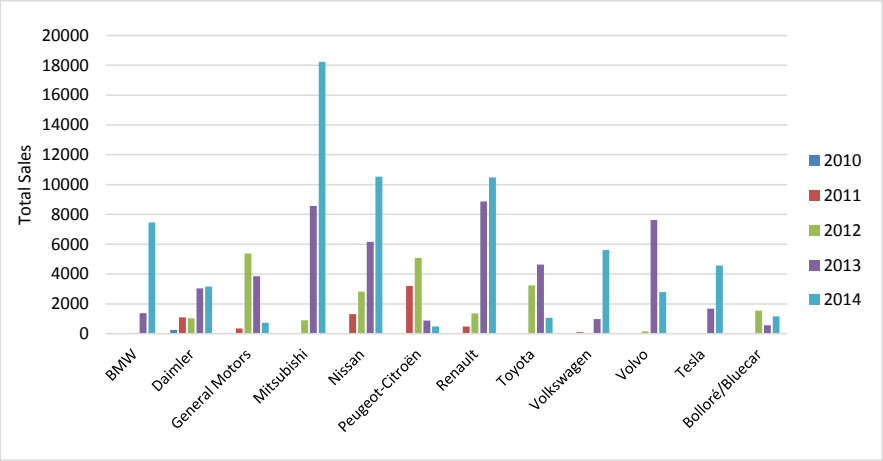
EV sales across Europe continued to grow strongly in 2014 – although the rate of growth was less than in previous years. Annual sales for the EU reached approximately 67,000 in 2014, up from just 700 in 2010, as shown in Figure 4 below. As against this, sales of this scale still made up only just over 0.5% of all the new cars sold – around one car in every 200 sold and still a tiny proportion of the total car market.

Figure 4: EV sales by manufacturer 2010-2014



This growth is partly the result of more major car companies offering EV models in the market in 2013 and 2014, although not all have prospered and some appear to be holding back as they shift their focus to fuel cells. This is illustrated in Figure 5 below.

Figure 5: Yearly progress in EV sales by manufacturers



Several major manufacturers – most notably Ford and Fiat – are absent from the chart, reflecting the fact that they have as yet made no serious inroads into the EV market. It is not clear what ultra low-carbon technology Fiat in particular plans to offer. Conversely, two brands specialising only in EVs (Tesla and Bluecar) feature in the chart as they have registered significant sales on a par with some of the mainstream manufacturers.

Daimler, Nissan and Renault have all made steady progress after an early entry into the field, with Nissan and Renault both exceeding 10,000 EVs sold in 2014 for the first time. Even more striking, however, is the continuing success of Mitsubishi, which passed 18,000 to become the clear leader in sales in 2014, having only entered the EV market in 2012. BMW and VW are also notable for a substantial showing in 2014.

In contrast General Motors has faltered as sales of its Volt/Ampera models have suffered from growing competition in the plug-in hybrid market. PSA and Toyota are also notable for a marked fall in sales after a promising start in earlier years, reflecting the fact that they are no longer making EV technology a priority.

Top-selling EV models in 2014

Most brands or companies currently promote only one major EV model at any given time, and so their profile in the EV market is defined by the success or failure of that model. This is in sharp contrast to the ICE fleet which comprises hundreds of different models, most of these offering numerous variants in terms of engine type and power, on-board equipment, level of trim, etc. For example, the Volkswagen brand alone offers more than 20 ICE models, at least a dozen of which are household names. A key requirement of increasing electric vehicle sales is to diversify the range of products offered by carmakers, driven, for example, by a 2025 car CO_2 regulation.

Table 4 below shows the sales of individual models, from which a number of important developments are apparent.

