HOW CLEAN ARE EUROPE'S CARS?

An analysis of carmaker progress towards EU CO_2 targets in 2012

TRANSPORT & ENVIRONMENT

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Editeur responsable
Jos Dings, Director

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

http://www.transportenvironment.org

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Contents

Summary

This report

This report is the eighth annual report T&E has published on the performance of major car manufacturers in reducing the CO_2 emissions and improving the fuel efficiency of cars. The report examines progress in 2012 towards meeting the 2015 (130gCO_2/km) and 2020 (95g CO_2/km) targets of average emissions of new cars sold in these years. The report also examines:

- The growth in sales of electric cars, from which we derive the impact of so-called 'supercredits'; allowances in the regulations which permit multiple counting of these sales
- The extent to which progress measured in official tests is being replicated by fuel efficiency improvements on the road
- Average new car emissions in different Member States and the effectiveness of different vehicle taxation policies in encouraging the purchase of lower carbon cars
- Average emissions of new vans.

For petrol and diesel vehicles CO_2 emissions are directly related to the fuel consumption. Lower carbon vehicles therefore also use less fuel and are cheaper to run. Whilst this report presents CO_2 emissions the results are equivalent to the fuel efficiency of vehicles. The 16% reduction in CO_2 emissions measured in tests between 2007 (when the EU regulation was proposed) and 2012 should equate to a reduction in fuel consumption of around 1 litre for every 100 kilometres driven. Over the lifetime of a car (ca 200,000km) this represents around 2,000 litres of fuel, which at today's prices equates to nearly €3,000 in fuel savings for every car sold. The actual fuel saving is estimated to be approximately half this amount due to the widening gap between test results and performance of vehicles on the road.[1]

Main findings

The report highlights a growing disparity between the performance of different carmakers and Member States illustrating marked differences in the effectiveness of strategies and policies being pursued to reduce CO_2 emissions and improve fuel efficiency of cars. The data shows both premium and mainstream carmakers are on track to achieve their 2020 targets without requiring supercredits (recently confirmed by Europe's biggest carmaker, Volkswagen[2]). The report also shows it is possible for companies to achieve good progress in reducing emissions in both official tests AND on the road – but that some companies are excessively relying on using flexibilities in testing procedures to achieve artificially low test results.

At the time of writing, legislation for 2020 targets has been agreed between the EU's three legislative institutions.[3] But in an unprecedented move, the German government, encouraged in particular by BMW, has blocked formal adoption of the

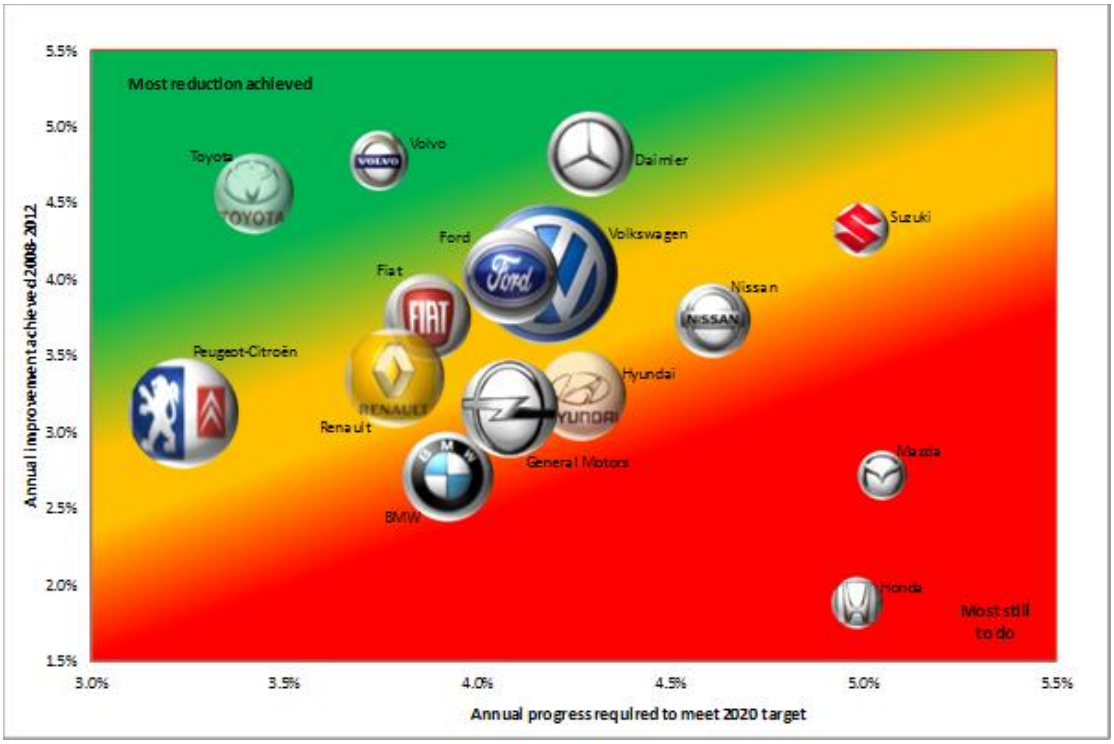
[1] *Mind the Gap! Why official car fuel economy figures don't match up to reality*, T&E, March 2013, Brussels

[2] https://www.volkswagen-media-services.com/medias_publish/ms/content/en/pressemitteilungen/2013/03/04/volkswagen_group_to.standard.gid-oeffentlichkeit.html

[3] The European Commission, European Parliament and the Council of Ministers reached agreement on details of the regulation in June 2013.

deal in Council by preventing a vote. The deal confirms the 95g/km average target but Germany is seeking much more generous allowances for selling electric cars (supercredits). They would effectively weaken the target by allowing ultra-low emission cars to be counted multiple times.

Overall the required rate of progress to 2020 is slightly greater (4.1%pa) than the rate that has already been achieved over the past five years (3.6%pa). However, these figures (and the analysis presented in this report) do not include the effect of flexibilities (such as supercredits) that effectively provide free grams. Carmakers are therefore even closer to achieving targets than the data suggests. The clear conclusion is that the 2020 target is achievable for makers of all types and sizes of cars with appropriate planning and most are on track. The graph below illustrates recent past performance and compares it to the annual rate of progress required to 2020.



The graph above shows that Toyota, Volvo and Daimler appear to be well on track, while most of the other major manufacturers (PSA, Renault, Fiat, Ford and Volkswagen) need to accelerate their reductions only a little to meet the 2020 target. Only BMW, General Motors and most of the far eastern manufacturers need to do substantially more.

2012 progress in cutting CO_2 emissions

In 2012, the car industry reduced CO_2 emissions by 3.4g/km, to 132.4g/km, an annual rate of progress of 2.5%, slightly down on the previous year (3.3%). This was primarily because a number of countries with below-average CO_2 experienced a fall in sales in 2012, while only Germany and the UK (both above average) showed significant sales growth. Had sales in each country remained at 2011 levels, the rate

of improvement would have been in line with previous years. Other notable findings are that:

- The annual rate of improvement 2007-2012 was 3.5% per year, compared to just 1.2% per year before the regulation was introduced, clearly demonstrating the value and effectiveness of law
- Fiat continues to produce cars with the lowest average emissions at 118g/km, but Toyota, Peugeot-Citroën and Renault have narrowed the gap as Fiat made relatively little progress in 2012
- Daimler produces the highest emission vehicles but also achieved the biggest improvement in 2012 (6.2%)
- Fiat, Suzuki and GM registered the least improvement in 2012, all below 1%
- Six of Europe's seven largest carmakers by sales achieved improvements in the range 2-6% 2012 (the exception being Fiat).

Analysis of the progress of carmakers towards their 2015 targets shows that most are heading for very significant over-compliance as forecast in previous reports. T&E has consistently argued this target was lax and this is now, regrettably, being demonstrated. Specifically:

- The industry as a whole is now less than 2% away from hitting the 2015 target, last year it still had a 4% gap to close
- Toyota, Volvo and Renault all achieved their 2015 targets in 2012. PSA had earlier achieved its target in 2011 and is now 5.6% below the required level
- Seven carmakers are projected to meet their 2015 target in 2013: Fiat, BWM, General Motors, Ford, VW and Hyundai
- Only four carmakers need to improve by more than 5% over the next four years to meet the 2015 goals. Mazda (2017) and Honda (2018) need to significantly accelerate their progress in reducing emissions to achieve their respective targets by 2015 and avoid penalties.

Sales of electric cars and supercredits

Sales of both battery electric and plug-in hybrid cars (emitting less than 50gCO_2/km) increased rapidly in 2012 to around 23,000, from only a few hundred in 2010. However this level of sales only represents less than 0.6% of all new cars sold. In 2012, supercredits were awarded for selling ultra-low carbon cars with each new car sold being counted 3.5 times towards the manufacturer's average for that year. This accountancy trick effectively exaggerates the real performance of carmakers.

