HOW CLEAN ARE EUROPE'S CARS?

An analysis of carmaker progress towards EU CO_2 targets in 2011

TRANSPORT & ENVIRONMENT

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Summary

This report is the seventh T&E has published on the annual progress Europe's major car manufacturers have made in reducing CO_2 emissions and fuel consumption of new cars.

In previous years, we assessed how each carmaker was positioned to hit their mandatory CO_2 standards that the European Union has set for 2015 (130 g/km on average).

This year, for the first time we focus on how carmakers are positioned to achieve the 95 g/km targets for 2020. The European Commission has recently proposed how carmakers will need to achieve this target, which is currently discussed in the European Parliament and the Council of Ministers.

The reason for this change of target year is twofold. Our previous reports have shown that 2015 targets are weak and carmakers are well on track towards compliance, even over-compliance, and this year's report further underlines this conclusion. The reason they over-comply is partly because they are manipulating the test results to artificially lower the official data and partly because carmakers are planning for the stricter 2020 target. Loopholes in current tests must be closed and testing systems improved to avoid future abuses.

As we did in previous reports, we also assess progress per EU Member State.

In this year's report, we included two additional pieces of analysis:

- A review of how official CO_2 figures are translating into the 'real world';
- An analysis of the importance of lack of progress in reducing vehicle weight, and how progress in this area can be stimulated.

Main conclusions

Progress of Europe's largest 15 carmakers in cutting CO_2

- The industry as a whole reduced average CO_2 emissions by 3.3% last year continuing the trend of much faster reductions since adoption of the EU's mandatory CO_2 targets for cars. The regulation is working. The industry reached an average CO_2 emission of 136 g/km;
- Progress was more evenly spread across carmakers than before; Europe's six largest carmakers by sales all reduced CO_2 by between 2 and 6%. BMW, Mazda and Honda were negative outliers, with decreases in emissions of between just 1 and 2%;
- The top four in terms of fleet-average CO_2 emissions remains unchanged. Fiat leads with 119 g/km, followed by Toyota, PSA and Renault. Daimler remains last on the list, but reduced CO_2 in 2011 by 4.6%, one of the best improvements recorded.

Progress towards 2015 target (average 130 g/km)

- The industry as a whole is now less than 4% away from hitting its 130 g/km target for 2015; last year it still had a 7% gap to close;
- Toyota, PSA and Fiat have reached their 2015 target with four years to spare. Mazda is now furthest away with a 12% gap yet to close;
- The distance-to-target figures do not allow for loopholes such as 'eco-innovations', 'supercredits' and provisions for carmakers below 300,000 sales. Carmakers are therefore even closer to meeting targets than these figures suggest. These flexibilities are not needed for carmakers to achieve their targets and just reduce the CO_2 improvement and worsen average fuel economy.

The headline conclusion of last year's report therefore remains unchanged: all available evidence points towards carmakers in Europe heading for very significant 'over-compliance' with the CO_2 regulation and most are hence likely to hit the 130 g/km CO_2 target for 2015 several years in advance.

Progress towards 2020 target (average 95 g/km)

- Maintaining the average rate of progress achieved in the past four years is more than sufficient for the industry as a whole to hit the 95 g/km target for 2020;
- European carmakers are well placed for hitting 2020 targets. In the ranking of best placed manufacturers, all European manufacturers (except Daimler) are in the top 9. The bottom 6 largely consists of Asian manufacturers;
- The list of distance-to-target for 2015 is similar to the list for 2020; the proposal to achieve 95 g/km hence does not change the distribution of efforts required. The data excludes flexibilities in the regulation that depending upon the detail of the final agreement could make compliance significantly easier.

Progress in real-world driving

- Evidence is emerging that reductions in official CO_2 and fuel consumption figures do not necessarily translate in similar reductions in the real world;
- A recent report, analysing 28,000 fuel consumption data generated by German car users, for the first time quantifies this phenomenon. It suggests that German users do not experience about half of the reduction in 'official' fuel consumption of new cars that was realised in the 2006-2010 period. Of the promised lifetime fuel savings of €2,600 per car, only about €1,300 has really materialised;
- The only realistic explanation is that carmakers go at ever greater lengths to 'optimise' their test vehicles for the official fuel consumption test. We intend to publish further research into the detailed explanations for this phenomenon.

Lack of progress in reducing vehicle weight (average 95 g/km)

- Reducing vehicle weight is one of the most important avenues for reducing CO_2 emissions. 1% of weight reduction results in 0.7% of fuel savings. Recent evidence indicates that cars can be made a third lighter, leading to 23% lower fuel consumption, at very modest costs without loss of functionality or safety;
- Average new car weight in 2011 was 1,389 kg, the highest since 2003 and up 53 kg since 2009. Carmakers have been pursuing many avenues for lower fuel consumption, but not making vehicles lighter;

- Had carmakers kept vehicle weight at 2009 levels, their average CO_2 emissions would have been almost 4 g/km lower: 132 instead of 135.7 g/km;
- Part of the lack of progress can be explained by the structure of the EU law. The CO_2 target per manufacturer depends on the weight of the vehicles each carmaker produces. Carmakers that cut average vehicle weight by 100 kg see their company CO_2 target for 2015 tightened by 4.57 g/km. This seriously blunts incentives for lightweighting of vehicles;
- Changing the law for it to be based on vehicle size (so-called 'footprint) instead of weight would give carmakers full CO_2 credit for making vehicles lighter.

Introduction

This report is the seventh T&E has published on the annual progress Europe's major car manufacturers have made in reducing CO_2 emissions and fuel consumption of new cars.[1]

As usual, the main objective of this report is to assess the progress that major car manufacturers in Europe are making towards cutting their average CO_2. We also assess how each carmaker is positioned to hit the mandatory CO_2 standards that the European Union has set for 2015 and, for the first time, for 2020.

This year's report contains two additional pieces of analysis.

Firstly, we look at currently available evidence about the extent to which reductions in official CO2 and fuel consumption figures translate into reductions in everyday use of vehicles.

Secondly, we look into the development in vehicle weight, since weight reduction is so important in reducing CO2, and how reductions in vehicle weight can be accelerated.

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 monitoring programme set-up for these agreements contained a non-disclosure clause which prevented company-specific information being published by the EU. Fortunately, the EU CO_2 legislation adopted in 2009 has led to far greater data transparency with annual reports and databases published by the European Environment Agency.

[1] 2006 report: www.transportenvironment.org/Publications/prep_hand_out/lid:442
2007 report: www.transportenvironment.org/Publications/prep_hand_out/lid:481
2008 report: www.transportenvironment.org/Publications/prep_hand_out/lid:513
2009 report: www.transportenvironment.org/Publications/prep_hand_out/lid:549
2010 report: www.transportenvironment.org/Publications/prep_hand_out/lid:610
2011 report: http://www.transportenvironment.org/publications/how-clean-are-europes-cars-2011-edition

Transport in EU climate and energy policy

Trends 1990-2010

CO_2 emissions from the transport sector have increased by 27% between 1990 and 2010, whereas those of other sectors decreased by 19%.[2] The contribution of the transport sector to the EU's CO_2 emissions now stands at 29%, up from 20.5% in 1990.

