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A REVIEW OF THE PASSENGER CAR MARKET IN THE UK THROUGH HISTORY TO THE PRESENT

DRIVEN

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CONSUMER CAR CHOICES AND CO_2

SMARTER DRIVING

PASSENGER CAR MARKET TRENDS OF THE LAST DECADE

THE EXPLOSION OF THE MOTOR CAR

energy saving trust®

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ENERGY SAVING TRUST

The Energy Saving Trust is one of the UK's leading organisations tackling climate change. Funded by Government and the private sector, we are a private not-for-profit limited company with offices in England, Scotland, Wales and Northern Ireland. Our purpose is to help reduce carbon dioxide (CO_2) emissions through energy efficiency and renewable sources of energy in the home, on the road and in communities. Since the Energy Saving Trust was established in 1993, through our initiatives we have funded or influenced the installation of sustainable energy measures which over their lifetime will lead to savings of over 100 million tonnes of CO_2.

We are perhaps best known for our work on energy efficiency, where our national network of advice centres engages with over a million customers per year. We also have a significant portfolio of transport services, including consumer transport advice (such as low-carbon car purchase and smarter driving advice) provided through our advice centres, business transport advice for fleets and a low-carbon research and development programme. In Scotland, we also provide a travel planning service on behalf of the Scottish Government [1].

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1 This is an Energy Saving Trust publication. All views expressed within this report are those of the Energy Saving Trust and are not intended to represent the views of Government. All numbers and statistics were correct at the time of publication, however as many areas are evolving, numbers and projections are subject to continual review.

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EXECUTIVE SUMMARY

Climate change is now accepted as one of the greatest challenges facing mankind today. The time for talk is over. The focus is now on taking action to deliver the CO_2 savings needed to meet our reduction targets.

In the UK, the transport sector produces nearly a quarter of our total CO_2 emissions, with 57 per cent of those emissions directly attributable to the passenger car. Whereas emissions from most sectors have been decreasing, transport emissions have significantly increased since the 1970s. This is a review of the development of the passenger car market in the UK through history and its associated CO_2 emissions, undertaken to help understand how we can reduce CO_2 emissions most effectively in the future.

The new car market is complex and made up of a number of very different sub market segments, each contributing to the overall CO_2 emissions figure. Understanding the true nature of its CO_2 impacts and identifying the best opportunities for reductions requires detailed analysis – which this review provides.

To date, the passenger car market has been slow to respond to the problem of climate change and there is a very large range of CO_2 emissions within the choice of new cars available to buy in the UK today. We find that consumers are currently making poor choices when it comes to the emissions of their new cars, despite there now being good incentives to choose low CO_2 vehicles. This is not only having a negative effect on CO_2 emissions from the market, but is also bad for consumers' pockets in terms of unnecessarily high fuel and running costs.

The main reasons for current poor vehicle choices are:

- Lack of awareness of independent information and advice which makes CO_2 information clearer and more prominent throughout the vehicle purchase process and so can encourage consumers to take action.
- The current market structure, where more desirable cars within vehicle model ranges tend to have higher CO_2 emissions.

Car buyers are making poor choices when it comes to the CO_2 emissions of their new cars. This means there are opportunities to reduce CO_2 emissions by up to 25 per cent – simply by improving new vehicle choices

In this review we find that there are a number of significant opportunities that could reduce new car CO_2 emissions by up to 25 per cent in the short to medium term. This is equivalent to the annual CO_2 emissions of a third of a million houses, or a city the size of Glasgow[2].

Importantly, these reductions can be achieved without the need for new technologies, which are still some years away from achieving real market success. The main course of action is to help consumers to choose the traditionally fuelled[3], lower-CO_2 models of vehicles which are already available on the market.

Funded by the Department for Transport and the Scottish Government, we have recently started to provide consumer transport advice through our network of advice centres. These focus on helping consumers to purchase lower-carbon vehicles, to drive their cars more efficiently and to use their car less.

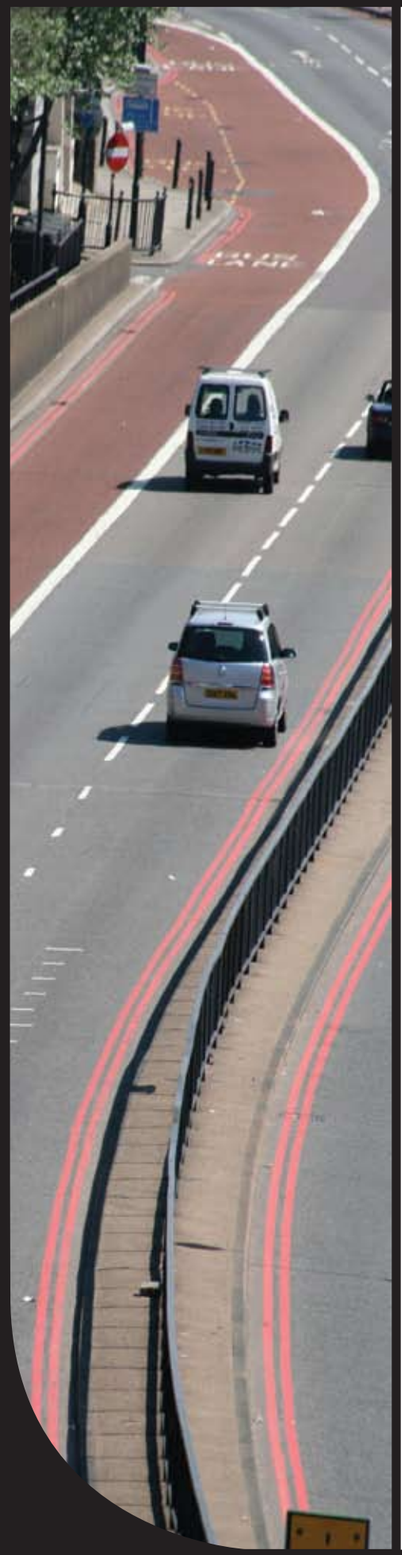
This is an encouraging start, because this review shows that advice for consumers will play a crucial part in delivering these reductions. Information alone is not enough and little proactive advice is provided at the moment.

There is much greater potential for CO_2 savings to be made through scaling up these services and working increasingly with local delivery partners. So the main action recommended in this review is to increase the level of independent, proactive, in-depth advice for consumers from 2009/10.

Our current turbulent economic situation and very high oil prices mean that reducing road transport costs is going to be high on householders' agendas. We believe that scaling up advice services will encourage people to act, because our advice will help significantly reduce these costs as well as saving CO_2.

However, advice alone will not deliver the potential for CO_2 reductions in the new car market. Manufacturers also need to work hard to improve the quality and desirability of traditionally fuelled low-CO_2 models within their vehicle ranges in order to improve sales. Finally, further development of government CO_2-reduction policies also will play a fundamental role in delivering a low-carbon car market in the future.

2 This refers to household emissions only
3 i.e. petrol and diesel



2

INTRODUCTION

In the UK, there are more than 26 million cars on the roads. There are more cars than there are households, or one car for every two people.

The car has been one of the most pervasive inventions of our time and our enduring love affair with it dates back to its invention in the late 19th century. Particularly since the Second World War, the car population has exploded, to the extent that there is now one car for every two people, or more than one car per household in the UK.

While CO_2 emissions from other sectors have largely been decreasing, the opposite has been the case for transport, where emissions have risen significantly since the 1970s. This has been a direct result of our desire for more cars and other forms of transport. As car numbers have grown, so have their negative impacts and recently, the impact of automotive CO_2 emissions has risen to the top of the agenda.

Transport is now one of the most significant producers of CO_2 emissions worldwide. In the UK, transport is now responsible for 25 per cent of all UK CO_2 emissions, with nearly 60 per cent of those emissions directly attributable to the passenger car.

So the problem of car-related CO_2 emissions is clear. Unfortunately, solutions delivered by new technologies are still a long way from market[4]. How can these emissions be significantly reduced in the near term?

While CO_2 emissions from other sectors have largely been decreasing, the opposite has been the case for transport

This review is the latest in a series of market review documents from the Energy Saving Trust[5] assessing high energy-using markets in terms of CO_2 emissions, exploring major trends and the opportunities for reductions in CO_2. In this report, we review the development of the new car market in the UK throughout recent history to the present and assess the impact of this development on CO_2 emissions. The aim of this report is to:

- Explore the development of the new car market in the UK through history to the present.
- Improve understanding and awareness of where CO_2 emissions are produced within the new car market by analysing emissions from each segment of the passenger car market.
- Through this analysis, explore the opportunities available to reduce emissions through delivering 'energy efficiency' in the car market.
- Make recommendations for action in order to deliver significant CO_2 reductions from the new car market in the near to medium term.

The report focuses on highlighting the opportunities to make CO_2 savings using existing technologies in the market – i.e. through 'energy efficiency' means. This is because 'new' (i.e. non petrol or diesel based) low-carbon vehicle technologies are expensive and still far from being competitive in the market. There is a need to reduce emissions from road transport significantly in the near term – and there is an opportunity to achieve up to 25 per cent reductions using petrol and diesel technologies now.

4 Energy Saving Trust (2007) Market Transformation Model www.energysavingtrust.org.uk/aboutest/publications/index.cfm?selTopic=172
5 Energy Saving Trust (2007) Rise of the Machines www.energysavingtrust.org.uk/uploads/documents/aboutest/Riseofthemachines.pdf

3

THE EXPLOSION OF THE MOTOR CAR

Although there is no straightforward answer to who invented the automobile, with first designs tracing back as far as Leonardo da Vinci, the first true gasoline-powered vehicle is generally regarded to have been created by Karl Friedrich Benz[6] in 1885/6.

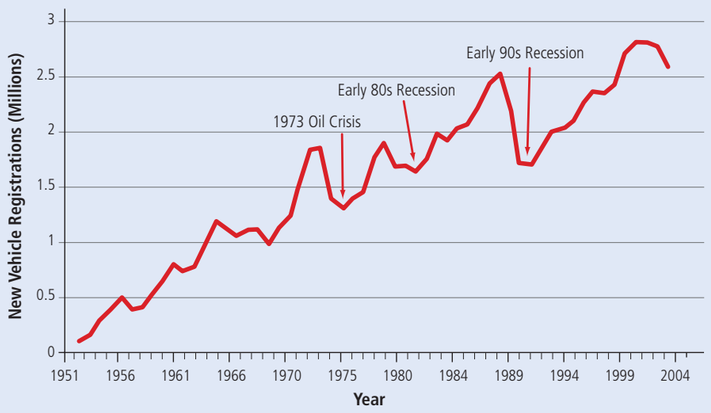
There are very few inventions which have so successfully met human needs as the motor car, providing the freedom to be able to make door-to-door journeys whenever and wherever required. The car itself has changed very little as a functional entity since its invention. Cars in the late 18th century generally had four wheels, an internal combustion engine, seats and controls, exactly as they do today. The key change has been a sustained explosion in the number of vehicles on our roads.

After World War Two, Great Britain saw the start of massive growth in its car population. Figure 3.2 shows that new vehicle registrations increased nearly 20-fold between 1950 and 2005. Figure 3.2 also clearly suggests the extent to which the car has been both a cause and an effect of post-industrial economic growth, indicating how important the car has become within modern life.

Growth in the numbers of cars in the UK has been so strong over the past 50 years that by the early 2000s, the number of cars in the UK overtook the number of households for the first time (Figure 3.3).

Figure 3.1 one of Karl Friedrich Benz's first automobiles

Figure 3.2: Private and Light Goods Vehicle Registrations (1950-2005, DfT Statistics)



6 Karl Benz produced his first car, a three wheeled gasoline powered internal combustion engine car. Karl Benz went on to found the Benz company, precursor to Mercedes-Benz (Daimler Chrysler)

The level of growth in road vehicles has had a deeply worrying effect on the CO_2 emissions from transport

Effect on CO_2 emissions

Car growth has had a very significant effect on the CO_2 emissions from transport. Almost every sector, including the energy industry and households, has decreased emissions significantly since the 1970s, with the exception of transport. Its emissions have increased, largely as a result of continued growth in the passenger car sector (Figure 3.4).

With current petrol and diesel technologies destined to remain the main motive power for cars over many years to come, it will be impossible to eliminate CO_2 emissions from cars in the near term. At face value seems it very difficult to reduce CO_2 emissions, as this is the major waste product from burning petrol or diesel.

The following sections look at new car purchase trends in relation to CO_2 emissions, which highlight some of the major opportunities for achieving near-term reductions. However, first we look at how the car itself has evolved over the past 30 years and how this has affected CO_2 emissions.

7 DfT and CLG Statistics http://www.communities.gov.uk/housing/housingresearch/housingstatistics/livetables/
8 Defra 2006 – http://www.defra.gov.uk/environment/statistics/index.htm

Figure 3.3: Registered Vehicles and Households in Great Britain 1950-2006[7]

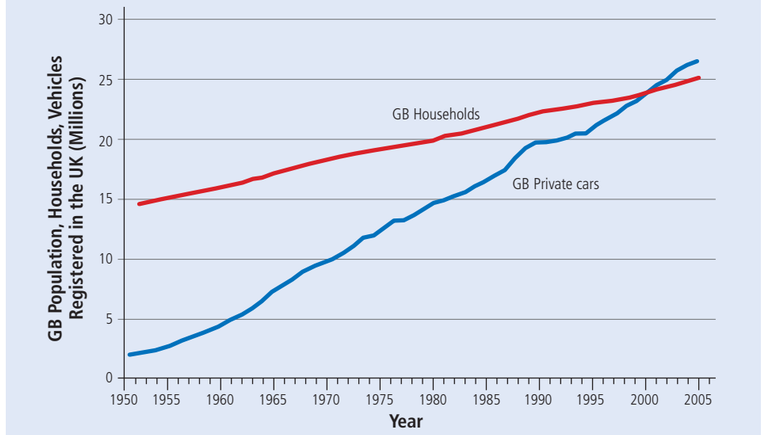
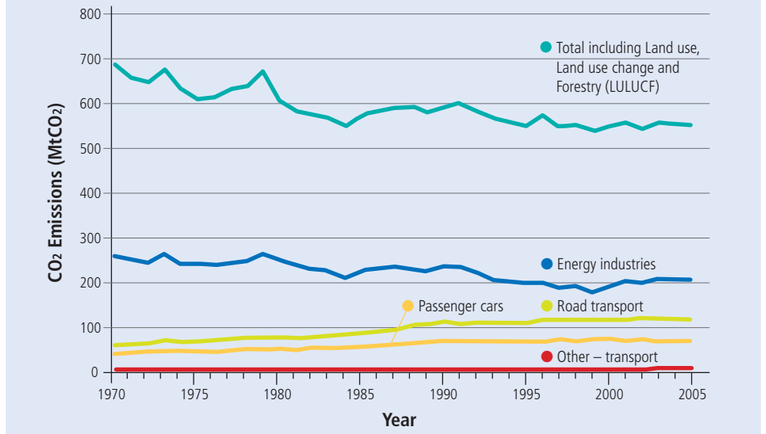


Figure 3.4: Total UK CO_2 emissions and CO_2 emissions from Transport 1970-2005



The EVOLUTION of the Car: 1970s to Present

In most markets, products usually become more efficient as they evolve over time, reducing in size and providing more output whilst requiring less energy to operate (e.g. mobile phones). However, the evolution of the car has been complex, affected by many market and non-market drivers – and as a result it has not followed this trend. In fact, it has done the opposite as cars are larger, heavier and more powerful than they have ever been.

