The Society of Motor Manufacturers and Traders New car CO_2 report 2009

Driving down emissions

Introduction

The freedom and mobility granted by the car surpasses that of any invention in the last century. Far from a luxury item, the car is now a necessity for many, delivering a level of transportation essential to modern living. Yet, while the number of vehicles on the road and the distance travelled increases, CO_2 emissions from road transport continue to fall.

For over a decade, vehicle and component manufacturers have been committed to slashing the environmental impact of their products. Last year alone, average new car CO_2 emissions fell by their biggest ever margin, dropping 4.2%. The average new car in the UK now emits just 158.0g/km, down from 164.9g/km at the end of 2007 and 16.8% down on the 189.8g/km base in 1997.

Through technological innovation and consumer education, manufacturers have made genuine progress towards meeting tough environmental targets. We've cut the average fuel consumption and CO_2 emissions of the two million cars bought each year and the introduction of the voluntary colour-coded new car CO_2 labels, now used in 91% of dealerships, has resulted in an increase in diesel registrations and a 76% rise in alternative fuelled cars.

However, the biggest challenges still lie ahead. The adoption of the EU new car CO_2 regulation in December 2008 set strict pan-European targets of 130g/km by 2015. An annual improvement of 2.5% is needed to meet the European target, although the decline in fleet renewal brought on by the global economic crisis is likely to slow the rate of improvement.

Positive government action is therefore vital, not only from an economic perspective but also an environmental one. Immediate action to boost the market is essential to maintain the rapid improvement in new car CO_2 emissions achieved to date. Across Europe scrappage incentive schemes have proved successful, driving consumers into showrooms and taking older, high emission vehicles off the road. On behalf of the motor industry, SMMT continues to push government for the introduction of a UK scheme to support sales and maintain fleet renewal.

Despite the economic downturn, investment in research and development remains essential. Steady fleet renewal coupled with the continued introduction of new technology will ensure average new car CO_2 emissions continue to fall. The UK motor industry has a long-term future at the heart of the low carbon agenda but government must act now to guarantee the country's position at the forefront of environmental innovation and production. Government must create an environment in which low carbon automotive manufacturing can prosper, securing employment and prosperity for years to come.

Paul Everitt, The Society of Motor Manufacturers and Traders chief executive

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Chapter 1—Summary of car CO_2 emissions

Average new car CO_2 emissions

- Average new car CO_2 emissions have fallen in every year on record
- In 2008, the average fell to 158.0g/km, 4.2% down on 2007 and 16.8% on 1997
- 2008 rate of improvement best on record and three times the pace of 2007

Table 1 Average new car CO_2 emissions in the UK

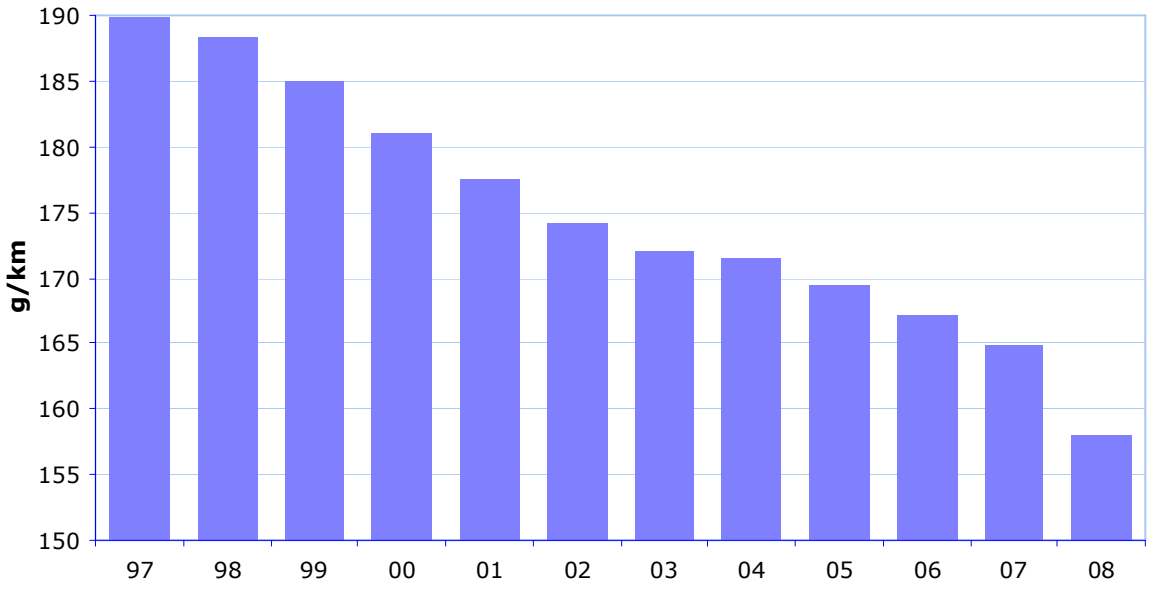
Year	Average CO_2 g/km	y/y % ch	y/y % ch vs 1997
1997	189.8		
2000	181.0	-2.2%	-4.6%
2007	164.9	-1.4%	-13.1%
2008	158.0	-4.2%	-16.8%

1. Average new car CO_2 emissions have fallen in every year since SMMT has collated the statistics, with data from 1997. In 2008 the annual rate of decline was the steepest on record, at 4.2% or 6.9g/km, to 158.0g/km. This was over 2.5 times the rate of improvement averaged over the previous 11 years. The 2008 average was 16.8% or 31.8g/km below the level first reported in 1997.

2. The improvement in performance can be attributed to a number of factors, although the precise impact of each is difficult to ascertain. In recent years, vehicle manufacturers have been investing huge resources in developing lower emitting vehicles and technologies. This has helped emissions across most model ranges to be reduced. 2008 also saw the launch of a number of specific 'eco' models within manufacturers' product ranges such as Volkswagen's Bluemotion, Ford's Econetic and Vauxhall's Ecoflex.

3. The rapid rise in fuel prices, CO_2 related fiscal measures and enhanced information about going 'green' and saving money has also helped deliver lower average new car CO_2 emissions.

Chart 1 UK average new car CO_2 emissions (Source SMMT)



4. In addition, the economic situation encouraged a switch to low cost, more efficient vehicles, but also squeezed demand for certain aspects of the market - notably higher cost, more discretionary spend items, which tend to be higher CO_2 emitting vehicles.

5. SMMT reported on new car CO_2 performance throughout 2008 on a quarterly basis and it was evident throughout the year that there was a noticeable improvement in the rate of progress. The delivery of cleaner vehicles and technology to the marketplace, and the enhanced attention on CO_2 emissions, were having a noticeable impact on the sales weighted new car CO_2 emissions performance prior to the economic downturn.

6. Diesel penetration rose again in 2008, to 43.6%. As diesels emit less CO_2 than their petrol equivalents, the shift to diesels has been an important contributor to lowering emissions.

7. In 2008 average CO_2 emissions from diesel and petrol cars both fell. All segments reported a decline in CO_2 emissions. And both private and fleet average CO_2 emissions declined on 2007 levels.

8. A record 11.0% of the new car market was 120g/km or below in 2008, more than double the 5.4% rate recorded in 2007 and over three times the 2005 rate.

9. 2008 also saw the principles of new car CO_2 regulations agreed, which set out challenging targets for vehicle manufacturers to achieve. Manufacturers will continue to develop and bring to the marketplace more efficient models and technical solutions. The principles of the integrated approach remain of key importance. There is also concern that given the financial crisis, manufacturers could find funds to invest in new technologies limited and the slowdown in the renewal of the vehicle fleet, could damage the longer term environmental profile of the fleet.

Action by vehicle manufacturers to lower CO_2 emissions

10. The reduction in average new car CO_2 emissions is due, in a large part, to the efforts of vehicle manufacturers to develop and improve existing technologies and bring to the market new technologies. The industry has focused upon:

- Conventional and alternative powertrain technologies
- Increased use of stop-start technologies
- Improved energy management systems
- Improved direct injection systems
- Improved and more efficient transmissions
- Regenerative braking technologies
- Materials, with focus on lightweighting
- Aerodynamics
- Improved energy efficiency of car components eg air conditioning, alternator, power steering
- Driver information devices, eg gearshift indicators

11. It takes time to develop and introduce many of these technologies and even longer for them to then be widely adopted. Often these technologies come at a cost and consumers need to be educated about the benefits of change. This is an issue when collective action and government support can assist.

Importance of the car

12. The car is a necessity for many. Cars provide access to culture, education, employment and wealth. They are also a liberating consumer good, enabling people to travel where they want, when they want. There is now more than the equivalent of one car per household in the UK. Cars allow people to live where they want, commute to work, visit friends and family and go shopping. For some just driving is a pleasure, for others the car is a simple transportation tool.

13. Cars have become an integral part of our society. They account for 84% of all journeys, by distance travelled (TSGB 2008 table 1.1) and only 24% of households did not have access to regular use of a car (TSGB 2008 table 9.14), down from 30% in 1997.

14. The type of car purchased is typically dependent firstly on price and affordability. However, the car is typically a compromise purchase - having to provide space, utility and functionality for a variety of tasks. Many users also buy a car for looks, prestige, and performance, whilst at the same time being constrained by running costs, dealer/servicing location and space.

15. The rapid growth in car ownership has come at a cost. The roads are more congested and as cars burn fossil fuels to enable them to move, so emissions have gone up. However, over the past decade emissions from cars have been falling. The improvements in the efficiency of vehicles have mitigated their increased number and use.

16. More efficient use of the vehicle and a more efficient infrastructure setting would help enable emissions to come down further. The development of the integrated approach is an important concept in reducing overall emissions from transport and also to speeding up the flow of traffic, so making the whole transport process more efficient.

Car CO_2 in relation to road transport and total emissions

- Cars accounted for 57% of all CO_2 emissions from road transport in 2006
- Cars accounted for 11.5% of total UK CO_2 emissions in 2006
- Both shares have declined in recent years

Table 2 - CO_2 emissions: cars, road transport and total UK, $MtCO_2$ (Source: DfT)

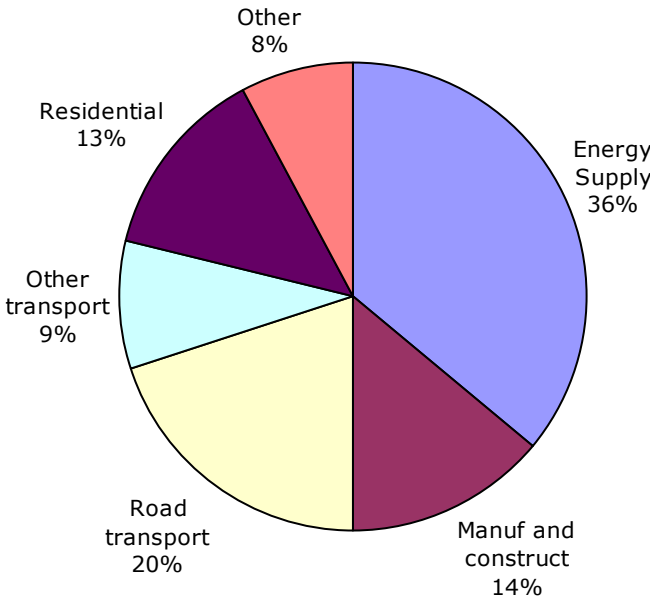
Year	Total UK	Road transport	Cars	% total	% road transport
1997	579.1	116.6	72.2	12.5%	61.9%
2000	595.4	116.0	72.2	12.4%	62.3%
2005	596.4	119.9	69.6	11.7%	58.1%
2006	596.9	120.3	68.7	11.5%	57.1%

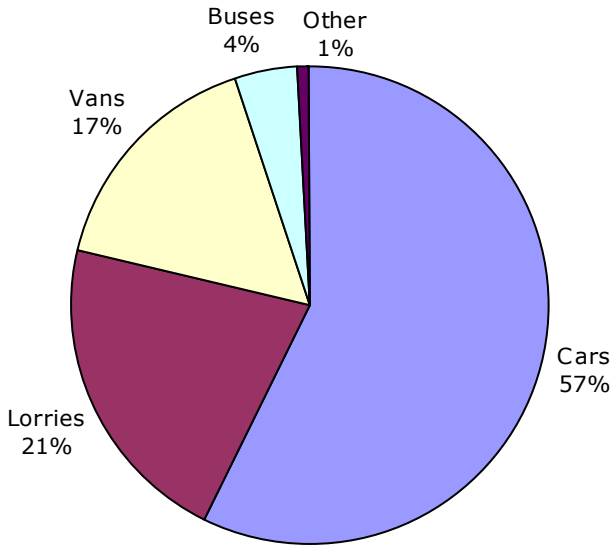
17. Government figures on CO_2 emissions are presented in table 2 and chart 2, sourced from the Department for Transport's (DfT) Transport Statistics Great Britain (TSGB) 2008. The figures for total UK Co2 emissions come from AEA and include land use, land use change and forestry and international bunkers (ie aviation).

18. Cars account for less than one eighth of total CO_2 emitted in the UK and less than 60% of road transport CO_2 emissions. Cars' reduced share of the road transport and total UK emissions reflects the improvements in vehicle technology and in particular a continuing move towards diesel power. Commercial vehicles and buses are predominantly already diesel powered and so do not have the ability to switch to this lower CO_2 emitting fuel, as cars have.

19. The performance also reflects stronger growth in other areas. In road transport the light commercial vehicle, predominantly van, market has shown exceptional growth as sectors like construction, retail and housing boomed and new entrants came to the marketplace - annex 4 looks at CVs and CO_2 emissions. In addition, total UK CO_2 emissions were boosted by a 22.7% rise in electricity and heat production, reflective of a growing population and a population increasingly using electrical gadgets. Over this same period of economic growth emissions from cars have fallen, to deliver a performance around 30% better than the power generating sector.

Chart 2 Total CO_2 and road transport emissions, market shares (Source: DfT)





Total CO_2 emissions from the car fleet

- Total new car CO_2 emissions continue to fall
- Amount of fuel consumed by cars fell by 1.5% in 2007
- Parc size and distance travelled rising, but rates of growth begin to cool

Table 3 - Total car CO_2 emissions, fuel consumption, distance travelled and parc size, GB (Source: DfT)

Year	Total CO_2 ($MtCO_2$)	Fuel consumption (Mt)	Distance travelled (bn kms)	Parc size (mn)
1997	72.2	23.0	365.8	25.6
2006	68.7	21.9	402.6	29.9
2007	-	21.5	404.1	30.2
% ch '07				
vs '06		-1.5%	0.4%	1.0%
vs '97		-6.3%	8.6%	17.9%

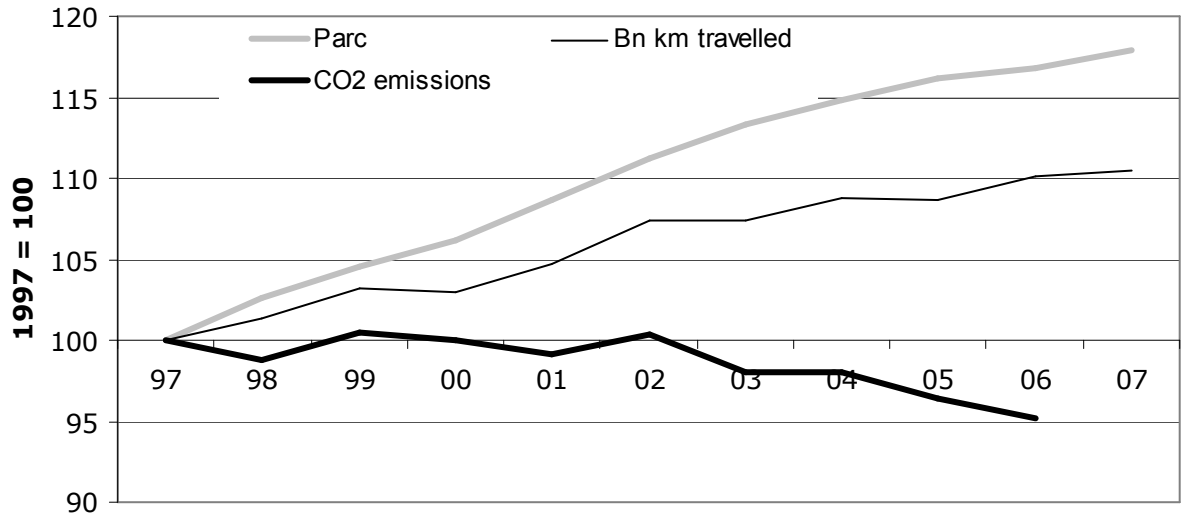
20. It is a common misconception that total CO_2 emissions from cars are increasing. This is not true. Since 2003 emissions have been falling. Latest data shows that in 2006 emissions fell by 1.4% compared with 2005 and by 4.8% compared with 1997. Data for 2007 is still to be published by DfT. The improved performance comes despite more cars in use and the distance travelled increasing.