Overall supercredits awarded in 2012 reduce measured emissions by about 0.6g/km. For General Motors, Nissan, PSA, and Toyota supercredits would lower measured emissions by about 1g/km, and for Nissan by more than 2g/km despite sales of less than 0.7% of vehicles. If the current rapid upward trajectory in sales continues, we anticipate substantially more supercredit weakening in 2013, as the multiplier remains at 3.5.

The 2012 data illustrates the risk of unlimited supercredits and high multipliers. The agreement reached between the European Institutions capped supercredits in 2020 at 2.5g/km/pa per manufacturer and set the 2020 multiplier at 2. Deviation from this position, as advocated by Germany and BMW, could significantly weaken the 95g/km 2020 target.

Real world improvements in fuel efficiency

Earlier in 2013, T&E published a report highlighting the growing gap between the CO_2 emissions measured in official test results and those achieved by most drivers on the road.[4] The growing disparity results primarily from: the outdated test that carmakers can manipulate to achieve lower results; some new technologies giving much lower results in the test than on the road; and, ignoring energy consumed by electrical and electronic equipment and air conditioning. In this report we used data from the largest database of real-world driving emissions[5] to measure how much actual improvement has been achieved on the road and not just in tests. The results show that since 2006:

- Only five companies have achieved real-world emissions reductions of more than 10% (Toyota, Fiat, Ford, PSA and Volkswagen)
- Two companies have achieved barely more than 5% real-world improvement (Daimler and General Motors)
- Whilst BMW achieved the greatest percentage reduction in emissions measured in tests (22%) the 'real' improvement on the road is less than half this.

The data illustrates that it is possible for companies to make significant progress both in tests *and* in the real-world. Many companies that have made good progress towards meeting their targets have largely done so legitimately without resorting to excessively using testing flexibilities – most notably Toyota, PSA and Renault. It is important that loopholes in the testing procedure are eliminated to ensure the benefits of achieving the 2020 target in terms of CO_2 and fuel savings are fully realised.

Vans

Two years after the CO_2 legislation for cars was agreed, the EU extended it to light commercial vehicles, commonly known as vans. There are two targets: 175g/km by 2017; and, 147g/km for 2020. Confirmation of the 2020 target is currently being prevented by the cars delay but the target is expected to be unchanged and supercredits to be phased out.

2012 is the first year there has been a comprehensive database of new van CO_2 emissions. Overall, the average CO_2 of vans sold in 2012 was 180g/km, just 3% below the 2017 target. Fiat and Iveco have achieved their targets 5 years early and all others are within 10%. This confirms T&E's previous assertion[6] that the target is so unambitious as to be pointless. The 2020 target is only moderately tougher. Iveco only requires a 9% improvement in the next 8 years. All other companies must improve at between 2.3 - 3.5% pa, much slower than what is required for cars.

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

[5] *From laboratory to road: a comparison of official and 'real-world' fuel consumption and CO_2 values for cars in Europe and the United States*, ICCT, May 2013

[6] http://www.transportenvironment.org/press/vans-become-more-fuel-efficient-not-till-after-2020

The effectiveness of national policies to encourage the purchase of lower carbon cars

Substantial differences in the rate of progress of companies are mirrored by Member States, principally because of differences in the ways cars are taxed. While some countries have made conspicuous efforts to improve the fuel economy of their new cars, others have done very little to support the aims of the cars and CO_2 legislation.

In 2012, the top three performing countries all achieved annual emissions reduction of new cars of more than 5% (Greece, Denmark and the Netherlands). In contrast Belgium and Hungary achieved the dubious distinction of increasing average CO_2 emissions in 2012. Notably low emission cars are also bought in Portugal and France. All countries with low average emissions have purchase taxes or vehicle circulation taxes that are steeply differentiated by CO_2.

Germany is by far the worst performer of the 'old' EU15. Germany and the small number of other countries still calling for a weaker CO_2 limit in 2020 are notable in that they have amongst the highest average emissions, well above the EU average: Czech Republic (18^{th} of 27 countries), Slovakia (19^{th}), Germany (20^{th}) and Hungary (24^{th}). All these countries have made relatively little progress, largely owing to a lack of incentives for fuel efficiency in their tax systems.

Introduction

This report is the eighth annual progress report T&E has published on how far Europe's major car manufacturers have succeeded in reducing the CO_2 emissions and fuel consumption of their new cars.[7] 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 2020.

T&E began this series of annual reports to bring public attention to the progress of carmakers on delivering CO_2 reductions based on voluntary commitments agreed by the industry in 1998/9. The EU CO_2 Regulation of 2009 now requires that progress by carmaker be officially published by the European Environment Agency (EEA). The EEA has already published provisional results for 2012 and this report is based on these. The EEA will produce a final analysis in the autumn, but T&E will continue to publish its own reports as these contain analysis that goes beyond what the EEA is required to publish, for example producing rankings of the performance of different manufacturers and Member States.

In this year's report, we also include a detailed analysis of each manufacturer's progress in improving fuel economy in the 'real world' compared to official test results. A significant part of the reduction in official CO_2 figures is being achieved by exploiting weaknesses in the test procedure instead of by taking technical measures to improve the efficiency of their cars on the road. For a few manufacturers, a large part of the progress that they reported on paper turns out to be illusory.

As 2012 is also the year in which 'supercredits' (explained below) are awarded for the first time to the cars with the lowest CO_2 emissions, this report also includes an analysis of developments in sales of these cars.

7

2006: http://www.transportenvironment.org/publications/reducing-co2-emissions-new-cars-study-major-car-manufacturers-progress-2006
2007: http://www.transportenvironment.org/publications/how-clean-are-europes-cars-2007-edition
2008: http://www.transportenvironment.org/publications/how-clean-are-europes-cars-2008-edition
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2012: http://www.transportenvironment.org/publications/how-clean-are-europes-cars-2012-edition

The cars and CO_2 legislation – how it works

The 2009 Regulation

The 2009 Regulation (443/2009) is a crucial component of the European Union's strategy to reduce greenhouse gas emissions. The law is designed to reduce the average CO_2 emissions from new cars to 130g/km by 2015 (approximately 5.3 litres per 100 kilometres (ℓ/100km), about 18% below the average in 2007.

The target is an average for all cars sold by a given manufacturer in a given year. Individual manufacturers are given differentiated targets, with those making larger cars receiving higher targets (less stringent in absolute terms). Individual manufacturers' targets are derived from a formula based on the average weight of the cars they sell in the target year. 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. Manufacturers can also apply to combine their targets with other manufacturers, in order to average their emissions over a larger pool of vehicles.

Enforcement is through a system of fines. For every g/km a manufacturer exceeds its company target, it has to pay a €95 fine per vehicle sold. However, the law also includes several flexibilities and loopholes 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, which allow manufacturers to count each low emission vehicle (with emissions below 50g/km) as more than one car and hence 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 €95.

All these loopholes 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.

Changes in the new Regulation for 2020

The 2009 law adds an indicative 95g/km target for 2020 and requires that the 'modalities' and 'aspects of implementation' should be reviewed prior to adoption of new legislation. At the time of writing, these revised arrangements were agreed by all three EU lawmaking bodies (European Commission, Irish Presidency on behalf of the Council of Member States and European Parliament), but are being blocked from formal adoption by Germany, which has prevented the issue being voted upon by Council.

The main changes now agreed for the new Regulation are:

- The 95g/km target for 2020 has been confirmed
- It flattens the 'slope of the curve' i.e. the CO_2 credit for producing heavier cars, 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, and the required reduction from 2015 levels is 27% for all carmakers[8]

- It re-introduces so-called 'supercredits' which were to be phased out by 2016. Supercredits permit counting of ultra-low carbon vehicles (with emissions below 50g/km) more than once towards the fleet average. The new law proposes a supercredit ratio of 2.0 in 2020 falling to 1.0 in 2023. The aggregate level of supercredits for any one manufacturer is capped at 2.5g/km in any year. The German government hoped for a more generous settlement in this area in particular
- The current test cycle is to be replaced by the worldwide harmonised light-duty test procedures (WLTP) "as soon as practicable", with suitable adjustments to the emissions targets if appropriate.

[8] For further explanation: http://www.theicct.org/blogs/staff/detailing-eu2020-co2emissionregs-cars

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.[9]

This database includes figures for all cars sold in the EU27 for the years 2010 to 2012 including weight, footprint, and CO_2 emissions. Only the volume car manufacturing groups (those that sold over 150,000 vehicles in the EU27 in 2012) were included in this study. These were the same 15 manufacturers that were included in our last report.

