



Car buyer research report
Consumer attitudes to low carbon
and fuel-efficient passenger cars

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1 Background

In December 2004, the Low Carbon Vehicle Partnership commissioned Ecolane Limited to research the role of consumer attitudes to low carbon and fuel-efficient passenger cars. This research was to be desk based and was to focus on new car buyer segments in order to aid targeting and planning of policy and marketing activity for low carbon and/or fuel-efficient passenger cars in the UK. The study was intended to prepare the way for later research that would investigate key issues in more detail – in particular, to define specific requirements for supplementary field-based research that should be commissioned to obtain key information that is not presently known. The research method involved the review and analysis of existing research for the purpose of identifying and consolidating current knowledge. This work was conducted between January and March 2005.

The aims of the initial desk-research were to investigate:

- Awareness, knowledge and understanding of low carbon and/or fuel-efficient passenger cars;
- Attitudes to the environment in relation to low carbon passenger cars; and
- Likely adoption of fuel-efficient/low carbon passenger cars, including barriers and motivations.

Three distinct market segments were identified:

- Business fleets;
- Individual consumers; and
- Contract hire/leasing companies.

The following outputs were anticipated from the research:

- A profile of the market for both new passenger cars and specifically low carbon / fuel efficient vehicles. Specifically, the decision-making process for these audiences and whether any regional concentrations can be identified
- Awareness and perception of low carbon / fuel efficient and cleaner vehicles including vehicle manufacturers that supply these vehicles. Specifically, the extent to which fuel economy and environmental and social responsibility are drivers of the purchase decision both now and in the future; and the extent to which availability of fuel efficient vehicles limits purchasers choice.
- What marketing methods, or other approaches, could motivate the purchase of low carbon or cleaner fuel cars by customers who currently show no or little environmental interest? The importance of peer-pressure and social acceptability in their decisions regarding vehicle purchase
- An analysis of the information purchasers require prior to making a decision and to what extent this information is available. Also, how vehicle purchasers source information and what would encourage the purchaser to source information from a manufacturer, Government or environmental organisation.
- An outline of further field-based behavioural research that would assist manufacturers, Government and other stakeholders accelerate the market for low carbon vehicles.

The outputs of the research were intended to be used to inform both future developments in UK Government policy (tax, regulatory and other) and the marketing approach of companies engaged in the sale of low carbon and fuel-efficient vehicles.

2 Executive summary

In December 2004, the Low Carbon Vehicle Partnership commissioned Ecolane Limited to conduct a desk based research study of consumer attitudes to low carbon and fuel-efficient passenger cars. This was to focus on new car buyer segments in order to aid targeting and planning of policy and marketing activity for low carbon and/or fuel-efficient passenger cars in the UK. The research methodology involved the review and analysis of existing research for the purpose of identifying and consolidating current knowledge. The work was conducted between January and March 2005.

The aims of the research were to investigate awareness, knowledge and understanding of low carbon and/or fuel-efficient passenger cars; attitudes to the environment in relation to low carbon passenger cars; and the likely adoption of low carbon/fuel-efficient passenger cars. Three distinct market segments were identified: business fleets, individual consumers, and contract hire/leasing companies. In order to achieve the aims of the brief, the study compiled the existing research findings for a set of twelve research questions grouped under the following five research headings: the car buying market, the car buying process, attitudes to low carbon/fuel-efficient passenger cars, promotional strategies, and further research.

For the purposes of the research, attitudes were grouped into three categories:

- Awareness and Concerns – *vague notions that consumers may possess;*
- Knowledge and Understanding – *particular ‘facts’ that consumers believe to be the case; and*
- Culture and Values – *deeply held beliefs that consumers hold about themselves and the world.*

Conceptual framework - The ‘attitude-action gap’

Economic incentives are necessary but not sufficient in themselves to stimulate pro-environmental consumer behaviour. According to a recent study conducted on behalf of the Department for Environment, Food and Rural Affairs, other factors must also be present including a positive *attitudinal* position adopted by users/consumers (Darnton 2004). Understanding existing attitudes is therefore a pre-requisite for designing effective promotional strategies.

However, the link between the attitudes and behaviour of car buyers is far from simple. Attitudes are themselves informed by awareness, knowledge, understanding, opinion, commonly held beliefs and cultural values – factors that are themselves difficult to quantify, predict and manage. Even when attitudes are known, behavioural change is difficult to predict due to the loose causal linking between attitudes and actions. This is the infamous ‘*attitude-action gap*’. As noted by the Department for Transport: “*Concern for the environment in general and the environmental impact of cars which is evident does not often translate into behavioural change at an individual level*” (DfT 2004a).

Providing cleaner vehicle information and/or incentives to consumers appears to support the formation of attitudes that are more conducive to the purchase of low carbon/fuel-efficient cars. However, there is no guarantee that these strategies always succeed as attitudes and behaviour are “...*intimately dependent on ... interpretation of the issues*”, rather than presentation of the ‘facts’ (Eden 1996). It is therefore imperative that before promotional policies are developed the existing prevalent attitudes are identified.

Results of the desk research – The car buying process and market

The decision-making process for private car purchases is predominantly driven by financial and performance considerations including: price, fuel consumption, comfort, size, practicality and reliability (DfT 2004a). Environmental issues play little part in the process and are among the least

important considerations for new car buyers. For the private sector, the research reviewed suggests a two-stage decision-making process. First, the capability and purchase price of available vehicles determine which models are to be considered. Then, secondly, the consumer conducts a more sophisticated consideration of running costs, performance, safety, styling, brand, reliability, etc.

Although ‘mpg’ is *reported* as a key decision factor for private buyers, one study notes that: “*For most [car buyers], little effort is expended in comparisons of fuel consumption during the decision-making process*” (TRI/ECI 2000). Reasons proposed to explain this include the observation that many car buyers assume that there is little difference in fuel economy between cars *within a class* (eg within diesels, superminis, etc). Also it is common for consumers see ‘mpg’ as an aspect of car design that can only be achieved by compromising performance and safety, and few car buyers have confidence in the validity of published fuel economy data.

When sourcing information, private car buyers collect information from a wide range of sources including: manufacturer brochures, the Internet, car magazines, sales staff, consumer guides, family and friends, TV programmes and radio and newspaper advertising (DfT 2003/04). In the UK, the Internet is seen as an increasingly useful information source and is considered by those who use it to contain reliable information (Capgemini 2004). With the expansion of access to the Internet, it is likely that the World Wide Web is one of the fastest growing information resources used by car buyers, one considered particularly useful by UK consumers.

Within the company sector, when deciding which cars to purchase, fleet managers consider whole life costs to be of paramount importance and are highly sensitive to financial incentives (Shell 2004). Fleet managers are also more concerned with vehicle reliability and maintenance issues than private buyers, but are less concerned with image, viewing vehicles from a more functional perspective. Regarding vehicle acquisition, fleet managers take what action they can to reduce (economic and other) risks and future uncertainties and look for high degrees of certainty regarding future policy incentives (Lex 2004; HC Select Committee 2004). Fleet managers also respond to pressure from employees who are the recipients of company cars. Company car users are keen to choose cars that reduce tax costs as far as possible while providing a car suitable for private as well as business use (IR 2004). Therefore the system of company car tax is a crucial factor in determining employee car choice and indirectly influencing the fleet managers’ purchasing decisions.

One of the most significant trends identified within the conventional car sector is the recent increase in popularity of diesel cars. Since 1999 the proportion of UK diesel car registrations has increased from 10% to over 30% (SMMT 2004b). For the UK private sector, most commentators attribute this ‘dieselisation’ to the relative price of diesel and petrol fuels and the improved fuel-efficiency offered by diesel engine technology (IPTS 2003). For fleets, the increase is a direct consequence of the reform in the system of company car taxation that occurred in 2002 (IR 2004). These observations provide useful insights into the design of effective price signals for alternative fuel and vehicle types.

Regarding the market profile for low carbon/fuel-efficient cars, a Cambridge MBA study identifies seven early adopter segments for new car fuels/technologies within the UK (Shell 2004). These include fleets (the largest segment, comprising around half of the total car market), and six private market segments that account for 10%-20% of the *private* UK car market. Several characteristics are common to these private early adopters. They are typically new car purchasers, have high educational levels and incomes, are urban dwellers, and are interested in technology. Being the largest early adopter segment, fleets play a key role in the early stages of market development and in raising awareness of new fuels/vehicle technologies in the wider market.

Consumer attitudes to low carbon/fuel-efficient cars, price signals and the environment

Overall, the level of consumer awareness and concern regarding the environmental impact of cars is high. Indeed, the environmental issues of most concern to public over next 20 years are traffic, air pollution and climate change (DEFRA 2002). However, there is evidence that consumers of all types have a very low knowledge base regarding the impacts of low carbon and fuel-efficient vehicles. “*The relationship between inputs (fuel) and outputs (emissions) is only very generally – if at all – understood by most drivers*” (DfT 2003). There are also strong indications that misconceptions are present at all levels. For example, although the public know that CO₂ leads to climate change, mobile phones and the ‘hole in the ozone layer’ are also blamed (DEFRA 2002).

The level of awareness of low carbon/fuel-efficient passenger cars can be summarised as moderate. Whereas some studies show that drivers are well aware of the range of fuel and technology types being commercially developed (Shell 2004), other more open-ended surveys suggest a less realistic view of alternative fuel/technology types (eg solar cars) (DoE 2002, Lane 2000). However, the evidence is clear that consumers of all types have very poor technical understanding of low carbon and fuel-efficient vehicle technologies. Misconceptions are also present at all levels. Examples include: “*LPG is dangerous*”, “*hybrid electric cars have limited range need a special recharge point*”, and “*no positive tax incentives for biodiesel as yet*” (Shell 2004).

Although car buyers’ economic concerns are high, levels of awareness/knowledge regarding actual car costs are very low. For example, the average motorist underestimates their car costs by around a factor of two – servicing and repair costs are underestimated to the greatest degree (RAC 2004). Car owners are most aware of fuel costs, road tax and insurance, but private car owners are particularly unaware of the cost of depreciation. Company car users/fleet managers have a better appreciation of overall costs, but their knowledge level is still lower than might be expected given the importance and size of this sector (IR 2004).

The awareness of financial incentives for cleaner cars is also low, particularly among private buyers. According to the Department for Transport: “*Understanding that VED is based on carbon emissions is patchy*” and awareness of PowerShift grants for bi-fuel conversion is low (DfT 2003). When offered, consumers also appear (on first inspection) to be highly receptive to fiscal incentives (EST 2004). However, although car buyers report that costs are paramount, they are highly resistant to changing their consumer behaviour and (on average) are prepared to endure an extra £1,100 per year before changing to a different fuel, smaller engine or smaller car (RAC 2004).

Strategies to promote sales of low carbon/fuel-efficient cars

The findings of the desk research suggest that attitude management strategies can be grouped into four categories. First, research shows that where **providing information** increases environmental knowledge, this raises concern, reduces fatalism and increases the *intention* of the consumer to change behaviour (Walton 2004). However, while educational tools continually need to be developed to provide up-to-date relevant information, attitudinal barriers also need to be addressed. This is because existing attitudes and misconceptions affect how information is *interpreted* by the consumer who, therefore, may not receive the educational messages as intended.

Secondly, using **price signals** to effect behavioural change circumvents the need for consumers to understand complex environmental and technological issues. However, the barrier to the use of effective price signals is that car buyers are already confused about conventional car costs and are resistant to change even if price signals are strong (RAC 2004). There is, therefore, an argument for either improving the effectiveness (reception) of existing incentives or for introducing new types of economic promotional measures for low carbon/fuel-efficient cars (eg use of ‘feebates’).

The car as a status symbol has been shown to be a key factor in reinforcing anti-environmental car travel behaviour (Golob and Hensher 1997). This suggests that a third effective strategy to effect (consumer) behavioural change is to improve the **status of low carbon cars**. The appeal of low carbon vehicles could be raised by increasing their *amenity value*. This could be achieved either by designing cleaner cars with capabilities not offered by ordinary vehicles (eg acting as mobile power units), or by giving them preferential access to key areas of the road network (eg in city-centres, ‘low carbon vehicle’ lanes) (LowCVP 2005b).

Finally, rather than addressing the average car buyer, **targeting early adopters** can be a more cost-effective promotional strategy during the initial stages of market development. A speculative exercise based on the Cambridge MBA study suggests that, assuming the 10% low carbon car sales target for 2012 is achieved, fleets alone are likely to account for at least 8% of sales of low carbon cars with the remaining percentage being composed of *private* early adopter sales (Ecolane 2005).

Recommendations for further research

For some attitudes of UK car buyers and the general public, a great deal of research has already been done. This includes work conducted in preparation for the new car-labelling scheme (DfT 2003a; 2003b) and national surveys such as the *Survey of public attitudes to quality of life and to the environment* (DEFRA 2002). However, these studies tend to focus on awareness and concerns. Far less research has focused on assessing consumers’ level of knowledge and understanding of vehicle technologies, environmental impacts, car costs and economic incentives. In addition, few studies attempt to identify UK early adopters of low carbon cars or assess the impact of cultural values on consumer behaviour.

This report therefore recommends that further research (conducted using focus groups and national quantitative surveys) is required to more fully ascertain the attitudes of UK car buyers to low carbon/fuel-efficient cars. This should include (in order of priority, highest first):

1. A detailed survey of the existing levels of **consumer knowledge and understanding** of low carbon/fuel-efficient cars. Issues should include: vehicle technologies, environmental impacts, car ownership costs and cleaner car incentives. As part of this survey, the impacts of the **new UK car-label** should be monitored over the period of its introduction (July-September 2005).
2. Research to identify how low carbon/fuel-efficient cars can be made more attractive to consumers through the use of new **economic incentives** (eg feebates). The types and levels of incentives and taxation measures that could be used to successfully promote sales of fuel efficient/low carbon cars should be explored.
3. Further research to confirm the role of UK **early adopter segments** and to identify how low carbon/fuel-efficient cars can be made more attractive to these groups through the use of *targeted* incentives (economic and otherwise). Given that fleets are the most important early adopter segment, **fleet managers’ attitudes** to low carbon and fuel-efficient cars should be investigated through structured interviews with key personnel.
4. Research to identify how low carbon/fuel-efficient cars can be made more attractive to consumers through the use of innovative **non-fiscal incentives** (eg dedicated cleaner vehicle lanes). The types and levels of non-economic benefits that could be used to successfully promote sales of low carbon/fuel-efficient cars should be explored.

Finally, one important issue highlighted by the desk research is that the most significant insights regarding consumer attitudes are generated through the design of attitude surveys that *link attitudes with actual travel/consumer behaviour*. Therefore, all the suggested avenues for further research should incorporate this approach as central to their research methodology.

3 Introduction

During the last decade, cleaner fuelled vehicles have developed sufficiently to challenge the use of conventional cars on cost and environmental grounds. Commercially available cleaner options include the cleaner *fuels*: bioethanol, biodiesel, natural gas and liquefied petroleum gas (LPG); and two vehicle *technologies*: battery-electric and hybrid-electric cars.

While cleaner fuelled cars currently represent less than 1% of all car sales, the situation is set to change dramatically. This is being driven by a growing awareness concerning the environmental costs of motoring, ever tightening regulated emission standards and by an increasing number of cleaner car models on the market. The Government is supporting this transition and has set the target that cleaner cars (defined as ‘low carbon’; $\leq 100\text{g/km CO}_2$) should represent 10% of all car sales by 2012 (DfT 2002). To achieve this target, the Government has introduced a set of coordinated economic incentives including:

- The *PowerShift* programme – awards capital grants to assist with the purchase of cleaner cars.
- Preferential excise duties – reduces costs of cleaner vehicle fuels.
- Vehicle excise duty (road tax) – rates are now dependent on the fuel and level of vehicle emissions, with cleaner fuelled cars being charged lower rates.
- Congestion charge discounts – the cleanest cars are eligible for a 100% discount under the current London Congestion Charge.
- A new system of company car tax – “*designed to provide financial incentives for employers and company car drivers to choose cars which produce lower levels of CO₂ emissions*” (IR 2004).

These economic instruments illustrate the fact that the UK Government’s primary strategy to stimulate the uptake of cleaner fuels and vehicles is through the use of financial incentives. This approach is based on the concept of Ecological Taxation Reform – the development of a taxation system based on environmental impacts (Whitelegg 1992). There is a great deal of evidence that economic instruments can be highly successful in many transport cases (Hayashi *et al.* 2001, Ewing and Sarigöllü 1998, Rouwendal and de Vries 1998). One successful example is the use of preferential fuel duties to promote the uptake of ultra low sulphur petrol and diesel in the UK, a transition that was completed in less than three years (HMT 2003).

However, economic incentives are necessary but not sufficient to stimulate behavioural change. According to a recent study conducted on behalf of Department for Environment, Food and Rural Affairs, at least two other factors must also be present (Darnton 2004). These are the development of fuel infrastructure and a positive *attitudinal* position adopted by users/consumers. Given that the refuelling infrastructure provision has already been addressed for some cleaner fuels/technologies or is not an issue (eg LPG and petrol-hybrids), any barriers that continue to inhibit the uptake of cleaner fuelled vehicles are likely to be due to economic or attitudinal factors.

3.1 The ‘attitude-action gap’ and consumer understanding

The link between attitudes and behaviour of car buyers is far from simple. Attitudes are themselves informed by awareness, knowledge, understanding, opinion, commonly held beliefs and cultural values – factors that are themselves difficult to quantify, predict and manage. Even when attitudes are known, this by no means makes it possible to predict behavioural change due to the loose causal linking between attitudes and actions. This is the infamous ‘*attitude-action gap*’ (also known as the ‘*value-action gap*’) (Kollmuss and Agyeman 2002). As noted by the Department for Transport:

“...concern for the environment in general and the environmental impact of cars which is evident does not often translate into behavioural change at an individual level. So, many people do express concern about the environmental impact of cars but do not think that it is their own responsibility to negate the impact”(DfT 2004a)

It is reasonable to assume that raising car buyers’ awareness, knowledge and understanding of vehicle technology and environmental issues may increase sales of cleaner cars (although this depends on the comparative costs of cleaner and conventional cars). However, if the level of knowledge of environmental and technological issues is low, it is unlikely that consumer behaviour will change in a manner that minimises environmental impact. This suggests that promoting accurate information regarding cleaner technologies is a good initial strategy as it supports the formation of attitudes that are more conducive to sustainable behaviour (in this case the purchase of low carbon/fuel-efficient cars). It is for this reason that the UK Government has supported a number of information campaigns including the new car-labelling scheme due for introduction in July 2005 (DfT 2003a).

However, even if good quality information is provided, there is no guarantee that the desired actions will follow. This is for two reasons. First, there is the attitude-action gap mentioned above – positive attitudes may lead to the purchase of more sustainable products, but they may not. Second, and more crucially, providing information does not necessarily lead to improved levels of understanding. This is because attitudes and behaviour are “...intimately dependent on ... interpretation of the issues”, rather than presentation of the ‘facts’ (Eden 1996). Indeed, although most of us hold beliefs (scientific or otherwise) that are false or only true in part, this does not prevent us from action. On the contrary, we have to act and do so on the best possible interpretation of the available information.

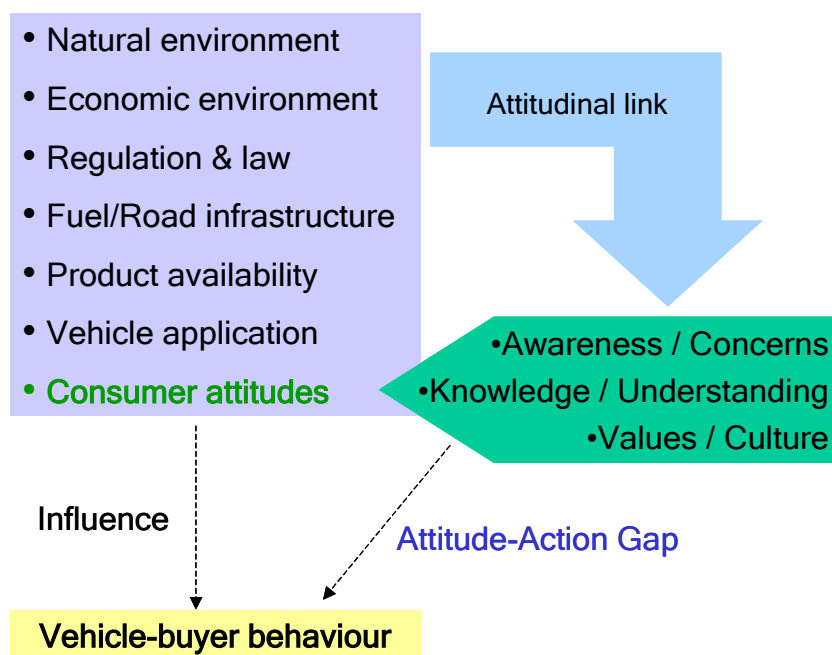
This second issue concerning *misconceptions* is usually overlooked in the design of an information campaign. A well-designed campaign should first research the prevalent misconceptions before deciding how to best convey the appropriate message (indeed, this is the purpose of most misconception research). What is often found (and what makes this approach valuable) is that where misconceptions do exist, they are *stable*, *predictable* and are often *common* to many populations (eg private and fleet car buyers).

3.2 Conceptual framework – definition of terms

Within the field of attitudinal research, the word ‘attitude’ is used to denote a large number of factors including: awareness, concern, knowledge, understanding, opinion, commonly held beliefs and cultural values. Many report titles and academic papers use the word loosely to mean very different things. It is therefore instructive to define what we mean by ‘attitudes’ (and categorise attitude types) as they arise in a wide variety of contexts. For the purposes of this desk research, attitudes are taken to include all the terms used above. These are then grouped into three categories that are (see Figure 3.1):

- Awareness and Concerns – vague notions that consumers may possess;
- Knowledge and Understanding – particular ‘facts’ that consumers believe to be the case; and
- Culture and Values – deeply held beliefs that consumers hold about themselves and the world.

As Figure 3.1 shows, a large number of factors directly or indirectly influence consumer behaviour. For example, it is well established that the economic environment (including: taxation, charges and incentives) is a strong driver of vehicle purchasing behaviour for both private and fleet buyers – hence the use of fiscal incentives to increase the uptake of vehicles with lower emissions. Other factors such as infrastructure provision, regulation, vehicle availability and application have also been demonstrated to be important determinants of vehicle-buying behaviour.

Figure 3.1 Conceptual framework – vehicle-buyer attitudes and consumer behaviour

As noted by Darnton (2004), consumer attitudes also play a crucial role. What makes them of particular interest is that, not only do they include social issues (such as image and peer-group pressure), they also mediate all the other more ‘objective’ factors listed within Figure 3.1. For example, it is how the consumer perceives the economic environment that influences behaviour rather than the ‘actual’ cost factors (some of which may be unknown or misunderstood by vehicle owners). Managing consumer attitudes therefore provides a challenge (and an opportunity) to those who would wish to promote consumer behaviour to certain ends (eg increasing sales of low carbon vehicles).

One additional definition is also worth making at this point. The term consumer *acceptance* is sometimes used to denote “*the bridge between consumer awareness and consumer adoption*” (Shell 2004). In the context of the above discussion, this term describes the process by which the attitude-action gap is bridged through the successful management of consumer attitudes or targeting of a specific market segment. Research focusing on the range of promotional strategies that can be used to increase acceptance will be discussed in Section 7 of this report.

3.3 Types of consumer – market segmentation

Empirical research by Rogers points to the importance of adopters or consumers (organisational and/or individuals) within the innovation process (Rogers 1971). Rather than merely acting as passive recipients of new products or services, the perceptions, beliefs and behaviour of adopters strongly determines the success or otherwise of an innovation. Furthermore, by studying the history of a large number of technologies, Rogers distinguished five categories of adopters who were involved in successive stages of the diffusion process. The adopter categories (some of which are used in this report) are as follows:

- The first individual consumers of a new technology are referred to as *innovators*. These are individuals who are either willing to pay premium prices, purchase the product/service for business use or are in a position where they have above average need of the new technology. They are not representative of the market as a whole and are uniquely motivated. Typically, they make up around 2.5% of the population.

- The next section of the population (around 13.5%) is the *early adopters*, who like the innovators are willing to pay over the odds for a new product/service. Unlike the innovators, they are more representative of the population as a whole but are characterised by their high earning potential, status, education and influence.
- The next two groups are the *early* and *late majority* who each represent around a third of the population. The early majority will assess the pros and cons of the new technology for some time before appropriating it for their own needs. The late majority will only do so once they are forced to by either economic necessity and/or increasing social pressure to do so.
- Finally, the *laggards* (16%) will adopt the technology. However, they may be suspicious about the nature of the advantages offered and may continue to question the suitability of the technology for their needs. By the time they have accepted it (if they eventually do), the new technology may itself have been superseded by a new innovation.

3.4 Structure of report – research questions 1-12

In order to more fully understand the attitudinal factors that affect the sales of low carbon cars, and to achieve the aims of the research brief, this desk based research study examines and compiles the existing research findings for a core set of issues. Based on the desired research outputs, the report identifies the following list of research questions. The aim is to answer these as fully as is possible within resource/time constraints for three car buyer sectors – business fleets; individual consumers and contract hire/leasing companies. The research questions are as follows:

The car buying market	<ol style="list-style-type: none"> 1. What is the market profile for new passenger cars? 2. What is the market profile for new low carbon/fuel-efficient passenger cars?
The car buying process	<ol style="list-style-type: none"> 3. What information do purchasers require prior to making a decision and to what extent is this information available? 4. What is the decision-making process for each market sector and are there any regional variations? 5. To what extent are fuel economy and environmental and social responsibility drivers of the purchasing decision both now and in the future; to what extent does the availability of fuel-efficient vehicles limit purchasers' choice? 6. What is the importance of peer-pressure and social acceptability in decisions regarding vehicle purchase?
Attitudes to low carbon/ fuel-efficient passenger cars	<ol style="list-style-type: none"> 7. What are the levels of awareness, knowledge and understanding of low carbon / fuel-efficient passenger cars? 8. What are the levels of awareness, knowledge and understanding of low carbon / fuel-efficient car financial incentives? 9. What are the levels of awareness, knowledge and understanding of the environmental impacts of conventional and low carbon/fuel-efficient cars?

