HOW CLEAN ARE EUROPE'S CARS?

An analysis of carmaker progress towards EU CO_2 targets in 2009

TRANSPORT & ENVIRONMENT

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Editeur responsable
Jos Dings, Director

T&E – European Federation for Transport and Environment AiSBL
Rue d'Edimbourg, 26 | B-1050 Brussels | Belgium

www.transportenvironment.org

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Summary

This report is the fifth 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. The main purpose of these reports is to assess the progress that major car manufacturers in Europe are making towards cutting the average CO_2 emissions of their products. We also assess how each carmaker is positioned to hit the mandatory CO_2 standards that the European Union has set for 2015. In this year's report, we add an analysis showing to what extent the CO_2 reductions achieved can be attributed to the financial crisis i.e. sales of cheaper, smaller cars, and to what extent to technological improvements.

The source is the official data the European Commission collects[1] in order to monitor progress of the industry under voluntary CO_2 reduction commitments agreed with the industry in 1998/9[2]. Analysis of the Commission data was carried out by the consultants AEA Technology[3] except the analysis for the section entitled 'Was progress due to the crisis or technology?' (pg 14-17 and Annex 1), which was carried out by T&E.

The main conclusions of this year's report are:

1. The car industry as a whole reduced its sales-weighted average emissions of CO_2/km by a record 5.1% in 2009. All 14 major manufacturers reduced emissions, with rates between 2 and 10%;
2. The financial crisis and government subsidies for new cars (so-called 'scrappage schemes') played their role in reducing sales average CO_2/km by shifting demand to cheaper cars (which are typically smaller and pollute less). But they do not explain all of the progress - in fact our analysis suggests that actually at least half of the reductions in 2009 were achieved through better drivetrain technology;
3. Toyota made the biggest progress in 2009. The company recorded a 10% improvement in fuel efficiency over the year, and consequently is now best placed for compliance with its EU regulatory target for 2015. It has six years in which to reduce by a further 4%, half the progress it made in 2009 alone. Toyota also jumped from 6th to 2nd place in terms of average CO_2 (132 g/km). Fiat is the carmaker with the lowest average CO_2.
4. According to the analysis in this report, Toyota, Suzuki, Daimler, Mazda and Ford appear to be the manufacturers achieving the most progress through better technology rather than by selling more small cars. These carmakers all achieved more than 3% improvement in average CO_2 in 2009 through the application of fuel-efficient technologies.

[1] The data source used for this report is the official EU database established to monitor CO_2 emissions from passenger cars. It is available online. The source is an updated version of the one used for the previous three editions of this report. It should be noted that the geographical coverage of the figures is the EU27, whereas in last year's report it was the EU27 minus Bulgaria and Slovakia. As these missing countries represented less than 1% of total sales in the EU27, the impact of this change in scope is minimal. This report, like the three previous editions, deals with manufacturer groups, not individual brands. When it speaks, for example, of Volkswagen, it refers to sales of all the car brands within the Volkswagen group i.e. Audi, Bentley, Bugatti, Lamborghini, Seat, Skoda and VW.

[2] europa.eu/legislation_summaries/internal_market/single_market_for_goods/motor_vehicles/interactions_industry_policies/l28055_en.htm

[3] www.aeat.co.uk

5. It appears that Hyundai, Suzuki and Fiat benefited most from subsidies to reduce their sales-average CO_2, each with more than 3% cuts resulting from sales of lighter and less powerful vehicles;
6. Manufacturers furthest away from regulatory targets were boldest in cutting emissions, a trend first seen in last year's report. This is further evidence of the effectiveness of the EU regulation. Toyota was the exception, having made substantially more progress than necessary to meet the target on time;
7. Taken together carmakers closed 30% of the gap towards the 130 g/km target for 2015 in just one year. Toyota closed more than two thirds, while on the other hand BMW, Daimler, Nissan and General Motors all closed less than a quarter. Renault only closed 1 of the 10% it still has to cut, and its progress was explained by selling smaller cars, not better technology;
8. Other carmakers with limited technological progress include PSA and BMW. The latter company appears to have finalised introduction of its 'Efficient Dynamics' technologies across its fleet. In the previous two years, BMW made the most progress of any carmaker.
9. All available evidence suggests that carmakers in Europe are heading for very significant 'overcompliance' with the CO_2 regulation and are hence likely to hit the target for 2015 years in advance.
10. Western European member states saw good progress, ranging from 3.6% in Portugal to 7.9% in Ireland, while all Central and Eastern European member states had below-average rates of progress. The Czech Republic and Romania were, for the second year in a row, the only two member states where average fuel efficiency of new cars actually got worse.

Introduction

This report is the fifth 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. The first report was published in October 2006, the second in November 2007, the third in August 2008 and the fourth in September 2009[4].

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

The EU's car market in 2009 was heavily affected by the economic crisis and the subsidies (so-called 'scrappage schemes') introduced by many governments. The impact of both was that cars sold in 2009 were typically cheaper, smaller and less powerful than normal, and hence typically had lower CO_2 emissions than normal.

As a consequence of these exceptional developments, T&E analysed, for the first time to what extent reductions in average CO_2 emissions can be explained by the crisis and scrappage schemes (i.e. largely temporary demand-size changes) on the one hand and better technology (i.e. more structural supply-side changes) on the other hand.

Such insights are currently relevant in light of a follow-up proposal to reduce CO_2 emissions from light commercial vehicles (vans) that is currently working its way through the EU's decision-making process.

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 monitoring programme set-up for the voluntary agreements contained a non-disclosure clause which prevented company-specific information being published by the EU. Fortunately, the new CO_2 regulation demands that progress by carmaker be officially published starting with sales data for the year 2010.

Fuel efficiency and CO_2 emissions are used interchangeably in this report because the two are directly linked. One litre of petrol consumption leads to about 2.34 kg of CO_2, one litre of diesel consumption to about 2.62 kg of CO_2. Reducing CO_2 emissions is therefore not only beneficial in the context of mitigating climate change, but it also helps to reduce Europe's oil import burden and drivers' fuel bills.

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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

EU climate and energy policy and the role of transport

The European Union is committed under the Kyoto Protocol to reduce greenhouse gas emissions by 8% by 2008-2012 compared to the 1990 level. In addition, the EU has committed to a 20% cut in its greenhouse gas emissions by 2020, and a 30% cut if other countries follow suit. The EU has also adopted a target of improving energy efficiency in the European Union by 20% by 2020.

These targets were legally implemented with the adoption of the 'climate and energy package' in December 2008. The package contains laws on the emissions trading system (EU-ETS), 'effort sharing', carbon capture and storage, renewable energy, transport fuel quality, and car emissions. A directive to include aviation in the trading system was adopted a few months earlier.

The package is a step forward and recent figures indicate that formally the 20% target has already almost been met, but there are no reasons to be complacent.