21. The improvement in vehicle efficiency has mitigated the success of the car in terms of its popularity. However, more action is needed to deliver more significant progress in reducing net CO_2 levels.

22. 2007 saw the rate of growth in distance travelled slow and provisional 2008 data reported a 1.7% decline in car travel occurred. This is likely to reflect the higher fuel prices and slowdown in the economy.

23. Whilst overall the amount of fuel consumed has fallen, the switch to diesel has been significant. Between 1997 and 2007 the amount of diesel consumed by car users doubled, but was offset by an 18.6% decline in petrol consumption. Diesel fuel accounted for 22.2% of all fuel used in 2007, double the 10.5% in 1997.

Chart 3 Growth in CO_2 emissions, parc and distance travelled (Source: DfT)



CO_2 and fuel consumption - closely linked

24. CO_2 emissions and fuel consumption are closely linked. As fuel is a mixture of different constituents a direct ratio is not possible, however an approximation is calculable. There is also a difference between the ratio of fuel consumed to CO_2 produced for petrol and diesel cars. An approximate ratio is CO_2 for petrol = 1/(mpg x 0.000148) and for diesel = 1/(mpg x 0.000132). Mpg equals miles per gallon. So a petrol car averaging 35mpg emits approximately 193gCO_2/km and a diesel car averaging 35mpg emits 216/gkm. Vehicle Certification Agency (VCA) and Department for Environment Farming and Rural Affairs (Defra—now DECC) also publish mpg to CO_2 conversion tables. The ratios give similar figures to both: VCA's—35mpg = 192g for petrol and 214g/km for diesel, and Defra's—35mpg = 187g/km for petrol and 212g/km for diesel. Whilst the carbon content of diesel fuel is higher diesels typically produce 10-20% less CO_2 emissions than an equivalent petrol model.

25. The data for fuel use and CO_2 from cars follows almost exactly the same path - see chart 4. This shows fuel consumption and CO_2 emissions from cars using 1997 as a base (data sourced from DfT's TSGB).

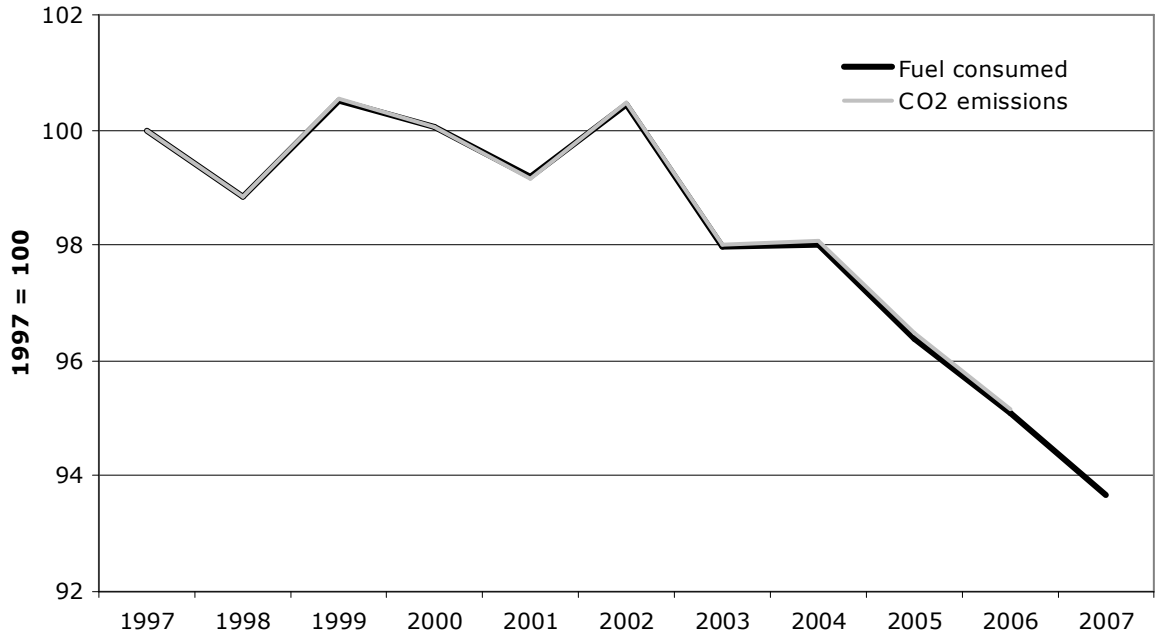
26. Fuel consumption is often cited near the top of consumer priorities when choosing a car (see King Review 2007), but emissions are much lower down the rankings, despite their link.

27. Consumers are often more familiar with mpg figures. They can work out their mpg from fuel bills and increasingly cars are fitted with on-board computers to tell the user directly. The CO_2 number is often more of a theoretical figure, that the consumer may not fully understand. For mpg the higher the number the better, but for CO_2 the lower the figure, the more efficient the vehicle is. This may be a further complication for the consumer to understand.

28. The increased use of CO_2 based taxes and advertising features having to display the CO_2 rating of a car have raised the profile of CO_2 emissions.

29. It is important to convey to motorists that all the measures to help reduce fuel consumption also help reduce CO_2 emissions. The government's 'Act on CO_2' campaign (www.direct.gov.uk/actonco2) is working hard to encourage best in class and efficient use of vehicles. Tips to buy a more efficient vehicle and to use it more efficiently are helping consumers understand that they play an important role in the emissions from the vehicle fleet. The rapid rise in fuel prices in 2008 ensured that such tips were more widely promoted by the media. The economic downturn that has since arisen is likely to have helped maintain consumers' desire to use their vehicle more efficiently and effectively, and in the process save fuel and emit lower levels of CO_2 emissions.

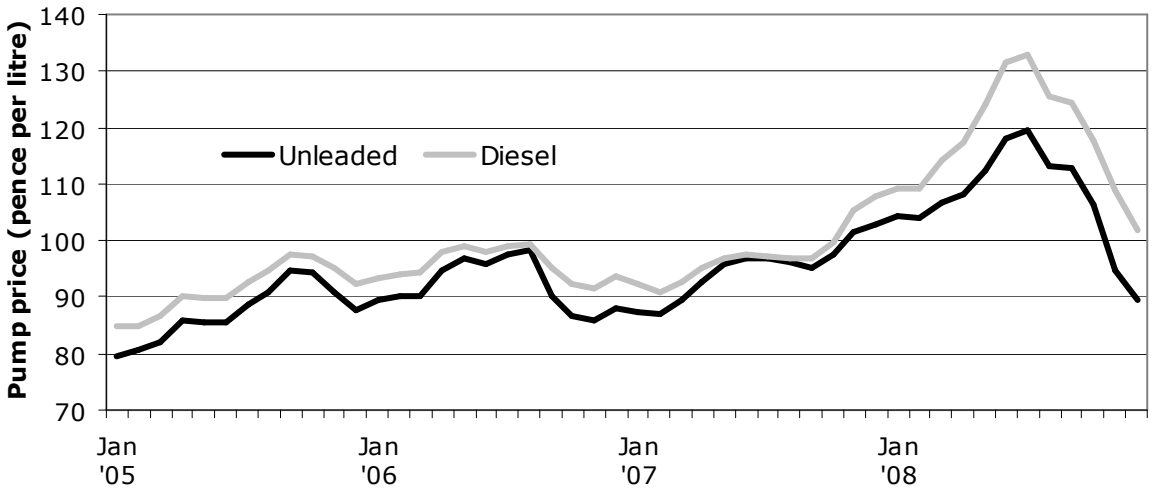
Chart 4 CO_2 emissions and fuel consumed by cars (Source: DfT)



Fuel price trends

- Fuel prices showed steep net rise in 2008, but fell sharply from August onwards

Chart 5 Pump price of petrol and diesel, 2005-2008 (Source: AA)



30. Data from the AA shows the extreme movements in pump prices in 2008. Fuel prices had been very steadily increasing, but in 2008 petrol prices rose rapidly on the back of a hike in crude oil prices. The rise was linked to concerns over supply, as well as strong levels of demand - notably from Asia.

31. UK pump prices ended the year up 13.2% for petrol and 21.2% for diesel. Diesel remains above petrol, unlike many other European nations where diesel duty rates are much lower, giving it an advantage at the pumps. Diesel started the year 4.9p/ litre more expensive than petrol, but ended the year 12.4p/litre or 13.9% higher.

32. The net gain will have encouraged people to use their vehicles more conservatively and also look to more efficient choices in their next vehicle purchase, but the rapid fall in pump prices in the second half of the year, notably in Q4, would have undone some of that.

33. The outlook for fuel prices is always uncertain, and 2008 showed how rapidly prices could shift. In the longer term, the price of oil is expected to rise as supplies become more scare. Pump prices are also expected to rise generally as the government looks to raise fuel duty and encourage the shift to efficiency.

34. The recent changes in fuel prices would have changed the economic setting for encouraging fuel switching. Reports from America suggest that the switch to alternatively fuelled vehicles (AFVs) and vehicles using alternative propulsion technologies (APT, such as electric vehicles) unwound at the end of 2008 and into 2009, as petrol prices have fallen. Demand for AFVs and APTs did fall sharply in Q4 in the UK, although this might reflect other market influences (see page 19 for details).

35. The increased differential between petrol and diesel will mean that for some the switch to diesel will no longer be so attractive. It could also see some switch back to petrol. This depends on how long the relative prices hold, which in part is reportedly due to refining capacity for diesel currently being too low. If consumers do switch back to petrol this would have an adverse effect on average CO_2 performance - as previously noted, diesels are up to 20% lower CO_2 emitting than petrol. This would reduce successes for the UK to meet national CO_2 target reductions and also make manufacturers' targets for the new car CO_2 regulations harder to attain.

Impact of UK economic slowdown

- UK economic growth falls sharply, after long period of growth
- Recession evident in second half of 2008 and steeper decline due in 2009

36. The UK economy slipped into recession in 2008, and is expected to contract by over 2.5% in 2009. The economic crisis comes after a sustained period of economic growth, which has made the downturn feel all the more abrupt and created a greater fear of uncertainty - over how long the recession will last and how large the impact will be.

37. While for many, cars are an essential purchase, for some cars are a large item of discretionary spend and one of the first items consumers have held off purchasing as the economic slowdown has unfolded. As this economic crisis is rooted in the financial sector and the housing market, the withdrawal of cheap and ready credit and availability of equity withdrawals from once growing house prices has resulted in the vehicle market contracting sharply in the second half of 2008. The new car market fell by 27.2% in the final quarter.

38. Within the overall market volumes of high-end products have in particular fallen sharply. Registrations of larger saloons and life-style choice vehicles (such as 4x4s and sports cars) have fallen far more than demand for small and medium sized family cars. This has had a positive short-term impact on average new car CO_2 emissions.

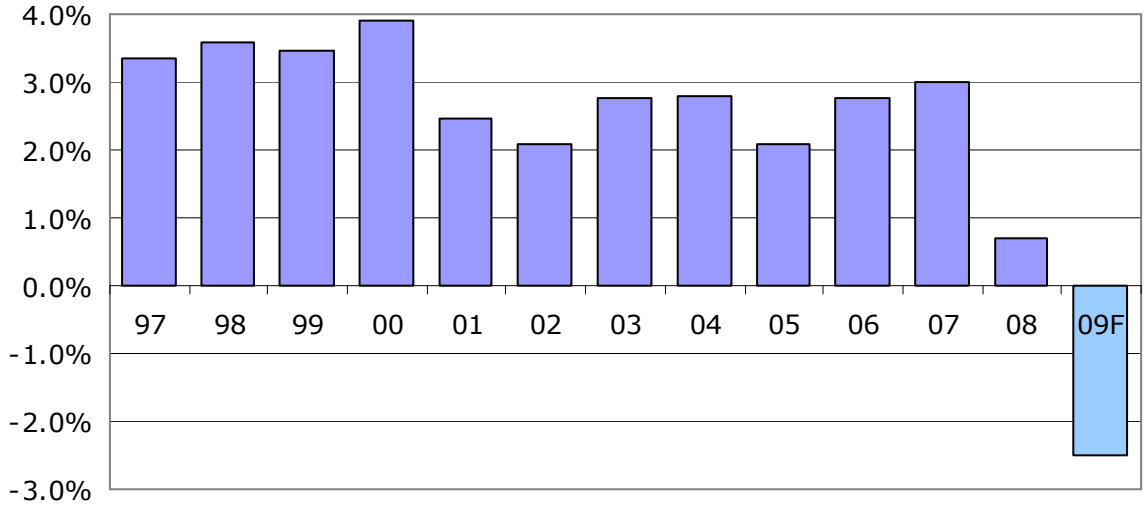
39. However, the contraction in the market and the slowdown at the higher end will have implications for future CO_2 emissions. It will mean lower revenue for vehicle manufacturers. This means money that will be used to develop new vehicles and new more efficient technologies will impact at a critical time when further development of new technologies is required.

40. Within the European Climate Change Programme, the independent scientific institute, TNO, in 2006 said the costs of achieving 130gCO_2/km were almost €3,000 per vehicle. This is a substantial increase at a time when manufacturers and consumers will find it difficult to incur extra costs.

41. Industry has sought support from governments to stimulate the economy, relieve the credit crunch and restore consumer confidence.

42. It is unclear whether the slowdown will have any lasting structural impact on the market; whether volumes in the UK will return to the 2.5 million unit level of 2002-2004; whether consumers will remain more focused on lower running costs and cheaper, more efficient motoring; whether the move to more expensive alternatively fuelled cars and advanced propulsion vehicles is curtailed; and whether manufacturers will be able to survive and invest in alternative fuels and other lower CO_2 emitting technologies. After the oil crisis in the early 1970s the marketplace became much more conscious about fuel efficiency.

Chart 6 Change in UK GDP growth, 1997-2009 (Source: ONS)



F = indicative forecast

Average CO_2 emissions of the UK parc

- Assumptions used to develop average CO_2 emissions on all cars in use since 1997
- Average was 173.7g/km, 9.9% above average new car CO_2 figure
- Average improving as lower emitting cars enter parc and older cars leave

Table 4 - Estimates of average CO_2 emissions of parc, 1997-2008

Year	New volume (million)	Survival rate (estimated)	Parc volume (million)	Ave CO_2 g/km
1997	1.74	71.5%	1.25	189.8
1998	1.99	81.0%	1.61	188.4
1999	2.13	86.5%	1.84	185.0
2000	2.21	92.0%	2.04	181.0
2001	2.46	95.0%	2.33	177.6
2002	2.56	96.0%	2.46	174.2
2003	2.58	97.0%	2.50	172.1
2004	2.57	98.0%	2.52	171.4
2005	2.44	98.5%	2.40	169.4
2006	2.34	99.0%	2.32	167.2
2007	2.40	99.5%	2.39	164.9
2008	2.13	100.0%	2.13	158.0
Total	**27.56**	**93.6%**	**25.80**	**173.7**

43. Based on assumptions about survival rates the average CO_2 figure for the parc since 1997 can be estimated. The figure will not be wholly accurate as the survival rates are based on averages over the recent past and actual levels will differ. In addition, it is likely that the more expensive and probably higher CO_2 emitting cars last longer, as their economic value is higher and so they are likely to be scrapped at a later stage than the average car. Total average emissions in the parc will probably be higher, as pre-1997 cars are likely to be less efficient. However, total emissions from the parc will also be dependent on a number of factors such as mileage vehicles undertake, state of tune and congestion.

44. The figures here suggest that the average CO_2 figure for all cars in use since 1997 is 173.7g/km. This is 0.9% down from the 175.3g/km figure average estimated for the 1997-2007 parc. This improvement reflects the arrival into the fleet of lower CO_2 emitting cars and the removal of older, less efficient ones. The parc average CO_2 figure is some 10% above the new car average. New cars emit around 15% less emissions than cars from a decade earlier.

45. The slowdown in the overall new car market in 2008/09 is likely to mean a reduction in the pace of fleet renewal. Existing cars will be kept going for longer as consumers try to stretch their resources in a time of economic hardship.

46. To improve CO_2 emissions of the vehicle parc the replacement cycle in the fleet should be speeded up. This could come from the ownership or use of older, higher emitting cars becoming more penalised or those vehicles being encouraged to leave the parc.