Promotional strategies	<p>10. What marketing methods, or other approaches, could motivate the purchase of low carbon or cleaner fuel cars by customers who currently show no or little environmental interest?</p> <p>11. How do vehicle purchasers source information and what would encourage the purchaser to source information from a manufacturer, Government or environmental organisation?</p>
Further research	<p>12. Provide an outline of further field-based behavioural research that would assist manufacturers, Government and other stakeholders accelerate the market for low carbon vehicles.</p>

The reports on which the desk research are based are listed in the reference section at the end of the document. As far as possible, reports and studies which are recent (dating from 2000) and that focus on the UK market have been used. However, given that for many of the issues raised by the research questions, little existing research has been conducted, some research from outside the UK has been used in cases where the methodology or findings are relevant to the UK situation.

The research question groupings provide the main structure of the report and are used to denote the headings for Sections 4 to 8.

4 The car buying market

4.1 Profile of the market for new passenger cars – private car

Private car sales account for just under half (47%) of all annual new car registrations in the UK. In 2004, this equated to around 1.2 million sales (SMMT 2004a).

Several recent UK reports have surveyed the new (private) car buyer market. One recent study quotes data collected by the MORI General Public Omnibus poll (DfT 2004a).¹ This report defines car buyers as those who have bought a car in the preceding two years or are planning to buy a car in the next 12 months (company car drivers are excluded). The demographic profile of new car buyers (as defined by the survey) is as shown in Table 4.1.

Table 4.1 Demographic profile of UK private new car buyers (DfT 2004a)

Gender Male (55%) Female (45%)	Age 18-24 (9%) 25-34 (22%) 35-44 (22%) 45-54 (20%) 55+ (27%)	Car Ownership 1 car or light van (45%) 2 cars or light vans (37%) 3+ cars/light vans (15%)
Social Class AB (37%) C1 (32%) C2 (19%) DE (12%)	Region North (34%) South (32%) Midlands (18%) Wales (5%) East (12%)	Children In Household 1 (14%) 2 (15%) 3 (5%) 4 (1%)
Social class definitions: A Higher managerial, administrative or professional B Intermediate managerial, administrative or professional C1 Supervisor or clerical and junior managerial, administrative or professional C2 Skilled manual workers D Semi and unskilled manual workers E State pensioners etc, with no other earnings		

Figures 4.1-4.3 show the results of this survey according to: general demographic profile, manufacturer popularity, type of vehicle, engine size and annual mileage (DfT 2004a). The DfT survey gives the manufacture of the newest cars within each household. Among new car buyers the most popular car manufacturers are Ford (13%), Vauxhall (9%) and Peugeot (8%) with hatchback models the car type preferred by just over half. Around a quarter own or intend to buy a saloon (23%). Cars with smaller engine sizes (below 1.6 litre) account for just under half of vehicles (47%).

The *RAC Report on Motoring* gives the average price paid for new private cars (in 2003) as £12,300 (and for a used car £6,600) (RAC 2004). For all private cars, the average vehicle age and period of ownership are 5.9 and 4.7 years respectively (as of 2003).

The average annual mileage for private cars is 8,240 miles (2002) (DfT 2004c). This consists of 680 miles for business, 2,470 miles for commuting and 5,090 for private mileage. Using the results of the MORI survey, the distribution of annual mileages is shown in Figure 4.4.

¹ A national sample of adults aged 15+ that was representative of the population of Great Britain in terms of sex, age, social class, working status and geographic spread was interviewed. 435 face-to-face interviews were conducted in July 2003.

Figure 4.1 Profile of New Car buyers' Vehicles – Manufacturer (DfT 2004a)

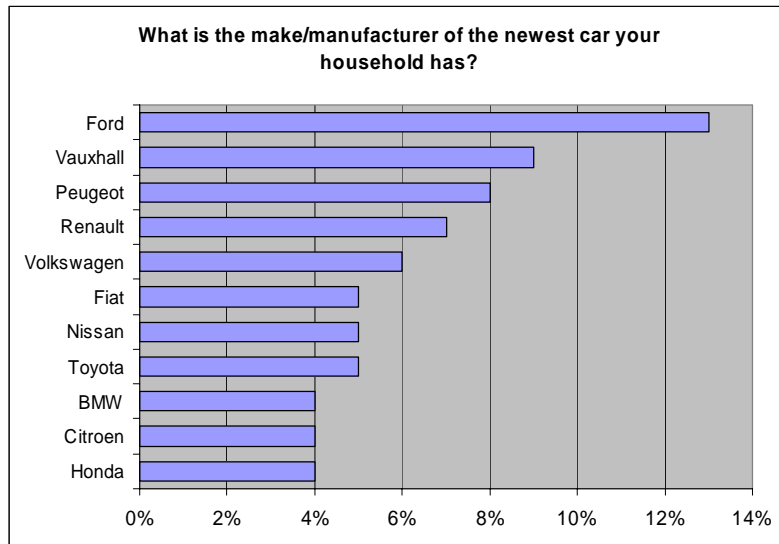


Figure 4.2 Profile of New Car buyers Vehicles - Car Type (DfT 2004a)

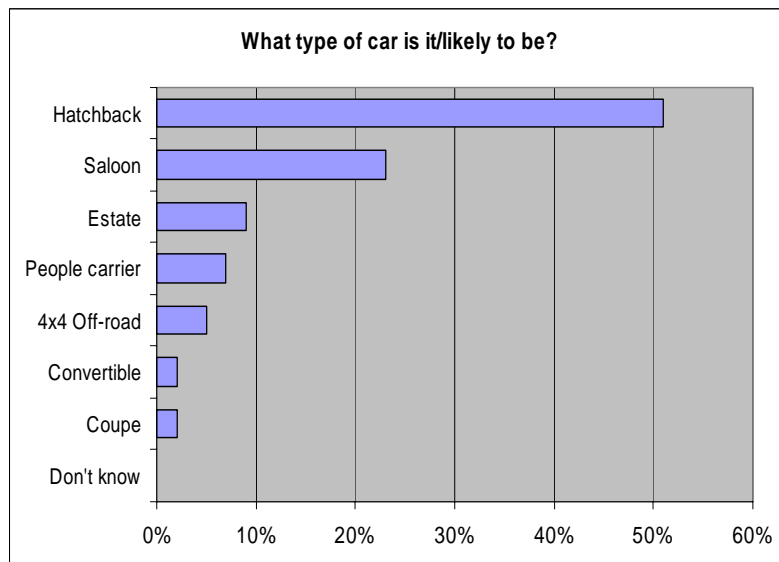


Figure 4.3 Profile of New Car buyers' Vehicles - Engine Size (DfT 2004a)

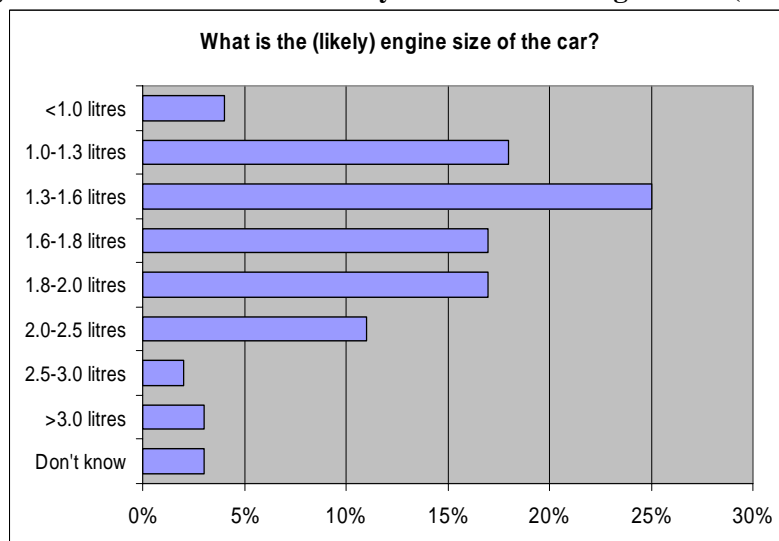
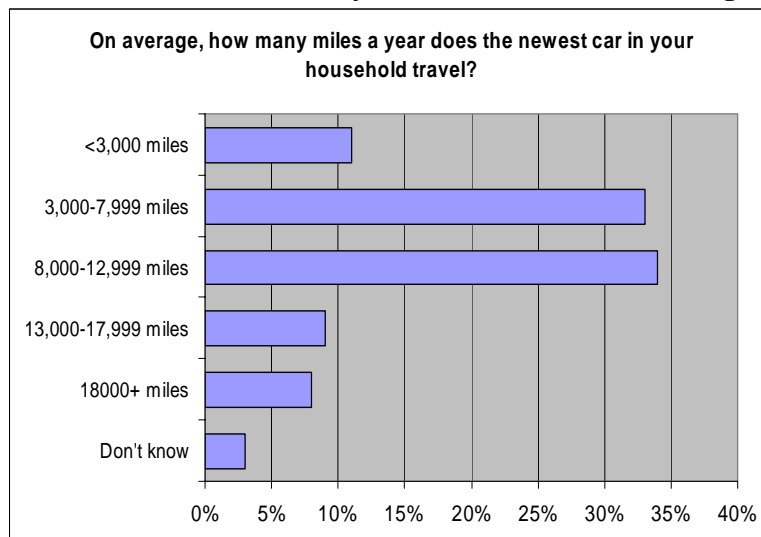


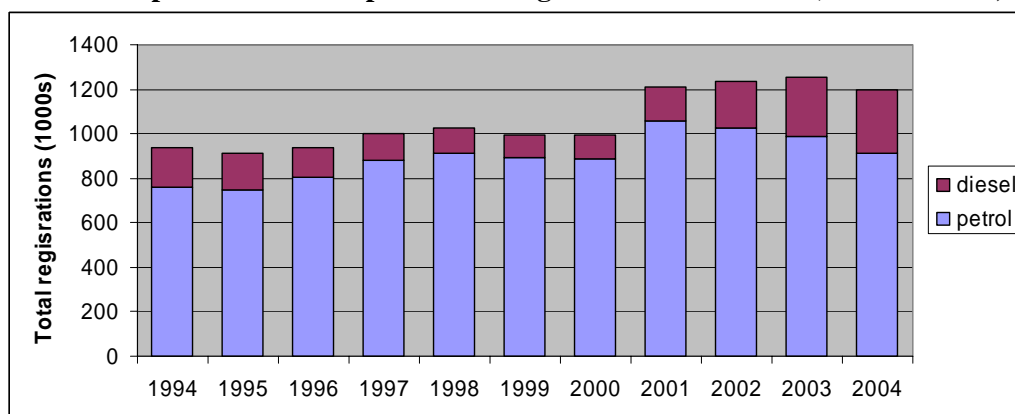
Figure 4.4 Profile of New Car buyers’ Vehicles - Annual Mileage (DfT 2004a)



Conventional fuel and technology trends

One of the most significant trends within the private sector (and of particular relevance to this report) is the recent increase in popularity of diesel cars over petrol. Since 1999 the proportion of UK diesel private car registrations has increased from 10% to over 23% (see Figure 4.5) (SMMT 2004b) – this follows a similar trend in the company car and fleet sectors (see next section). Although this increase in popularity of diesel cars has been dramatic, diesel penetration remains significantly lower in the UK than elsewhere in EU – most notably in France, the total market share for diesels is around 67% (all sectors).

Figure 4.5 New petrol and diesel private car registrations 1994-2004 (SMMT 2004b; RAC 2004)



Understanding the reasons underlying the increasing UK market penetration of diesel cars is of particular interest for the purposes of this report as the issues driving the increasing popularity of diesel over petrol are likely also to apply to alternative fuel and vehicle types. Several factors are likely to be responsible diesel’s increasing popularity. (Note that Graduated Vehicle Excise Duty alone is not thought to be a significant driver of the switch to lower CO₂ cars (including diesel) as “the current graduated scheme does not offer a large enough incentive to encourage behavioural change” (DfT 2004a).)

According to the Institute for Prospective Technological Studies (IPTS), the process of ‘dieselisation’ has been occurring slowly but steadily across Europe over the last 20 years (IPTS

2003).² IPTS consider that the main drivers of this trend have been (and continue to be) the relative price of diesel and petrol fuels and the improved fuel-efficiency offered by diesel engine technology – together these result in typical fuel cost savings of 20%-30% per kilometre for diesel cars as compared to their petrol equivalents. This advantage has (until recently) been counterbalanced in part by diesel's lower performance and higher purchase price (diesels typically command a 10% premium). However, according to IPTS, the trend accelerated (across the EU) in the early 1990s with the advent of improved performance direct injection turbo diesels.

To test these assertions, and to understand the reasons underlying the increasing popularity of private diesel cars in the UK, the author has compared the average diesel penetration (for all sectors) (2000-2003) with the average petrol-diesel fuel cost differential³ (2000-2003) for five countries (France, Germany, Italy, Spain, UK) and the EU15 average (using data sourced from SMMT 2004b and DTI 2004) – see Table 4.2. Although the data used cover all sectors, the results do seem to confirm a (moderate) positive correlation between fuel cost differential and diesel penetration – *of the five countries and one region, the UK has smallest fuel cost differential between petrol and diesel and also the lowest percentage penetration of diesels.*

As a second simple test, the author also compared the average diesel penetration (for all sectors) (2000-2003) with the price premium for diesel cars⁴ (in 2002) for five countries (France, Germany, Italy, Spain, UK) (using data sourced from SMMT 2004b and Eurostat 2003) – see Table 4.2. Within the limitations of the analysis the results again seem to confirm a (moderate) negative correlation between purchase price premium and diesel penetration – *of the five countries, the UK has the largest purchase premium between petrol and diesel and also the lowest percentage penetration of diesels.*

Table 4.2 EU car dieselisation rates, fuel cost differentials and diesel car premiums (all sectors)

Country/region	Level of dieselisation (average 2000-2003)	Fuel cost differential (average 2000-2003)	Diesel car price premium (2002)
	<i>percentage</i>	<i>pence per litre*</i>	<i>EU15 petrol = 100</i>
France	59.0%	28.0	9.6
Germany	35.6%	26.6	12.6
Spain	55.5%	18.8	13.1
Italy	40.4%	25.8	12.2
EU15	38.6%	24.6	10.0
United Kingdom	20.7%	17.6	15.9

Sources: SMMT 2004b; DTI 2004; Eurostat 2003
*Taking into account the improved efficiency of diesel as compared to petrol.

It should, however, be noted that the limitation of these analyses is that each country has its own unique private/company car split and method of car taxation. Having said that, the data presented does not contradict IPTS' assertion of the importance of vehicle and fuel costs (per kilometre) (or 'mpg') for consumer car buying behaviour in this context. It is also worth noting that the data used is more useful in throwing light on the UK private car market rather than the UK company car sector, which is primarily driven by the system of company car taxation – see next section.)

4.2 Profile of the market for new passenger cars – company car/fleets

Company car sales account for just over half (53%) of all annual new car registrations in the UK. In 2004, this equated to around 1.4 million sales (SMMT 2004a) – and consisted of 1.1 'fleet' cars

² In common with the aims of this report, the purpose of IPTS' analysis of dieselisation was to understand consumer acceptance of alternative vehicle fuels and technologies.

³ On a per litre basis – assuming a 25% fuel cost reduction (per km) for diesel cars as compared to petrol.

⁴ As compared to their petrol equivalents and assuming an EU15 price premium of 10%..

(with 25+ vehicles in fleet) and 0.3 ‘business’ cars (purchased by companies with <25 vehicles). The total number of company cars (business and fleets) is around 2.9 million vehicles.

According to the RAC Report on Motoring, the company car driver and company car profiles (new registrations and existing vehicles) are as shown in Tables 4.3 and 4.4. The percentage of company car drivers agreeing with the statement “my company car is essential to my job” has steadily grown from around 69% in 1993 to 80% in 2003.

Table 4.3 Profile of company car drivers by gender, age and region (RAC 2004)

Gender (2003)	Age (2003)	Region (2003)
Male (87%)	17-34 (19%)	North (25%)
Female (13%)	35-54 (67%)	Midlands (22%)
	55+ (14%)	London and SE (34%)
		SW and Wales (16%)
		Scotland (3%)

Table 4.4 Profile of company cars by fleet size and industry sector (RAC 2004; SMMT 2004a)

Annual company car sales by fleet size (2004)	Company cars by industry sector (2000)
In fleets <25 cars – 274,000 (18%)	Service sector (43%)
In fleets 25+ cars – 1,093,000 (82%)	Self-employed and I-car fleets (25%)
	Manufacturing/primary (20%)
	Public sector (12%)

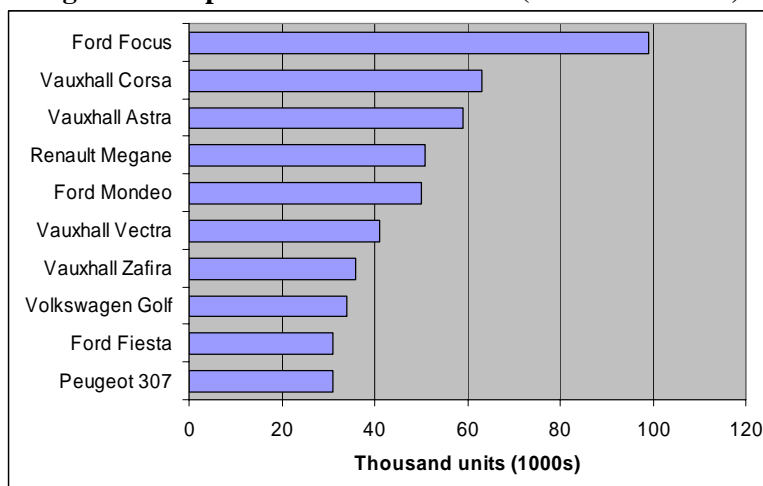
The RAC Report gives the average price paid for new company cars (in 2003) as £18,200 (RAC 2004). Table 4.5 shows the sources of finance used for vehicle purchase together with the methods of acquisition and disposal.

Table 4.5 Company cars: finance, acquisition and disposal in 2000 (RAC 2004)

Acquisition	Disposal	Sources of finance
Contract hire (46%)	Contract hire (51%)	Contract hire (40%)
Local dealer (35%)	Local dealer (23%)	Outright purchase (24%)
National dealer (8%)	National dealer (6%)	Finance leasing (16%)
Direct (5%)	Direct (1%)	Hire purchase (10%)
Other (6%)	Auction (13%)	Bank loans (5%)
	Employee (6%)	Contract purchase/PCP (3%)

In 2004, the most popular company/fleet cars included the Ford Focus (which accounted for 7% of company car sales), the Vauxhall Corsa (5%) and the Vauxhall Astra (4%) (Fleet News 2005). The ‘top 10’ UK fleet cars for 2004 are as shown in Figure 4.6.

Figure 4.6 Top 10 fleet models in 2004 (Fleet News 2005)



For all company cars, the average vehicle age and period of ownership are 2.6 and 3.2 years respectively (as of 2003) (RAC 2004). The average for employer provided cars is 1.5 years and those that are purchased as business expense have an average age of 4.1 years.

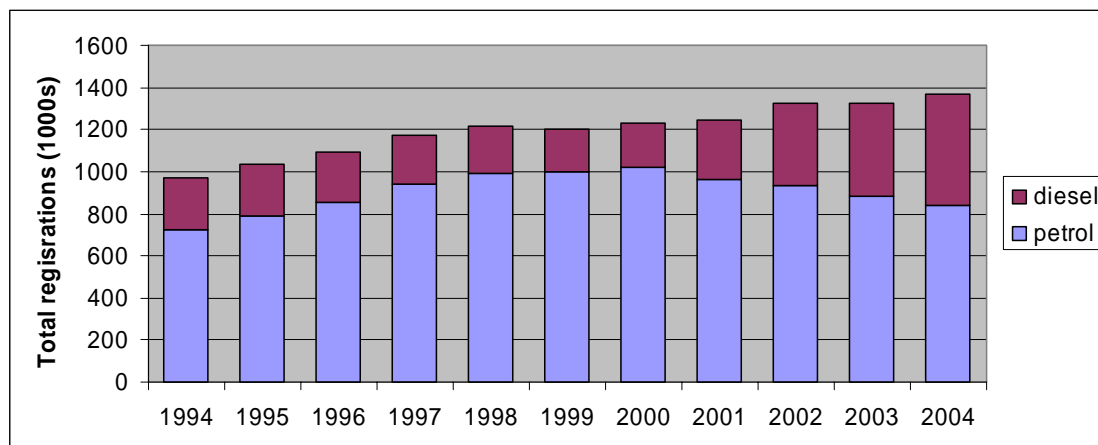
The average annual mileage for all company cars is 19,950 miles (2002) (DfT 2004c). This consists of 8,600 miles for business, 5,760 miles for commuting and 5,580 for private mileage. Drivers of company cars receiving ‘free’ fuel have a slightly higher annual mileage of 21,120 miles.

Conventional fuel and technology trends

As was noted in the last section for private cars, one important recent trend has been the increase in the market-share of diesel company cars. Since 1999, there has been a significant increase in the levels of company diesel sales to the extent that diesel cars now represent over 40% of company fleets (IR 2004; SMMT 2004a; SMMT 2004b) – see Figure 4.7. Most commentators attribute this increase directly to the reform in the system of company car taxation that occurred in 2002 (see footnote for details)⁵ – indeed, the new popularity of company diesels can be traced back to 1999 when the 2002 reform of company car tax was announced.

According to the Inland Revenue, almost 40% of employers providing company cars also consider that the taxation reforms prompted changes in policies towards the type of fuel used and almost half are of the opinion that at least some of their staff are switching to diesel as a result of the changes in the tax system (IR 2004). This suggests a high level of success regarding this policy’s impact on reducing carbon emissions from the company car sector and provides useful insights into the design of effective price signals for alternative fuel and vehicle types – this issue will be discussed in more detail in later sections.

Figure 4.7 New petrol and diesel company/fleet car registrations 1994-2004
(SMMT 2004a; SMMT 2004b; RAC 2004)



⁵ Since April 2002, the charge on the benefit of a company car is based on a percentage of the list price of the car (plus accessories), the rate being determined by the car’s CO₂ emissions. (This replaced the old system that used the list price and mileage to calculate the tax payable.) The benefit-in-kind (BIK) is then taxed at the appropriate rate of personal taxation (ie 22% or 40%) and is usually collected through the PAYE system. For petrol and Euro IV compliant diesels, the percentage BIK rates range from 15%-35%, depending on the car’s CO₂ emissions (rounded down to the nearest 5g/km). In 2005/06, the percentage is 15% if the CO₂ emissions figure is 140g/km or less. For each additional 5g/km, the percentage increases by 1% up to a maximum rate of 35%. Diesel cars not meeting Euro IV standards incur an additional 3% charge to reflect their high levels of regulated emissions (compared to petrol). Note that all diesel cars registered on or after 01/01/2006 will incur the extra 3% charge.

4.3 Profile of the market for new low carbon/fuel-efficient passenger cars

In contrast to the detailed consumer profile of buyers of conventional cars, there is less information concerning the profile of the low carbon UK car market. This is to be expected for two reasons:

- Relatively few cars in the UK are highly fuel-efficient or could be defined as low carbon – less than 3% are currently defined by the AA and AAA VED categories, and only around 590 vehicles are currently registered under the AAA band (SMMT 2004c); and
- What information is available is likely to be treated as confidential by those companies that manufacture highly fuel-efficient models.

That said, one recent study that does investigate the UK market profile for new low carbon/fuel-efficient passenger cars is the *Consumer acceptance of new fuels and vehicle technologies* report, an MBA research project conducted at the Judge Institute of Management in Cambridge on behalf of Shell (Shell 2004).⁶ The study focuses on consumer acceptance during the early growth phase of market development of new car fuels and technologies. Through the use of consumer market research, expert interviews and desk research, the study considers UK private car and fleet sectors and includes: liquefied petroleum gas (LPG), compressed natural gas (CNG), hydrogen, ethanol (E85), bio-fuels and gas-to-liquid (GtL) fuels; and also hybrid-electric and fuel cell technologies.

The Shell report identifies no less than seven *early adopter* segments for new car fuels/technologies within the UK (see Section 3.3) (Shell 2004). These are given the names: ‘Stars’, ‘Mr Fast-tracker’, ‘Mrs Fast-tracker’, ‘Individualists’, ‘Long hauler’, ‘Green papas’, and ‘Fleet buyers’. Table 4.5 lists the characteristics of each of these early adopter segments.

Table 4.5 New fuel and vehicle technology early adopter segment definitions (Shell 2004)

Stars	Green papas	Ms Fast-tracker	Mr Fast-tracker	Individualists	Long hauler	Fleet buyers
Extremely fashionable	Extremely sensitive to cost	Concerned with safety	Fashionable middle class	Medium mileage / usage frequency	Extremely sensitive to cost and technology reliability	Motivated by total cost of ownership
High social status	Middle class - "nest builder"	Medium mileage and frequent city user	Medium mileage and frequent user	Private use	High mileage and frequent use	Highly sensitive to financial incentives
Low mileage / high frequency use	Medium mileage and frequent use	Private use	Private use / commuting	Emotional view of vehicles	Commuting	High mileage and frequent use
Private use	Private/professional use	Functional view of vehicles	Emotional view of vehicles	Urban dweller	Functional view of vehicles	Technology reliability paramount
Emotional view of vehicles	Functional view of vehicles	Urban dweller	Urban dweller	Highly environmental sensitivity	Urban/rural dweller	Centrally/depot based
Urban dweller	Urban dweller	Less sensitive to environment	Not environment driven	Interested in technology	Less sensitive to environment	Business/professional use
Not motivated by environmental concerns	Environmentally conscious	No interest in technology	Interested in technology	Demand similar refuelling experience	Interested in technology	Less interested in fashion
Interested in technology	Less interested in technology	Insensitive to performance	Insensitive to cost	Style driven	Sensitive to availability and performance	Environmental issues not a priority
Cost insensitive	Insensitive to performance		Performance driven			
Performance driven						

⁶ The aims of the research are to: understand consumers’ level of familiarity with new fuel technologies; identify the associations consumers make with new fuel technologies; and explore the critical attributes that influence consumer acceptance of new fuel technologies.

All seven early adopters share common characteristics. They are: predominantly new car purchasers; have higher than average education levels; have higher than average wealth; are urban dwellers; and are interested in technology and innovation (Shell 2004). However, their differences are also revealing. According to the study, some segments are more price-sensitive than others (most: Fleet buyers, Long haulers; least: Stars, Mr and Mrs Fast-tracker). The Stars, Fleet buyers and Green papas also engage with the market at an earlier stage than the Fast-trackers and Individuals.