One of the interesting aspects of the evolution of the car is the lack of significant change it has undergone. This is testimony to how good an invention it really was: it has been difficult to make fundamental improvements. Unfortunately, this has meant that the negative impacts associated with cars have also not changed (e.g. CO_2 and other tailpipe emissions) and the explosion in vehicle numbers has turned these issues into chronic problems which now require urgent attention.

However, to state that the car has not changed at all through recent history would be far from the truth. The car has developed significantly, but in more subtle ways, explored here.

The miraculous growing car?

Clearly, as more energy is required to move greater mass, weight is the most fundamental factor determining the CO_2 emissions of cars. As a result, it would be natural to expect that the weight of vehicles would have reduced over recent years as fuel efficiency and reduction of CO_2 emissions have become higher priorities.

Unfortunately, there is a surprising lack of data available on vehicle weight trends across the passenger car market. In spite of this, some studies show that vehicle weight has actually increased by 30-40 per cent between the 1970s and the present.[9] [10] Figure 4.1 provides a useful comparison between the development of weight, power, engine capacity and CO_2 emissions of the passenger car from 1995 to 2004.

To explain this weight increase, a look at the features and options available on vehicles in the 1970s compared to those available today is instructive. Table 4.1 shows an indicative list of standard vehicle features and options available on a 1978 car compared with a 2008 model.

This highlights one of the main areas where vehicles have developed significantly over the last 30 years. As cars have grown in number and people have been spending increasing amounts of time in them, manufacturers have sought to make them safer and more pleasant places to be – like 'homes from home'.

Furthermore, safety has become a much higher priority recently as traffic levels have increased. As a result, features, options and safety equipment have proliferated.

Shown in Table 4.1, these have added a huge amount of weight to cars, resulting in the trend illustrated in Figure 4.1.

Clearly a significant proportion of this weight gain has been the result of impressive developments in safety features[12]. Action on reducing CO_2 emissions from cars should not compromise vehicle safety and so this proportion of weight gain must be viewed in context. However it is clear that if vehicle weight had not increased as it has, vehicle CO_2 emissions could have decreased much more significantly than they actually have – possibly by as much as 30-40 per cent.

9 Carslaw, D. C., (2006) A heavy burden for heavy vehicles: Increasing vehicle weight and air pollution. Atmospheric Environment 40(8), pp.183-184 http://eee.leeds.ac.uk/CO_workshop/Carslaw.pdf
10 Wells P & Nieuwenhuis P (2002) 'Weight and the future of automotive materials', Automotive Environment Analyst, Issue No 93, November, 22-24
11 ACEA (King Review Part 2, 2007)
12 Driven by improved safety legislation, and consumer demand

To further compound the issue, many of the features shown against the 2008 'indicative' vehicle also directly worsen fuel consumption because they need power in order to operate. (See Table 4.1) This extra power requirement is supplied ultimately from the engine, which has to work harder to operate these power hungry devices[13]. The most significant examples are air conditioning and climate control systems, which can increase fuel consumption by as much as 30 per cent when set to the maximum cooling setting[14]. Other power-sapping features include satellite navigation, multifunction in-car entertainment systems (such as CD multi-changers, DVD players etc.), heated windscreens and mirrors. Unlike air conditioning, these features reduce efficiency by requiring the engine to charge the battery more via the alternator.

It is unlikely that these options and features will be removed from cars in future, because to a large extent they have become a driver expectation. So it is clear that if CO_2 emissions are to be reduced using current vehicle technologies, one of the main challenges for manufacturers is to produce lighter vehicles, with more energy efficient features.

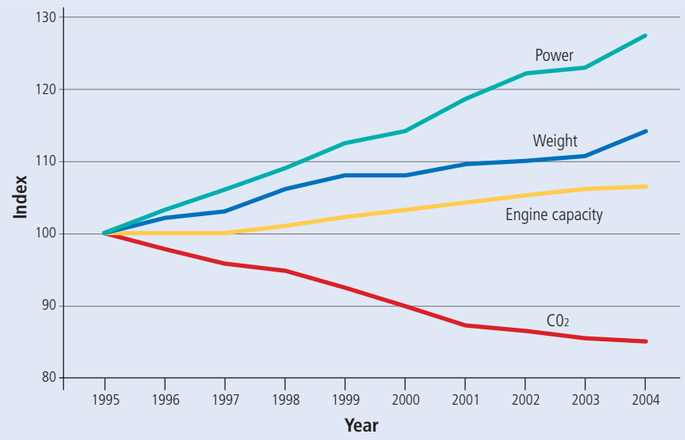
Another trend which corroborates the weight gain findings is that vehicles have got significantly larger over time, as shown by Paul Neiuwenhuis's paper on 'the miraculous growing car'[15]. On average, 'like-for-like' cars have increased in volume by 21 per cent since 1965[16]. This is because of the need to accommodate extra equipment and also the trend for cars to 'mature' over time in order to attract return buyers as they progress through different life stages. One of the major ways in which this is achieved is by allowing car models to grow when a new model is released.

Table 4.1: Indicative Passenger Car Features and Options 1978 and 2008

1978		2008	
Standard features	**Optional features**	**Standard features**	**Optional features**
Console warning indicators	Mud flaps	Power steering	Trip/fuel/temperature computer
Air recirculation	Sunroof	Console warning indicators	Rain sensitive windscreen wipers
Radio	Cassette player	Heated door mirrors	Rear parking sensors
2 speakers	Rear speakers	Electrically adjustable door mirrors	Electrically foldable door mirrors
Heated rear windscreen	60/40 folding rear seats	12 Volt Auxiliary Power Socket	Electric sunroof
Anti roll bar	Rear seat belts	Air recirculation	Headlight washers
Front seat belts	Rubber floor matts	Pollen filters/active carbon filters	Satellite navigation system
Seat belt force limiters	Cup holder(s)	Air conditioning	Hands free telephone systems (e.g. Bluetooth capability)
Rear fog lights	Leather seats	Front cup holders	Electric seat adjustment
Cigarette lighter	Alloy wheels	Cooling glove box	Quick clear heated windscreen
Interior light		Front electric windows	Emergency brake assist (eba)
		Rds stereo radio	TV/DVD player
		CD player/changer	Cruise control
		Remote audio controls	Rear electric windows
		6 speakers (4 front 2 rear)	Leather seats
		60/40 rear folding seats	MP3 connectivity
		Rake and reach adjustable steering column	Alloy wheels
		Heated rear windscreen	Additional front (full beam) spot lights
		Service interval monitor	
		Remote central locking	
		Driver airbag	
		Front passenger airbag	
		Driver and front passenger side airbags	
		Rear passenger side airbags	
		Anti lock brakes (abs)	
		Anti roll bar	
		Immobiliser	
		Alarm	
		Side impact protection beams	
		Front seat belts	
		Rear seat belts	
		Load limiting Steering Column	
		Clutch and brake pedal intrusion prevention system	
		Deadlocks	
		Active safety front seat head restraints	
		Reinforced safety cell	
		Child seat restraint system	
		Height adjustable seat belts	
		Seat belt force limiters	
		Front fog lights	
		Rear fog lights	
		Boot load compartmentaliser	
		Rubber floor mats	
		Cigarette lighter	
		Rear head restraints	
		Interior light	
		Reading lights	

Vehicle weight has actually increased by 30-40 per cent between the 1970s and the present

Figure 4.1: Changes in average vehicle CO_2 emissions, power, engine capacity and weight (1995-2004, indexed to 100 in 1995)[11]



13 Usually via the alternator, which recharges the car battery (with the exception of air conditioning)
14 Barbusse S., Gagnepain L. (2003). Automobile Air conditioning Its Energy and Environmental Impact. ADEME http://www.ademe.fr/anglais/publication/pdf/clim_auto_gb.pdf
15 Neiuwenhuis, P. (2006). The miraculous growing car. Automotive Environment Analyst, Issue 130, May 2006.
16 E.g. Ford Escort of 1965 compared to the 2008 Ford Focus

Engine developments

Engine technology is a key area where there has been a continuous, gradual improvement in fuel efficiency. As a result, engines are approximately one-third more efficient than thirty years ago. However, as noted previously, this improvement has been offset significantly by a similar increase in the weight and size of cars. Furthermore, as Figure 4.1 (page 9) shows, engines have also got much more powerful, which has had a further negative impact on CO_2 emissions. As a result, improvements in fuel efficiency and CO_2 emissions have been much smaller than the potential over the time period.

Because the nature of the internal combustion engine constrains the level of possible fuel efficiency, existing engine technology has diminishing potential for further improvement. However, there are a number of developments which have helped improve efficiency over the years, noted below.

Petrol engine development

The most significant development in petrol engine technology in relation to CO_2 emissions performance has been the introduction of fuel injection systems. These replaced the carburettor as the primary method of managing delivery of fuel into engines during the 1980s in Europe. Fuel injection allows the fuel/air mixture burnt in an engine's cylinders to be controlled more effectively.

The mixture of air and fuel within an engine's cylinders needs to achieve a delicate balance to get optimum performance from the fuel burned. Even small deviations from the optimum mixture result in reduced fuel efficiency, poor exhaust emissions and engine wear. Therefore the introduction of fuel injection has significantly increased fuel efficiency per unit of power (or brake horse power)[17]. Worryingly, the consequence of this has been for more powerful cars to be produced, which has negated a significant proportion of the potential efficiency improvement (see figure 4.1, page 9) to a similar degree as the weight gain described above.

Turbocharging or supercharging has also been applied to many petrol engines, which in both cases involves forcing extra air into the cylinders[18], allowing more fuel to be burnt during each revolution of an engine. This process can increase fuel efficiency, mainly by increasing the power output of an engine without increasing its size, and therefore

weight. Unfortunately though, these are relatively expensive applications and as a result, turbo and supercharging for petrol engines has generally been applied only to expensive, high-performance vehicles, again to increase performance rather than fuel efficiency.

Diesel engine development

The roots of the diesel engine lie in agricultural vehicles, ships and trains. It has the same fundamental basis and set up as the petrol engine, but the main difference is that fuel is ignited through heat and very high compression with air as opposed to using sparkplugs.

The diesel engine is significantly more efficient than a petrol engine of the same power output (generally by 15-25 per cent). However, until recently diesels have not been popular in the passenger car market. Before the late 1990s, they tended to be much noisier, slower and less refined than petrol engines while also being heavier and more expensive to manufacture.

Recent developments, including direct fuel injection, turbocharging and the development of common-rail technology[19], (alongside increasing demand for fuel efficiency in certain parts of the market) have meant that demand for diesel-powered cars has taken off over the last 10 years, with sales nearly tripling over the decade. Diesel sales now account for 40 per cent of the whole new car market.

It is this boost in diesel vehicle sales over the past decade and consequent decline in petrol sales that has delivered the largest proportion of the CO_2 reductions

Interestingly, the diesel engine is more efficient than petrol even though the fuel has a lower calorific value[20]. Its efficiency is due to several factors. Higher compression required within the cylinders (for combustion) means less of the fuel's energy is wasted as heat loss. Secondly, the engine suffers from fewer efficiency losses from pumping because it has no throttle valve.

And the addition of a turbocharger, which is standard in most modern diesels, improves efficiency because, as for petrol engines, it allows the engine to be smaller, thus reducing weight. Furthermore, the lack of a separate ignition system greatly improves the reliability of diesel engines, which has also increased their popularity.

It is this boost in diesel vehicle sales over the past decade and the consequent decline in petrol-car sales that has delivered the largest proportion of the recent CO_2 improvements seen from vehicles on a per-vehicle basis (see Figure 5.1, page 12). This highlights a concern for the future, as there is a limited extent to which further migration towards diesel is possible.

17 Known as Specific fuel consumption
18 Turbochargers are driven by the engine's exhaust gases, whereas supercharging usually involves a pump driven by the engine to force more air into the engine.
19 Common Rail Diesel Systems allow diesel to be supplied to the engine under very high pressure, which allows for better combustion. The technology also allows for improved control of fuel injection. Bosch Automotive Handbook 7th Edition.
20 Diesel calorific value ≈ 38 MJ/kg, Gasoline ≈ 44 MJ/kg

Diesel sales now account for 40 per cent of the whole new car market

Finally and more recently, there has been an increasing trend for the diesel engine to be used in higher performance vehicles where it has been found to be a very viable application[21]. This has resulted in an actual increase in new diesel car CO_2 emissions since 2002. This means CO_2 emissions from the new car market have only reduced because consumers have bought many more diesels - which are generally lower CO_2 than petrols - not as a result of improvements in diesels themselves. This has very worrying consequences for continued CO_2 abatement in the market.

Bolt-on CO_2 reduction technologies

There have been some encouraging recent developments designed to reduce CO_2 from petrol and diesel in the form of 'bolt-on' technologies. The most notable of these are 'intelligent alternators'[22], and stop/start technology launched in 2007 by manufacturers such as BMW. It has delivered some remarkable improvements in CO_2 emissions, for example the BMW 520d achieves 136 g/km. Other technological improvements coming onto the market with varying costs and efficiency savings include variable valve actuation and low rolling-resistance tyres[23].

New low-carbon vehicle technologies

It is important to note that there are two distinctly different types of low-carbon car: those which are powered by new technologies (such as hybrids and electric vehicles); and those which are petrol or diesel powered but are more efficient than the average. This review is focussed on the latter, as these vehicles have significantly greater potential for near-term market success due to their comparable performance and lower costs.

However, looking briefly at novel, low-CO_2 technologies shows that their pace of development has increased since the late 1990s. Different manufacturers have dabbled in the development and demonstration of a number of technologies with mixed levels of success. These technologies include LPG[24], electric vehicles, hydrogen[25], hybrid electric, bio-fuels and natural gas.

Despite heightened media attention, the real level of market success of these technologies to date has been miniscule (sales in 2007 comprise less than 0.7 per cent of the total market). In fact, the only technology which has shown any significant promise both in terms of CO_2 reductions and market sales is hybrid electric. This technology has been pioneered by Japanese manufacturers such as Toyota and Honda – with cars like the Honda Civic IMA and the Toyota Prius – and is essentially a 'stepping stone' solution, still fundamentally dependent on the internal combustion engine.