The real picture is even worse, mainly because transport greenhouse gas (GHG) emissions statistics do not include lifecycle emissions, only 'tailpipe' emissions – those that come from burning fuel. In the case of oil this leads to an underestimation of about 20%. 4% of transport energy is delivered by biofuels and this counts on paper as zero emissions, thanks to flawed greenhouse gas accounting conventions. If we assume, quite realistically, that the EU's biofuels emit the same over their full lifecycle as fossil fuels,[3] the rise of transport emissions since 1990 would be 32%, not 27%, and the share of transport CO_2 emissions be 30%.

The economic crisis that started in 2008 caused overall emissions to drop. Transport CO_2 emissions in 2010 were 7% below their 2007 peak and roughly back at 2003 levels.

Despite these recent drops in emissions, none of the future scenarios developed over the past years foresee sustained decreases in transport emissions unless decisive policy action is taken. The main reasons are that volume growth in sectors such as road freight transport, aviation and shipping are expected to keep on outpacing improvements in energy efficiency, and because transport fuels are not 'decarbonising' at any significant rate.

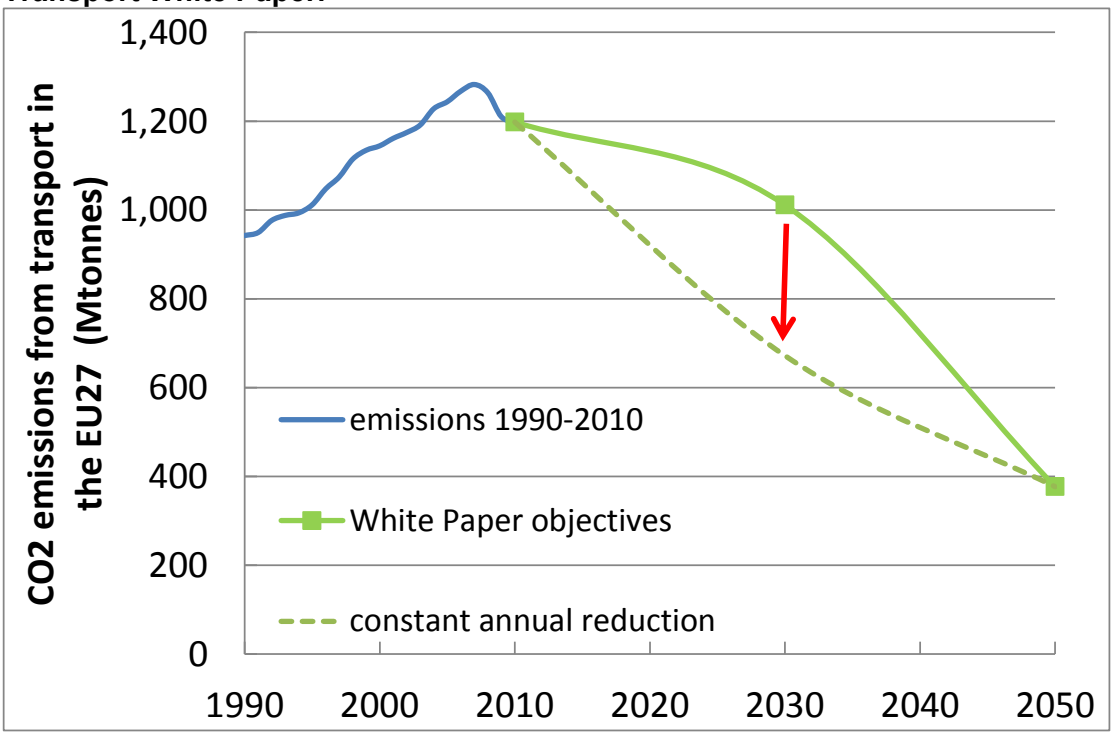
The European Environment Agency estimates that cars are responsible for 14% of the EU's total CO_2 emissions[4], and they are the single largest source of transport emissions, representing around half of the total.

[2] See: www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2012
[3] See: www.transportenvironment.org/News/2010/11/Member-state-biofuel-plans-will-cause-higher-emissions-than-fossil-fuels
[4] See: www.eea.europa.eu/publications/towards-a-resource-efficient-transport-system

The 2030-2050 timeframe

In March 2011 the European Commission published its White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'.[5] It said that 'a reduction of at least 60% of GHGs by 2050 with respect to 1990 is required from the transport sector.' This translates into a 70% reduction compared with current levels. It also said a 20% reduction target compared with 2008 would be needed by 2030. These commitments are summarised in graph 1.

Graph 1: trends in EU27 transport CO_2 emissions 1990-2010, combined with reduction targets as set out in the March 2011 European Commission Transport White Paper.



The 60% reduction target for 2050 means 377 Mt of transport CO_2 in 2050, a 69% decrease compared with 2010 levels. In order to achieve this, a 2.8% reduction of GHG emissions per year is needed between the 1,198 Mt of CO_2 in 2010 and the 377 of 2050.

But there's something odd about the way reduction efforts are distributed over time. The target for 2030, a 20% cut compared with 2008 levels on 1,011 Mt, represents a hardly ambitious 0.8% decrease per annum between 2010 and 2030. But in order to hit the 2050 target, annual cuts of 4.8% would be needed between 2030 and 2050, a near-impossible figure.

A trajectory with a constant annual reduction path of 2.8% would be a much more realistic proposition; this would imply a reduction of some 44%, not 20%, in 2030 compared with 2008 levels. CO_2 levels in 2030 would be 672 instead of 1011 Mt, a very significant difference, indicated in the graph.

[5] See: http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm

Owing to the slow turnover of vehicle stocks, it is essential that we plan now for the fuel efficiency of the vehicles that we will be using in 2030 and beyond, and hence the importance of challenging targets for 2020 and 2025.

Transport is also critical in the debate on Europe's energy dependence. In 2011 the EU imported approximately €300bn worth of oil every year, or €800m every day. For comparison - this is not much less than the Greek, Irish and Portuguese bailouts combined – every year. Transport is responsible for about two thirds of oil use. Cars are the single biggest consumer of oil in the EU, responsible for using around half of transport sector demand and hence a third of all oil[6], hence about €100bn worth of imports per year.

[6] Precise statistics on the split of road transport fuel consumption between cars, vans and trucks are not available because diesel is sold in all three categories.

A short history of EU cars and CO_2 policy

The EU target to reduce average new car emissions to 120 g/km was first proposed by Germany at a meeting of European environment ministers in October 1994. It was presented as the ambition to lower fuel consumption of new petrol cars to 5 litres per 100 km and new diesel cars to 4.5 litres per 100 km by 2005. The European Commission adopted the suggestion in its 1995 communication (COM(95)689). It represented a 35% reduction over the 1995 level of 186 g/km, or a 4.2% reduction per annum.

Originally the target date was set for 2005. But before it became legally-binding, the target was postponed or weakened four times.

The first postponement occurred in 1996 when the Environment Council introduced the term 'by 2005, or 2010 at the latest'.

The second postponement took place in 1998 when the European Automobile Manufacturers Association (ACEA) committed to the EU to reduce the average CO_2 emissions from new cars sold in the EU to 140 g/km by 2008. The Commission agreed to postpone the deadline for delivery of the '120' target to 2012.

The third weakening was in December 2007 when the European Commission proposed to move the target for 2012 from 120 to 130 g/km. The Commission said that the missing 10 g/km should be taken up by non-car-related measures such as the use of biofuels, tyres and by emission reductions in vans.

The fourth weakening took place when the law was finally adopted, in December 2008. The law further postponed full compliance with '130' from 2012 to 2015, and added several loopholes that would even allow a fleet average CO_2 figure of approximately 140 g/km to go largely unsanctioned.