Firstly, reductions on paper do not match reductions in reality because of carbon accounting errors. Both the emissions trading directive and the effort sharing decision allow offsets to be used instead of real, domestic emissions reductions. Emissions from international aviation and shipping, the fastest-growing sources of emissions, are also not counted towards the -20% target. Biofuels are counted as having zero emissions although the most recent science demonstrates that most of today's biofuels increase rather than reduce emissions when compared to use of fossil fuels.

Secondly, a 20% reduction falls well short of the 40% reduction by 2020 scientists say is necessary to hit the EU's 'maximum 2 degrees warming' target.

Therefore the accounting errors need to be fixed, and the target needs to be tightened.

Transport is the worst performing sector under Kyoto and seriously jeopardises the achievement of the targets. Transport CO_2 emissions in the EU grew by 34% between 1990 and 2008. Other sectors reduced their emissions by 14% on average over the same period. The share of transport in CO_2 emissions was 21% in 1990, but by 2008 this had grown to 29%[5]. The European Environment Agency estimates that cars are responsible for 14% of the EU's total CO_2 emissions[6], and they are the single largest source of transport emissions, representing around half of the total.

Transport is also critical in the debate on Europe's energy dependence. At current oil prices Europe imports approximately €250 billion worth of oil every year, or almost €0.7 bn every day. Cars are the single biggest consumer in the EU, using around 4.4 million barrels a day, and responsible for 40% of imports.

[5] www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2010
[6] www.eea.europa.eu/publications/towards-a-resource-efficient-transport-system

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. The target was formally announced in a 1995 European Commission communication (COM(95)689) and represented a 35% reduction over the 1995 level of 186 g/km.

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 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%).

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 adds a new 95 g/km target for 2020. See next section.

The 130g/km legislation and target

The new 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 for diesel cars). That is 18% below the average in 2007 and some 11% below the average of 2009.

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[7].

Significantly, the law adds a 95 g/km target for 2020, the 'modalities' and 'aspects of implementation' of which will have to be reviewed by the Commission by January 2013.

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 4.6 g/km higher CO_2 target (134.6 instead of 130 g/km CO_2 on average). Conversely, if their cars are lighter than average they get a tougher target.

Manufacturers can also file for joint-compliance with other manufacturers, in order to average 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, in principle

The law also includes several loopholes:

- Up to 7 g/km credits for as yet undefined '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 overall CO_2 reductions which 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;
- Exemptions 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, and Porsche are likely applicants);
- Exemptions for carmakers with less than 10,000 sales in the EU, who can negotiate their own target with the Commission.

[7] See: *The Impact of Phasing in Passenger Car CO_2 Targets on Levels of Compliance*, www.transportenvironment.org/Publications/prep_hand_out/lid:515

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

Carmaker progress in 2009

On behalf of T&E, the consultants AEA Technology analysed sales and CO_2 information in the European Commission database that forms the basis of the official monitoring mechanism on cars and CO_2[8].

This database includes figures for all cars sold in the EU27 in 2009 including weight, power, and CO_2 emissions. On the basis of this data we were able to produce the rankings published in this report. It is important to note that all the data is 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 and its predecessor the voluntary commitment are also based on sales-weighted figures.

It should be noted that for the first time the geographical coverage of the figures is the entire EU27. Our previous report on 2008 data did not include Bulgaria and Slovakia. Together these two countries represented less than 1% of new car sales in the EU27 and hence do not have a significant impact on analysis of progress over time.

Only the volume car manufacturing groups (those that sold over 200,000 vehicles in the EU27 in 2009) were included in the study. These were the same 14 manufacturers reported in our previous reports.

In this report we present four rankings of the 14 largest carmakers, based on performance in 2009:

1. On the basis of sales-average CO_2 emissions per km (table 1);
2. On the basis of progress made in cutting sales-average CO_2 emissions (table 1);
3. On the basis of progress made in cutting sales-average CO_2 emissions through technological improvements only, as opposed to selling smaller cars (table 2, graph 2). It's the first time we include a ranking on this basis;
4. On the basis of improvements needed to hit company-specific CO_2 targets for 2015 as set by the new cars and CO_2 regulation (table 3, graph 3);

We also include a ranking of the 27 EU Member States, on the basis of the average CO_2 emissions of cars registered in 2009.

Analysis of the Commission data was carried out by the consultants AEA Technology[9] except the analysis for ranking 3 detailed in the section entitled 'Was progress due to the crisis or technology?' (pg 14-17 and Annex 1), which was carried out by T&E.

[8] ec.europa.eu/environment/co2/co2_monitoring.htm
[9] www.aeat.co.uk

1. Progress by carmaker

Table 1 shows the improvement in fleet-average CO_2 emissions of each carmaker group in 2009 compared with the previous year

Manufacturer group	**Ranking 2008**	**Sales 2009**	Average CO_2 Emissions (g/km)		
Ranking by sales-average CO_2 in 2009					
			2009	2008	Reduction in %
1.Fiat	1	1,212,365	131	138	5.3%
2.Toyota	4	728,805	132	147	10.0%
3.PSA Peugeot-Citroen	2	1,816,766	136	139	2.7%
4.Renault	3	1,306,604	140	143	1.8%
5. Hyundai	5	563,418	141	149	5.4%
6. Suzuki	10	242,995	142	156	9.1%
7. Ford	6	1,437,768	144	152	5.1%
8. Honda	8	231,789	147	154	4.1%
9. General Motors	7	1,253,692	148	153	3.2%
10. Mazda	11	199,299	149	158	5.4%
11. BMW	9	681,056	151	154	1.8%
12. VW Group	12	2,973,183	153	159	4.1%
13. Nissan	13	359,037	154	161	4.4%
14. Daimler	14	666,503	167	175	4.8%
Total			145.7	153.5	5.1%
ACEA*			146.7	152.3	3.7%
JAMA*			140.1	153.6	8.8%
KAMA*			140.5	149.6	6.1%
Ranking by *progress* in sales-average **CO_2** in 2009					
1.Toyota	11	728,805	132	147	10.0%
2.Suzuki	5	242,995	142	156	9.1%
3.Mazda	2	199,299	149	158	5.4%
4.Hyundai	3	563,418	141	149	5.4%
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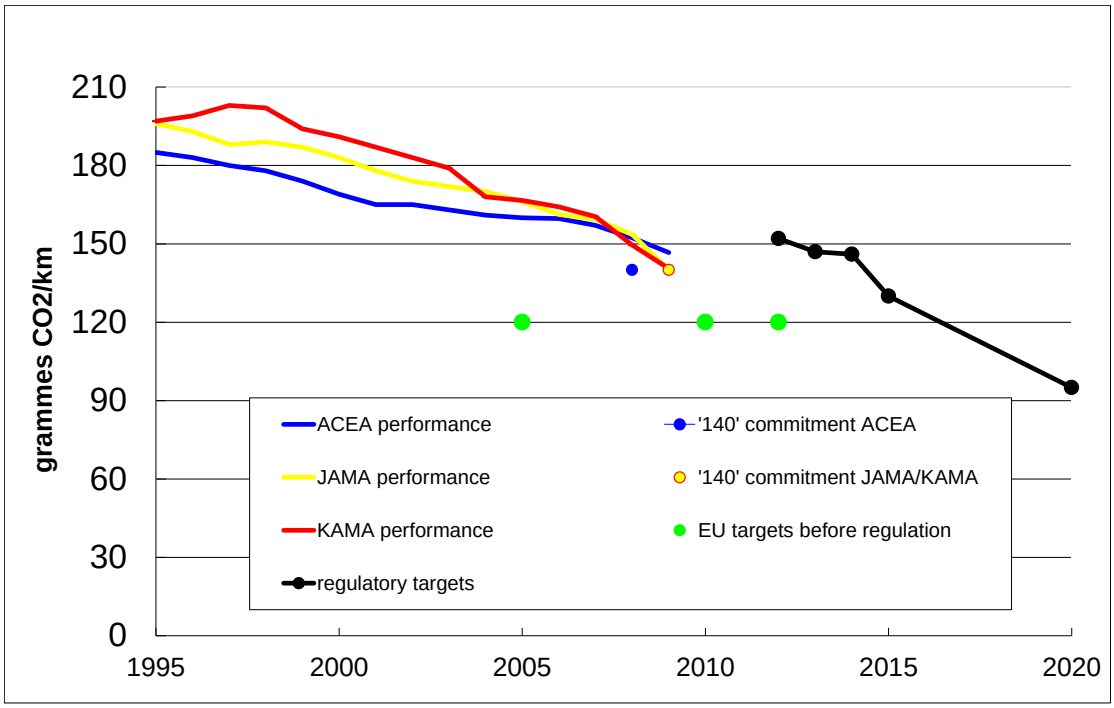
12.PSA Peugeot-Citroen	14	1,816,766	136	139	2.7%
13. BMW	1	681,056	151	154	1.8%
14. Renault	9	1,306,604	140	143	1.8%
Total / average			145.7	153.5	5.1%