There are a multitude of reasons behind the poor performance of these technologies in terms of sales; however it is principally the result of an inability to compete effectively with petrol and diesel vehicle technologies because of high production costs and relatively poor driving performance. In the absence of very significant market incentives, the Energy Saving Trust's Transport Market Transformation Model shows that development of these technologies in passenger cars[26] will not achieve significant market penetration until at least 2015.

Given the high CO_2 emissions associated with traditional fuels, this paints a worrisome picture for the future, as it is apparent that mass-market low-carbon technologies are still a long way off.

Despite the poor short- to medium-term market uptake forecast, there has been a distinct focus on low-carbon technologies as being the solution to car-related CO_2 emissions. This is clearly not wasted effort, as technological solutions are the key to de-carbonising the car market in the long term. However, to date the effect of this has been that some other opportunities available to reduce CO_2 through improved use of existing technologies have not been acted on fully. It is clear that these opportunities now need to be explored fully in order to deliver CO_2 reductions in the nearer term, so that road transport can play its part in the Government's overall CO_2 reduction targets[27].

We believe that significant near-term CO_2 reductions can be delivered through improving our choices of vehicles, as there is a very wide range of CO_2 emissions in the cars available on the market today. The following section examines the current car market in detail in order to determine the potential for these savings, achievable through delivering 'energy efficiency' across the passenger car market.

21 Achieving refinement tends to be easier to achieve in larger (consequently more powerful) diesel engines.
22 Traditional car alternators recharge the car's battery constantly, regardless of the state of charge of the battery. Intelligent alternators sense the level of charge of the battery and switch off recharging when the battery is fully charged, only to re-start charging when needed. powerful) diesel engines.
23 HMT (2008) The King Review of Low Carbon Cars. Part II: Recommendations for action (p26).
24 Liquefied Petroleum Gas (often referred to also as Autogas)
25 Combined with fuel cell or internal combustion engine technology
26 Energy Saving Trust (2007) Market Transformation Model http://www.energysavingtrust.org.uk/download.cfm?p=0&pid=1152
27 Energy Saving Trust (2007) Market Transformation Model

5

PASSENGER CAR MARKET TRENDS OF THE LAST DECADE

Within this section, we explore the development of the new-car market over the last decade and its impact on CO_2 emissions. This includes an overview of the development of the whole market and its emissions. However, examining the market in its entirety only shows part of the picture, as the nature of the car market is highly heterogeneous, made up of a number of different 'segments' of vehicles each aimed at a different audience of buyers.

The last decade has brought with it some significant changes within the market, which only become explicit when individual market segments are explored in detail. Therefore we look at each major vehicle segment and review its evolution over the last ten years, which helps to develop a more informed picture of the market.

Fleet cars vs. private cars

Aside from analysing the market by vehicle segment, the other main aspect to consider is that the new car market is made up of two distinct components, private car sales (44 per cent) and fleet or company car sales (56 per cent [28]). Market drivers and CO_2 emissions policies which affect these two parts of the market are different and therefore these are distinguished from each other where relevant. Figure 5.1 shows the change in the sales-weighted average CO_2 of new cars from the private sector and fleet sales from 1997-2007. It is important to note that we only consider the CO_2 footprint of vehicles resulting from the 'in use' phase of a vehicle's lifecycle – i.e. the emissions generated whilst the vehicle is being driven. The main reason is that this part of a vehicle's life cycle generally accounts for around 85 per cent of the total footprint[29 30].

Furthermore, we also only consider the market for new cars here. It is important to note that there is a much larger body of used vehicles than new sales, which are making the largest overall contribution to CO_2 emissions from cars. However, as new vehicle sales regenerate the market (and used vehicles will eventually exit the market through scrapping), we focus on the new car market as influences here are key to reducing emissions.

5.1 Market overview

Figure 5.2 shows the range of CO_2 emissions of new cars in the UK, distributed by sales from 1998 to 2007. The importance of this becomes clear when considering that the range of CO_2 emissions shown represents the real CO_2 'choice' presented to the consumer when considering which new car to purchase. The car subsequently bought then persists within the market (producing CO_2) for another 13 years (average) or so, before it reaches the end of its useful life.

In 2007, the lowest CO_2 emitting vehicle on the market was 99 g/km CO_2[31], and the highest was more than five times this at 545 g/km CO_2[32]. However, the graph shows that most 2007 sales have been for vehicles emitting between 120 and 220 g/km.

It also shows that improvements in CO_2 emissions per vehicle have been made, as the distribution of sales has moved to the left over time. However, comparing the shape of the sales distribution shows that although it has moved to the left (lower carbon) end of the scale, the shape of the distribution in 2007 is very similar to what it was a decade ago.

This means that although manufacturers are producing more efficient vehicles than 10 years ago, consumers are not choosing to purchase any more lower CO_2 (or 'best in class') vehicles than they did in 1998 compared to what is available on the market.

This is surprising, given that there has been considerable activity in recent years to incentivise the take-up of lower CO_2 vehicles, and there are now very good financial reasons to choose a low CO_2 car over a high CO_2 car (see Section 7, CO_2 legislative and policy developments, page 26).

What this also indicates is that the new car market could reduce emissions by up to 25 per cent if consumers started to seek out the lowest CO_2 emission vehicles in class (best in class). This can be achieved by influencing purchase decisions to reflect the 'low carbon choices' in figure 5.2. This is explored in further detail for each market segment.

Figure 5.3 shows the overall contribution to CO_2 emissions of the market, split by market segment. This type of analysis has not been shown before with such a degree of accuracy as it is not correct to assume that the annual mileage driven is the same across all segments. In order to account for this, we have combined UK stocks and sales data with DfT National Transport Survey data, which records the annual mileage of UK drivers by different classes of vehicles[35].

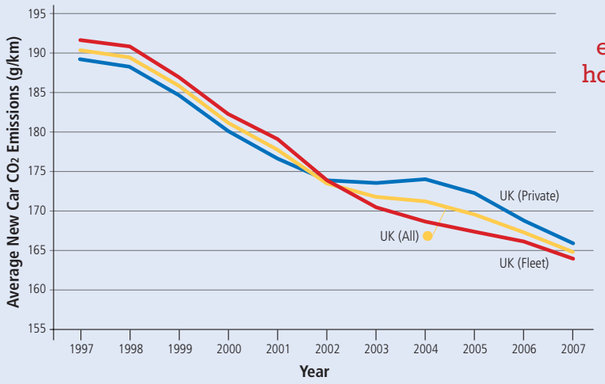
The chart shows that the lower medium, supermini, upper medium and sports utility vehicle (SUV) segments are currently the four largest contributing segments to the overall CO_2 emissions of the new car market.

Figure 5.4 looks at the change in CO_2 emissions of each segment from 1998 to 2007. It shows that the upper medium (large family cars) and executive vehicle segments have reduced emissions significantly, but this has been offset by large increases in the supermini, SUV and people carrier (MPV) segments[37].

The development of each market segment from 1998 to 2007 is reviewed in the following sections. These are included largely as a reference guide for those interested in particular parts of the new car market.

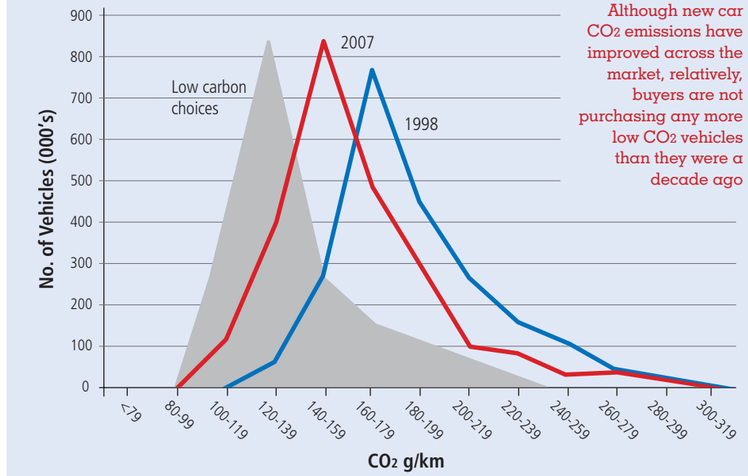
28 SMMT (2007)
29 SMMT (2007). The UK Automotive Sector Sustainability Report: Production, Consumption and Disposal Eighth Industry Report.
30 Note that the production of some very low-carbon technology vehicles like hybrids may diverge from the above generalisation, which will become more important to consider should they become much more prevalent within the market in future. However, as this review focuses on existing technologies this is not considered here.
31 VW Polo Bluemotion/SEAT Ibiza Ecomotive
32 Maserati MC12
33 Note – the distributions shown are grouped into 20 g/km CO2 bands in order to help visually represent the market. As a result, the extremes of the market may not be 100% accurate (e.g. the 2007 distribution sold 544 vehicles between 80-99 g/km CO2, however all of these vehicles were 99 g/km vehicles).
34 EST Analysis of SMMT Sales Data and DfT National Transport Survey Mileage Data
35 Note of caution – the vehicle categorization used by the DfT and the SMMT differ slightly. DfT categories include – Small Car (applied to Mini and Super Mini categories), Small/Medium Car (applied to Lower Medium category), Medium Car (applied to Upper Medium and Executive categories), Large Car (applied to Luxury Saloon and MPV categories), Land Rover, Jeep or similar (applied to SUVs). Sports cars do not have a close equivalent category in NTS, so the overall average vehicle mileage is applied.
36 EST Analysis of SMMT Sales Data and DfT National Transport Survey Data
37 Note, an average mileage has been applied over time, so variations in emissions by segment are determined by changes in sales only.

Figure 5.1: UK Sales Weighted Average New Car CO_2 Emissions



New-car emissions have fallen over a decade

Figure 5.2: New Car Sales Weighted CO_2 g/km Distribution[33]



Although new car CO_2 emissions have improved across the market, relatively, buyers are not purchasing any more low CO_2 vehicles than they were a decade ago

Figure 5.3: 2007 Annual Passenger Car CO_2 Emissions by Segment[34]

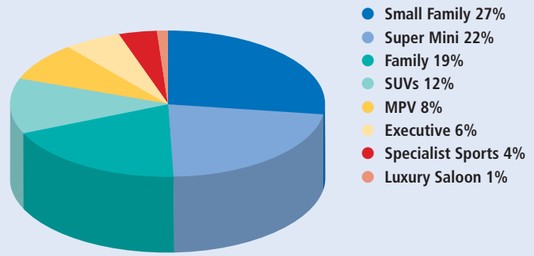
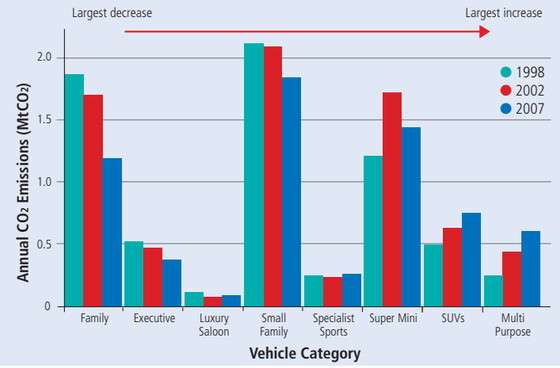


Figure 5.4 Annual New Car CO_2 Emissions 1998, 2002 and 2007 by Vehicle Category[36]



Superminis 5.2

SUPER MINIS

Sales trends

This is the most popular segment in terms of car sales, accounting for a third of all market sales in 2007. Furthermore, the segment has enjoyed increasing popularity over the last decade, with sales increasing by 34 per cent between 1998 and 2007. This has come at the expense of other high-volume classes such as the upper and lower medium segments, which have lost market share.

This segment is largely dominated by private purchases, which account for 60 per cent of sales, and this has changed little since 1998, showing that the increase in popularity of small vehicles has occurred across both the fleet and private market. It is worth noting that a significant portion of fleet sales in the segment are for daily rental cars (e.g. Avis/Hertz) which are also not subject to the same taxes as normal fleet vehicles.

CO_2 emissions

Sales-weighted average CO_2 emissions of superminis are 15 per cent lower than the market average, which is a function of the small size and weight of the vehicles. The massive popularity of this segment is helping to deliver a significant proportion of the CO_2 reductions across the market. However despite this, within the supermini segment itself there are some areas of concern on CO_2 emissions.

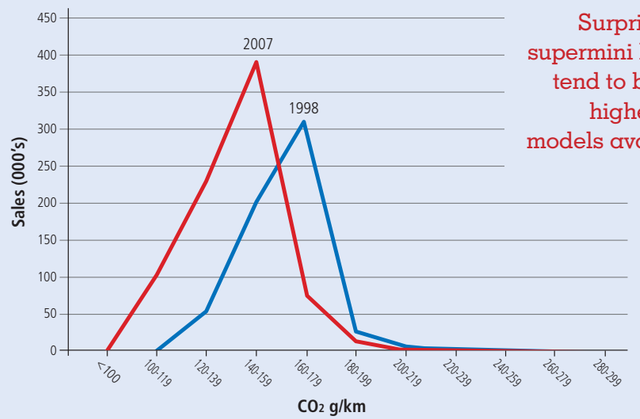
Since 1998, the sales-weighted average CO_2 performance of superminis has improved from 160 to 141g/km, a reduction of 12 per cent. This shows that although some progress is being made, this segment is showing below-average improvement in this area.

A key factor in determining this trend is that increases in diesel car sales, a major driver in CO_2 reductions across other segments, have not occurred to any significant degree here, rising from 6 per cent to just 13 per cent of total sales over the past decade[38].

Another major reason for their increasing popularity is that superminis have grown in size (volume) a lot over the past 10-20 years (see section 4, page 8). This has happened across many parts of the market, but is particularly pronounced in the supermini market, which has allowed the cars to appeal to a much larger audience than before and has therefore helped increase sales.

Manufacturers often allow popular models of cars to 'grow' over time when new models come out, so that they remain attractive to the same buyer when they come to replace their car after a few years, but have moved on to another 'life stage'. For example, a 2008 VW Polo is a very similar size to a 1990 Mark 1 VW Golf.

Figure 5.5: Mini/Supermini CO_2 sales weighted distribution 1998 and 2007



Surprisingly, supermini buyers tend to buy the higher CO_2 models available

Table 5.1: Supermini sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	591	871	792
Sales weighted average (CO_2 g/km)*	160	148	141.39
Difference to market average g/km CO_2 (per cent)	84 per cent	85 per cent	86 per cent
Annual CO_2 emissions ($MtCO_2$)**	1.2	1.7	1.4
Percentage of total CO_2 emissions (per cent)**	17 per cent	23 per cent	22 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

38 Note the lack of dieselisation may have affected CO_2 emissions of the segment, but as many Superminis are driven in urban environments, there are positive air quality benefits as a result of this as diesels emit pollutants such as particulate matter which contribute to poor air quality.