In total, all these steps have resulted in a 10-year delay and a weakening of the target by approximately 20 g/km (15%). The required annual reduction from 1995 has decreased from 4.2% to 1.6%.

On the upside, the law now adopted does offer a legally binding framework, including penalties, to deal with CO_2 emissions from cars.

Significantly, it also added a new 95 g/km target for 2020 that is under review at the time of writing. If adopted, required annual reductions between 1995 and 2020 back from 1.6% to around 2.5%. See next section.

The legislation – how it works

The 2009 law nominally strives to reduce the average CO_2 emissions from new cars to 130 g/km by 2015 (approx. 5.6 litres per 100 km for petrol cars and 5.0 litres per 100km for diesel cars). That is 18% below the average in 2007 and some 4% below the average of 2011.[7]

For the 2012-14 period, a so-called 'phase in' is provided for, in which 65% (2012), 75% (2013) and 80% (2014) of cars from each manufacturer will have to comply. Carmakers are free to select 'compliance vehicles' and will therefore leave out the cars farthest from the target, i.e. the worst gas guzzlers such as SUVs. The effect is a postponement of the 130 target to 2015.[8]

The target is an average for all cars sold, not a fixed limit that no car may exceed. Manufacturers can average the CO_2 emissions from all cars they sell.

Individual manufacturers' targets are differentiated on the basis of the weight of the cars they produce in the target year. For example, if a manufacturer's cars by 2015 are 100 kg heavier than the industry average, they are allowed a 4.57 g/km higher CO_2 target (134.57 instead of 130 g/km CO_2 on average). Conversely, if their cars are lighter than average they get a tougher target. The disadvantages of weight-based standards are discussed on page 22.

Manufacturers can also file for joint-compliance with other manufacturers, in order to average their emissions over a larger pool of vehicles. This flexibility mechanism is called 'pooling'.

Enforcement will take place 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. The law also includes several loopholes:

- Up to 7 g/km credits for 'eco-innovations', off-cycle credits of unmeasured CO_2 that can be exchanged for measured reductions on the official test cycle;
- 'Supercredits' for very low-emission cars, which allow manufacturers to count each low emission vehicle as more than one car and would hence water down the overall CO_2 reductions because they are based on fleet averages;
- Much lower penalties for missing the target by a few grammes (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;
- A special regime for carmakers with between 10,000 and 300,000 sales in the EU. They can apply for a default target of a 25% reduction compared with 2007 (Tata, the owner of Jaguar/Land Rover, is a likely applicant, and some Japanese carmakers like Mazda and Suzuki could apply too);
- Exemptions for carmakers with less than 10,000 sales in the EU, who can negotiate their own target with the Commission.

All these loopholes together in practice mean that the target for 2015 is closer to 140 g/km, rather than 130 g/km.

[7] See: The official website explaining the law can be found at http://ec.europa.eu/clima/policies/transport/vehicles/cars/index_en.htm

[8] See: *The Impact of Phaseing in Passenger Car CO2 Targets on Levels of Compliance,* www.transportenvironment.org/Publications/prep_hand_out/lid:515

Review of 'modalities' of 95 g/km for 2020

As already said, the 2009 law adds a 95 g/km target for 2020 and says the 'modalities' and 'aspects of implementation' of this target will have to be reviewed by the Commission by January 2013.

The Commission made its review proposal half a year ahead of time, in July 2012.[9] It keeps in place the 95 g/km industry-average target for 2020, the €95/g/km penalty level, the system of 'eco-innovations', and the weight-based differentiation of manufacturer-specific targets. The main changes it proposes are:

- It flattens the 'slope of the curve' i.e. the CO_2 credit for producing heavier cars, from 4.57 g per 100 kg, to 3.33 g per 100 kg. Although notably Germany has strongly opposed this change, it is not a political but a technical move: the more efficient cars become, the less fuel is needed and less CO_2 emitted to propel 100kg of extra weight. In relative terms the advantage of heavier over lighter cars remains the same, at 60% of the natural correlation between additional weight and arising CO_2 emissions to propel the vehicle. The required emissions reduction from 2015 levels is 27% for all carmakers.[10] T&E advocates a shallower slope of 2.96 g per 100kg for several reasons: it would improve lightweighting incentives and would deliver greater CO_2 savings as it would require larger vehicles, which drive higher annual distances, to reduce their emissions more;
- It re-introduces so-called 'supercredits' – a euphemism for counting ultra-low carbon vehicles more than once. This introduces 'hot air' into the law. The current legislation phases them out in 2016. The Commission proposal limits the weakening and proposes a supercredit ratio of 1.3 (which is rather low compared with the 1.5-3.5 ratios for the 2012-15 years), a tightening of the threshold from 50 gCO_2/km to 35, and a limit to the number of ultra-low carbon vehicles per manufacturer that supercredits can be applied to, to 20,000. The industry is arguing for more generous allowances. T&E opposes supercredits and has instead developed an alternative flexible mandate that would require carmakers to sell 2.5% ultralow carbon vehicles in 2020. Those achieving more than 3% would be rewarded with a 1 gCO_2/km reduction in their target. Those achieving less than 2% would have 1 gCO_2/km added to their target;
- It introduces an optional 45% reduction target for 2020, compared with 2007, for manufacturers which sell less than 300,000 vehicles on the EU market. This can be attractive for those manufacturers who's 2007 emissions are very high; for comparison, the 'standard' 95 g/km target represents on average a 40% reduction compared with the 158 g/km baseline of 2007. T&E is calling for revisions to the system of derogations for small volume manufacturers to improve the transparency of targets and reduce market distortions.

[9] See: The European Commission website with the proposal for 2020 can be found at http://ec.europa.eu/clima/policies/transport/vehicles/cars/documentation_en.htm#Proposed_legislation_for_2020. T&E published a fact sheet on the proposal http://www.transportenvironment.org/publications/te-faq-cars-co2-standards

[10] See: For more in depth explanation: http://www.theicct.org/blogs/staff/detailing-eu2020-co2emissionregscars

Methodology and data

We analysed 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[11].

This database includes figures for cars sold in the EU27 in 2011 including weight, footprint, and CO_2 emissions. On the basis of this data we were able to produce the rankings published in this report.

Note on data quality

It is important to note that the database 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 significantly better than the database collected under the voluntary commitment. The database now appears to contain very few aberrant data on CO_2 or weight. Data quality is still slightly uneven as collection methods vary by Member State, but continues to improve significantly. Footprint data in particular appear much improved since last year, although there are still some missing or implausible values.

For our analyses we restricted the calculations to points where data was 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, and some numbers may change slightly as a result of the ongoing review being undertaken by the EEA. Nonetheless we do not anticipate that any changes will affect the overall picture significantly relative to what is presented here.

The EEA also analysed the data and reported on them earlier this year.[12] The EEA focuses on overall trends and data per Member State. This report is intended to complement the EEA's report by focusing on the position of manufacturers, distance to regulatory targets, and the impact of possible regulatory changes including the proposed 2020 target.

It is important to note that all the data are sales-weighted i.e. based on the actual number of cars sold by each manufacturer in each country. This is relevant because the CO_2 law also does not apply to individual vehicles nor the average of the range of vehicles on offer but rather to sales-weighted averages.

Only the volume car manufacturing groups (those that sold over 150,000 vehicles in the EU27 in 2010) were included in the study. These were the same 14 manufacturers that were included in our previous reports, plus one new entrant: Volvo. Volvo was previously owned by Ford so included in the parent company's figures. Volvo was sold to Geely in 2010 and sold enough cars in 2010 to warrant inclusion in our analysis.