47. One solution, used in several European countries, is the adoption of scrappage incentive schemes (SIS). These typically give a financial stimulus to someone scrapping an old vehicle and replacing it with a new one. The schemes, adopted in countries including France, Germany, Greece, Ireland, Italy, and Spain, have reported sizeable improvements in the green credentials of their vehicle fleets. The schemes have also often seen an increase in sales volumes, although the timing of sales can be disrupted by the schemes and the value of additional sales is often difficult to gauge.

48. More stringent vehicle inspections, for example MOTs, could be used to ensure vehicles are maintained to a higher standard, and so operate more efficiently.

49. Policy makers often have to balance the environmental needs with social needs. Typically drivers of older cars tend to be those less well-off who cannot afford newer, more efficient vehicles.

UK new car CO_2 performance compared with EU15

- UK made above EU15 gains in six of past seven years to 2007
- UK average new car CO_2 emissions remains 3.7% above the EU15 average
- UK made the second best net improvement since 2000, after Portugal

50. The European Commission publishes annual CO_2 figures for EU member states on its website - http://ec.europa.eu/environment/air/transport/co2/co2_monitoring.htm. That data reports on performance between 2000 and 2007.

51. Between 2000 and 2007 within the EU15 the UK has moved from being the 14th highest CO_2 emitter to being the ninth highest. This follows an 11.1% improvement over this period from 185.4g/km to 164.7g/km The average within the EC15 was 7.7% over this period.

52. It should be noted that EC data does not match SMMT figures, with the EC not reporting on the full market. In 2000 the EC reported on 2.04 million units, compared with SMMT's 2.22 million units. In 2007 the difference was nearer 50,000 units, at 2.35 million units against 2.40 million units.

53. Portugal has recorded the largest improvement in average new car CO_2 emissions during the period, improving by 14.7% to become the member state with the lowest average CO_2 emissions. It was followed by Italy and Spain, who had been the best two performers in 2000.

54. Average new car CO_2 emissions in Portugal were 9.2% below the EU15 average in 2007, at 144.2g/km. This was 12.4% below the UK figure. In part this difference in performance reflects differing wealth levels, market maturity and the UK's desire for larger and often more exotic machinery, such as MPVs, 4x4s and sports cars. The UK also has a lower diesel penetration level than many EU markets, reflecting the higher duty charged on diesel fuel in the UK compared with other member states.

55. The UK has, however, made better improvements than the EU15 average in each of the past three years and in every year since 2000 except 2004. In part this reflects the fact that the UK started from a higher base - so had further to fall - and that diesel penetration had been comparatively low. The UK's performance has also been encouraged by the government being one of the first in Europe to adopt CO_2 based taxation measures.

56. Since 2000, of the big five markets (Germany, France, Italy, Spain and UK), only the UK and France made a better reduction in CO_2 emissions than the EU15 average. Average CO_2 emissions in France, Italy, and Spain were below the EU15 average in 2007. Of the big five markets only Germany has a higher average CO_2 figure than the UK.

Table 5 - Average CO_2 emissions in EU15 (g/km). (Source: EC)

Year	2007	2006	2000	% ch '07 vs '06	% ch '07 vs '00
Austria	162.9	163.7	168.0	-0.5%	-3.0%
Belgium	152.8	153.9	166.5	-0.7%	-8.2%
Denmark	159.8	162.5	175.7	-1.7%	-9.1%
Finland	177.3	179.2	181.0	-1.1%	-2.0%
France	149.4	149.9	163.6	-0.3%	-8.7%
Germany	169.5	172.5	182.0	-1.7%	-6.9%
Greece	165.3	166.5	180.3	-0.7%	-8.3%
Ireland	161.6	166.3	161.3	-2.8%	0.2%
Italy	146.5	149.2	155.1	-1.8%	-5.5%
Luxembourg	165.8	168.2	176.7	-1.4%	-6.2%
Netherlands	164.8	166.7	174.2	-1.1%	-5.4%
Portugal	144.2	145.0	169.2	-0.5%	-14.7%
Spain	153.2	155.6	159.2	-1.5%	-3.7%
Sweden	181.4	188.6	200.0	-3.8%	-9.3%
UK	164.7	167.7	185.4	-1.8%	-11.1%
Total	**158.8**	**161.5**	**172.1**	**-1.7%**	**-7.7%**

Chapter 2 - Trends within the UK new car market

57. This section of the report studies the new car market by CO_2 performance in more detail. It looks at the breakdown by distribution, VED band, company car tax, by segment, by sales type, by fuel type and at model detail.

Overall distribution of new car market by CO_2 emissions

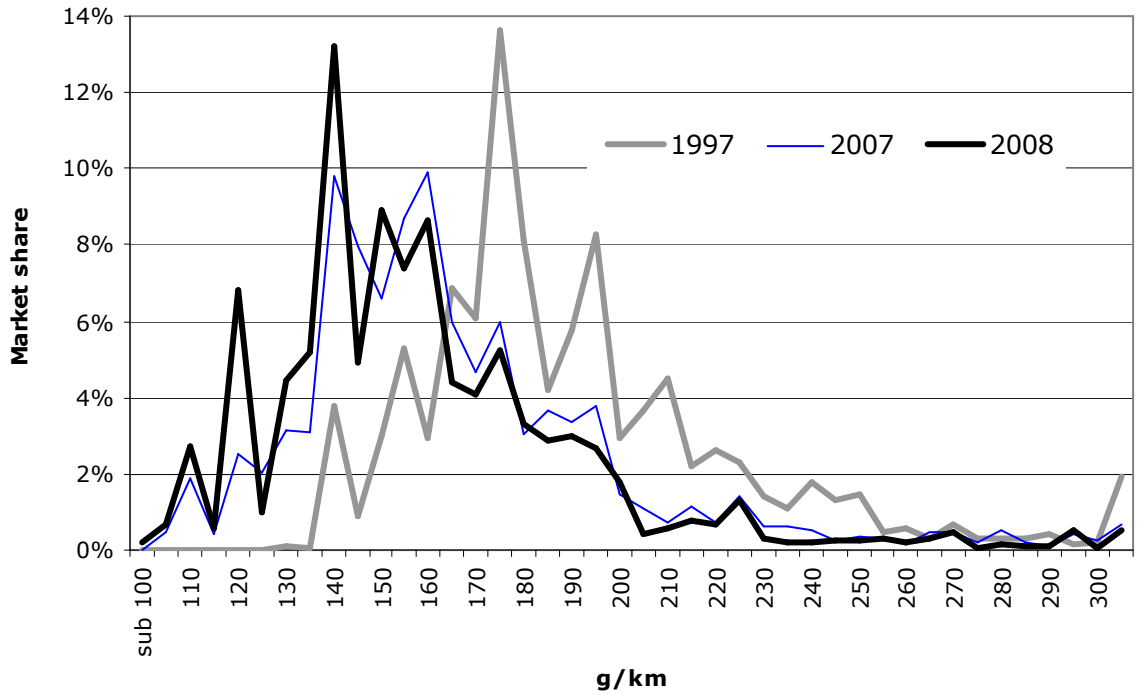
- Significant shift to lower CO_2 emitting cars
- Almost half the market now below 150g/km, share of sub 120g/km cars doubles
- Product mix and model diversity key, but improvements evident across the range

58. The UK market continues to shift towards lower emitting cars. It remains open to a large array of different models and derivatives and this is important in allowing consumers to choose the vehicle which most aptly meets their needs. A new car purchase is typically a compromise of finding a car at a suitable price that is practical enough, efficient enough, cheap to own, operate and maintain, and has the right performance and image to be an effective tool.

59. As models, drivetrains and technologies have shifted alongside wealth, running costs, social conscience and fashion, so too has the type of car purchased.

60. A positive overriding trend has been the move to overall lower emitting cars. The chart below shows the distribution of the market by 5g/km bands. The lines on the chart have shifted to the left indicating a move to lower CO_2 emitting cars. In 1997 no cars were sold below 120g/km. By 2000 that sector still only accounted for 0.1% of the market. It rose to 5.4% by 2007 and doubled in 2008 to 11.0%. The peaks on the chart have moved from 171-175g/km in 1997 down to 136-140g/km in 2008. In 2008, 48.7% of the market was 150g/km or below. This compares with 38.0% in 2007 and 7.8% in 1997. There remains a long tail on the chart, but the proportion of cars over 200g/km in 2008 was just 7.8% compared with 28.1% in 1997.

Chart 7 Distribution of the new car market by 5g/km CO_2 bands



Distribution of the market by VED band

- Market moving into lower CO_2 emitting bands
- Band C (121-150g/km) the most common band, in 1997 was equivalent to band F
- Just 4.0% of market resided in the top band, band G (over 226g/km) in 2008

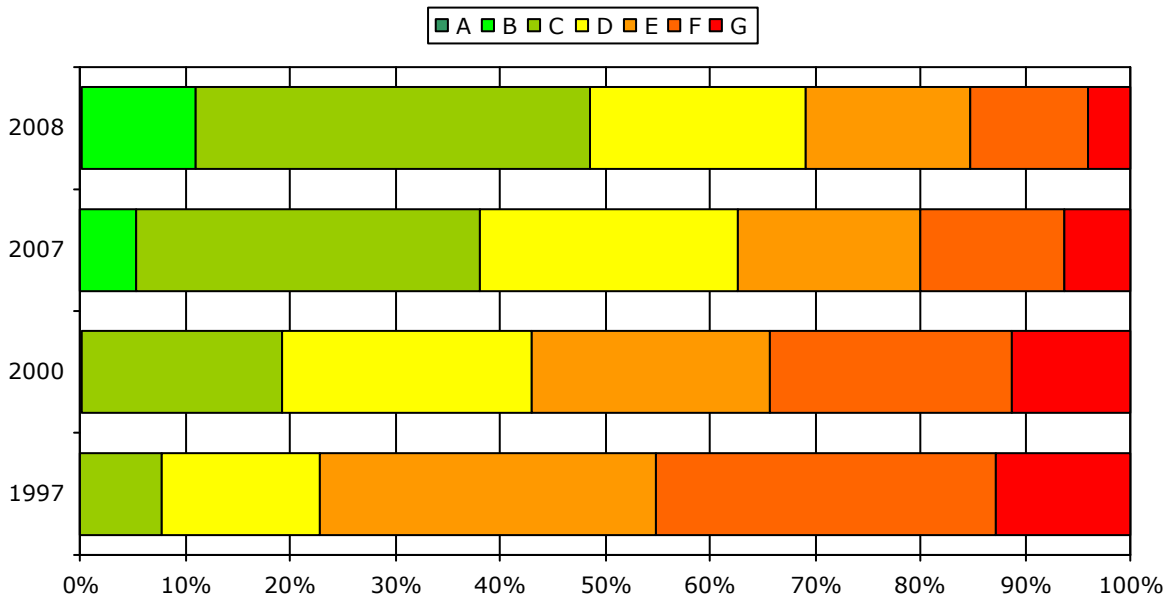
Table 6 - New car market by VED band

VED band	Volume	Market share			
	2008	2008	2007	1997	All
A (sub-100g/km)	3,917	0.2%	0.0%	0.0%	0.0%
B (101-120g/km)	230,216	10.8%	5.3%	0.0%	4.0%
C (121-150g/km)	803,756	37.7%	32.7%	7.8%	30.3%
D (151-165g/km)	435,979	20.5%	24.6%	15.1%	23.4%
E (166-185g/km)	331,588	15.6%	17.4%	32.0%	17.9%
F (186-225g/km)	240,750	11.3%	13.7%	32.3%	16.2%
G (over 225g/km)	85,589	4.0%	6.2%	12.8%	8.3%

61. Vehicle excise duty (VED) is a tax on the ownership of a vehicle, with an annual charge. Since March 2001 the system for new cars has been based on CO_2 emissions. The data presented here is split into the current seven bands - as detailed in table 6 above and presented graphically in chart 8.

62. In 2008 the C band remained the most populated, as it has since 2002. In 1997 the equivalent F band was the most heavily populated, on a sales weighted basis. Bands A to C have all seen their share of the total market rise during the past 11 years. Almost 4,000 cars were registered in the A band in 2008 - some seven times more than in 2007. The share in band B doubled between 2007 and 2008.

Chart 8 New car market by VED band



Trends by market segment

- All segments report net improvement in average CO_2 emissions in 2008
- Market shift towards smaller cars helps UK average CO_2 performance
- Upper medium segment makes best gain versus 2007; MPVs best since 1997

Table 7 - SMMT segment by CO_2 performance, g/km

Segment	2008 CO_2	% ch vs '07	% ch vs '97	Ch g/km vs '97
Mini	123.9	-3.6%	-16.0%	-23.6
Supermini	137.7	-2.9%	-14.2%	-22.8
Lower medium	153.7	-3.1%	-16.2%	-29.7
Upper medium	161.0	-4.8%	-18.5%	-36.5
Executive	185.9	-3.5%	-21.2%	-49.9
Luxury	266.1	-2.8%	-16.8%	-53.6
Specialist sports	214.7	-4.2%	-2.4%	-5.2
Dual purpose 4x4	219.1	-4.0%	-23.2%	-66.3
MPV	175.4	-2.4%	-26.2%	-62.3

63. In 2008 there were 381 different model ranges specified, which SMMT differentiates into nine segment classifications. Annex 1 details the nine SMMT MVRIS segments and how they are defined.

64. In general the smaller the car type, the lower the CO_2 value, although this is not always the case. Cars in the mini segment had the lowest average CO_2 figures in 2008, at 123.9g/km - 21.6% below the market average. However, as table 8 shows the mini segment only accounts for 1.3% of the annual market. The supermini segment is the largest segment, and represented 34.1% of the 2008 market. Superminis had an average CO_2 figure of 137.7g/km in 2008 - 12.9% below the total market average.

65. Both the mini and supermini segments reported an improvement in market share in 2008 compared with 2007 and even more so versus 1997, see table 7. This reflected some new model activity in these segments, with the likes of new smart, Hyundai, Ford and Vauxhall products. The rise in running costs, notably with higher fuel prices during the summer months would have meant that vehicles in other segments probably saw demand tail off more than in these small car markets.

Chart 9 Change in average new car CO_2 emissions by segment, 2008 compared with 2007 and 1997

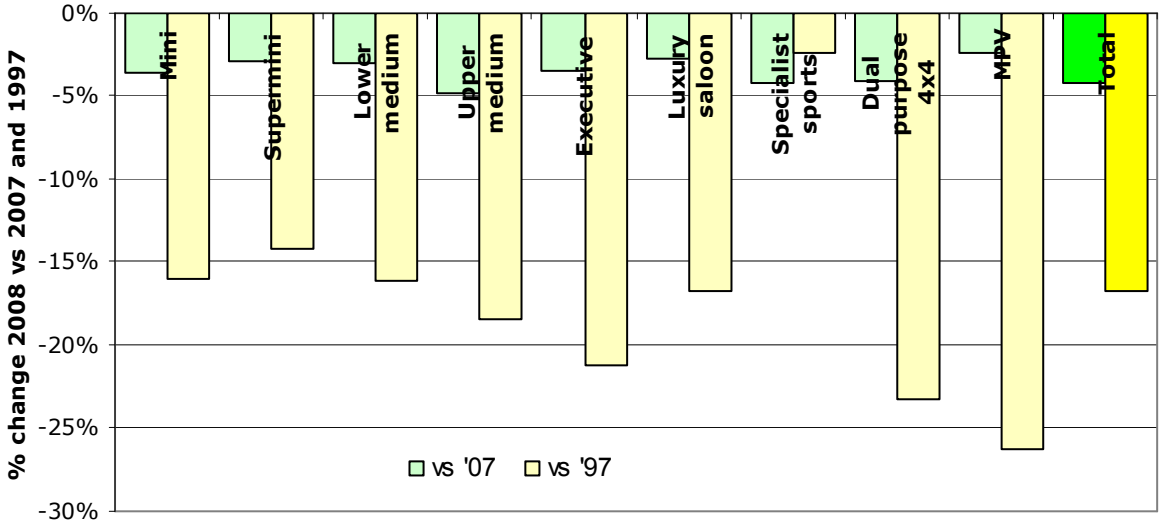


Table 8 - SMMT segment classification and market share

Segment	Best seller	Mkt sh '08	Mkt sh '07	Mkt sh '97*
Mini	Hyundai i10	1.3%	0.9%	0.7%
Supermini	Vauxhall Corsa	34.1%	32.1%	26.5%
Lower medium	Ford Focus	28.4%	30.0%	32.4%
Upper medium	BMW 3 Series	16.0%	16.1%	25.2%
Executive	Mercedes C Class	4.6%	4.3%	5.8%
Luxury	Mercedes S Class	0.5%	0.5%	0.7%
Specialist sports	Audi TT	2.4%	2.7%	2.9%
Dual purpose 4x4	Honda CRV	6.4%	7.3%	3.8%
MPV	Vauxhall Zafira	6.4%	6.0%	2.0%

66. As the higher fuel prices passed, the credit crunch began to tighten the new car market and this is likely to have impacted on more expensive, more luxury and higher CO_2 emitting types of cars.

