SMMT
DRIVING THE
MOTOR INDUSTRY

New Car CO_2 Report 2012

The 11th report

THE SOCIETY OF
MOTOR MANUFACTURERS
AND TRADERS LIMITED

INTRODUCTION

The UK automotive industry recognises the impact of climate change and our role in helping minimise the impact that vehicles have on the environment. The sector continually innovates in support of government plans to reduce CO_2 emissions and our use of fossil fuels. The industry also understands that motorists are keen to use more efficient vehicles and enjoy the benefits they provide. Through investment in R&D, the sector consistently delivers lower CO_2 emitting technologies and provides more choice to motorists across all vehicle markets. This, our 11th annual CO_2 report, highlights the progress that has been made during the past 15 years since SMMT first collated data on tailpipe CO_2 emissions from cars.

2011 was a landmark year, with UK sales weighted average new car CO_2 emissions falling below 140g/km for the first time, to 138.1g/km. In 2011, a new car emitted 27.2% less CO_2 than one did 15 years ago and was 4.2% below the 2010 figure. Last year, the market for diesel cars surpassed petrol variants for the first time and registrations of alternatively-fuelled vehicles rose to over 25,000 units - boosted by the arrival of mainstream electric vehicles.

European legislation has established fleet CO_2 targets for manufacturers to achieve by 2020 - starting in 2012 for cars and in 2014 for vans. Ultra-low carbon vehicles will be important contributors to these goals but over this period petrol and diesel cars will continue to dominate the market, playing a crucial role in reducing emissions. We welcome the improvements being made in enhancing efficiency across all vehicle types and segments and look forward to further progress.

The debate is now underway on longer-term targets for cars and vans – beyond 2020. Progress towards decarbonisation of the transport system will require step-changes in technology development and the re-fuelling infrastructure, while motorists will also need to welcome and adapt to changes. Industry will continue to work with government and other stakeholders to develop a strategic approach to deliver progress.

The automotive industry in the UK is well placed to contribute towards the development, delivery and manufacturing of these new lower emitting technologies and increasingly efficient vehicles. By incentivising an increased rate of technology development, establishing new infrastructure (notably for alternatively-fuelled vehicles), encouraging the decarbonisation of energy generation, building consumer confidence and speeding-up the rate of vehicle replacement, government can help the UK industry to lead the global transition to ultra-low carbon vehicles while helping to rebalance the economy and create high value jobs.

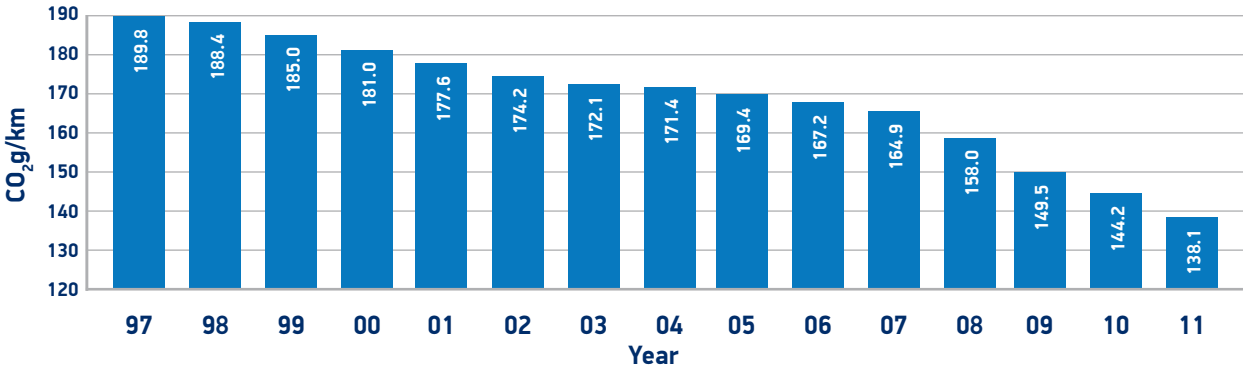
I trust you find this report of use and for more details and regular updates on progress, go to:
www.smmt.co.uk/CO2report

Paul Everitt,
SMMT Chief Executive

SUMMARY

- **New car CO_2 emissions fell to a new low of 138.1g/km in 2011, 4.2% down on 2010.**
- **Industry delivering array of low emitting cars providing consumers with more choices.**

UK average new car CO_2 emissions, 1997 – 2011



Sales-weighted average new car CO_2 emissions fell to 138.1g/km in 2011, a 4.2% reduction on 2010 and one of the best gains on record. Emissions have fallen by 23.7% since 2000, with 70% of this progress made in the past four years.

As in the UK, the rate of progress across the EU has picked up in recent years although the UK has matched or bettered the EU rate of improvement in each of the past seven years.

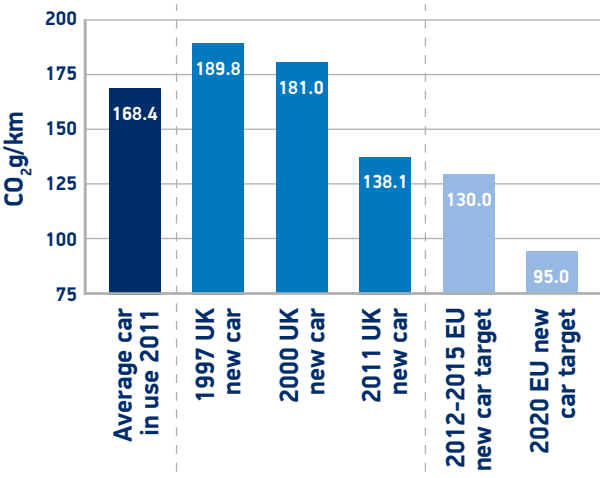
A new car bought in the UK is now 18.0% more efficient than the average car in use in the UK. If the rate of vehicle replacement could be increased, the rate of emissions reductions would bring greater environmental and efficiency improvements. Considerable progress has to be made to deliver the challenging 2020 pan-EU CO_2 target of 95g/km.

Average new car CO_2 emissions fell in the UK in 2011 as diesel cars took a record 50.6% of the market and registrations of alternatively-fuelled vehicles rose by 11.3%. Both these fuel types offer lower tailpipe CO_2 emissions than a comparable petrol car. 2011 also saw the arrival of mainstream electric vehicles to the market. Improved market share by CO_2 conscious fleet buyers and lower than average emitting Supermini models also contributed to the strong performance in recent years.

All market segments reported a further decline in CO_2 emissions in 2011, highlighting the broad nature of the total market shift to more efficient cars. The current challenging economic setting has further increased consumer awareness and the desire to reduce running costs and purchase lower CO_2-emitting cars.

The automotive sector has invested significant resources to develop and bring to market lower CO_2-emitting technologies. This sustained progress in new car efficiency has helped to deliver a 10.2% reduction in CO_2 emissions from all cars in use between 2000 and 2010 as this new technology infiltrates the vehicle parc. Further progress on reducing emissions will be achieved by manufacturers delivering more efficient products, continued support from government and policy makers to facilitate the take-up of these vehicles and consumers purchasing them. Manufacturers will also have to meet the targets set out in the EU New Car CO_2 Regulation and the evolving Euro emissions standards on regulated emissions.