[11] See: http://ec.europa.eu/clima/documentation/transport/vehicles/cars_en.htm
[12] Monitoring the CO2 emissions from new passenger cars in the EU: summary of data for 2011, June 2012, http://www.eea.europa.eu/publications/monitoring-co2-emissions-from-new

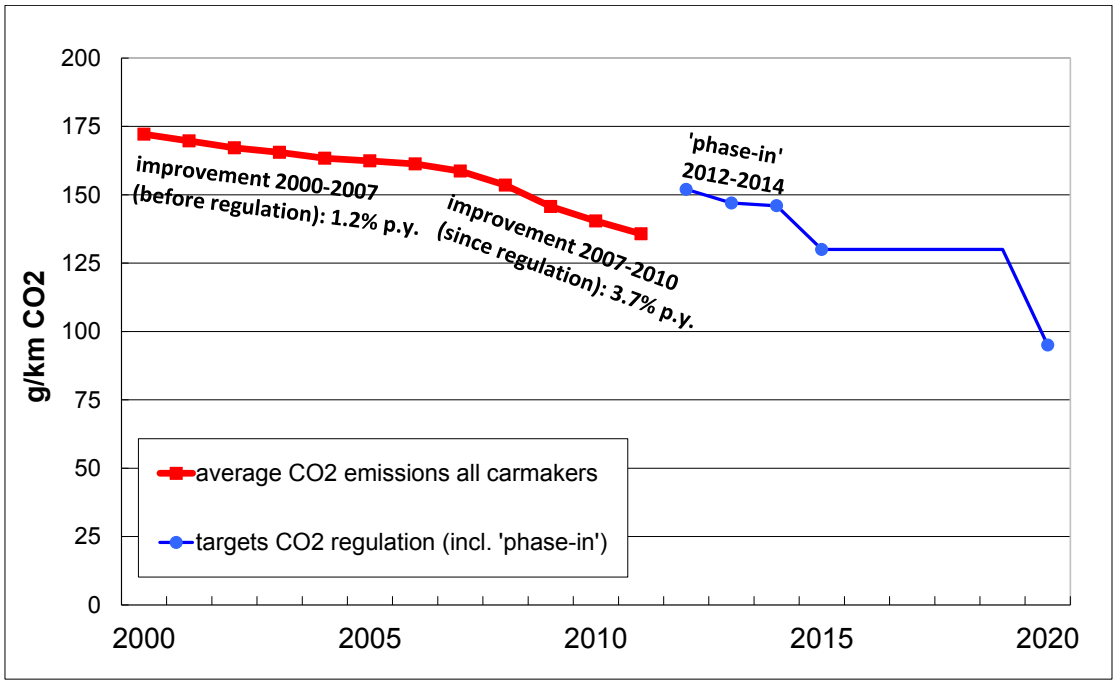
Overall developments in CO_2 emissions

In this chapter we present the progress of the industry as a whole in cutting CO_2 and look at industry cost estimates for reaching targets, followed by an examination of actual retail price developments.

Progress in official CO2 figures

The graph below depicts historical progress of the industry and future targets as set by the EU's regulation on CO_2 from cars.

Graph 2: fleet-average CO_2 emissions of new cars in the EU versus regulatory CO_2 targets



The car industry reduced CO_2 emissions from 140 g/km in 2010 to 136 g/km in 2011. This is a rate of progress of 3.3%. Progress in 2008, 2009 and 2010 was 3.0%, 5.1% and 3.7% per year, respectively. Overall progress over the 2007-2011 period was 14%, or 3.7% per year. That is three times faster than the progress achieved before the legislation. Progress between 2000 and 2007 was only 8%, or 1.2% per year.

The 14% reduction in CO_2 emissions between 2007 (when the EU regulation was proposed) and 2011 – from 158 to 136 g/km - equates to a reduction in fuel consumption of 0.9 litres per 100 km. Over the lifetime of a car – roughly 200,000 km – this represents 1,800 litres of fuel, which at today's prices equates to about €2,600 in fuel savings per car sold.

CO_2 reductions in the real world

Recently evidence has emerged that the reductions in official CO_2 and fuel consumption figures do not necessarily translate into equal reductions in fuel consumption on the road. Car magazines and TV shows have over the past years paid significant attention to this issue. However, until recently systematic analysis was lacking.

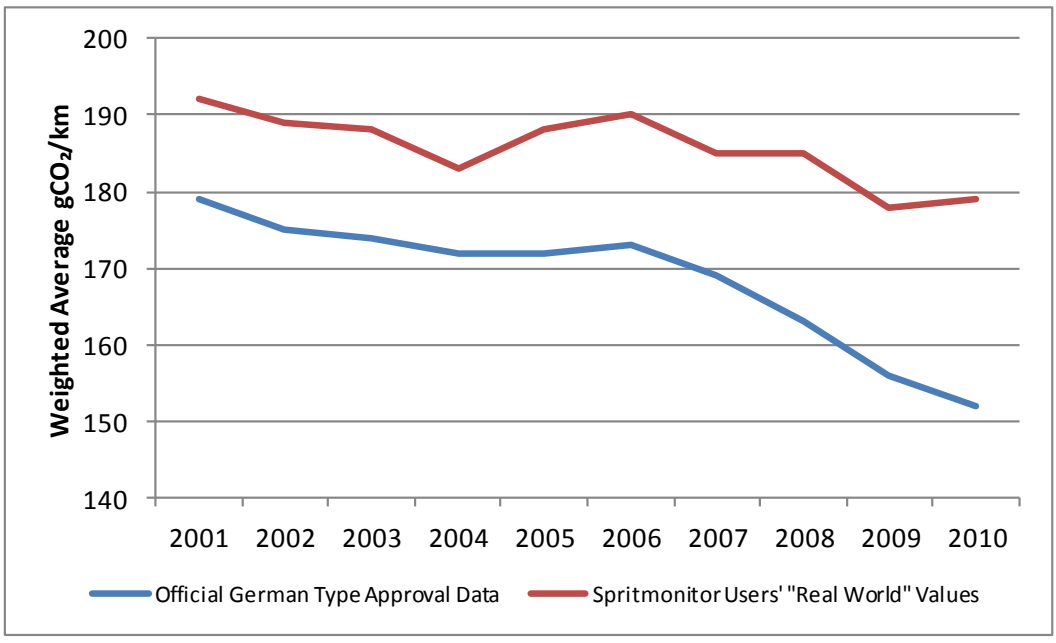
This changed when ICCT published a report in April 2012[13]. It takes the German website www.spritmonitor.de as a basis for real-world fuel consumption figures. Spritmonitor is a site that allows users to record the fuel consumption of their vehicles. ICCT compared over 28,000 records of real-world emissions with the official CO_2 figures of the same vehicles.

The report draws the following conclusions:

- *'The difference between type-approval and real-world CO_2 emission levels of new passenger cars in Germany has increased from about 8% in 2001 to about 21% in 2010. The widening of the gap is especially noticeable since 2007 when mandatory CO_2 emission standards for the EU were under development;*
- *The analysis confirms that there was a decrease in the level of CO_2 emissions of new passenger cars in Germany since 2001. However, the magnitude of reduction in reality appears to be only about half of what is suggested by the type-approval values (about 7% instead of 15% since 2001).*

The graph below illustrates these statements. It shows that between 2006 and 2010, official CO_2 figures fell from 173 to 152 g/km (12%), whereas equivalent data from www.spritmonitor.de (i.e. 'real-world') data show a fall from 190 to 179 g/km (6%).