Using the study's categories, Fleet buyers represent the largest of the early adopter segments and account for around 53% of the total car market (representing 1.4 million annual sales) (Shell 2004). Excluding fleets, the Shell study estimates that the other six early adopter market segments account for 10%-20% of the *private* UK car market (representing 120,000-240,000 annual sales). Based on calculations by the author, the absolute and relative sizes of the segments are shown by the figures and percentages shown in Table 4.6. Being the largest segment, Fleets (according to the study) play a key role in the early stages of market development and are seen as the key drivers of infrastructure and vehicle development. They therefore play an important role in raising awareness of new fuel/vehicle technologies.

Table 4.6 Absolute and relative sizes of UK early adopter segments (Shell 2004; SMMT 2004a)

Market (Per year)	Total (1000s / %)	Stars	Green papas	Ms Fast-tracker	Mr Fast-tracker	Individualists	Long hauler	Fleet buyers
Private UK car sales	120-240	5-11	26-52	13-25	21-41	27-55	28-56	
	10-20%	0.4-0.9%	2.2-4.3%	1.1-2.1%	1.7-3.4%	2.3-4.6%	2.3-4.7%	
Total UK car sales	1487-1608	5-11	26-52	13-25	21-41	27-55	28-56	1367
	58-62%	0.2-0.4%	1.0-2.0%	0.5-1.0%	0.8-1.6%	1.1-2.1%	1.1-2.2%	53.0%

Although there is no other major UK study that investigates (in any great detail) the market profile for new low carbon/fuel-efficient passenger cars, academic research and consumer preference surveys have been conducted in several other countries. These focus on profiles of early adopter car consumers for three car fuel/technology types: LPG, clean diesel and petrol-hybrid car sales. Reports pertinent to these issues include: *Car Fuel-Type Choice Under Travel Demand Management And Economic Incentives* (Ewing and Sarigöllü 1998); *The taxation of drivers and the choice of car fuel type* (Rouwendal and de Vries 1999); and *Consumer Awareness of Hybrid Electric and Clean Diesel Vehicle Technologies on the Rise* (report summary) (JD Power 2004a).

On first reading, these reports seem (in part) to contradict each other. However, on closer inspection, these studies reveal aspects of a unified (though complex) picture. It appears that different studies focus, to varying degrees, on different early adopter sub-groups.

In a Dutch study (where the comparative car cost structure has similarities with the UK), the authors make the observation that high mileage drivers are more likely to be attracted by lower fuel costs. As noted by Rouwendal and de Vries "... it should be expected that drivers who have a large demand for kilometres are more inclined to choose diesel or LPG" (Rouwendal and de Vries 1999). They also note that the lower variable costs of diesel and LPG are more attractive to younger male drivers. (Even in the US, where cost structure is very different to the UK's, the demographic profile of diesel car owners shows that they are more likely to be male, are younger than average and have higher than average annual mileage (JD Power 2004a).)

A second set of findings come from a more theoretical Canadian study that used a stated preference survey methodology to compare the views of almost 900 car commuters regarding three car types: a conventional car, a more fuel-efficient car, and a zero-emission car. Each car type was associated with a set of fixed and variable costs and performance characteristics. The study concludes that:

- Younger respondents are more likely to choose an innovative vehicle – a 20 year age difference increases the likelihood of choosing an battery-electric or fuel-efficient vehicle by 18%-24%;
- Acceleration and vehicle range issues are of more concern to men, and to younger car buyers – an increase of 20 years reduces the importance of acceleration by 17% and range by 12%;
- In general, consumers are more likely to purchase an innovative car if they are ‘actively concerned’ about the environment;
- The more consumers are willing to pay for a zero-emission vehicle, the more likely they are to choose one; and
- The longer a car is kept by its owner, the more emissions matter – an additional 3 years reduces the likelihood of choosing a car with higher emissions by 8%.

Although still in its infancy, the emerging petrol-hybrid market provides a third set of useful insights into the low carbon car buyer’s profile. In a recent study of US car buyers who had purchased a vehicle with the last three years, a quarter of those interviewed owned petrol-hybrid vehicles (JD Power 2004a; HybridCars 2005). The report summary states that petrol-hybrid car owners are: more likely to be female; older than average; very highly educated; from very high income households; drive lower than average annual mileage; and keep their vehicle longer than average before resale (more than five years). The report also notes aspects of the attitudinal profile of petrol-hybrid car owners who are: more likely to want to reduce vehicle pollution; more willing to pay for ‘green’ products; more likely to be a recycler; and are more likely to believe that fuel prices will be higher in the future.

“The faster a consumer expects fuel prices to rise, the more likely they are to buy a vehicle with hybrid electric power-train or a clean diesel engine” (JD Power 2004b).

Evidence from the online and printed press confirms the existence of these early adopter segments. For example, there are numerous reports of celebrities who have already purchasing a hybrid car including Tom Hanks, Meryl Streep and Sting (HybridCars 2005). Press reports also state that 71% of Prius buyers are men, have an average age of 53, a college education and a median income of \$85,900 a year (Washington Post 2001). A moderator on the Yahoo Toyota Prius discussion group notes that:

“Prius owners tend to be very interesting people—interested in a lot of different things. They get these cars not just as a means to get from one place to another. Some of them are making a statement. For some of them, me included, it’s very practical as a brilliant technology. People like me who got them in the beginning had to be a little more courageous than your average person” (HybridCars 2005).

This also accords with the view of Honda, that buyers of hybrid electric vehicles tend to be technology enthusiasts who want to be the first in their neighbourhood to get the car (Washington Post 2001). One interesting issue raised is that, over time, the demographic profile of a hybrid driver will shift (HybridCars 2005). The next generation of larger, more mainstream hybrids will emphasize luxury and power rather than environmental benefits. Whereas the Escape has been dubbed *“the automotive equivalent of the iPod”*, the Lexus SUV hybrid *“is about to enter the latte generation’s comfort zone”* (Edmunds.com 2004).

The Shell study goes a stage further than just identifying the early adopter segments by matching ‘consumer preference curves’ of each segment with ‘technology profiles’ that summarise the pros and cons of each fuel/technology relative to a petrol car (Shell 2004). (These profiles are created

through a series of market and expert interviews – see Section 6.4.) Given that each early adopter sub-group has a different ‘needs profile’, the study finds that specific early adopter segments are best served (to varying degrees) by particular fuel technologies (see Table 4.7). The Shell report stresses the point that new fuel/vehicle technologies represent a range of ‘value propositions’ for consumers and therefore address different types of early adopters.

Table 4.7 Matching of fuel/technologies with specific early adopter segments (Shell 2004)

	Stars	Individualists	Mr Fast-tracker	Mrs Fast-tracker	Green papas	Long haulers	Fleet buyers
Hybrids	☒	☒	☒	☒		☒	☒
Bio-Fuels		☒	☒	☒			
Ethanol							
LPG					☒	☒	☒
CNG					☒		☒
GtL		☒	☒				
Hydrogen/ Fuel Cell	☒		☒				

4.4 Research questions 1-2

RQ1 - What is the profile of the market for new passenger cars?

The market profile for conventional cars is well known from data from existing data sources (including DfT, SMMT and VCA). Rather than repeat the profiles again, the reader is referred back to Sections 4.1 and 4.2.

That said, one of the most significant trends within the private and fleet sectors (and of particular relevance to this report) is the recent increase in popularity of diesel cars over petrol. Since 1999 the proportion of UK diesel private car registrations has increased from 10% to over 23% (SMMT 2004b). This follows a similar trend in the company car and fleet sectors. Since 1999, there has been a significant increase in the levels of company diesel sales to the extent that diesel cars now represent over 40% of company fleets (IR 2004; SMMT 2004a; SMMT 2004b).

For the UK private sector, most commentators attribute the increasing popularity of diesels to the relative price of diesel and petrol fuels and the improved fuel-efficiency offered by diesel engine technology. Although this advantage has (until recently) been counterbalanced in part by diesel’s lower performance and higher purchase price, the trend accelerated with the advent of improved performance direct injection turbo diesels. For fleets, the increase is a direct consequence of the reform in the system of company car taxation that occurred in 2002 – indeed, the new popularity of company diesels can be traced back to 1999 when the 2002 reform of company car tax was announced. These observations provide useful insights into the design of effective price signals for alternative fuel and vehicle types.

RQ2 - What is the profile of the market for new low carbon/fuel-efficient passenger cars?

Only one research study was found that directly address this question for the UK market – the Cambridge MBA research project conducted at the Judge Institute of Management in Cambridge on behalf of Shell (Shell 2004). This report identifies seven early adopter segments for new car fuels/technologies within the UK, including fleets, the largest segment (comprising around half of the total car market), and six private market segments that account for 10%-20% of the *private* UK car market.

The common characteristics shared by these early adopters include that they are: predominantly new car purchasers; have higher than average education levels; have high incomes wealth; are urban dwellers; and are interested in technology and innovation (Shell 2004). However, some segments are more price-sensitive than others (most: Fleet buyers, Green papas; least: Stars, Mr and Mrs Fast-tracker). The Stars, Fleet buyers and Green papas also engage with the market at an earlier stage than the Fast-trackers and Individuals. Being the largest segment, Fleets play a key role in the early stages of market development and are seen as the key drivers of infrastructure and vehicle development. They therefore play an important role in raising awareness of new fuel/vehicle technologies.

Research from other countries also reveals the existence of early adopter markets. While the findings of several non-UK studies at first appear confusing, a more consistent picture emerges if one considers that each are sampling a different early adopter subgroup. These findings then generally concur the results from the Cambridge MBA report.

5 The car buying process

5.1 Key factors involved in car-purchasing decision-making – private car

In the last five years, several studies have detailed the decision-making processes involved in buying a car for private use. Although this has not been their main objective in most cases, the process has been studied in detail to assist with the understanding of the role of vehicle excise duty and the design of the new UK car-labelling scheme due for introduction in July 2005 (DfT 2003a).

Figure 5.1 Factors involved in the decision-making process when buying a car (Source: DfT 2003a)



According to the quantitative survey reported in *Assessing the Impact of Graduated Vehicle Excise Duty*⁷ (DfT 2004a), the car buying decision-making process for private car purchases is predominantly driven by financial and performance considerations including: price, fuel consumption, comfort, size and practicality and reliability. Environmental issues play little part in the process and, as Table 5.1 indicates, are among the least important factors feeding into the new-car buying decision process.

Table 5.1 What factors were/will be important in deciding what car to buy? (Source: DfT 2004a)

Most important (10%-30%)	5%-10%	Least important (<5%)
Price MPG/Fuel consumption Size/Practicality Reliability Comfort Safety Running costs Style/Appearance	Performance/Power Image/Style Brand name Insurance costs Engine size Equipment levels	Depreciation Personal experience Sales Package Dealership Environment Vehicle Emissions Road tax Recommendation Alternative fuel

⁷ Study uses data collected by a MORI General Public Omnibus poll (435 face-to-face interviews) conducted in 2003.

This is supported by the qualitative survey that was part of the same study (DfT 2004b), which analysed the range of factors considered during procurement of a new vehicle. The survey found that several factors stand out as key within the decision-making process. These include:

- **Costs** - the initial cost of the vehicle, its depreciation rate and running costs including insurance, fuel consumption/economy and servicing. *“Straight away it has to be within budget. There will be a budget I am working to and then for me it’s reliability” (Male 25-50)*
- **Brand loyalty** - many car buyers stay with one brand name of car once they find one that they are satisfied with. *“I’m a Rover man, have been for the past 20-25 years. The last car I bought I got a 30% discount for being a loyal customer” (Male 50+)*
- **Reliability** - people want reliable cars that require minimal maintenance.
- **Image** - cars are often seen as a source of prestige...and many are concerned that their car exudes the right kind of image and is ‘good looking’. *“I personally go on looks first” (Male 50+)*
- **Comfort** - cars must be comfortable, have enough legroom, good visibility, and good seating. *“I’d be really looking at comfort because I have a bad back” (Female 25-50)*

The report identifies a set of ‘secondary’ factors which include: running costs, size of car, performance, colour, safety, petrol/diesel; and ‘tertiary’ issues such as: emissions/environmental impact, warranty, (VED) tax band, and number of doors.

Similar findings are reported in an earlier study entitled ‘*Comparative colour-coded labels for passenger cars*’ which assessed reactions to the use of car labels (DfT 2003a).⁸ Whilst no single factor is found to be exclusively important when deciding what car to buy, certain issues are significant. These include practicality, reliability, cost, the sales package and safety. The report lists the factors that play a key role in the decision-making process as follows:

- Vehicle type (size, layout etc.);
- Comfort (eg driving position, seating, suspension);
- Initial Cost / Affordability;
- Performance / Power (negative and positive);
- Practicality (eg size, versatility);
- Reliability;
- Reputation of make / Personal recommendation of car;
- Running costs (eg fuel costs, insurance, VED, servicing);
- Safety features;
- Sales Package (eg finance deal, free insurance/servicing, extended warranty, breakdown cover);
- Style / Image (interior / exterior).

In addition to these ‘essential aspects’, a number of less important factors are identified by the study and are viewed as additional bonuses. Used to make final comparisons (other factors being equal), these are:

- Additional interior style features (eg heated seats, air conditioning, climate control, sunroof);
- Additional exterior style features (eg metallic paint, tinted glass, front fog lights);
- Colour;
- Gadgets (eg navigation system, CD player, courtesy mirror, cup holder);
- Likely depreciation;
- Power steering / Manoeuvrability.

⁸ The research programme comprised three stages: (1) focus groups to assess reactions to the use of car labels, and proposals for the design of the labels (Oct- Nov 2002); (2) quantitative survey among new car buyers (Feb - Mar 2003); and (3) researching sales-staff and consumers to gauge a broader range of views of a pilot car label within the showroom environment (May - July 2003).

Again, although the survey is unable to pinpoint a single key factor that determines the purchasing decision, cost considerations are prevalent and environmental issues are less important (if mentioned at all). The study concludes that the final decision is made based on a combination of different objective and subjective criteria, the exact combination depending on the individual and their requirements (DfT 2003a).

If further evidence were required that environmental issues are low on most car buyers' list of priorities, a study by the Transport Research and Environmental Change Institutes (*Choosing Cleaner Cars: The Role of Labels and Guides*) analyses the relative vehicle characteristics in purchase choice. In the study,⁹ respondents are asked to rate how important characteristics are in their decision to purchase a new car (see Table 5.2) (TRI/ECI 2000).

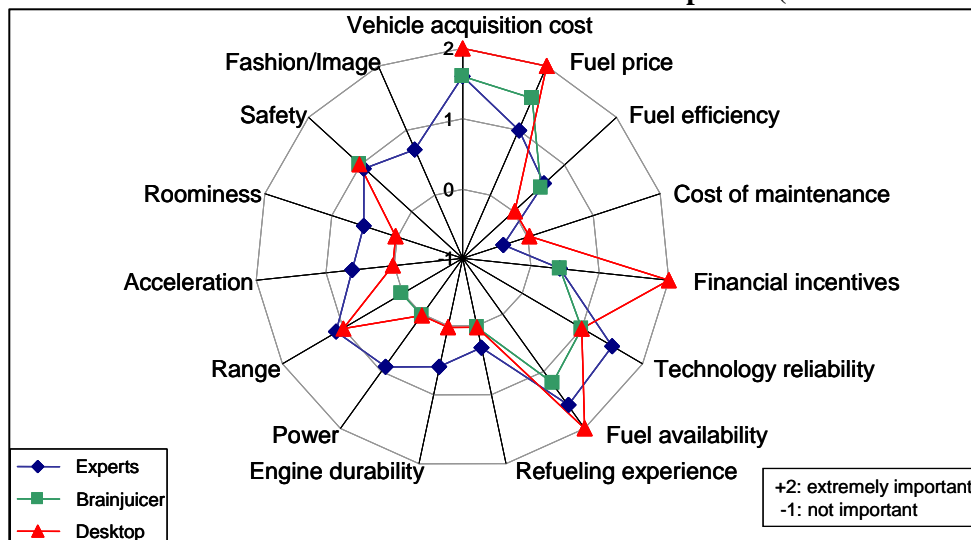
Table 5.2 Importance of vehicle characteristics in purchase choice (Source: TCI/ECI 2000)

	Very important	Quite important	Important	Not very important	Not important	Don't know	Overall ranking
Reliability	84	7	8	-	1	-	1
Safety	66	19	8	4	1	2	2
Comfort	60	21	14	4	1	-	3
Price	54	19	16	5	6	1	4
Appearance	37	30	20	6	7	-	5
Fuel economy	44	18	22	7	9	-	6
Internal space	39	26	17	12	6	-	7
Physical size of car	28	27	19	14	11	1	8
Brand	30	20	15	18	16	0.4	9
Env. impact (emission levels)	27	26	19	11	17	1	10
Engine size	19	25	19	19	17	1	11
Resale value	25	23	18	12	19	3	12
Fuel type (diesel/petrol)	24	19	19	17	20	1	13
Financial package available	30	13	13	11	30	3	14
Recommendation	21	20	16	18	23	3	15

The results show that environmental impact is ranked overall in 10th place (out of 15); clearly a fairly low priority for most new car buyers (TRI/ECI 2000). A related factor, fuel economy, is ranked number 6. The study notes that both these characteristics seem to lie in a second tier of criteria after reliability, safety, comfort, price and appearance. (Interestingly, the TRI/ECI report also notes the findings of a previous consumer survey carried out by the RAC (in 2000), which found that 87% of consumers take price into account, 84% reliability, 63% safety and 60% fuel efficiency (top four) and far fewer (25%) take 'environmental friendliness' into account.)

The study conducted for Shell (mentioned in previous sections) has also analysed the most important factors involved in consumer *acceptance* of new fuel/technology vehicles (see Section 3.2 for definition of the term). Through the use of consumer market research, expert interviews and desk research, the research team notes 33 attributes considered important by consumers (Shell 2004). Of these, 15 are identified (by experts, a 'Brainjuicer' consumer survey and desktop research) as the most relevant in the process of consumer acceptance of a new vehicle fuel or technology. These are then rated on a sliding scale (see Figure 5.2). According to the expert interviews and consumer surveys, the four most important attitudes are (in no particular order): **Vehicle acquisition cost; Fuel price; Fuel availability; and Technology reliability.**

⁹ The survey research was conducted in two phases. The first phase involved focus groups of participants that had bought a passenger car in the previous two years. In a second phase, the results from the focus groups were used in 2000 to inform a telephone questionnaire of 278 individuals who had reported they had bought a new car in the previous two years, taken from a geographically representative, monthly OMNIBUS sample of 1,000 motorists.

Figure 5.2 Most relevant attributes for car consumer acceptance (Source: Shell 2004)

In addition to the importance of cost factors (which are to be expected), it is interesting to note the high priority given to technology reliability by both the TCI/ECI and Shell studies (see Table 5.2 and Figure 5.2). This is likely to have implications for the acceptance of new technologies whose reliability is less well known and points to the potential role of brand reputation in overcoming consumer uncertainty. (The issue of reliability turns out to be particularly important for fleets – see Section 6.4).

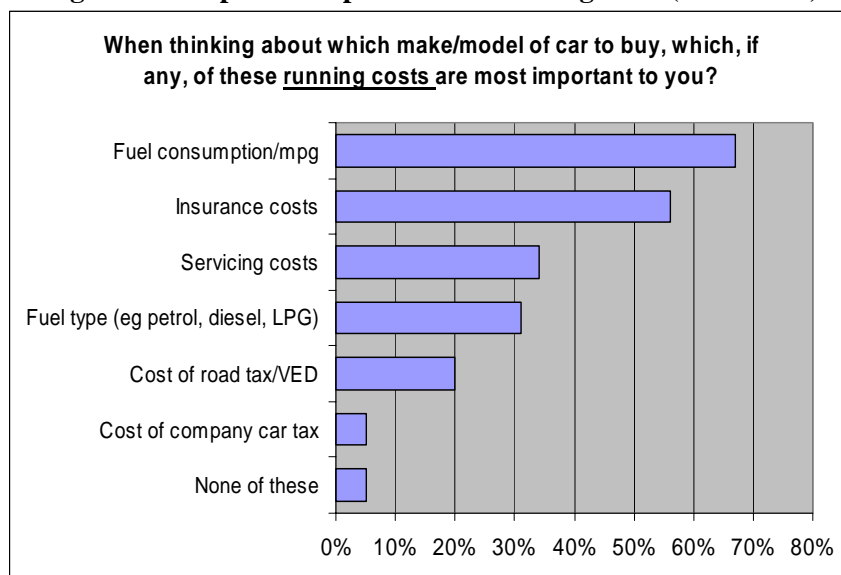
The DfT car-labelling study of 2003 notes a two-stage process whereby vehicle requirements and costs are taken into account by a prospective car buyer. First, the car's capabilities and purchase price initially determines which cars are to be considered by the consumer. Second, as these cars are reviewed, the cost consideration becomes more sophisticated involving new cost (and other) issues that include: available fuel types, likely depreciation, available engine sizes, VED tax band, fuel consumption, insurance group and maintenance costs (DfT 2003a). The TRI/ECI report *Choosing cleaner cars* confirms the existence of two-stages of the car buying process.

“In the first phase, a class or classes of vehicle were decided upon. In the second phase, choices within the class were screened” (TCI/ECI 2000).

Importance of costs and fuel economy

The ‘secondary’ cost considerations (see above) are also noted by the report that assesses the impact of graduated VED (DfT 2004a). This finds that, of these cost factors, car buyers ranked them in order of importance as follows: fuel consumption, insurance costs, servicing costs, fuel type consideration and road tax (DfT 2004a) (see Figure 5.3). The report also notes that younger new car buyers (aged 18-24) are more likely to identify insurance (80%) and road tax (39%) as important costs. [Note: Section 6.5 will examine the accuracy of consumer perceptions regarding fixed and variable car costs.]

However, although fuel economy is rated as a key variable cost by the DfT studies (and is widely reported elsewhere as a key factor), the TRI/ECI report throws some doubt on the actual use made of fuel economy information in consumer purchasing behaviour: *“For most, little effort was expended in comparisons of fuel consumption during the decision-making process”* (TRI/ECI 2000). This report notes at least six reasons why, for the majority of car buyers, little use is made in comparing ‘mpg’ rates of different cars.

Figure 5.3 Reported importance of running costs (DfT 2004a)

Note: A small number of respondents (5%) include costs associated with owning a company car. Although the survey was targeted at those with private vehicles some may also have a company car within the household and therefore included costs associated with owning a company vehicle in their answer.

First, for luxury car purchases, fuel economy and overall fuel costs form a relatively smaller proportion of overall costs (TRI/ECI 2000):

“I mean, if you have got the money to buy a fast performance car then frankly you aren’t really interested in how much its going to cost you to run it...” (Focus group participant)

This argument also applies to drivers with low annual mileage:

“I wasn’t really worried about MPG at all, purely because I don’t do the mileage” (Focus group participant)

A third reason proposed is that any consideration of fuel consumption generally takes place after the class of vehicle has been chosen. The focus group discussions conducted as part of the study suggest that many car buyers assume that there is little difference in fuel consumption between cars within a class (particularly for mid-range vehicle classes). One focus group participant is quoted:

“I mean you tend to know what cars use in the class that you drive and I mean they are all pretty much in the same range [referring to fuel consumption]. I know I am not going to be buying a BMW or whatever because I am not going to spend that much money and I don’t want to be at the bottom of the range because I don’t feel safe. So I know I am going to be in the middle somewhere and that there is not really that much difference” (Focus group participant)

Next, although there is a perception that there is a large variation in fuel consumption across the entire range of vehicle classes, this is also commonly coupled with the view that ‘buying new is buying best’. The assumption made is that as manufacturers are constantly improving the fuel efficiency of their engines, just by buying a new car, one is automatically making a fuel-efficient choice.

“The other thing is, the manufacturers now are getting everything off to a fine art. The technology has advanced so rapidly that cars are getting more and more efficient, so you are probably looking at the newer the car now the better” (Focus group participant)

Fifth, those consumers who *are* interested in fuel efficiency, consider it as an important factor early on in the decision process, are usually interested in economy more generally and tend to buy smaller, cheaper and more functional cars most suited to short-trip urban driving.

“I’ve got a Nissan 1 litre. The reason I bought it was economical. It’s got low taxation and I think it’s enough for me, sort of thing, just for going to and from town”
 (Focus group participant)

Lastly, among car buyers, there is little confidence in the validity of published fuel economy data. One reason for this is that consumers are well aware that fuel economy is highly dependent on driving style. Car buyers are also unaware that, although the fuel economy data do not represent real driving conditions, the repeatable test cycles allow a useful comparison of ‘mpg’ between different models.

“I mean the average figures quoted, I mean they are not really relevant are they. Nobody travels at a constant 56 miles per hour” (Focus group participant)

The author would like to draw the reader’s attention to an apparent contradiction between the evidence presented by the TCI/ECI report (which asserts that ‘mpg’ has little impact on car choice) and the recent increase in diesel penetration that appears to be driven (in part) by the fuel cost savings offered by diesel’s high fuel economy (as compared to petrol) – see Section 4.1.

One possible explanation that removes this paradox centres on the observation by the TCI/ECI study that “any consideration of fuel consumption generally takes place after the class of vehicle has been chosen”. While some car buyers may use fuel economy as a way of identifying the class of vehicle they wish to purchase (eg those who believe that ‘diesel cars give better mpg than petrol cars’), if the TRI/ECI findings are correct, once the class has been decided upon, fuel economy may have only marginal impact on car choice during the second phase of the car buying process.

The TRI/ECI study also investigates in detail the prevalence of the assumption that similar sized vehicles use the same amount of fuel. Respondents are asked to state their level of agreement with the statement: ‘The differences in fuel consumption between cars of the same size are insignificant’. As Table 5.3 shows, only 16% are strongly opposed to this idea, 39% disagree to some extent, while more (44%) agree with the proposition.