Note on data quality

It is important to note that the database for 2012 contains preliminary data (provided by the administrations responsible for car registrations in each of the 27 Member States), which are currently under review by the carmakers.

The preliminary data are of significantly better quality than the data collected under the voluntary commitment and are improving each year. Data quality is still slightly uneven as collection methods vary from country to country, but continues to improve significantly. Footprint data in particular are much improved, although there are still some missing or implausible values.

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). Also we have not accounted for the effect of special allowances such as supercredits in the main analysis but addressed these separately. Some numbers may change slightly as a result of the ongoing review being undertaken by carmakers and the EEA but no changes to the conclusions or key findings are anticipated.

The EEA also analysed the provisional raw data and reported on them earlier this year.[10] 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 manufacturers, distance to future regulatory targets, effect of supercedits and further analysis including the impact of Member State actions.

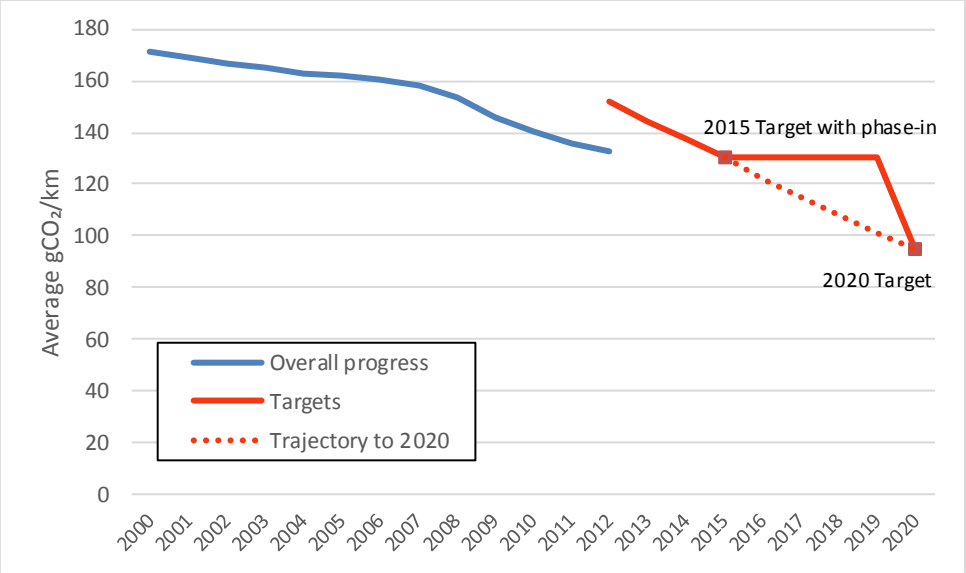
[9] http://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-4

[10] Monitoring the CO_2 emissions from new passenger cars in the EU: summary of data for 2012, April 2013, http://www.eea.europa.eu/publications/monitoring-co2-emissions-from-new-cars

Overall developments in CO_2 emissions

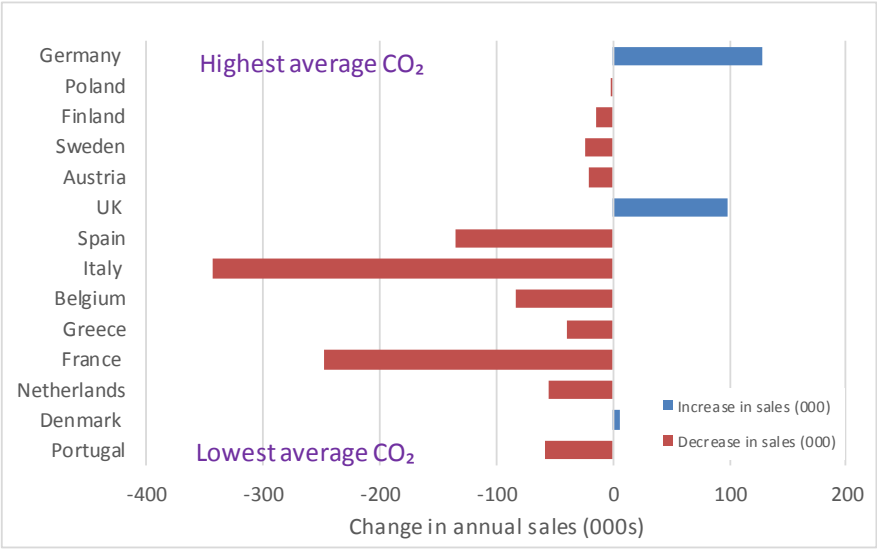
In this chapter we present the progress of the industry as a whole in cutting CO_2. Figure 1 below depicts historical progress of the industry and future targets as set by the EU's regulation on CO_2 from cars.

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



The car industry as a whole reduced CO_2 emissions from 135.7g/km in 2011 to 132.4g/km in 2012. This is a rate of progress of 2.5%, slightly down on the previous year at 3.3%. Overall progress over the 2007-2012 period was 3.5% per year, three times faster than before the legislation when it was only 1.2% per year. This highlights the benefits of the regulatory approach.

Figure 2: Changing annual car sales in Member States



As Figure 2 illustrates, sales of cars fell in 2012 in most of the major markets, and in particular in those characterised by lower-than-average CO_2 from new cars purchased. In contrast, it was primarily Germany and the UK that enjoyed growing sales, and these are both markets wherein the cars sold typically have emissions above the EU average. If each country had delivered its average CO_2 performance for 2012, but with sales maintained at 2011 levels, the weighted average for the whole EU would have been approximately 1g/km less than it actually was, and the improvement year on year would have risen to 3.2% — in line with the annual gains of previous years. It thus seems clear that this change in the distribution of sales was a major contributor to the slowdown in the improvement in CO_2 emissions in 2012, but that the underlying rate of technological progress is unabated.

As a result of the more rapid progress in recent years, the 130g target for 2015 has almost been reached already across the 2012 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.

The 16% reduction in CO_2 emissions between 2007 (when the EU regulation was proposed) and 2011 – from 158 to 132g/km – should equate to a reduction in fuel consumption of around 1 litre for every 100 kilometres driven. Over the lifetime of a car – roughly 200,000 km – this should represents around 2,000 litres of fuel, which at today's prices should equate to nearly €3,000 in fuel savings for every car sold. The actual fuel saving is approximately half this amount due to the widening gap between test and real-world emissions.[11]

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

Progress and position of carmakers in 2012

This section presents two rankings of the 15 largest carmakers, based on performance in 2011 and 2012 for the lowest average CO_2 and the greatest reduction year on year.

Table 1: Ranking of fleet-average CO_2 emissions of each carmaker and 2012 progress

Rank	2012 CO_2 Ranking	Registrations 2012	Average CO_2 2012	Average CO_2 2011	Improvement Ranking	2011-12 % change
1	Fiat	689,334	118.4	119.2	1 Daimler	-6.2%
2	Toyota	518,441	122.1	126.5	2 Volvo	-6.1%
3	Peugeot-Citroën	1,423,820	122.4	127.1	3 Renault	-5.0%
4	Renault	1,028,443	124.7	131.3	4 BMW	-4.5%
5	Ford	919,482	129.0	131.9	5 Peugeot-Citroën	-3.7%
6	Suzuki	151,933	130.7	131.5	6 Toyota	-3.5%
7	Hyundai	746,482	131.0	134.2	7 Mazda	-3.3%
8	Volkswagen	2,950,074	134.6	137.3	8 Nissan	-3.0%
9	General Motors	983,608	134.6	135.4	9 Hyundai	-2.4%
10	Nissan	420,999	138.3	142.5	10 Ford	-2.2%
11	BMW	764,107	138.3	144.8	11 Volkswagen	-2.0%
12	Mazda	113,568	141.8	146.6	12 Honda	-1.5%
13	Volvo	204,429	142.2	151.5	13 Fiat	-0.7%
14	Honda	132,378	142.7	144.9	14 Suzuki	-0.6%
15	Daimler	635,598	143.6	153.1	15 General Motors	-0.6%
	All Manufacturers	11,992,879	132.4	135.7	All Manufacturers	-2.5%