Data apply to the EU27. Last year's report on 2008 data excluded Bulgaria and Slovakia.
*Figures for ACEA, JAMA and KAMA reflect the commitments made in 1998/9: they apply to the EU15, they are corrected downward with 0.7% to reflect changes in the test cycle; Toyota is still counted as a JAMA member although the company joined ACEA in 2008.
The European Automobile Manufacturers Association (ACEA) is the industry association of European manufacturers. www.acea.be/index.php/about_us/members/ . The Japan Automobile Manufacturers Association (JAMA) is the industry association of Japanese manufacturers. www.jama-english.jp/about/member.html. The Korea Automobile Manufacturers Association (KAMA) is the industry association of Korean manufacturers. www.kama.or.kr/eng/MC/K_eng_mc1.jsp

Graph 1: Historic progress by the three carmaker associations, and the historic and future EU targets for fleet-average CO_2 of new cars



Note: The 2012-2020 target line does not include allowances for earlier-described loopholes such as 'eco-innovations'. The 2012-2014 'phase-in' targets, in which 65, 75 and 80% of each carmaker's fleet has to comply with the regulation respectively, have been based on research carried out by the Institute for European Environment Policy (IEEP) for T&E and can be found at www.transportenvironment.org/Publications/prep_hand_out/lid:515.

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

- The industry as a whole achieved a record rate of progress with a 5.1% reduction. Just like in 2008, progress per carmaker again ranged from 2% to 10%.

- Unlike ACEA, which missed its 140 g/km voluntary target for 2008 by over 12 g/km, JAMA and KAMA just about met their 2009 targets under the voluntary commitment (they had a 0.1 and 0.5 g/km shortfall respectively, which is very little particularly in light of the accuracy of the data). In the case of JAMA the achievement of the target is almost entirely due to Toyota. For the first time, both JAMA and KAMA now have lower average CO_2 emissions than ACEA. Given the fact that the new CO_2 regulation does not address associations but individual carmakers and the voluntary commitments now formally expired, this will be the last time we report on progress per association.

- Fiat remains in the lead with respect to average CO_2 emissions from new cars with a 131 g/km average. The company cut average CO_2 emissions by 5% in 2009 which contributed to this.

- Toyota made dramatic progress in 2009 with a 10% cut in fleet average CO_2. The company is now second on the fleet-average CO_2 ranking with 132 g/km, just below Fiat. Progress is due to a combination of many factors: improvements in

family models like the Auris and Avensis, the success of small new models like the iQ and the Aygo and weak sales of high-consuming cars like the Land Cruiser and RAV4.

- Volkswagen Group, Europe's biggest-selling carmaker, keeps disappointing both in fleet average CO_2 (12th of 14) and in year-on-year progress (10th of 14) despite having individual models with very competitive CO_2 ratings. Apparently VW keeps the share of these best-technology vehicles relatively low compared with other carmakers. This also explains why the average new car from the VW Group still has higher CO_2 emissions than the average BMW despite being 8% lighter and 27% less powerful.

- BMW, having taken the top spot in terms of progress made in our two previous reports, has stalled and now sits at the bottom of the progress ranking with Renault. Apparently the introduction of 'Efficient Dynamics' technology to the BMW fleet effectively ended in 2008;

- Suzuki and Mazda achieved significant reductions for the second year running; Hyundai for the third year running.

- The two French carmakers showed relatively poor progress in 2009. A difference between the two is emerging, with PSA having lower CO_2 figures and stronger reductions than Renault. Possibly an explanation is that Renault has chosen to emphasise developing electric cars, thereby slowing development of its conventional powertrain technology;

2. Was progress due to the crisis or technology?

The year of the scrappage scheme

2009 was an exceptional year for the world in general, and for the automotive industry in particular. The world went through the depths of an economic crisis that began in autumn 2008, and of a scale not seen in decades. Sales of virtually all industrial goods and feedstocks fell dramatically.

But many European governments chose to protect the automotive industry from these fierce economic headwinds with the vigorous introduction of so-called 'scrappage' schemes that started to pop up in late 2008 and proliferated throughout 2009. The schemes had in common that buyers of a new car (in some cases an almost new car) could obtain a government subsidy if they could demonstrate they had an old car scrapped.

Throughout 2009, 13 EU Member States adopted such schemes[10] and together the schemes covered 86% of the EU market in terms of sales. Almost €8bn was spent on direct payments plus overheads.[11]

The result was that EU15 new car sales remained, at 13.3 million, virtually the level of the average of the 1990-2009 period. Sales were 7% below the average recorded during the nine 'boom years' 1999-2007, but 5% above the average for the other 11 years.

Box: Scrappage schemes not proven to have reduced overall CO_2

It is very important to note that scrappage schemes have not been proven to have reduced emissions from overall car driving.

Such schemes may have had a widely publicised positive impact on the average fuel efficiency of the fleet, but they also make car transport significantly cheaper, directly through the €8bn subsidy and indirectly through the fact that this subsidy, as described, caused a market shift towards cheaper vehicles. For example, in Germany cheap cars like the Fiat Panda and Ford Ka were offered at 50% discount rates under the scrappage scheme and sold for prices in the range of €5,000.