Vehicle choice and CO_2

In 2007, the choice available to consumers in terms of CO_2 emissions in absolute terms was large, ranging from the lowest at 99 g/km (VW Polo Bluemotion) to more than twice that for the highest at 221 g/km (Mini Cooper S [Auto]). However, 90 per cent of sales are for vehicles between 109 and 168 g/km CO_2[39]. 10 years ago, this range was 139 to 179 g/km CO_2.

This shows a significant increase in vehicle choice and the main area of increase has been at the lower end of the scale. However, although the choice of low-CO_2 vehicles and CO_2 performance has improved, consumers are not choosing to buy the lower-CO_2 models. Figure 5.5 shows that buyers are now showing a bias towards purchasing the higher CO_2 vehicles in the segment. This trend highlights a very significant potential for saving CO_2 through changing consumer behaviour in this segment.

Applying average annual mileage data to this segment[40] shows that the total annual contribution to CO_2 emissions from superminis has increased from 17 per cent to 23 per cent over the last decade, as a result of increased sales.

In summary, it is encouraging that the supermini segment has become more popular over the past decade, as the CO_2 emissions of the vehicles are on average 15 per cent lower than the market average. However, the rate of CO_2 reduction in this segment is worryingly slow, and consumers tend to seek out the higher CO_2 vehicles in the segment more readily than the lowest.

The increasing popularity of this segment is helping to deliver a significant proportion of the CO_2 reductions across the market

39 For 2006 sales, the 5th percentile of the distribution occurs at 109 g/km and the 95th at 175 g/km.
40 DfT National Transport Survey

SMALL FAMILY CARS

Although these are small family cars, this segment is dominated by the fleet market, accounting for almost two thirds of sales within the segment. Since 1998, fleet sales have increased, but interestingly private sector sales have decreased by a quarter over the same time period.

Sales trends

The segment itself has shown a 12 per cent improvement in average CO_2 emissions. This is a similar, 'average' level of improvement compared to superminis and the rest of the market, which is slightly worrying, given that this segment represents such a large proportion of the whole market.

CO_2 emissions

Improvements in CO_2 performance have largely been driven by increases in diesel sales, which have more than doubled over the period from 1998, whilst petrol sales have declined by one third. The proportion of diesel sales is largely driven by the fleet market, which is largely as a result of company car tax.

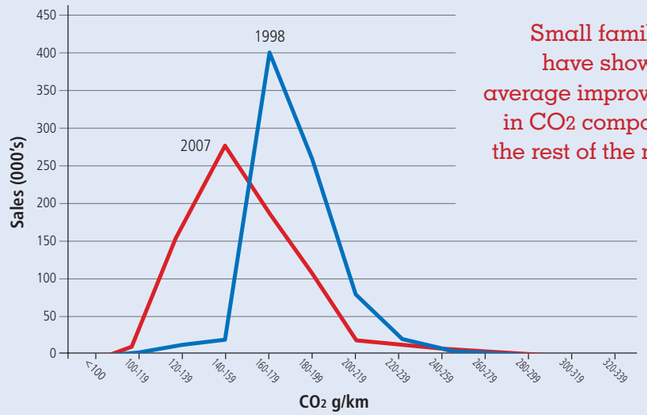
Interestingly, the distribution of sales in terms of CO_2 in 2007 (Figure 5.6) is almost symmetrical. This means that consumers are buying as many lower CO_2 models as higher CO_2 models. What is interesting is that the 1998 distribution shows more customers buying lower carbon vehicles – so although the average emissions of the segment have improved over the past decade, customers are no longer seeking out the lower CO_2 models! There is much potential in this segment for improvement from encouraging the fleet and private market to seek out the lowest emitting models.

Vehicle choice and CO_2

The lowest emitting lower medium car in 2007 was the hybrid Honda Civic IMA at 109 g/km CO_2[41] and the highest is the VW Golf R32 at 259 g/km CO_2, so there is a very wide range to choose from in terms of CO_2 emissions.

Since 1998, fleet sales have increased, but interestingly private sector sales have decreased by a quarter over the same time period

Figure 5.6: Lower medium CO_2 sales-weighted distribution 1998 and 2007



Small family cars have showed an average improvement in CO_2 compared to the rest of the market

Table 5.2: Lower medium sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	751	771	721
Sales weighted average (CO_2 g/km)*	181	168	159
Difference to market average g/km CO_2 (per cent)	96 per cent	97 per cent	96 per cent
Annual CO_2 emissions ($MtCO_2$)**	2.1	2.0	1.8
Percentage of total CO_2 emissions (per cent)**	31 per cent	28 per cent	28 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

41 The similar Toyota Prius (104 g/km CO_2) is classed as an 'Upper Medium' vehicle

FAMILY CARS

Sales trends

The family car or upper medium segment is very popular, the third largest in terms of sales and accounting for approximately one sixth of all sales. It is also dominated by the fleet market, which makes up over 73 per cent of sales. Sales of family cars have also decreased significantly over the last 10 years.

CO_2 emissions

Today, this segment's sales-weighted average CO_2 emissions are slightly above the market average at 169 g/km. This reflects the fairly large and heavy nature of the vehicles.

There has been a 14 per cent improvement in sales-weighted average CO_2 emissions from 1998 to 2007, which is average compared to other segments. This is very much as a result of the large proportion of fleet sales, which have been driven towards diesel mainly through company car tax incentives. Remarkably, in 1998 80 per cent of fleet sales were petrol vehicles; in 2007, the exact opposite is true, with 73 per cent diesel.

What is interesting to note about the segment is that individual improvements in diesel and petrol cars have only reduced their CO_2 emissions by 5 per cent. This is much less than the improvements in other segments and illustrates that CO_2 performance here is only driven by the much greater number of diesels that consumers purchase.

It is also apparent that there is little further opportunity for reductions in CO_2 emissions through further increases in diesel sales, so improvements in the engines themselves are needed to improve the segment further using technology. Lack of progress to date suggests that there is potential to do this, because it has been achieved in other segments. New models such as the Ford Mondeo ECOnetic and VW Passat Bluemotion will help this in 2008.

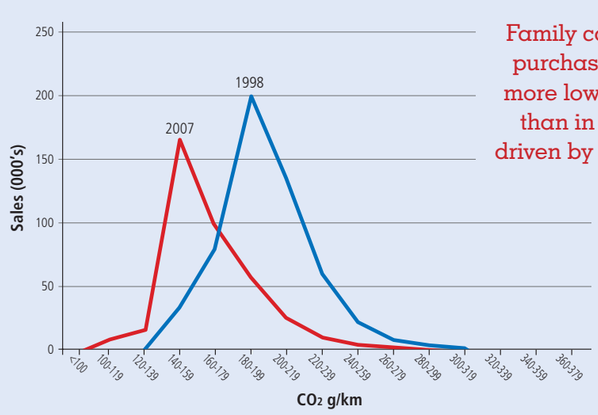
Vehicle choice and CO_2

As with other segments, the range of CO_2 emissions for the segment is very large, 104 g/km (Toyota Prius) to 334 g/km (Audi RS4 Quattro), although 90 per cent of sales are between 138 and 219 g/km.

Figure 5.7 shows the distribution of CO_2 emissions of vehicles sold in 1998 and 2007. The graph highlights the improvement made since 1998, and also shows that more consumers are now seeking out more efficient models in the segment. As noted previously, this is likely to be due to the dominance of fleet sales, and the impact of company car taxation.

The graph shows that consumers are purchasing the lower CO_2 vehicles within the segment, and this is likely to be largely driven by the company car tax regime. However, the graph also confirms that there is limited opportunity to further reduce CO_2 emissions through changing consumer behaviour. So future CO_2 reductions in this segment are going to be small and difficult to achieve unless manufacturers begin to produce more efficient vehicles.

Figure 5.7: Family cars CO_2 sales-weighted distribution 1998 and 2007



Family car buyers are purchasing relatively more low CO_2 models than in 1998, largely driven by the company car market

Table 5.3: Upper medium car sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	550	505	386
Sales weighted average (CO_2 g/km)*	197	184	169
Difference to market average g/km CO_2 (per cent)	104 per cent	106 per cent	103 per cent
Annual CO_2 emissions ($MtCO_2$)**	2.0	1.7	1.2
Percentage of total CO_2 emissions (per cent)**	29 per cent	24 per cent	19 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

EXECUTIVE CARS

Sales trends

Executive vehicles take up 4 per cent of the total market and their sales comprise 62 per cent fleet and 38 per cent private sales. Over the past decade, the segment has shrunk by 16 per cent as buyers have diversified into other segments such as SUVs.

CO_2 emissions

CO_2 emissions are nearly 20 per cent more than the market average, which means that although executive cars account for only 4 per cent of sales, they are responsible for 6 per cent of total CO_2 emissions.

The level of 'dieselisation' within this segment has been very high, with the market share of petrol vehicles falling from 87 per cent to just 25 per cent over the last decade. This has been driven by company car tax, which encourages diesel sales in fleets.

This huge increase in diesel sales has resulted in executive cars showing the second largest reduction in sales-weighted average CO_2 emissions of all the segments in the market[42] – with a 19 per cent reduction over the past decade.

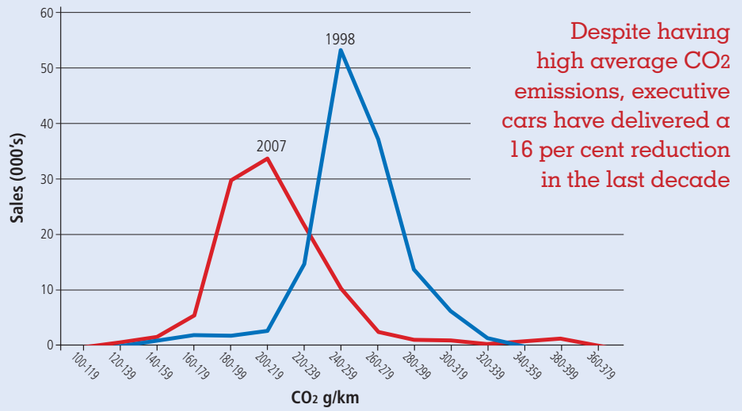
Vehicle choice and CO_2

The absolute choice of vehicles ranges from 136 (BMW 520 2.0 Diesel) to 369 g/km CO_2 (Mercedes CLK63 AMG Black Series), however 90 per cent of sales are for vehicles between 158 and 234 g/km CO_2.

As shown in Figure 5.8, the distribution of sales in terms of CO_2 emissions shows that an equal amount of consumers purchase high and low CO_2 vehicles.

42 The segment with the largest improvement in SWA CO_2 is the MPV segment

Figure 5.8: Executive vehicle CO_2 sales-weighted distribution 1998 and 2007



Despite having high average CO_2 emissions, executive cars have delivered a 16 per cent reduction in the last decade

Table 5.4: Executive car sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	124	114	104
Sales weighted average (CO_2 g/km)*	239	220	193
Difference to market average g/km CO_2 (per cent)	126 per cent	127 per cent	117 per cent
Annual CO_2 emissions ($MtCO_2$)**	0.5	0.5	0.4
Percentage of total CO_2 emissions (per cent)**	8 per cent	6 per cent	6 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

SPORTS CARS

Sales trends

The sports car segment includes a very wide range of vehicles, from small roadsters to supercars. In essence, the segment is an amalgamation of smaller niche segments (coupes, grand tourers, roadsters, supercars etc.), which have been brought together in order to provide a simpler classification.

The segment is relatively low-volume, representing less than 3 per cent of sales of the total market and sales consisted of 60 per cent private purchases and 40 per cent fleet sales in 2007. Overall, the size of the segment in terms of sales has stayed relatively constant over the last decade.

CO_2 emissions

Most sports cars are high performance vehicles and as a result, the segment has the third-highest CO_2 emissions, only exceeded by SUVs and luxury saloons.

What sets this segment apart from all others is that average CO_2 emissions have increased significantly over the last decade, whereas all other segments have shown decreases. So in terms of emissions (g/km) per vehicle, this segment is the worst-performing by a significant margin.

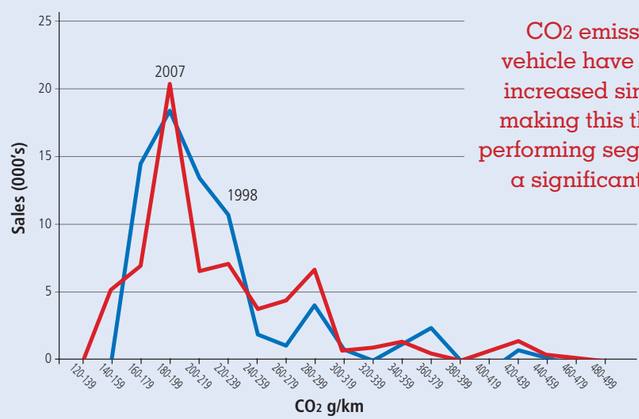
The sports car segment has traditionally been largely driven by vehicle performance and as a result, its development has focused on the production of higher-performance vehicles. This is the main driver behind the increase in CO_2 emissions here.

Vehicle choice and CO_2

As this segment includes a wide range of vehicles, the range of CO_2 emissions of the vehicles is also very wide, ranging from 124 g/km (Vauxhall Tigra CDTI 16V) to 545 g/km (Maserati MC12), however 90 per cent of sales occur between 146 and 358 g/km CO_2.

The distribution of sales in terms of CO_2 emissions is irregular, as Figure 5.9 shows. This is a function of the 'sports cars' comprising multiple, niche vehicle segments.

Figure 5.9: Sports car CO_2 sales-weighted distribution 1998 and 2007



CO_2 emissions per vehicle have actually increased since 1998 making this the worst performing segment by a significant margin

Table 5.5: Sports car sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	68	60	66
Sales weighted average (CO_2 g/km)*	215	219	224
Difference to market average g/km CO_2 (per cent)	113 per cent	126 per cent	136 per cent
Annual CO_2 emissions ($MtCO_2$)**	0.2	0.2	0.2
Percentage of total CO_2 emissions (per cent)**	4 per cent	3 per cent	4 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

SUVs

Sales trends

SUV sales have increased by 79 per cent in a decade, the second largest increase in the whole market. This rise plus the high CO_2 emissions per vehicle have given this segment a bad press over the past few years. The private market accounts for 58 per cent of sales, a figure which has not varied significantly over the past decade.

CO_2 emissions

Due to the size and weight of these vehicles, CO_2 emissions per vehicle are very high compared to the average (40 per cent above the market average). However, contrary to popular press, this is not the worst-performing segment on CO_2[43].

Taking into account mileage and sales, the total contribution to annual CO_2 of SUVs has increased more than 50 per cent, a worrying trend. This means the segment has now become the 4th largest contributor to CO_2 in the market (see Figure 5.3, page 14).