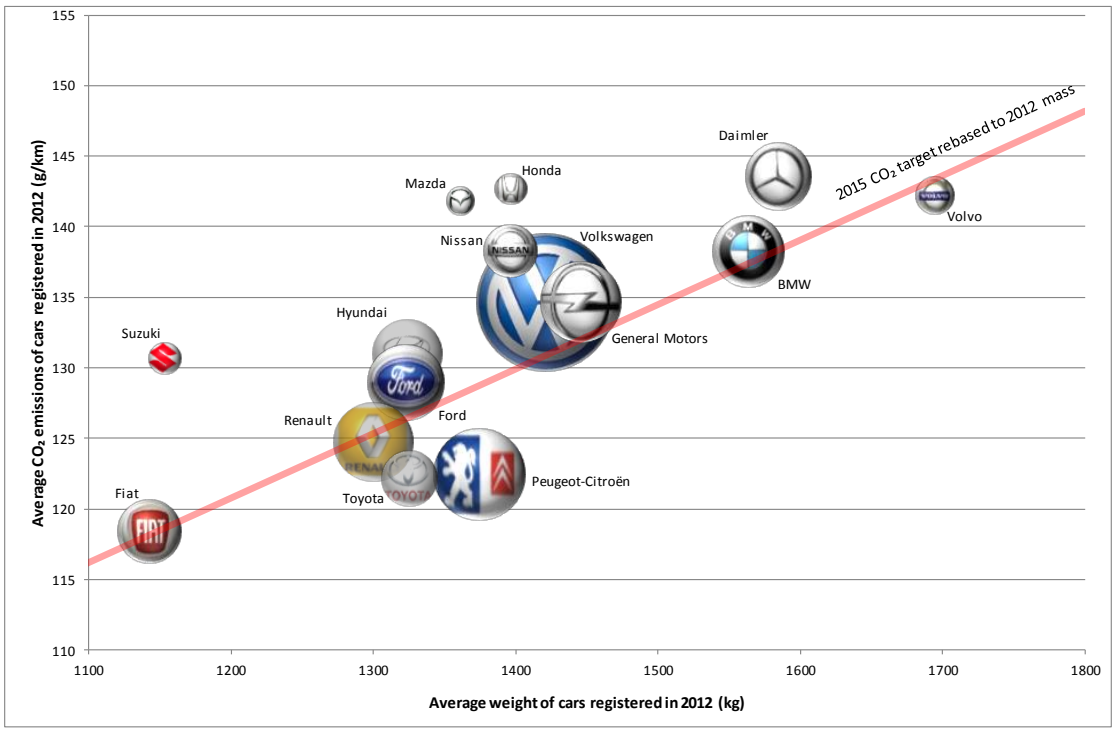
The following conclusions can be drawn regarding the progress of the 15 largest carmakers in the EU in 2012:

- Fiat has maintained its lead as the manufacturer with the lowest average emissions at 118g/km, but Toyota, Peugeot-Citroën and Renault all gained ground as Fiat made relatively little progress in 2012 compared to 2011
- Daimler remains at the foot of the 2012 ranking, but also registered the greatest improvement on the previous year. Daimler and Volvo both registered improvements of greater than 6% in 2012, with Renault, BMW and PSA also performing well
- Fiat, Suzuki and GM registered the least improvement in 2012, all below 1%
- The Asian carmakers remain scattered throughout the table in terms of both average emissions and rate of improvement. Toyota is by far the highest in the ranking and continued to make good progress in 2012. In contrast, Honda is now only marginally above Daimler, and again registered a below average improvement in 2012.

Distance to 2015 targets by carmaker

This section assesses how far carmakers are away from their individual regulatory targets for 2015. The regulation on cars and CO_2 is designed to achieve a 130g/km average figure by 2015. However, this average target does not apply to individual carmakers directly, and carmaker targets for 2015 are determined on the basis of the weight of the vehicles they produce in 2015 compared with the average weight of the vehicles the entire industry will produce over the 2011-13 period. The carmakers with the lowest emissions are not therefore necessarily the closest to their targets, as Figure 3 illustrates.

Figure 3: Fleet-average weight and fleet-average CO_2 emissions by carmaker, compared with EU target line



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 131g/km, still has to reduce its emissions by over 10g/km further because it makes relatively light cars. In contrast, PSA, Toyota and Renault are all safely over the line in spite of emitting more CO_2 than Fiat, and BMW is almost as close to the line as Fiat in spite of having much higher average emissions, because its cars are more than 400kg heavier on average.

Table 2 below shows the manufacturers' positions in relation to their individual targets in numerical form, and the ranking of their further effort required. In the top four cases (PSA, Toyota, Volvo and Renault) this is negative, indicating that they have already surpassed their 2015 target.

Table 2: Ranking of the percentage reduction in CO_2 each carmaker now has to make in order to hit its 2015 CO_2 target*

Ranking		2012 Average	Target 2015	Reduction Required
1	Peugeot-Citroën	122.4	128.8	-5.2%
2	Toyota	122.1	126.5	-3.6%
3	Volvo	142.2	143.4	-0.8%
4	Renault	124.7	125.4	-0.5%
5	Fiat	118.4	118.1	0.2%
6	BMW	138.3	137.4	0.6%
7	Ford	129.0	126.4	2.0%
8	General Motors	134.6	132.0	2.0%
9	Volkswagen	134.6	130.9	2.8%
10	Daimler	143.6	138.4	3.6%
11	Hyundai	131.0	126.4	3.5%
12	Nissan	138.3	129.8	6.2%
13	Suzuki	130.7	118.7	9.2%
14	Mazda	141.8	128.1	9.6%
15	Honda	142.7	129.8	9.1%
	All Manufacturers	132.4	130.0	1.8%

** Assuming the average weight of the company's new cars in 2015 will be the same as in 2012*
*** Average = average of all carmakers*

The following conclusions can be drawn from the graph and table:

- Although Fiat has the lowest CO_2 in absolute terms, PSA has now taken a clear lead over Toyota in the top spot in terms of hitting regulatory targets
- Volvo now ranks in third place, after a very strong performance in 2012 which demonstrates that the formulation of the company targets does not disadvantage the makers of larger and heavier cars
- PSA, Toyota, Volvo and Renault have all now exceeded their targets, with three years to spare
- Six more carmakers are likely to meet their 2015 target in 2013. All the major European manufacturers are on course to reach their targets at least two years early
- Only four of the major manufacturers now need to improve by more than 5% over the next four years. Honda and Mazda need to significantly accelerate progress in reducing emissions in order to achieve their respective targets by 2015.

Our headline conclusion from the last two annual reports is therefore further underlined: all available evidence points towards the major carmakers in Europe heading for very significant 'over-compliance' with the 2009 CO_2 Regulation: all are likely to hit the target for 2015, and most with several years to spare.

Towards the 2020 target

Although it has not yet been passed into law at the time of writing, all three of the EU institutions have agreed to confirm a 95g/km overall target for the year 2020, 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. The analysis does not take account of either supercredits or eco-innovation flexibilities.

In Table 3, below, progress in terms of percentage improvement per annum is shown both for the period 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 required to meet the proposed 2020 target. Note that, as above, individual targets are calculated on the assumption of no further change in average vehicle mass per manufacturer between now and 2020.

Table 3: Comparison of past and future progress to meet the 2020 target

		Progress as % year on year		
	Ranking	2000-2008	2008-2012	2012-2020
1	Peugeot-Citroën	1.9%	3.1%	3.2%
2	Toyota	1.8%	4.6%	3.4%
3	Volvo	n/a	4.8%	3.7%
4	Renault	1.5%	3.4%	3.8%
5	Fiat	1.6%	3.8%	3.9%
6	BMW	3.6%	2.7%	3.9%
7	General Motors	0.8%	3.2%	4.1%
8	Ford	2.4%	4.0%	4.1%
9	Volkswagen	0.6%	4.0%	4.2%
10	Hyundai	2.8%	3.2%	4.3%
11	Daimler	1.5%	4.8%	4.3%
12	Nissan	1.0%	3.7%	4.6%
13	Honda	3.0%	1.9%	5.0%
14	Suzuki	1.3%	4.3%	5.0%
15	Mazda	2.1%	2.7%	5.1%
	All Manufacturers	1.4%	3.6%	4.1%