Table 5.3 ‘The differences in fuel consumption between cars of the same size are insignificant’

Agree strongly	Agree slightly	Neither agree nor disagree	Disagree slightly	Disagree strongly	Don’t know
17%	27%	12%	23%	16%	5%

Source: TCI/ECI 2000

According to the study, the logic of this apparently common view leads to the perception that larger vehicles consume more for a certain distance and are therefore less “efficient” whilst smaller vehicles consume less and are therefore more “efficient”. Consequently, *efficiency* is conflated with *consumption* and it becomes hard to imagine an efficient sports car or an inefficient small car; fuel efficiency is necessarily traded off against performance, safety and even aesthetic appeal.

“If you run about in a wee tin box you’ll get stacks of miles to the gallon but if you’ve got a heavy well built car like the Honda with side impact bars that will reduce the efficiency. This all has to be a carried about but it’s a good thing” (focus group participant)

“You don’t get a big beautiful car that will do 60 miles to the gallon and still get a little tinny car that does 20 miles to the gallon” (focus group participant)

This perception has serious consequences when attempting to market fuel efficiency as a desirable product attribute – at present many see it as an aspect of vehicle design that can only be achieved by compromising performance and safety. The broader implication of these findings is that active comparisons of fuel economy both *within* and *across* vehicle classes are often considered unnecessary; the view is that all cars of a particular class will all tend to have the same or similar fuel consumption.

A further reason is cited for giving efficiency a low priority. Respondents strongly endorse the notion that whatever the specification of the car, economy is highly influenced by driving style. Whilst undoubtedly true, this fact is often used to undermine the validity of any fuel economy data that may have been encountered during the information gathering process (see Section 5.3). Although the identical test conditions allow a valid comparison of ‘mpg’ between vehicles, many of the respondents have the sense that fuel economy information does “not really apply to me” because of the influence of driving style.

“[Referring to the range of fuel consumption of different cars] I would say that most of them get about 40 [MPG] now, but I could be wrong. I don’t know that the car makes much difference to the consumption. I do think that it makes a difference the way people drive...”
(Focus group participant)

Importance of environmental factors

As is apparent in the evidence already presented, a car’s environmental performance is (usually) not a key factor in the car buying process. When asked whether a car’s CO₂ emissions would influence their purchasing decision, participants in the study *Assessing the Impact of Graduated Vehicle Excise Duty* (DfT 2004b) respond with comments which are typified by the following:

“It (lower emissions) would not influence me to buy a car that was especially green if I didn’t like it” (Male, 25-50)

“I don’t think it is an important factor. It’s the other things that come into play like brand loyalty, reliability and comfort. I think they come first. You might think about it but you wouldn’t disregard the car if all other things were in place” (Male, 50+)

It could be argued that, because fuel economy is rated as an important issue by car buyers, that car consumers are (indirectly) interested in a car’s environmental performance. However, the 2004 DfT report notes that “*although fuel consumption and engine size are key drivers of purchase this is due to cost reasons (eg petrol costs) and not environmental concerns*” (DfT 2004b). This point is backed up by the 2003 DfT report ‘Comparative colour-coded labels for passenger cars’:

“Environmental considerations are a low priority when purchasing cars. If considered, it tends to be driven by a financial benefit to the individual rather than desire to help improve the environment” (DfT 2003a).

This position also extends to buyers of cars that run on alternative fuels (such as LPG bi-fuel cars). According to the 2003 DfT report, this is principally due to the fuel cost savings offered by alternative fuels, rather than to the desire to be ‘greener’ (DfT 2003a).

“The reason for looking for better miles per gallon is because it’s cheaper, not because it’s greener” (Male respondent)

Furthermore, there is very little awareness of cars being promoted for their environmental attributes and generally little spontaneous interest in knowing such information. In fact, some drivers see driving as the antithesis of being ‘green’ as driving a car implies making an environmental impact.

“No car is ‘green’. Some are more ‘green’ than others, but they are still polluting the atmosphere“ (Male respondent)

The report also notes that the environment is seen as a dull (although important) issue. This contrasts with other non-economic issues such as safety that could be considered more ‘sexy’ (one which receives increasing attention through the NCAP rating scheme). There is also the perception that, as individuals, consumers can have very little impact on global environmental problems. This makes it difficult to justify higher purchase costs (for a cleaner car) – particularly for low mileage drivers (DfT 2003a).

5.2 Key factors involved in car-purchasing decision-making – company car/fleets

As was discussed in Section 4.2, around half of the new cars purchased in the UK each year are company/ fleet cars. At any one time, there are around 2.9 million company cars in use on UK roads that account for around 15% of all car miles driven (TSGB 2003, IR 2004, RAC 2004). Given that the average company car will become a used private car after around 3 years, the large number of company vehicle sales is therefore very important in determining the future profile of the UK car fleet.

Fleet managers have to take account of a large number of factors when deciding which cars to purchase on behalf of a company or to offer employees. Duty of care and legislation issues are the two of the main priorities of fleet managers, who rate them above economic concerns. This reflects the growing burden of companies’ responsibilities regarding health and safety and other legal obligations dictated by European, national and local Government. According to Lex Vehicle Leasing (Lex 2004), the top operational concerns of fleet managers are (in descending order):

1. Providing duty of care to employees;
2. Conforming to current legislation;
3. Speeding/speed camera issues;
4. Winning management support on key projects;
5. Advising drivers of company car tax bands;
6. Congestion charging/road tolls; and
7. Free fuel for private motoring.

Duties and legislative responsibilities aside, when deciding what cars to purchase on behalf of their company and/or employees, fleet managers consider economic issues to be of paramount importance and are highly sensitive to financial incentives. Combining the finding from Lex and the Shell study (discussed in Section 4.3), these economic concerns include (in no particular order) (Lex 2004; Shell 2004):

- Total costs of ownership;
- Vehicle capital cost;
- Vehicle running costs;
- Fuel prices;
- Residual vehicle values;
- Vehicle taxation; and
- Government incentives.

Of particular note is that most of these financial and legislative concerns are more important to fleet managers than environmental issues – unless these are associated with economic benefits or other

incentives. The Shell study suggests that, if fleet managers are presented with new cleaner car fuels and technologies, they are (understandably) much more concerned with vehicle reliability and maintenance issues than are private buyers (Shell 2004). More positively, however, they are less concerned with image and see vehicles from a more functional perspective.

In car purchasing decisions, fleet managers also respond to pressure from employees who are the recipients of company cars. While the employer pays for the costs associated with the business use of company cars, the provision of a company car and 'free' fuel count as 'benefit in kind' and are taxable. Company car users are keen to choose cars that reduce tax costs as far as possible while providing a car suitable for private as well as business use (IR 2004). Therefore the system of company car tax is a crucial factor in determining employee car choice and indirectly influencing the fleet managers' purchasing decisions.

In April 2002, the Chancellor of the Exchequer introduced a new system of company car tax "*designed to provide financial incentives for employers and company car drivers to choose cars which produce lower levels of CO₂ emission. It also aims to encourage car manufacturers to develop greener cars*" (IR 2004). The objectives of the new system also include the reduction in traffic and congestion by reducing unnecessary business miles of company cars. The new charge on the benefit of a company car is based on a percentage of the list price of the car, the percentage being determined by the car's CO₂ emissions (replacing the old system which used the list price and mileage to calculate tax payable) – (see footnote 5 for details). Tax is also paid on fuel if this is provided 'free' for private use.

The introduction of the new company car tax system has already had a measurable effect on the use and range of *conventional* cars within the company car fleet. To date, the number of business miles has reduced by over 300 million miles per year and the average CO₂ emissions of new company cars has decreased from 196g/km in 1999 (when new tax system was announced) to 182g/km in 2002 (assisted by fuel efficiency improvements of new cars) (IR 2004). The overall effect has been to reduce the emissions of carbon from the company car fleet (by around 0.5% of all CO₂ emissions from road transport in UK). However, a significant switch to *alternative* fuel/technology company cars has not occurred.

The reduction of the average CO₂ emissions of new company cars has been assisted by the increase in the market-share of diesel company cars. Since 1999, there has been a significant increase in the levels of company diesel sales to the extent that diesel cars now represent over 40% of company fleets (IR 2004; SMMT 2004a). Most commentators attribute this increase directly to the reform in the system of company car taxation that occurred in 2002 – see Section 4.2.

Following the reform of company car taxation in 2002, a detailed survey of fleet managers by the Inland Revenue shows that over half have changed their policies towards CO₂ emissions (driven by tax reductions rather than environmental concern) and are actively encouraging employees to switch to cars with lower carbon emissions, with almost a third being encouraged by the employees themselves (IR 2004). Among employees who are aware of the reform when choosing a new company car, 61% opt for a car with lower CO₂ emissions (compared to 55% of those who are not aware of the reform) and 40% said they would consider lower carbon emissions next time they chose a company car.

The main priority for employees has switched (after the tax reform) from getting the best car specification for a given price limit to (in order): minimising their company car tax liability; getting the best car for a given price; and the physical suitability of the car for family or work use (IR

2004). However, **still only around 10% of company car drivers consider the environment a very important issue when choosing a company car** (Lex 2001).

This shift in company car buying priorities has had implications for the vehicle leasing industry that has had to respond to the increase in demand for conventional cars with lower carbon emissions. As noted by Gerald Gornall, the Associate Director of Lex Vehicle Leasing, in a question and answer session with the Select Committee on Transport (Hansard 2004; Questions 196-198):

Chairman: What impact has the change in tax regime had on company car purchasing decisions?

Mr Gornall: It has had a significant impact from a CO₂ angle. Habits were largely driven by personal preference of what car people wanted to drive and that really solely, other than the fact that they had to be suitable for the job they had to do. Now there is very much a focus on CO₂ to bring the personal tax down it has had a huge impact, with the cars now being more fuel efficient in the company car market than they were in the retail market.

Chairman: Would that be the purchasing managers looking at the economics and saying that this is what they are going for?

Mr Gornall: Generally speaking, but it has very much been driven by employee demands as well. They want their purchasing managers to put CO₂ friendly cars on their choice lists. They want to make sure they have a good choice of vehicles.

Given the increasing importance generally attributed to environmental issues within business, it is perhaps surprising that environmental issues continue to factor so low on the list of fleet managers' and employees' priorities. According to Lex and the Inland Revenue, very few fleet managers (around 5%) provide incentives to encourage their company car drivers to use 'environmentally friendly' cars and fewer than half of fleet managers consider using alternative fuels for their company car fleet (Lex 2001, IR 2004). The low priority given to environmental issues by fleet managers is of particular interest because, not only is it Government policy to reduce emissions from road transport, but car taxation has been designed to benefit greener car users. One would also expect a higher proportion of fleet managers to be explicitly considering environmental issues as they impact on legislation and costs.

As noted by the Shell study, fleets (in principle) are in an excellent position to play a key role in the early stages of market development for low carbon cars and are seen as key drivers of infrastructure and vehicle development (Shell 2004). However, a set of related issues may go some way to explaining why businesses are currently reticent to use alternative fuels and greener vehicles. Although fleet buyers are strongly influenced by whole life costs (as compared to other sectors), they are often tied into fleet contracts for 3-4 years and have to predict future market developments (eg future resale values). Fleet managers, therefore, have to take what action they can to reduce these risks and future uncertainties. As noted by Gornall and his colleague Nick Addison, again in the question and answer session with the Select Committee on Transport (Hansard 2004; Questions 203, 228):

Clive Efford: What could be introduced that would improve the uptake of alternative fuel vehicles [within fleets]?

Mr Gornall: It is difficult really because whilst a grant does make cost benefits, they are not really sufficient for people to make that decision due to the uncertainty in the market of ... alternative fuels...that even if the cost benefits are there, the uncertainty around it the refuelling problems and also the problems with the vehicles themselves ..., just mean that people do not have confidence in it as an alternative, despite the fact that there might be financial benefits to be gained.

Miss McIntosh: Could I ask you about the impact that tax has on alternative fuels. Do you think it is always a positive effect?

Mr Addison: It is the uncertainty as to how long any subsidy or reduced level of fuel duty will be in place that is, I think, the fundamental problem.

One unintended consequence of the reform in company car tax has been the increase in employees taking cash in place of a company car. In a very real sense, there is a degree of policy ‘leakage’ as, rather than acquire a company car under the new system of company car tax, employees are circumventing what has been a very successful tax reform. This trend is important as it reveals a strong driver in the decision-making process – it appears that there is some resistance to being ‘forced’ to purchase cars with lower emissions. Employees are likely to be opting for the cash alternative so that they can, once again, have free reign in their choice of vehicle. This is already having a negative impact on carbon emissions from conventional company cars. As noted by Gerald Gornall, (Hansard 2004; Questions 249-253):

Mr Stevenson: ...employees are often given the option of taking cash rather than a company car. What difference is this system likely to make...in terms of cleaner fuel usage?

Mr Gornall: It is proven with our figures that if people take a personal vehicle the CO₂ emissions from that vehicle are somewhat higher than the average company car user. As the band into the CO₂ emissions on company cars go up the more people take cash. Therefore more people move into potentially less CO₂ friendly vehicles.

Mr Stevenson: ... because choice tends not to be the cleaner fuel technologies when cash is provided, it begins to defeat the object of the exercise. Is that a fair statement?

Mr Gornall: Yes.

Mr Stevenson: Why are [leasing companies such as yours offering a cash option]?

Mr Gornall: It is companies' policies that allow people to take cash. With that option and the increase in taxation on company cars it becomes more cost effective for an individual to save his company car tax, take the cash and purchase his own vehicle. People are going to purchase vehicles so we have a product to satisfy that market.

The historical data provides evidence of a small decrease in the projected number of company cars and a corresponding increase in private car ownership that occurred around 2000/01 – see Figures 4.5 and 4.7 in Sections 4.1 and 4.2 respectively.

5.3 Information provision and the car buying process

As noted by the DfT report *Assessing the Impact of Graduated Vehicle Excise Duty*, buyers of private cars collect information from a wide range of sources including; car manufacturer brochures, the internet, car magazines, sales staff and from family and friends (DfT 2004b). These sources are also mentioned by the *Comparative colour-coded labels for passenger cars* report, which lists: car showrooms, the internet, friends and relatives, car magazines (eg *What Car?*, *Top Gear*), consumer guides (eg *Which?*, *Parker's Guide*), TV programmes (eg *Driven*, *Top Gear*) and radio and newspaper advertising (DfT 2003a).

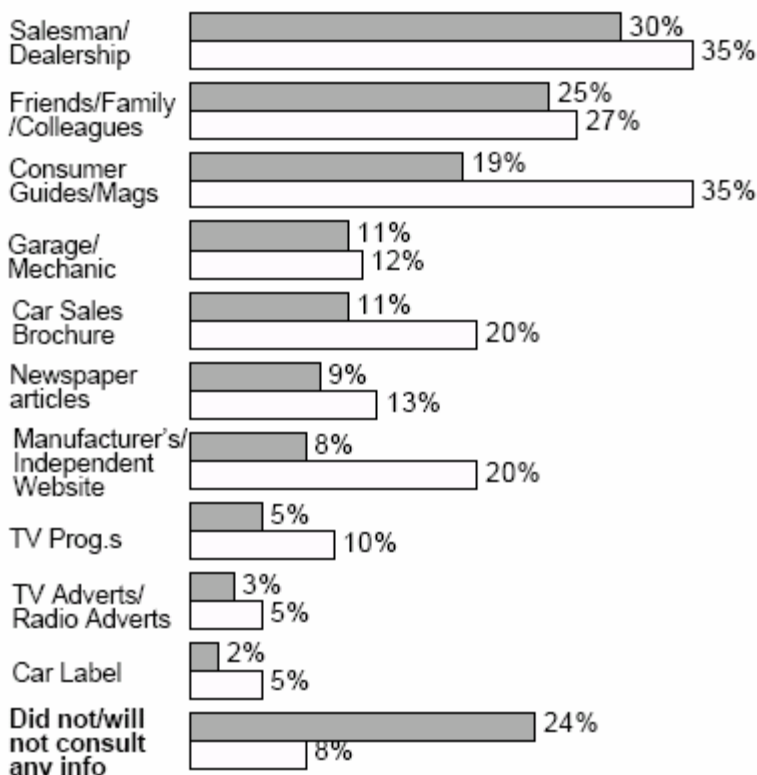
Although never published in its original form, the first draft of the 2003 DfT report¹⁰ provides the results of a large survey that asked car owners and prospective car buyers what sources of information they have or were planning to use (DfT 2003b). This shows the relative importance of the main information sources (see Table 5.4).

Interestingly, the results show that almost a quarter of car owners had not consulted any information before they bought their current car. Older car buyers were more likely to be in this category (30% of those aged 55+ years did not look at information as compared to 18% of 17-34 year olds).

Table 5.4 Information used when choosing a car (DfT 2003b)

Q9 When choosing this car, which of the following sources of information, if any, did you consult?

Q10 Thinking about the next time you choose a car, which of the following sources of information, if any, do you think you might consult?



Base: All those with a car (3,347);
All those planning to get a car registered since 1st March '01 (624)
Source: MORI

Manufacturers’ sales brochures and company web sites are often used by prospective car buyers, although these can be of limited use due to the large amount of technical information they contain (DfT 2003a). Buyers often also have difficulty in comparing sales brochures (“*There aren’t standard paragraphs*”). For this reason car magazines are commonly used for this instead. Buyers are also somewhat sceptical of the reliability of the claims made in the manufacturers’ brochures, so prefer to also source their own independent reviews. Prospective buyers also rely heavily on their own experience gained through the test-drive:

*“You have to test drive what you are going to buy... You can’t buy it and not drive it first”
(Male, 25-50) (DfT 2004b)*

¹⁰ Questions were placed on three waves of MORI’s face-to-face Omnibus survey. A nationally representative quota sample of 5,763 adults (aged 17+) was interviewed in total. Each wave respondents were interviewed face-to-face in their homes across Great Britain. The interviews were conducted in February and March 2003.

The time taken to choose a car varies from a matter of days (eg those who are replacing their particular car with a newer model) to several years. This means that the sources of information used are many and varied. According to the main 2003 DfT survey, car buyers are becoming increasingly “savvy” in comparing cars and consulting a wide range of sources of information.

In the UK, the Internet is seen as an increasingly useful information source as it provides easy access to a wide range of information as well as discount buying sites, and is considered by those who use it to contain reliable information (DfT 2004b). With the expansion of access to the Internet, and the increase in broadband coverage, it is likely that the web is one of the fastest growing information resources used by car buyers. As noted by the report *Cars Online 04/05*:

*“UK consumers...accord greater importance to the ability to research automotive information on the web than do respondents in many other European countries”
(Capgemini 2004)*

In 2003, 27% of those with Internet access say they would use this medium to find out information before they purchase their next car (DfT 2003b). The proportion of car buyers willing to use the web is particularly high for younger and more affluent consumer groups (24% of 17-34 year olds; 3% of those aged 55+; 29% of ABs; 16% of other social classes). These findings reflect the profile of Internet users, which is skewed towards younger and more affluent social groups.

While the evidence provided in *Cars Online* does not suggest *how* consumers can be encouraged to source more information from the web, the Capgemini report notes that UK car buyers visiting websites are particularly seeking: product information, price information, vehicle configurations and cost calculators (Capgemini 2004). Interestingly, (and of particular note to car manufacturers) of the prospective consumers who are satisfied by a company’s website, 46% are ‘more likely to purchase’ from that car manufacturer.

Most car buyers give the impression that they are fairly methodical in their comparative work (TRI/ECI 2000). The motivation for this research seems to be not only to arrive at a final choice but also to prepare the buyer when visiting showrooms where engagement with the sales staff is necessitated. There is a strong sense that one should ‘arm oneself’ with information prior to entering the showroom so that whatever the sales staff may say can be critically assessed. Consequently, for many, sales staff are only encountered right at the end of the decision-making process, once the basic research has been done.

*“Once we’d decided what car we wanted it was just a question of how we were actually going to purchase the car. I made the decision on what sort of car we were going to buy from looking at magazines. I didn’t particularly want to go to a dealership because you get the heavy sell, you get pressure - but we had to go in the end to take the test drive”
(Respondent) (TRI/ECI 2000).*

The types of information sought by prospective car buyers include: costs, finance plans, technical specifications (including performance data such as fuel economy, engine size and speed), style and safety issues. Note that fuel economy information is (reportedly) sought with regard to running costs rather than emission impact (DfT 2004b). Indeed, according to the DfT reports from 2003 and 2004, environmental information (including carbon emissions) is sought only rarely, and other factors tend to be much more important.

“My mind was I wanted a silver [Ford] Focus. So, I was only going to look at the silver [cars]” (Female respondent) (DfT 2003a)

The fact that personal recommendations can be a very important source of information illustrates (one aspect of) the role of peer-pressure in vehicle choice. There is some evidence that what

interests friends and family of the car buyer are issues that could be considered superficial, with little interest shown in the environmental or fuel performance of cars. In one of the DfT surveys, when asked what friends and relatives had raised as issues when discussing their recent purchase, participants noted that their peer groups were mainly interested in “the look, the style, the gizmos” rather than in carbon emissions or fuel consumption.

“Don’t like where the reverse light is - that was the only feedback we got”; “They don’t ask what are the CO₂ emissions. My friends don’t even ask how many miles it does to the gallon” (Female respondents) (DfT 2003a)

One information source whose impact has not yet been analysed is the new environmental ‘**green**’ **car-label**, which is to be introduced in UK showrooms from July 2005. The new label is intended to enhance the pre-existing statutory label through the addition of colour-coding as well as VED and running (fuel) cost information. This car-label is modelled on the successful rating system used for white goods, and is the result of detailed research, much of which is presented (with different emphasis) in this report (TRI/ECI 2000; DfT 2003a; DfT 2003b; DfT 2004a; DfT 2004b).

It remains to be seen whether the new car-labelling scheme will be effective as hoped. To date, there is little evidence of attempts by sales staff to highlight carbon emissions when people are in showrooms looking at cars (DfT 2003a). Whilst sales staff are generally happy to have the (pre-2005) labels on hand, they do not tend to discuss them with customers because the labels do not reflect customers’ main interests, nor is there any incentive for staff to promote fuel-efficient models. In addition, few customers are observed looking at the existing labels independently, or talking about them with sales staff. The showroom research demonstrates that most customers do not currently consider car labels to be a key source of information, and this has implications for the effectiveness for the new labelling scheme.

“When you go into a car salesroom and they ask you what kind of car you are looking for, they are just trying to sell you a car. They don’t persuade you to buy a more fuel efficient or less polluting car” (Male) (DfT 2003a)

However, this situation could change during 2005/06 with the introduction and promotion of the new car-label. The DfT surveys do suggest that ‘environmental performance’ (as opposed to fuel efficiency in the context of motoring costs) “*could have the potential to become another marker of distinction, in the same way that car safety is now used to distinguish between cars*” (DfT 2003a). It is also encouraging that, in the pilot study, around half of sales staff reported that the new label helped them ‘a fair amount’ in helping them sell cars. The survey found that, *in principle*, car buyers are receptive to comparative information to help them choose which make and model to buy, and this extends to environmental information and information about fuel efficiency. Future research will need to be conducted to see if this is indeed the case, to evaluate the impact of the new labelling scheme and to identify ways to further encourage salesroom staff to actively use the new car labels to increase sales of fuel efficient cars.

5.4 Research questions 3-6

RQ3 - What information do purchasers require prior to making a decision and to what extent is this information available?

As noted by two Department for Transport reports (conducted in preparation for the new car-label – see below), buyers of private cars collect information from a wide range of sources including: car manufacturer brochures, the Internet, car magazines, sales staff, consumer guides, from family and friends, TV programmes and radio and newspaper advertising (DfT 2003/04). The types of information sought by prospective car buyers include: costs, finance plans, technical specifications

(including performance data such as fuel economy, engine size and speed), style and safety issues. Environmental information (including carbon emissions) is sought only rarely, and other factors tend to be much more important.

In the UK, the Internet is seen as an increasingly useful information source as it provides easy access to a wide range of information, and is considered by those who use it to contain reliable information (DfT 2004b). With the expansion of access to the Internet, and the increase in broadband coverage, it is likely that the World Wide Web is one of the fastest growing information resources used by car buyers, one considered particularly favourably by UK consumers.

One information source whose impact has not yet been analysed is the new environmental ‘**green**’ **car-label**, which is to be introduced in UK showrooms from July 2005. It remains to be seen whether the new car-labelling scheme will be effective as hoped. Future research will need to be conducted to see if this is indeed the case and to evaluate the impact of the new labelling scheme.

(In sourcing evidence for this report, no research was found regarding information/information sources used by fleet managers.)

RQ4 - What is the decision-making process for each market sector and are there any regional variations?

RQ5 - To what extent are fuel economy and environmental and social responsibility drivers of the purchasing decision both now and in the future; to what extent does the availability of fuel-efficient vehicles limit purchasers’ choice?

According to the report *Assessing the Impact of Graduated Vehicle Excise Duty* (DfT 2004a), the car buying decision-making process for private car purchases is predominantly driven by financial and performance considerations including: price, fuel consumption, comfort, size and practicality and reliability. Environmental issues play little part in the process and are among the least important factors feeding into the new-car buying decision process. For the private sector, the research reviewed suggests a two-stage decision-making process. First, the capabilities and purchase prices of available vehicles determine which models are to be considered. Second, the consumer conducts a more sophisticated consideration of running costs (including mpg), performance, safety, styling, brand, reliability, etc.

Although ‘mpg’ reported as a key decision factor for private buyers, one study notes that: “*For most [car buyers], little effort is expended in comparisons of fuel consumption during the decision-making process*” (TRI/ECI 2000). Several reasons are proposed for ‘mpg’ not being highly important to some consumers when buying a car. These include the observation that many car buyers assume that there is little difference in fuel economy between cars within a class (eg within diesels, superminis, etc). Also it is common for consumers see ‘mpg’ as an aspect of car design that can only be achieved by compromising performance and safety, and few car buyers have confidence in the validity of published fuel economy data.

Within the fleet sector, duties and legislative responsibilities aside, when deciding what cars to purchase on behalf of their company and/or employees, fleet managers consider whole life costs to be of paramount importance and are highly sensitive to financial incentives. Fleet managers are also more concerned with vehicle reliability and maintenance issues than are private buyers, but are less concerned with image and view vehicles from a more functional perspective. Regarding vehicle acquisition, fleet managers take what action they can to reduce risks and future uncertainties and look for high degree of certainty regarding future policy incentives (such as fuel differentials and grant programmes) (Lex 2004; HC Select Committee 2004).