67. The upper medium segment made the largest improvement in annual CO_2 emissions in 2008, falling 4.8%. This comes after relatively weak performances in recent years and follows the replacement of several key models in the sector, like the Ford Mondeo. As those models were replaced manufacturers also brought more efficient vehicles to the marketplace. In addition, higher-specification models tend to arrive later in the product cycle.

68. Since 1997 the multipurpose vehicle (MPV) sector has recorded the steepest reduction in emissions, down 26.2%. Like the dual purpose sector, the MPV market has undergone some significant changes over the past decade with the arrival of vehicles based on smaller platforms. In 1997 the MPV segment was dominated by 'full-size' models like the Ford Galaxy, but since 2000 the Vauxhall Zafira and other smaller MPVs based on lower medium sized vehicles have entered, taken over the market and helped improve the segments' average CO_2 emissions. Lower CO_2 emitting derivatives of existing models have also been introduced.

69. The MPV, dual purpose, executive, luxury and upper medium segments have also benefitted from a significant rise in diesel penetration since 1997. Chart 10 shows diesel penetration by segment. In each of these segments diesel penetration has climbed to over 50% and in dual purpose over 80%. Diesel engines tend to be bigger, so fit more easily into larger vehicles. They also tend to command a price premium, and typically are associated with users doing higher mileages. Diesel penetration remains relatively low in the supermini and mini segments, but diesels are making inroads and some of the lowest emitters are diesel superminis - see table 11.

Chart 10 Diesel penetration, by segment, of UK new car market

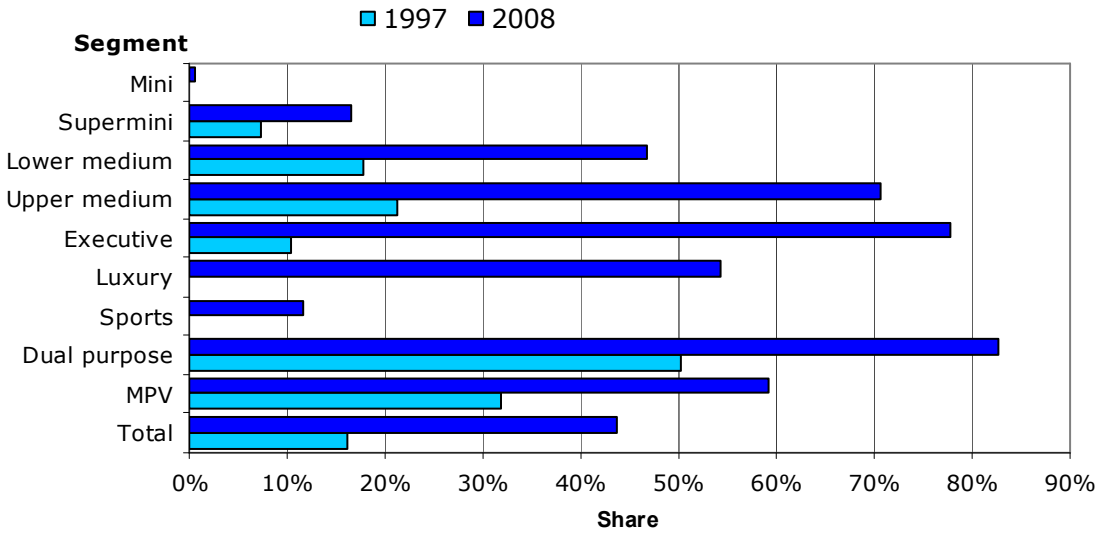
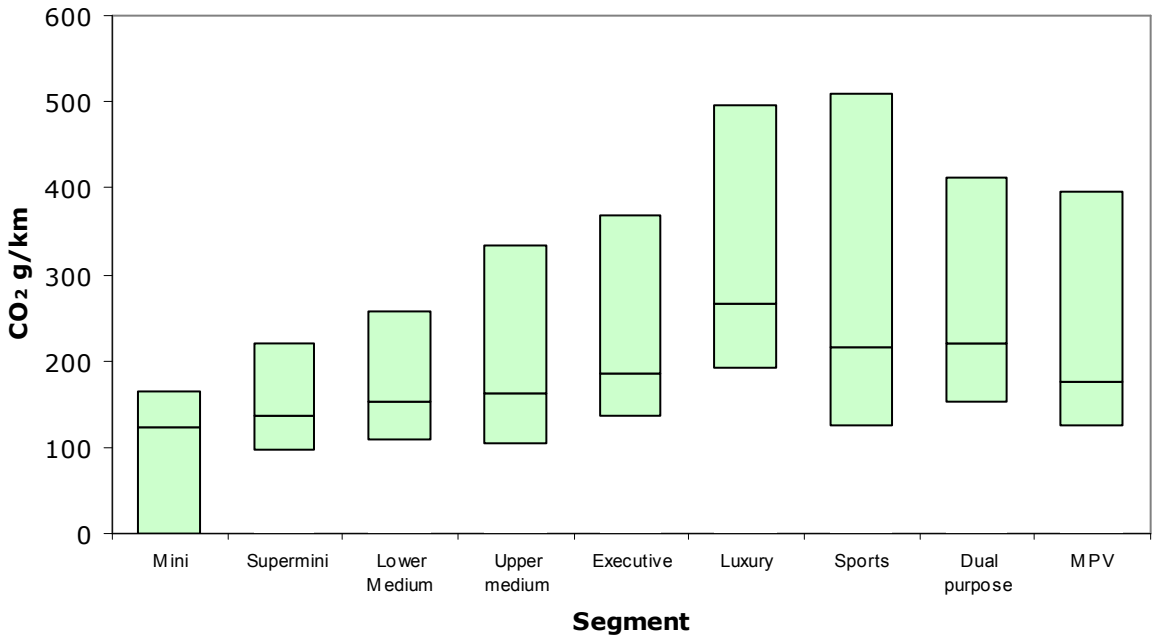


Chart 11 Range and average of CO_2 emissions by segment



70. The range by CO_2 in each segment is shown in chart 11, above. This chart also includes the sales weighted average in each segment, the mid point on the bars. In all cases, except the mini segment due to the presence of EVs, the average is in the lower quartile of the bar. Table 9 below shows the lowest CO_2 emitting model in each segment.

71. In principle, if the lowest emitting model in each segment was purchased then the average new car CO_2 figure would be 31% lower than the actual average at 108.8g/km. Whilst these models represent the lowest emitting vehicles and give a good indication of what can be achieved the diverse nature of the UK new car market needs to be fully appreciated. Some of the models may be too expensive, too small, not have an automatic transmission, are not supported by a local dealer network or fail in the other areas a consumer looks at when they make a new car purchase.

72. It is encouraging to see the diversity of the model mixes on offer and the impressively low CO_2 figures that can be generated by cars even in segments noted for their size, grandeur or sporting prowess.

73. Later in this report, page 21, further details on the growing diversity of the market are presented.

Table 9 - Lowest CO_2 emitter in each segment

Segment	Average	Lowest	Make/model	Low vs ave
Mini	123.9	0*	smart fortwo EV	-
Supermini	137.7	98	Ford Fiesta	-28.8%
Lower Medium	153.7	109	Honda Civic	-29.1%
Upper medium	161.0	104	Toyota Prius	-35.4%
Executive	185.9	136	BMW 5 Series	-26.8%
Luxury	266.1	192	BMW 7 series	-27.8%
Sports	214.7	124	Vauxhall Tigra	-42.2%
Dual purpose	219.1	153	Subaru Outback	-30.2%
MPV	175.4	124	Ford C Max	-29.3%

** at tailpipe*

Trends by fuel type

- Shift to diesel cars maintained and helps lower overall fleet average CO_2 figure
- Alternatively fuelled and advanced propulsion vehicle market stable in 2008

74. In last year's report we demonstrated that diesel cars are 10-20% more efficient than their petrol equivalents in terms of CO_2 emissions. It is therefore welcome that diesel penetration of the new car market rose further in 2008.

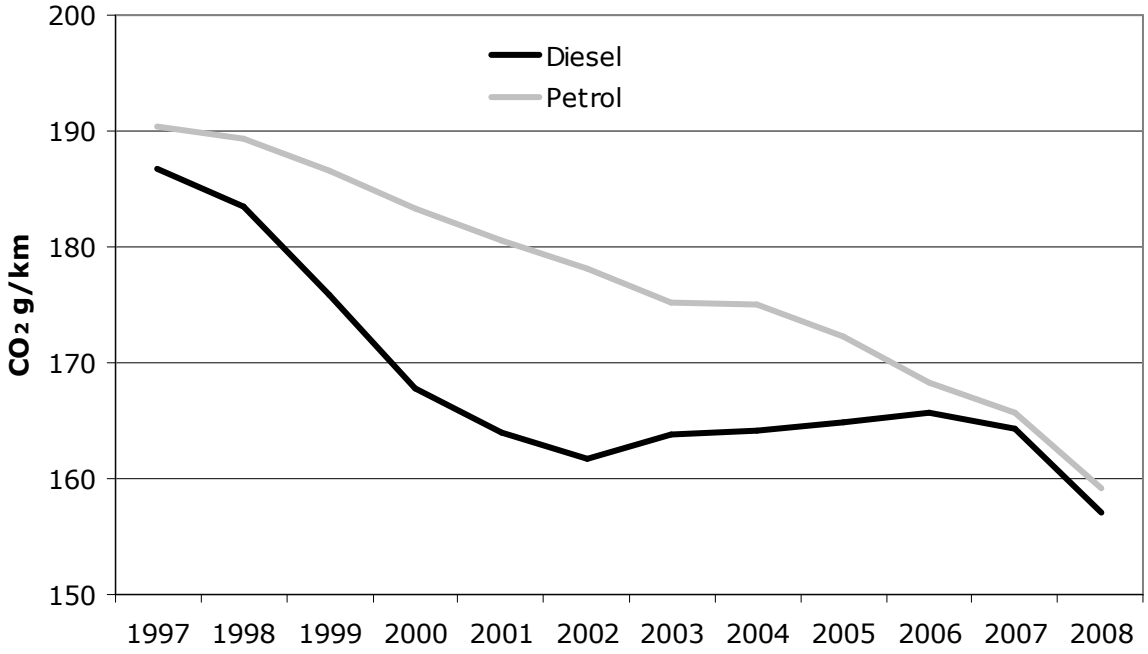
75. Diesel penetration reached a record 43.6% in 2008, although overall registration volumes dipped by 4.0%. This was the first decline in diesel volumes since 1999, but diesel penetration has been increasing since 2000. Demand for diesels have improved, largely because of their lower CO_2 ratings, bringing benefits in terms of lower taxation charges, but also lower running costs and the green image. The availability of diesel variants and significant improvements in diesel's driveability and performance has also helped improve its standing in the sales charts. They are now more refined, have vastly improved air pollutants and often offer better 'real-world' driving performance in the shape of better torque or pulling power than petrol cars.

76. As seen in the previous section of this report on segments, the growth in certain sectors - notably MPV and dual purpose since 1997, where diesels are particularly prevalent - has also helped their overall volumes climb.

Table 10 - New car market by fuel type

Year	Petrol	share	Diesel	share	Other	share
1997	1,819,812	83.8%	350,913	16.2%	0	0.0%
2000	1,908,098	85.9%	313,192	14.1%	357	0.0%
2007	1,419,931	59.1%	967,436	40.2%	16,640	0.7%
2008	1,187,360	55.7%	928,605	43.6%	15,830	0.7%

Chart 12 Average new diesel and petrol CO_2 emissions

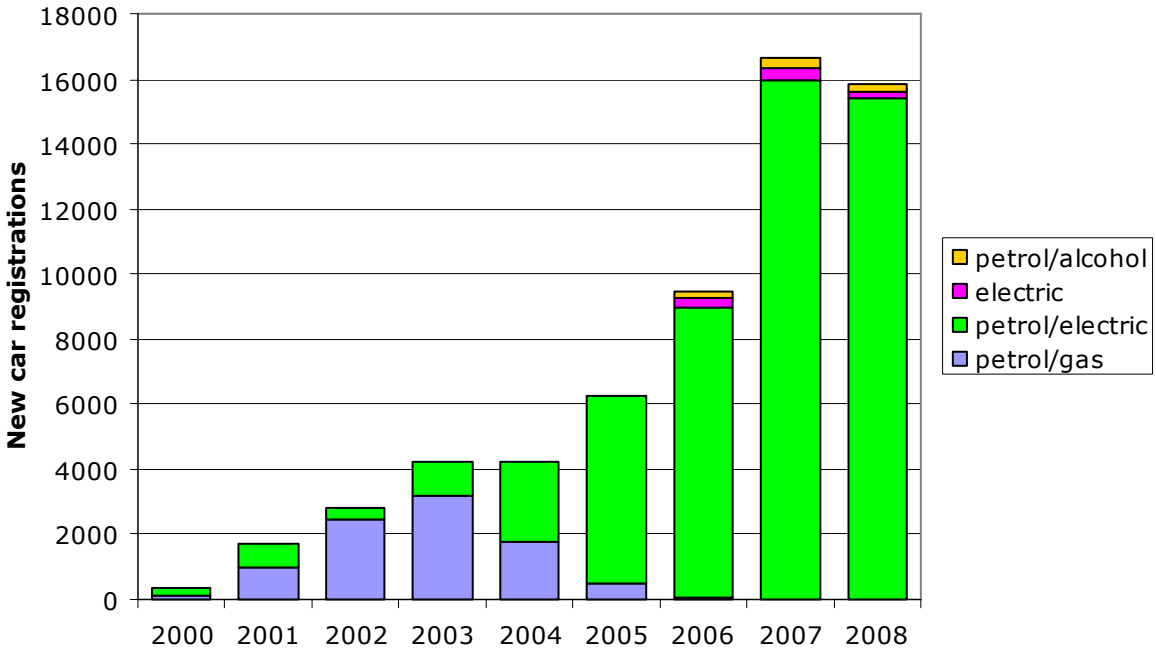


77. Despite diesels being 10-20% lower CO_2 emitting than the equivalent petrol model, the sales-weighted performance of diesel cars is very similar to that of petrol cars. In 2008 the gap was just 0.7% - with diesel at 157.1g/km and petrol at 159.2g/km.

78. The sales-weighted performance is blurred by diesel engines being typically fitted to larger vehicles, while petrol engined cars are still largely the preserve of the supermini market. In 2008 four out of every five superminis was a petrol version - with volumes of almost 600,000 they represented half the petrol car market.

79. Average new car CO_2 emissions of petrol and diesel cars fell by 3.9% and 4.4% respectively in 2008, on 2007 levels. For petrol cars this was the steepest decline on record and more than twice the rate recorded in 2007. For diesels it was the best rate of improvement since 2000. Both petrol and diesel have also seen a similar rate of improvement since 1997, down 16.4% and 15.9% respectively.

Chart 13 UK new alternatively fuelled/propelled car registrations



80. Registrations of alternatively fuelled vehicles (eg biofuels) and advanced propulsion technology vehicles (eg electric and hybrid) are in this report abbreviated to AFV. Volumes of such vehicles slipped by 4.9% in 2008 - the first fall in volumes since 2004. At that time the Powershift grant was removed, which unsettled the market, notably for new gas-powered cars. In 2008 it was the impact of the economic crisis that knocked the overall market and impacted on all new car demand including AFVs. The AFV market's share in 2008 was unchanged, at 0.7%, on the 2007 level.

81. The AFV market in 2008 was also affected by possible changes to the London congestion charge (CC), changing fuel prices and product supply. It had been planned to shift the London CC to become a CO_2 based measure, so all cars under 120g/km would be exempt and move away from just AFVs getting exception. However, a change in mayor saw these plans revoked. This action may have unsettled AFV demand prior to the changes being abandoned, especially for AFVs emitting more then 120g/km.

82. AFVs are typically more expensive than traditionally powered cars - the technology is new and the investment costs are spread over a much shorter product portfolio and volume. The economic case for moving to AFVs is therefore usually driven upwards when fuel prices rises or taxes are penal on high CO_2 emitters. This was the case for much of the year but in the final few months, fuel prices fell sharply and the government also announced plans to raise VED costs would be scaled back.