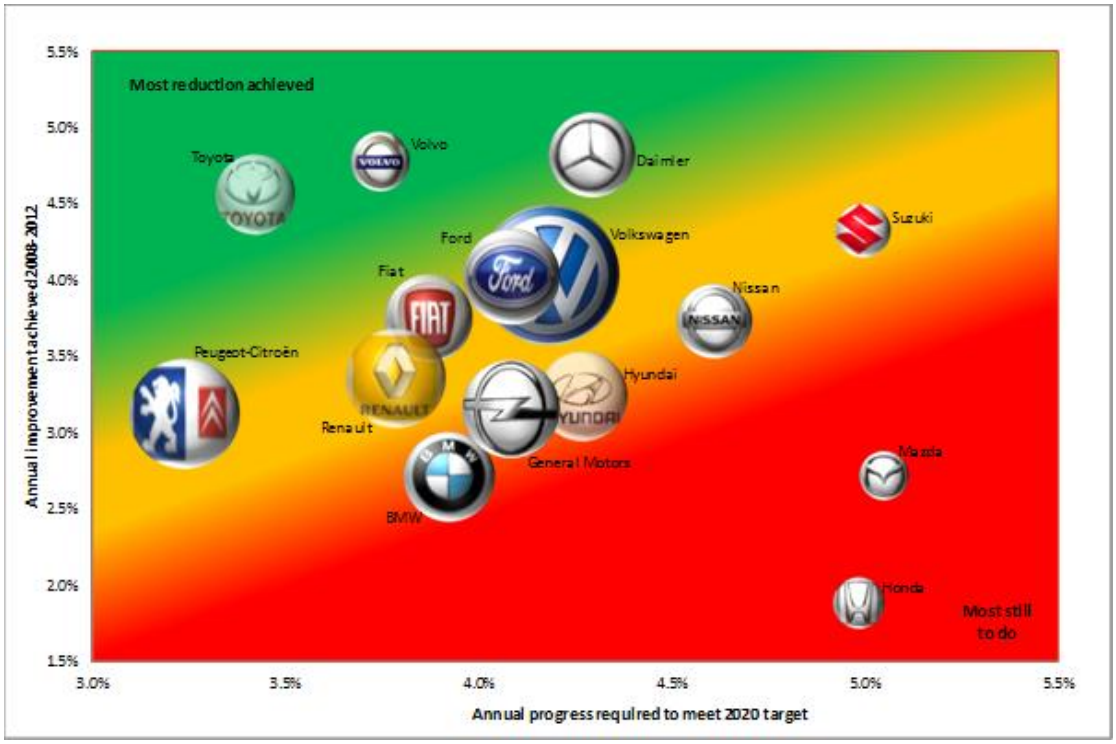
This calculation illustrates that, across future EU car sales as a whole, the rate of progress required from now until 2020 is only slightly greater (4.1%pa) than the rate that has actually been achieved over the past five years (3.6%pa). There are six manufacturers that are required to reduce emissions by below 4%pa; six 4-5%pa and three Asian manufacturers that must achieve more than 5%pa to meet 2020 targets.

The table also illustrates that the relative performance of different manufacturers has varied enormously over time. Now, most of the main European manufacturers will have to deliver the smallest improvements in year-on-year emissions up to 2020, whereas, with the exception of Toyota, it is importers from the Far East who will have to do most to catch up. Of the European manufacturers, Daimler has by far the toughest target in percentage terms, but has actually registered even faster

improvement over the past five years. The data clearly shows the 2020 target is achievable for makers of both large and small cars by 2020 if the companies make appropriate plans now.

Figure 4 illustrates the past progress of all manufacturers compared to the required future progress needed to achieve 2020 goals.

Figure 4: Comparison and past and required future CO_2 emissions reductions by carmaker



The following conclusions can be drawn from the Figure:

- Toyota, Volvo and Daimler on the basis of past progress appear to be already on track to achieve the 95g/km target by 2020 or before, in the sense that they have less to do per year in future than they have already achieved in recent years
- Five additional carmakers only need to slightly accelerate progress to achieve the 2020 target including: PSA, Fiat, Renault, Ford and Volkswagen
- There are six carmakers that need to significantly accelerate progress in reducing emissions to avoid missing the 2020 target and incurring penalties. These are: General Motors and Hyundai, BMW, Honda and Mazda.

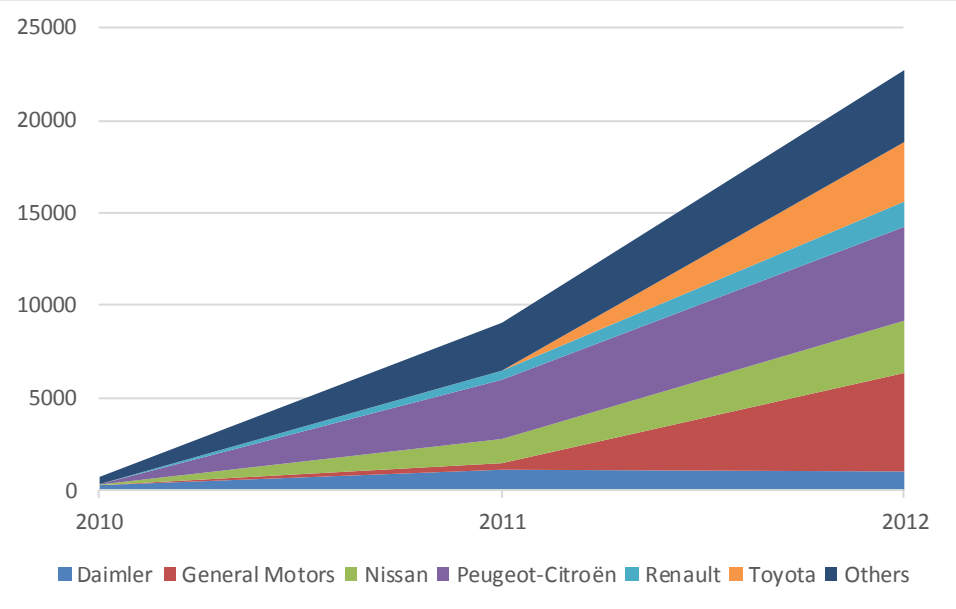
Supercredits and low carbon cars

Under the Cars and CO_2 Regulation, 2012 is the first year in which supercredits become available for low carbon cars. That is, each new car sold with tested CO_2 emissions of 50g/km or below is now counted 3.5 times towards the manufacturer's average for that year. Supercredits are designed to incentivise sales of cars with the lowest carbon emissions, but do this by effectively weakening the target by creating 'hot-air' — fictitious emissions reductions only created through an accounting trick.

This section examines the pattern of sales of low-carbon cars, in order to assess their impact upon each manufacturer's average as calculated for the purposes of the Regulation. In the tables above, the impact of supercredits has *not* been included in order to present the 'true' averages.

Figure 5, below, illustrates levels of sales over the past three years for the main manufacturers across the EU. It shows a dramatic increase of sales over the past two years from a base of only a few hundred in 2010 to nearly 23,000 in 2012. However, this still only represents less than 0.6% of new cars sold.

Figure 5: Sales of low-carbon cars (<50g/km), 2010-2012



For 2012, the largest sales by manufacturer were to General Motors and Peugeot-Citroën, each with over 5,000 vehicles sold, followed by Daimler, Nissan, Renault and Toyota, each with sales of 1,000 or more. In terms of vehicle models available, the headline breakdown of sales in 2012 is summarised in Table 4:

Table 4: Principal low-carbon car models sold in 2012

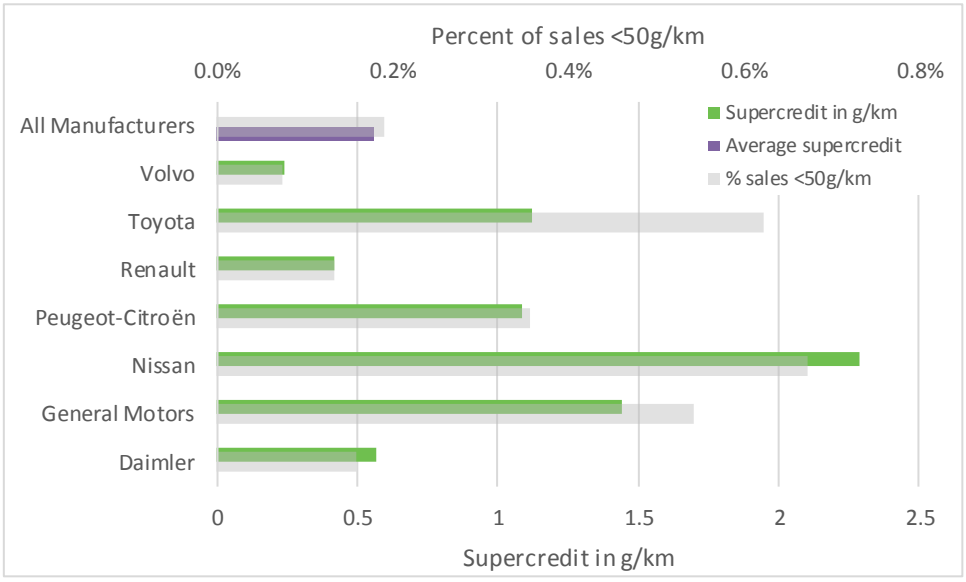
Manufacturer	Model	2012 Sales (approx)	% Total Sales	Type
GM/Opel*	Ampera	4800	0.54%	Range-extended hybrid EV
	Volt	500		
Peugeot-Citroën**	C-Zero	2500	0.36%	Electric
	iOn	2600		Electric
Toyota	Plug-in Prius	3200	0.62%	Plug-in hybrid
Nissan	Leaf	2800	0.67%	Electric
Bolloré	Bluecar	1500	~100%	Electric
Renault	Fluence***	1200	0.13%	Electric
Daimler	Smart ForTwo Electricdrive	1000	0.16%	Electric
Mitsubishi	i-MiEV	900	1.34%	Electric
Mia electric	Mia	500	~100%	Electric

** Both names for the same vehicle under different brands*
*** Both are brand names for the Mitsubishi i-MiEV*
****The Renault Twizy, the best-selling electric four-wheeled vehicle in 2012, is legally classified as a quadricycle.*

As the table shows, the majority of sales were of pure EVs, but also with significant showings from several plug-in hybrids, most notably the Volt/Ampera, a range-extended hybrid which operates primarily as an EV, but with a small petrol engine which can either recharge the battery when needed or provide direct power to the drivetrain. The other qualifying hybrid sold in significant numbers was Toyota's Plug-in Prius.