Graph 3: CO_2 emissions according to official German type-approval data and real-world values



[13] Discrepancies between type-approval and real-world fuel consumption and CO2 values in 2001-2011 European passenger cars, ICCT, April 2012, **http://www.theicct.org/fuel-consumption-discrepancies**

This means that according to this analysis, users do not achieve half of official reductions in CO_2 and fuel consumption reductions in their everyday use of the vehicle. This conclusion is as striking as it is worrying. Of the €2,600 of fuel cost savings that buyers of new cars would have enjoyed were official data true, they probably enjoy only €1,300. The other €1,300 has not materialised.

The big question is why. It is not likely that German users have massively changed driving behaviour over the past decade. It is also unlikely that driving patterns and typical trips have changed significantly enough in Germany to offer an explanation. The test cycle and test procedures also have not changed in the past decade.

The only realistic conclusion is that manufacturers have become more adept at 'optimising' the CO_2 testing of their vehicles. There are many possible strategies to do this, and as a result it is becoming increasingly difficult to reproduce official CO_2 emissions figures in laboratory tests, and the gap between official and 'real world' CO2 figures is growing.

Further evidence on this issue is currently emerging, and T&E will produce a separate report on this in 2013.

Progress and position per carmaker in 2011

In this chapter we present two rankings of the 15 largest carmakers, based on performance in 2010 and 2011.

Table 1: ranking of fleet-average CO_2 emissions of each carmaker and 2011 progress

		Registrations	Average CO2			Improvement 2010-11	
CO2 Ranking		2011	2011	2010	Ranking		%change
1	Fiat	844,791	119.4	125.8	1	Fiat	-5.1%
2	Toyota	531,116	126.8	129.6	2	Daimler	-4.6%
3	Peugeot-Citroën	1,609,102	127.4	131.1	3	Volkswagen	-3.9%
4	Renault	1,239,444	131.4	135.8	4	Suzuki	-3.7%
5	Suzuki	177,248	131.6	136.6	5	Volvo	-3.5%
6	Ford	1,035,594	132.2	136.5	6	Renault	-3.3%
7	Hyundai	641,631	134.2	137.9	7	Ford	-3.2%
8	General Motors	1,134,845	135.4	139.0	8	Peugeot-Citroën	-2.9%
9	Volkswagen	2,987,113	137.3	142.9	9	Nissan	-2.9%
10	Nissan	441,461	142.9	147.1	10	Hyundai	-2.7%
11	BMW	755,988	144.8	147.5	11	General Motors	-2.6%
12	Honda	139,681	144.9	146.8	12	Toyota	-2.2%
13	Mazda	125,241	146.6	149.4	13	BMW	-1.9%
14	Volvo	224,534	151.4	156.8	14	Mazda	-1.8%
15	Daimler	626,182	153.5	160.9	15	Honda	-1.4%
	All Manufacturers	12,793,903	135.8	140.4		All Manufacturers	-3.3%

The following conclusions can be drawn regarding the progress of the 15 largest carmakers in the EU in 2011:

- The industry as a whole achieved 3.3% progress, less than the two previous years' rates of progress of 3.7 and 5.1% respectively, but significantly higher than the 1.2% per year average reduction in the 2000-2007 period;
- Fiat has further extended its lead as the manufacturer with the lowest average emissions by achieving the highest level of improvement in 2011;
- Six of Europe's seven largest carmakers by sales are in the 2-6% range for progress in 2011. Only BMW falls slightly below this range. The range in performance amongst volume carmakers is less wide than in previous years, with all making measurable progress;
- Asian carmakers occupied most of the lowest positions in terms of progress in 2011, although all improved by more than 1%. The exceptions are Toyota, which improved on last year's performance and remains in the top three overall, while Suzuki moves into fifth place;
- The two American groups, Ford and GM, maintained a performance close to that in 2010, although they fell slightly below the average improvement in 2011;

- As a result of the relatively even performance amongst major carmakers, the top-four in terms of average CO_2 remained unchanged in 2011. Fiat remains in the lead with respect to average CO_2 emissions from new cars with a 119 g/km average, and the greatest percentage improvement in 2011 as well. Toyota, PSA and Renault continued to fill positions 2-4;
- Volkswagen made a further strong improvement to add to its 6% reduction in 2010, but still ranks below other European large volume manufacturers;
- Daimler remains the volume carmaker with the highest emissions but made good progress in 2011;
- Volvo also improved further but remains only slightly ahead of Daimler.

Distance to 2015 targets by carmaker

The regulation on cars and CO_2 is designed to achieve a 130 g/km average figure by 2015. This average target does not apply to individual carmakers directly. Carmaker targets for 2015 are differentiated 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.

This chapter assesses how far carmakers are away from the regulatory targets for 2015.

The graph below presents how Europe's top-15 carmakers are placed with respect to hitting the 130 g/km target for 2015, which is based on vehicle weight.

Graph 4: fleet-average weight and fleet-average CO_2 emissions by carmaker, compared with EU target line

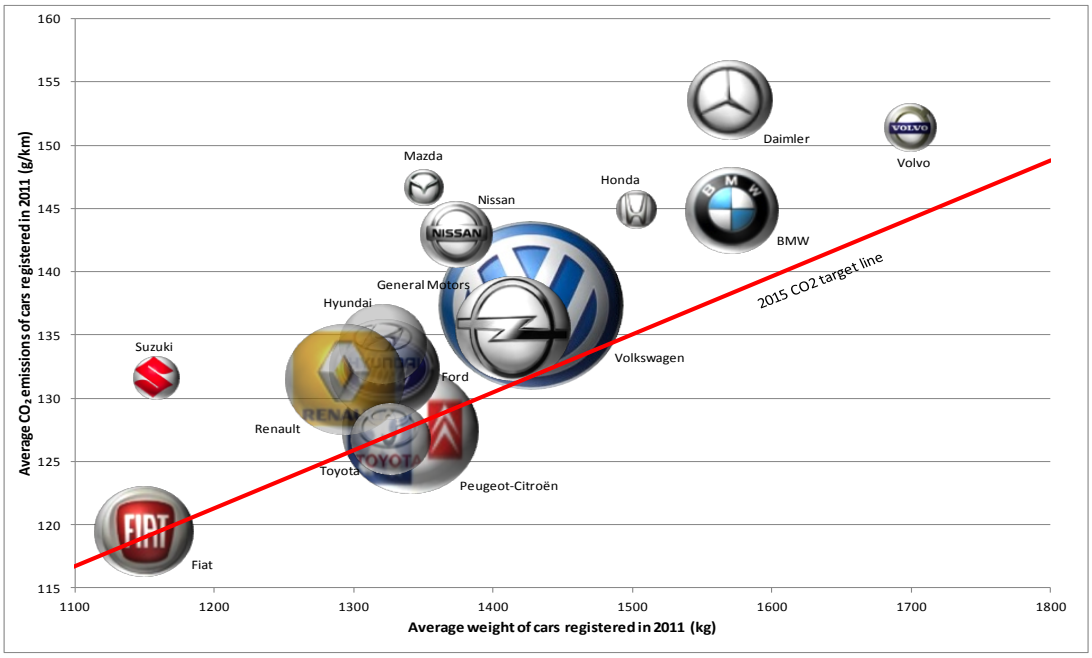


Table 2: ranking of the percentage reduction in CO_2 each carmaker now has to make in order to hit its 2015 EU CO_2 target