UK average car in use, average new car CO_2 emissions and EU targets to 2020



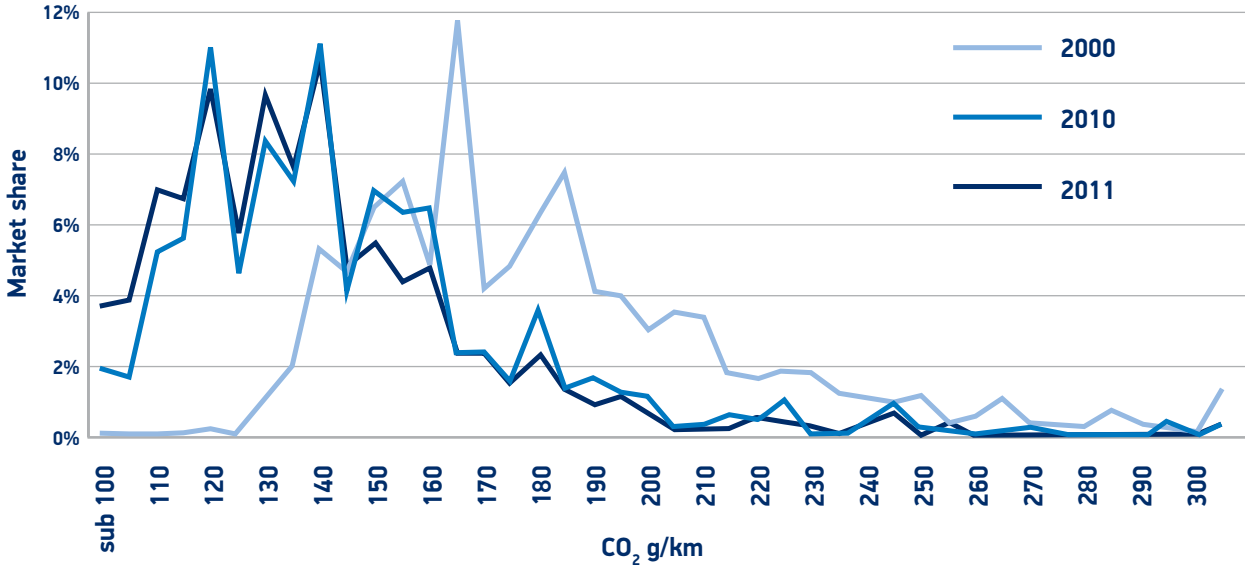
UK NEW CAR CO_2 EMISSIONS AND MARKET TRENDS

- **Shift to lower CO_2-emitting cars across all segments, sales and fuel types.**
- **Increased consumer choice, including availability of ultra-low and zero emission cars.**
- **Increased volumes of diesel and alternatively-fuelled vehicles.**

The SMMT CO_2 database can be differentiated by a number of vehicle characteristics including make, model, engine variant, fuel type, sales type and market segment. In all these metrics average new car CO_2 emissions have fallen consistently. This section of the report outlines these key trends in the market to 2011.

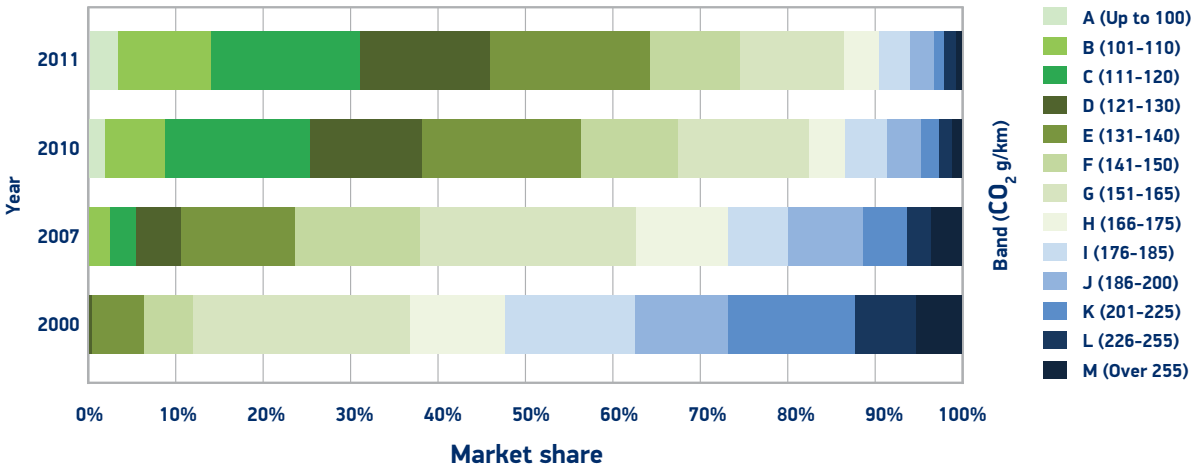
The following charts show the general distribution of the market split by CO_2 bands and also by the current 13 band Vehicle Excise Duty (VED) system. This shows how the market has shifted into lower CO_2-emitting vehicles. In 2011 almost half the market (46.8%) had CO_2 emissions of 130g/km or lower, compared with 10.6% in 2007. In 2011 the lowest 'A' VED band, cars with CO_2 emissions of 100g/km or lower, took a 3.4% market share, almost double the level recorded in 2010 and four times the volume in 2009. Similarly the market share for higher CO_2-emitting cars has fallen – whereas 23.2% of the market had emissions over 200g/km in 2000, the share was just 3.2% in 2011.

Distribution chart – shows trend to lower CO_2-emitting vehicles



New car market split by VED band

(note all data split by current 13 band VED system)



Market size and change in buyer type

The new car market fell to 1.94 million units in 2011, 4.4% below the 2010 market, 12.6% below the 2000 market and some 22%, or around 540,000 units, less than the 2.5 million units averaged in 2002-2007 before the recession impacted. This slowdown in new car registrations will reduce the rate of renewal in the car fleet and adversely affect overall CO_2 emissions from the vehicle fleet.

The new car market in 2011 was supported by a 4.7% rise in fleet and business registrations. Fleet car users are likely to have access to a restricted choice of vehicle type which might include a CO_2 limit imposed by their fleet manager. Fleet buyers typically do a higher average mileage, so might opt for a larger car than a private motorist but to contain costs and reduce Company Car Tax (CCT) they are likely to opt to minimise CO_2 emissions. In 2011 on a sales weighted basis, average new CO_2 emissions for fleet cars were 1.7% below the private buyer average, at 137.1g/km and 139.5g/km respectively.

Increased choice

Motorists are offered a greater choice of product today than a decade ago, and increasingly those choices are of lower CO_2-emitting vehicles. The SMMT new car registration database can be differentiated by make, model and engine variant. In 2011, over 7,600 variants had at least one registration against them, compared with less than 6,000 in 2000, a 28% rise. Of those variants in 2011, 24.3% had CO_2 emissions of 130g/km or below, compared with 1.2% in 2000 and on a non-sales weighted basis their average CO_2 emissions were 22% lower than in 2000.

Segment trends – across the board improvements

SMMT differentiates the market into nine distinct vehicle segments. These are shown in the table below with their average sales weighted CO_2 emissions in 2011. This shows cars in the Mini, Supermini and Lower Medium segments have below market average CO_2 emissions.