Unsurprisingly an estimated 2m extra cars were sold as a result of scrappage schemes. This, particularly through its knock-on effect on second hand car prices, significantly boosts car ownership and hence car driving with it. We have not seen a study on the scrappage schemes which takes this important effect into account.

[10] Austria, Cyprus, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, Romania, Slovakia, Spain and the UK

[11] Assessment of the Effectiveness of Scrapping Schemes for Vehicles - Economic, Environmental, and Safety Impacts, Global Insight, March 2010. Most of the other factual references to scrappage schemes such as extra sales are also derived from this report.

Scrappage schemes increased the shift to cheaper, smaller cars

Not only did these schemes boost car sales, they also changed the type of vehicle sold. As the schemes were typically designed as fixed cash paybacks, the effect on new prices was much larger for cheap cars than for expensive ones. This magnified the effect of people shifting to cheaper cars, a trend that could be expected during tough economic times. As a result, 2009 saw a strong increase in the market share of cheap cars, which are typically (but not always) lighter and less powerful than expensive cars, and typically (but not always) have lower CO_2 emissions per km.

Therefore, even if technological progress would have halted completely in 2009, a decrease in average CO_2 emissions from newly sold cars in 2009 could have been expected.

As our report of last year showed, this law plays a large role in the vigorous competition on CO_2 performance that has been taking shape since 2008, under labels like Efficient Dynamics (BMW), ECO_2 (Renault), DrivE (Volvo), Bluemotion (VW), BlueEfficiency (Daimler), Econetic (Ford) and Ecoflex (Opel).

But until now, no attempt has been made to separate the effects of changes in demand from the effects of the improved technologies that carmakers have been implementing. Such a distinction is important, though, because the demand effect is more likely to be of a one-off character than the technology effect. When the economy recovers and scrappage schemes are phased out, demand is likely to return to 'normal', but technology will be here to stay.

The table on the next page ranks carmakers based on how much of their reduction in CO_2 emissions can be attributed to implementation of better technology. It also shows how much of their reduction can be attributed to a shift to smaller vehicles. The methodology is described in Annex 1.

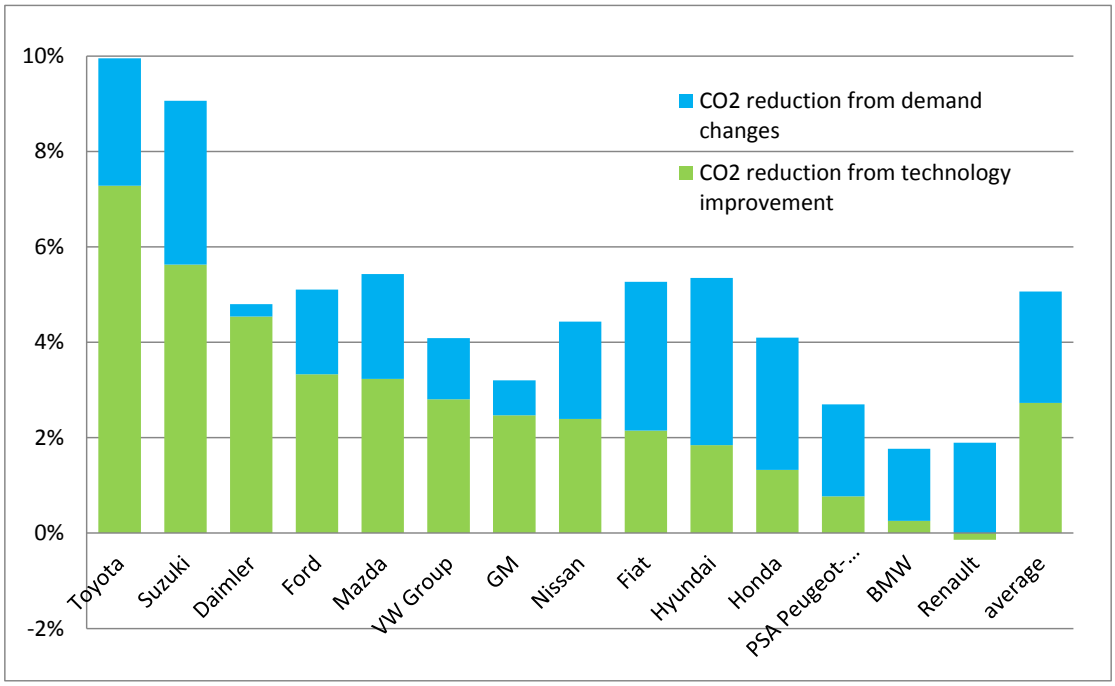
Table 2: CO_2 improvements in 2009 attributed to less weight & power (i.e. shifts in demand towards smaller vehicles) versus better technology. Carmakers are ranked on the basis of their technology-only performance

	CO_2 reduction 2009	CO_2 reduction compared with 2008 due to ...			
		Less weight	Less power	Less weight & power	Better technology
1 Toyota	10.0%	2%	1%	3%	7%
2 Suzuki	9.1%	3%	1%	3%	6%
3 Daimler	4.8%	0%	0%	0%	5%
4 Ford	5.1%	2%	-0%	2%	3%
5 Mazda	5.4%	0%	2%	2%	3%
6 VW Group	4.1%	1%	0%	1%	3%
7 GM	3.2%	1%	-0%	1%	2%
8 Nissan	4.4%	2%	-0%	2%	2%
9 Fiat	5.3%	2%	1%	3%	2%
10 Hyundai	5.4%	3%	1%	4%	2%
11 Honda*	4.1%	1%	2%	3%	1%
12 PSA Peugeot-Citroen	2.7%	1%	1%	2%	1%
13 BMW	1.8%	1%	1%	2%	0%
14 Renault*	1.8%	3%	-1%	2%	-0%
Total	5.1%	1.8%	0.6%	2.3%	2.7%

* Honda weight figures show large gaps in the EU monitoring database, they should therefore be treated with caution.

The table is also represented in the graph on the next page.

Graph 2: progress in sales-average CO_2 emission in g/km per carmaker in 2009 compared with 2008, and split between demand-side changes and technology changes. Carmakers are sorted on the basis of their technology-only performance



Although the results in the table and the graph above should be treated with caution, as stated before, we can draw the following conclusions:

- The economic crisis and the scrappage schemes alone do not explain the CO_2 reductions achieved; in fact our analysis suggests that actually more than half of the reductions in 2009, or close to a 3% improvement, was achieved through better technology;
- Toyota, Suzuki, Daimler, Ford and Mazda seem to be the manufacturers that achieved the significant CO_2 reductions (more than 3% in this analysis) through better technology.
- It appears that Hyundai, Suzuki and Fiat benefited most from the scrappage schemes in reducing their sales-weighted average CO_2, with over 3% of CO_2 emissions reductions attributed to these demand-side changes;
- The analysis also reveals that Renault and BMW, and to a somewhat lesser extent PSA, stalled in 2009 in terms of improvements to conventional powertrain technology. Renault's case (a very small CO_2 increase due to technology only) could be explained by a rising share of the Logan brand.