For all major manufacturers, cars below 50gCO_2/km account for less than 1% of sales in 2012, and only for GM, Nissan and Toyota did they represent more than 0.5% of sales. As yet, therefore, the numbers sold are too small to have a major impact upon company averages. Figure 6 illustrates the benefit of the small number of sales once the supercredit multiplier of 3.5 is factored into the analysis in terms of the amount the company target is weakened.

Figure 6: Hot air from supercredits gained in 2012



Across all carmakers, supercredits in 2012 weakened the 130g/km target for 2015 by about 0.6g/km. However, targets for GM, Nissan, PSA, and Toyota are effectively increased by 1g/km, and for Nissan it is worth well over 2g/km. If the current rapid upward trajectory in sales continues, we can expect to see substantially higher figures for supercredit weakening in 2013, as the multiplier remains at 3.5 for a second year.

The figure illustrates the risk of unlimited supercredits and high multipliers. The agreement reached between the European Commission, Parliament and Council capped supercredits in 2020 at 2.5g/km in any year per manufacturer and set the 2020 multiplier at 2.0. Deviation from this position, as advocated by Germany which is seeking to block the agreement, could significantly weaken the 95g/km 2020 target.

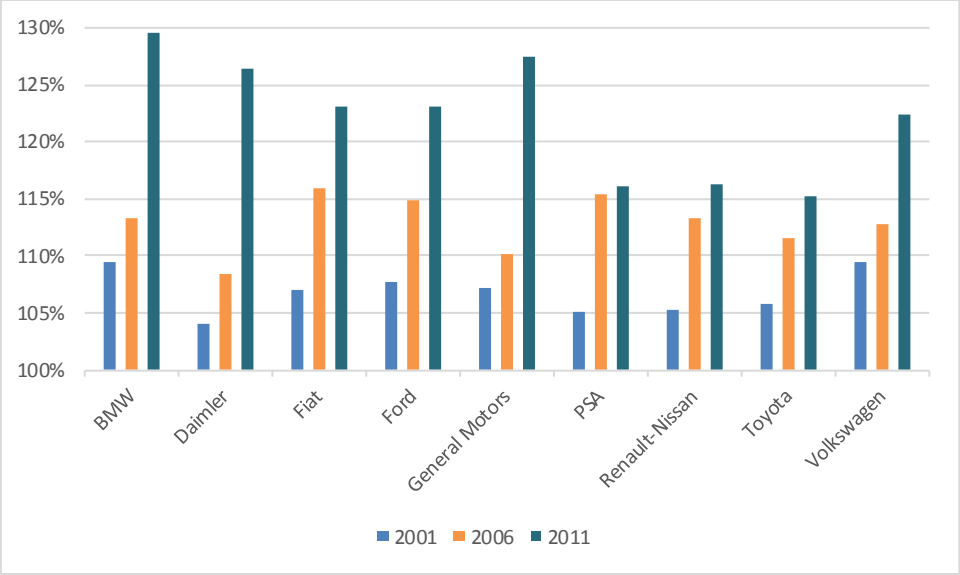
Fuel economy results and the real world

Earlier in 2013, T&E published a report highlighting the discrepancy between the fuel economy suggested by official test results and the actual fuel consumption that most drivers experience on the road.[12] This report documented a substantial and growing body of evidence that the gap appears to be increasing over time, and set out a range of reasons why this is happening. The main ones are:

- The test itself is not very rigorous, and as the pressure to cut CO_2 emissions to meet the regulation becomes more intense, manufacturers appear to be finding new ways to use flexibilities in the rules to get lower test results
- Some new technologies, such as start/stop systems, give very favourable results on the current test cycle, but these apparent benefits are not fully realised in typical real-world driving
- An increasingly wide range of electrical and electronic equipment – most obviously air-conditioning systems – make additional demands on a car's battery and alternator and indirectly use extra fuel, but this is not measured in the current test procedure.

The ICCT has published further data representing the most comprehensive analysis to date from a range of evidence sources across Europe.[13] This new data confirms beyond doubt that this gap is both real and growing. As an example, Figure 7 below illustrates the growing discrepancy over time for each of the main manufacturers from the most comprehensive database available, the German Spritmonitor[14] website.

Figure 7: The changing relationship between test cycle and real-world fuel use



Note: the percentage on the y-axis is the ratio of 'real world' to test cycle emissions

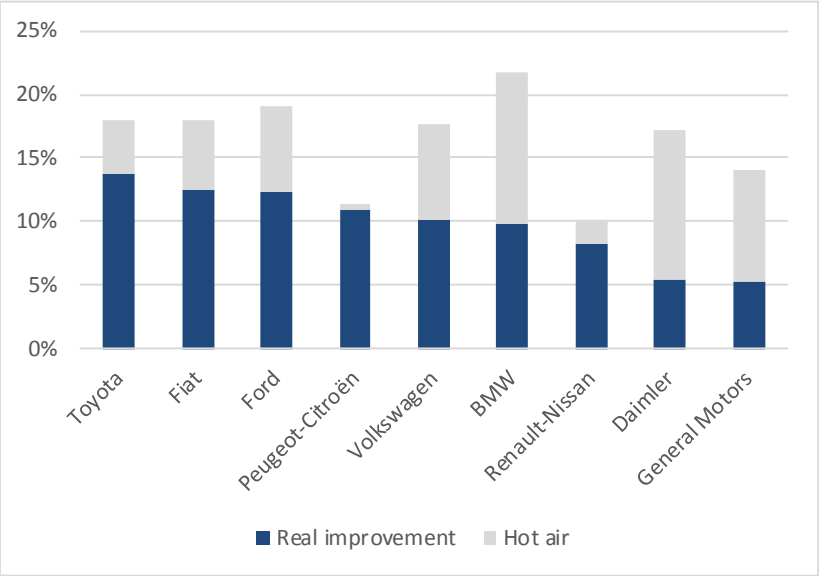
[12] *Mind the Gap! Why official car fuel economy figures don't match up to reality*, March 2013
[13] *From laboratory to road: a comparison of official and 'real-world' fuel consumption and CO_2 values for cars in Europe and the United States*, ICCT, May 2013
[14] www.spritmonitor.de

As this graph illustrates, in 2001 the excess of real-world average fuel consumption over the test results was in the range of 4 to 10%. Since then, however, the gap has widened for all of the manufacturers, such that in 2011 it was at least 15% in all cases, and in excess of 25% for BMW, Daimler and General Motors. This is a serious issue, as it means that car buyers are not getting the full benefit of the fuel economy that is advertised, but also that the greenhouse gas reductions that were expected to result from the Regulation are not being fully realised.

To illustrate this point, we have used the data above to apply a correction factor to each company's CO_2 results for the past six years, in order to get a sense of how much of their claimed improvements can be attributed to real technical improvements that drivers will experience on the road, and how much is just 'hot air' caused by changes in testing practice and exaggerated benefits from some technologies. The Spritmonitor data presented above are of high quality and good statistical validity, but they are derived only from German data. However, the ICCT report cites a range of other databases covering different EU Member States that give rather similar results, so we would expect to see broadly similar trends across the whole of the EU. While the mix of vehicles sold and their patterns of use may vary from one country to another, the vehicles on offer from a given manufacturer are essentially the same in every member state.

Figure 8, below presents the official test results as reported for each manufacturer in rank order alongside the calculated split between real reductions (in dark blue) and hot air (in grey) as percentage changes from 2006 (when the divergence between real and test cycle results seemed to accelerate) for each of the main manufacturers.

Figure 8: Comparison of the percentage reduction in CO_2 since 2006 as measured on the test cycle and in the real world



From this it can be seen that different manufacturers present a very different picture when their results since 2006 are reanalysed in this way. Firstly, it can be seen that the 'real' improvement is typically substantially less than the test results suggest for most manufacturers.