SMMT segments, average new car CO_2 performance (g/km) and market share

Segment	2011 CO_2	% ch vs '10	% ch vs '00	Lowest emitter	Mkt sh '11	Mkt sh '00
Mini	107.8	-5.6%	-29.9%	0	2.2%	2.3%
Supermini	124.6	-2.4%	-18.6%	87	36.3%	31.0%
Lower Medium	132.5	-5.7%	-24.4%	0	25.2%	29.8%
Upper Medium	139.3	-4.3%	-27.6%	27	13.2%	21.5%
Executive	153.4	-9.5%	-34.9%	117	5.7%	4.7%
Luxury	221.8	-5.3%	-24.1%	174	0.4%	0.5%
Specialist Sports	177.7	-7.0%	-19.4%	0	2.3%	3.0%
Dual Purpose 4x4	184.2	-6.2%	-29.0%	115	8.6%	4.5%
MPV	150.2	-5.9%	-28.8%	107	6.2%	2.7%
Total	138.1	-4.2%	-23.7%	0	100.0%	100.0%

The market shift towards the Supermini segment between 2000 and 2011 will have contributed to lowering average new car CO_2 emissions. All segments have posted double digit reductions in average emissions compared with 2000, with some of the largest reductions coming in segments where there has been a notable shift to diesels (see following chart). The Executive segment has made the best improvement in average CO_2 emissions since 2000, down 35%, with a 9.5% change between 2010 and 2011 alone. This followed diesel registrations in the segment rising by 19.7% in 2011 volumes and diesel penetration rising to 84.3%.

There are vehicles with CO_2 emissions around 30% below the segment average available in every segment, highlighting the low emitting choices available to motorists. The market has also shifted into niche vehicles (such as Dual Purpose and MPVs), which have an above market average CO_2 value. These niche segments have made some of the best gains in average CO_2 emissions, following the introduction of wider model choice, notably diesels and smaller models. Several models in these segments also offer greater occupancy and load carrying capabilities than a standard car, which could result in emissions on a per occupant basis being better than a standard vehicle, if the occupancy capacity is utilised.

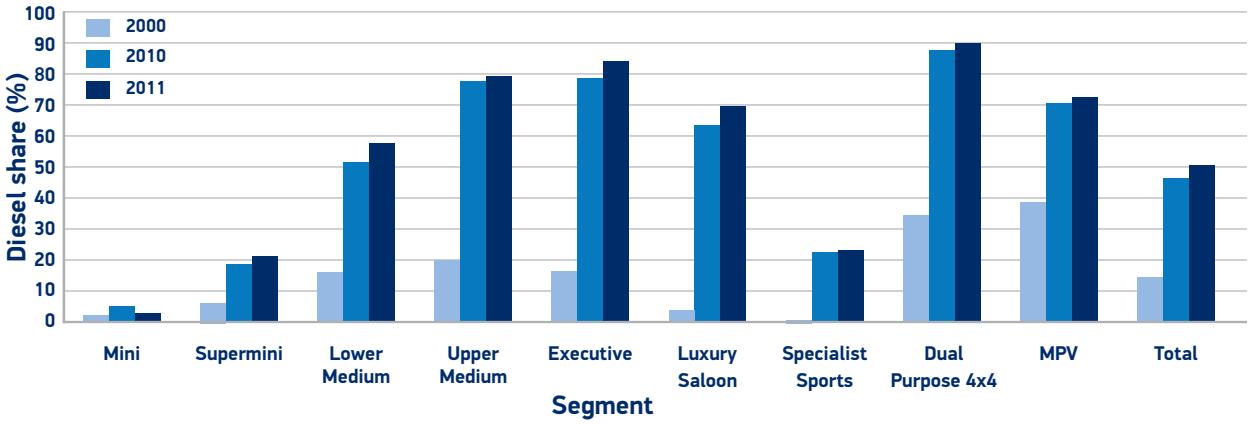
Further improvements by diesel and petrol cars

Many of the increased variants on offer now are diesels. Diesels accounted for 52% of the variants in 2011, compared with 23.1% in 2000. They accounted for 50.6% of total new car registrations in 2011, up from 14.1% in 2000. The shift to diesels has been a key reason for the continuing improvement in average new car CO_2 emissions. On a non sales-weighted basis diesel cars were 13.9% lower CO_2-emitting than petrol cars in 2011.

When comparing the best seller in each segment, diesel variants were 15-20% lower CO_2-emitting than the petrol variant (see www.smmt.co.uk/CO2report for details). Due to their higher production costs and different performance characteristics, diesels tend to be fitted into segments where CO_2 levels are above average. On a sales-weighted average, CO_2 emissions of diesel and petrol cars being broadly equal since 2007, and were 137.8g/km and 139.3g/km respectively in 2011. Despite the rise in diesels, which tend to have larger capacity engines, there has not been a noticeable shift in the engine capacity of vehicles registered between 2000 and 2011.

Petrol cars have also made strong progress in reducing emissions. In 2011 the lowest emitting diesel had CO_2 emissions of 85g/km, whilst the lowest petrol was at 90g/km. This compares with 116g/km and 118g/km in 2000.

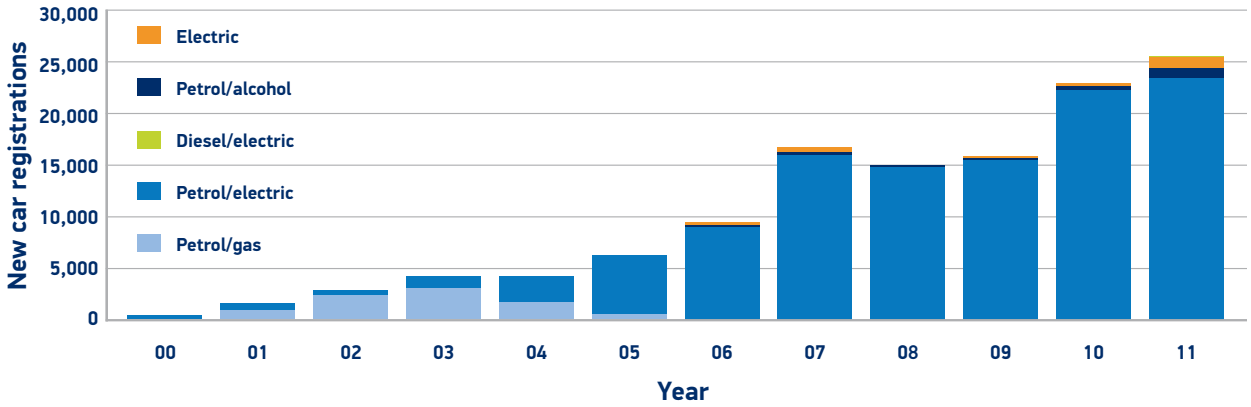
Diesel share of the UK new car market by segment, in 2000, 2010 and 2011



Accelerated introduction of ultra-low CO_2 emitting vehicles

The market has seen the arrival of ultra-low CO_2 emitters. Of the 347 models in the SMMT new registration database in 2011, 47 (13.5%) had variants emitting 100g/km of CO_2 or below. In terms of emissions from the tailpipe, pure electric vehicles (EVs) have zero emissions. In 2011 there were six EVs on the market; the Citroën C-Zero, Mitsubishi i-MiEV, Peugeot iOn, smart fortwo, Nissan LEAF and Tesla Roadster. EV registrations rose by 557% in 2011 to 1,098 units, boosted by the launch of new models and the Plug-In Car Grant[1]. It will take time for the EV market to develop, just as it has taken the market for