Table 4: Top-selling EVs in 2014

Manufacturer	Model	Type	Segment	Sales 2013 (approx)	Sales 2014 (approx)	New Entrant
Mitsubishi	Outlander	PHEV	SUV	8200	18030	
Nissan	Leaf	BEV	Compact	6160	10400	
Renault	Zoe	BEV	Supermini	8500	10380	
BMW	i3	BEV/PHEV	Compact	1050	5850	
Tesla	Model S	BEV	Sports	1660	4570	
Daimler	ForTwo Electric Drive	BEV	Citycar	2960	2950	
Volvo	V60 Plug-in	PHEV	Large hatch	7580	2730	
Volkswagen	Golf	BEV/PHEV	Midsize hatch	-	2370	✓
Volkswagen	eUP	BEV	Citycar	950	2330	
BMW	i8	PHEV	Sports	-	1600	✓
CeComp (Bolloré)	Bluecar	BEV	Small hatch	570	1170	
Toyota	Prius Plug-in	PHEV	Midsize hatch	4620	1070	
Audi	A3 E-Tron	PHEV	Midsize hatch	-	910	✓
General Motors	Volt/Ampera	PHEV	Midsize hatch	3860	730	
PSA	C Zero/iOn	BEV	Small hatch	880	490	

The standout success, with over 18,000 sold in 2014, is the Mitsubishi Outlander SUV. This was a new entrant in 2013, but has achieved unprecedented demand in the company car sector in particular, as in some countries it attracts very generous benefit-in-kind tax rates over and above purchase subsidies and low or zero annual circulation tax rates.

The perennial Nissan Leaf returns to second place, while third is another newcomer from 2013, the Renault Zoe. Both of these also reached more than 10,000 sales in 2014 – a level not achieved by any EV in previous years.

Beyond this, the BMW i3, Tesla Model S and VW eUP all increased their sales substantially. In contrast, some other big names (including the Prius Plug-in and Volt/Ampera) have lost ground significantly.

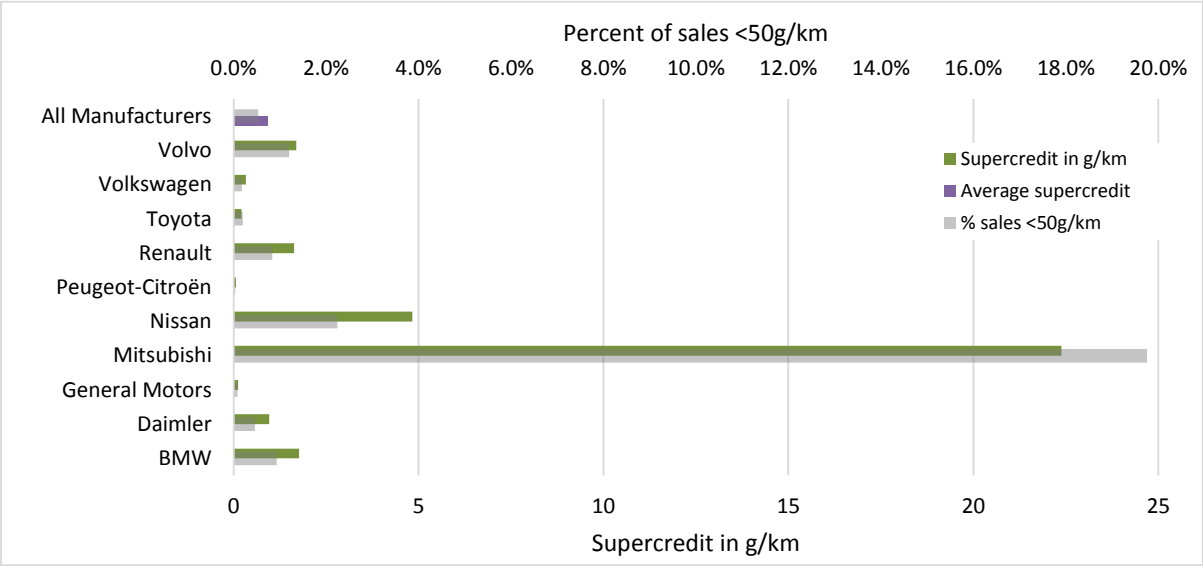
The number of new entrants into the electric vehicle market was very limited in 2014 compared to 2013. The Volkswagen group added electric versions of two of its most popular and iconic models – the VW Golf and Audi A3. The BMW i8 became a potential rival to Tesla in the high-end sports car market. Others, such as the electric Ford Focus and Electric Kia Soul are now on the market, but launched too late to have much impact on 2014 sales.