In car purchasing decisions, fleet managers also respond to pressure from employees who are the recipients of company cars. Company car users are keen to choose cars that reduce tax costs as far as possible while providing a car suitable for private as well as business use (IR 2004). Therefore the system of company car tax is a crucial factor in determining employee car choice and indirectly influencing the fleet managers' purchasing decisions.

In sourcing evidence for this report, little evidence was found regarding (negative or positive) effects on consumer behaviour as a result of the availability of fuel-efficient vehicles. However, the author notes that the popularity of diesels accelerated (across the EU) in the early 1990s with the advent of improved performance direct injection turbo diesels (IPTS 2003). It therefore seems plausible that, as more high quality low carbon cars become available, consumer interest will rise, so increasing the likelihood of cleaner car sales.

RQ6 - What is the importance of peer-pressure and social acceptability in decisions regarding vehicle purchase?

The only evidence for the role of social pressure in the decision-making process for buying a car comes from a report by the Department for Transport. This suggests that peers can be a very important influence. However, the evidence (although limited) is that the issues that interest a consumer's friends and family are often superficial, with little interest shown in the environmental or fuel performance of cars (DfT 2003). Therefore, at present in the UK, peer-pressure does not appear to be an important promoter of cleaner/more fuel-efficient car sales (despite the high level of concern expressed regarding environment impacts).

On this issue, one interesting development in the US has been the dramatic polarisation between those consumers that are fuelling the demand for 'gas guzzling' SUVs, and Americans that are campaigning against their use (sometimes under the banner of '*What would Jesus drive?*' – CarKeys 2003). It is likely to be the case that, depending on which deeply held cultural beliefs are dominant, social values can be either beneficial or detrimental to the promotion of low carbon cars.

6 Attitudes to low carbon / fuel-efficient passenger cars

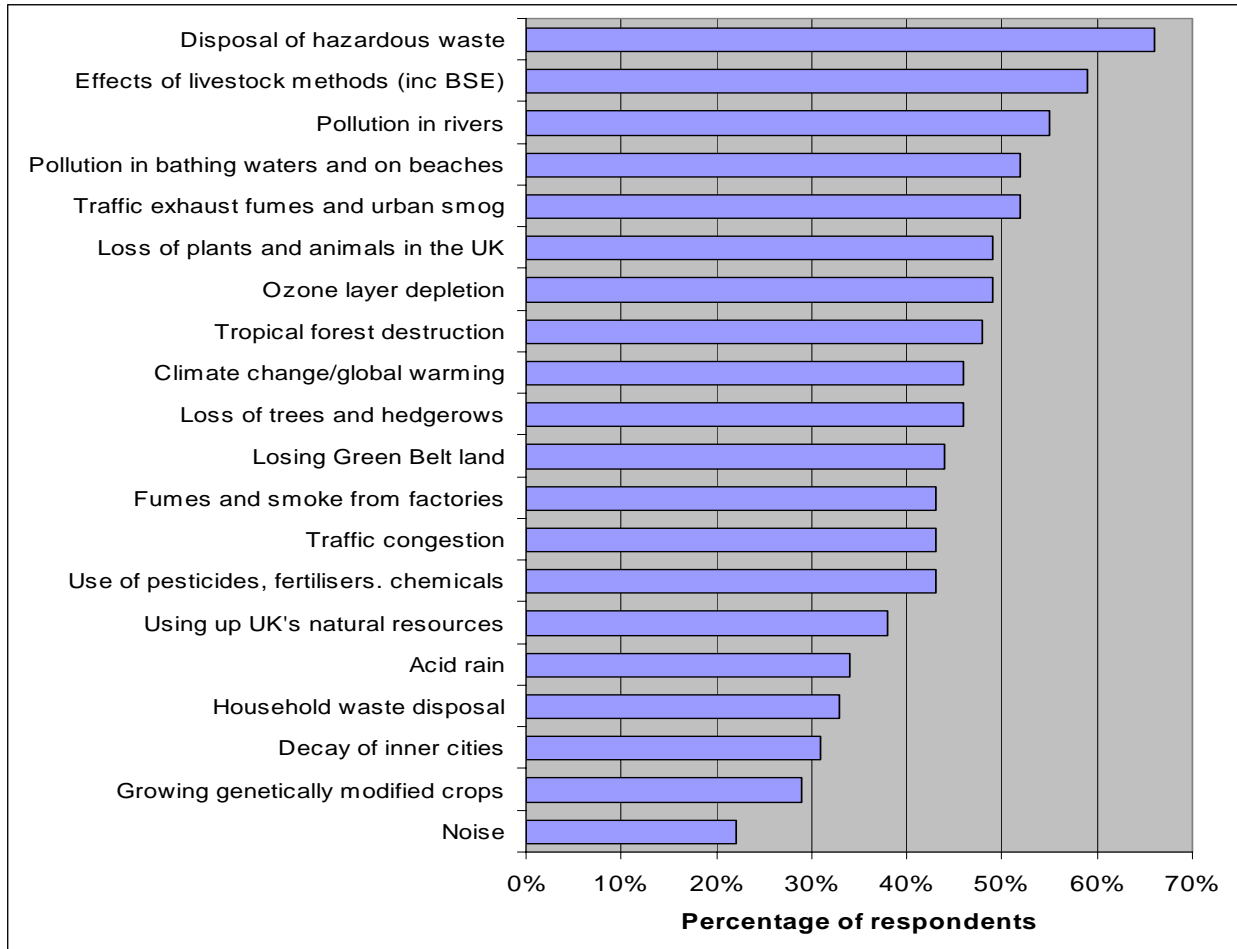
6.1 Attitudes of UK public to the environment and road traffic

Although car buyers form a subset of the UK population, it is informative to summarise some aspects of general public attitudes as these are regularly assessed by DEFRA in their *Survey of public attitudes to quality of life and to the environment* (last published in 2002). These results are a useful barometer of public concerns and knowledge levels.

In the DEFRA survey, respondents are asked how concerned they are regarding a set of twenty environmental issues. The five issues causing most concern to the general public are (in order): disposal of hazardous waste; effects of livestock methods (eg BSE); pollution in rivers; pollution in bathing waters and beaches; and traffic exhaust fumes (see Figure 6.1). The degree of concern for the environmental issues presented to respondents is broadly similar across the country. However, in London, there is more concern over traffic exhaust fumes and urban smog, issues linked to levels of transport use.

Of particular interest to the car buyer report is the level of general concern for traffic and transport-related environmental impacts; of the impacts surveyed, these are ranked fifth, ninth and thirteenth. In general, domestic issues are generally regarded as of more concern than global issues such as: ozone layer depletion; tropical forest destruction; climate change; and acid rain (DEFRA 2002). (Issues related to BSE are likely to cause less concern in 2005 compared to 2001.)

Figure 6.1 Percentage of respondents ‘very worried’ about each environmental issue (DEFRA 2002)



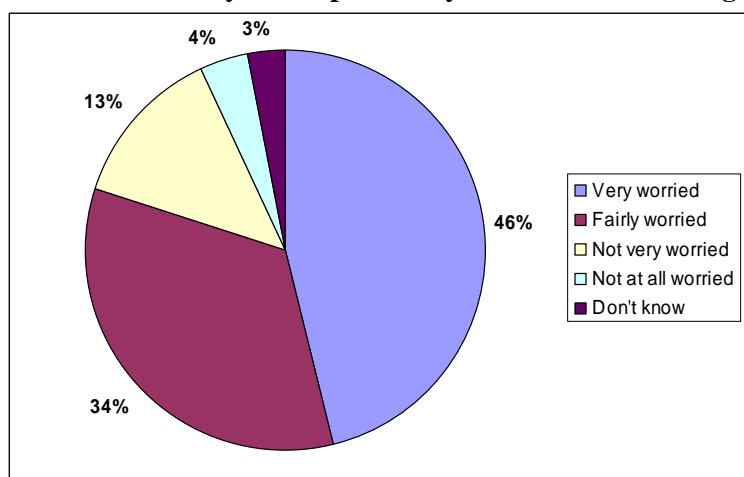
While the concern of transport related issues may not seem high, when asked what environmental trends or issues cause the most concern for the future, the ranking order markedly changes. The environmental issues of most concern in 20 years time are: traffic (congestion, fumes, noise); air pollution; climate change; and water pollution. If responses about concern for climate change are combined with concern expressed about its potential effects (ie worse weather, sea level rise) then 44% consider it is an issue of concern for the future, making it the second place future concern.

Climate change and air quality: concern and knowledge

Looking more closely at one of the key areas of general public concern (associated with transport), over 75% of people have heard of the term ‘climate change’ – men (86%) are more likely to have heard of it than women (69%) (DEFRA 2002). Those with degrees are also more likely to have heard of the term (91%) than those with no qualifications (68%). However, most of those who have not heard of climate change have heard of global warming or the greenhouse effect. Overall, 99% of people are aware of at least one of these terms.

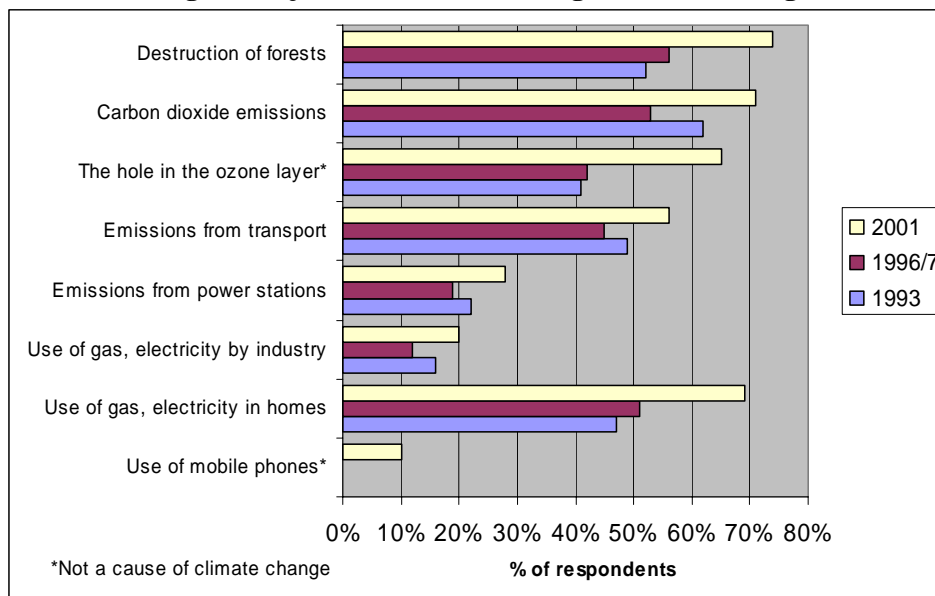
Most respondents (80%) were ‘fairly’ or ‘very’ worried about climate change (see Figure 6.2). Almost half are ‘very’ worried (up 11% from 1996/7). When asked what environmental trends or issues will cause the most concern in 20 years time, of issues which are climate related, respondents mention climate change (32%), worse weather (17%), flooding (15%) and sea-level rise (6%).

Figure 6.2 How worried do you feel personally about Climate Change? (DEFRA 2002)



The majority of respondents (85%) are convinced that the earth’s climate and long-term weather patterns are changing (DEFRA 2002). There is little variation in the extent to which different age groups were at least fairly convinced. 70% of respondents think climate change is due to human activities and two thirds of respondents blame the UK floods of 2000/1 on climate change. Respondents most commonly suggest changes in weather (50%), flooding from rainfall (44%), higher temperatures (34%) and sea-level rise / coastal flooding (34%), as future effects of climate change. Only 4% of respondents think that there are no effects.

Nearly three quarters of respondents correctly recognise the destruction of forests as a contributor to climate change (see Figure 6.3). The majority of respondents also correctly recognise carbon dioxide emissions (71%), emissions from transport (65%) and emissions from power stations (56%) as causes. Only 28% think that the use of gas and electricity by industry is a contributor and only a fifth of respondents correctly identify the domestic use of these fuels. However, 70% wrongly think the ‘hole in the ozone layer’ is a *cause* of climate change and 10% blame the use of mobile phones.

Figure 6.3 Knowledge of major factors contributing to climate change (DEFRA 2002)

When asked what environmental actions respondents take at home, 40% report regularly reducing their use of electricity or gas, 21% reported having done so on one or a few occasions and 38% have not (DEFRA 2002). Of those respondents who regularly cut down usage, most (81%) report doing it to save money, a fifth to save energy and only 15% to help the environment/reduce pollution.

When asked to what degree they supported or opposed a number of Government policy options (noting that each may incur a direct cost to themselves), 94% of respondents support stricter controls on factory emissions to the air, rivers and sea; 84% support charging factories for emissions to the air, rivers and sea; and **53% support restricting the use of certain roads when air pollution levels are high**. Around half of respondents support the introduction of an energy/carbon tax on electricity and other fuels that damage the environment, and around **80% are supportive of the policy of rewarding drivers of cars with lower CO₂ emissions**.

Road traffic: concern and remedial action

When prompted, over two fifths of respondents are very worried about traffic congestion. As noted above, the survey also highlighted traffic (congestion, fumes and noise) as the environmental issue to cause the most concern in the next 20 years (DEFRA 2002).

In terms of reducing car use, 42% of respondents to which it was applicable, reported using public transport, walking or cycling instead of using a car and 39% have cut down their use of a car for short journeys. People's motives, however, are not primarily to help the environment or reduce pollution but to get more exercise (59%), to save money (25%) and only 17% to help the environment/reduce pollution.

Support is high for potential Government actions that would reduce the environmental impacts of car driving, but respondents are less supportive of actions that would directly affect them financially. When respondents are asked about the degree to which they support or oppose a number of transport related policies that the Government could introduce (knowing that each policy could have a cost) they respond as follows:

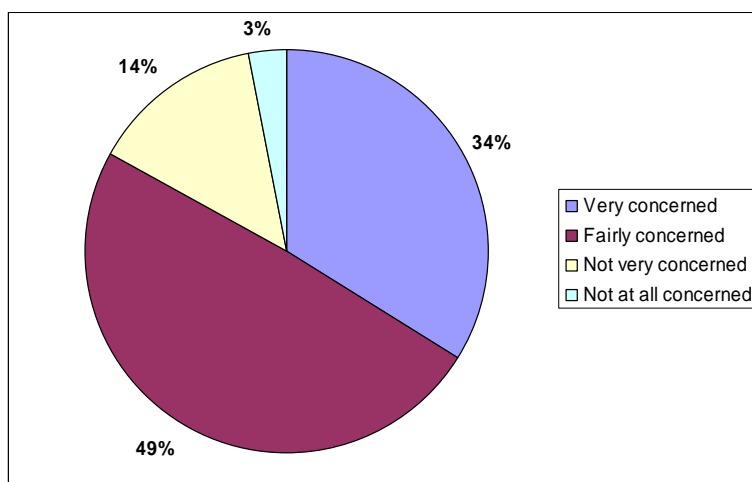
- 95% support providing more (reliable) public transport;
- 92% support making public transport cheaper;
- 84% support increasing pedestrian-only zones in towns and cities;

- **82% support rewarding drivers of cars with lower CO₂ emissions;**
- 79% support providing more cycle paths or lanes;
- 78% support tightening MOT testing for emissions standards;
- 73% support preventing drivers leaving their car-engines running when stationary;
- 70% support increasing roadside checks on vehicle emissions;
- **53% support restricting the use of certain roads when air pollution levels are high;**
- 34% support increasing parking restrictions or introducing higher meter charges in town centres;
- 24% support charging drivers for the use of certain roads.

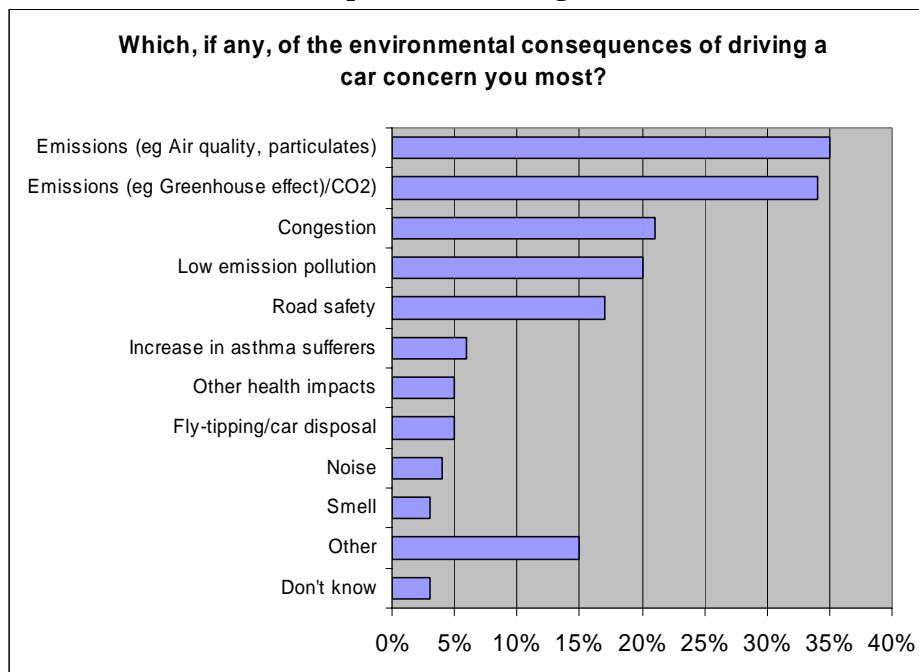
6.2 Attitudes of car buyers to the environmental impact of car use – private car

Many of the attitudes of *private* car buyers to the environment are similar to those of the general public (detailed in the previous section). This similarity can be seen in the responses to a MORI survey conducted as part of the *Assessing the Impact of Graduated Vehicle Excise Duty* report (DfT 2004a). This shows that most new car buyers display concern regarding the environmental impact that car CO₂ emissions have on global warming with women being slightly more likely than men to be concerned about this impact (see Figure 6.4).

Figure 6.4 Car buyers’ concern of the impact of car CO₂ emissions on global warming (DfT 2004a)



As is the case for the UK population as a whole, for car buyers, vehicle emissions, whether they affect air quality or climate change, are the environmental consequences of cars of most concern (see Figure 6.5) (DfT 2004a). In total, around 70% of car buyers are concerned with the impact of car emissions in one form or another (combining those mentioning air quality and/or greenhouse gas emissions).

Figure 6.5 Environmental consequences of driving a car of most concern (DfT 2004a)

Knowledge of vehicle emissions and their impacts

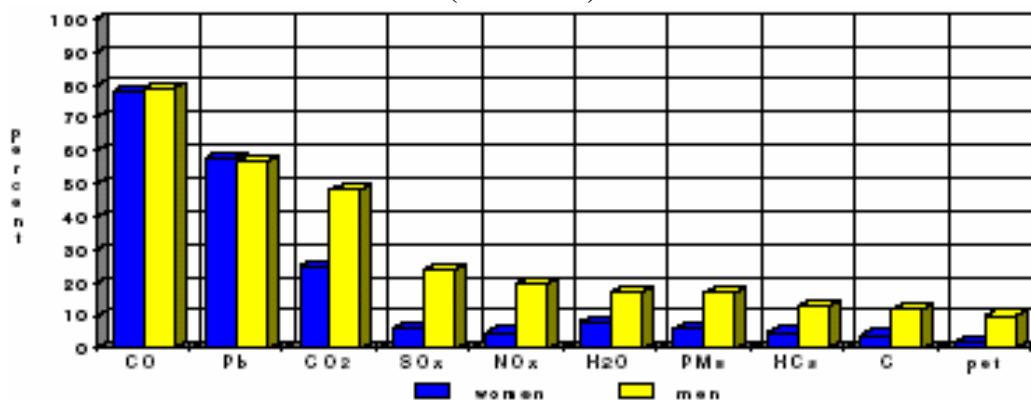
The TRI/ECI report notes that although the respondents within the study *Choosing cleaner cars* are aware that car use results in serious environmental impacts, these are predominantly understood as attributable to visible elements of the exhaust (ie fumes and particulates rather than carbon dioxide) (TRI/ECI 2000). This finding is one that is confirmed by a number of other studies (see below) and shows that environmental impacts are usually viewed in local terms (eg pollution in the high street, combustion products settling on washing, asthma in children) rather than global effects (such as climate change).

Only a very small amount of research has been conducted in the UK to identify the depth of public or car buyers knowledge of vehicle emissions. However, one study, the *Public understanding of the environmental impact of road transport*, has investigated this issue in a pilot study¹¹ (Lane 2000). In response to the open-question ‘Can you name any of the substances present in petrol or diesel exhaust fumes?’, more than 20 substances are named, with 95% of replies giving at least one constituent (Figure 6.6). Three emissions are reported significantly more often than others; carbon monoxide (CO), lead/lead oxides (Pb), and carbon dioxide (CO₂). Of the sample, male respondents display a wider knowledge of the composition of vehicle emissions. However, the two most reported emissions (CO and Pb) are reported equally by both sexes.

The paper points out that carbon monoxide is the emission most often reported and suggests this is because its presence is more easily understood (partial oxidation of carbon-based fuel) than that of compounds that result from secondary reactions (such as NO_x and ozone) or impurities in the fuel (sulphur) (Lane 2000). It notes that the dangers of CO are also widely publicized in non-transport contexts, including maintenance of household gas appliances to avoid carbon monoxide poisoning. The paper also notes that carbon dioxide is widely reported by respondents as a result of educational campaigns and high media coverage, which have focused on chlorofluorocarbons (CFCs) and CO₂ as the main gases responsible for the enhanced greenhouse effect.

¹¹ Sample size of 400 self-selecting respondents; open-style questionnaire.

**Figure 6.6 “Can you name any of the substances present in petrol/diesel exhaust fumes?”
(Lane 2000)¹²**



The research also investigates public understanding of the effects of vehicle emissions. In response to the question “What effects do any of these emissions have on humans or the environment?”, respondents give a large number of responses, including (in order): human respiration/ breathing problems (42%), specific reference to asthma (36%), global warming (24%), impairment of intellectual development (especially of children) (19%), lead pollution (19%), ozone (predominantly stratospheric ozone depletion) (17%), acid rain (16%), and carbon monoxide poisoning (12%). The analysis by gender shows no clear trend for the most popular responses.

Almost 70% of respondents mention at least one respiratory effect. The high reporting of global warming also confirms that it is an issue that is widely acknowledged by the general public. The fact that respiratory effects are reported more than global warming is another indication that people often refer to the experience of their immediate environment (in this case poor air quality) in preference to accepting more abstract scientific knowledge (eg enhanced greenhouse effect) (see point above).

The study draws attention to a particular response that differs from accepted scientific fact. Of the responses that mention ozone, the vast majority refer to *depletion* of the ozone layer.¹³ The conclusion is that the scientific community and the public perceive the ozone problem from completely different perspectives. Whereas the public is aware of ozone depletion within the stratosphere, it seems few are aware of the environmental and health issues relating to the toxicity of ground-level (tropospheric) ozone. If this is indeed the case on a national scale, it would need to be borne in mind in the design of educational material concerning vehicle-related pollution.

The paper attempts to quantify the perceived mortality risk of road accidents as compared to deaths caused by air pollution. Respondents were asked two questions: ‘How many people do you think: (1) are killed in road accidents each year in Britain?; and (2) die each year in this country as a result of health problems caused by vehicle air pollution?’. The modal average response for both questions is 5000 deaths per annum. This accords reasonably well with actual number of deaths caused by road accidents (around 3500) but, in the light of growing evidence, is likely to be an underestimate for premature deaths caused by air pollution.¹⁴ The paper notes that, despite the absence of a national educational campaign that specifically alerts the public to the health dangers of pollutants from vehicle emissions, the public seem to be aware that a significant health impact already exists.

¹² The study was conducted in 2000 at a time when leaded fuels were still in the process of being phased out. It is likely that lead would be reported less often in 2005, as leaded petrol has not been widely available for 5 years in the UK.

¹³ Stratospheric ozone depletion.

¹⁴ In 1998 the Committee on the Medical Effects of Air Pollutants estimated that 12,000-24,000 people die prematurely each year in the UK as a direct result of air pollution.

Knowledge of link between ‘mpg’ and CO₂

A particular issue investigated by a number of studies is car buyers’ understanding of the link between fuel economy and emissions of carbon dioxide. The report on *Comparative colour-coded labels for passenger cars* asserts that car buyers have a poor understanding of the relationship between CO₂ emissions and ‘mpg’. In general it notes that “*the relationship between inputs (fuel) and outputs (emissions) is only very generally - if at all - understood by most drivers*” (DfT 2003a). This despite the importance apparently attributed to fuel economy when buying a car (see below – and also refer back to Section 5.1).

This issue was investigated in some depth by the TRI/ECI study which asked respondents the question: ‘What is the most effective way to reduce carbon dioxide?’, providing several response categories (see Table 6.1). Less than a third correctly chose the burn less fuel option. The study suggests that fuel efficiency seems to fall into a conceptual blind spot with regard to minimising the environmental impact of car use. The set of beliefs described, whilst internally consistent, may be leading to the view that inefficient fuel use need not cause environmental problems so long as the exhaust is cleaned up. Consequently, individuals who would otherwise be motivated to minimise their (global) environmental impacts through buying an efficient car are discouraged from doing so because the connections between wasteful fuel use, carbon dioxide production and climate change are not made.

Table 6.1 What is the most effective way to reduce carbon dioxide?

Plant trees	Clean up exhausts and industrial pollution	Burn less fuel	Other	Don’t know
18%	45%	27%	2%	8%

Source: TCI/ECI 2000

Knowledge of conventional fuels and technologies

The research paper by Lane explores the level of public understanding of cleaner (conventional) vehicle technologies (Lane 2000). In response to the question “Do you know of any changes to the design of road vehicles in the last decade that have reduced pollution from vehicle exhausts?”, 92% could name at least one improvement in vehicle design. Only two replies are reported by more than 10%; the introduction of the catalytic converter (79%) and the use of unleaded fuel (21%). The means that the catalytic converter is by far the most widely known technical development employed to reduce the impact of vehicle emissions.