Registrations of alternatively-fuelled cars, 2000 -2011



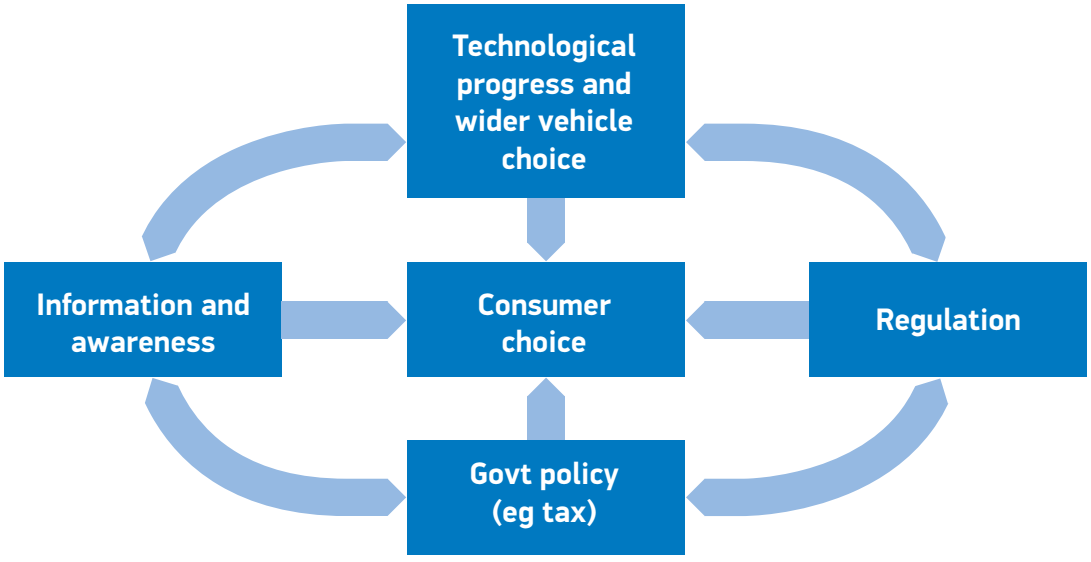
hybrid vehicles to develop. In 2011 registrations for all alternatively-fuelled cars rose to a record 25,456 units and 1.3% share of the total market. Petrol-electric hybrids, which accounted for 92% of all 2011 AFV volumes, had average CO_2 emissions of 103g/km, 25% lower than the UK average. A number of manufacturers now offer petrol-electric and diesel-electric hybrids, and plug-in electric hybrid vehicles are also now available to consumers.

UK made greater progress than across the EU

UK average new car CO_2 emissions have fallen by 22.2% between 2000 and 2010, compared with an 18.5% reduction across the EU, reports the European Environment Agency[2]. JATO Dynamics calculates the EU average fell 4.7% (on its 2010 figure) to 136.1g/km in 2011, with the UK making a 5.9% reduction to 138.0g/km[3]. The UK average remains above the EU, due in part to the UK's higher than average per capita GDP and consumers demanding cars with higher specification, as well as lower market share by diesels. Diesel penetration in the EU was 56.1% in 2011, compared with 50.6% in UK. Duty on diesel fuel across the EU is, on average, 25% lower than on petrol[4], whereas in the UK rates are the same.

INFLUENCES ON AVERAGE NEW CAR CO_2 EMISSIONS

- **New lower CO_2-emitting technologies, notably new engines, driving down emissions.**
- **Government can play key role in helping shape the market, eg through taxation.**
- **New car CO_2 targets to contribute to manufacturers development of low carbon cars.**



Many interconnecting factors help shape the new car market and average CO_2 emissions of the fleet. Assigning levels of influence is difficult but new technologies and the wider choice of low CO_2-emitting variants have been key drivers.

Lower CO_2-emitting technologies

Improvements in CO_2 emissions across all fuel types, segments and sales types suggest that developments in vehicle technology and a wider choice of models (notably diesels) have helped deliver the greatest reduction in new car CO_2 emissions. These technologies have also overcome a backdrop of vehicles getting heavier, which act as a drag on improving CO_2 emissions. In part, some of the rise in weight has come from added safety features and in some instances technologies to reduce other pollutants.

Technological measures to deliver lower CO_2-emitting vehicles:

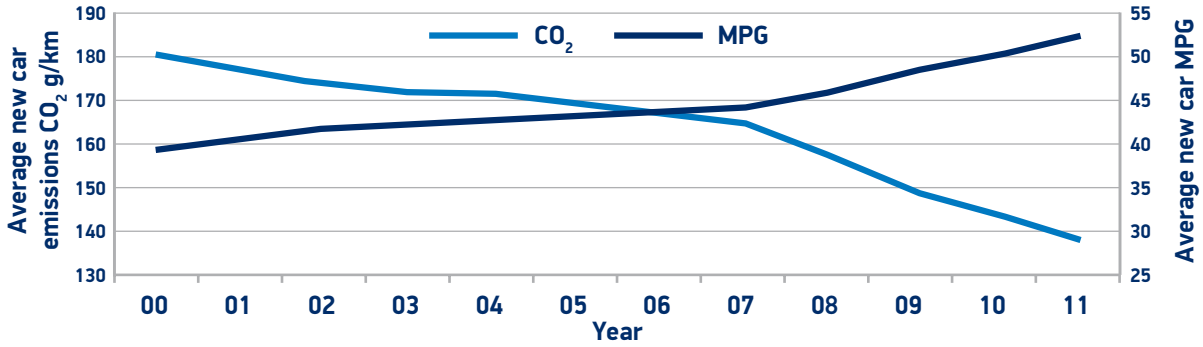
Alternative fuels	General improvements	Internal combustion engine	Non-test cycle
• Biofuels • Diesel-electric hybrids • Electric vehicles • Gas-powered vehicles • Hydrogen vehicles • Petrol-electric hybrids • Plug-in hybrids • Range extenders	• Aerodynamics • Energy recovery braking • Light weighting • Low rolling resistance tyres • Low viscosity lubricants • More efficient ancillary devices • More efficient cooling and heating systems • Optimised transmissions	• Common rail injection • Direct injection • Downsizing of engine capacity, with forced induction (eg turbocharging) • Stop-start systems • Variable valve lift	• Gear-shift indicators • Smart satellite navigation systems

Consumer information

CO_2 emissions from vehicles have been on the public conscience for more than a decade. CO_2 is used for Vehicle Excise Duty (VED) and Company Car Tax (CCT), manufacturers are required by law to display fuel consumption and CO_2 data for their cars in promotional material and since 2005, the industry has also had a voluntary agreement to show the colour-coded new car efficiency label at point of sale, developed in partnership with the LowCVP[5]. The Government also provides consumers with advice about buying a 'green' car[6].

Consumers may still be more at ease with, or aware of, their vehicle's MPG (miles per gallon). CO_2 emissions and MPG are directly related, although the conversion factors for petrol and diesel are different. As CO_2 emissions have fallen, so MPG has risen – see chart below.

Change in new car CO_2 and MPG, 2000 - 2011



Regulation

It takes several years to design and bring to market a new product. The introduction of a new engine will be a key component of a new model. Manufacturers face two challenges, reducing CO_2 emissions and regulated emissions. Optimising an engine for one may have adverse impacts upon the other. Euro standards are set in reduce regulated emissions (like NO_x and PM), and as these standards change, as they did with Euro 5 in 2011, so the engines will be developed. Typically, simultaneously CO_2 reducing technologies will be applied at this time.