Supercredits for EVs in the EU market

Under the Cars and CO_2 Regulation, 2014 is the third year in which 'supercredits' are available for low-carbon cars. Under this provision, each new car sold with tested CO_2 emissions of 50g/km or below is now counted 2.5 times towards each manufacturer's average for that year (down from 3.5 times in 2013). That is, 1.5 'imaginary' EVs are added to the company total for each actual EV sold. Supercredits are designed to incentivise sales of cars with the lowest carbon emissions, but in doing so they also effectively weaken the targets for companies that sell EVs and allow them to make less improvement in their conventional vehicles sold.

Initially this provision had only quite limited impact on company performances; in 2012, only GM, Nissan and Toyota had EVs accounting for more than 0.5% of sales, and only for Nissan did the credit generated exceed 2g/km of improvement on its total sales-weighted average CO_2 emissions. However, as the figure below illustrates, recent developments in the market have drastically transformed this picture for 2014.

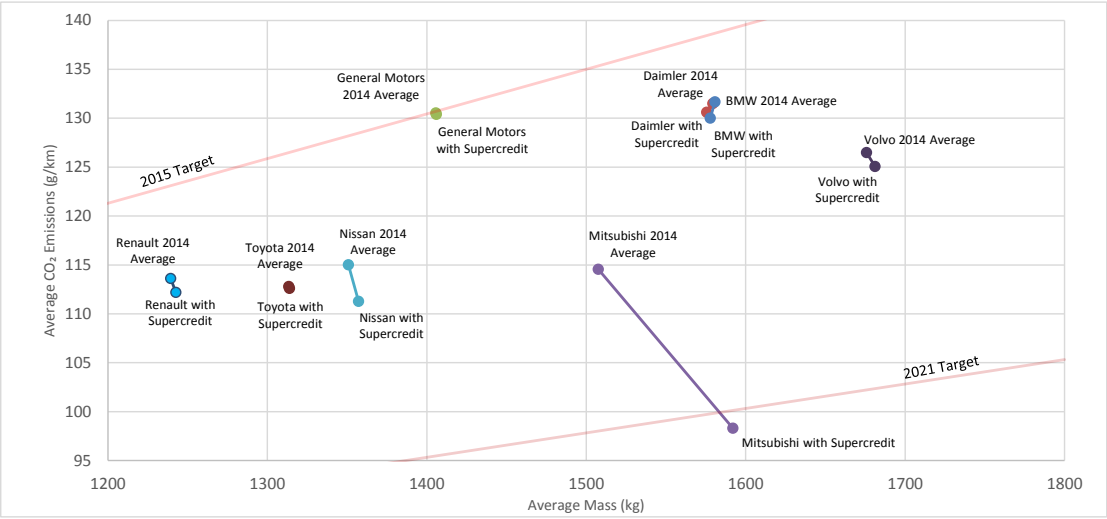
Figure 6: Supercredits for EVs in 2014



The most striking feature is the huge supercredit benefit again gained by Mitsubishi, reflecting the fact that the Outlander accounted for nearly 20% of its total sales in 2014. As a result it receives a supercredit of over 22g/km – up from last year in spite of the reduced multiplier in use. Nissan also increased its supercredit slightly to 4.8g/km as a result of a growing EV market share – as did BMW with EVs now accounting for nearly 1% of its sales. Most others received fewer supercredits in 2014, owing to the lower credit multiplier or reduced EV sales, or both.

As noted above, all the major manufacturers represented in this chart have in any case exceeded their 2015 targets already without recourse to supercredits, so these have become rather irrelevant for the time being at least. However, Figure 7 below illustrates the impact of supercredits on companies' distance to target.

Figure 7: Supercredits in 2014 and their impact on targets



As the chart illustrates, most companies gain a smaller benefit from supercredits in 2014 owing to the reduced multiplier, and in the cases of GM and Toyota this is magnified by a marked reduction in EV sales as a percentage of the total. As against this, BMW now appears as a significant beneficiary of supercredits for the first time.

By far the most striking feature of this chart, however, is the performance of Mitsubishi. Already it has outstripped all the major manufacturers analysed in this report by virtue of its low average CO_2 and high proportion of EVs, and is well on its way to the 2021 target. With its added supercredits for 2014, however, it has already comfortably exceeded its 2021 target, seven years ahead of schedule. In practice supercredits are capped at 7.5g/km over three years (2021-3) so Mitsubishi could not claim such a benefit to comply with its target.