This is largely due to the increase in sales, but interestingly, the National Travel Survey also shows that annual mileages of SUVs are 10 per cent higher than the average.

More positively, the segment has improved relatively well in terms of average CO_2 emissions, achieving the third best improvement (equal with the upper medium segment) behind MPVs and executive vehicles.

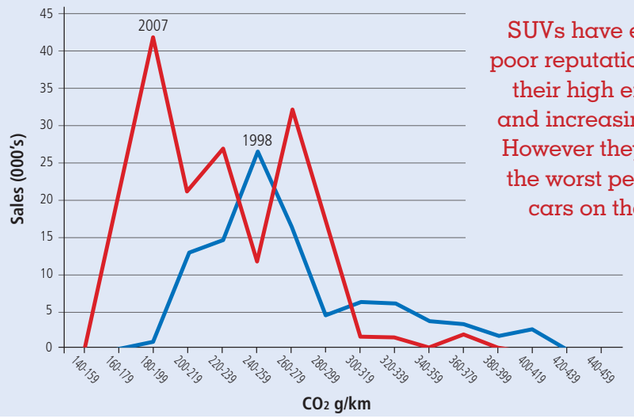
Vehicle choice and CO_2

What is apparent from Figure 5.10 is that not only have sales of SUVs increased significantly since 1998, but the segment has also split into two; large, seven-seat SUVs (e.g. Land Rover Discovery) and smaller five-seat SUVs (e.g. Honda CRV). This is evident from the two peaks of the CO_2 distribution shown in 2007. This trend has been recognised by a number of trade publications in recent years, and should be noted for stocks and sales data in future.

Absolute choice in terms of CO_2 in 2007 emissions ranged from 171 g/km (Suzuki Jimny 1.3 JLX Diesel) to 392 g/km (Mercedes M-Class ML63 AMG 4MATIC), however 90 per cent of sales occur between 173 g/km CO_2 and 299 g/km CO_2.

The distribution is not significantly positively skewed, with the two peaks relatively symmetrically distributed. This indicates that within both sub-segments, consumers are not actively seeking out the lower CO_2 models.

Figure 5.10: SUV CO_2 sales-weighted distribution 1998 and 2007



SUVs have earned a poor reputation due to their high emissions and increasing sales. However they are not the worst performing cars on the market

Table 5.6: SUV sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	99	138	176
Sales weighted average (CO_2 g/km)*	268	247	228
Difference to market average g/km CO_2 (per cent)	142 per cent	142 per cent	138 per cent
Annual CO_2 emissions ($MtCO_2$)**	0.5	0.6	0.7
Percentage of total CO_2 emissions (per cent)**	7 per cent	9 per cent	12 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

43 Luxury saloons have the highest CO_2 emissions per vehicle. Sports cars and executive vehicles also have very high CO_2 emissions per vehicle.

LUXURY SALOONS

Sales trends

Sales of luxury saloon vehicles are low compared to the rest of the market, as shown by Table 5.7. Fleet sales account for just over half (55 per cent) of total sales.

CO_2 emissions

Average CO_2 emissions here are the highest of any segment. However, as sales are very low compared to other segments, the overall CO_2 emissions contribution of luxury saloons is also low, at 1 per cent of the total market.

Emissions have decreased by 7 per cent (average per vehicle) which is the second worst performance behind sports cars. This is likely to be because the high cost of these vehicles means that purchasers can afford high running costs, so fuel efficiency is less of a priority compared to other segments.

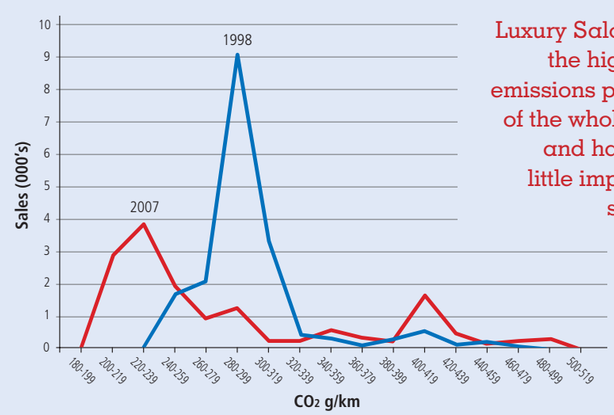
In 1998 there were no diesel luxury saloons sold in the UK at all but now, diesel vehicles account for half of all sales. Diesel sales have driven the segment's reductions in CO_2 and their sales-weighted average CO_2 emissions of 223 g/km are significantly less than the 317 g/km of petrol equivalents. The average CO_2 emissions of petrol luxury saloons per vehicle have in fact increased by 11 per cent since 1998.

Vehicle choice and CO_2

In 2007 absolute choice in terms of CO_2 emissions for this segment ranges from 199 g/km (Audi A8 FSI SE Diesel 2.8) to 495 g/km CO_2 (Bentley Arnage RL6.8), which shows that even though this is a small segment in terms of sales volume, the range of choice is still very significant. 90 per cent of sales occur between 214 g/km and 410 g/km CO_2, showing that unlike other segments, the extremes of the distribution are not very large.

Interestingly the distribution of CO_2 emissions vs. sales shows that the segment is skewed towards the lower CO_2 vehicles in the segment. This could be due to the concentration of diesel sales towards the lower end of the range (which accounted for 50 per cent of sales in 2007).

Figure 5.11: Luxury saloon CO_2 sales-weighted distribution 1998 and 2007



Luxury Saloons have the highest CO_2 emissions per vehicle of the whole market, and have shown little improvement since 1998

Table 5.7: Luxury saloon sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	17	10	13
Sales weighted average (CO_2 g/km)*	295	283	274
Difference to market average g/km CO_2 (per cent)	156 per cent	163 per cent	166 per cent
Annual CO_2 emissions ($MtCO_2$)**	0.11	0.07	0.08
Percentage of total CO_2 emissions (per cent)**	1.6 per cent	0.9 per cent	1.3 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

MPVs MULTI PURPOSE VEHICLES

Sales trends

In the past decade, this segment has grown from a small niche into a massive mainstream segment, accounting for 8 per cent of the total market. This is due to huge increases in sales since 1998, making it the fastest growing car-market segment, with sales increasing more than three times from 1998 to 2007. Contrary to expectations, MPVs are dominated by fleet sales, which make up over 72 per cent of the market. This has not varied significantly since 1998.

CO_2 emissions

Table 5.8 shows that the average CO_2 emissions of this segment have improved from 23 per cent above the market average in 1998 to just 9 per cent above average in 2007. This makes the MPV segment not only the fastest growing, but also the best improver in terms of CO_2 emissions per vehicle, with a 23 per cent improvement since 1998.

Considering the size of these vehicles, with many having the ability to transport up to seven adults, the potential CO_2 emissions per passenger are relatively low (although there is little data available to establish real occupancy rates of MPVs vs. other vehicles). The improvement in CO_2 emissions of MPVs since 1998 indicates that there is more potential amongst the other segments to improve their CO_2 emissions over and above what has been achieved to date. There are a number of factors which have helped to achieve this improvement in emissions:

- MPVs are primarily utilitarian vehicles, mainly used to provide efficient and safe transport for companies and families. This means that manufacturers have placed more emphasis on efficiency, with power arguably playing a secondary role, unlike in other segments.
- One of the main drivers of increased sales has been the development in recent years of small, 5-seater MPVs such as the Citroen Xsara Picasso and the Ford Focus C-Max. The additional space offered by these vehicles has attracted many buyers away from other traditional segments (e.g. lower medium). This development has also reduced the average size and weight of vehicles in the segment and therefore the emissions per vehicle. However, as this trend this may have attracted buyers away from other lower-CO_2 car segments (such as lower medium) this therefore could have pushed CO_2 emissions up overall.

There is little data availability on occupancy rates for different segments of vehicles, but it is likely that people- carriers have higher average occupancy rates than other types of vehicle. This indicates that MPVs are likely to be one of the more efficient vehicle segments in terms of CO_2 emissions per passenger kilometre.

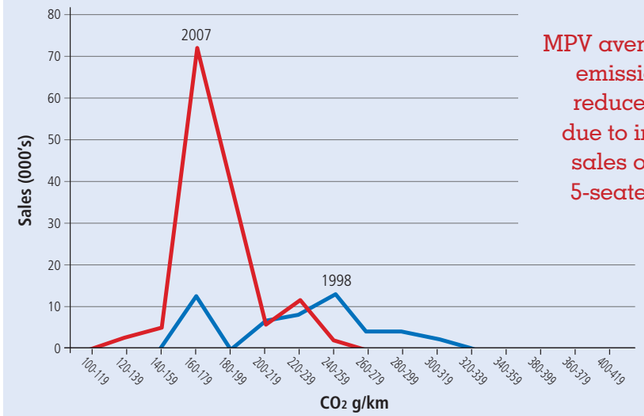
Vehicle choice and CO_2

The choice available to consumers in terms of CO_2 emissions is very large, ranging from 127 g/km (Ford focus C-Max 1.6 Diesel) to 396 g/km CO_2 (Cadillac SRX V8). However 90 per cent of sales are between 157 and 230 g/km CO_2[44]. Figure 5.12 shows the 2007 distribution of CO_2 emissions is very significantly skewed towards lower-CO_2 vehicles within the segment. This is consistent with utility and efficiency being significant vehicle purchase drivers here and increasing sales of 5-seaters expanding the sector.

MPVs are the fastest growing segment with sales increasing more than two and a half times from 1998 to 2007

44 In 1998, this range was 176 to 302 g/km CO_2

Figure 5.12: MPV sales-weighted distribution 1998 and 2007



MPV average CO_2 emissions have reduced mainly due to increased sales of smaller 5-seater models

Table 5.8: MPV sales and CO_2 emissions 1998-2007

Year	1998	2002	2007
Vehicle Sales (000's Vehicles)*	48	93	145
Sales weighted average (CO_2 g/km)*	234	200	180
Difference to market average g/km CO_2 (per cent)	123 per cent	115 per cent	109 per cent
Annual CO_2 emissions ($MtCO_2$)**	0.3	0.4	0.6
Percentage of total CO_2 emissions (per cent)**	4 per cent	6 per cent	9 per cent

* = SMMT Data
** = DfT National Travel Survey Data applied to SMMT Data

The MPV segment is the best improver in terms of CO_2 emissions per vehicle, with a 22 per cent improvement since 1998

6

Whilst delivering CO_2 reductions through improving consumer choice of vehicles is likely to be the most significant way of reducing CO_2 emissions from the market, it is not the only action available to consumers.

SMARTER DRIVING

One issue with action on vehicle purchase is that consumers tend to replace their cars only every three to five years. This means the opportunity for taking action on the vehicle you drive only comes along once in a while. The other major mechanism for reducing CO_2 emissions from road transport is through driver behaviour and the adoption of a 'smarter' driving style.

The term 'smarter driving', also known as 'ecodriving', simply means driving in a fuel-efficient manner. This reduces fuel consumption and CO_2 emissions: for a given fuel, the two are directly proportional, so a reduction of X per cent in fuel consumption will also give a reduction of X per cent in CO_2 emissions. Smarter driving also brings other benefits, most notably a reduction in accident rates, primarily because of the emphasis that smarter driving places on greater anticipation. Several smarter driving campaigns, including SAFED[45] in the UK and the long running Dutch campaign "Het Nieuwe Rijden[46]" have in fact led with joint environmental and safety messages. There is also strong anecdotal evidence that smarter driving leads to significant non-fuel financial savings through reduced wear and tear on various vehicle components including brakes, tyres, clutch and gearbox.

Potential CO_2 savings

It is difficult to generalise about the extent of the fuel and CO_2 savings that smarter driving can achieve, since this depends very much on how a driver drove in the first place. Furthermore, evaluation of smarter driving campaigns will show very different results depending on whether the campaigns involved one-to-one driving lessons, targeted information or simply awareness-raising through mass media. However after receiving one-to-one smarter driving lessons around circuits designed to simulate urban driving, drivers will often achieve savings of around 15 per cent – and some nearer 25 per cent.

Our experience from working extensively on smarter driving initiatives gives us confidence that most drivers will be able to achieve 15 per cent fuel/CO_2 savings if they follow smarter driving advice.

Activities in Europe

The EC-funded TREATISE[47] project, which was led by the Energy Saving Trust, ran from January 2005 to June 2007 and involved eight countries. The project ran a total of 63 training workshops at which more than 1700 transport advisers were trained in: smarter driving; cleaner fuels and vehicles; and mobility management. The project has also produced reference manuals and electronic training tools.

Ecodriven[48] is a European Commission funded project to promote smarter driving in nine European countries, including the UK, where the Energy Saving Trust is the project partner. Ecodriven began in January 2006 and will continue until December 2008. Partners have initiated hundreds of national activities under the Ecodriven banner, from the production of posters, leaflets and freebies that promote smarter driving, to running smarter driving competitions in conjunction with vehicle manufacturers, to developing electronic and web-based tools to promote the concepts.

45 http://www.safed.org.uk/
46 http://www.hetnieuwerijden.nl/
47 http://www.treatise.eu.com/
48 http://www.ecodrive.org/

Whilst smarter driving has only recently begun to gain wider recognition in the UK, many European countries have run national smarter driving campaigns for many years. For example the "Spritspar" campaign in Austria[49], the "Neues Fahren" campaign in Germany[50], and the previously mentioned "Het Nieuwe Rijden" campaign in the Netherlands.

Finally, the proposed European Commission CO_2 Emissions target (see Section 7, page 26) of 130 g/km includes an additional 10 g/km of reductions to be achieved by 'complementary measures', which refers mainly to encouraging more efficient driving through the application of bolt-on technologies such as gear shift indicators and tyre pressure gauges.

Activities in the UK

The Department for Transport's 'Act on CO_2'[51] campaign began in March 2007 by promoting smarter driving messages through a mass media advertising campaign including TV, billboards, and national press. The campaign messages are consistent with those of the European campaigns mentioned above, because the DfT references TREATISE for much of its factual statements.

Funded by the Scottish Government, the Energy Saving Trust ran an eco-driving pilot in Glasgow and Edinburgh in 2006/07 and this activity is planned to be scaled up in 2008/09.

Transport for London launched a smarter driving campaign[52] in London in February 2008. The campaign is planned to last for two years and will include advertising on buses, billboards, local radio and local printed media. The messaging is again consistent with the European projects and the Act on CO_2 campaign.

Focus ECOnetic Smart Driving Challenge

Ford and the Energy Saving Trust will be running a national smarter driving competition from May to Autumn 2008. This will involve regional heats at six locations across the UK and a final at Silverstone, at which a significant prize will be at stake. Ford intend to use these events to promote the low-carbon variant of the Ford Focus and to achieve significant national press coverage of smarter driving.