In response to a follow up question, only one-fifth volunteer a change in emissions associated with the use of a catalyst, and only around 10% name a substance that is reduced according to accepted measurement. CO is reported most often, in this case by more than twice the number who mention any other emission reduction. A typical response is the comment being: “*converts carbon monoxide (some of it) into carbon dioxide*”. Lead is thought by some to have been reduced, which suggests this response is prompted by the belief that catalytic converters are able to remove lead (“*filters out heavy metals*”). These findings seem to contradict those of an earlier report that concluded that nearly three-quarters of drivers were “*aware of what a converter does*” (Lex 1990). However, as we have seen elsewhere in this report, the apparent contradiction may be explained by the difference between surveying ‘awareness’ and ‘knowledge’ (and one of the reasons underlying the attitude-action gap).

This low knowledge level is also generally noted in the *Comparative colour-coded labels for passenger cars* report that states: “*There is a limited understanding of how cars need to be improved to make them more environmentally-friendly*” (DfT 2003a). The report also makes some observation regarding perceptions of petrol versus diesel with an environmental perspective. It

notes that petrol is preferred for being cleaner to handle, cheaper and quieter (and not for performance). The higher visibility of diesel emissions, coupled for some with a reluctance to handle the fuel, means that diesel is it not always the ‘green’ choice. Many think that unleaded petrol is ‘green’ and do not see an environmental benefit in buying diesel. On the other hand, diesel owners are motivated by the cost of fuel and lower depreciation, lower fuel consumption (miles per gallon) and durability – see Section 4.1. Any environmental benefit (disputed by some petrol drivers) is a bonus, not an essential factor (DfT 2003a).

6.3 Attitudes of car buyers to fuel-efficient and low carbon cars – private car

Given the growing international importance of transport emissions, it is perhaps surprising that only a relatively small amount of research has been conducted regarding the attitudes of car buyers to low carbon/fuel-efficient cars. One of the few detailed studies (of which the author is aware) is the North American Transportation Energy Survey that compiles the findings of studies that assess the US public’s knowledge and opinions of the environment, oil supply and alternative vehicles (DoE 2002). Although the study focuses on the US market, it is instructive to see the level of detail the research methodology provides.

One study detailed within the report asks a US car buyer sample the *open-ended* question: ‘What fuel will most likely replace gasoline and diesel when they become too expensive to use in cars and trucks?’. The main survey replies (over 10% response rate) name electric, solar, alcohol and hydrogen cars as fuels/technologies that would replace conventional fuels when they become too expensive or run out (Table 6.2).

Table 6.2 Public Perception of Which Fuel Will Replace Gasoline and Diesel (DoE 2002)

Fuel	Number	Percent
Electricity/battery	332	33%
Solar	123	12%
Alcohol/ethanol/methanol	102	11%
Natural gas/CNG/LNG	61	6%
Hydrogen	26	3%
Propane (LPG)	23	2%
Water, nuclear	25	3%
Other	54	4%
Don’t know/none	253	25%
Total	1,000	99%
Primary Source: ORCI for NREL (1998b), Study #707349		

A second study asks the *closed* question: “Consider a future date when gasoline is no longer available. Which of the following do you think would be the best fuel for use in personal vehicles: electricity, ethanol, or hydrogen?” Americans choose electricity over ethanol and hydrogen as the best fuel to use in personal vehicles when gasoline is no longer available (see Table 6.3).

Table 6.3 Public perception of best fuel for use in personal vehicles when gasoline not available (DoE 2002)

Best Fuel for Use in Personal Vehicles	Number	Percent
Electricity	522	52%
Ethanol	206	21%
Hydrogen	151	15%
Don’t know	121	12%
Total	1,000	100%
Primary Source: ORCI for NREL (2000b), Study #709489 (The ORCI study # 709489 was conducted before the electricity problems in California)		

Respondents are then asked to give reasons for their answers enabling a deeper investigation of the attitudes held. The primary reasons given are: electricity because of environmental benefits (cleaner and less polluting) and its availability; ethanol due to its availability; and hydrogen due to hydrogen's availability, along with environmental advantages.

The survey also addresses the issue of the *worst* fuel to use when gasoline is no longer available. Around 30% select ethanol because of environmental concerns; those who rate hydrogen as the worst fuel do so mainly because of safety concerns (explosive, flammable/combustible and dangerous/not safe); those who select electricity cite electricity being expensive, environmental concerns, and that electric vehicles cannot hold a charge for long and, therefore, have a short range. Although the precise percentages would be different for a UK car buyer audience, it is likely that many of the general issues raised/reasons given would be the same.

The DoE report also assesses levels of awareness of petrol-hybrid cars (at a time when two hybrid electric vehicles were available in the United States; the Toyota Prius and the Honda Insight). In response to the question: "How much have you heard about this [hybrid] technology: a great deal, some, very little, or nothing?", some American drivers show that they are aware of hybrid electric vehicles (DoE 2002). However, a majority are unable to name or do not know of any hybrid electric vehicles (see Table 6.4). Participants are also asked (in an open-ended question) to name a hybrid-electric car. 44% of US drivers are able to name at least one manufacturer and/or model (see Table 6.5).

Table 6.4 Amount of information heard pertaining to hybrid-electric power-trains (DoE 2002)

	August 2000	November 2001
A Great Deal	13%	10%
Some	33%	33%
Very Little	34%	30%
Nothing	20%	26%
Don't Know	0%	2%

Table 6.5 Names of advanced hybrid-electric vehicles known by the public (DoE 2002)

	August 2000	November 2001
Any	36%	44%
Honda	15%	24%
Insight	1%	2%
Toyota	4%	11%
Prius	1%	2%
Other	14%	6%
Don't Know	64%	56%

A more recent US survey by JD Power and Associates (of over 7000 consumers) focuses on consumer awareness of hybrid electric and clean diesel vehicle technologies. This study summary reports that over 75% of US car buyers are aware of hybrid technology and 40% have some awareness of cleaner diesel engine options (JD Power 2004a). (Interestingly, the level of *awareness* of hybrid power-trains is similar to figures quoted for 2000/01 – see above.)

According to the JD Power report summary, the attributes of clean diesels that are most attractive to consumers include: high fuel economy, high torque and proven technology (JD Power 2004a). The attributes that most concern consumers are availability of repair and service locations. For hybrids, the attributes attractive to consumers are: high fuel economy and environmental credentials. The attributes of hybrids that most worry potential consumers are higher maintenance costs, reliability and life of the battery pack, acceleration performance and availability of the power-train in a desired vehicle. Owners of hybrid vehicles only tend to worry about battery pack life and availability issues

(implying that acceleration, maintenance and reliability concerns are reduced with familiarity with the vehicle).

In the UK, similar research of equivalent detail is hard to find. However, one pertinent study that provides detailed insight into consumer attitudes to new vehicle fuels and technologies is the *Consumer acceptance of new fuels and vehicle technologies* report conducted by Cambridge MBA students for Shell (Shell 2004). This study focuses on the emerging UK private car and fleet markets for the following fuel technologies: LPG, CNG, Fuel cell, Hydrogen, Ethanol (E85), Bio-fuels, Gas-to-Liquids, and Hybrids.

As part of its identification of early adopter segments (discussed in Section 4.3), the study develops ‘consumer value’ bar charts that represent the relative importance attributed by car buyers to a range of vehicle attributes (see Figure 5.2 in Section 5.1). These are based on the combined results of consumer market research, expert interviews and desk research. Also developed are ‘technology profiles’ for each of the fuels/technologies investigated – these are line graphs that represent the pros and cons of each new option as compared to a petrol car. The bar charts and line graphs are then superimposed – graphs of four technology profiles are shown in Figures 6.7 to 6.9.

Figure 6.7 Consumer values bar chart and technology profile for LPG (petrol baseline) (Shell 2004)

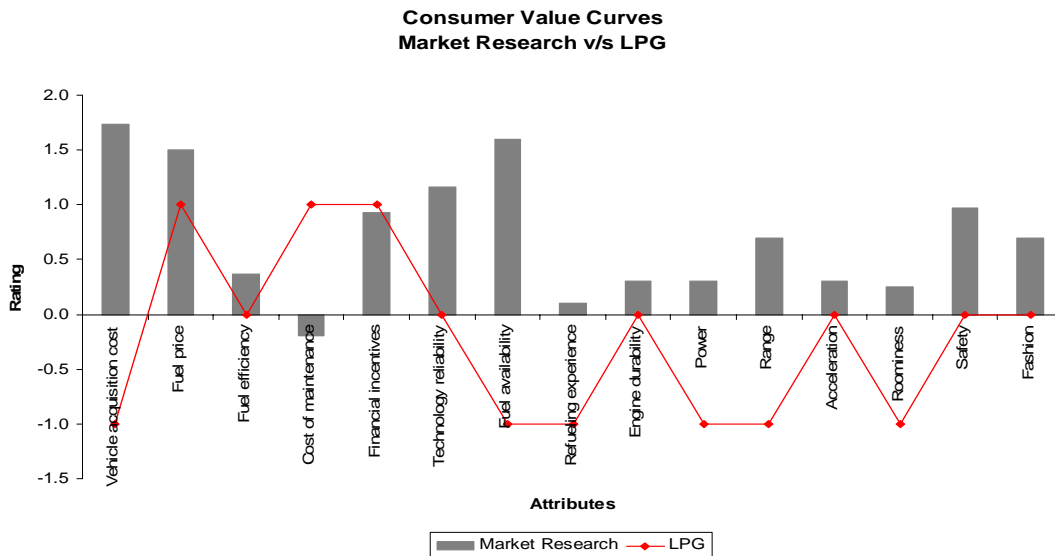


Figure 6.8 Consumer values bar chart and technology profile for bio-diesel and hybrids (petrol baseline) (Shell 2004)

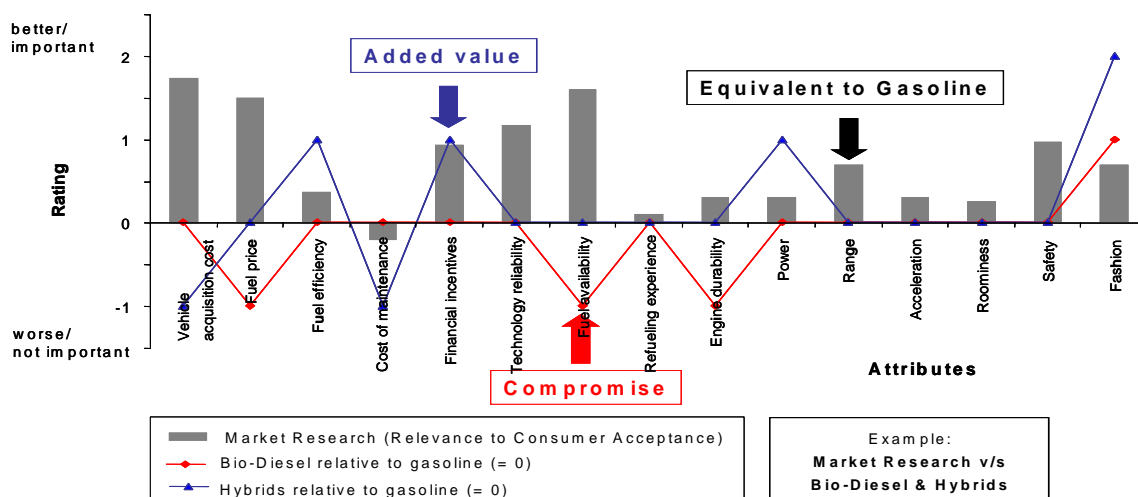
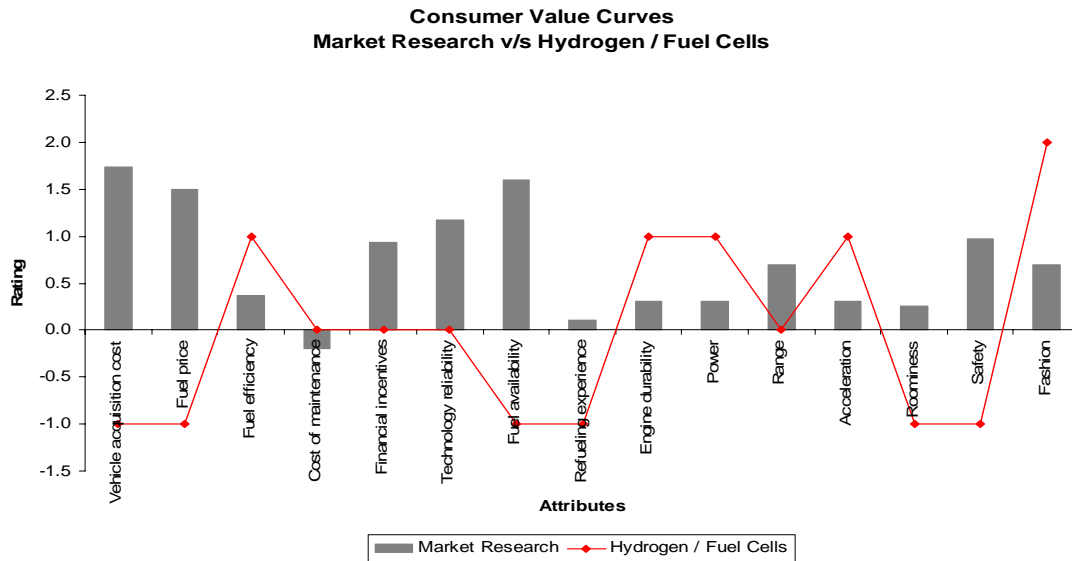


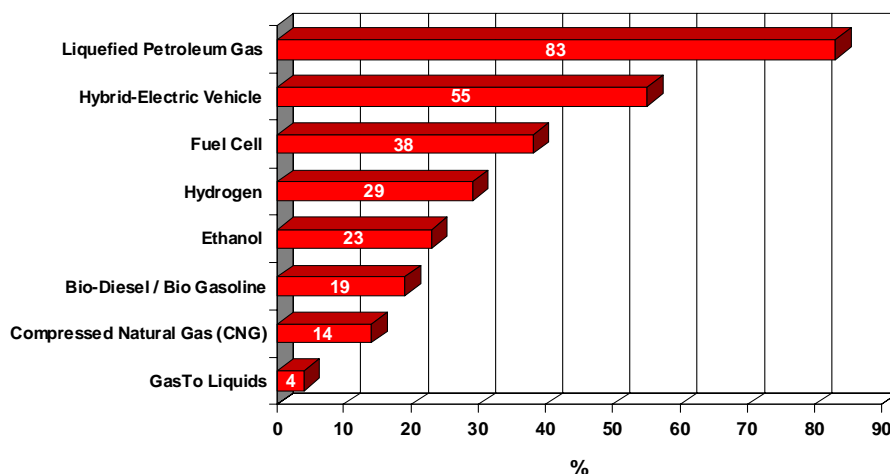
Figure 6.9 Consumer values bar chart and technology profile for hydrogen fuel cells (petrol baseline) (Shell 2004)



As is shown in Figure 6.8, the attributes that are rated positively for a consumer value *and* on the technology profile provide ‘added value’. Where a mismatch occurs, a compromise is required. According to the Shell study, the greater the match of the consumer value chart and the technology profile, the higher the consumer acceptance for that option.

The Shell study includes a consumer survey of 120 UK car owners and over 100 International MBA Students and Shell employees (Shell 2004). One of the first questions asks respondents to indicate their familiarity with a list of eight car fuel technologies. The results (shown in Figure 6.10) reveal high familiarity with LPG and hybrids, moderate awareness of fuel cell, hydrogen and ethanol and low familiarity with bio-fuels, CNG and gas to liquid fuels. Participants are also asked to indicate which of these fuels they would be most likely to use. Their responses (in order) are: LPG (33%), hybrid (26%), fuel cell (15%), bio-fuel (8%), CNG (6%), gas-to-liquids (5%), hydrogen (4%) and ethanol (4%).

Figure 6.10 With which of the following car fuel technologies are you familiar? (Shell 2004)



The survey also investigates the reasons that respondents would most/least be likely to use new vehicle fuels and technologies. The overall results indicate that the most important attributes are: availability of the technology, environmental friendliness, efficiency, sustainability, and lower costs. Those attributes most likely to deter acceptance are: poor safety, lack of infrastructure, higher

costs (conversion, fuel, vehicle), poorer performance and range, and lack of sustainability. UK respondents report that they would compromise on power and range but not on safety, fuel efficiency and roominess. When asked what changes in costs would be acceptable, 30% of participants state a willingness to purchase a cleaner fuel even if it's cost is higher by 10%.

Table 6.6 Qualities attributed to new vehicle fuels and technologies by consumers (Shell 2004)

Fuel-technology option	Positive attributes (selection)	Negative attributes (selection)
Liquefied petroleum gas	Already available Cars can be converted to LPG Better for the environment Cheap fuel	No local filling station Expensive to convert cars It can be very dangerous
Hybrid electric	Better for environment Cheaper to run	Vehicle price, Not much vehicle choice Limited range, worse performance due to weight Need a special recharge point Environmental benefits not significant
Hydrogen fuel cell	Clean and efficient Totally clean in use	Hydrogen can be unpredictable Expensive Less range
Biodiesel/bioethanol	Better for the air Works similar to existing transport Move in the right direction	Poor availability No positive tax incentives as yet Very little advantage over conventional fuel
Compressed natural gas	Natural	Limited resources Dangerous Price

Source: Shell 2004

Other insights offered by the research team are that ‘greenness’ is a more important acceptance attribute than fuel efficiency (in contrast to the findings of other studies already discussed), and that safety is a major concern for all (even existing) fuel technologies (Shell 2004). The team notes general consumer doubts about the viability and sustainability of new technologies and underlines the importance of familiarity as a critical acceptance factor. The survey also shows that most consumers expect financial incentives for adoption.

Regarding particular technologies, the team notes some uncertainties and misconceptions regarding petrol-hybrids, some polarisation regarding bio-fuels and LPG, a negative perception by a majority of consumers regarding CNG and very positive emotional feelings towards hydrogen although the fuel is seen as non-sustainable (doubts are expressed regarding renewable production) (see Table 6.6).

*Of particular interest to this report is that the findings of the consumer survey reveal that a large number of (mostly negative) misconceptions are attributed to new vehicle fuels and technologies. A selection of these is shown in **bold** in Table 6.6.*

The Shell study is by far the most comprehensive survey conducted in the UK to date regarding new vehicle technologies. The only criticisms that could be made of the study is that the ‘Brainjuicer’ survey sample was small and not fully representative of all UK car buyers, and that it focused on eight known fuel/technology options, all of which could be used (in principle) to provide commercially available vehicles. Other more open-ended surveys have shown that the general public are as likely to mention more futuristic technologies, ones that are not being considered for commercial production. For example, solar cars are second in the list of technologies reported in by the DoE study¹⁵ (DoE 2002) (see Table 6.2). A similar response has also been recorded from a UK

¹⁵ In response to the question: Which Fuel Will Replace Gasoline and Diesel?

audience¹⁶ (Lane 2000). What these surveys may be detecting is evidence of successful advertising campaigns. In the UK study, some respondents refer to the car “*as shown on Honda adverts*” (on UK television from 1996), which used the Dream Solar Car to promote the Honda Prelude.

6.4 Attitudes of car buyers to fuel-efficient and low carbon cars – company car/fleets

As was discussed in Section 5.2, according to the Inland Revenue analysis of the reform of company car tax, over half of fleet managers have changed their policies and are actively encouraging employees to switch to *conventional* cars with lower carbon emissions, with a third being encouraged by the employees themselves (IR 2004).¹⁷ The main priority for employees has also changed from getting the best car specification to minimising their tax liability. However, a significant switch to cleaner fuelled (including low carbon) company cars has not occurred.

On a positive note, 13% of company car drivers would consider choosing a cleaner car (IR 2004). In addition, as many as 30% of employers would consider providing a new LPG, hybrid-electric or electric-only car. The Inland Revenue study concludes that “*this suggests that there is in theory the potential for numbers of alternative fuel company cars to increase in the future*”. However, there remains a discrepancy (attitude-action gap) between these proclaimed intentions and the purchasing behaviour of fleet managers.

One possible explanation for the low uptake of cleaner fuelled company cars is fleet managers’ and company car drivers’ low knowledge-level of cleaner car options. Given the low knowledge base discussed in previous sections, it would come as little surprise if fleet managers’ level of knowledge was similar to that of private car buyers. However, the company car and fleet sector are much more driven by costs, and are more susceptible to uncertainty, than is the private market. Therefore, there is the strong possibility that economic factors and market projections are also acting as barriers to the uptake of low carbon cars for fleet use.

To investigate these issues, and the attitudes of fleet managers to new fuel technologies, the Shell study (already described in previous sections) assesses the consumer preferences for UK fleets. A sample of fleet experts is surveyed representing fleets with an average annual mileage of between 10k-30k miles and a comparatively high level of awareness of LPG and hybrids.¹⁸ The study notes that fleet users consider the total cost of ownership to be most important and are not willing to pay more for new fuel technologies. The most important drivers for fleet vehicle purchasers are identified as vehicle and fuel costs (including incentives) and technology reliability followed by environmental concerns. Fleets also consider refuelling experience, vehicle power, resale value and range to be of greater importance than do private consumers.

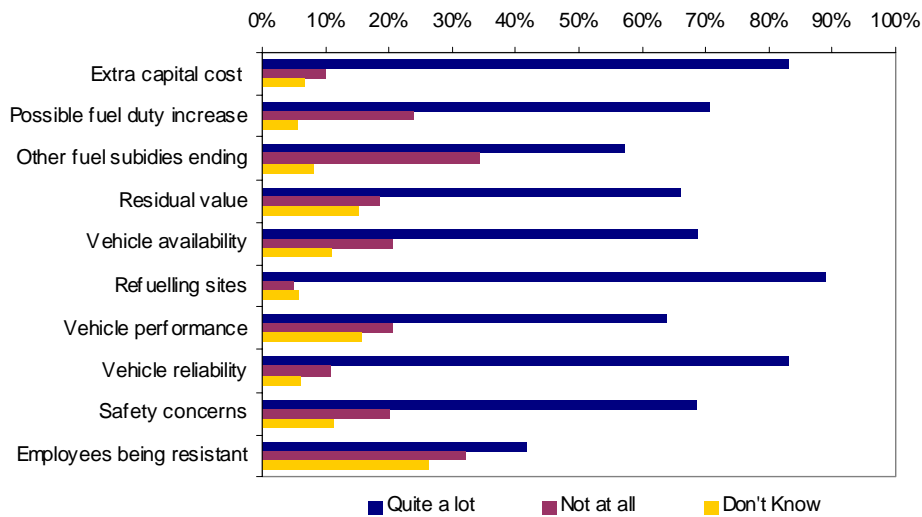
As part of the study, fleets are asked the question: ‘How much would the following factors affect your decision to change to clean fuel vehicle?’ (Shell 2004). The results (shown in Figure 6.11) show the high sensitivity of fleets to a large number of factors that include economic, infrastructure and technology reliability issues. To some degree, these responses highlight the large number of concerns of fleet managers – concerns that underlie their reticence to adopt new clean fuels and vehicles.

¹⁶ The question asked: “...Do you know of any other types of alternative fuels or vehicles which are being considered for use on British roads?” (Lane 2000).

¹⁷ This is due in part to the increase in the number of company diesel sales that now represent around 40% of fleet car sales (SMMT 2004).

¹⁸ Other details of the size and composition of the fleet survey sample are unknown.

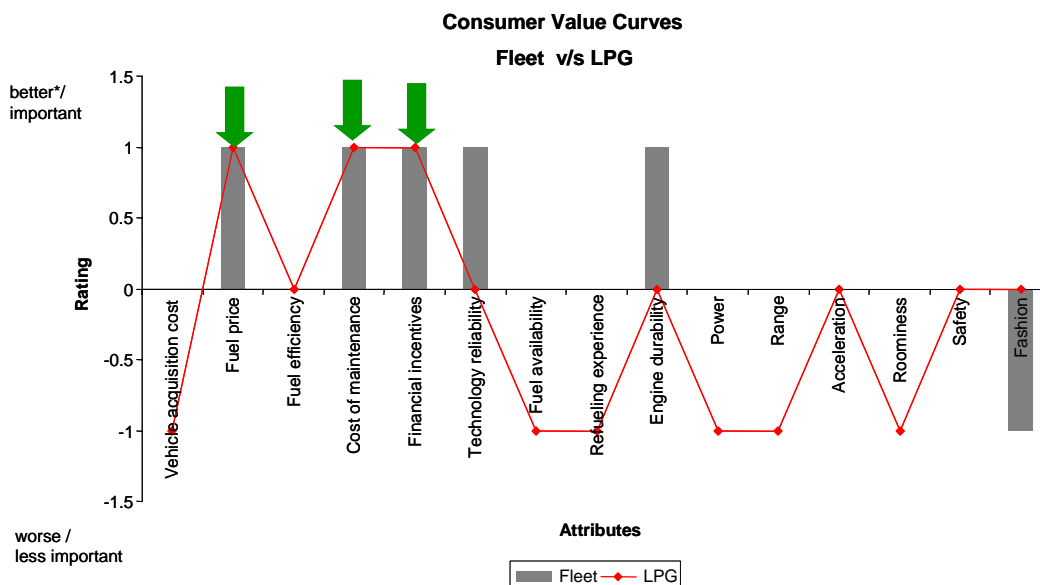
Figure 6.11 Factors affecting fleet managers’ decision to change to clean fuel vehicle (Shell 2004)



The House of Commons Transport Committee also notes the importance of vehicle reliability and dealer/maintenance support for fleet operations (House of Commons 2004; para 135). The report concludes that fleet consumers will only buy advanced technology cars if they are confident that there is sufficient servicing and repair support. To illustrate this issue, Lex Vehicle Leasing reported to the Committee that one Government department that had switched to using LPG vehicles had since given up leasing LPG cars as a result of maintenance difficulties and lack of experienced technicians.

Using a similar methodology as for more general consumers (see Section 6.3), the Shell study compares the technology profiles for three new technologies (LPG, CNG and petrol hybrids) with those issues most important to emergent early adopter fleets (ie those factors fleets are *least* willing to trade off). The profile for LPG is shown in Figure 6.12. By comparing the degree of match between the *fleet* consumer values and several fuel/technology profiles, the study is able to identify those new technologies most likely to be accepted by fleets. With additional expert interviews, the study concludes that **although half of fleets are unlikely to change to new fuel technology, 50% would switch to LPG if they were to adopt a new fuel and 10% would switch to using petrol-hybrid cars** (Shell 2004). Only 2% of fleets were willing to adopt CNG.