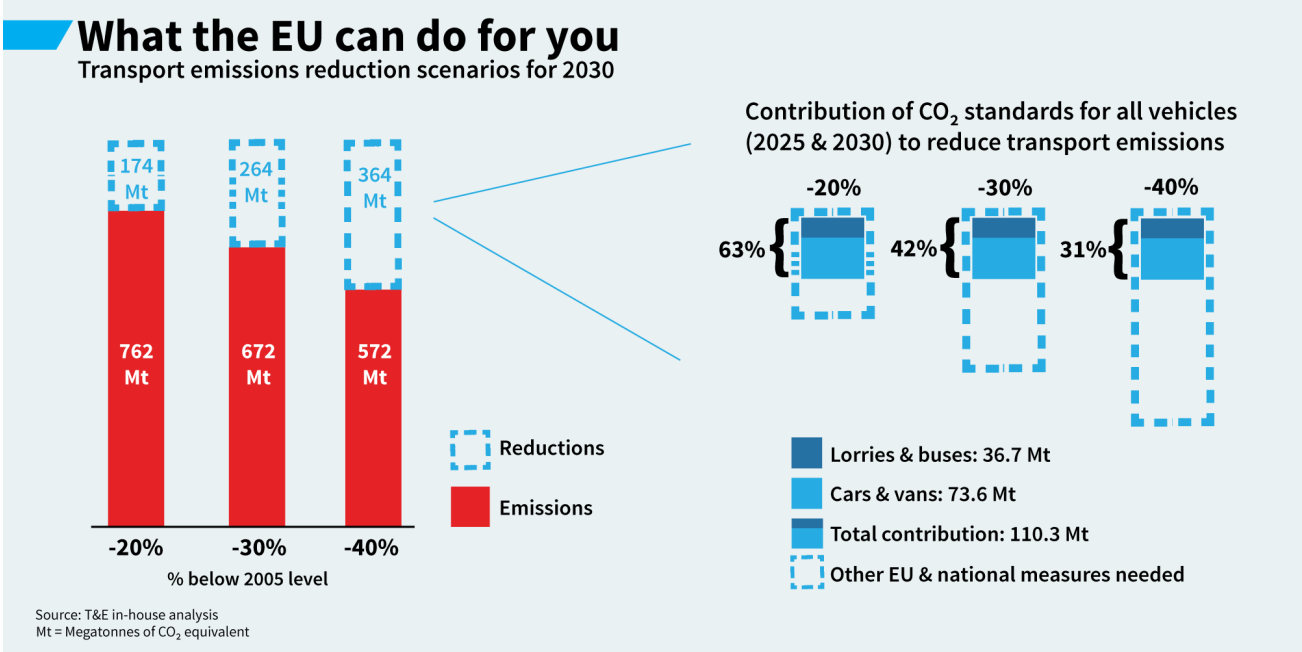
10 years of reporting car CO2 emissions

This is the 10th edition of this report and it is therefore instructive to look back on trends in car CO_2 emissions and the profile of car sales from the 10-year perspective. A number of key trends stand out:

- On average, the size of new cars in terms of their average footprint appears to have changed remarkably little in recent years, in spite of the diversification of car types available, for example, into supercompact cars and large SUVs.
- What was once termed by the car industry as an 'autonomous weight increase' in new cars sold – that is, an assumption based on past experience that new cars would get heavier year by year – appears to have ended. That is, the average weight of cars no longer appears to increase year on year. On the other hand, the trend has not yet been reversed because the important opportunities for lightweighting as a means of cutting CO_2 emissions have been largely ignored. This is because the current structure of the targets rewards higher weights and reduces the benefits of using lightweight materials and techniques as a means to cut CO_2.
- We may now have witnessed 'peak diesel' as a share of new car sales. Diesels rose from only 31% of all sales in 2000 to more than 55% in 2011, but since then they have fallen back slightly. The CO_2 advantage of diesel engines over petrol is also being reduced as more small petrol engines are being introduced.
- After years of waiting, electric vehicles have finally begun to see commercial success over the last few years and some popular brands have emerged. As yet they still make up a tiny proportion of new sales, and can still only succeed with the benefit of significant subsidies and other incentives.
- As Table 3 illustrates, carmakers' progress can vary greatly from year to year. For example, BMW made excellent early progress but has since fallen back, while Nissan and Volvo have made remarkable progress in recent years although with very different approaches. Some of the Asian manufacturers are frontrunners in cutting CO_2, but others are still at the back of the field. Fiat has improved rather little in spite of a very advantageous position at the start of the period.
- There is no doubt at all that the Car CO_2 Regulation has been the principal driver of reduced CO_2 emissions from cars – the rate of improvement has tripled relative to the voluntary agreement that preceded it. Also it has shown that improving car technology is by far the best and most cost-effective way of cutting emissions: the 'Integrated Approach' proposed by the car industry failed entirely, and experience has shown the severe limitations of relying on biofuels to cut emissions.
- The official car-testing regime (the NEDC) was already obsolete when T&E began this series of reports 10 years ago, and it continues to drift further from real-world conditions. There was always a gap between test results and reality, but growing regulatory pressure has tempted some carmakers in particular to exploit the weaknesses of the test procedure. As a result, the gap is growing steadily to the point where only about half of the supposed reductions is translated into better fuel economy on the road, and it is no longer certain that improving official figures have been accompanied by any real improvement in new cars sold in the past two years.