3. Distance to regulatory targets, by carmaker

The regulation on cars and CO_2 strives to achieve a 130 g/km average figure by 2015. This average target does not apply to individual carmakers; targets per carmaker 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.

Note on weight-based standards

T&E has always opposed this weight dependence of CO_2 standards, arguing that it takes away important incentives for vehicle lightweighting[12], and commissioned research that shows it's better to base CO_2 standards on the car's footprint (a proxy for interior space) instead[13]. 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.

Table 3: ranking on the basis of the percentage reduction in CO_2 each carmaker now has to make in order to hit its EU target.

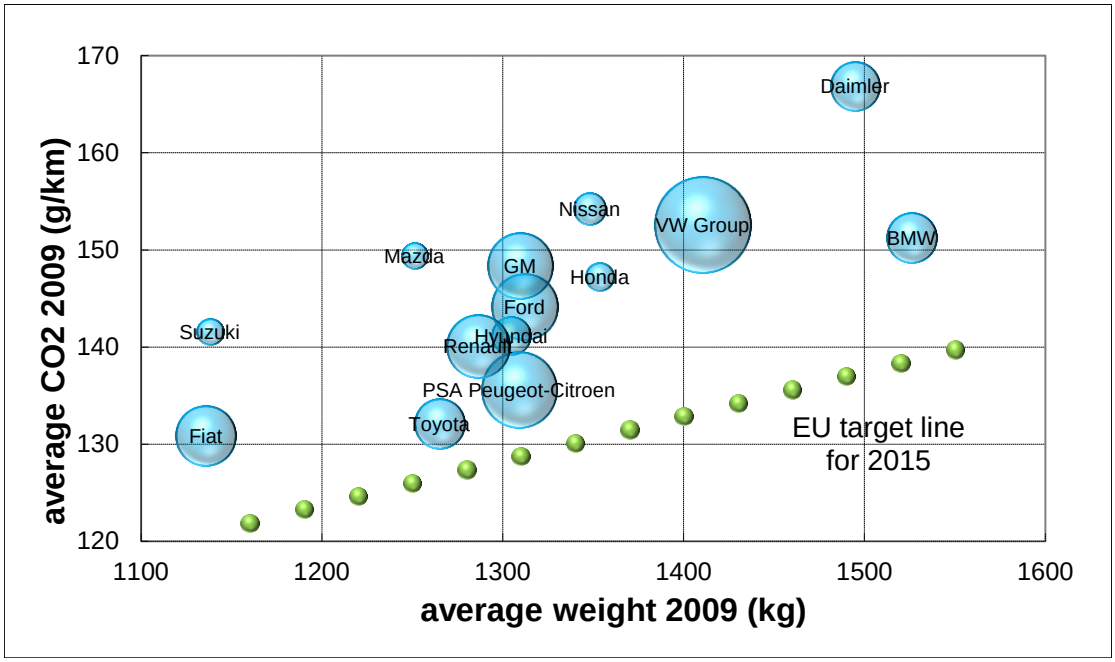
Manufacturer	CO_2 target 2015* (g/km)	Year 2009			Year 2008			Rank
		CO_2 (g/km)	Weight (kg)	Distance to target*	CO_2 (g/km)	Weight (kg)	Distance to target	
1 Toyota	127	132	1,265	4%	147	1,305	14%	**6**
2 PSA Peugeot-Citroen	129	136	1,309	5%	139	1,333	8%	**1**
3 Fiat	121	131	1,136	8%	138	1,172	13%	**3**
4 BMW	139	151	1,526	8%	154	1,540	11%	**4**
5 Renault	128	140	1,286	9%	143	1,341	10%	**2**
6 Hyundai	129	141	1,305	9%	149	1,365	13%	**5**
7 Ford	129	144	1,312	11%	152	1,354	15%	**7**
8 Honda**	131	147	1,354	11%	154	1,381	15%	**8**
9 VW Group	133	153	1,410	13%	159	1,429	17%	**10**
10 GM	129	148	1,310	13%	153	1,327	17%	**9**
11 Suzuki	121	142	1,138	15%	156	1,190	22%	**13**
12 Nissan	131	154	1,348	15%	161	1,395	19%	**11**
13 Mazda	126	149	1,251	16%	158	1,256	21%	**12**
14 Daimler	137	167	1,495	18%	175	1,494	23%	**14**
Average	**130**	**145.7**	**1,337**	**11%**	**153.5**	**1,374**	**15%**	

* Assuming the average weight of the company's new cars in 2015 will be the same as in 2009, and the average weight of cars sold by the entire industry in 2011-13 will be 1,337 kg.
** We have less confidence in the accuracy of weight figures from Honda where a high share of weight data was missing

The data in the table above are represented on the next page as a graph.

[12] T&E briefing: www.transportenvironment.org/Publications/prep_hand_out/lid:500
[13] TNO/IEEP study: www.transportenvironment.org/Publications/prep_hand_out/lid/512

Graph 3: fleet-average weight and fleet-average CO_2 emissions by carmaker, compared with EU target curve



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

- Toyota has taken the top spot from PSA Peugeot-Citroën as the carmaker best placed to meet its regulatory targets. Toyota, 6th last year, only has a 4% cut left to make, compared with 14% last year, thanks to a 10% jump in 2009;

- Fiat, despite having slightly lower average emissions than Toyota, has to reduce by 8%; it receives a tougher target for making vehicles that are on average 130 kg lighter than Toyota's;

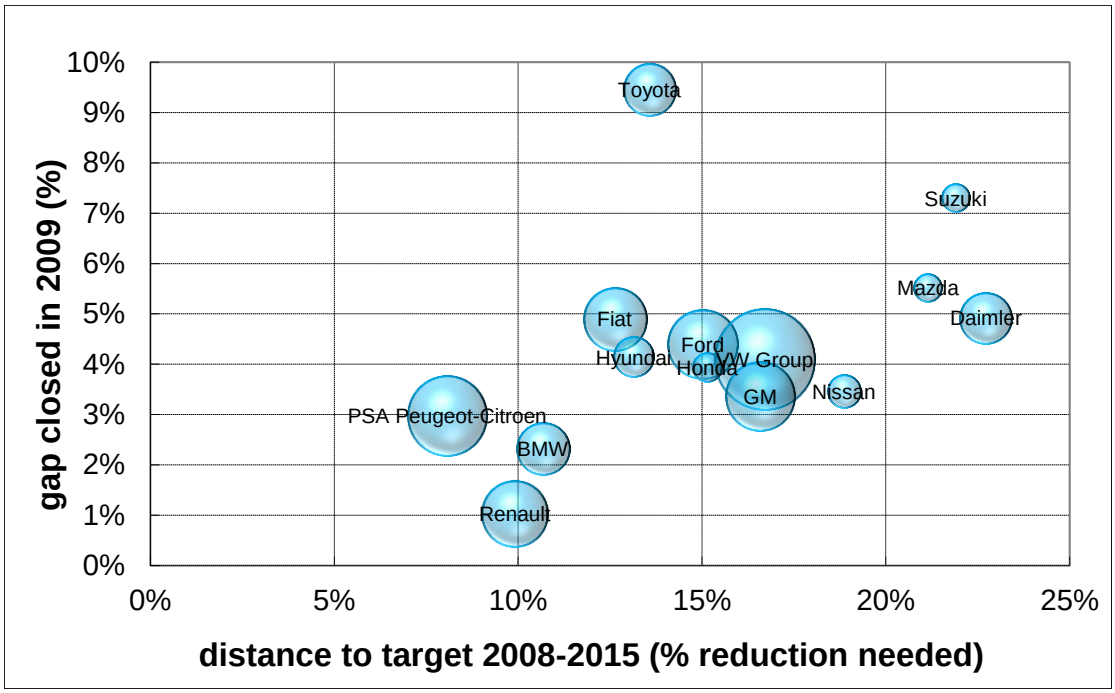
- BMW fell to 4th place, but is still 5 and 10 percentage points closer to reaching its target than the VW Group and Daimler, respectively.