Ranking		2011 Performance	Target 2015	Reduction Required
1	Peugeot-Citroën	127.4	127.8	-0.3%
2	Toyota	126.8	127.2	-0.3%
3	Fiat	119.4	119.1	0.3%
4	General Motors	135.4	131.2	3.2%
5	Ford	132.2	127.0	4.0%
6	Volkswagen	137.3	131.8	4.0%
7	Renault	131.4	125.7	4.4%
8	BMW	144.8	138.4	4.4%
9	Volvo	151.4	144.2	4.7%
10	Hyundai	134.2	126.9	5.5%
11	Honda	144.9	135.2	6.6%
12	Suzuki	131.6	119.5	9.2%
13	Nissan	142.9	129.3	9.5%
14	Daimler	153.5	138.3	9.9%
15	Mazda	146.6	128.3	12.5%
	Average	135.8	130.0	4.3%

* Assuming the average weight of the company's new cars in 2015 will be the same as in 2011
** 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 very slightly overtaken Toyota to achieve the top spot when it comes to hitting regulatory targets. PSA and Toyota have apparently already exceeded their targets, a full four years ahead of time;
- Fiat has already reached the originally-proposed target line, but falls just short of the target when rebased to reflect the higher 2011 vehicle weights;
- Progress was more evenly spread across manufacturers than in previous years, with virtually all carmakers now rapidly approached their targets. Only five of the major manufacturers now have more than 5% further effort to make over the next four years;
- Daimler is still furthest away of the EU carmakers with a 9% gap still to close. However it made some of the fastest progress in 2011, at twice the pace required from now to 2015, so this still looks easily achievable if progress is maintained.
- Four Japanese carmakers - Mazda, Nissan, Suzuki, and Honda - are the others left with most to do;
- Mazda is the only manufacturer with more than a 10% reduction still to make, but may benefit from a loophole in the EU legislation that enables carmakers with sales below 300,000 units to apply for a 25% reduction target compared with 2007 levels. In Mazda's case this would weaken the target, but probably only slightly.

The 3.3% progress carmakers achieved in 2011 again brings them much closer to the 2015 target. In 2010 they were 7% away from the target, but have now barely half

that still to do with four more years of results to come. The outstanding 3.7% figure does not even take earlier-described loopholes like ‘eco-innovations’ and ‘supercredits’ into account, which in effect water down the 130 g/km target to values closer to 140 g/km.

Our headline conclusion from last year’s report is therefore further underlined: all available evidence points towards carmakers in Europe heading for very significant ‘over-compliance’ with the CO_2 regulation and are hence all are likely to hit the target for 2015, most of them with several years to spare.

Towards a 2020 target

The Commission has now proposed 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 such a target.

In the table 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 commitments applied. These rates of progress are then compared with what is required in order 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	2008-2011	2011-2020	Outlook
1	Peugeot-Citroën	1.9%	2.9%	3.3%	☺
2	Toyota	1.8%	4.9%	3.3%	☺
3	Fiat	1.6%	4.7%	3.4%	☺
4	General Motors	0.8%	4.0%	3.7%	😐
5	Ford	2.4%	4.5%	3.8%	😐
6	Volkswagen	0.6%	4.7%	3.8%	😐
7	Renault	1.5%	2.8%	3.8%	😐
8	BMW	3.6%	2.1%	3.9%	😐
9	Volvo	n/a	n/a	3.9%	😐
10	Hyundai	2.8%	3.5%	4.0%	😐
11	Honda	3.0%	2.0%	4.1%	☹
12	Suzuki	1.3%	5.5%	4.4%	☹
13	Nissan	1.0%	3.9%	4.4%	☹
14	Daimler	1.5%	4.3%	4.5%	☹
15	Mazda	2.1%	2.5%	4.8%	☹
	Average	1.4%	4.0%	3.8%	😐

This calculation illustrates that, across future EU car sales as a whole, the rate of progress required from now till 2020 is somewhat less than the rate that has actually been achieved over the past four years.

The list of distance-to-target for 2015 is similar to the list for 2020; the proposal to achieve 95 g/km hence does not change the distribution of efforts required.

It is striking that almost all EU manufacturers are in the top 9. The average reduction the top-9 has to make is 3.7% per year. The only EU manufacturer present in the bottom 6 – who have to reduce by 4.3% per year on average - is Daimler.

At the level of individual manufacturers, the position is more variable:

- Perhaps not surprisingly, the current front runners (Fiat, Toyota and PSA) seem well-placed to meet the target, with Fiat and Toyota required to make significantly less effort than they have shown in recent years;
- The same is also true of Ford, General Motors, Suzuki and Volkswagen, all of which have significantly raised their game in recent years in comparison to their previous performance;
- Daimler is low in the list but will have to do only slightly more than it has done in the past four years on average, while BMW will have to do only slightly more than it achieved in the period before the legally binding targets were agreed;
- Perhaps surprisingly, Renault is one of the European manufacturers required to raise its game the most. Although it currently has the fourth-lowest average emissions of any of the major manufacturers, it began from a favourable position and has actually progressed rather slowly from there, so it will need to accelerate its progress;
- Several of the Japanese manufacturers (excluding Toyota) plus Hyundai will need to do more to meet the new target.

Special analysis: vehicle weight

The importance of vehicle weight for CO_2

Vehicle weight has a huge impact on fuel consumption and CO_2 emissions.

Fuel consumption is a result of overcoming four forces: acceleration, rolling resistance, gradients (uphills) and aerodynamic resistance. Only the last is not directly related to car weight; the other three are.

As a result, every per cent vehicles are made lighter typically results in 0.7% lower fuel consumption and CO_2 emissions. Not other single vehicle characteristic is as important; size, frontal area and engine power are all very important drivers of fuel consumption, but not this important.

Potential for weight reduction and CO_2 savings

Surprisingly little publicly available research has been done that looks specifically and in-depth into opportunities for vehicle weight reduction.

A study by Lotus published by ICCT[14] is an exception. It shows that cars can be made 33% lighter using technologies ready for mass production in 2020, resulting in 23% fuel and CO_2 savings, at marginally (3%) higher component costs (NOT to be confused with manufacturer costs).

How current EU law discourages weight reductions

EU policymakers felt that car CO_2 standards should take account of the 'utility' or purpose of the vehicle and makers of larger cars should achieve higher targets. This is despite the fact average car in the real world only carries one to people and others only two.

However, the EU's solution to the utility question was to base CO_2 standards on the weight of the vehicle. In many ways this was a bizarre choice as weight is not linked to utility in any meaningful sense. There are two-seaters on the market that weigh 2 tonnes and seven-seaters that weigh 1.5 tonnes. Consumer car reviews tend to see weight as a negative rather than a positive. Clearly then, weight fails as a proxy for the utility of a car.