Figure 6.12 Fleet values bar chart and technology profile for LPG (petrol baseline) (Shell 2004)



The Shell study notes that many of the fleet attitudinal factors towards new vehicle fuels and technologies are amenable to influence by Government (Shell 2004). The study asked fleet respondents to rate the importance of factors that would encourage them to adopt to clean fuel vehicles. The factors that would encourage fleets to adopt to clean fuel vehicles are (in descending order of importance):

- Lower fuel costs;
- Reduced (company) car tax;
- Reduced road tax (VED);
- Grants to fund additional capital costs;
- Environmental issues;
- Social responsibility issues;
- Reduction of drivers' private mileage;
- Legislation/best practice issues;
- To improve PR image;
- Congestion charge savings;
- Other issues (mainly fuel availability).

It is interesting to note that the first four relate to economic issues – ones that relate directly to current strategies used by Government to promote cleaner vehicles.

One further factor (not investigated in detail by the Shell study) has impacts on cost *perception*. This is the level of uncertainty associated with alternative vehicle fuels and technologies (by fleet managers). Industry tends to reduce risks wherever possible and interprets price and performance unknowns as a negative rather than as a potential cost-saving opportunity. This position is supported by comments of Nick Addison, the Product Manager of Lex Vehicle Leasing, in the question and answer session with the Select Committee on Transport (Hansard 2004; Question 199):

Chairman: Why has there only been a small uptake of alternative fuel vehicles in the company car market?

Mr Addison: Primarily because they are not actually the cheapest option. Once you take into account the purchase price of the vehicle, the resale value at the end of its life and the fuel cost in between it is not necessarily always the cheapest option. There is also limited driver incentive to make that choice. The refuelling network itself from the convenience point of the view for the driver also has an impact. I think the most important is probably the uncertainty looking forward as to the grant levels and the levels of fuel duty that make it very difficult to predict how expensive that car is going to cost you as a driver in the future.

6.5 Attitudes to existing price signals – private car/fleets

Previous sections of this report investigating attitudes to the environment and technology have revealed varying degrees of concern, awareness and understanding of these issues. Given the importance attributed to economic factors regarding consumer behaviour, it is also necessary to assess car buyers' attitudes to economic issues and to ascertain how price signals are received.

The RAC Report on Motoring 2004¹⁹ focuses specifically on the costs of motoring and devotes at least three chapters to understanding how costs are perceived by UK drivers (RAC 2004). The key observation made by the report is that, although vehicle owners are strongly motivated by costs, most do not fully appreciate the level of costs of car ownership and usage, nor do they understand the structure on which costing are based. In particular, the report finds that the average motorist underestimates their car costs by around a factor of two. (The average ‘spontaneous’ estimate of annual motoring costs are almost £2150, whereas the RAC’s Motoring Index shows actual costs are closer to £5200.)

The survey also highlights those costs of which drivers are most/least aware and how confident they are in their estimates of each cost element. In general, drivers are most aware of fuel costs, road tax and insurance and are most accurate in estimating their road tax and insurance. (The report suggests that, unlike other costs elements, fuel costs are considered as part of the household budget.)

Servicing and repair costs are underestimated to the greatest degree. The confidence levels for their estimations are also low: only 14% are confident in guessing depreciation rate, 29% parking fees, 34% servicing and less than half were confident in gauging fuel costs (which is surprising given the importance attributed by drivers to this cost element).

The high importance attributed to fuel costs by private car owners (above depreciation, servicing and repair costs) accords with the recent increase in diesel penetration that appears to be driven (in part) by the fuel cost savings offered by diesel’s high fuel economy (as compared to petrol) – see Section 4.1. However, diesel cars are typically 10% more expensive than petrol cars. In addition, diesels no longer necessarily offer better reliability, lower depreciation rates or lower servicing and repair costs (What Car? 2004; Guardian 2004). Therefore, if whole-life costs are compared, for the average private car buyer, diesels are not necessarily cheaper than their petrol equivalents. In spite of this, it appears that private diesel car sales are being driven by a false perception of car costs.

*“Over the past three years [to 2004] British motorists have been flocking to buy diesel cars, convinced they offer a cheaper option. The majority of them are probably mistaken”
(Guardian 2004)*

The RAC report notes that whereas private car owners are particularly unaware of depreciation rates, company car owners are less aware of their tax burden than might be expected (the report suggests this is due to it being taken directly from their pay through PAYE). It has also been reported that a large proportion of company car drivers do not understand the company car tax system (30% are not aware of the 3% supplement for non-Euro IV diesel cars) (see below) (IR 2004). According to the RAC, company car users under-estimate their car costs almost as much as private drivers, although their estimates of itemised elements do increase more markedly and get closer to the actual amount.

Although only a small percentage of total costs, the RAC survey finds that all drivers are highly sensitive to *perceived* increases in fuel price (RAC 2004). 37% of interviewees are of the opinion that fuel has gone up ‘a lot’ in the last two years as compared to only 18% who say the same about insurance costs (both have increased by a similar percentage over the past 10 years).

In relation to this report, a particularly pertinent part of the RAC survey investigates the additional costs that motorists would endure before changing their consumer behaviour. The survey presents

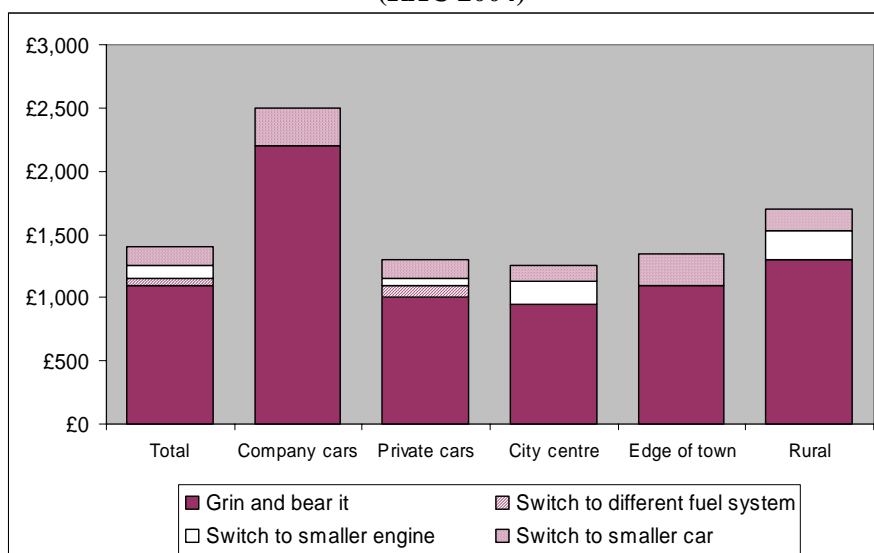
¹⁹ The study surveyed 1000 regular British drivers and included: private car owners, over 250 company car drivers (car provided by company), and those who drive a car bought at business expense. Interviews were conducted face-to-face during November 2003.

interviewees with three alternative car buying scenarios and asks them, if motoring costs were increased, at what point would they switch to an alternative fuel/car type. The scenarios offered are:

- Switch to a different fuel system;
- Switch to a car with smaller engine;
- Switch to a physically smaller car.

Although car buyers say cost is paramount in their decision-making, it turns out that they are prepared to endure large increases in costs before changing their behaviour (see Figure 6.13). On average, annual costs have to increase by at least £1,100 before drivers will consider switching to an alternative fuel or smaller engine (both of which are preferred to a smaller car). Company cars drivers are even less sensitive to increases in car costs and will endure an extra £2500 before switching to a physically smaller car (the lower threshold is less clear due to survey responses). Also of interest are comparisons made of the additional costs with drivers' *perceived* fuel costs: lower income groups will endure an extra cost equivalent to 88% of their perceived fuel costs; higher income groups (182%); those in rural areas (172%); and city dwellers (100%).

Figure 6.13 Additional annual costs motorists will endure before switching to an alternative option (RAC 2004)



Focusing on the company car sector, although cleaner fuelled cars do offer potential economic benefits compared to petrol and Euro IV compliant diesels under the system of company car taxation (for some annual mileages etc), the reform in company car tax has had virtually no impact on the interest in, or uptake of, cleaner fuelled cars by the company car sector. Only around 1.5% of employers provide either OEM-manufactured or converted bi-fuel petrol/LPG cars in their fleets (LPG being the most popular cleaner fuel) (IR 2004). Fleets using biodiesel, battery-electric or hybrid-electric cars are even fewer in number. This suggests that the discounts available for cleaner fuels and cars under the company car tax system have not been successful in incentivising the uptake of cleaner fuelled company cars (or of overcoming non-economic concerns – see Section 6.4). Nor have they been successful in encouraging car manufacturers to develop greener cars (more than they are already doing), one of the key objectives of the company car tax reform.

One possible reason for the low interest in cleaner fuelled vehicles for company car use is a poor understanding of the details of the company car tax reform and its implications (among fleet managers and recipients of company cars). In the study by the Inland Revenue, although 97% of company car drivers were aware of the reform, 80% did not know the correct CO₂ emission figure for their car, only 20% were aware of the range of percentages for petrol cars on which the tax is based and only around 30% were aware of the supplement for non-Euro IV diesels (IR 2004). In

short, although there is a high level of awareness of the new system of company car tax, there is far less awareness of the detail of the charge calculation or of the full options available. It is unsurprising, therefore, that any cleaner car incentives which exist as part of the system may be overlooked.

6.6 Research questions 7-9

RQ7 - What is the level of awareness, knowledge and understanding/misconceptions of low carbon/fuel-efficient passenger cars?

Overall, the level of awareness of low carbon/fuel-efficient passenger cars can be summarised as moderate. Whereas some studies show that drivers are well aware of the range of fuel and technology types being commercially developed (Shell 2004), other more open-ended surveys suggest a less realistic view of alternative fuel/technology types (eg solar cars) (DoE 2002, Lane 2000). However, there evidence is clear that consumers of all types have very low knowledge-base regarding low carbon and fuel-efficient vehicles. There are also strong indications that stable misconceptions are present at all levels – it seems that most misconceptions are negative attributes (there is an opportunity here for these to be removed). Examples include: ‘LPG is dangerous’, ‘hybrid electric cars have limited range need a special recharge point’, and ‘no positive tax incentives for biodiesel as yet’ (Shell 2004). Further research is required to identify level of knowledge in key areas and identify misconceptions – only then will it be possible for these issues to be addressed.

RQ8 - What is the level of awareness, knowledge and understanding/misconceptions of low carbon/fuel-efficient car financial incentives?

Overall, car buyers’ economic concerns are high, but levels of awareness/knowledge regarding car costs are very low. For example, motorists underestimate car costs by around a factor of two – servicing and repair costs are underestimated to the greatest degree (RAC 2004). Car owners are most aware of fuel costs, road tax and insurance, but private car owners are particularly unaware of depreciation rates. Company car users/fleet managers have better appreciation of costs, but knowledge level still lower than might be expected given the importance and size of this sector – 80% company car drivers don’t know vehicle’s CO₂ emission figure and only 29% aware of 3% supplement for non-Euro IV diesels (IR 2004).

In addition to a low appreciation of existing car costs, awareness of financial incentives for cleaner car is low, particularly among private buyers. According to the DfT: “*Understanding that VED is based on carbon emissions is patchy*” and awareness of PowerShift grants for bi-fuel conversion is low (DfT 2003). When offered, consumers also appear (on first inspection) to be highly receptive to fiscal incentives – 80% of car buyers say they would buy a greener car if financial assistance were available (EST 2004). However, although car buyers report that costs are paramount, they are highly resistant to changing their consumer behaviour and are prepared to endure an extra £1,100/yr before changing to a different fuel/smaller engine/smaller car (RAC 2004).

RQ9 - What is the level of awareness, knowledge and understanding/misconceptions of the environmental impacts of conventional and low carbon/fuel-efficient cars?

Overall, the levels of consumer awareness and concerns regarding the environmental impact of cars are high. Indeed, the environmental issues of most concern to public over next 20 years are traffic, air pollution and climate change (DEFRA 2002). There is also evidence of a greater concern for

local, rather than global issues – visible emissions are of more concern to car drivers than CO₂ emissions and air quality is of more concern than climate change (TRI/ECI 2000; Lane 2000).

However, there is evidence that consumers of all types have very low knowledge-base regarding the impacts of low carbon and fuel-efficient vehicles. “*The relationship between inputs (fuel) and outputs (emissions) is only very generally – if at all – understood by most drivers*” (DfT 2003). There are also strong indications that stable misconceptions are present at all levels. Although the public know that CO₂ leads to climate change, mobile phones and the ‘hole in the ozone layer’ are also blamed (DEFRA 2002). In addition, more people are aware of CO than CO₂ (Lane 2000). The evidence, therefore, reveals a significant attitude-action gap – although concerns are high, levels of knowledge are low and (for private buyers at least) action minimal. To address these issues, with the aim of closing the gap, further research is required to identify key misconceptions.

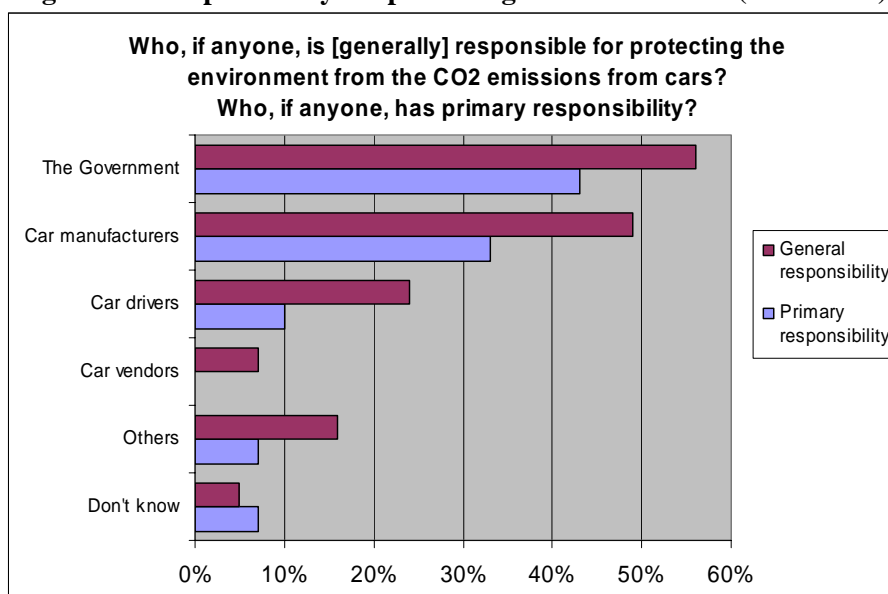
7 Designing strategies to promote low carbon cars

This chapter explores three issues: what are the prevalent attitudes regarding the responsibility of reducing vehicle emissions; what evidence is there for a link between cognitive processes and actual consumer behaviour; and what implications do the research findings have on the role and management of attitudes in the promotion of low carbon/fuel-efficient cars.

7.1 Reducing the environmental impact of cars – whose responsibility is it?

According to the MORI poll conducted on behalf of the DfT, private car owners identify the Government and manufacturers as those agencies most responsible for protecting the environment and reducing vehicle emission of CO₂ (see Figure 7.1). When asked who has the primary responsibility, only one in ten car drivers believe that the primary responsibility is theirs. This shows that, while new car buyers are deeply concerned about the environmental impacts of motoring, few consider themselves to be individually responsible for taking action to reduce its impact (DfT 2004a).

Figure 7.1 Responsibility for protecting the environment (DfT 2004a)



The focus group research that formed part of the same study²⁰ also drew the same conclusions, revealing a hierarchy of responsibilities as perceived by car drivers. The agencies responsible for reducing the environmental impacts of car use are viewed as (DfT 2004a):

- The Government are perceived as having the primary responsibility;
- The secondary responsibility is attributed to car manufacturers – almost all drivers (97%) think that manufacturers are under an obligation to ensure that their products and operations do not harm the environment.
- Car users/drivers consider themselves to have tertiary responsibility – few motorists think that they have a personal responsibility. Reasons given for this stance are dependence on the car for everyday needs and the lack of good public transport. This suggests that driver attitudes need to change substantially before environmental issues become a priority.

²⁰ Four focus groups were conducted among recent and future new car buyers in May 2003. The groups taking part were located in Stockport and Watford and were either likely to buy a new car in the next six months or had purchased a car post-March 2001.

“You vote in a Government and expect them to control the environment which they do. They can reduce emissions year on year and you expect that from any Government. I believe it is their problem not mine” (Male, 25-50)

“Isn’t this up to the manufacturers to make the cars better for us to drive” (Female, 50)

There is also evidence that car drivers reduce the significance of their own actions by believing that vehicle technology has already sufficiently improved, and by placing most of the blame for emissions on sectors other than road transport (DfT 2004a).

“We are all driving newer cars so I don’t think personally that there is a great deal of a problem...” (Female, 50+)

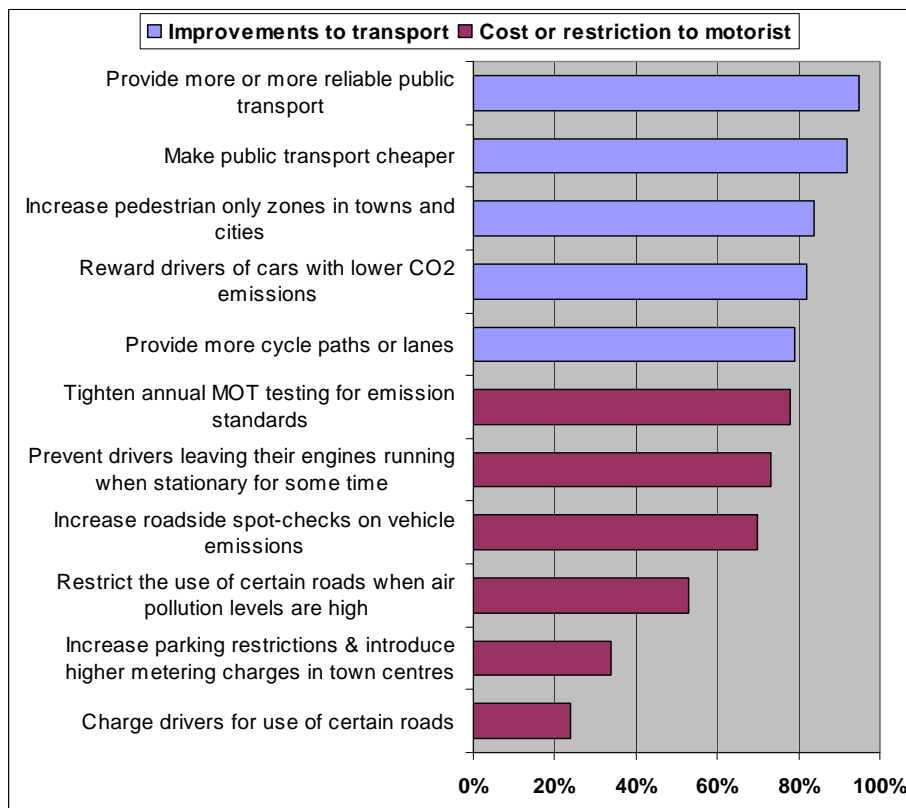
“I am very concerned that is why I went onto diesel with all its emission rates. And I think, well I have done my bit” (Male, 50+)

“Everybody complains about passive smoking but you look at all the cars on the street and they are causing a lot more damage” (Female, 50+)

When it comes to attitudes regarding specific measures to reduce vehicle emissions, there is little awareness of actions taken by Government. The few measures of which drivers are aware include: congestion charging, park and ride schemes and attempts to improve public transport (DfT 2004a).

The *Survey of public attitudes* report by DEFRA provides more detail concerning the public’s attitude to transport emission reduction measures. The two most popular policies both involve improving public transport either by *providing more public transport* (95%) or by *making public transport cheaper* (92%) (see Figure 7.2) (DEFRA 2002). Predictably, the most popular policies are incentive measures that involve no cost to the individual, and the least popular are those that charge or restrict motorists in some way.

Figure 7.2 Support for potential Government transport policies (DEFRA 2002)



Interviews with key opinion formers²¹ representing car manufacturers, fleet operators and vendors reveal attitudes regarding responsibility that are somewhat different to those of car drivers. They emphasise a more equitable spread of actions required across all agencies (DfT 2004b) – the main responsibilities are seen to rest with the Government and the manufacturer, and to a lesser extent car sellers and cars drivers (including what car they buy). The Government’s role is seen as legislative and the manufacturers’ role is one of compliance and technical advancement.

“I don’t think it’s a single person, I think it’s a joint responsibility. Probably policy from Government that is set to give us guidelines and then the responsibility of the manufacturers to make sure they achieve or even exceed the standards that are set” (Car manufacturer)

“I would hope that everybody has a responsibility. The manufacturers have a responsibility to manufacture clean products. Government has a big responsibility to set out the legislative framework which it wants and expects people to operate within ...” (Car fleet operator)

“I think the onus is on everyone. From Government legislation, the vehicle producers right down to peer pressure from the consumers themselves...” (Car vendor)

The DfT survey notes that the environmental impact of cars is recognised throughout the industry and that reducing the impact (eg through the development of low carbon cars) is seen as a necessary and significant challenge. Whereas car drivers underplay the importance of vehicle emissions by blaming other sectors, the vehicle industry widens its sphere of concern by including impacts across the whole vehicle’s life from manufacture to disposal. Overall, vehicle emission reduction targets introduced by Government are welcomed and there is a view that improvements may not have been made by manufacturers had they not been imposed. It is also recognised (by those interviewed) that manufacturers have made significant environmental improvements regarding the emission levels of cars in recent years.

However, there is also some evidence that specific knowledge regarding emissions targets and measures is limited within some parts of the industry.

“I don’t think the Government have been particularly clear with the targets that we’re trying to achieve, so I don’t know how achievable the targets are as I don’t know what they are” (car vendor)

There also remains some tension between the needs of shareholders and the promotion of cleaner vehicles within some sectors. As noted by Gerald Gornall, the Associate Director of Lex Vehicle Leasing, regarding the leasing industry’s difficulty in promoting cleaner cars (in this case LPG) without strong Government support (Hansard 2004; Questions 237-238):

Mr Stevenson: Do you not see any responsibility in companies such as yours—Lex is probably the leading company in the country in terms of volume of business—in filling the gap that reduction in grant might result in terms of your responsibility towards a better environment?

Mr Gornall: We have a very clear environment policy. Commercially I think it would be wrong to expect a business whose responsibility is to its shareholders to reduce profits simply to help the environment.

Mr Stevenson: ...There are those that might argue...that we have all got a responsibility here. What you are saying very clearly is profound substantial effect—deleterious effect presumably—grants are reduced, companies such as yours do not see any responsibility whatsoever in attempting to develop financial mechanisms in terms of your business that

²¹ In-depth interviews were conducted in 2003 with car manufacturers (8), fleet operators (16), and car vendors (12).

would perhaps encourage the use of environmentally friendlier fuels that would be under threat if the grant is cut. You do not have that responsibility.

Mr Gornall: There are external forces that make LPG such an uncertain fuel going forward. There is no reason for us to price that any differently.

7.2 Consumer attitudes and actions – bridging the gap

While there is a relatively small amount of research into car buyer attitudes (as can be seen by the evidence already presented) even fewer studies have attempted to link cognitive processes with actual (consumer and travel) behaviour.

One recent study that does make the link (thereby exploring the attitude-action gap) is a paper that investigates the attitudes of New Zealand commuters regarding the environment and effects of vehicle emissions (Walton *et al.* 2004). This surveys 566 commuters who travel by public transport and private car and includes drivers of highly polluting ('smoky') vehicles. This study attempts to find correlations of commuter attitudes with travel behaviour. The attitudes investigated include: levels of knowledge of emissions, environmental concern, specific attitudes towards emissions-related behaviours and individual pressure to reduce emissions. The behaviours investigated include: method of transport used for commuting and contributions to an environmental organisation.

The results are as follows:

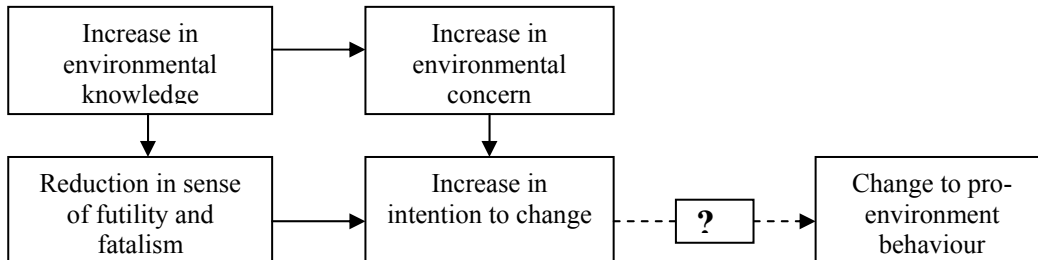
- Environmental concern and knowledge of emissions are found to be independent of behaviour;
- Drivers of highly polluting cars do not have lower levels of knowledge of emissions or environmental concern compared to other private car commuters;
- Rail commuters show no greater concern for the environment than car commuters;
- Both general environmental concern and knowledge of emissions positively correlate with a self-reported pressure to reduce vehicle emissions;
- The greater the level of environmental concern, the higher the level of emissions knowledge;
- The level of general environmental concern negatively correlates with a futile and fatalistic outlook;
- The level of emissions knowledge negatively correlates with a futile and fatalistic outlook.

If these results are transferable to other countries (including the UK), several important conclusions (for the purposes of this report) can be made. The first is that the level of environmental concern and knowledge held by commuters does not determine their method of transport. Furthermore, commuters are just as likely to be very concerned for the environment even if they drive a highly polluting vehicle. This suggests that, within the general population (rather than just early adopters), the concern and knowledge are not the determining factors for using or purchasing a cleaner car. However, given that higher concern and knowledge increases pressure to reduce emissions, one interpretation is that other factors are acting as barriers to the uptake of less polluting vehicles.

The second conclusion follows on from the lack of correlation between knowledge and behaviour. As noted in the paper: *"The results suggest that a policy that aims to change emission behaviour by improving environmental attitudes and knowledge... is likely to be ineffective."* This has important consequences for strategies to promote low carbon cars. Information and education may be necessary, but they are (according to this research) insufficient in themselves to promote more environmentally friendly behaviour.