On the positive side, PSA in particular presents results which appear to consist almost entirely of genuine technical improvements, with the Spritmonitor motorists reporting improvements in fuel economy almost identical to the official test results. Renault-Nissan and Toyota also show improvements that appear to be to a large extent 'real'. This illustrates that it is possible for companies to make significant progress both in tests and the real-world. Furthermore those companies that have made the most rapid progress towards meeting their targets have largely done so legitimately without resorting to deploying testing flexibilities.

In contrast, the improvements reported by BMW, Daimler and General Motors appear to be primarily attributable to the flexibilities in the testing procedure, with real world improvements in fuel economy likely to be far less than those reported on the basis of vehicle tests. For Daimler and General Motors, their real-world improvements since 2006 appear to be barely above 5%, only around a third of the value suggested by their official test results. BMW in contrast has made a much larger 'real' improvement (at just under 10%), such that nearly half of its claimed improvements are actually reflected on the road. However, all three appear much lower in the rank order when only the 'real' improvement is taken into account than they do on the basis of the official figures alone. It is therefore important that loopholes in the testing procedure are eliminated to ensure that the benefits of achieving the 2020 target in terms of CO_2 and fuel savings are realised.

Status and progress by Member States

This section provides an overview of progress by EU Member States in reducing average new car CO_2 emissions. Countries do not have individual targets under the legislation, but are able to influence sales of low-CO_2 vehicles in many ways including CO_2-based registration and circulation taxes, company car taxation and through regulation of labelling and car advertising.

Table 5: Average CO_2 emissions of new cars sold in 2012 in EU Member States and improvement since 2011

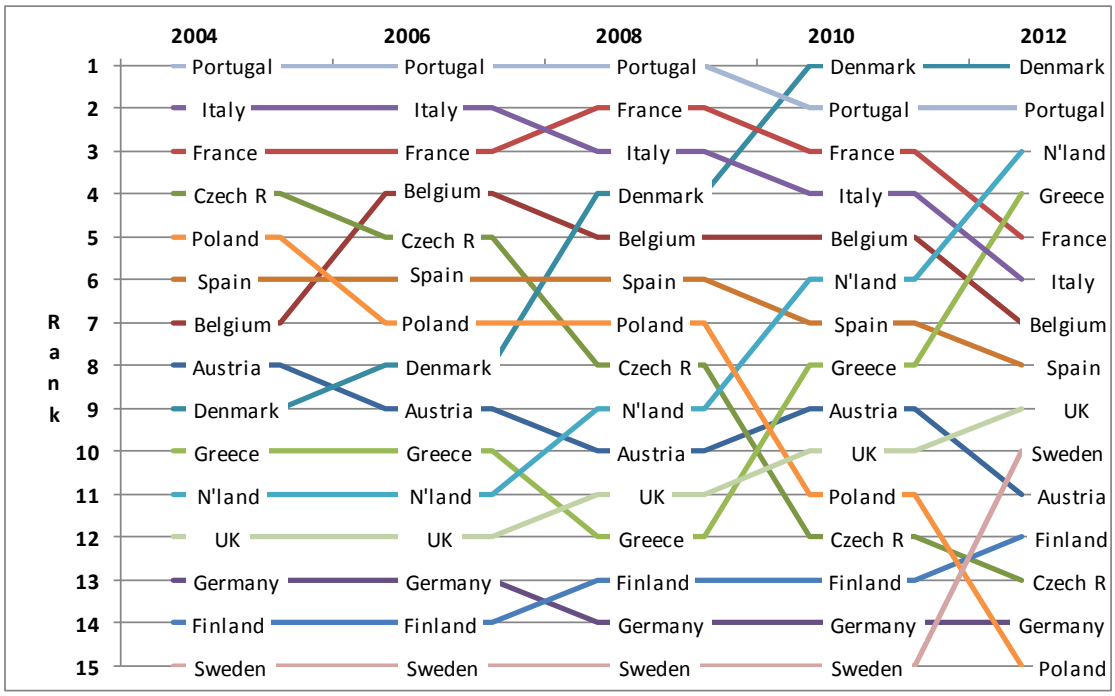
	2012 CO_2 Ranking	Registrations 2012	Average CO_2 2012	Average CO_2 2011		Improvement Ranking	% change
1	Denmark	170,754	117.3	125.0	1	Greece	-9.0%
2	Portugal	95,459	117.7	122.8	2	Denmark	-6.2%
3	Netherlands	498,748	118.7	126.2	3	Netherlands	-5.9%
4	Greece	57,608	121.1	133.1	4	Slovenia	-4.5%
5	Malta	5,814	121.5	124.6	5	Sweden	-4.4%
6	France	1,926,127	124.8	127.7	6	Portugal	-4.2%
7	Ireland	73,179	125.0	128.3	7	Spain	-3.8%
8	Italy	1,402,107	126.2	129.6	8	UK	-3.7%
9	Belgium	488,890	128.1	127.3	9	Cyprus	-3.6%
10	Spain	674,166	128.7	133.8	10	Luxembourg	-3.5%
11	UK	2,035,373	133.0	138.1	11	Finland	-3.4%
12	Slovenia	49,538	133.4	139.7	12	Slovakia	-2.8%
13	Sweden	264,612	135.8	142.0	13	Germany	-2.7%
14	Austria	335,142	135.9	138.7	14	Ireland	-2.6%
15	Luxembourg	49,357	137.2	142.2	15	Czech Republic	-2.6%
16	Romania	66,360	139.0	140.7	16	Italy	-2.6%
17	Finland	107,383	139.1	144.0	17	Malta	-2.5%
18	Czech Republic	169,939	140.8	144.5	18	France	-2.3%
19	Slovakia	70,317	140.9	144.9	19	Austria	-2.1%
20	Germany	3,060,222	141.6	145.6	20	Poland	-1.7%
21	Poland	273,779	141.9	144.4	21	Estonia	-1.6%
22	Lithuania	11,844	144.2	144.4	22	Latvia	-1.5%
23	Cyprus	10,916	144.5	149.9	23	Bulgaria	-1.4%
24	Hungary	52,427	146.9	141.6	24	Romania	-1.2%
25	Bulgaria	13,676	149.2	151.4	25	Lithuania	-0.1%
26	Latvia	10,278	152.1	154.4	26	Belgium	+0.6%
27	Estonia	18,864	154.5	156.9	27	Hungary	+3.8%
	EU27	11,992,879	132.4	135.7		EU27	-2.5%

This table illustrates the enormous contrasts from one country to another, and illustrates the importance of national policies to encourage more fuel efficient vehicles. In 2012, the top six countries all achieved greater than 4% reduction in fleet average CO_2, while the bottom third achieved around 2% or less. At the very bottom,

Belgium and Hungary both achieved the dubious distinction of actually increasing the average CO_2 of new cars sold in 2012.

A longer term perspective is shown in Figure 9, which summarises the relative performance of the Member States with the largest car markets across the past nine years.

Figure 9: Relative performance of the largest Member States over time



Taking these two datasets together, we can summarise recent performance of the Member States into the following categories.

The Front Runners

Denmark has improved its position steadily over recent years to first in 2010 and now again in 2012. In 2007, the Danish vehicle purchase tax (which has for a long time been high) was restructured to be much more strongly based on CO_2. This made a huge difference in fleet average CO_2. But it also lowered average tax rates and hence increased car sales. Annual circulation taxes are also graduated according to fuel economy.

Portugal drops to second place after leading the field in 2011. In Portugal relatively few cars are bought new and they are on average smaller than the average for the EU as a whole. Fuel taxes are high and vehicle taxes are also steeply differentiated against CO_2. All these factors help explain Portugal's continued strong showing.

The Netherlands has now joined Denmark in rising furthest and fastest in the rankings over the past six years. It also shows the greatest reduction of any Member State since 2005, at just over 30%. This is largely due to an initial registration tax that is strongly graduated according to CO_2 emissions, as well as exemptions from circulation tax for very low-CO_2 vehicles and CO_2-based differentiation of the taxation of 'benefit in kind' payments for company cars. The thresholds and emission categories were further revised downwards in 2012 to incentivise the lowest emitters

and this seems to be driving a continuing improvement. But the same applies as in Denmark; average tax rates have fallen, with uncertain rebound effects on car sales.

Greece is once again the most improved Member State in 2012, and is now in fourth place. This may be partly due to graduated circulation tax and to sharply higher fuel taxes, especially on petrol, but sadly it also reflects the economic crisis which has resulted in a crash in demand for new cars, especially, it seems, the larger and higher emitting ones. On the other hand, better fuel economy is likely to be at a premium in the difficult years ahead.