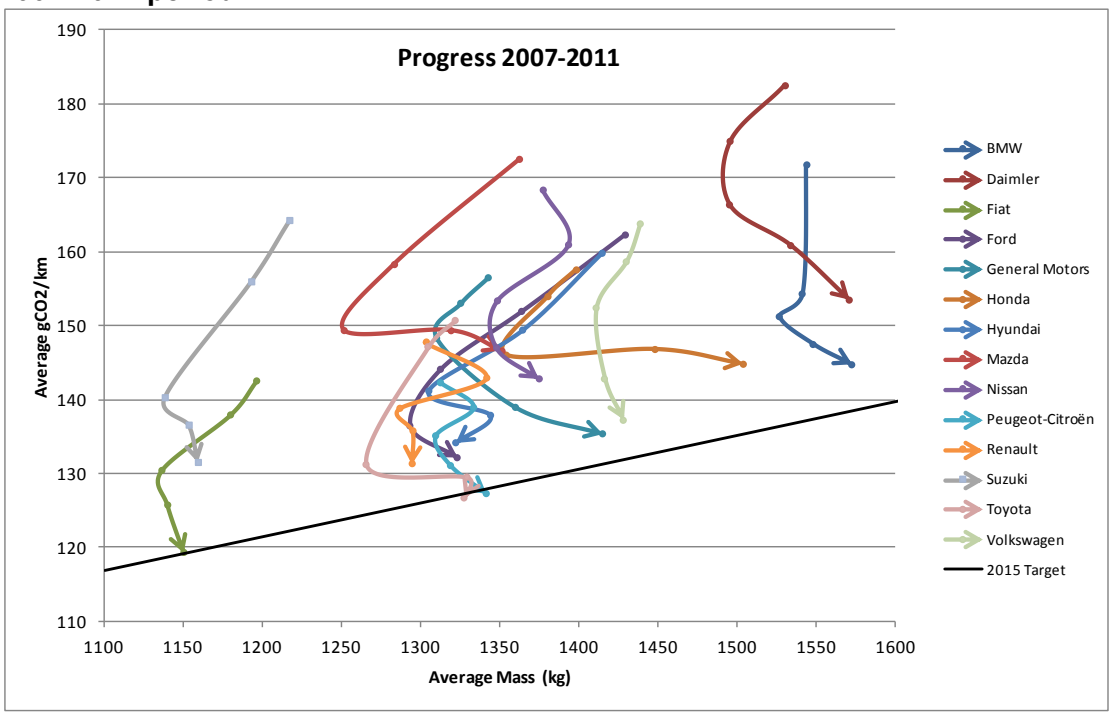
T&E has always opposed linking CO_2 standards to vehicle weight, arguing that it takes away important incentives for vehicle lightweighting.[15] A carmaker that makes his cars 100kg lighter on average sees its company CO_2 target tightened by 4.57 g/km.

[14] See: http://www.theicct.org/lotus-lightweighting-study
[15] T&E briefing: www.transportenvironment.org/Publications/prep_hand_out/lid:500

The effect of vehicle mass on targets

In the graph and table shown in the previous chapter, the distance of each manufacturer from the target was calculated on the assumption that their average vehicle mass in 2015 would remain the same as it is now. This is the safest assumption to make, but in reality the targets can change from year to year if the average mass of vehicles sold also changes. This point is illustrated in the graph below which sets out the path of each manufacturer's progress towards the 2015 'finishing line' over the past five years.

Graph 5: development in fleet-average weight and CO_2 per carmaker over the 2007-2011 period



As in the table above, this illustrates Fiat (lower left) and Toyota and Peugeot (centre left of group) just about reaching the black target line in 2011, while others have more to do. However, it can be seen that none of the manufacturers have proceeded in a straight line towards their target.

All of the arrows point towards the lower edge of the graph, reflecting a general progress towards the target. However, most show some degree of shift to the left in the upper part of the line, reflecting that the average mass of the cars they sold during the recession of 2008/9 decreased. This was not because they made their cars lighter during this period (they could not in any case have done so this quickly), but rather that car buyers tended to choose smaller cars and cars with fewer additional features, not least because of scrappage subsidies which made cheap cars (typically light ones) suddenly extremely affordable.

In more recent years this shift to the left has largely halted, and in many cases has been substantially reversed leading to heavier cars. This is remarkable, given the dominant continued recession and austerity in the EU which likely drives people towards cheaper and lighter cars.

Ironically the 'shift to the left' in 2008/9 took most manufacturers further away from the target line than if they had maintained sales at a constant mass while achieving the same CO_2 reduction, and the 'shift to the right' has brought them closer.

Unsurprisingly, then, carmakers have explored many possible avenues to reduce CO_2 emissions, but not weight reduction. The overall average weight of cars sold has increased to 1,389kg, its highest value since 2003.

Had carmakers managed to keep the weight of their vehicles at 2009 levels (53 kg lighter), their fleet-average CO2 would have been 132 g/km, not 135.7 g/km.

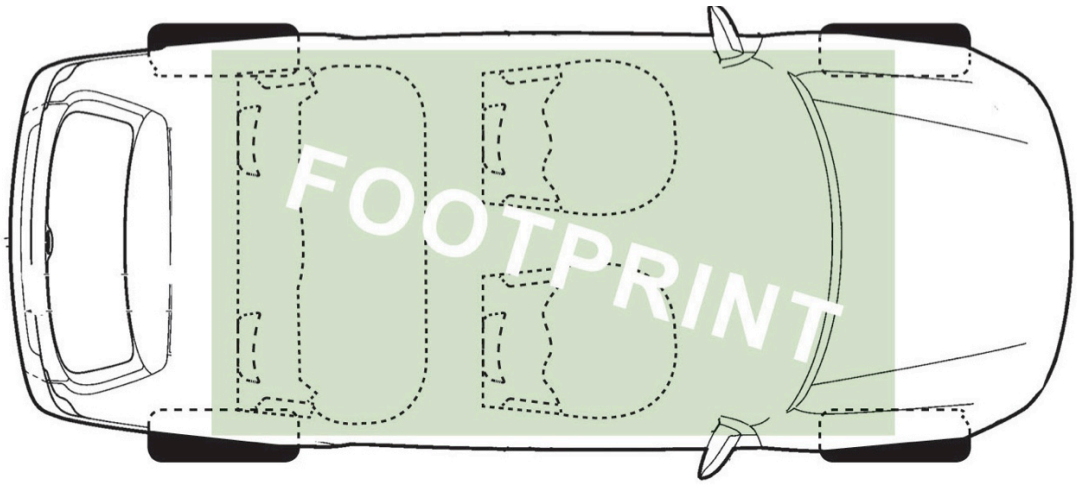
A better alternative: CO_2 standards based on 'footprint'

Research commissioned by T&E found that basing CO_2 standards on the car's 'footprint' is likely to allow cheaper and deeper CO_2 reductions because it would fully reward lightweighting strategies. It would also likely to lead to safer vehicles than weight based standards.[16]

More recent research by ICCT[17] confirms these findings, and additionally concludes that a change towards a footprint-based system has very little impact on the distribution of efforts between manufacturers – but does reduce the costs of compliance.

Figure 1 illustrates the concept of the 'footprint' of a car. Technically it is the average track width multiplied by the wheelbase of a car, which is roughly speaking the area between the four wheels. This is typically the space in which the passenger compartment is built, and hence a good proxy for the utility of a passenger car.

Figure 1: A car's 'footprint": the surface of the light green area



Footprint has little impact on CO_2 emissions; the only impact is that high-footprint cars have bigger frontal areas hence more air resistance.

The US already bases its fuel consumption and CO_2 standards for cars on their footprint, for reasons of exploiting lightweighting, and for reasons of safety. The EU should follow suit.