- Daimler is still furthest away with an 18% gap yet to close. Three Japanese carmakers, Mazda, Nissan and Suzuki, follow with 16, 15 and 15% respectively, despite significant progress of all three in past years.

3. Distance to targets in 2008 vs. progress in 2009

The graph below shows the reductions carmakers had to make on the basis of their 2008 performance (last year's report) and what they actually did to close the gap in 2009.

Graph 4: what carmakers need to do between 2008 and 2015, and what they have done in 2009



The graph shows that in 2009, just like in 2008, badly-placed carmakers were much bolder in cutting emissions than well-placed carmakers:

- well-placed carmakers, those who needed to cut emissions by less than 12%, cut their emissions by less than 3% last year.
- badly placed carmakers, those who needed to cut emissions by more than 12%, all made cuts of more than 3%. Those with more than 20% to go cut by 5% or more.

Toyota clearly stood out in terms of progress in 2009 compared to what the company has to do. In a single year it has closed more than two-thirds of the gap to its regulatory target for 2015. On page 12 we described the factors explaining this progress.

On the other side, Renault, BMW, Daimler, Nissan and General Motors all closed less than a quarter of the gap needed to reach their regulatory targets in 2009. Renault only closed 10%; most of its progress came from selling much (55kg) lighter vehicles in 2009 than in 2008, which toughens up its target significantly.

Taken together, the 5.1% progress carmakers achieved in 2009 closed almost a third of their collective gap towards the 130 g/km target for 2015. They were 15% away from the target, now only 11%. For the 2010-15 period, the required annual progress to hit 130 g/km is only 1.9% per year, about the historical average.

This 1.9% 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 around 140 g/km. Precise calculation is difficult as the size and nature of the ‘eco-innovations’ loophole depends on its precise implementation, while the size of the ‘supercredits’ loophole depends on future sales of cars below 50 g/km (likely to be mostly electric cars).

As an example, a 138 g/km effective target would require only a cut of 5% compared with today’s levels. Preliminary figures for the first months of 2010 indicate that carmakers continue to make progress at a rate of approximately 3%, which would bring them within a razor-thin margin of hitting regulatory targets five years in advance.

All available evidence points towards carmakers in Europe heading for very significant ‘overcompliance’ with the CO_2 regulation and are hence likely to hit the target for 2015 years in advance.

4. Status and progress by Member State

Table 4: average CO_2 figures of new cars sold in EU Member States as well as the percentage improvement made over the last year.

		Registrations 2009	Average CO_2 2009	Average CO_2 2008	Improvement 2008-2009	Rank 2008
1	France	2,258,955	134	140	4.7%	**2**
2	Portugal	158,955	134	138	3.3%	**1**
3	Malta	6,097	136	147	7.6%	**5**
4	Italy	2,159,065	136	145	5.8%	**3**
5	Denmark	109,417	139	146	5.0%	**4**
6	Belgium	475,126	142	148	3.9%	**6**
7	Spain	828,286	142	148	4.0%	**7**
8	Ireland	56,254	144	157	7.9%	**14**
9	Slovakia	69,568	147	150	2.3%	**8**
10	Netherlands	383,868	147	158	7.0%	**15**
11	UK	1,949,342	150	158	5.3%	**17**
12	Austria	319,278	150	158	5.0%	**16**
13	Poland	219,434	152	153	1.0%	**9**
14	Slovenia	59,019	152	156	2.5%	**12**
15	Luxembourg	47,250	153	160	4.4%	**18**
16	Hungary	65,841	153	153	0.0%	**10**
17	Germany	3,765,358	154	165	6.5%	**21**
18	Czech Republic	158,909	156	154	-0.8%	**11**
19	Romania	115,386	157	156	-0.6%	**13**
20	Finland	88,740	157	163	3.6%	**20**
21	Greece	220,916	157	161	2.0%	**19**
22	Cyprus	15,934	161	166	3.0%	**22**
23	Sweden	208,990	165	174	5.4%	**24**
24	Lithuania	7,129	166	170	2.4%	**23**
25	Estonia	9,878	170	177	4.0%	**25**
26	Bulgaria	20,563	172	n.a	n.a.	**n.a.**
27	Latvia	5,123	177	181	2.1%	**26**
	EU-27	13,782,681	145.7	153.5	5.1%	

This table shows that France has taken the top spot from Portugal, the country that led the ranking in previous years; last year it improved faster than Portugal which allowed France to narrowly take the top spot.

Of the four member states with the biggest car markets (DE, FR, IT and UK, together representing 74% of EU car sales in 2009), Germany made most progress with a reduction of more than 6%. Italy and the UK were not far behind. France comes in fourth with a 4.7% reduction, but measured over 2007-9 it was the only one of the four countries which recorded more than 10% progress.

All Central and Eastern European member states recorded below-average rates of progress. Just like last year, both the Czech Republic and Romania stand out by being the only two member states with worsening fuel efficiency. Of CEE countries, Estonia made most progress with 4%. Car markets in these countries are still relatively small so the impact on EU-wide fleet averages is limited.

- The best progress in 2009 was achieved by Ireland, Malta and the Netherlands, with over 7% improvement;

- Scandinavia (with the exception of Denmark) and the Baltic states continue to have relatively inefficient cars, although Sweden and particularly Finland have made strides since 2007.

Vans and CO_2 - policy recommendations

This section contains a briefing and policy recommendations for the current regulatory debate in Brussels regarding CO_2 emissions from light commercial vehicles (vans). This discussion is closely related to the legislation on cars and CO_2 as most of the technologies are the same.