2025 the next step for car CO_2 regulations

In the EU, transport CO2 emissions have risen by 29% since 1990 with 12% of the total EU emissions now arising from the exhaust of cars.[9] Emissions reductions in other sectors are being largely offset by the increase in those from transport. As part of its 2030 Climate and Energy Package the EU has set a target to reduce emissions in the non-ETS sectors (principally building, agriculture and transport) by 30%. Each sector will need to cut emissions and with aviation and shipping emissions excluded, technology to improve vehicle efficiency and shift away from fossil fuels must deliver a large part of the contribution from transport.



The required non-ETS emissions reduction is 936Mt from 2005 to 2030. Realistically transport will need to be make a sizable contribution to achieving this reduction, a 20-40% reduction in the sector contributing 174-364Mt. T&E analysis[10] shows 2025 and 2030 CO_2 standards for cars, vans trucks and buses can contribute a sizable 110 Mt to the required emissions reductions.

A holistic approach to tackling transport emissions is needed, including policies to reduce journeys; switching modes to low and no-carbon solutions; and decarbonising fuels. But CO_2 standards for cars, vans, trucks and buses will do the "heavy lifting" in terms of emissions reductions – without this member states will need to take draconian action to require less car use.

Standards have multiple benefits. On average about 2.5 Kg of CO_2 is produced from burning 1 litre of fuel in vehicles. Low carbon, fuel-efficient vehicles therefore save drivers and businesses money through using less fuel. A 2025 target of 70g/km for cars would save a new car buyer €350 pa and payback the costs of technology within three years.[11] It would also increase spending on other goods and services boosting national economies and employment. Around 660,000 to 1.1 million jobs are expected to be created. The EU would also import less oil, strengthening balance of payments and reducing the flow of Euros to Russia improving regional security. Fuel-efficient cars are a quadruple-win for drivers, the economy, energy security and the environment.

[9] http://ec.europa.eu/clima/policies/transport/vehicles/cars/index_en.htm
[10] http://www.transportenvironment.org/what-we-do/cars-and-co2/publications
[11] Assumes direct manufacturing costs of €700; an uplift for indirect costs of 1.24; 20,000km pa from a new car; €1.35/l; a real work uplift of 1.31

A range of cost-effective technologies to improve the efficiency of conventional vehicles to well below the 95g/km are available as illustrated. But new technologies will not be further developed and deployed on cars without a policy incentive since future fuel savings are heavily discounted by new car buyers that tend to prioritise performance over efficiency in making car purchase choices. 2025 EU-wide CO_2 standards are therefore needed to continue to drive technology into the market and ensure European companies remain at the cutting edge in developing fuel-efficient technologies. To 2025, there will also be a progressive shift away from fossils fuels to electrical propulsion (both plug-in hybrid and battery electric vehicles) for an increasing proportion of journeys. CO_2 standards can help stimulate this shift.

There are five good reasons for the European Commission to continue its pattern of five-year targets and propose a 2025 goal.