The MPG Marathon[53] is an event that first took place in 2000 and which will be running again in 2008. Competitors drive a course of several hundred miles over two days and compete for the lowest fuel consumption. The event has some high profile sponsors and achieves good media coverage.

Smarter driving measures

The first four points listed below are the key smarter driving measures. These are the techniques that really make a big difference to fuel consumption and therefore CO_2 emissions. The other points are all significant, but should be considered secondary.

1 When accelerating, change up to a higher gear between 2000 and 2500 rpm. Changing up at these relatively low revs saves fuel because an engine's internal friction increases with engine speed. The more subtle point about the use of gears is that with a modern engine, it's more efficient to change gear at the recommended low revs, even if to achieve a reasonable level of acceleration you have to compensate by putting your foot down harder on the accelerator.

2 Slow Down. Above approximately 40-45 mph, fuel consumption increases with speed because air resistance and engine friction increase with speed. The effects can be dramatic. For example, data from the AA Motoring Trust show that cars at 85mph consume approximately 25 per cent more fuel than at 70mph.

3 Anticipate the road and traffic further ahead to avoid unnecessary acceleration and braking. In urban driving this can make an enormous difference since driving at low constant speeds requires very little fuel or power – almost all the fuel consumed in urban driving is used to accelerate.

4 Step off the accelerator early. When decelerating or driving downhill with a trailing throttle (i.e. foot off the accelerator), a modern vehicle recognises that it does not need to power the wheels and so it reduces the fuel flow to the engine to virtually zero. This uses less fuel than coasting in neutral. The advice, therefore, is always to remain in gear but to step off the accelerator as early as possible, for example when approaching a red light or a roundabout.

5 Remove roof racks, bike racks etc. Vehicle manufacturers go to great lengths to make their vehicles aerodynamic, even focusing on the aerodynamic design of items such as door handles and badges! It is therefore no surprise that large items such as roof racks, roof boxes and bike carriers play havoc with the manufacturers' careful designs and greatly increase fuel consumption at medium to high speeds[54]. A study by IDEA in Spain concluded that at 120 kph (75mph) a typical roof rack can increase fuel consumption by 16 per cent and a roof box by 39 per cent. The advice therefore is to remove roof racks, bike racks etc when not in use.

6 Air conditioning (a/c) systems use mechanical power from vehicle engines to drive their compressors. These compressors require a lot of power and significantly increase fuel consumption. Research by ADEME[55] in France found that for typical use over a 12 month period a car with a/c would on average consume around 5 per cent more fuel than the same car without a/c. However at high speeds – typically over 45 or 50 mph – opening a window is likely to cause fuel consumption to rise due to increased air resistance. The advice therefore is to use a/c sparingly as long as this doesn't require opening a window at high speed.

7 Carrying excess weight in a vehicle increases fuel consumption so heavy items e.g. large tool kits, golf clubs etc, should be removed when not required.

8 Turn off. Re-starting a modern engine incurs virtually no penalty in terms of fuel consumption. So whenever you turn an engine off – even for just a few seconds – you'll be saving fuel. The recommendation is to turn your engine off if you think you're going to be stationary for more than a minute or so. It is worth noting that for older vehicles with carburettors, which were common until the late 80s, re-starting the engine would use extra fuel as some unburned fuel would pass straight through the engine. A legacy of this is that many older drivers are resistant to the idea that turning the engine off for a short time saves fuel.

9 Under inflated tyres increase fuel consumption. Tyres under-inflated by 25 per cent will typically increase fuel consumption by around 2 per cent[56].

10 Try to avoid using your car for short journeys where other more sustainable means of transport could be used (e.g. cycling) and cold engines burn more fuel and produce more emissions.

49 http://www.spritspar.at/
50 http://www.neues-fahren.de/neues-fahren/default.htm
51 http://www.dft.gov.uk/ActOnCO2/
52 http://www.tfl.gov.uk/roadusers/smarterdriving/5564.aspx
53 http://www.mpgmarathon.com/
54 At low speeds air resistance (drag) is low, so items such as roof racks incur little penalty
55 http://www.ademe.fr/anglais/publication/pdf/clim_auto_gb.pdf
56 http://www.treatise.eu.com/UserFiles/TREATISE%20Ecodriving,%20July07(1).pdf

7

CO_2 LEGISLATIVE AND POLICY DEVELOPMENTS

European-level new car CO_2 targets

CO_2 emissions targets for new cars are set at a European level, as opposed to within the UK. The UK new car market accounts for 2.5 million sales and is, to some degree, a subset of the wider European market, which has annual sales of approximately 15 million cars and accounts for 33 per cent of all new car sales worldwide[57]. European new-car CO_2 targets have been a hotly debated topic over the past few years, particularly more recently due to the proposed introduction of mandatory targets.

European voluntary target

In 1998, an agreement was signed between the European Commission and the European Automobile Manufacturers Association (ACEA) on a voluntary basis to target the market to achieve an average of 140 g/km CO_2 by 2008, which represents a 25 per cent reduction on the 1995 average of 186 g/km. However, it is now apparent that the target (Figure 7.1) is likely to be missed by nearly 20g/km at the end of 2008.

European mandatory 130g/km CO_2 target

As a result of the limited progress made against the voluntary target, the European Commission initiated proposals in early 2007 to introduce a mandatory CO_2 target, which includes penalties for manufacturers who do not achieve the average target across their vehicle sales. The final target is still currently under discussion, but the proposal is for manufacturers to achieve sales-weighted emissions of 130 g/km across their range of vehicles, with a further 10 g/km reduction to be delivered through 'complementary measures'[58].

Although the UK market has higher average emissions than mainland Europe (Figure 7.1), the government's recently published King Review[59] fully supports the target, and further recommends a longer-term target of 100 g/km to be met by 2020. Other recent developments include an agreement that Germany and France will 'phase in' the law, which may result in a delay in implementation.

Vehicle Excise Duty

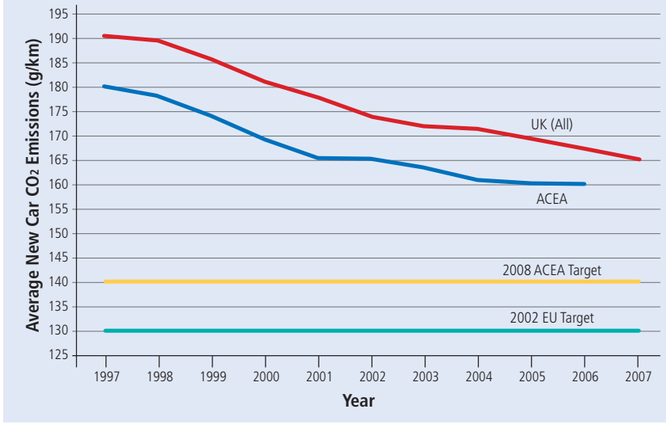
In the Chancellor's budget in 2001, a lower rate of Vehicle Excise Duty (VED, also known as road tax) was announced for owners of vehicle with an engine size of less than 1549cc (£115 per annum reduced from £180) and applied to vehicles registered prior to March 2001. This was largely because it was not mandatory to state the CO_2 emissions for new vehicles sold prior to this time, and engine size is a crude proxy for CO_2 emissions.

Vehicles registered from March 2001 (which are required to have stated CO_2 emissions[60]) are subject to vehicle excise duty which is graduated according to CO_2 emissions as shown in Table 7.1. In 2006, Band G, for vehicles over 225 g/km, was added to separate very high-emitting vehicles into a further band. Band G vehicles are currently charged £400 per annum in VED.

The 2008 budget announced a number of changes to the VED system which achievable introduced in 2009/10. These are shown in Table 7.1. In 2009, there will be 6 new VED bands graduated according to CO_2. A new Band M for the highest emitting cars (> 255g/km CO_2) will pay £425. The standard rate of VED will also be reduced in 2009-10 for all new and existing cars that emit150g/km CO_2 or less. There will also be a new, higher, first year VED rate for higher CO_2 new cars.

The introduction of graduated CO_2 based VED is very encouraging as a way to help incentivise the shift towards lower-CO_2 vehicles. The ground-breaking nature of the scheme has been such that several other European countries have started to follow suit with their own CO_2-based initiatives[62]. To date, however, the actual levels of fiscal incentive under the UK scheme have unfortunately not been strong enough to significantly influence new car purchasing (see section 5).

Figure 7.1: Sales Weighted Average CO_2 Emissions progress Europe (ACEA) vs. UK to European Targets



57 ACEA (2006) 'Motor Vehicle Registrations' http://www.acea.be/images/uploads/VEHICLE_REGISTRATIONS_2006.pdf

58 to promote efficiency such as such as gear shift indicators and other 'bolt-on' technologies (see section 4 for further details)

59 HMT (2008) The King Review of Low Carbon Cars Part 2: Recommendations for Action

60 Vehicles type approved in category M1 and registered on the basis of CO_2 emissions by EC whole vehicle type approval (Vehicle CO_2 emissions are shown on the V5/ V5c document).

The introduction of graduated CO_2 based VED is very encouraging as a way to incentivise the shift towards lower CO_2 vehicles

There are two critical, distinct areas where CO_2-based fiscal drivers can influence the market: at the point when a consumer purchases a new car; and on second-hand vehicle residual value.

Until now, first-year VED level was the same as across the whole life of a vehicle. This limits its influence at the critical new-car purchase stage, as it is a small sum to pay relative to the cost of the car.

Research undertaken by the Energy Saving Trust showed that introducing a VED level of £600 on 225 g/km car has a significant negative impact on the residual value[63] of a vehicle (and poor residual value usually means a car is scrapped earlier).

The Sustainable Development Commission has previously recommended very high VED levels for the highest CO_2-emitting vehicles. However, given the impact on residual values, we believe it is more effective and viable to make smaller VED increases from lower down the CO_2 emissions range, i.e. 160 g/km and above.

Furthermore, the higher first year VED levels announced in the 2008 budget for new high CO_2 vehicles are also welcome as they will start to help further influence new car purchases, where the intervention previously has been limited.

61 HMT (2008) Financial Statement and Budget Report. http://www.hm-treasury.gov.uk/media/2/5/bud08_chaptera.pdf

62 ACEA (2008) 'Overview of CO_2 Based Motor Vehicle Taxes in the EU' http://www.acea.be/images/uploads/files/20080302_CO%202%20tax%20overview.pdf

63 This can also have an impact on new purchase decisions in circumstances where whole life costing is undertaken, such as with most company car purchases

Table 7.1: CO_2 Based Graduated Vehicle Excise Duty (2008-2011)[61]

		2008-09[1]		2009-10	2010-11	
VED band	**CO_2 emissions (g/km)**	**Standard rate**	**CO_2 emissions (g/km)**	**Standard rate**	**First year rate**	**Standard rate[4]**
A	Up to 100	0	Up to 100	0	0	0
B	101-120	35	101-110	20	0	20
C	121-150	120	111-120	30	0	35
D	151-165	145	121-130	90	0	95
E	166-185	170	131-140	110	115	115
F	Over 186[2]	210	141-150	120	125	125
G	Over 226[3]	400	151-160	150	155	155
H			161-170	175	250	180
I			171-180	205	300	210
J			181-200	260	425	270
K			201-225	300	550	310
L			226-255	415	750	430
M			Over 255	440	950	455

[1] 2008-09 rates effect from 13 March 2008. [2] Cars registered before 23 March 2006. [3] Cars registered on or after 23 March 2006.
[4] Alternative fuel car discount: 2009-10 £20 bands A-I, £15 bands J-M: 2010-11 £10 all cars.

Figure 7.2: UK New Car CO_2 Label

Passenger car fuel consumption and CO_2 information regulations [64] [65]

In 2001, legislation was put in place to help improve consumer awareness and understanding of fuel consumption and CO_2 emissions of vehicles linked to VED. The legislation requires that fuel consumption and CO_2 data is displayed on point-of-sale and promotional information for all vehicles. The data shown must be specific to the model (e.g. VW Golf 2.0 TDI S) vehicle being promoted.

A voluntary agreement amongst government and the motor industry led by the Low Carbon Vehicle Partnership (LowCVP), gave rise to the launch of the new-car CO_2 label in 2005 (example shown in Figure 7.2). The most recent compliance survey carried out by the LowCVP found that in 2007, 68 per cent of all new cars on sale in dealerships displayed the label. The introduction of the label has been a success and a step forward in providing consumers with necessary information. However it has suffered from criticism not as a result of the label its self, but because to date, the label has not been used widely within car advertising or through other information and advice channels. Currently, the consumer only sees the label on the car in the showroom, limiting its potential impact because by the time they see it, many customers will already have chosen the car they want. The CO_2 label is currently being updated by LowCVP to account for the recently announced changes to vehicle excise duty.

Fuel duty

In 1993, the Government introduced the fuel duty escalator, which set fuel taxes to rise at 3 per cent above inflation in order to discourage car use for environmental reasons and to fund public services. This continued until 2000 when it was scrapped because of protests against high oil prices[66].

Fuel duty and VAT currently account for approximately 70 per cent of fuel prices at the pump and current policy is for fuel duty to rise each year at least in line with inflation. However, the latest planned 2p rise has been deferred from April to October 2008 and this deferred rise is again under discussion in response to recent rises in fuel prices. Further rises are planned for April 2009 and 2010. Details can be found on the Budget website[67].

Congestion charging

Congestion charging was first introduced by the Mayor of London in February 2003[68] as a way of limiting congestion in the capital. The initial scheme had a flat £5 per day charge (payable on the day), which has now increased to £8. The annual estimated CO_2 savings of the scheme are 110-120,000 tonnes. From October 2008, it has been announced that the scheme will change to a CO_2 basis, where high-emitting vehicles (> 225 g/km) will have to pay £25 per day for entry into the zone, and low-emitting vehicles (≤ 120 g/km) will receive 100 per cent discount. The Energy Saving Trust is supportive of the CO_2-based scheme, although there is some concern that the lower 121 g/km level may be not be low enough, as there are many more sub-121 g/km cars available on the market than when the change was initially proposed by TfL. This means that close monitoring will be required to understand whether there are negative impacts in terms of congestion and higher CO_2 emissions resulting from the sub-121 g/km discount. Finally, the current set up of the London congestion charging scheme is likely to be reviewed with the election of the new mayor Boris Johnson.

Other types of road charging schemes are currently being investigated by the Department for Transport, for example the road Pricing Demonstrations Project. Further information is available on their website[70].