83. In 2006/2007 several new AFVs were launched, such as the Honda Civic and Toyota Prius hybrids. There were no such models launched in 2008. In addition, with several new models due in 2009 there might have been some hold off in demand. There were also concerns over the supply of some AFVs; late in 2008 the NICE car company went into administration.

84. Petrol/electric hybrids represented 97.2% of the AFV market in 2008, marginally up on 2007. The Toyota Prius continues to dominate the market, accounting for 57% of volumes after a 2.8% rise in registrations.

85. Volumes of the hybrid Honda Civic and Lexus RX both declined in 2008. On a sales-weighted basis the average petrol/electric vehicle's CO_2 figure was 124.7g/km in 2008. That was 3.3% below the 2007 average and 21% or 33g/km below the UK's overall new car average.

86. Registrations of electric vehicles (EVs) also fell in 2008 down 54.9% to 179 units. The Reva G-Wiz quadricycle was the principal cause of the decline. Registrations of the electric smart car rose to 70 units, making it the best selling EV in 2008.

87. Since 2000 over 61,500 AFV cars have been newly registered. 82.8% of those were petrol/ electric hybrids - with the Prius representing 58% of all petrol/electric cars and 48% of the total AFV volume over that nine year period. Since 2000 still less than 1,000 EVs have been registered. Almost one in eight AFVs since 2000 are gas-powered, but new registrations of gas-powered vehicles have been miniscule since 2006.

Trends by model

- EVs remain the lowest CO_2 emitters—with zero tailpipe emissions
- Small cars, hybrids and diesels dominate the top ten lowest emitters list
- Increasing model choice, especially of low CO_2 emitters, continues in 2008

Table 11 - Top ten lowest CO_2 emitting models registered in 2008

Rank	Model	Fuel type	CO_2g/km
1	smart fortwo	Electric	0*
2	Ford Fiesta	Diesel	98
=3	SEAT Ibiza	Diesel	99
=3	Toyota IQ	Petrol	99
=3	VW Polo	Diesel	99
6	smart fortwo	Petrol	103
=7	MINI	Diesel	104
=7	Toyota Prius	Petrol/Electric	104
=8	Citroën C1	Petrol	108
=8	Peugeot 107	Petrol	108

Note: Aixam, Microcar and Reva not included as only B1 type approval
** zero at tailpipe, but will be some CO_2 associated with the electricity generation*

88. The top ten lowest emitters registered in 2008 features a number of new models, compared with last year. Many of these new models are low CO_2 emitting branded versions of existing ranges: Ford has the Econetic range, Citroën Airdream, Peugeot Blue Lion, Renault eco2, SEAT Ecomotive, Škoda Greenline, Vauxhall EcoFlex, Volkswagen Bluemotion, and Volvo DRIVe. These greener models are beginning to gain a firmer footing in the market. For many the penetration on their total sales in 2008 was around 0.5%, but for others that have had the models in place for the full year the penetration was over 5% - for Volkwagen's Polo the Bluemotion variants took a 6.7% share.

89. Other manufacturers have applied improved technologies across the range, such as BMW's Efficient Dynamics. Stop-start technologies are also more prominent.

90. The UK's best selling model is the Ford Focus. In 2008 this model had a sales-weighted average CO_2 figure of 154.1g/km. This was 20.3% below the level the Focus' predecessor, the Escort, averaged in 1997, at 193.4g/km. The lowest CO_2 emitting Focus, the Econetic version, has CO_2 emissions of 114g/km, 26.0% below the average for the range in 2008. Similarly the best selling supermini, Vauxhall's Corsa, has seen average emissions fall from 167.0g/ km in 1997 to 140.1g/km in 2008, a 16.1% improvement. The lowest CO_2 emitting Corsas emitted just 119g/km, 15% below the average and in 2008 accounted for 14.6% of all Corsa volumes.

91. These eco models will not satisfy the demands of every user, but they do show how low CO_2 levels for existing ranges can fall. Typically, manufacturers will learn from the successes of such models and implement the efficiency measures across the wider model ranges in the future.

Trends by sales type

- All sales type categories report improved average new car CO_2 emissions
- Company car tax (CCT) helps encourage fleets to move to lower emitting cars
- Removal of diesel penalty in CCT would encourage further diesel take-up
- Net exodus of drivers paying company car tax

Table 12 - New car CO_2 emissions by sales type, g/km

Year	Fleet	Business	All company	Private
2001	175.4	195.0	178.8	176.4
2007	164.0	165.9	164.2	165.8
2008	158.2	159.3	158.4	157.6
% ch '08 vs				
2007	-3.5%	-4.0%	-3.5%	-4.9%
2001	-9.8%	-18.3%	-11.4%	-10.7%

92. SMMT classifies registrations into three distinct sales type group: fleets - vehicles registered at a business address with 25 or more vehicles, business - those registered at a business address with less than 25 vehicles and the remainder are private buyers.

93. Average CO_2 emissions from all three buyer groups have fallen consistently over time. Since 2001 business cars have made a slightly better gain, but in 2008 the private sector made the strongest gain. Over time the impact of the CO_2 based company tax has helped business cars' average CO_2 performance and the strong shift to diesels. For private buyers the shift to diesel has been slower and the move into utility and lifestyle vehicles may also have slowed their relative performance. However, the rise in fuel prices, concerns over expected rises in vehicle taxation and the credit crisis impacted more on the private buyer and in particular for those buyers who might have been buying higher CO_2 emitting cars.

94. Since 1 April 2002 an individual's company car tax (CCT) liability has been based on their vehicle's CO_2 emissions. A driver is taxed (at 22% or 40% depending upon their income tax rate) on 15%–35% of the vehicle's list price, cross-referencing to the CO_2 band in which it sits. Diesels pay a 3% surcharge, up to the 35% top rate.

95. The starting CO_2 rate for the 15% tax rate was 165g/km or less in 2002-03. It moved down to 140g/km in 2005/06, where it remained until 2008/09, when it moved to 135g/km and is set to remain at this level in 2009/10. In addition, in 2008/09 a new 10% rate for cars 120g/km or below was introduced - diesels below 120g/km would be charged at 13%.

96. Alternatively fuelled cars also get discounts. For EVs the rate is 9%, whilst E85 cars get a 2% discount on the basic rates.

97. The rates are currently set in the Budget with a two-year lead-time. In 2008 it was also announced that business capital allowances are set to become based on CO_2 emissions. Cars over 160g/km will only get a 10% writing–down allowance, and cars under 160g/km get 20%. However, for cars below 110g/km the capital allowance is 100%. The full details are still to be confirmed, but it is understood that company car fleet managers are already positioning their fleet choices to limit liability on over 160g/km vehicles.

98. HM Revenue & Customs (HMRC) estimates that there were around 1.1 million company cars in use in 2007. This was some half a million units less than in 2001. The arrival of the CO_2 based CCT in April 2002 brought about a review of many companies' CCT policy. This often entailed cash-for-cars opt out schemes, as well as development of employee car ownership (ECOS) schemes and approved mileage allowances payments (AMAPs). This enhanced choice led to a net reduction in people having company cars.

99. There is concern that the slowdown in the economy will encourage a wider take up of cash-for-cars options, as people look to shore up their own personal finances.

100. The concern is that if people move out of company cars they will replace a generally new, well maintained, car with an older and less efficient model.

Chapter 3 - Outlook for new car CO_2 emissions

Overview

101. New car CO_2 emissions will continue to fall. However, determining the pace of decline is very difficult to calculate as there are so many influences.

102. The new car CO_2 regulation, agreed at the end of 2008, sets a pan-European sales weighted average CO_2 target for each vehicle manufacturer. The integrated approach is required to most effectively deliver upon this regulation. The integrated approach calls for burden sharing of effort to ensure all stakeholders are engaged and pulling in a common direction.

103. This section looks at the technical options, fuel quality, availability and infrastructure, traffic and demand management measures, consumer information and fiscal regimes and how these influence emissions.

New car CO_2 regulation

- Regulation introduced to ensure manufacturers hit sales-weighted CO_2 target in EU
- Will require significant improvement in performance to achieve target
- Structure of major fines in place to ensure compliance

104. The adoption of a new car CO_2 emissions regulation will be a key driver in delivering lower CO_2 emissions from new cars and the total car fleet.

105. In 1998/99, European vehicle manufacturers signed a voluntary agreement to reach a pan-European sales-weighted target of 140g/km by 2008. Japanese and Korean manufacturers signed a similar deal for 2009. The agreement was based on three pillars - the voluntary commitment on technology, fiscal measures and consumer information. This commitment significantly reduced CO_2 emissions from new cars. However, due to the counter-productive effect of competing regulations, a weak demand for fuel-efficiency and consumer preference for larger cars, the targets were not met. A regulation on new car CO_2 emissions was agreed in December 2008.

106. The regulation covers new passenger cars and sets a sales-weighted CO_2 target of 130g/km. Individual manufacturers will face a pan-European sales-weighted specific emission target as a function of their mass (eg weight) via a so-called 'limit curve value'. To ensure there is not a move to heavier vehicles, the Commission will monitor weight and potentially move to a new system based on vehicle footprint.

107. A series of 'complementary' measures, such as biofuels, smarter driving and lower rolling resistance tyres, will contribute an additional 10g/km saving.

108. The 130g/km target will in effect be phased in with 65% of each manufacturer's new registrations having to comply with the 'limit curve value' target in 2012, rising to 75% in 2013, 80% in 2014 and 100% by 2015.

109. Manufacturers will face major fines if they miss these targets. These fines are based on the excess emission premium multiplied by the volume of registrations. The premium will be €1 for the first gram over target, €10 for the second gram, €25 for the third gram and €95 for four grams and above. From 2019 the premium will be €95 for every gram missed. So, for example, in 2012 a manufacturer missing the target by 1g and selling one million cars will face a €1 million fine.

110. Manufacturers will be able to use 'eco-innovations', eg LED lights and solar panels, to contribute up to 7g/km towards their specific emissions target. Super credits will apply to cars with CO_2 emissions below 50g/km. These will have a multiplier effect, counting as 3.5 cars in 2012 and 2013, 2.5 cars in 2014, 1.5 cars in 2015 and then one car in 2016 and beyond. Cars which run on the biofuel E85 can also get special treatment.

111. There will be derogation for small and niche manufacturers with registrations below 10,000 units and 10,000-300,000 units per annum respectively. They will have to comply with specific targets agreed by EC based on their individual product development cycles and reflecting their lower output levels.

112. This regulation will provide very challenging targets for all vehicle manufacturers; a long term target of 95g/km was set for 2020.

113. To achieve the industry average of 130g/km by 2015 will require an annual improvement of around 2.5% or 3.6g/km. In 2007 the EU15 made an improvement of 1.7%. UK's 2008 performance was more significant, but it remains to be seen if it was matched across EU and if the pace can be sustained.

The integrated approach (IA)

- To achieve the new car CO_2 regulation the IA is required
- The IA is a partnership of all stakeholders, working together for a common goal
- Unified action needed to make a difference and ensure burden sharing is equitable

Overview

114. The automotive sector has a very important role to play in developing and promoting the use of more efficient vehicles. However, to reduce overall road transport emissions most effectively, action on new cars and technology will not be most effective. It is more effective for collective action to take place, with all stakeholders pulling in a similar direction most efficiently to achieve society's goal of reducing emissions, while at the same time ensuring its competitiveness.

115. The IA supports a sharing of responsibility between stakeholders, such as the automotive industry, fuel supply industry, government - at local, national and European levels - and, of key importance, consumers.

116. The IA was discussed in the 2006 CO_2 report. Its concept remains as important today, perhaps even more so with the desire to improve further average new car CO_2 emission levels and also in the development of turning alternatively fuelled cars from niche to mainstream.

117. The IA also broadens out the focus from solely new cars to all vehicles on the roads, which in turn broadens the scope for reducing CO_2 emissions. The IA promotes CO_2 reductions through a range of complementary measures, delivered by a cross-section of stakeholders.

118. Improvements in the efficiency of vehicles remain a key role within the IA. The industry spends a huge sum of money on developing and bringing to market lower CO_2 products. European motor manufacturers already spend a greater share of turnover on research and development than any other industry sector. Studies suggest that the cost of meeting CO_2 targets through technology alone will be very expensive – two to three times higher, ACEA suggests. A technology only approach may also deliver cars consumers do not really want and place the industry at a competitive disadvantage against brands which do not have to meet the same CO_2/km targets in global markets.

119. By using the wider tools available the same or better CO_2 levels could be achieved, at lower cost, delivering vehicles more like what the consumers desire and maintaining the competitiveness of the European motor industry. These impacts on CO_2 levels would include fuels, infrastructure, fiscal measures, traffic management and influences on driver behaviour.

Level of ambition

120. The new car CO_2 regulation will largely set the pace of new car CO_2 performance, but the UK has its own domestic legally binding targets for CO_2 reductions and is constructing five year carbon budgets to set the UK on the route of delivering a lower carbon economy.

121. The Committee on Climate Change (CCC) was set up in 2008 to recommend what the level of the UK's carbon budget should be. The CCC in its first report, published in December 2008 (www.theccc.org.uk) recommends the UK reduces GHG emissions by 34% by 2020 from a 1990 base (21% from 2005), which should rise to an 80% reduction by 2050. The CCC made a number of recommendations, on energy and buildings, as well as transport.

122. Within transport the CCC recommends three ambitious scenarios saving 5—32MtCO_2 by 2020. For road transport, the committee believes improvements of 30-40% are possible with fossil fuels, but believes electric and hydrogen vehicles, increased use of hybrids, biofuels, and non-engine technologies should be developed. The CCC believes 100g/km is possible by 2020.

123. The CCC affirms the key role of the tax regime (principally fuel duty and VED), but believes information and incentives must also be put in place to deliver their targets.

124. The CCC believes 11.8MtCO_2, can be saved by 2020 through technology improvements. A further 5MtCO_2 plus could be delivered by vehicles using 10% by volume biofuels, but there is a need to take into account concerns about sustainability. The CCC also believes that 10.3MtCO_2 savings are possible through demand management, eg smarter choices in travel (modal shift), voluntary eco-driving and enforced eco-driving (e.g. enforcing current speed limits or reducing speed limits).

Technological developments

- Manufacturers bringing new technologies and more efficient models to market
- Portfolio of technologies required to meet challenge of different consumer needs
- Traditional internal combustion engine can still improve further

125. Much of the focus of moving to lower CO_2 emitting cars comes from technological developments. Cars have changed significantly since their invention, but still predominantly rely upon the internal combustion engine (ICE). However, further developments are under way to change the motor vehicle dramatically, predominantly in the type of fuel consumed - notably electrification, as well as light-weighting and aerodynamics.

126. Annex 2 details some of the different types of alternative fuel types and advanced propulsion technologies being developed, like electric vehicles, hybrids, fuel cells and biofuels.

127. Table 13 details these fuels/propulsion technologies and gives some summary pros and cons. It can be seen that no solution is perfect. The different needs, different issues, costs and resources available are likely to mean a basket of solutions is developed and used and the mix will change over time.

Table 13 - Pros and cons of different technologies/fuels

Technology	Pro	Con
Internal combustion Engine (ICE)	Technology already in place Consumers accept technology Proven technology - safe, reliable Further efficiency gains possible Refuelling quick and easy Refuelling infrastructure in place Service/maintenance system in place	Alternatives seen as greener Cheap, readily available fossil fuels to run out CO_2 and other emissions at point of use
ICE using Biofuel	Possible lower well-to-wheel emissions Can make use of variety of feedstock Can improve diversity of supply	Issue of sourcing of feedstock Public perception poor: food vs fuel Still produces CO_2, incl indirect Fuel quality issues
Electric vehicle (EV)	Zero emissions at tailpipe Cheap to recharge (at present) Easy to drive Fewer parts - cheaper to maintain Quiet	Where electricity sourced? Slow to recharge Expensive to produce Need recharging infrastructure Too quiet?
Extended range EVs (EREV)	As EVs but removed range anxiety	As EV, but no recharging issue or need for new infrastructure
Hybrid	Technology already in place Reasonable range Fewer tailpipe emissions than ICE	Expensive Complex Still produces some emissions
Fuel cell	Zero emissions at tailpipe Hydrogen in plentiful supply Quick to refuel Provides fuel security of supply	Expensive to produce vehicle Expensive and energy intensive to produce hydrogen Needs refuelling infrastructure Safety concerns

128. Most manufacturers are still pursuing a portfolio of technologies as no clear winner has emerged. Public perception appears to have shifted from hydrogen fuel cells to electric vehicles as the long-term solution.