Much Improved

Sweden has traditionally bumped along the bottom of the car CO_2 table. This is owing to a strong preference for heavy Saabs and Volvos among its motorists. Then in 2005 the annual vehicle taxation switched from being based on weight to CO_2 emissions and since that year the average for new cars has fallen consistently and considerably - just short of 30% against an EU average of less than 19%. In 2012 it again achieved one of the best annual improvements in average CO_2, and as a result has overtaken several more Member States and is now in the top half of the table for the first time. Since 2009, cars emitting less than 120g/km have enjoyed a five-year exemption from annual circulation tax, while a new 'super green premium' has been introduced for electric vehicles from 2012. As noted above, sales of Volvos show a similar trend to that of its home nation.

Falling Behind

Italy was historically a front-runner in CO_2 emissions owing to a consumer preference for domestically-produced cars which were compact and efficient. However, this trend appears to be weakening, and Italy is now only eighth in the overall list and sixth among the major car markets. Italy does not have vehicle purchase or ownership taxes that are graduated according to fuel economy or CO_2 emissions.

France rose to the top of the table in 2009 following the implementation of a 'bonus malus' scheme whereby generous allowances were given towards the purchase of the most fuel-efficient cars, while those with higher CO_2 emissions paid a purchase tax. The system proved too generous however and is estimated to have cost the state at least €1bn in lost revenues. A government study cast doubt over the environmental benefits of the first phase of the system because of a rebound effect on car sales, prompting more car use.[15] The scheme remains in place, but the incentives are now less generous and their impact has been correspondingly diluted.

The Backmarkers

Poland, Hungary, the Czech Republic and most of the other newer Member States inhabit the lower half of the league table. When they first reported under the monitoring mechanism in 2004, their average CO_2 emissions were significantly below the EU average. However, they have made relatively little progress, at least partly owing to a lack of incentives for fuel efficiency in their tax systems. They now find themselves well above the EU's average level, with Poland and the Czech Republic performing conspicuously and consistently badly.

[15] http://www.insee.fr/fr/themes/document.asp?ref_id=iana3

Germany continues in the bottom third of the table, by far the worst performer of the EU15. Germany does not have a significant car registration tax, while annual circulation taxes are so weakly graduated according to CO_2 emissions (€2/g/km above a given threshold) as to have little or no effect on consumer choice. Meanwhile, the national government promotes a labelling scheme so counterintuitive that it rates a 191g/km Porsche Cayenne the same as a 114g/km Citroen C3.[16] Germany is by far the largest manufacturer of passenger cars in Europe, and also the largest market for them, but is failing to deliver the market signals necessary to encourage a reduction in CO_2 emissions.

[16] http://www.transportenvironment.org/press/porsche-suv-get-%E2%80%98green-rating%E2%80%99-under-new-german-labelling-scheme

CO_2 from light commercial vehicles (vans)

Background

Since the CO_2 legislation for cars came into force, the vehicle CO_2 regime has been extended to light vans of class N1 under Regulation 510/2011. This establishes a separate system for vans, but one with many of the same basic features as the earlier cars legislation. That is, each manufacturer has an average target, which is based upon the average weight of their vans sold. There are two targets: 175g/km by 2017, and 147g/km for 2020.

The 2020 target is currently being reviewed. As for cars an agreement has been reached between the European Parliament, Commission and Council Presidency that remains to be ratified. The 147g/km target is expected to remain unchanged and supercredits will be phased out.

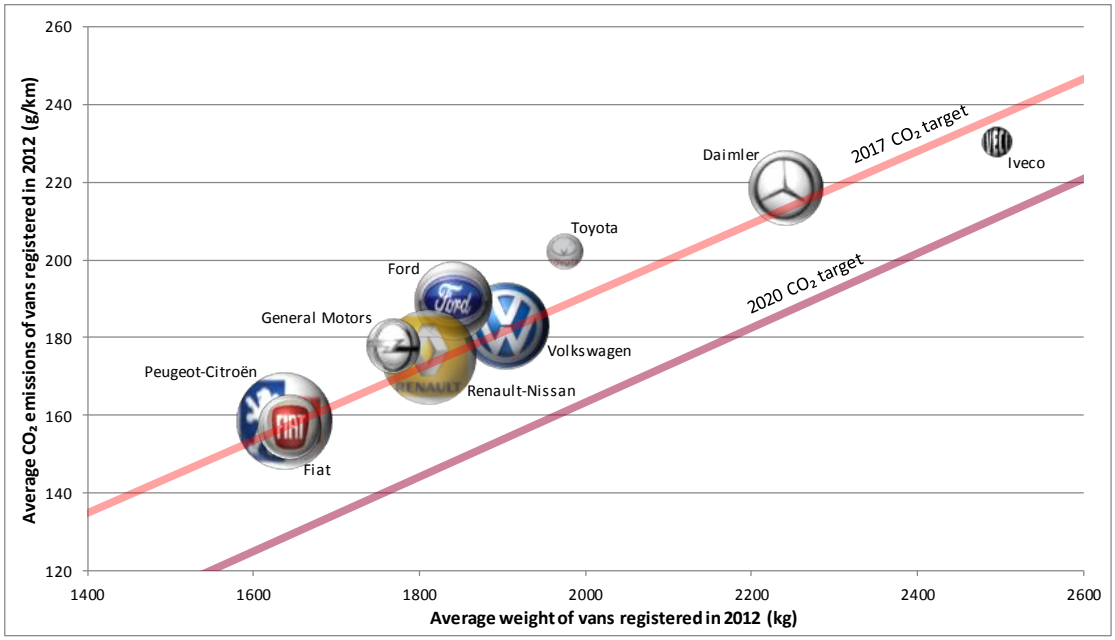
As the legislation is more recent, this is the first year in which the EEA has reported provisional results, for van sales in 2012. These are set out and analysed in the next section.

2012 CO_2 results for vans

Overall, the average CO_2 of vans sold in 2012 was 180g/km, already only 3% short of the 2017 target. This reflects the fact (highlighted by T&E at the time[17]) that this target was set at a hopelessly unambitious level on the basis of inaccurate CO_2 emissions data for the van fleet at that time. As Figure 10 demonstrates, all manufacturers are crowded around the 2017 target line, and some have already achieved the limit a full five years early!

Figure 10: Fleet-average weight and fleet-average CO_2 emissions by van manufacturer, compared with EU target lines 2017 and 2020

[17] http://www.transportenvironment.org/press/vans-become-more-fuel-efficient-not-till-after-2020



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

Table 6 presents the results and the distance-to-target figures for each company in greater detail.

Table 6: Ranking of the percentage reduction in CO_2 each van manufacturer now has to make in order to hit its 2017 and 2020 EU CO_2 targets*

Ranking		2012 Average	Target 2017	Reduction Required	Target 2020	Reduction Required
1	Iveco	230.3	236.9	-2.8%	210.9	9.2%
2	Fiat	157.2	157.6	-0.3%	129.0	21.8%
3	Volkswagen	182.9	181.9	0.6%	154.1	18.7%
4	Renault-Nissan	175.0	173.3	1.0%	145.2	20.5%
5	Peugeot-Citroën	158.6	157.0	1.0%	128.4	23.5%
6	Daimler	218.6	213.2	2.5%	186.5	17.2%
7	General Motors	177.8	169.3	5.0%	141.1	26.0%
8	Toyota	202.1	188.5	7.2%	160.9	25.6%
9	Ford	189.3	176.0	7.6%	148.0	27.9%
	All Manufacturers	180.0	175.0	2.9%	147.0	22.5%

** Assuming the average weight of the company's new vans will remain the same as in 2012*
*** Average = average of all vanmakers*

In absolute terms, Fiat is in the lead with the lowest average emissions, with PSA very close behind. At the other end of the spectrum, Toyota, Daimler and Iveco make substantially heavier vans on average and have average emissions above 200g/km.

Performance relative to target presents a very different picture. Iveco makes the heaviest vans and has already comfortably achieved its 2017 target. Fiat comes in second place, and it too has already reached its 2017 target. Most other companies have only a few percentage points of further improvement to make by 2017, with only Ford and Toyota required to make slightly more than 1% improvement per year up to 2017. The 2017 target provides little or no incentive for CO_2 reductions for most of the major manufacturers.

The 2020 target offers only a slightly tougher challenge. Iveco is again the best placed, with only 9% further improvement required over the eight intervening years, or barely more than 1% per year. All others remain quite closely placed with around 20% improvement left to make on average, and none requiring more than a 30% improvement. Only GM, Toyota and Ford have to make more than a 25% reduction. This typically requires about 2.5% improvement per annum, which appears easily achievable.