Context

In October 2009 the European Commission published a proposal to reduce CO_2 from light-commercial vehicles (vans)[14]. This proposal is part of the so-called 'integrated approach' carmakers have called for, whereby less has to be done to improve fuel efficiency of cars (i.e. a 130 g/km target instead of 120). The Commission has said the 10g/km shortfall should be compensated through measures on fuels, tyres, gear shift indicators, vehicle air conditioners and **vans**. This was announced as early as February 2007[15].

The 2007 non-legislative communication announced targets for average CO_2 emissions from vans of 175 g/km for 2012 and 160 g/km for 2015, respectively 14 and 21% reductions on the 2007 level of 203 g/km[16].

But the October 2009 legal proposal watered this down significantly – it proposes 175 g/km by 2016 – but it adds a 135 g/km target for 2020.

Currently, 12% of Europe's fleet of light-duty vehicles are vans, but their number is rising fast. Between 1997 and 2007, the total fleet of vans increased by about 50%.[17]

The proposal is currently working its way through the Council and Parliament, institutions, with a first reading expected to be completed in the European Parliament shortly.

Regulation – a response to the environmental, energy and economic crises

Regulating CO_2 emissions from vans reduces CO_2 and hence helps fight climate change.

But it also helps reduce oil use and oil imports, which at today's prices cost the EU economy approximately €250bn per year.

It also reduces the €30bn fuel bill that Europe's businesses, particularly small and medium-sized enterprises, currently pay every year.

Another effect of CO_2 targets is the creation of value, as well as high tech and secure jobs in the automotive industry, through increased use of low carbon technologies.

In economic terms, such legislation shifts spending away from oil imports towards low-carbon technology development.

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[14] eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0593:FIN:En:PDF
[15] eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0019:EN:NOT
[16] ec.europa.eu/environment/air/transport/co2/pdf/final_report_lcv_co2_250209.pdf
[17] Compare: www.acea.be/images/uploads/files/20090218_EU_Motor_Vehicles_in_Use_2007.pdf and ec.europa.eu/transport/roadsafety_library/publications/improver_final_report_sp2_060430.pdf

T&E views on targets, timetables and speed limiters

T&E believes that the Commission proposal should be strengthened on three key points:

1. It should revert to the original ambition level of 175 g/km by 2012 and 160 g/km by 2015.
2. The 2020 target should be set at 125 g/km, not 135 g/km. This represents a 38% reduction based on 2007 levels, and matches in ambition the 40% reduction required for cars to achieve 95 g CO_2/km by 2020.
3. Vans should be equipped with speed limiters set at 100 km/h. This would reduce on-road CO_2 emissions by a further 8%.

The remainder of this chapter describes the reasoning behind each of these points.

The vans market is less 'rational' than often thought

It has been claimed by the motor industry that vans are already very fuel-efficient because professional customers take fuel consumption into account when buying vans – and that therefore little could be done to improve fuel efficiency.

But the car industry itself admits that there are large discrepancies between models with similar functionality. According to the UK car industry association, *"If everybody buying a new van bought the most fuel efficient model in its class the average buyer could save up to 17% on both* CO_2 *emissions and fuel costs"*[18].

In addition, engine power of vans has been rising dramatically, although rationally it's more economical to mount smaller (i.e. cheaper and more fuel efficient) engines and keep the power constant. This is another symptom of a market that is not fully rational. To investigate this issue further Transport & Environment commissioned a study, the findings of which are described later in this chapter.

Diesel technology for cars has moved very fast and could be fitted in vans too

The Commission's impact assessment for the van CO_2 legislation says achieving a 160 g/km target would be 'unrealistic in the 2015 time horizon'. In reality, the legislation has been planned since 2007 – allowing eight years for compliance.

In addition, reductions of 20 to 30% have been reached on diesel cars in only three years and comparing like with like (i.e. the lowest-CO_2 variants of the same model in 2007 and 2010). All these reductions were achieved without major and costly technology changes such as hybridisation but with a range of less expensive measures (see Table 5).

As fuel saving technologies are virtually all transferable from diesel cars to diesel vans, in principle comparable reductions can be achieved. A 160 g/km target by 2015 is therefore feasible and does not require excessive technological investment.

[18] www.smmt.co.uk/articles/article.cfm?articleid=19726

Table 5: Improvement of 'best practice' diesel cars 2007 and 2010[19]

Brand and model	CO_2 of best available diesel variant (g/km)		Improvement (%)	Fuel-saving programme
	2007	2010		
VW Golf	135	99	**-27%**	BlueMotion
VW Passat	151	109	**-28%**	BlueMotion
Ford Focus	127	99	**-22%**	Econetic
Volvo S40	129	99	**-23%**	DrivE
Volvo V70	172	119	**-31%**	DrivE
Opel Corsa	115	94	**-18%**	Ecoflex
Citroën C5	142	120	**-16%**	Airdream
Mercedes C220	169	127	**-25%**	BlueEfficiency
Mercedes S	220	149	**-32%**	
BMW 118	150	119	**-21%**	Efficient Dynamics

[19] The year 2007 is chosen because it is the baseline year for CO2 emissions from vans as used in the supporting study ordered by the Commission.

Study: Deeper cuts possible at lower cost through lower engine power

T&E asked TNO and CE Delft to investigate an overlooked, but quick and cheap way to reduce fuel use and CO_2 emissions of vans, namely '*optimal engine sizing*'[20] i.e. offering vans with smaller and less powerful engines. The official studies by the European Commission completely overlook this option for achieving CO_2 cuts. This is wrong because it is likely to be one of the ways industry reacts to CO_2 challenges – the data on cars certainly testifies to this.

The TNO study for T&E shows that 'optimal engine sizing', i.e. returning to engine power levels of 1997, can cut fuel costs and CO_2 emissions by up to 16%, cut vehicle purchase costs by up to 10%, and cut total cost of ownership by up to 12%. Moreover, optimal engine sizing can be introduced quickly and in existing models.

The 175 g/km target proposed for 2016 could be met using optimal engine sizing alone, and at the same time make vans cheaper to buy instead of more expensive. In addition the long-term target of 135 g/km would be significantly easier to meet.

The European Commission's impact assessment completely ignored this potential and is hence far too pessimistic about how far fuel consumption can be cut, at what speed, and at what cost.

Study: Fitting vans with a speed limiter to save lives and more CO_2

Following EU legislation adopted in 1992, Europe's lorries have been fitted with a speed limiter which prevents them from going faster than 90 km/h. Buses are limited at 100 km/h.

Vans are therefore the only commercial goods vehicles left without a limit to their top speed. This despite the fact that they can, unlike lorries and buses, be driven with a standard 'B' type car licence i.e. by non-professional drivers.

T&E commissioned CE Delft to analyse the effects of limiting the top speed of vans to 100 km/h – the speed at which buses are currently limited. The report concludes that this would cut the number of deaths that occur as a result of accidents involving vans on motorways by around half, and would cut CO_2 emissions by 6-7% [21].

The latter figure assumes, however, that the average engine power of vans stays the same after introduction of speed limiters. Customers might as a result of the limited top speed choose vans with less powerful engines, which would further increase the CO_2 and fuel saving benefits of speed limiters.