Manufacturers have developed low CO_2-emitting cars ahead of the European New Car CO_2 Regulation (EC443/2009[7]), which started in 2012. Under this regulation manufacturers face corporate fleet average targets, based in part on vehicle weight, designed to reduce the EU new car fleet average to 130g/km by 2015 (65% of fleet must meet the target in 2012, rising to 100% by 2015). Failure to achieve target will result in fines, up to €95 per gram of CO_2 away from target multiplied by the number of cars registered. Past progress will also have come from action to meet the European voluntary agreement to deliver 140g/km in 2008/09.

Government influence

Government has an array of measures that can influence the type of car bought and used, including regulation, taxation and incentives, as well as softer measures such as information and advice. Vehicle Excise Duty (VED) has been CO_2-based for all cars registered since March 2001[8] and Company Car Tax (CCT) became CO_2-based in 2002[9]. Both these regimes use CO_2 bands to apply differential tax rates to encourage the take-up of lower emitting cars, including a zero rating for pure EVs introduced in CCT in 2009 and set for five years. VED and CCT rates are set at the Chancellor's discretion.

In 2010 first year VED rates were introduced, which show a greater differentiation of rates for new cars. Cars emitting up to 130g/km pay nothing under the first year rate, cars between 131-165g/km pay the standard rate and cars over 165g/km pay above the standard rate. Cars in the highest VED band (over 255g/km) pay £1,000 in the first year since April 2011, over twice the standard rate of £460. Budget 2012 announced VED rates from April 2012 will rise in line with inflation and government will consider whether to reform VED over the medium term.

Fuel duty is a direct tax on the use of the vehicle and, given the frequency of refuelling, consumers may be more aware of fuel price variation than changes to VED or CCT. Almost 60% of the price at the pump is made up from taxes. In the 1990s the fuel duty escalator pushed the price of fuel up rapidly and again in the late 2000s. Crude oil price trends have been volatile, but increased by 70% over the past five years. Pump prices in 2011 were some 70% above those in 2000 and 15% up on 2010, despite the government reducing or postponing duty rate increases. Rising fuel prices encourages consumers to reduce fuel use, which could include measures such as driving less and switching to more efficient cars.

Biofuels offer a way to reduce CO_2 emissions from transport[10]. At present biofuels account for around 3% by volume of blend in petrol and diesel fuel. New petrol cars are generally capable of running with a blend of up to 5% biofuel, while for diesels it is 7%, but concerns about the sustainability of biofuels have so far limited their reach. The Renewable Energy Directive requires the transport share by energy to rise to 10% by 2020. The Committee on Climate Change supports a rise to 8%, as in the Gallagher report. Industry is developing cars to run on higher blends of fuel, but at present not all cars can do so.

Since April 2002 the capital allowance treatment of cars has been designed to benefit lower CO_2 emitters[11]. Businesses can claim capital allowances to reduce the tax they pay on profits for the purchase of certain products or investments, called writing down allowances (WDA). Expenditure on cars registered after 1 April 2009 with CO_2 emissions above 160g/km attract a 10% WDA and for those with emissions of 160g/km or below attract 20% WDA (from April 2012 rates will be 8% and 18% respectively). From April 2013 the main rate of capital allowances for business cars will reduce from 160g/km to 130g/km. The threshold above which lease rental restriction applies will also reduce from 160g/km to 130g/km at this time. From April 2010, cars emitting less than 110g/km of CO_2 or pure EVs qualify for first year WDA of 100% (due to expire for cars in 2013 and for vans in 2015).

There are measures in place to support the take-up of ultra-low carbon vehicles, including pure EVs. Pure EVs are zero rated for VED and CCT. Through the Office for Low Emission Vehicles there is also the Plug-In Car Grant, which since April 2011 gives a 25% incentive, up to £5,000, off the price of a qualifying car emitting less than 75g/km of CO_2[12].

Some local authorities use CO_2 as a basis for differential charging with parking permits and sub-100g/km Euro 5 compliant cars get a 100% discount on the London congestion charge.

Household and business finances and budgets will also shape the type of cars purchased and used. The UK has a high degree of car ownership and consumers look for high levels of specification on their cars. The recession cut new car demand sharply and slowed the replacement of the fleet. However, it also focused consumer attention on efficiency and reducing running costs. In 2009/10 the scrappage scheme was introduced to support the market[13]. This may have brought a step-change in consumer buying habits, with the scheme resulting in a rise in demand for Superminis.

TOTAL CO_2 EMISSIONS

Total CO_2 emissions from all cars in use and other emissions

- **Improvements in new car CO_2 performance delivering real world savings.**
- **Total CO_2 emissions from all cars in use down 10.2% between 2000 and 2010.**
- **New cars are 18% more efficient than the average car in use in the UK fleet.**
- **Other emissions are also falling, as Euro standards deliver improvements.**

The delivery and take-up of more efficient new vehicles contributes to falling total CO_2 emissions from all cars in use – the 'parc'. Reducing CO_2 emissions from the parc is critical to ensuring sustainable mobility.

Government figures show total CO_2 emissions from all cars in use are falling[14], see table below. The 10.2% reduction in CO_2 emissions from the car parc between 2000 and 2010 has come despite a 4.1% rise in the number of cars in use to 31.26 million units and a 12.4% rise in total distance travelled to 385.9 billion kms[15]. Since the recession the distance travelled has stabilised and the growth in the car parc has slowed. The average car covered 8,420 miles per annum in 2010, down from a peak of over 9,000 miles in 2000[16].

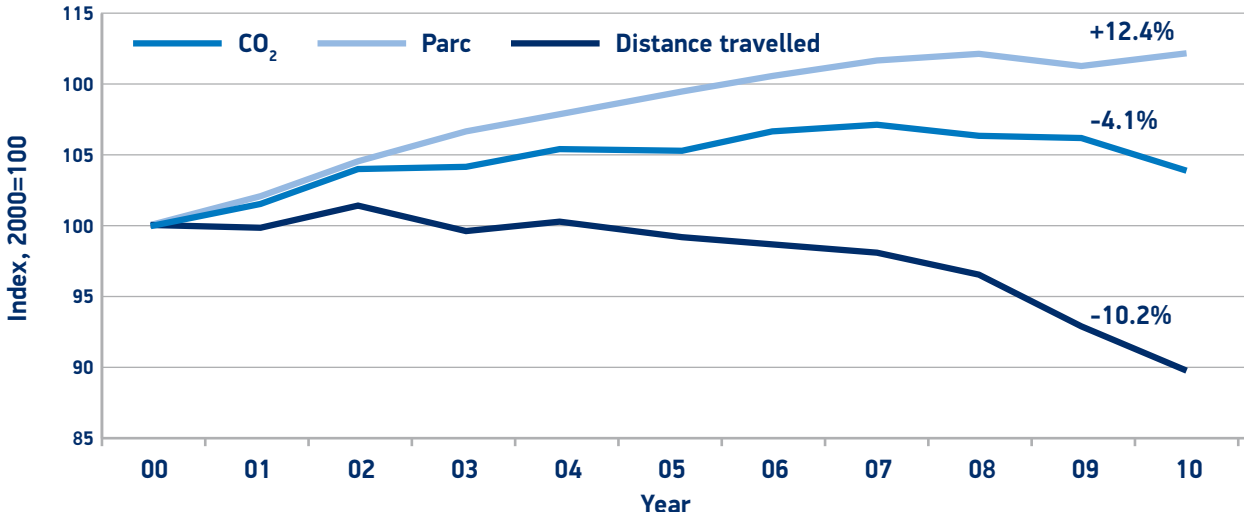
Total CO_2 emissions from all cars in use, road transport and UK total

$MtCO_2$	Total*	Road Transport	Cars	Cars as % total	Cars as % road transport
1990	614.67	108.44	71.23	12.1%	65.7%
2000	587.40	114.83	75.07	13.6%	65.4%
2009	520.79	111.13	69.71	14.6%	62.7%
2010	536.03	111.13	67.40	13.6%	60.7%
% change 2010 versus					
- 1990	-12.8%	2.5%	-5.4%		
- 2000	-8.7%	-3.2%	-10.2%		
- 2009	2.9%	0.0%	-3.3%		

(Source: DECC) *Includes memo items – international aviation and shipping bunkers.