1. **Because stretching, realistic targets with long lead times are the optimal approach**. They give suppliers investment security and carmakers adequate time to deploy the technologies in regular model cycles.
2. **Because 2025 targets are needed to make a material contribution to 2030 climate goals.** Standards only apply to new cars so their impact requires several years of fleet turnover to have a significant effect. T&E has proposed declining annual targets are introduced from 2022 to 2025 with a system of banking and borrowing credits to provide flexibility for manufacturers.
3. **Because the stringency of the 95g target has been effectively halved by an obsolete testing system.** This report highlights only half the measured improvement in emissions and fuel consumption has been delivered on the road. This has created a huge benefit for carmakers who in practice have only needed to deploy half the anticipated technology on vehicles to achieve their targets. The new WLTP test will replace the current discredited system, hopefully from 2017, but requires company targets to be revised to account for the new test. In doing so the Commission has made a commitment to ensuring "comparative stringency" which means most of the current "flexibilities" in the test exploited by carmakers to unfairly lower test results are being allowed for in the target translation exercise. In practice this means the WLTP-based targets include an allowance for the current manipulation of the NEDC test. Setting an ambitious 2025 target will lead to the on-road fuel economy anticipated when the 2020, 95g/km target was originally agreed in 2009. Delaying setting a target until 2030 means the ongoing abuse of the testing system will effectively continue for another 15 years despite the introduction of WLTP.
4. **Because the EU is falling behind in developing advanced technology**. In the decade 2000-10 EU companies generated half the number of automotive patents in advanced hybrid, electric and fuel cells technologies of their Japanese and Korean competitors. Instead European carmakers have focused on diesel technology that is a niche product in every other major automotive market. Standards will drive the development and deployment of advanced low-carbon technologies in demand globally and help to ensure European carmakers remain globally competitive and not overly focused on diesel solutions.
5. **Because there is too much uncertainty about 2030**. Forecasting future technologies, their costs and take-up in 15 years' time is highly speculative. Notably sales of electric vehicles are likely to accelerate significantly during the decade 2020-30 as new battery technologies emerge offering longer ranges and lower costs. Carmakers calls to jump to a 2030 target are simply designed to delay progress.

10 key conclusions

The following 10 key conclusions are drawn from the report:

1. Overall CO_2 emissions from new cars sold in 2014 were 123.4g/km, a reduction of 2.6% – significantly less than the average for the period 2007-2014 of 3.6% per year.
2. Peugeot-Citroën has become the manufacturer with the lowest average emissions at 110g/km; Honda has the highest emissions (133g/km).
3. The most rapid progress in 2014 was made by Nissan, which reduced its emissions by a remarkable 12%. Once the effect of supercredits would be included, this reduction would be even greater.
4. Ford and Hyundai actually increased their emissions in 2014.
5. The 130g/km target for 2015 has already overachieved across the new car fleet as a whole. Just three companies (Honda, Suzuki and Hyundai) have still to meet this target and look unlikely to do so next year and are therefore at serious risk of incurring fines.
6. On average the 95g/km target is expected to be met by 2021 but this masks widely differing performances between carmakers. Based upon past performance:
    a. Five companies will achieve their targets early: Nissan and Volvo (2018); Peugeot-Citroen and Toyota (2019); and Daimler (2020)
    b. Three further companies are broadly on schedule: Renault (2021); VW and Ford (2022)
    c. Seven companies will miss their target unless they accelerate progress to reduce emissions: Mazda (2023); BMW and Suzuki (2024); Fiat (2025); GM (2026); Honda and Hyundai (2027).
7. Provisional analysis suggests none of the progress recorded in official figures delivered a real-world fuel economy improvement due to manipulation of tests. This will be confirmed in a subsequent report.
8. Electric vehicle sales continue to grow strongly up to 67,000 vehicles but still only represent 0.5% of the total annual sales, however, and progress was not as strong in 2014 as in 2013. Mitsubishi with the plug-in hybrid Outlander was the top-selling manufacturer of electric cars. Several manufacturers remain entirely absent from the market including Ford and Fiat.
9. Supercredits only confer a significant benefit on Mitsubishi and Nissan and these had already exceeded their 2015 targets without the additional credits.
10. The European Commission needs to propose a 2025 target in 2016 as part of the package of proposals on the 2030 effort sharing decision for the non-ETS emissions.