129. Biofuels had been cited a viable solution and did offer impressive well-to-wheel emissions savings. However, concerns that crops would be diverted to road transport from food supply and the impact of indirect emissions led to concerns over the use of biofuels. Second generation biofuels, which use waste, could offer a much better social solution. This issue demonstrates that great care and best possible prior impact assessment needs to be developed before switching to a new technology or fuel source.

130. The majority of alternatives to ICEs on offer in the UK are hybrids. Hybrids allow use of lower emitting engines, but as they still use an internal combustion engine they have the benefits of refuelling infrastructure and range.

131. Much of the recent focus of development appears to be on electric vehicles (EVs) and fuel cells. Lotus, MINI, Nissan, PSA, Renault and smart have all showcased EVs recently. GM is set to bring the Ampera model to Europe by 2012, an EREV with an on-board internal combustion engine to re-charge it. For short trips (up to 60kms) the Ampera will run only on lithium-ion battery, but for longer distances the car will continue to drive on electricity that is generated by a small internal combustion engine. GM, Honda, Mercedes and Nissan are among those that have developed vehicles with fuel cells. Honda is now publicly trialling the FCX in America.

132. To resolve the many issues around a switch to new fuels or technologies, and in line with the IA, partnerships are being developed. The electric vehicle partnership in London is just being established to help develop the market and infrastructure for EVs. The Clean Energy Partnership is another example of collective action. This project aims to get over 40 hydrogen cars in use by 2010 in Berlin, Germany and includes BMW, Daimler, Ford, GM and Volkswagen.

Hydrogen and electric cars, being refuelling/recharged

133. It should be noted that vehicles with traditionally fuelled internal combustion engines (ICEs) still have the potential to be around for a number of years yet. Manufacturers have made significant progress in making ICE more efficient and further gains will be made in the coming years.

134. Technologies like multi-valve engines and direct injection systems are designed to improve efficiency. Turbo-charging, super-charging technologies and a series of both, were typically associated with making cars go faster, but are now increasingly being used for efficiency savings. These performance improvements allow downsizing, where smaller displacement engines deliver similar power and so can replace larger units. This ensures the same performance for less fuel. It also saves weight - another contributor to vehicle efficiency.

135. Stop-start technology, where a vehicle automatically switches off the engine when the vehicle is stationary and then instantly restarts when the accelerator is pressed, is a very mild form of hybrid. Such technology was brought to the market several years ago but was not a sales success. Now with the importance of saving CO_2 emissions the technology is much more welcomed by consumers and being rolled out on a larger scale. Manufacturers such as BMW, Fiat, PSA and Volkswagen already offer stop-start, with others such as Land Rover to introduce it shortly.

136. Manufacturers are also introducing more light-weighting to vehicles. Past CO_2 performance had been blighted by cars getting heavier, which was often due to enhanced safety features or creature comfort items being fitted. Improved aerodynamics and increased use of low rolling resistance tyres are also being used to help improve vehicle efficiency and lower CO_2 emissions.

Position of UK manufacturers

- UK is home to a diverse range of manufacturers
- In 2008 28% of cars produced in the UK had CO_2 emissions of 140g/km or below
- UK has strong engineering and design capability

137. The UK is home to a wide variety of vehicle manufacturers. Many well known brands tend to be higher CO_2 emitting products, such as luxury saloons, dual purpose 4x4s or sports cars. However, over 400,000 of the 1.45 million cars produced in the UK in 2008 were sub 140g/km models. This represents 28% of total output.

138. Currently the MINI factory in the UK produces the lowest CO_2 emitting mainstream model in the UK, with a 104g/km variant. Other volume products below 140g/km include particular variants of the Honda Civic, Nissan Micra, Nissan Note, Toyota Auris, Toyota Avensis and Vauxhall Astra.

104g/km MINI

139. Manufacturers are looking at a number of different technologies to make their vehicles more efficient. The UK has a strong design and engineering capability, with Ford, Jaguar Land Rover and Nissan having research sites within the UK. Ford and Jaguar Land Rover are among the top ten investors in research and development in the UK. There are also a number of specialist design and engineering companies in the UK, such as Lotus, Prodrive and Ricardo.

140. The UK is also home to a number of niche manufacturers which are developing innovative solutions to the low carbon car concept. The UK low volume manufacturers have a strong heritage in innovative design. For example several companies, such as Lotus, Lightning, Modec, and Zytek are all producing or developing electric vehicles.

Lotus Elise 'Eco'

141. Developing lower carbon transport and also remaining competitive in the global market place is a key challenge for the automotive industry in the UK. The new automotive innovation and growth team (NAIGT - http://www.berr.gov.uk/whatwedo/sectors/automotive/naigt/page45547.html) aims to create a strategic view, collectively from industry, on what the innovation and growth challenges are for the future competitiveness of the UK automotive industry. The team will consider the strengths and weaknesses of the UK industry and assess the opportunities in order to develop a forward looking strategy for the sector. The NAIGT aims to report on its findings by April 2009.

Fuels and infrastructure

- Cleaner petrol and diesel fuels already offered, but are more expensive
- New fuel types need new infrastructure which is costly and timely to introduce
- Some concerns over safety with new fuel technologies

142. Cleaner versions of existing fuels could be developed. In some cases these are already here - eg super-unleaded offered alongside regular unleaded. The higher octane fuel is more expensive, but reportedly gives improved performance, lower emissions and increases the life-span of the engine.

143. Biofuels are already in use in the UK. As part of the renewable transport fuels obligation (RTFO) the move to a higher proportion of biofuel within the market can be achieved using the existing infrastructure.

144. If the vehicle fleet is to migrate to a new type of fuel entirely, such as electric or hydrogen, then a new refuelling infrastructure would be required. Bringing alternatively fuelled and advanced propulsion vehicles to the marketplace and the availability of refuelling stations are intrinsically linked and will play a large element in the success of any new technology. The refuelling process should be safe and simple and preferably quick and cheap.

145. The idea of going to a common refuelling station could be redundant with a move to EVs, which would instead see recharging points at home and at parking spaces by shops and offices or in dedicated parking bays. Industry is actively involved with energy suppliers to resolve the issues of refuelling, including the commercial issue of billing.

146. Project Better Place (www.betterplace.com) proposes one approach to a shift to EVs. It proposes to replace the batteries in EVs at refuelling stations, rather than recharge the battery in the vehicle. This will require trained technicians and common battery technologies to be used by manufacturers to work effectively on a national scale. Such proposals are under development in Denmark and Israel.

Traffic management and infrastructure

- Congestion and interruptions to the flow of traffic increases emissions
- Improved road network and traffic management to deliver environmental benefits
- Enhanced traffic information is also assisting motorists

147. The right roads, traffic management and better planning of road works could speed up traffic flows, so creating real world benefits of reducing congestion, lowering CO_2 emissions, and reducing accidents.

148. Improved road surfacing, lighting and sign-posts could also reduce the number of accidents and help ensure traffic flowed better. Better information for consumers in terms of signs, electronic information boards, radio information and satellite navigation systems would also enable drivers to complete their journey more quickly and so avoid unnecessary mileage or delays, which again would save fuel and so emissions. Car to car communications, such as alerts about breakdowns, can help avoid accidents and congestion.

149. Smart traffic lights, that assess volumes of approaching traffic and alter their own timings when necessary, would allow traffic to flow better and allow drivers to maintain a constant speed, avoiding unnecessary acceleration or braking, would improve fuel efficiency and lower emissions. Car to infrastructure technologies are also under development, eg where the car tells the traffic light it is approaching.

150. Road building can also ensure traffic flows smoothly and congestion can be reduced. Better planning of road works and speeding up the pace of road maintenance would also ensure that drivers face the least congestion and disruption. This would have environmental and economic benefits.

151. Bottlenecks and disruptions on the roads often increase the likelihood of accidents. These in turn create congestion. Measures to reduce accidents and speed up the aftermath of an accident would again improve traffic flow and reduce the impact of congestion.

Measures to support industry and encourage low carbon cars

- Governments, globally, are giving fiscal stimulus to support automotive sector
- Some of these packages linked to developing low carbon cars
- Some packages give stimulus to market and purchase of low emitting vehicles

152. Climate change and reducing CO_2 emissions are a global issue and action is being taken around the world to mitigate the effect mankind is having on the planet. Governments understand that for the good of society, improved vehicles and infrastructure are required. In several cases, governments are part-funding the development of vehicles and participating in projects to develop the infrastructure. Governments also understand that the design and build of the vehicles also bring with it jobs and wealth.

153. The dramatic slowdown in the global vehicle market has impacted heavily upon the viability of many automotive companies. This in turn is putting jobs at risk and undermining local economies. The slowdown in the rate of renewal of the vehicle fleet also has serious implications for its environmental profile.

154. Action to support the industry has in many cases been closely linked to the delivery of lower CO_2 emitting vehicles and making the production facilities more efficient.

155. The financial package in the USA to the big three domestic manufacturers was linked to them delivering cleaner vehicles in the future. In France a €1.3bn package was announced to help domestic manufacturers, with a further €6bn expected to be given in loan guarantees and 'soft loans'. The European Investment Bank's (EIB) Clean Transport Facility is a €4 billion package which aims to finance investment in research and development projects that focus on emissions reduction and energy efficiency.

156. Both the UK government and the Conservative party believe that electric vehicles have a key role to play in delivering lower CO_2 emissions. In January 2009 government announced its intention to provide £250 million of funding to 'consumer incentives' and 'infrastructure development' for 'ultra low emission cars', with details to be released later in the year. The Conservatives also believe electric and plug-in hybrids should be encouraged, as detailed in their paper 'Low Carbon Economy'.

157. Governments could also ensure their own procurement policies are conducive to low CO_2 emitting vehicles. If a government wanted to stimulate sales, it could enhance those public procurement policies and if it wanted to help local jobs, only domestically produced vehicles could be purchased.

158. A government can use regulation and fiscal policy to shape the type of vehicle sold in the marketplace. The UK was one of the first nations to adopt CO_2 based taxes. In France a bonus-malus scheme is in place which gives incentive of €5,000 for purchase of a car <=60g/km and €200-1,000 for cars <=130g/km, with malus (penalty) of €200-€2,600 for cars over 160g/km of CO_2.

159. Several European markets have introduced scrappage incentive schemes (SIS). These involve an incentive on the purchase of a new (or nearly new) vehicle if an old vehicle is scrapped. SISs have been widely used in European member states over the past 15 years. Several countries, notably France, Italy, and Spain, introduced schemes in the mid-1990s to encourage the replacement of older cars with newer ones, so improving the environmental profile of the fleet.

160. In 2009 Austria, France, Germany and Italy are among those announcing new schemes, with up to €2,500 incentives to encourage new vehicle purchases. In some cases the schemes are linked to buying a car meeting a minimum Euro environmental standard (eg Euro 4) or emitting below a certain level of CO_2.

161. The current schemes are aimed at stimulating the market and are reportedly set to lift volumes by around 10%. The size of the incentive is often offset by increased revenue from the sale of a new vehicle, e.g. from VAT, purchase or circulation taxes. The environmental benefits of the schemes are less well reported upon, but typically a new car will be 15% lower CO_2 emitting than a ten year old model. The scheme also brings benefits of lower air quality emissions and a safer vehicle fleet.

162. SISs can lead to major distortions in the timing of sales. While the pull forward effect is positive for short-term sales, when the incentive is withdrawn it can leave a market depressed. Furthermore, policy makers need to ensure that the schemes deliver additional sales and the incentives are not used up by consumers who would have bought a new vehicle anyway. The pull forward effect might, however, be precisely what the industry is seeking to kick-start demand while the market is in a downturn and when the scheme finishes the market will be in a more robust state.

Consumer information

- Information empowers consumers to make more informed choices
- Government and industry to provide information

163. Ultimately consumers decide which mode of transport they use. For motorists it is which vehicle they purchase, use, when and where they use it, how they drive it and how they maintain it.

164. There are already a number of signals in place to encourage consumers to travel in a more efficient manner and for motorists in particular to lower their CO_2 emissions. Those signals come from the government, media, interested stakeholders and society as a whole.

165. There is a considerable amount of choice for the consumer. The Vehicle Certification Agency (VCA - www.vcacarfueldata.org.uk) maintains a database on new models available on the market. Annual reports (typically released in May) show that in 2008 there were 3,900 distinct new models and derivatives (eg Citroën C3 1.4HDI) available to the consumer. This was up over 30% on the 2007 level and 124% on the 1,738 detailed in 2000.

166. A wide variety of consumer choice not only suggests strong competition within the marketplace, but also allows consumers to find a model and derivative that best suits their needs. The size, level of comfort, running costs and performance of a vehicle are key components of consumer choice, alongside price. By necessity some consumers may need a larger car - if they have a large family or need certain load space for their job or leisure activities. Some consumers may require the need for four wheel-drive and some may need automatic gearboxes. In many instances these derivatives will be higher CO_2 emitting vehicles.

167. The Department for Transport (DfT) has also launched the Act on CO_2 campaign (see www.direct.gov.uk/actonco2). Act on CO_2 aims to encourage the purchase of best-in-class models and the efficient use of vehicles. The Act on CO_2 is an England only initiative, with the devolved administrations setting up their own measures to encourage lower CO_2 emissions.

168. The Act on CO_2 campaign is being delivered with TV and other media campaigns to help consumers calculate their own CO_2 footprint and find ways of reducing it. For motorists this includes comparative information on vehicle choice.

169. Industry also works with the Low Carbon Vehicle Partnership (LowCVP—www.lowcvp.org.uk) to deliver lower carbon vehicles. An initiative delivered through the LowCVP is the voluntary new car fuel efficiency label. Industry is also working with LowCVP on a used car label, green claims, car advertising, and van CO_2.

170. The new car fuel efficiency label gives consumers information on the vehicle's fuel efficiency and CO_2 rating. It also gives the VED band it sits in, the cost of the VED and an illustrative annual fuel bill for the vehicle. In the latest survey it was shown that this label was evident in 91% of new car dealer showrooms.

171. Chart 14 is an example of the new car fuel efficiency label to be introduced from 1 April 2009. The label maintains the seven colour coded bands to be consistent with other efficiency labels, but now contains the 13 VED band letters and CO_2 bands. To encourage consumers to look at comparative data the label also includes a weblink to data sources.

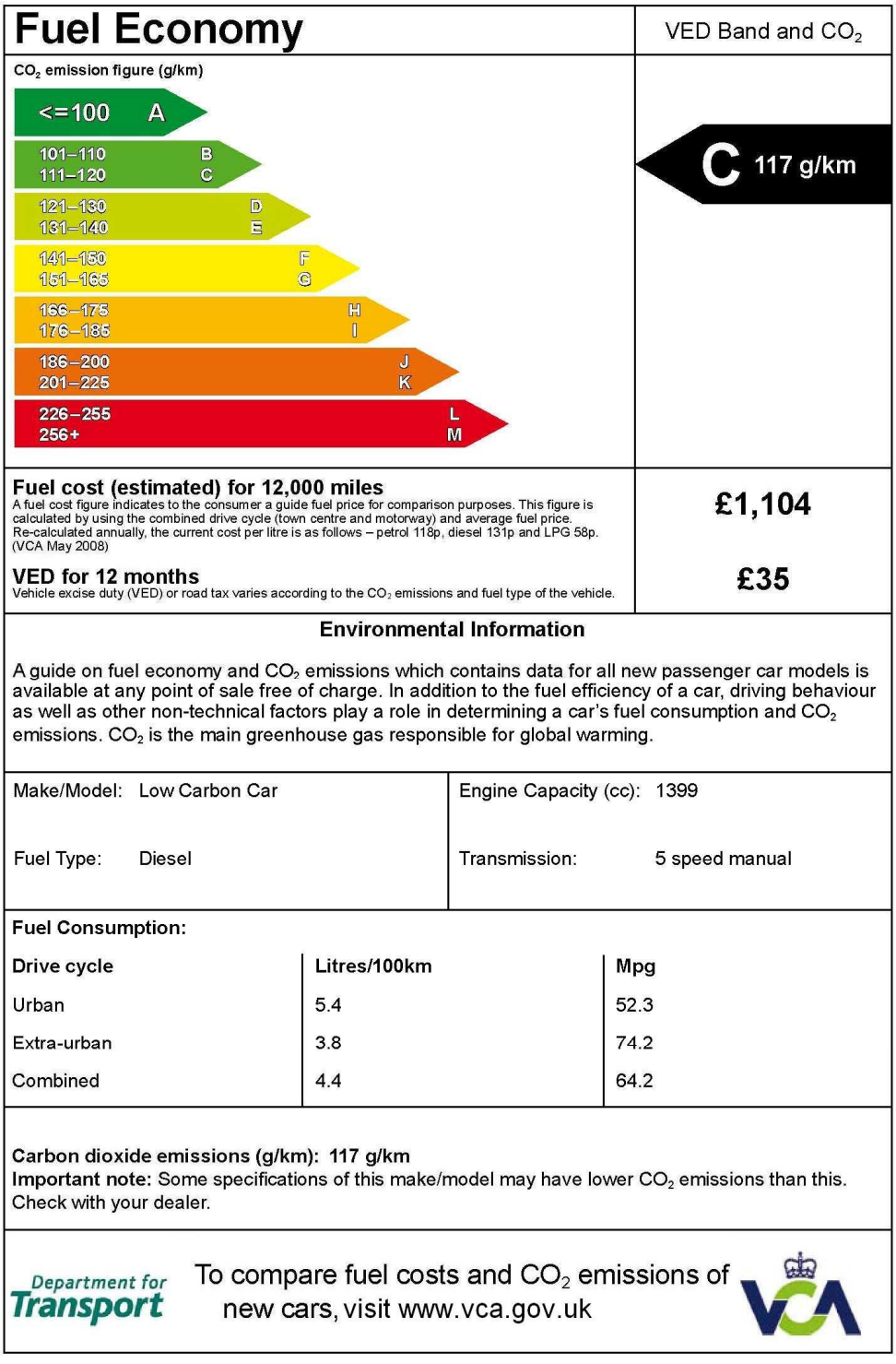
172. Information and driver education could be undertaken on many different levels, in the classroom, during the driving test, before vehicle purchase, in-use driver training and when refuelling or servicing a vehicle.