[16] TNO/IEEP study: www.transportenvironment.org/Publications/prep_hand_out/lid/512
[17] http://www.theicct.org/evaluation-parameter-based-vehicle-emissions-targets-eu

Status and progress by Member States

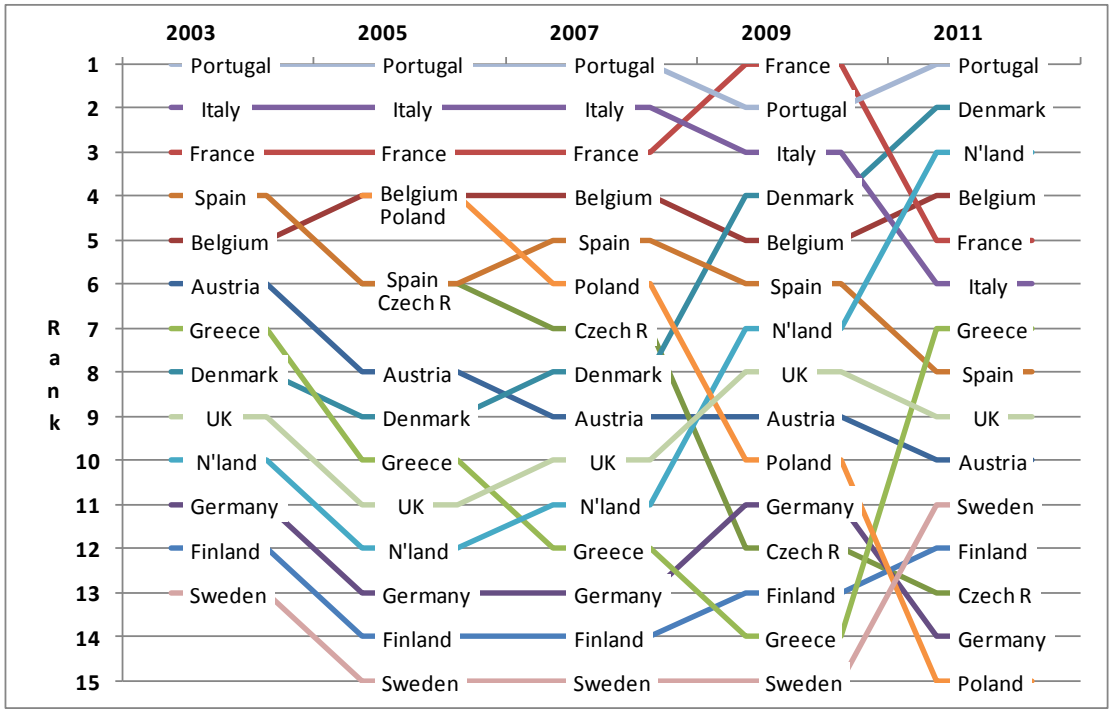
This chapter provides an overview of progress by EU Member State in reducing average new car CO_2 emissions. Countries do not have individual targets, but are able to influence sales of low-CO_2 vehicles in many ways including CO_2-based registration and circulation taxes, company car taxation and through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

Table 4: Average CO_2 emissions of new cars sold in 2011 in EU Member States and improvement since 2010

		Registrations	Average CO2			Improvement 2010-11	
	CO2 Ranking	2011	2011	2010		Ranking	% change
1	Portugal	154,268	122.8	127.2	1	Greece	-7.4%
2	Malta	6,332	124.5	131.2	2	Netherlands	-7.1%
3	Denmark	169,966	125.0	126.6	3	Sweden	-6.3%
4	Netherlands	553,687	126.2	135.8	4	Romania	-5.2%
5	Belgium	576,636	127.3	133.4	5	Malta	-5.1%
6	France	2,173,906	127.7	130.5	6	Bulgaria	-4.7%
7	Ireland	90,167	128.3	133.2	7	Latvia	-4.7%
8	Italy	1,745,276	129.5	132.7	8	Belgium	-4.6%
9	Greece	97,050	133.1	143.7	9	Lithuania	-4.4%
10	Spain	809,956	133.8	137.9	10	UK	-4.2%
11	UK	1,937,317	138.1	144.2	11	Hungary	-3.9%
12	Austria	355,781	138.7	144.0	12	Cyprus	-3.8%
13	Slovenia	55,119	139.7	144.4	13	Germany	-3.7%
14	Romania	81,600	140.8	148.5	14	Austria	-3.7%
15	Hungary	46,828	141.7	147.4	15	Ireland	-3.7%
16	Sweden	288,789	141.8	151.3	16	Portugal	-3.5%
17	Luxembourg	49,886	142.1	146.0	17	Finland	-3.4%
18	Finland	122,227	143.9	149.0	18	Slovenia	-3.3%
19	Lithuania	12,291	144.3	150.9	19	Estonia	-3.1%
20	Czech Rep	169,261	144.6	148.9	20	Spain	-3.0%
21	Slovakia	69,203	144.9	149.0	21	Czech Rep	-2.9%
22	Germany	2,932,608	145.6	151.2	22	Slovakia	-2.8%
23	Poland	275,198	146.0	146.2	23	Luxembourg	-2.7%
24	Cyprus	14,598	149.9	155.8	24	Italy	-2.4%
25	Bulgaria	14,082	151.4	158.9	25	France	-2.1%
26	Latvia	10,481	154.4	162.0	26	Denmark	-1.3%
27	Estonia	17,022	156.9	162.0	27	Poland	-0.1%
	EU27	12,829,535	135.8	140.4		EU27	-3.3%

To give a longer term perspective, the graphic below summarises the relative performance of the Member States with the largest car markets across the past nine years.

Graph 6: 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

Portugal has returned to pole position after being briefly overtaken by France and Denmark in the past two years. Portugal remains one of the poorer countries in the EU15, so relatively few cars are bought new and they are on average smaller than the average for the whole EU. Vehicle taxes are steeply differentiated against CO_2. All these factors explain Portugal's renewed lead.

Denmark has improved its position steadily over recent years to first in 2010 and now a top-three place, in spite of having to accommodate some of Europe's tallest drivers. In 2007 the Danish high vehicle purchase tax 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.

The Netherlands has risen even further and faster on the rankings over a similar period of time. 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 a company car tax system with strong incentives in 'benefit-in-kind' tax rates for low-CO2 vehicles. The thresholds and emission categories were further revised downwards in 2012 to incentivise the lowest emitters. But the same applies as in Denmark; average tax rates have fallen, with uncertain rebound effects on car sales hence car use.

Much Improved

Greece stands out as the most improved Member State in 2011, just ahead of the Netherlands. 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 or more luxurious ones. On the other hand, better fuel economy is likely to be at a premium in the difficult times ahead.

Sweden has traditionally bumped along the bottom of the car CO_2 table. This is owing to a strong preference for (typically heavy) 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 - by nearly 27% against an EU average of only 17%. In 2011 it achieved one of the best annual improvements in average CO_2, and as a result it has now overtaken several other Member States and is moving towards the middle ranks. Since 2009, cars emitting less than 120 g/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.

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 and ended up costing the state approximately €1bn. A government study cast doubt over the environmental benefits of the first phase of the system because of before-mentioned rebound effects on car sales, prompting more car use.[18] The system has been reformed to better balance bonus and malus.

The Backmarkers

Poland, the Czech Republic and a number of the other members of the EU10 inhabit the lower part 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 slow progress, at least partly owing to a lack of incentives for fuel efficiency in the tax system. They now find themselves well above the EU's average level.

Germany continues to drift towards the bottom of the table. 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 has launched a new labelling scheme so counterintuitive that it rates a 191 g/km CO_2

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

Porsche Cayenne the same as a 114 g/km Citroen C3.[19] 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.

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