CO_2 emissions from all cars in use, parc size and distance travelled

(% change vs 2000)



(Sources: CO_2 and distance travelled from DECC/DfT, parc figures SMMT)

Improvements in vehicle efficiency, infrastructure, traffic management, alternative fuels and modes of transport and reductions in travel (eg working from home or internet shopping) can all be part of the collective action to reduce CO_2 emissions.

Motorists can reduce CO_2 emissions by driving more efficiently and saving fuel and money. Techniques to drive in a more environmentally friendly manner can reduce emissions by some 10-25%, with organisations like the Energy Saving Trust providing advice and training on efficient driving techniques[17]. Consumers can also minimise emissions by ensuring their vehicle is functioning properly by regularly servicing it, maintaining correct tyre pressures and not carrying items which unnecessarily add weight or reduce the aerodynamic efficiency of their vehicle.

Dividing total distance travelled by total CO_2 emissions for all cars suggests the average car in use emitted 171.8g/km in 2010, down 13.8% from 199.2g/km in 2000. SMMT's Motorparc database contains details of the 31.26 million cars in use after 2011, and 89.9% of those vehicles have a CO_2 value attached. The average CO_2 emissions of a car in the SMMT parc database were 169.3g/km in 2010, which closely aligns with government data. The average new car in 2011 was 18.0% more efficient than the average car in use, based on SMMT data. In 2011 the SMMT parc average was 168.4g/km. Speeding up the renewal of the parc would ensure overall CO_2 emissions fall at a faster rate.

In the medium to long term it is expected that the focus on CO_2 emissions of the in-use phase may shift towards whole lifecycle emissions. This includes reporting not just the fuel consumed by the vehicle in use, but also the production of the fuel and the vehicle, and its recycling at end-of-life. At present the industry estimates that 10% of a vehicle's lifetime emissions are from the production phase, 85% from the in-use phase and 5% from the end-of-life phase. SMMT's 2011 Sustainability Report shows emissions from the production phase were down by 28% between 2000 and 2010. As alternatively-fuelled vehicles, notably pure electric vehicles (EVs), come to the fore, the emissions involved in the energy production are more in the spotlight. This report focuses on tailpipe CO_2 emissions and so pure EVs in this report are classed as zero emitting. There are emissions associated with the production of electricity, as there are with the production of petrol and diesel fuels.

There could also be a broadening of the focus to other emissions beyond just CO_2 emissions. Industry is committed to tackle all emissions, not only GHG emissions, but also pollutants affecting air quality. There are Euro emission standards, which define the regulated limits of exhaust emissions of carbon monoxide (CO), nitrogen oxides (NO_x), hydrocarbons (HC) and particulate matter (PM), ie pollutants affecting air quality. The emission levels are tested via the standardised New European Drive Cycle (NEDC) test cycle, as used for CO_2 emissions. Euro standards are shown in the table below for all new cars. A new car registered in 2011 would meet the Euro 5 standards, which had NO_x limits 75% lower and for diesels PM10 limits 94% lower than a car registered in 2000 complying with Euro 2 standards. The average new car CO_2 emissions in the UK are also presented in the table, as a comparison.

Euro emission standards for all cars[18]

(date applies for all cars first registered)

		Emissions limit - mg/km (% change on Euro 2)					UK Average CO_2 emissions (SMMT data)
		NO_x		PM	CO		
Std	Intro date	Petrol	Diesel	Diesel	Petrol	Diesel	g/km
Euro 2	Jan 1997	250	730	80	2200	1000	186.0
Euro 3	Jan 2001	150 (-40%)	500 (-32%)	50 (-38%)	2300 (15%)	640 (-36%)	172.9 (-7%)
Euro 4	Jan 2006	80 (-68%)	250 (-66%)	25 (-55%)	1000 (-55%)	500 (-50%)	157.4 (-15%)
Euro 5	Jan 2011	60 (-76%)	180 (-75%)	5 (-94%)	1000 (-55%)	500 (-50%)	138.1 (-26%)
Euro 6	Sept 2015	60 (-76%)	80 (-89%)	5 (-94%)	1000 (-55%)	500 (-50%)	-

The standards have helped air quality emissions from all cars in use to fall, as shown by DfT statistics[19]. These show CO emissions from cars have fallen by 73.4% between 2000 and 2009, by 65.2% for NO_x over the same period and by 24.0% for PM10. The rate of decline in particulates is partially offset by the shift in the market to diesel cars, which have higher particulate levels than petrol. Particulate emission limit values under the regulation for petrol and diesel cars will be on par, at 5mg/km, following the introduction of the Euro 5 standard. The reduction in pollutant emissions has also come despite the rise in the number of vehicles and total distance travelled. However, there are reports which suggest that in some areas local air quality has not improved at the same rate, possibly due to high levels of congestion. Alternatively-fuelled vehicles may offer solutions on air quality, as well as on CO_2 emissions.

LIGHT COMMERCIAL VEHICLE CO_2 EMISSIONS

- **SMMT estimates the average LCV emitted 199.2g/km CO_2 in 2011.**
- **Vans are work tools bought to meet diverse business needs.**
- **EU-wide LCV CO_2 targets in place, although base data still being developed.**

SMMT is developing a light commercial vehicle (LCV) CO_2 database equivalent to that it has for cars. In 2011, 65% of LCV (van) registrations had a CO_2 value assigned by the manufacturer, delivering a sales weighted average of 188.8g/km for the UK. If missing data is estimated using VCA data or that of similar model ranges, then the average rises 5.5% to 199.2g/km for all LCVs. Both these figures should, however, be used with caution given the missing data and assumptions used.

LCVs would be expected to have a higher CO_2 figure than cars, reflecting in general their larger physical size, weight and engine capacity. Over the past decade there has been a shift in market share towards heavier LCVs – 82.5% of the market is over two tonnes, compared with 67.2% in 2000. Larger LCVs allow greater payload efficiency and flexibility of use. As vans are work tools, operators are already very cost conscious and look to improve efficiency wherever possible, but they are also mindful that LCVs tend to travel high mileages, have tough duty cycles and a strong need for reliability. The LCV market is already 99.9% diesel, highlighting the focus on running costs, but also limiting the scope for further fuel switching.