Table 7.2: Taxable Percentages of Company Car Purchase Price[71]

Per cent of P11D price to be taxed	2007/8 CO2 (g/km)	2008/9 CO2 (g/km)	2009/10 CO2 (g/km)
10*	-	120	120
15*	140	135	135
16*	145	140	140
17*	150	145	145
18*	155	150	150
19*	160	155	155
20*	165	160	160
21*	170	165	165
22*	175	170	170
23*	180	175	175
24*	185	180	180
25*	190	185	185
26*	195	190	190
27*	200	195	195
28*	205	200	200
29*	210	205	205
30*	215	210	210
31*	220	215	215
32*	225	220	220
33**	230	225	225
34***	235	230	230
35****	240	235	235

* Add 3 per cent for diesel ** Add 2 per cent for diesel *** Add 1 per cent for diesel
**** Max charge, so no supplement

64 http://www.dft.gov.uk/pgr/roads/environment/thepassengercarfuelconsumpti3850
65 Passenger Car (Fuel Consumption and CO_2 Emissions Information) regulations Guidance Notes. http://www.vca.gov.uk/additional/files/fcb--co2/enforcement-on-advertising/vca061.pdf
66 BBC News (2000) 'UK protests trigger fuel shortages' http://news.bbc.co.uk/1/hi/uk/918105.stm
67 HMT (2008) 'Budget 2008' http://www.hm-treasury.gov.uk/budget/budget_08/bud_bud08_index.cfm
http://www.tfl.gov.uk/roadusers/congestioncharging/6725.aspx
69 Transport for London (2007) 'Central London Congestion charging Scheme: ex-post evaluation of the quantified impacts of the original scheme' http://www.tfl.gov.uk/assets/downloads/Ex-post-evaluation-of-quantified-impacts-of-original-scheme-07-June.pdf
70 Department for Transport (2008) 'Road Pricing Demonstrations Project' http://www.dft.gov.uk/pgr/roads/roadcongestion/roadpricingdemoproject/
71 P11D Value

Fleet vehicle CO_2 reduction policy developments

In addition to the CO_2 reduction policies noted thus far, which apply to all vehicles, the following developments have occurred specifically within the fleet market. Prior to 2002, company car tax was calculated on the number of miles driven by an employee within a tax year. Because it was based on non-incremental mileage thresholds, this crude system had detrimental effects in terms of emissions as it actively incentivised employees to strive to drive more than 18,000 miles per year in order to secure a lower tax charge (15 per cent)[72].

The 2002 Budget changed the calculation basis from mileage to one based on the CO_2 emissions of the vehicle being driven.
By removing the high mileage incentive and instead encouraging employers and employees to choose the lowest CO_2-emitting vehicles, this reform revolutionised the fleet market. Since 2002, the new company car tax bands have reduced by 5g/km each year since the scheme was introduced to help promote the continual reduction in CO_2 of fleet vehicles.

From April 2008, the minimum threshold has been reduced to 10 per cent (13 per cent for diesels) for band B cars (≤ 120 g/km CO_2), making it attractive for the employee to choose a very low CO_2 vehicle. A summary table of company car tax bands is shown in Table 7.2. The 2008 Budget announced that from 2010-11, the level of company car tax will be increased on all cars emitting 135 g/km or more.

Of all the UK CO_2-based schemes, this has had the most marked impact on the CO_2 emissions reductions, indicated by Figure 4.1 on page 10. An HMRC evaluation of the scheme estimates savings of 0.2-0.3 MtC per year in 2005[73].

In addition to company car tax (benefit in kind) there are a number of other less well-known fiscal policies that affect company cars and have CO_2 implications:

For each case, examples of cost savings on low-CO_2 vehicles are provided based on purchasing and running a diesel vehicle with band B CO_2 emissions (<= 120 g/km) vs. a diesel with band D CO_2 emissions. (151-165 g/km). Both vehicles are assumed to cost £17,000 (or monthly contract hire charge of £300 per month).

1 Employers national insurance contributions:
Employers are liable to pay national insurance contributions (Class 1A NIC) based on the taxable value of a vehicle. For 2009, the annual charge is calculated by multiplying the purchase cost of the vehicle (P11D value) by the relevant CO_2-based BIK percentage (shown in Table 7.2). This value is then multiplied by 12.8 per cent to work out the annual tax charge[74]. Cost savings for a diesel vehicle with band B CO_2 emissions would be of the order of £220 per year compared to a band D vehicle.

2 Capital allowances treatment of business cars:
This relates to limits on tax relief on company profit from expenditure on the hire or purchase of vehicles. The 2008 budget announced the replacement of the partially emissions-based scheme relating to tax relief on expensive cars with a completely emissions-based approach from April 2009. Cars bought by businesses are now placed in two capital allowance 'pools' according to their emissions. Cars above 160 g/km receive 10 per cent writing down allowance, compared with 20 per cent between 111 and 160 g/km. However, cars with emissions of 110 g/km or less get 100 per cent first year writing-down allowances, which can provide considerable savings to a business.

3 Tax relief for leased cars:
For companies that lease cars, a proportion of rentals is currently disallowed[75] for corporation tax purposes depending on the value of the car. The amount of disallowance varies from 0 per cent for vehicles below £12000 up to 25 per cent disallowance for vehicles over £24000.

This regime will change in April 2009 such that any car with emissions of more than 160 grams will have 15 per cent of lease rentals disallowed, whilst lower emission cars will have no rental disallowance. Clearly a strong incentive for fleet purchases to favour cleaner cars.

4 Tax on 'free' fuel[76]: Employer-provided 'free' fuel is viewed as a taxable benefit. The taxable amount is calculated using the same CO_2-based tax percentages shown in Table 7.2. 2008/09 has seen an increase in the fuel scale charge from £14,400 to £16,900, meaning that a typical higher-rate tax payer needs to drive approximately 10,000 private miles per year to break even (the average private mileage for a lower rate tax payer is about 5,000 miles).

72 15% of the P11D value (list price) of the vehicle multiplied by employee tax bracket Tax was charged at 35% for the first 2,500 miles, 25% for 2,501-18,000 and 15% for over 18,000 miles/annum. These bands are non-incremental (i.e. driving 2,499 miles results in a total BIK calculation charged at 35%, whereas driving 2,501 miles is based on 25%).
73 http://www.hmrc.gov.uk/budget2006/company-car-evaluation.pdf
74 E.g. on a diesel vehicle costing £17k in CO2 band B (e.g. VW Gold Bluemotion), the annual charge would be £277 compared £499 to an equivalent £17k diesel vehicle in CO_2 band D (e.g. Vauxhall Astra 1.9CDTi 120ps Design 5 dr) (saving £222).
75 Registered on or after 17 April 2002
76 Further details can be found at http://www.comcar.co.uk/newcar/companycar/poolresults/gfuelben.cfm

8

CONSUMER CAR CHOICES AND CO_2

This review shows that across most segments of the market, consumers are making poor choices when it comes to fuel efficiency and CO_2 emissions of their new car purchases. Not only is this damaging in terms of contribution to global warming given the high CO_2 emissions of the car market, but it also translates to higher running costs for the consumer.

Energy Saving Trust evaluation research has shown that when consumers are asked to rank factors that are important to them when considering a vehicle purchase, fuel efficiency comes third highest behind safety and price, and CO_2 emissions are ranked lowest (Figure 8.1). One of the main challenges is that the casual link between the two is not understood. However, other more recent evidence is starting to show more consumer movement towards lower carbon vehicles. What Car? recently released a poll which showed that two thirds of prospective car buyers will be looking to purchase a greener car in the next twelve months. However, the main reason for this was to save money as opposed to being concern for the environment, which was a lesser factor (19 per cent). What Car? suggests that this comes largely as a result of increased cost of living and the recent changes to road taxes announced in the 2008 budget. Despite this, it remains to be seen whether this will translate into a real change in car purchase trends.

An increasing number of people in the UK are expressing a high level of concern about the cost of motoring and greenhouse gas emissions but, as shown in this review, this is not reflected in actual purchases made, so why is there such a difference between attitude and action?

The King Review highlights that although consumers say that fuel efficiency is one of their top criteria when making a vehicle purchase, they heavily discount future cost savings from increased fuel efficiency when making a car purchase. We believe that there are a number of important reasons for this.

77 Energy Saving Trust Evaluation (2007)

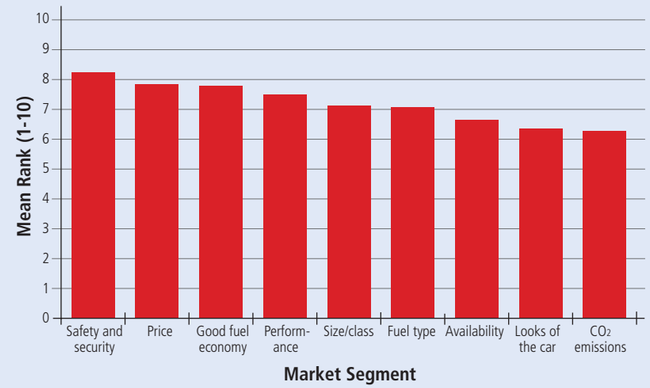
Firstly, consumers do not have easy access to easily understandable and persuasive information on vehicle CO_2 emissions which might provide help when making a purchase decision. The CO_2 label is an encouraging step forward in terms of providing CO_2 emissions information to consumers in an easily understandable format (A-G label). However, the label is currently only found on the new vehicle itself in the showroom, so is only seen late in the consumer's decision-making process (when they have often already chosen the car they want).

Information on CO_2 emissions is mandatory on all car advertising material, however this is only provided as a number (e.g. 167 g/km CO_2) in the small print. This is neither helpful nor persuasive for the consumer, because the information is not placed in context. However, the Low Carbon Vehicle Partnership is working to help improve this in future.

Finally, the current structure of the market is that in general, the higher specification, more desirable cars tend to be higher emitters of CO_2. This plays on the softer motivations associated with car purchases, such as status and brand, and influences car buyers to discount financial savings through improved fuel economy in preference for higher specification.

The very recent increases in fuel prices have started to have an impact on vehicle choice in 2008. For example in May 2008, the mini segment (a sub segment of the Supermini segment as presented in Section 5.2 (on page 14) showed a 27.4 per cent increase in year to date sales compared to 2007. Furthermore, the trend to Diesel continues with an 8.4 per cent increase on May 2007 according to the SMMT.

Figure 8.1: Consumer stated importance of main factors influencing car purchase decision (Rank 1-10)[77]



9

CONCLUSIONS AND RECOMMENDATIONS

The love affair with the car continues. And if the last 100 years are anything to go by, it is not likely to diminish at any point soon. In addition, driver expectation of comfort, safety and performance is ever-increasing, which makes reducing CO_2 emissions even more challenging as these features all increase vehicles' weight.

The evidence in this review shows that within almost all segments of the passenger car market, many consumers are making poor choices when it comes to CO_2 emissions. This not only has a negative impact on climate change, but also represents a significant market failure: low-carbon vehicles make more sense for consumers both economically and environmentally.

This is worrying news, as CO_2 emissions are much higher than they need to be. However on the other hand, the findings also highlight that there are some easy wins that can reduce CO_2 from the market by improving consumers choices of cars from the range available today.

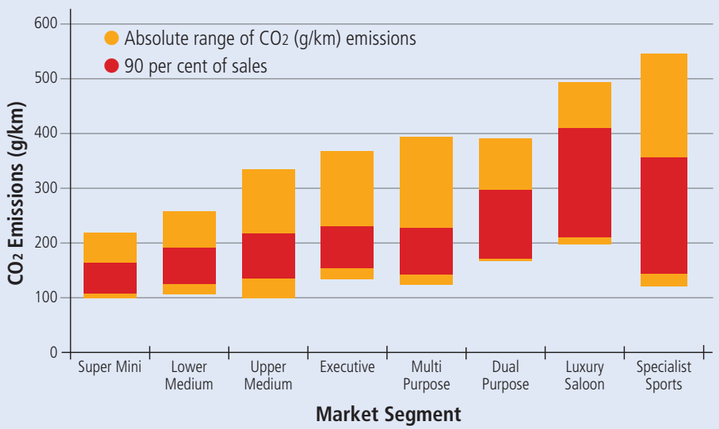
The new vehicles registered in 2007 produce annualised emissions of 6.5 million tonnes of CO_2

This is encouraging as other sectors (such as domestic energy efficiency) are likely to suffer diminishing potential for CO_2 reductions in future[78].

The new vehicles registered in 2007 produce annualised emissions of 6.5 million tonnes of CO_2. We predict that through achieving energy efficiency in road transport, this could be reduced by up to 25 per cent in the next 5 years (1.62 MT CO_2). This is ignoring any improvements in vehicle technology, which would provide additional savings. So acting to deliver energy efficiency in the new car market could be the solution that passenger cars need to reform its historically poor performance in responding to the challenge of climate change. Figure 9.1 helps to illustrate the range of CO_2 emissions of each segment of the market and indicates the overall potential for emissions savings.

In addition to this, emissions across the whole car market[79] could be further reduced by 10-15 per cent by taking greater action on smarter driving measures and by reducing the number of miles driven.

Figure 9.1: 2007 CO_2 Emissions Range by Market Segment



78 Due to high level targets set under the Supplier Obligatation (CERT)
79 i.e. Second hand as well as new vehicles

The Energy Saving Trust runs a UK wide network of advice centres, which provide advice on home energy efficiency, transport, renewables, water and waste to more than one million consumers per year

9.1 Recommendations for government and the Energy Saving Trust

The main recommendation arising from this review is to increase the level and scope of consumer transport advice being provided through our network of advice centres from 2009/10. Currently there is a lack of awareness of this advice, and this is a significant contributory factor behind the poor choices made with regards to fuel efficiency and CO_2 emissions.

Car manufacturers are starting to provide CO_2 information more prominently in their marketing and advertising[80]. This is helpful to a degree, but it is difficult for consumers to understand the meaning of CO_2 information without comparison to other vehicles within a segment. There is also added value to be gained from advice that is provided by an independent, trusted source.

The network is uniquely placed to provide transport advice to an audience that are already engaged on sustainable energy issues, and therefore more likely to take action

We believe that providing more independent information and advice to persuade consumers to take action will have a significant effect on reducing CO_2 emissions in the near term, through improving vehicle choice. The case for advice is also directly supported by the King Review, which recommends the further development of 'best in class' and 'smarter driving' messages through proactive advice services[81].

Furthermore, the current turbulent economic situation in the UK, combined with very high oil prices and increased vehicle excise duty for higher CO_2 vehicles, means that reducing fuel and driving costs will rise up consumers' agendas significantly over the next year. As advice on low-carbon car purchase and smarter driving can significantly help, we believe that delivering more of this activity in 2009/10 will prove to be highly successful.

Energy Saving Trust Consumer Transport Services

The Energy Saving Trust runs a UK wide network of advice centres, which provide advice on home energy efficiency, transport, renewables and water & waste to more than one million consumers per year. The centres also work in partnership with local businesses and delivery partners to increase the reach of their work. Evaluation of our consumer audience showed that in 2006/07 the services directly influenced savings of 12 million tonnes of CO_2[82].

The network is uniquely placed to provide transport advice to an audience that is already engaged on sustainable energy issues and therefore more likely to take action.