173. ACEA believe that eco-driving can deliver some 20% savings in CO_2 emissions. In January Ford and the Energy Saving Trust (EST) jointly launched 'ECO Drive', a 50 minute lesson which would cut users' emissions by at least 15% and save them an estimated £250 per annum.

174. The industry has a major role to play in encouraging consumers to make more effective choices. The industry is one of the largest advertisers of any sector and is constantly trying to influence the consumer to purchase their particular make or model. This advertising is a very powerful tool. Fuel consumption and CO_2 emissions information regulations require information on CO_2 and fuel economy to be included in advertising if other information on the car is shown (eg speed, acceleration). All advertising should show the CO_2 of the product(s) displayed in the advert. The Advertising Standards Authority is the regulatory body on advertising and can challenge and potentially fine companies if they make untrue claims.

175. Industry is looking to strengthen advertising practices through improved self-regulation in the UK and to feed into European policy debate. SMMT believes that informing consumers about product innovation and the choices available when buying a product is essential to meet future environmental standards and contributes to the success of the integrated approach.

Chart 14 Proposed new car fuel efficiency label for 2009



Fiscal and charging instruments

- Consumers often focus on cost—so taxes help shape demand
- Policy should ideally be harmonised wherever possible on an international scale
- Taxes should be as linear as possible to encourage change at all levels

176. Fiscal and charging policies at a European, national and regional level can play an important role in the types of vehicles brought to the marketplace and bought and used by consumers. Ideally the policies and incentives should be 'technology neutral', ie not favouring one technology over another.

177. SMMT is also keen to ensure that harmonised measures are introduced on as wide a scale as possible and nationally at a minimum level. Manufacturers increasingly build a single vehicle for a global or European market, to reduce costs and improve production efficiencies.

178. A host of local measures actively seeking to lower CO_2 emissions may not be comparable and could confuse the motorist. For example, one local scheme could impose congestion or parking charging on a particular technology or fuel type, whilst another might not. SMMT would like to see national guidelines or recommendations drawn up.

179. Fiscal regimes should focus upon the use of the vehicles, rather than ownership. Fiscal measures should be simple, effective and efficient to police and enforce. Schemes should ideally map out long-term pricing structures to enable manufacturers and motorists to plan their activities better. However, schemes should be periodically reviewed and be open to change to make them more effective.

180. The influence of fiscal regimes on the shape of the market can be marked. The proposals to increase penalties on high CO_2 emitting vehicles were already beginning to impact adversely on certain vehicle types and manufacturers. At times of general economic slowdown, as currently being witnessed, a loosening of taxes could help stimulate the market.

Tightening fiscal regime

181. In the March Budget and November Pre-Budget Report 2008 there were several announcements made to fiscal measures to encourage the ownership of lower CO_2 emitting cars further.

182. The current seven band VED system is due to move to a 13 band system in May 2009 and from April 2010 a first year rate is proposed. The bands and rates under the current and proposed scheme are presented in table 14.

Table 14 - VED rates for cars registered from March 2001

Pre 04/09		From 01/05/09					First year
Band	CO_2 g/km	**New band**	CO_2 g/km	**Standard rate***			**rate**
				2008-09	2009-10	2010-11	2010-11
A	Up to 100	A	Up to 100	£0	£0	£0	£0
B	101-120	B	101-110	£35	£35	£20	£0
		C	111-120	£35	£35	£30	£0
C	121-150	D	121-130	£120	£120	£90	£0
		E	131-140	£120	£120	£110	£110
		F	141-150	£120	£125	£125	£125
D	151-165	G	151-165	£145	£150	£155	£155
E	166-185	H	166-175	£170	£175	£180	£250
		I	176-185	£170	£175	£200	£300
F	186-225	J	186-200	£210	£215	£235	£425
		K**	201-225	£210	£215	£245	£550
		L	226-255	£400	£405	£425	£750
G	Over 255	M	Over 255	£400	£405	£435	£950

**AFV discount: 2008-09 A-E £20, F-G £15, 2009-10 A-I £20, J-M £15, 2010-11 onwards £10 all cars*
*** All cars over 225g/km registered 1 March 2001 - 23 March 2006 in K band*

183. The SMMT is supportive of the move to a more linear framework; ultimately the price paid should vary for each gram of CO_2 to encourage improvement across the scale. The standard rates for the 13 bands were originally proposed to range from £0 to £440 from April 2009, but given the changing economic setting, the rates were adjusted in the November 2008 pre-Budget report to £0-£405.

184. The proposed introduction of a first year rate is of serious concern. It could slow the new car market and reduce the profitability of vehicle manufacturers. Typically new cars are sold with an on-the-road list price, the first year rate would therefore likely be lost on many consumers. Any car over 160g/km would have to pay a higher first year rate and for cars over 256g/km the additional amount would be over £500. For cars below 130g/km the first year rate would be £0, and so for those between 101-130g/km they would be saving up to £90 in the first year.

185. VED is a tax on the ownership of a vehicle, not the use of a vehicle. Once a vehicle is owned there is a perverse incentive to use it more to spread the cost over a greater number of journeys.

186. Fuel duty directly taxes the use of the vehicle and adheres to the polluter pays principle, which SMMT supports. Fuel duty is a very influential tool. It also generates significant revenue for the government - £24.5 billion in 2007. Over 60% of the price of a litre of fuel is accounted for by tax.

187. In the UK the fuel duty rates for petrol and diesel are the same, whilst in most other member states diesel fuel is taxed at a lower rate so is cheaper that the pumps. The duty rates for the EU27 and big five markets in particular are presented in chart 15 (note EU27 average not weighted); on average the duty is more than a fifth lower for diesel than petrol across the EU27. If the UK adopted differentiated rates, as in other member states, then the economics of using a diesel would be improved. The chart also shows duty rates are the highest in the UK.

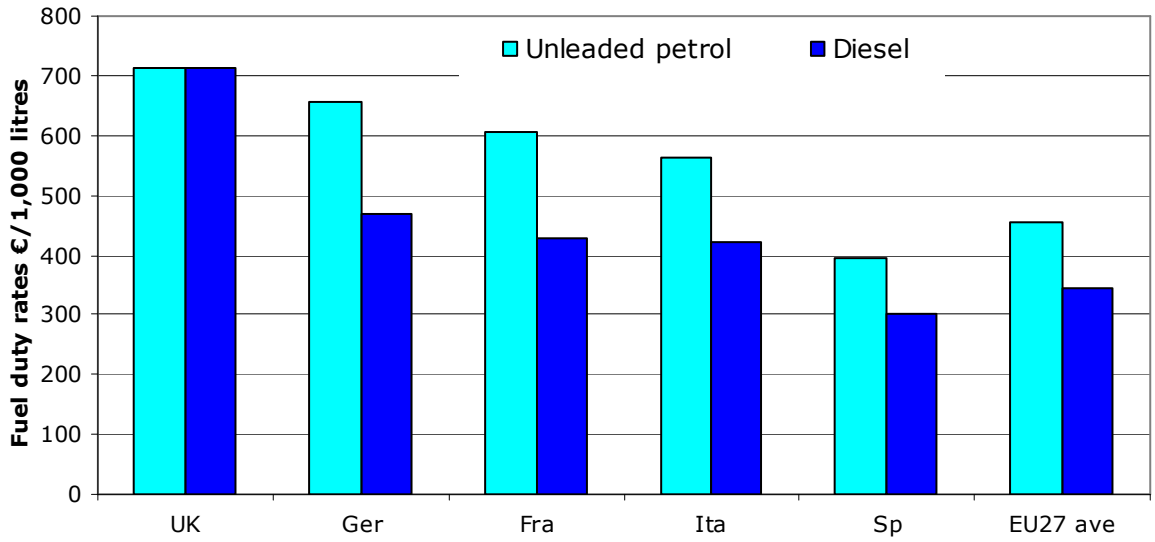
188. Diesel penetration in the EU15 stood at 52.9% in 2008, compared with 43.6% in the UK. The EU rate did ease marginally from 53.6% in 2007, reflecting changes in fuel prices across Europe as diesel prices increased at a faster rate then petrol prices. Diesel penetration was over 75% in Belgium, France and Luxemburg. Of the EU big five markets the UK has the lowest level of diesel penetration.

189. In the past air quality was often cited as a reason not to promote diesel use, as diesels emit higher levels of particulates. However, tightening of Euro emission standards have noxious emissions for new petrol and diesel cars become much more closely aligned, at levy low levels (see Annex 3 for details).

190. In company car tax, diesels pay a 3% surcharge (with cap at 35%). If this were removed than the system would encourage a greater diesel take up.

191. The government is also examining the implications for road user pricing. This could offer a measure to replace fully or partially VED and fuel duty and adhere to the polluters pays principle, but needs to overcome a number of issues, not least consumer acceptance.

Chart 15 Fuel duty rates in selected countries - July 2007 (Source: ACEA)



Price of carbon, costs to the motorist

- Price of carbon varies significantly across different carbon markets
- Motorists charged a much higher penalty for CO_2 emissions than other emitters

192. Fiscal instruments, such as fuel duty and VED, are being used to shape consumer demand for vehicles and the use of those vehicles. It is often difficult to assess the impacts of such measures and for consumers to understand the impacts of their actions.

193. Consumers increasingly understand that they should bear a cost for the environmental impact of their activities. Putting a price on the costs of those emissions is complex. The government has devised the social cost or shadow price of carbon (SPC). This was set at £25.5tCO_2 in 2007 (see www.defra.gov.uk/ENVIRONMENT/climatechange/research/carboncost/pdf/HowtouseSPC.pdf). The SPC is intended to reflect the full cost to society of climate change caused by each additional tonne of green house gas (GHG), quoted as CO_2 equivalent.

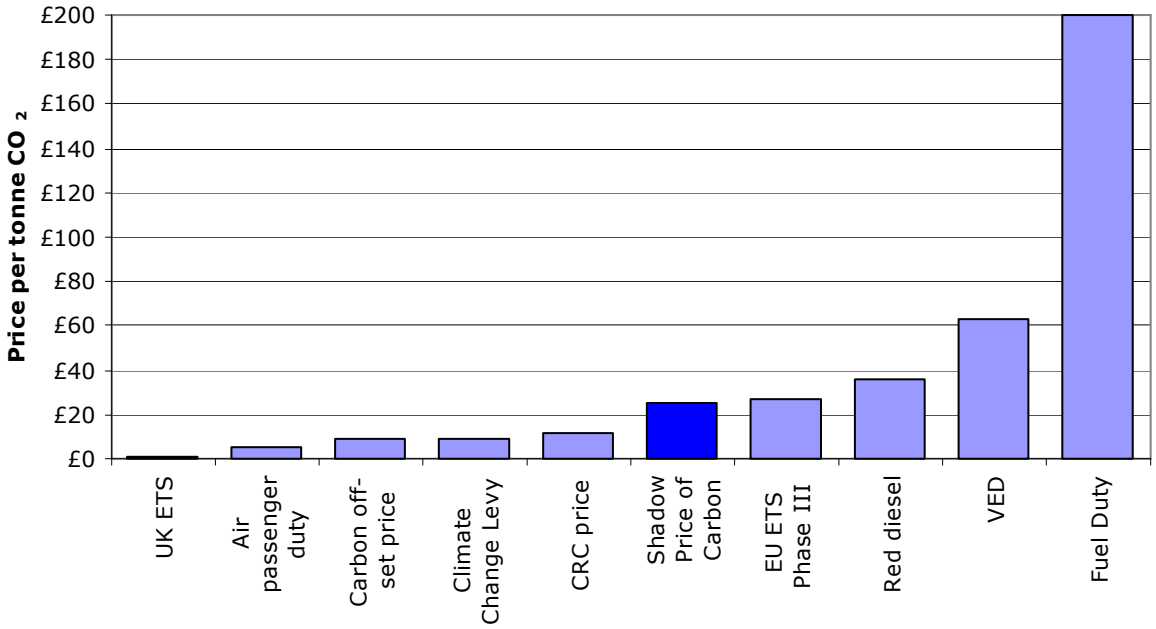
194. A key concern is that the price of carbon varies enormously across different markets, so making it difficult for consumers and businesses alike to understand the costs their action has. Further, a variety of values appear to be in use within government when designing policies such as abatement regulations and environmental taxes.

195. Chart 16 shows the price of carbon in various markets - the value ranges from £1-200p/tCO_2. This sends a confusing signal to consumers, industry and policy makers. It is also clear that motorists may pay significantly above the SPC.

196. While consumers may accept that fuel duty and energy taxation measures are not solely related to the carbon content and energy potential, it is only right to see greater transparency on the issue. The shadow price of carbon accounts for around 40% of the cost of VED and approximately an eighth of the fuel duty. For other sectors the duty rate or market price for carbon is well below the price the motorists pays and often below the SPC.

197. The emissions from a vehicle will be covered by numerous charges, eg fuel duty and VED, and so the final charge to the motorist for the emissions produced would be the sum of all those specific charges, in effect creating double taxation.

Chart 16 Effective price per tonne CO_2 in various markets/policies



ETS = emissions trading scheme, CRC = carbon reduction commitment, UK ETS = current price, APD - short haul flight, 2tCO_2, carbon offset from JPMorganClimateCare, EU ETS phase III - 2012+ - Deutsche Bank, VED based on average 2007 car's CO_2 and fuel duty based on 60/40 petrol diesel split at 2008 average prices.

Annexes

1. SMMT MVRIS segmentation

(MVRIS = motor vehicle registration information system)

A	=	MINI	(eg smart)
B	=	SUPERMINI	(eg NISSAN MICRA)
C	=	LOWER MEDIUM	(eg VAUXHALL ASTRA)
D	=	UPPER MEDIUM	(eg FORD MONDEO)
E	=	EXECUTIVE	(eg BMW 5 SERIES)
F	=	LUXURY SALOON	(eg ROLLS ROYCE)
G	=	SPECIALIST SPORTS	(eg PORSCHE 911)
H	=	DUAL PURPOSE	(eg RANGE ROVER)
I	=	MULTI PURPOSE VEHICLE	(eg RENAULT ESPACE)

SEGMENT A - MINI
Normally less than 1.0 cc
Bodystyle 'miniature'
Normally two doors
Length normally not exceeding 3050 mm (10 Feet)

SEGMENT B - SUPERMINI
Normally between 1.0 - 1.4 cc
Bodystyle bigger than mini
Length normally not exceeding 3745 mm (~ 12.5 feet)
Performance greater than mini
More variety of trims per range

SEGMENT C - LOWER MEDIUM
Normally between 1.3 - 2.0 cc
Length of saloon not exceeding 4230 mm (~ 14 feet)

SEGMENT D - UPPER MEDIUM
Normally between 1.6 - 2.8 cc
Length of saloon normally not exceeding 4470 mm (~ 14.9 feet)

SEGMENT E - EXECUTIVE
Normally between 2.0 - 3.5 cc
Bodystyle generally bigger than Upper Medium
Normally four doors
Length of saloon normally not exceeding 4800 mm (~ 16 feet)
More luxuriously appointed

SEGMENT F - LUXURY SALOON
Normally above 3.5 cc
Most luxurious available

SEGMENT G - SPECIALIST SPORTS
Sports coupes, sports saloons and traditional sports

SEGMENT H - DUAL PURPOSE
4x4 off-road

SEGMENT I - MULTI PURPOSE VEHICLE
4x2 or 4x4 estates with a seating capacity of up to eight people

2. Alternative fuelled and advanced propulsion technologies

Electric Vehicle
EVs during 2008 were heralded as the future of the motor car, with high level support by the UK government and the prime minister in particular. EVs produce zero CO_2 emissions from the vehicle itself. They are also relatively cheap to fuel, have instant performance and are easy to drive.