Determining CO_2 levels for vans is more complex than for cars due to the number of different configurations (eg short/long wheelbase), body styles (eg panel van, Luton van, tipper) and payloads vans are offered with. This is further complicated by the fact that some commercial vehicles are sold as chassis, for subsequent completion by a third party not under control of the manufacturer. This can introduce different body styles, weights and particularly aerodynamic efficiencies. An earlier SMMT estimate for the UK suggested an average CO_2 figure of around 210g/km in 2009 – suggesting a 2.6% per annum rate of improvement. Data from the EU suggests the average van emitted 203g/km in 2007 and 181g/km in 2010 (a 3.6% per annum improvement), although the EC noted their latest figure could be inaccurate by +/-10g/km.

Similar to cars, the EU has adopted a Regulation to achieve EU-wide average CO_2 targets for new LCVs[20]. These are 175g/km in 2014-17 (with the phase-in, 70% of each manufacturer's fleet will have to comply in 2014, 75% in 2015, 80% in 2016 and 100% from 2017 onwards) and 147g/km in 2020. Also, as with cars, LCV producers face corporate fleet average targets, the same penalties of up to €95 per gram of CO_2 away from target, multiplied by the number of vehicles registered. They can also apply for super-credits, eco-innovations and a derogation if they register less than 22,000 units across the EU per annum.

To assist the transition to lower carbon vehicles, the UK government made electric vans exempt from the 'van benefit charge' (currently £3,000 per annum) for five years from April 2010 and the purchase of an electric van is also eligible for 100% first-year writing down allowance. In January 2012 the Plug-In Van Grant was introduced, which gives an incentive of 20% of the van's list price, up to £8,000, to qualifying vehicles emitting below 75g/km of CO_2[21]. In 2011 just 75 new alternatively-fuelled LCVs were registered, highlighting the scale of transition needed. Only some CO_2 saving technologies may be transferable from cars to LCVs due to their differing requirements for range, payload and/or volume capacity.

Rapid growth in van registrations over the past decade caused total CO_2 emissions from LCVs to rise. Between 2000 and 2007 the new LCV market grew by 40%, or almost 100,000 units, to 337,736 units. Then the recession impacted. The market recovered in 2011 to 260,153 units. The LCV parc rose by 28.9% between 2000 and 2010 to 3.57 million vehicles, and the total distance travelled rose by 28.5% to 67.2 billion vehicle kms. CO_2 emissions from LCVs over this period rose at a lower rate, 18.6%, reflecting improvements in vehicle efficiency. Further progress will be a balance between economic growth and market demand and the pace of progress in vehicle efficiency. Improving driver behaviour and more efficient logistic solutions could also bring sizeable benefits to fleet emissions.

OUTLOOK FOR NEW CAR CO_2 EMISSIONS

- **Further improvements are due as manufacturers deliver technological progress.**
- **Integrated approach remains key to achieving CO_2 aspirations, at least cost.**
- **Shift to alternative fuels needed to achieve decarbonisation of road transport.**

The UK has legally binding targets to cut CO_2 emissions by 34% of 1990 levels by 2020 and by 80% by 2050[22]. The Committee on Climate Change, which advises the government on emissions reductions, believes surface transport emissions, of which cars account for 60%, will need to come down by 26% from 2008 levels by 2020 and by 91% by 2050[23]. To achieve such aims will require radical change in the composition of the vehicle markets and a shift to electric vehicles (EVs) and/or hydrogen vehicles. Decarbonisation of grid electricity is urgently required, especially so if the move to EVs is to reduce total CO_2 emissions.

The New Car CO_2 Regulation demands that pan-European average new car emissions are reduced to 130g/km in 2012-15 and 95g/km by 2020, subject to review. Reaching 95g/km is challenging and will need the right regulatory framework to help industry deliver, eg taxation system, fuel prices, incentives and infrastructure support for alternatively-fuelled vehicles (AFVs). Industry is progressing towards the ambitious 2020 target and believes focus should now be placed on longer-term targets.

Technology To Deliver Further CO_2 Improvements

Internal Combustion Engines (ICEs)

ICEs will be part of the portfolio of technologies used to deliver a lower CO_2-emitting fleet. They have already made significant progress in reducing emissions over the past 15 years and notably so in recent years. The importance of ICEs is clear, as even under the scenario of 10% of the current market being AFVs (up from 1.3% in 2011) and half of those being EVs, average new car CO_2 emissions would only fall by 6% to 130g/km. The ongoing development of mass market power trains is therefore crucial to deliver the market as a whole to achieve short-term targets on CO_2 emissions.

There are a number of new Mini segment cars to enter the market place, such as VW up!, SEAT Mii and Skoda Citigo, which will be powered by small three-cylinder engines. These will offer low CO_2 emissions and, being smaller, will require less power to move around. Similarly the new, UK-designed, Ford 1.0 Ecoboost engine offers CO_2 emissions of 109-114g/km with the same power as an equivalent normally aspirated 1.6 litre petrol engine. The launch of compact models within segments could also see emissions fall.

The UK is a leading manufacturer of ICEs, producing some 2.5 million per annum. Improving ICEs is one of the top five R&D strategic technologies identified by the Automotive Council. Industry has already made several high profile announcements of investment into this area in the UK.

Alternatively-fuelled vehicles (AFVs)

EVs and fuel cell vehicles offer zero CO_2 emissions from the tailpipe. They can also offer other advantages in terms of improved air quality, less noise, greater security of supply of fuels and, in the case of EVs, potentially more convenient ways to refuel (if solutions to plugging in vehicles can be delivered). However, most AFVs have their own barriers to overcome, notably cost, range, refuelling time and lack of refuelling infrastructure. As technological hurdles are overcome and economies of scale are reached, AFVs should become ever more competitive.

The uptake of AFVs, including EVs, is difficult to forecast given the myriad factors which can influence these emerging technologies. To achieve the UK's targets the Committee on Climate Change foresees the market for EVs and plug-in hybrids reaching 16% by 2020[25]. Other forecasts are significantly lower. ACEA says original equipment manufacturers (OEMs) expect plug-in vehicle uptake within the range 3-10% in 2020-2025, depending on the infrastructure and supportive measures[26]. Independent forecaster LMC forecast that 8.1% of European personal vehicles in 2021 will be electrified (4.6% mild, full and plug-in hybrids, and 3.5% battery EVs, range extender and fuel cells) [27], whilst Morgan Stanley forecasts the global market for new cars to be 4.5% battery-only EVs by 2025[28].

It has taken over a decade to get AFV's market share to 1.3% in the UK and faster progress will prove more challenging, until a tipping point is made through technological progress and affordability. The emergence of new technologies could lead to a shift in the purchasing model, with the balance potentially tilting away from traditional ownership towards more flexible mobility solutions.

At present ultra-low carbon vehicles rely upon early adopters and benefit from government support, through grants and tax breaks. Government policies must reflect this reality and not be subject to change nor penalise early adopters. Continuation of the Plug-In Car Grant is welcome. The Budget 2012 announcement to remove the zero rating for EVs in CCT in 2015 risks damaging the emerging EV market. A consistent, clear, fair and long-term approach is essential to facilitate manufacturers, businesses and consumers to invest in more efficient technologies, and to ensure the products are competitive and desired.