During 2008/09, the centres are starting to provide advice on low-carbon vehicle purchase and smarter driving with funding provided by the Department for Transport and the Scottish Government. The service currently covers the following main activities:

- Low-carbon vehicle purchase advice in direct support of the DfT's Act on CO_2 campaign. Customers looking to purchase a vehicle are advised to refer to DfT Act on CO_2 best-in-class information, the new car CO_2 label and are given verbal advice about CO_2 emissions more generally to help make the information more relevant and useable (e.g. by explaining the financial benefits).

- Advice on smarter driving. This enables customers who are not planning to replace their current vehicle in the near future to also take action to increase their fuel efficiency.

Messages are focussed on emphasising the financial benefits of taking action, as this helps to influence a wide range of people. Currently the service is delivered through specialist transport advisors responding to customer enquiries and cross-selling transport advice to people enquiring on home energy issues. The advisors also organise a number of outreach transport events in their local areas.

An initial evaluation of the consumer transport advice service provided by the advice centres (as a pilot in 2006/07) showed that most customers who recalled receiving advice had taken some action either through smarter driving or vehicle purchase to increase their fuel efficiency[83]. This compares favourably with home energy advice, where on average 40 per cent of people take action following advice.

We believe one of the main reasons for this is because transport advice is a new area, with more options for consumers to take positive action. This further supports the case for significantly increasing the level of consumer advice provided on transport.

80 LowCVP, Passenger Car Working Group (2008)
81 HMT (2008) The King Review of Low Carbon Cars Part 2: Recommendations for Action (Recommendation 19).
82 Over the lifetime of measures acted on.
83 Note of caution: As customer numbers were low for the pilot, these results can only be used as a guide

We support the EU's proposed approach to regulate CO_2 emissions

From 2009/10, we need additional resources to scale up transport advice centres to meet this challenge. These are the areas that the Energy Saving Trust believes that an upscale service should cover:

- Greater intensity of transport advice services provided through the advice centre network. This will deliver considerable carbon savings, as evaluation of the pilot service indicates that consumers are more inclined to act on transport advice.

- Increased proactive advice provision, for example through local and regional road shows promoting best-in-class and smarter driving advice.

- Advice on the CO_2 performance of second-hand vehicles, enabling customers to search out the CO_2 emissions of vehicles being considered[84] and providing low-CO_2 alternatives. This would form part of a tailored verbal advice service that captures customers at the point where they are in the early stages of their purchase decisions.

- Increased work with local and regional partners to provide referral services to the advice centres. This would provide advice tailored to the partner, for example providing top tips on smarter driving could be displayed at filling stations, information on the rolling resistance tyres at tyre replacement centres.

- Promotion of low-carbon vehicle purchase at the point where consumers are starting to look for a replacement vehicle by working in partnership with car publications such as Autotrader.

- Smarter choices advice – investigating public transport services alongside regular journeys made by customers in order to help encourage better use of public transport in favour of car use.

Finally, we support many of the other recommendations to help promote CO_2 information to consumers made within the King review, notably:

- Colour-coded road tax discs according to CO_2 emissions[85].

- Regulation of vehicle advertising to make CO_2 and fuel economy information more prominent, ideally showing the CO_2 label to help provide relativity.

It is worth noting that there are some risks associated with providing advice which will lead consumers to benefit through greater fuel efficiency. For example, consumers may choose to purchase larger vehicles, or drive more, which can negate some of the benefits. For these reasons, there is also the need to continue simultaneously to strengthen other demand-side policy measures which promote fuel efficiency in cars, such as fuel taxation and vehicle excise duty.

Other low-carbon policy recommendations

There is a continuing challenge for government to promote the shift to low-carbon vehicles through regulation and incentives. We support the EU's proposed approach to regulate CO_2 emissions from passenger cars through setting a sales-weighted average target of 130 g/km. The emissions of the UK market are slightly higher than that of the European average, so this target would encourage significant change within the UK market to meet the target. We also fully support a further target of 100 g/km or lower by 2020 to help provide continued certainty for the market.

Within the UK market, we support the further development of fiscal policies such as vehicle excise duty differentials and fuel duty to incentivise the uptake of lower carbon vehicles. In particular, we support further development of CO_2-based purchase taxes, or first-year road tax as initiated in the 2008 budget. This is important, because as it is so small in relation to the purchase price, vehicle excise duty has less of an influence at the point of purchasing a new car.

The evidence in this review show that the policy mechanisms which have had a particularly clear, positive effect on the market in terms of CO_2 are fleet policies such as company car taxation. We welcome the developments in this field, however there has been less progress made in the private market, which is not impacted by these additional measures. We would therefore welcome further policy developments in the private market to help further the shift towards low-carbon vehicles.

As noted previously, it is particularly important to combine such measures with consumer advice and information to help consumers to act.

9.2 Challenges for manufacturers

As noted earlier in this review, there are two very distinct types of low-carbon car on the market: those which have novel low-carbon technologies (e.g. hybrids such as the Toyota Prius); and a larger range of petrol and diesel-powered low-carbon vehicles. It is clear that new technologies have a long way to go before they become competitive, so the potential for delivering energy efficiency in the new car market in the near term hinges on improving sales of the latter.

Notwithstanding some recent exceptions, traditionally fuelled low-carbon vehicles tend currently to be the lower end or 'bargain basement' vehicles within a range of models (see Figure 9.2, page 36). They are therefore usually viewed by consumers as compromise purchases because the higher specification (higher CO_2) models are less affordable. There are a number of challenges for manufacturers in order to help improve sales of these traditionally fuelled low-carbon vehicles.

84 For vehicles registered after 2001, where CO_2 information is available
85 Or some other form of labelling should discs be replaced in the future

ADVERTISING AND MARKETING OF 'TRADITIONALLY FUELLED' LOW-CARBON CARS

For many years, manufacturers have marketed the higher-carbon vehicles within a vehicle range (see Figure 9.2) as better quality, more expensive, faster and more desirable, and thus influencing consumers to make less rationale choices with regard to fuel and other running costs.

The industry has also noted that low-carbon cars are more available on the market now than ever before, but that sales of them are low[86]. One of the reasons for this is this rough correlation between performance and 'desirability'. The only major way in which current range-topping vehicles are functionally different to lower carbon derivatives is in performance (and consequently CO_2 emissions). However driving at high speed is both illegal and dangerous on today's congested roads. Furthermore, almost all new low-carbon car models deliver more than adequate performance both in terms of acceleration and outright speed.

There is a very clear challenge for car manufacturers to start marketing low-carbon vehicles as the new, top-quality models of cars within their ranges[87]. This may sound a little strange given that it is the opposite of how the car market has traditionally functioned, but it is in fact how many other consumer markets work. For example within home appliances markets (e.g. kitchen equipment) the most efficient products are the top quality products, and their marketing reflects this.

Figure 9.2: Example of CO_2 emissions distribution within the Ford Focus range

Entry level Ford Focus 1.6 TDCI CO_2 Emissions 115 g/km

Range topping Ford Focus ST CO_2 Emissions 224 g/km

Improvement of 'traditionally fuelled' low-carbon cars

Changing the market to help sell more low-carbon vehicles does not just depend on advertising and marketing, although it is a very important part of the process. There are also a number of ways in which the vehicles themselves require development in order to improve sales:

Desirability

Desirability needs to be significantly improved at this end of the market, so that low-carbon cars look and feel more attractive to the consumer. This will help to change the 'compromise' image of these cars and help increase sales. Some recently launched vehicles shows that high-quality, low-carbon cars can prove to be a very attractive package, for example the new Mini Cooper Diesel, which at 104 g/km has the same CO_2 emissions as a Toyota Prius.

Weight loss and 'bolt-on' CO_2 reduction technologies

Increases in vehicle weight have to a large extent cancelled out the improvements in the fuel efficiency of car engines over the last decade. Therefore, there is an imperative on manufacturers to produce lighter cars. This does not necessarily mean that significant compromises need to be made in terms of the in-car-entertainment or safety features that drivers have come to expect. However, the focus must be on making cars lighter and more energy efficient, in order to help improve CO_2 emissions across the new car market. This is particularly important for high energy-consuming devices such as air conditioning[88]. Furthermore, the application of add-on CO_2 reduction technologies such as intelligent alternators, stop-start and low roll-resistance tyres should be introduced across the whole market.

Almost all new low-carbon car models deliver more than adequate performance both in terms of acceleration and outright speed

86 ACEA (undated) 'Highly efficient cars are available but not much loved' http://www.acea.be/index.php/news/news_detail/higly_efficient_cars_are_available_but_not_much_loved/

87 This must go hand in hand with developments in quality of traditionally fuelled low-carbon vehicles

88 ENDS Europe DAILY 2515 (2008) 'EU Considers efficiency targets for car Air Con'

The combination of marketing and these improvements in desirability would help drive the CO_2 reductions that the market clearly has the potential to achieve. Taking this approach would not only be responsible in terms of CO_2 emissions, but it is also gives the customer what they really want – good quality, desirable cars with all the features and safety equipment they expect - but with low running costs and CO_2 emissions.

Market segment recommendations

Superminis

Surprisingly, superminis are biased towards the higher CO_2 vehicles within the segment (see Figure 5.5, page 14). Furthermore, this segment has grown significantly in recent years with comparatively poor progress in terms of CO_2 emission reductions. One of the main causes of this is that these vehicles have been growing in size and weight, and therefore encouraging some customers who would have bought larger vehicles to 'downsize'. Thanks to their size, superminis are on average comparatively low-carbon and therefore their increase in sales is encouraging. However, the segment needs to stop further increases in size and weight, and focus more on the lower-carbon end of the segment in terms of marketing and development.

Increases in fiscal incentives, particularly for private purchasers, will have a greater impact here, as most sales are private and buyers in this segment are likely to be more sensitive to fiscal drivers.

Finally, there is scope for increasing diesel sales (only 13 per cent in 2007) in order to save carbon, as dieselisation has not affected this part of the market to the same extent as other segments.

Surprisingly, superminis are biased towards the higher CO_2 vehicles

Lower medium, upper medium and MPVs

These segments occupy a very large proportion of the total new car market. Progress on reducing CO_2 emissions has been average-to-good in this part of the market and has largely come from the fleet market, through company car taxation and dieselisation. However in terms of CO_2, diesel and petrol vehicles have not improved significantly in this part of the market (the driver behind CO_2 reductions has been through buyers moving away from petrol towards diesel). There is limited further potential for reductions in future through more diesel sales, so other means of achieving further CO_2 reductions are needed.

There is still some significant potential for choosing lower-CO_2 vehicles, so this should be pursued, but there should be an equal focus here on improving the CO_2 performance of the vehicles themselves through weight reduction and applying 'bolt on' CO_2-reduction technologies such as intelligent alternators, stop/start and low rolling-resistance tyres.

Executive, luxury saloon and SUVs

Although these vehicles make up only a small part of the market, they tend to be 'flagship' models for manufacturers and are objects of desire for many car-enthusiast consumers, despite being affordable only to a few.

It is therefore particularly important that these segments work hard to improve their current, poor CO_2 emissions performance.

As these segments comprise high-quality, high-cost vehicles, they can be a good place to introduce new low-carbon technologies, as profit margins here can allow higher development costs to be absorbed better than in the rest of the market. This has been clearly demonstrated by manufacturers such as Toyota, through the introduction of hybrid technologies within its Lexus SUV and luxury saloon ranges.

Although SUVs are not quite the worst performing segment in terms of CO_2 emissions, they have earned themselves a bad press through large increases in sales, particularly for use in urban areas (where they have earned the name 'Chelsea Tractors'). Although sales are now not increasing as quickly as in recent years, it is increasingly worrying that SUVs are now the fourth largest contributor to the CO_2 emissions of the whole market.

Purchasers of many of these vehicles are able to absorb high running costs, and therefore very significant actions are required to discourage their use in less appropriate applications. SUVs do have a role to play in a rural context where they are used in suitable

It is increasingly worrying that SUVs are now the fourth largest contributor to the CO_2 emissions of the whole market

applications such as agriculture. Therefore we welcome the application of local measures such as the London congestion charge and urban council parking schemes designed to discourage urban use of the SUVs and other high CO_2 vehicles.

Sports cars and other high performance vehicles

A relatively small number of consumers demonstrate a desire for high-performance vehicles. This market segment is roughly split by vehicle weight and the super-light cars (e.g. Lotus Elise) produce significantly lower CO_2 emissions than the heavier, larger-capacity high-performance cars. This is demonstrated by the very wide range of CO_2 emissions in the sport car segment (see Figure 9.1, page 32).

Action should be taken to help influence these consumers to purchase the lighter, smaller-capacity cars: these provide very similar levels of performance to heavier cars, but emit significantly less CO_2. Due to the low sales here, this is not a high priority for the Energy Saving Trust.

9.3 Final Summary

In summary CO_2 reductions can be best achieved through action being taken to improve energy efficiency throughout the car market and encouraging consumers to purchase the lowest carbon car in its class.

The range of CO_2 emissions of new vehicles in each segment of the car market is very large, and consumers are currently making poor choices in terms of the CO_2 emissions of their vehicles. This is having a negative effect on CO_2 emissions from cars and is also bad for consumers because it keeps running costs high. So the main opportunity for achieving energy efficiency is through improving consumer's choices of cars from the range of new models

available in order to increase sales of the lower-CO_2 petrol and diesel models which are already on the market. We believe this is the key to delivering CO_2 emissions reductions from the car market in the short to medium term.

The main reasons for current poor vehicle purchase choices are:

- Lack of independent information and advice that makes CO_2 information clearer and more prominent throughout the vehicle purchase process and encourages consumers to take action.
- The current market structure, where the more desirable cars tend to have higher CO_2 emissions.

Adopting measures to improve vehicle choice could reduce the CO_2 emissions of the new car market by up to 25 per cent, which equates to

Increased uptake of Smarter Driving initiatives through advice services also has the potential to reduce CO_2 emissions by a further 10-15 per cent

approximately 2 million tonnes of CO_2. This is equivalent to the annual CO_2 emissions of a third of a million houses, or a city the size of Glasgow[89]. Increased uptake of smarter driving initiatives through advice services also has the potential to reduce CO_2 emissions by a further 10-15 per cent.

The main action recommended in this review is to increase the level of independent, proactive, in-depth advice for consumers. With its network of regional advice centres, the Energy Saving Trust is extremely well placed to deliver this service over the next few years.

Manufacturers also need to work hard to improve quality and desirability of the traditionally fuelled low-CO_2 models within their ranges in order to improve sales at this end of the market.

This needs to be supported by further development of other existing CO_2 reduction policies. Further action in this area would be particularly welcome in the private market, where the signals to move to lower-carbon vehicles are currently less strong than in the fleet sector.

89 This refers to household emissions only