[20] www.transportenvironment.org/Publications/prep_hand_out/lid/586
[21] www.transportenvironment.org/Publications/prep_hand_out/lid/581

Annex 1 : Methodology for splitting impacts of scrappage schemes and the economic crisis from technological improvements

As described in the body of this report, the economic crisis and the scrappage schemes have had mutually reinforcing impacts on the car market: both caused shifts towards cheaper, smaller cars with lower power and typically lower CO_2 figures.

The most important of these impacts for CO_2 emissions are lower weight and lower engine power, both of which are contained in the EU monitoring database analysed by this report.

Therefore we estimate the impacts of these two trends on CO_2 emissions and attribute it to the temporary demand side effects of the crisis and the scrappage schemes. The rest we attribute to better technology.

Of course this methodology is a simplification of reality, but we feel it does provide a good basis for making the split as its two major inaccuracies cancel each other out. On the one hand, the methodology underestimates the effect of the crisis and the scrappage schemes by not taking into account that they will also have reduced the average size and hence the frontal area of cars. On the other hand, the methodology overestimates their impact because a part of the change in weight will be due to lightweighting technology instead of changes in demand towards smaller cars. Carmakers have been stepping up lightweighting efforts; typically follow-up models introduced today are lighter than their predecessors, breaking a decades-old trend.

The major trends in CO_2, weight and engine power in 2009 are shown in the table on the next page.

Table A1: overview of trends in sales-average CO_2 emissions, weight and specific power of the 14 main manufacturers

	CO_2			Weight (kg)			Power per tonne (kW/t)		
	2009	2008	%	2009	2008	%	2009	2008	%
Fiat	131	138	5.3%	1,136	1,172	-3.0%	53	55	-3.4%
Toyota	132	147	10.0%	1,265	1,305	-3.1%	59	60	-2.1%
PSA	136	139	2.7%	1,309	1,333	-1.8%	52	53	-2.2%
Renault	140	143	1.8%	1,286	1,341	-4.1%	53	52	2.2%
Hyundai	141	149	5.4%	1,305	1,365	-4.4%	57	58	-1.9%
Suzuki	142	156	9.1%	1,138	1,190	-4.4%	59	60	-2.0%
Ford	144	152	5.1%	1,312	1,354	-3.1%	60	59	0.7%
Honda*	147	154	4.1%	1,354	1,381	-1.9%	66	69	-4.4%
General Motors	148	153	3.2%	1,310	1,327	-1.3%	57	57	0.4%
Mazda	149	158	5.4%	1,251	1,256	-0.3%	66	70	-5.7%
BMW	151	154	1.8%	1,526	1,540	-0.9%	81	83	-2.7%
Volkswagen	153	159	4.1%	1,410	1,429	-1.3%	63	64	-1.3%
Nissan	154	161	4.4%	1,348	1,395	-3.4%	59	59	0.4%
Daimler	167	175	4.8%	1,495	1,494	0.0%	73	74	-0.8%
Total	145.7	153.5	5.1%	1,337	1,374	-2.7%	60	61	-1.8%

*Honda weight figures show large gaps in the database, they should therefore be treated with caution.

The table has some striking figures. Average weight of cars dropped by 37 kg in 2009, a record. Power per tonne also dropped by 1.8%. Taken together these two figures mean that average power par car dropped by 4.4% in 2009.

Impact of weight changes, with constant power per tonne (kW/t)
The impact of changes in weight on a vehicle's CO_2 emissions has been well documented. The 2006 TNO/IEEP study[22] which formed the basis of the impact assessment of the European Commission on reducing CO_2 emissions from cars, for example, used the following formula: $\Delta CO_2 / CO_2 = 0.65 * \Delta M / M$. In other words: a 1% reduction in weight is associated with a 0.65% reduction in CO_2, provided engine power is lowered too in order to keep the performance of the car comparable. A study by Ricardo for the American market yields similar results[23].

Impact of lower power per tonne of vehicle (kW/t)
The impact of specific power (in kW/tonne) on a vehicle's CO_2 emission has been far less well documented. Lowering engine power can be achieved in two ways:
1. Keep engine size the same but cut its rated power output;
2. Reduce engine size and keep power output per litre, kW/l, constant.

The first measure reduces CO_2 less than the second.

Both effects are likely to have occurred as a result of the crisis and the scrappage schemes: customers are likely to have plumped more often than normal for relatively

[22] Review and analysis of the reduction potential and costs of technological and other measures to reduce CO_2-emissions from passenger cars, TNO/IEEP, October 2006, ec.europa.eu/enterprise/sectors/automotive/files/projects/report_co2_reduction_en.pdf, p59
[23] Impact of Vehicle Weight Reduction on Fuel Economy for Various Vehicle Architectures, aluminumintransportation.org/downloads/AluminumNow/Ricardo%20Study_with%20cover.pdf , Ricardo, April 2008, p58

cheap, baseline engines with relatively low kW/litre, but they are also likely to have chosen smaller engines more often.

Recently TNO and CE Delft did a study for T&E on the effects on CO_2 of lowering engine power of vans using method 2[24]. On the basis of five case studies it concludes that if diesel engines of light commercial vehicles are downsized by 13% while keeping kW/l constant, CO_2 would be cut by approximately 6%. The ratio would then be 6/13 = 0.46, or in a formula: $\Delta CO_2 / CO_2 = 0.46 * \Delta kW / kW$. As stated above this result overestimates the real effects of lower power ratings resulting from the crisis / scrappage schemes as part of the lower power will have been achieved not through smaller engines, but rather by customers choosing cheaper and less advanced engines with lower power output per litre swept volume.

The transport module of the US National Energy Modeling System[25] works with a formula $\Delta FE = -0.22 * \Delta kW – S * \Delta kW^2$, where FE stands for fuel economy in km/l, and S = +0.56 for increases in power and -0.56 for decreases in power. This formula appears to apply to the first method of lowering engine power – downrating the same engine. Unsurprisingly, for small changes in power (that we're talking about in this report) this non-linear formula yields a lower ratio of roughly 0.25.

Therefore, as a consensual middle estimate for the ratio between changes in engine power as a result of the crisis and scrapping schemes on the one hand and changes in CO_2/km, we take in this report the value 0.35, or in a formula: $\Delta CO_2 / CO_2 = 0.35 * \Delta kW / kW$.

This leads to the results shown in table 2, on page 16.

[24] Potential CO_2 reduction from optimal engine sizing for light commercial vehicles, TNO/CE Delft, April 2010, www.transportenvironment.org/Publications/prep_hand_out/lid/586, p7

[25] Transportation Sector Module of the National Energy Modelling System: Model Documentation 2010, Office of Integrated Analysis and Forecasting, Energy Information Administration, U.S. Department of Energy, Washington, DC 20585, June 2010, www.eia.gov/FTPROOT/modeldoc/m070(2010).pdf, p46