Details of some of the new products manufacturers have brought (or intend to bring) to market over the next couple of years are listed below:

Hybrids	Range Extender Electric Vehicles	Electric Vehicles	Plug-in Hybrid Vehicles
• BMW ActiveHybrid 3 • BMW ActiveHybrid 5 • Lexus GS450h • Mercedes E-Class hybrid • Mercedes M-Class hybrid • Peugeot 3008 Hybrid 4* • Peugeot 508 Hybrid 4* • Toyota Prius+ • Toyota Yaris Hybrid • VW Jetta Hybrid	• BMW i3 with range extender • Chevrolet Volt • Fisker Karma • Fisker Surf • Vauxhall Ampera	• Audi R8 e-tron • BMW i3 • Ford Focus BEV • Renault Fluence • Renault Zoe • Tata Vista • Tesla Model S • VW E-Up! • VW Golf Blue-e-motion	• BMW i8 eDrive • Ford C-Max Energi • Toyota Prius plug-in hybrid

*diesel/electric, other hybrids all petrol/electric

Integrated approach to facilitate progress to lower CO_2-emitting vehicles

Policy makers can help greatly by providing the right framework to encourage the provision and take-up of these lower CO_2-emitting vehicles. This could be through taxation, information provision or own-fleet procurement, ensuring a robust economy is set to enable consumers to feel empowered to buy new low CO_2-emitting cars and potentially encourage and help industry to deliver the technologies which will benefit society as a whole. Policy makers should also be looking to ensure that the recent recession and concerns over public finances do not cause support for innovative technologies to be withdrawn. However, there is also concern that as the economy fully emerges from recession, market demand for higher CO_2-emitting vehicles could return, adversely impacting on average new vehicle CO_2 emissions.

Matching environmental and industrial policy

Industry also looks for government to entice R&D, as well as vehicle and supply chain production, in ultra-low carbon vehicles in the UK. This will help deliver the wider objectives of lower CO_2 emissions from transport, and also support UK-based companies in their efforts to be key players in delivering those new technologies. Measures such as the Department for Business Innovation and Skills' £125 million fund to support innovative projects in advanced manufacturing supply chain, the Hydrogen Mobility Consortium and the Technology Strategy Board's £25 million low carbon vehicles innovation platform are welcome. R&D tax credits, investment in skills, and other measures equally need to be undertaken to help promote action in the UK.

Capital allowances for vehicles, plant and machinery are a long-established and valued cost relief for investment spending and could be used as a suitable mechanism to support the market for ultra-low carbon vehicles, helping overcome the initial higher purchasing price barrier to market development.

The UK, like most other member states, has CO_2-based taxes and measures to encourage the take-up of electric vehicles. In some countries the government has in place specific targets for AFVs to achieve and provides greater support to encourage their take-up. There is, though, no blueprint to follow and industry, government and other stakeholders need to continue to work together and engage regularly to ensure progress is delivered. Inevitably we will also need to discuss alternative revenue streams and reconstitution of policy regimes to reflect vehicles becoming more efficient and the arrival of new technologies.

UK production

The UK produces a diverse range of vehicles, which in turn have a wide spectrum of CO_2 emissions. In 2011 the average UK-built car emitted some 159g/km of CO_2, above the UK market average, reflecting the higher-end products made here. The UK-does make an array of low CO_2-emitting products.

Three models made in the UK have variants emitting below 100g/km, these are the MINI One, MINI Cooper Hatch and Toyota Auris Hybrid – the first European produced petrol-electric hybrid. There are also several models which have variants emitting less than 130g/km, such as the Honda Jazz, Honda Civic, MINI Coupe, MINI Clubman, MINI Convertible, MINI Roadster, Nissan Juke, Nissan Qashqai, Toyota Auris, Toyota Avensis and Vauxhall Astra.

The UK is also home to the world's largest collection of low volume manufacturers. Several of these low volume manufacturers have received a derogation from the EU New Car CO_2 Regulation, to ensure they face emissions targets in line with their specific technological and economic reduction potential. Industry believes the small volume and niche derogations are required to ensure these companies can continue to provide diversity to the market. These vehicles are sold in very small quantities and often only cover a low annual mileage and so have limited impact on total CO_2 emissions from the car fleet.

Low volume cars, notably sports cars, are often assumed to be higher CO_2-emitting vehicles. However, in reality these companies and the vehicles they produce are full of innovative technologies to maximise efficiency. These measures notably include light-weighting, efficient power trains and enhanced aerodynamics. Examples of advanced engineering solutions are Lotus' development of bonded aluminium body structures and McLaren's use of carbon composites. Companies such as AVID, Lightning, Lotus, Morgan and Westfield are also developing innovative power trains, including alternatively-fuelled vehicles.

All UK manufacturers have plans to develop and bring to the market low CO_2-emitting products. Among the recent investment announcements are Nissan's plan to build the electric LEAF model and a stand-alone electric battery production plant in Sunderland. Jaguar Land Rover is investing in hybrid and range extender technologies, and Ford and BMW's UK engine plants are producing ever more efficient internal combustion engines.

In 2011 over £4 billion of investment by manufacturers was announced into the UK, much of which to deliver the transition to low and ultra-low carbon vehicles. This transition is being assisted by the Automotive Council, which is helping facilitate the development of key technologies and the supply chain. Industry looks forward with continuing the partnership with government, regulators and other stakeholders to ensure the effective move to lower CO_2-emitting vehicles and enabling the UK to be a key contributor to the design, manufacturer and delivery of such products.

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Quick Facts

- **Average new car CO_2 emissions fell by 4.2% in 2011, on 2010, to 138.1g/km.**
- **Emissions have fallen in every year and between 2000 and 2011 fell by 23.7%.**
- **46.8% of the market had CO_2 emissions of 130g/km or below in 2011, in 2000 it was 0.9%.**
- **Diesel cars took a record 50.6% share in 2011 and alternatively-fuelled cars a record 1.3%.**
- **Total CO_2 emissions from all cars in use fell 3.3% in 2010 on 2009 and by 10.2% on 2000.**

	2000	2010	2011
Average new car CO_2 emissions	**181.0g/km**	**144.2g/km**	**138.1g/km**
% change on 2000		-20.3%	-23.7%
Share of market with CO_2 emissions:			
Up to 100g/km	0.0%	1.8%	3.4%
Up to 130g/km	0.9%	38.2%	46.8%
Up to 140g/km	8.2%	56.5%	65.0%
Total new car market	**2,221,647**	**2,030,846**	**1,941,253**
Diesel share	14.1%	46.1%	50.6%
Alternatively-fuelled car share	0.0%	1.1%	1.3%

	2000	2009	2010
Total CO_2 emissions from all cars in use*	**75.1MtCO_2**	**69.7MtCO_2**	**67.4MtCO_2**
Total number of cars in use	27.8Mn	31.0Mn	31.3Mn
Total distance travelled by cars**	376.8Bn kms	400.7Bn kms	392.4Bn kms

Key information:

All data SMMT unless otherwise stated (*DECC and ** DfT).

Key: CO_2 – carbon dioxide, g/km – grammes per kilometre, MtCO_2 – million tonnes of carbon dioxide, Mn – million and Bn kms – billion kilometres.

SMMT CO_2 data is collated by SMMT's Motor Vehicle Registration Information Service (MVRIS) and links the vehicles' CO_2 levels to the MVRIS new car registration database to create sales weighted figures. The CO_2 data is sourced from manufacturers' own CO_2 figures (as supplied on the vehicle's first registration document) and checked with type approval data from the Vehicle Certification Agency (VCA) to ensure accuracy.

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