The key concern for EVs' environmental credentials is: where does the electricity used to power them come from? If it is from renewable sources then the carbon footprint of the vehicle would be relatively low. However, if sourced from fossil fuels the CO_2 emission problem is moved from the tailpipe to the power plant and can be as high as an ICE. The other issue for manufacturers to resolve is the battery – how much energy it can store, which relates to the vehicle's range and how expensive that battery is. Batteries are also heavy and this acts as a drag on performance and efficiency.

At present most EVs have a relatively short range – less than 100 miles, or less than a quarter of what most petrol/diesel cars can achieve on a tank of fuel. This poor range often means the EVs' role is limited to short journeys and in particular urban motoring. The battery often takes some time to re-charge, as much as up to eight hours – compared to just a few minutes to refuel a petrol, diesel or LPG powered vehicle. EVs are typically more expensive than equivalent internal combustion engined vehicles, largely due to the batteries. Improvements in cost and effectiveness of batteries will be key to the future of EVs. As EVs move from specialist to niche to mainstream, economies of scale should further help make EVs more viable.

Most manufacturers are studying electric vehicles. Several firms already offer electric models, although these are mostly specialist companies. Larger vehicle manufacturers have been publicly displaying electric vehicles, such as MINI, Nissan, PSA, Renault and smart. Electric vehicles have also entered the sports car market, with the likes of Tesla and further offerings are due from Dodge, Fisker and Lightning.

Some manufacturers are using on-board recharging methods to provide EVs with extended ranges—**EREV**. An internal combustion engine (ICE), charging the battery and not driving the wheels, allows the ICE to operate under constant and more efficient load. This is the concept behind GM's range-extender series. In Europe, the Opel Ampera is expected in 2012.

Hybrids
One solution to the electric vehicle issue has been hybrid vehicles – vehicles which use two propulsion means or fuel types. In the UK the petrol/electric hybrid is the dominant alternatively fuelled vehicle, accounting for 96% of the market in 2008. The main players in the market are Honda and Toyota/Lexus. The Toyota Prius is the UK's best selling hybrid with over 9,000 units in 2008, representing 58.5% of the hybrid market, 56.9% of the total AFV market, 8.5% of Toyota's registrations and 0.4% of the total UK new car market.

Hybrids entail a mix of motors and fuels and manufacturers have adopted different solutions. Petrol/electric hybrids are presently the most common form, but again two versions are offered. One uses the electric motor at low speeds and the petrol engine when higher speeds or faster acceleration are needed. Alternatively, the petrol engine can be the main power source, with the electric motor adding the performance element.

Hybrids can offer a workable solution, with the electric motor in use in cities and low emission zones and the dual power during other journeys. At present hybrids are incentivised by the London congestion charge and this created a strong marketplace for such cars.

Because they have two power sources and motors, hybrids tend to be more expensive than the equivalent ICE vehicle. They are also more complex, heavier, potentially less efficient at high speeds and relatively untested in terms of durability and recyclability – although there has been no specific issues uncovered so far.

Hybrids on the market now charge the battery through use or the petrol motor. In the future the hybrid could be 'plug-in', where it is charged directly from the grid. Like pure EVs the battery could be recharged at night using off-peak electricity.

As with EVs, the plug-in hybrid only achieves zero emissions when the power is sourced from renewable energy.

Fuel cells
Prior to the recent focus on EVs fuel cell vehicles were seen as the best long-term solution to the CO_2 issue. A platinum fuel cell, as typically used in vehicles, uses hydrogen which when mixed with oxygen produces electricity, which is used to power the vehicle. The only by-product is water vapour. Hydrogen and oxygen are in abundant supply, but to get hydrogen requires considerable energy – it must be extracted from other molecules. Hydrogen is a gas and so can be difficult to transport – it must either be frozen or compressed to a high pressure. The whole process is, presently, expensive. The infrastructure is currently not available to refuel the vehicles easily. Several manufacturers though are using this technology, notably GM, Honda, Nissan, PSA and Mercedes. Honda is publicly trialling the FCX, firstly in America but if successful and the refuelling infrastructure put in place, the model could be introduced to other countries. It is an important first step though in gauging consumer reaction to this new technology and to developing it for more mainstream use.

Many petrol engined cars could be converted to run on hydrogen, as BMW is demonstrating with its hydrogen 7 series range. As they do not require the fuel cell, this would do away with the need to introduce an entirely new propulsion system. However, the hydrogen tank on board the vehicle would have to be large to provide decent range and, like fuel-celled vehicles, hydrogen powered cars would use a costly to produce fuel, a difficult/expensive to distribute fuel and need the refuelling infrastructure put in place. Hydrogen is also difficult to store, although progress is on-going. The European project StorHY (www.storhy.net/) made significant progress in hydrogen storage systems.

Biofuels
An SMMT publication 'Biofuels and road vehicles' is available to download from www.smmt.co.uk/ publications which gives summary information about biofuels.

Biofuels are fuels derived from crops. First generation biofuel is from growing crops specifically for transport fuel. The idea is that the crops use up CO_2 in the growing process and so the fuel has a net lower CO_2 value attached to it than traditional petrol or diesel. The tailpipe emissions from biofuelled cars and traditional fuelled cars do not differ significantly, but on a well-to-wheel basis up to a 60% saving on CO_2 emissions compared with traditional fuels is possible.

Second generation is from using crop waste, like husks of corn, or could potentially be from household waste and old tyres, etc. The crops could be grown on marginal land which is not suitable for cultivation to grow crops for human consumption.

As new technologies are developed so new issues arise that are often not expected and which can influence the potential use of the alternative. Such an issue has recently arisen with biofuels.

The concern is that crops would be produced to fuel vehicles, rather than to feed people. This could lead to deforestation or use of prime grassland to grow those crops, which itself would create further CO_2 issues for the environment and biodiversity.

Typically a car with a conventional engine can run on 5% blend biofuel - so no need to replace the existing parc to gain CO_2 advantages. Higher levels of biofuel blend are likely to require more costly redesign or engineering. Manufacturers have developed cars that can run on higher blends, eg B30 or E85. The B refers to a diesel blend and the E a blend for a petrol car.

The road transport fuels obligation (RTFO) sets out levels of biofuel mix government believes the UK should achieve. Following recommendations of the Gallagher review, the DfT has decided to set the obligation level at 5% in 2013/14, three years later than originally planned and reduced the rate of increase from 1.25% per annum to 0.5%.

3. Other emissions

- Euro emissions standards introduced to reduce other pollutants
- Lead to significant improvements in noxious emissions from passenger cars

Table A - Euro standards

Standard	Date	Emissions limit		
		Petrol NOx mg/km	Diesel NOx mg/km	Diesel PM mg/km
Euro 0		1000	1600	no limit
Euro 1	1992	490 (-51%)	780 (-51%)	140
Euro 2	1997	250 (-75%)	730 (-54%)	100 (-29%)
Euro 3	2001	150 (-85%)	500 (-69%)	50 (-64%)
Euro 4	2006	80 (-92%)	250 (-84%)	25 (-82%)
Euro 5	2011	60 (-94%)	180 (-89%)	5 (-96%)
Euro 6	2015	60 (-94%)	80 (-95%)	5 (-96%)

Euro standards, or European emission standards, define the regulated limits for exhaust emissions of new vehicles sold in the EU. The standards cover carbon monoxide (CO), nitrogen oxide (NOx), hydrocarbons (HC) and particulate matter (PM). The standards cover most vehicle types and are tested via the standardised NEDC test cycle. Table A shows the limits for all types of cars (typically new car approval types have to meet the limits one year before all cars).

Table A shows that NOx and PM levels have typically improved by 82% - 92% between Euro 0 and Euro 4. Euro 4 standards are also a quarter to a third of the Euro 2 levels (pre 2000).

The introduction of these standards has helped air quality from all cars in use, as shown in table B, sourced from the DfT's Transport Statistics GB 2008. This shows significant reductions in presented emissions have been made by passenger cars. The data also shows that passenger cars have made better gains than road transport overall and all transport in reducing the selected pollutants.

Table B - Trends in other selected pollutants (Source: DfT)

'000 tonnes	**1997**	**2000**	**2005**	**2006**	'06 vs '05	'06 vs '97
Carbon monoxide (CO)						
Passenger cars	3,085	2,108	951	830	-12.7%	-73.1%
Road transport	3,654	2,500	1,124	984	-12.5%	-73.1%
All transport	5,678	4,230	2,388	2,268	-5.0%	-60.1%
Nitrogen oxides (NOx)						
Passenger cars	550	397	215	195	-9.3%	-64.5%
Road transport	1,014	818	549	515	-6.2%	-49.2%
All transport	2,163	1,899	1,620	1,595	-1.5%	-26.3%
Particulates (PM10)						
Passenger cars	12.8	8.3	6.4	6.0	-6.3%	-53.1%
Road transport	47.5	38.6	33.7	32.3	-4.2%	-32.0%
All transport	224	184	150	152	1.3%	-32.1%

4. Commercial vehicles (CVs) and CO_2

- Commercial vehicles emit over 40% of UK's road transport CO_2 emissions
- Measuring CO_2 emissions from CVs much more complex than for cars
- Measures under way to impose CO_2 targets on light commercial vehicles

The focus of this report is on car CO_2 emissions, but as demonstrated on page 6 ,while cars make up 57% of emissions from report transport their share is falling. Commercial vehicles (CVs) including trucks, light commercial vehicles (LCVs, eg vans) and buses and coaches represented 42% of road transport emissions in 2006.

CVs are primarily used by businesses and their use is directly related to economic activity. Since 1997 the CV market has grown by 28.1% although, like cars, the market fell in 2008 on 2007 levels, by 10.5%.

Data from TSGB shows that CVs covered 103.3 billion miles in 2007, up 28.0% on 1997, with growth of 3.6% on 2006. Growth for cars over the same two periods were 10.5% and 0.6%, well below the levels from CVs. The growth in distances covered by CVs stems largely from a 40.3% increase from light vans, while goods vehicles and buses reported growth between 1997 and 2007 of just below the rate evident from cars.

The growth in new CV volumes and use since 1997 levels reflects increases in general economic prosperity, growth in the retail and construction sectors in particular, of increased home deliveries and self-employment and outsourcing of services.

Data is presented by the government of total CO_2 emissions and fuel use by CVs, but information on individual vehicle performance is not available as, at present, it is not part of the type approval process for CVs. SMMT is assisting the VCA in developing a searchable database for fully built LCVs (ie not chassis cabs) which is due to go live in April.

Measuring CO_2 levels is complex as base vehicles can be fitted with a number of different body styles - short-wheelbase/long-wheelbase, high roof, panel van, flat-bed and so on. In addition, the payload will have a significant impact. For example a lower CO_2 emitter unladen may emit more CO_2 than a larger vehicle once loaded up.

The EC has plans to introduce CO_2 targets for vans. In 2007 it announced aspirational targets of 175g/km by 2012 and 160g/km by 2015, from a base of 201g/km in 2002. There is no detail on how this base level has been derived.

Vans are very different from cars in terms of who buys them, why and how they are used. In some cases the technologies can be transferred over from passenger cars, but not always. CVs are already predominantly powered by diesel engines and so switching from petrol, as has benefitted the new car CO_2 figure, is not an option. CV customers are also different to car customers and have different requirements for their vehicles, eg increased need for reliability, residual value and running costs.

SMMT, along with the DfT and VCA, published a van buyers guide on 26 February 2009 which informs users how buying, maintaining and driving style can all play an important role in CO_2 emissions, fuel consumption and running costs.

Fuel economy and running costs are already a very significant factor in CV buyers' purchasing decisions, especially so at the heavier end of the market. At the 2008 IAA in Hanover European truck makers – DAF, Daimler, Iveco, MAN, Scania, Volkswagen and Volvo Group – outlined Vision 20-20. Vision 20-20 is a goal to decrease fuel consumption of the modern truck by an average of 20% per tonne kilometre by 2020. The group, however, noted that developing technological solutions is not enough to address all of the traffic-related concerns. All stakeholders: political leaders, the fuel industry, hauliers, vehicle operators and drivers, must do their part to help shape sustainable mobility – reiterating the integrated approach.

Data appendix

1. Size of the new car market - and share covered by CO_2 data

	All regs	CO_2 data	% total	vol diff
1997	2,170,725	1,742,251	80.3%	428,474
1998	2,247,402	1,993,301	88.7%	254,101
1999	2,197,615	2,125,465	96.7%	72,150
2000	2,221,647	2,212,786	99.6%	8,861
2001	2,458,769	2,457,368	99.9%	1,401
2002	2,563,631	2,562,764	100.0%	867
2003	2,579,050	2,579,050	100.0%	0
2004	2,567,269	2,567,269	100.0%	0
2005	2,439,717	2,439,717	100.0%	0
2006	2,344,864	2,344,864	100.0%	0
2007	2,404,007	2,404,007	100.0%	0
2008	2,131,795	2,131,795	100.0%	0

SMMT has published an annual CO_2 data report since 2002 and has CO_2 new car data from 1997 onwards. This data is sourced from manufacturers' own CO_2 figures (supplied on the first registration document) and checked with type approval data from the Vehicle Certification Agency to ensure accuracy. Since 2003, the low volume of missing data was estimated by using other models in the range or using models of a similar segment/engine size and type. SMMT believes the database it has compiled is the most accurate and reliable available and therefore provides the best source for analysing the UK's performance. The data is collated by SMMT's Motor Vehicle Registration Information Service (MVRIS). It links vehicles' CO_2 levels to the MVRIS new car registration database.

2. Average new car CO_2 emissions, 1997-2008

Year	Average CO_2g/km	y/y % change	y/y % change on 1997
1997	189.8		
1998	188.4	-0.7%	-0.7%
1999	185.0	-1.8%	-2.5%
2000	181.0	-2.2%	-4.6%
2001	177.6	-1.9%	-6.4%
2002	174.2	-1.9%	-8.2%
2003	172.1	-1.2%	-9.3%
2004	171.4	-0.4%	-9.7%
2005	169.4	-1.2%	-10.7%
2006	167.2	-1.3%	-11.9%
2007	164.9	-1.4%	-13.1%
2008	158.0	-4.2%	-16.8%

Quick Facts

- Average new car CO_2 fell to 158.0g/km, 4.2% down on 2007 level
- Rate of reduction three times the pace recorded in 2007
- Average new car CO_2 in 2008 down 16.8% on 1997 level
- Share of market under 120g/km more than doubled in 2008 to 11.0%
- Total CO_2 emissions from all cars in use fell 4.8% between 1997 and 2006

	2008	2007	1997
Average new car CO_2 emissions	**158.0g/km**	**164.9g/km**	**189.8g/km**
% reduction vs 2007	-16.8%	-13.1%	
Share of cars under:			
120g/km	11.0%	5.4%	0.0%
130g/km	16.4%	10.6%	0.1%
140g/km	34.8%	23.5%	3.9%
Total new car market	**2,131,795**	**2,404,007**	**2,170,725**
Diesel penetration	43.6%	40.2%	16.2%
Supermini segment share	34.1%	32.1%	26.5%

	2007	2006	1997
Total CO_2 emissions cars*	-	**68.7MtCO_2**	**72.4MtCO_2**
Fuel consumed by cars*	21.5Mt	21.9Mt	23.1Mt
Total GB car parc	30.2mn	29.9mn	25.6mn
Total distance travelled by cars*	404.1bn kms	402.6bn kms	365.8bn kms

SOURCES

All data sourced from SMMT unless otherwise stated

* DfT Transport Statistics Great Britain, 2008 edition

$MtCO_2$ = Million tonnes carbon dioxide.

Mt = Million tonnes. Mn = Million. Bn kms = billion kilometres.

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