The third point is more positive. Although increasing environmental concern and knowledge do not lead to pro-environmental behaviour, they do lead to pressure to reduce emissions and, most importantly, to a reduction in futility and fatalism. The interpretation is that the more drivers understand about the environment and the transport options available (such as buying a low carbon car), the more they feel empowered to act *even though they may not change their behaviour at that time*. This suggests that, when drivers know how to act, it increases their desire to act.

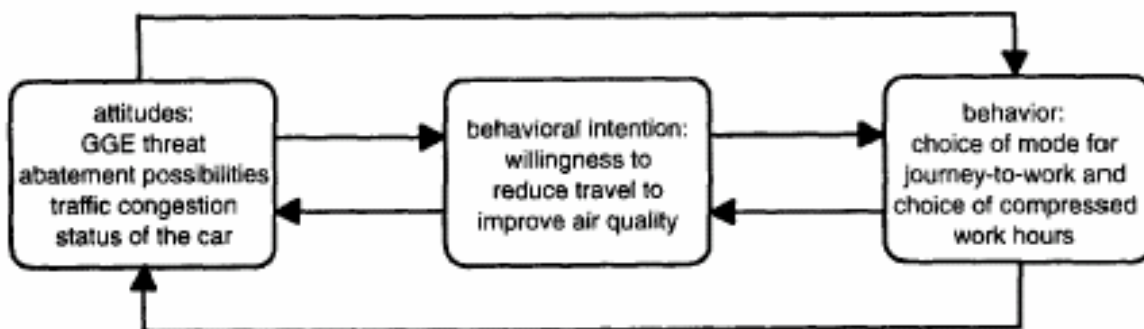
Figure 7.3 Pictorial summary of attitudinal linkages within commuter study (Walton 2004)



A second research paper addresses the link (or otherwise) between attitudinal support for environmental transport policies and commuters’ travel behaviour (Golob and Hensher 1997). The study is based on 1527 interviews with individual commuters using a number of travel modes (solo-driving, car pooling, users of public transport, compressed working) in six Australian cities. Although the main focus is on travel demand strategies (one policy investigated is the use of tax-rebates for fuel-efficient cars) the results are useful in showing why current behaviours (including car buying trends) are difficult to change.

The first point of interest is that the study adds the interim stage of behavioural *intention* within the attitude-action gap (see Figure 7.4). (This idea is used less explicitly within the Walton paper above.) Using this conceptual framework, the research question asked by the study is: “*how are opinions regarding the environment related to intentions to modify travel behaviour, and how are both opinions and behavioural intentions related to actual travel behaviour?*” The paper chooses a particular environmental issue and focuses on the attitudes, strategies and behaviours associated with reduction of greenhouse gas emissions (GGE).

Figure 7.4 Position of ‘behavioural intention’ stage within attitude-action gap (Golob and Hensher 1997)



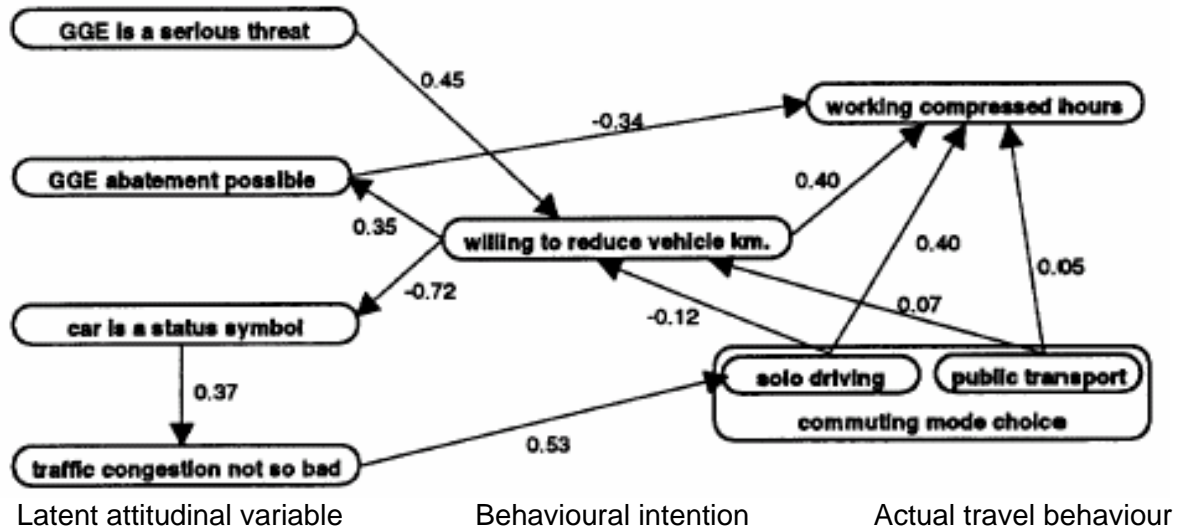
Interviewees are presented with a series of nine statements and are asked to rate them on a 5-scale response from ‘strongly disagree’ to ‘strongly agree’. In summary, these statements include attitudes regarding: the environment; levels of traffic; travel demand measures; economic incentives and disincentives for fuel-efficient cars; the car as a status symbol; and travel behavioural intention. Statistical analysis of these responses identifies four ‘latent’ attitudinal variables (that incorporate the responses of the original nine statements). The research team then causally linked

these ‘latent’ attitudinal variables with behavioural intention and actual travel behaviour using confirmatory factor analysis (see Figure 7.5).

The latent attitudinal variables are:

- ‘Greenhouse gas emissions are a serious threat’;
- ‘Greenhouse gas emission abatement is possible’;
- ‘My car is a status symbol’;
- ‘I am willing to drive fewer kilometres’.

Figure 7.5 Position of ‘behavioural intention’ stage within attitude-action gap (Golob and Hensher 1997)



Within this complex network of attitudes, intentions and behaviours, some strong causal linkages are revealed. These are indicated by the arrows and correlation ratings shown in Figure 7.5 and include:

- Commuters who view greenhouse gas emissions as a serious threat are more likely to be willing (intention) to reduce their car use;
- Commuters who are willing (intention) to reduce their car use are: more likely to believe that greenhouse gas abatement is possible; and less likely to view their car as a status symbol;
- Drivers who see their car as a status symbol are less likely to consider that congestion is a problem;
- Commuters who consider traffic congestion not a problem are more likely to drive alone;
- Commuters who drive alone are more likely to work compressed hours;²²
- Commuters who believe that greenhouse gas emission abatement is possible are less likely to work compressed hours; and
- Solo drivers are more likely to work compressed hours.

A number of observations are drawn by the paper’s authors regarding types of commuters and how their respective opinions relate to their behaviour. However, of most relevance to this report is the observation (clear in Figure 7.5) that at least one feedback loop is evident. In particular, drivers who see their car as a status symbol are less likely to consider that congestion is a problem. These in turn are more likely to be solo-drivers, are less likely to be willing to reduce their car commuting and thus are more likely to see their car as a status symbol. *“This means that these attitudes and the choice of solo-driving are reinforcing.”*

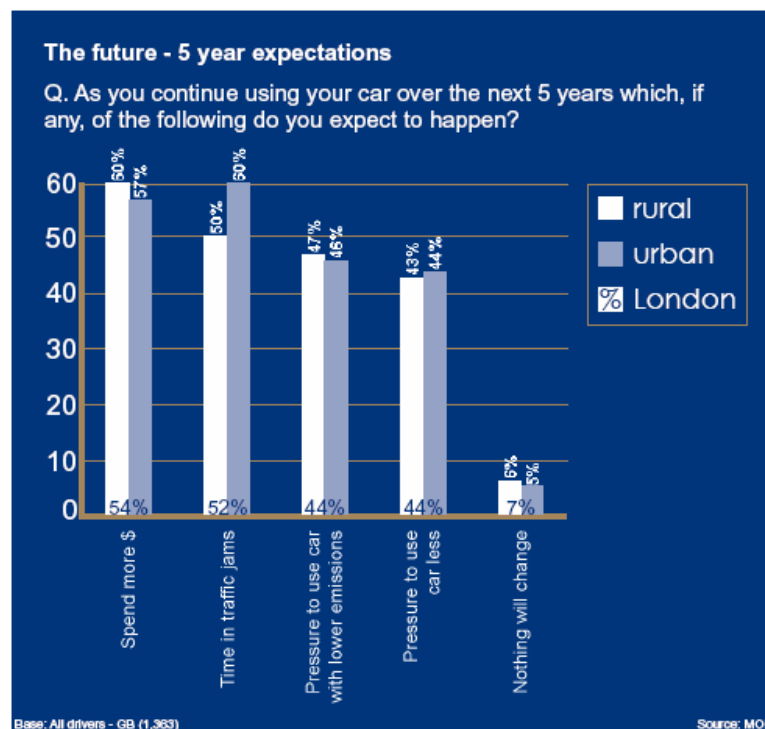
²² Compressed hours (or compressed working weeks) involve the reorganisation of working time into fewer and longer blocks during the week. Generally the number of hours worked during the week remains constant.

Although this feedback loop does not involve a car-purchasing behaviour, it illustrates that certain attitudes can lead to stable, non-environmental behaviours, which are self-sustaining. In these cases, addressing certain key attitudes is crucial if behaviour is to be changed. The research team suggest that “a media campaign aimed at demonstrating how images of the car as a status symbol are in conflict with the goal of reducing global warming... should be effective in reducing solo-driving and otherwise encouraging people to reduce their driving”. Although the paper focuses on travel demand measures and policies, this principle could be applied to the consumer behaviour of low carbon cars (ie a media campaign that demonstrates how a car’s symbolism conflicts with climate change could be effective in promoting sales of low carbon cars).

7.3 Promoting low carbon vehicles in the UK – desk based research

Fortunately, for the would be promoter of cleaner cars, there is a widespread expectation among British car drivers of forthcoming pressure either to make cars ‘greener’ (46%) (and use cars less) (see Figure 7.6). (This expectation is far more prevalent than it is in the US where the figure is just 25%.) In Britain, concern is highest among more affluent groups (perhaps reflecting their greater awareness of the issues). Those with children also show greater expectation of the need for ‘greener’ cars (AA 2004).

Figure 7.6 Expectations of British car drivers over the next 5 years (AA 2004)



To support the promotion of cleaner vehicles, the Government has introduced a set of coordinated economic incentives including: the *PowerShift* programme, preferential excise duties, graduated VED, congestion charge discounts and a new system of company car tax (see the Introduction). However, in addition to these economic incentives (which may or may not be as effective as intended), the research findings discussed in previous sections suggest that positive attitudinal factors are also important for the uptake of low carbon and fuel-efficient vehicles (Darnton 2004). This section, therefore, explores a range of promotional strategies that aim to improve consumer attitudes to low carbon and fuel-efficient passenger cars.

Although a large number of approaches are possible, attitudes management strategies can be loosely grouped into four categories:

- Improving information provision and educational campaigns;
- Increasing economic incentives and reception of price signals;
- Promoting image and amenity value of low carbon cars; and
- Targeting of early adopter segments.

Improving information provision and educational campaigns

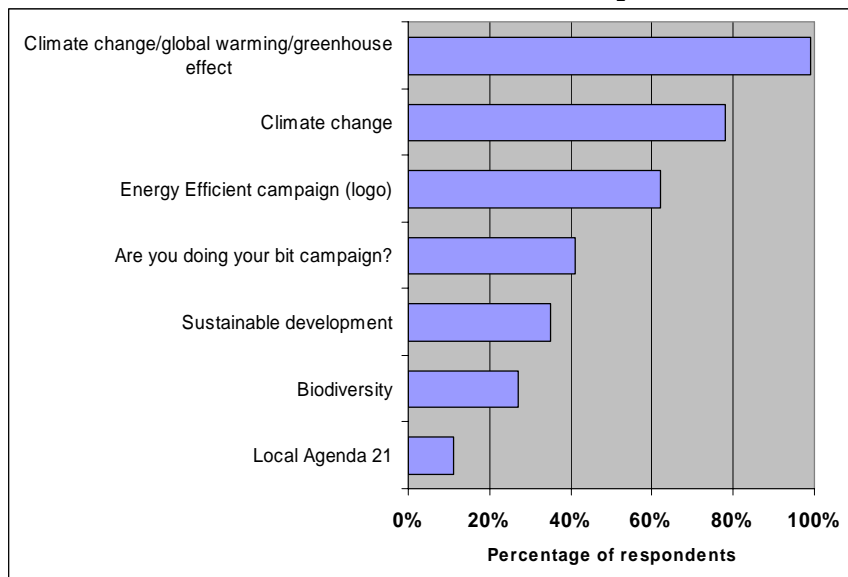
As was discussed in Sections 6.1-6.4, car buyers' have a low knowledge-base and hold many misconceptions regarding vehicle emissions, vehicle technology and the environmental impact of emissions. For example:

- Whereas awareness of carbon monoxide as a vehicle emission is overly high, awareness (among the general public) of particulates and NO_x is low (Lane 2000);
- Although most people have heard of a catalytic converter, few understand how it works and what emissions are reduced (Lane 2000);
- In one focus group study, less than a quarter of male car buyer participants were aware of the option to convert a conventional car to bi-fuel gas/petrol operation (DfT 2003a);
- Negative misconceptions regarding new vehicle technologies include: LPG is very dangerous; hybrid electric cars have limited range and need a special recharge point; solar cars are being developed commercially (Shell 2004);
- Although most people know that carbon dioxide emissions are a cause of climate change, mobile phones and the 'hole in the ozone layer' are also thought to be responsible (DEFRA 2002);
- Car purchasers are largely unaware of the level of greenhouse gas emissions produced by their car, and environmental impact is not given priority in their decisions (DfT 2004a).

There is, therefore, a strong case to be made for increasing information and education provision regarding cleaner cars. Although this may not be sufficient in itself to increase low carbon/fuel-efficient car sales, as shown by Golob and Hensher, an improved knowledge-base is likely to increase concern, reduce fatalism and increase the intention to change consumer behaviour. It seems reasonable to consider that these attitudinal changes are a pre-requisite for pro-environmental consumer behaviour.

Transport and environment information/education campaigns are nothing new and several national campaigns are in operation at any one time including the 'Are you doing your bit?' campaign which has been active for several years. To gauge their reach (if not their impact), the DEFRA *Survey of public attitudes* has investigated the UK public's awareness of this and other educational campaigns. In 2001, it found that 62% had heard of the Energy efficiency campaign, 41% were aware of Are you doing your bit? and 11% of respondents had heard of the local sustainable development initiative Local Agenda 21 (see Figure 7.7).

Analysis by gender revealed that female respondents were more likely to have heard of the Are you doing your bit? campaign (45% of women; 37% of men). By age, the Energy efficiency campaign was better known by younger respondents (78% of those 18-24; 43% of those 65+) as was the Are you doing your bit? campaign (58% 18-24 years; 27% of 65+). When it came to the more general awareness of development issues, male respondents were more likely to have heard of the term 'sustainable development' (42% of men; 26% of women) as were people aged 45-64 (41%) (average 34%; 18% 18-24 year olds).

Figure 7.7 Awareness of environmental and sustainable development issues: 2001 (DEFRA 2002)

In one important respect, information to car buyers will greatly improve with the introduction of the new colour-coded ‘green’ car-label due to be introduced from July 2005 (LowCVP 2005a). This uses the A to F style rating first adopted by ‘white goods’ to rate the car’s carbon dioxide emissions using categories similar to those for VED. Fuel consumption (urban, extra-urban and combined) and fuel costs (per 12,000 miles) are also provided by the label. As noted by Tim Brown of the National Society for Clean Air:

“...Motorists can help fight climate change by choosing lower-carbon models, and it will now be easy for them to avoid the real gas-guzzlers. Labelling has made a huge impact in the market for electrical goods; this is important step towards lowering emissions from the transport sector, and reducing fuel costs for drivers” (LowCVP 2005a)

One participant in the 2003 DfT study who had considered a dual-fuel vehicle stated:

“I like to recycle bottles and tins, and would like to carry this through with the car... I bought a washing machine because it had a low environmental impact. I’d do the same for a car” (Male participant; DfT 2003a)

In the report *Cars of the future*, the House of Commons Transport Committee also notes that the car-label could have an impact on demand for cleaner cars in much the same way that the Euro NCAP impact-rating scheme has influenced car manufacturers to make more crash-resistant vehicles (in some respects). The committee claims the scheme to have “*rapidly become a catalyst for encouraging significant safety improvements to new car design.*” (HC Transport Committee 2004).

However, in the light of the issues raised in this report, some caution is required when considering the provision of information. First, increasing the availability of information does not necessarily lead to increased knowledge. In the words of Sally Eden: “*policy tends to assume that providing environmental information and education will secure behavioural change, when behaviour is in fact intimately dependent upon public interpretation of the issues.*” (Eden 1996). The stress here is on how information is *interpreted* by car buyers considering the purchase of a new car. Secondly, overloading the consumer with too much information can defeat the object of an information campaign. The key is knowing which ‘facts’ are most pertinent and effective in changing consumer intentions and/or behaviour.

Several examples of how information can be misinterpreted (and misconceptions reinforced) can be given based on evidence discussed in previous sections:

- If carbon monoxide is more widely known as a vehicle emission than carbon dioxide, then a ‘low carbon’ car might be interpreted as a low-CO car (stressing reduced local pollutants);
- By focusing on fuel and VED costs, the new car-label may reinforce the misconception that these cost elements are a significant proportion of total motoring costs, whereas elements such as depreciation account for a larger proportion of costs for most car owners;
- On the new car-label, the phrase ‘fuel economy’ is written directly above the phrase ‘CO2 emission figure (g/km)’ – there is evidence that these two concepts are not associated in the minds of the majority of car buyers (as they are by those in the car industry).

One approach that reduces the risk of consumers misinterpreting or being overwhelmed by information, or having their misconceptions reinforced, is to identify commonly held attitudes prior to designing information tools. Ascertaining consumers’ understanding of road transport technology and its environmental impacts helps predict how potential consumers will interpret new information concerning new vehicle types and how this may affect patterns of car buying behaviour.

Increasing economic incentives and reception of price signals

If levels of knowledge regarding environment and vehicle technology are low, a case could be made for *not* providing environmental and/or technology information at all. Instead, given the facts that car buyers have little understanding of these issues *and* that costs issues are prioritised in the car buying process, low carbon vehicles could be promoted solely through the use effective price signals and incentives. This circumvents the need for consumers to understand what are complex environmental and technological issues.

The existing incentives for cleaner cars have been successful (to varying degrees) in increasing uptake of cleaner/fuel-efficient vehicles. These measures include *PowerShift* capital grants, preferential FED, graduated VED, congestion charge discounts and the new system of company car tax. Car buyers *report* that economic incentives are important in making the decision to purchase a cleaner car. In response to the recent survey question: ‘If you knew you could get financial assistance to help towards the costs, would it persuade you to buy a car that was less damaging to the environment?’, 80% of respondents said it would (EST 2004).

“For many, being green is all about fuel economy, not carbon emissions. In this context, being green can bring cost savings and this is an opportunity for Government and the industry to raise the profile of ‘the environment factor’ ” (DfT 2003a)

However, there is some evidence that consumers are not as persuaded by current incentives as they might be. For example, the cost of bi-fuel LPG and CNG cars (conversions) is seen as prohibitive and is exacerbated by the low awareness of the *PowerShift* grant programme (see below) (DfT 2003a). Given the *perceived* lack of refuelling stations, such vehicles would have to be “a lot cheaper” than conventional vehicles to become attractive to the majority of car buyers. For most private motorists, the differences between the VED bands are also not large enough to be taken into account when other costs are considered. For fleets, there is also the additional issue of uncertainty (regarding reliability and future incentives) (discussed in Sections 5.2 and 6.4), which makes fleet managers reluctant to invest in new vehicle technologies. According to the House of Commons Transport Committee report:

“[The Government] should make far greater use of fiscal incentives and grant programmes to influence the car market, and ensure customers understand the incentives available” (HC Transport Committee 2004; para. 138)

Intricately linked to the question about the effectiveness of incentives is the question of how existing price signals are *received* (this is similar to the issue of how environmental information is *interpreted*). As was discussed in Section 6.5, in addition to having a low knowledge-base regarding vehicle technology and environmental impacts, there is much evidence that car buyers do not fully appreciate the extent of car ownership costs, the car cost structure or the incentives that are available for cleaner cars. For example:

- On average, motorists underestimate their car costs by around a factor of two – servicing and repair costs were underestimated to the greatest degree (RAC 2004);
- Car owners are most aware of fuel costs, road tax and insurance – private car owners are particularly unaware of depreciation rates and company car owners are less aware of their tax burden than might be expected (RAC 2004);
- Although most company car drivers are aware of the reform in company car tax, 80% do not know the correct CO2 emission figure for their car, and 30% are not aware of the supplement for non-Euro IV diesels (IR 2004);
- “*Understanding that VED is based on carbon emissions is patchy*” and awareness of *PowerShift* grants for bi-fuel conversion is low (DfT 2003a);
- Although car buyers say cost is paramount, they are prepared to endure large increases in costs before changing their behaviour – on average, annual costs have to increase by at least £1,100 before drivers switch to an alternative fuel or smaller engine (both of which are preferred to a smaller car) (RAC 2004).

The implication of these examples is that a strategy of using effective price signals (in place of technology/ environmental information provision) is itself weakened by the lack of awareness and detailed knowledge of car-ownership and running costs. To ensure that the current and future system of economic incentives are as effective as intended, information provision (it appears) is also integral to a price signal strategy.

A further issue regarding costs, and one where there is some disagreement in the existing research, is whether consumers are indeed willing to pay more for cleaner car. According to the 2003 DfT report, environmental factors could become more important to car buyers if cleaner cars either reduce or incur no additional costs (DfT 2003a). This concurs with the findings of the ITS report *Estimating household demand for alternative fuel vehicles* in which focus group participants choose from a range of cleaner technology cars first on price and specifically discount those choices that exceed a threshold price (which effectively eliminates the most costly of the three options on offer) (ITS 2004).

However, other studies suggest that some car buyers (for whom environmental issues are important) would be willing to pay more for an environmentally friendly car. This is particularly the case for “*more affluent, young professionals with families*” (DfT 2003a). The report for Shell (see Section 6.3) also notes that (without making compromises for safety, fuel efficiency and roominess), 30% of participants state a willingness to use a preferred cleaner fuel technology even if costs increase by up to 10% (Shell 2004).

One explanation for these apparent differences is that (as was noted in Section 4.3) the survey samples are sometimes representative of the general population, and sometimes are more representative of early adopter groups. It seems plausible that those early adopter segments for which costs are less of an issue are more willing to pay more for a product that appeals to their (non-utilitarian) requirements. This could imply that targeting some specific early adopter groups would form a better strategy to increase low carbon car sales than would increasing the effectiveness of current and future price signals for the whole market (sector targeting is discussed below).

Promoting image and amenity value of low carbon cars

A third possible approach to marketing low carbon vehicles is to promote their increased amenity value where appropriate. Already, those cleanest cars on the *PowerShift Register* are exempt from the London Congestion Charge. Several London Boroughs also provide free parking and recharging points for battery electric vehicles. In a real sense, these cars have increased amenity as compared to conventional cars within these specific congestion charge and parking zones. There is also potential for offering low carbon vehicles use of dedicated lanes as is currently offered to drivers of high-occupancy vehicles (in ‘HOV’ lanes).

The ITS report *Estimating household demand for alternative fuel vehicles* investigates the consumer attitudes towards cleaner vehicles. In the study, respondents are asked to choose from several car types categorised according to cost, performance and amenity – the cars include a range of conventional, LPG, battery-electric and fuel cell-electric cars (ITS 2004). Issues raised include: details of the technology; how the technology might change travel behaviours; suppliers’ network coverage; modifications required to the car; the distances that can be travelled with new fuels; the fuel coverage outside of the UK and the rules governing facilities such as Euro-tunnel and ferry restrictions for alternative fuel/technology vehicles (ITS 2004).

Although the study notes ‘general and vague’ positive attitude towards lower emission cars, the overriding attitudes that emerge are that alternative fuel technologies:

- Currently offer inferior performance (and therefore less amenity) over at least some characteristics compared with conventional vehicles (though it should be noted that hybrid-electrics were not considered in the study); and
- “Should be *completely substitutable* with the current fuel technology to the extent that current social practices would not be affected by its introduction” (ITS 2004).

The report also identified an elasticity of 0.2 for alternative vehicle ownership with respect to vehicle range, and an elasticity of -0.2 for ownership with respect to refuelling time.²³ This study highlights the importance of vehicle performance and amenity – if these attributes are perceived (rightly or wrongly) as negative, this can have a seriously detrimental impact on the intention of consumers to purchase a new technology vehicle.

Although there is much anecdotal evidence of the failure of some technologies to perform as expected, there is nevertheless an opportunity here to promote those technologies that are able to provide *increased* performance and amenity. For example, several available petrol-hybrids cars are already able to offer increased range and improved acceleration in some cases, in addition to the economic benefits of reduced fuel costs and 100% congestion charge discounts. Indeed, many hybrid owners report an *improved driving experience*, one which some consider is currently underplayed:

“All advertisements and reports seem to conceal one of the most important features of [a hybrid]: it is really fun to drive one” (Hybrid car owner, Luxembourg; BBC 2004)

“My [hybrid] ... has been a real joy to drive... since the engine shuts down when the car is idling, the car is quiet and actually allays stress that one carries unnoticed from the ubiquitous sound of gasoline-driven engines” (Hybrid car owner, USA; BBC 2004)

These comments link to a related issue – some low carbon/fuel-efficient cars have an enhanced image that (for some attributes) challenges the status of conventional cars as ‘superior’.

²³ An elasticity of 0.2 for vehicle ownership with respect to vehicle range implies that the level of ownership increases by 20% for every 100% increase in range.

Targeting of early adopter segments

The fourth promotional approach suggested by the evidence presented is that, rather than increasing information and/or economic incentives for the market as a whole, low carbon and fuel-efficient cars should first be promoted specifically to key early adopter segments.

As noted in Section 4.3, the Shell report focuses on consumer acceptance during the early phase of market development of new car fuels and technologies. The report identifies seven early adopter segments for new car fuels/technologies within the UK. These segments are labelled as: Stars; Mr Fast-tracker; Mrs Fast-tracker; Individualists; Long hauler; Green papas; and Fleet buyers. Excluding Fleets (which account for around half of all car sales), the other six early adopter groups together account for 10%-20% of *private* car sales (Shell 2004).

In a *speculative exercise*, the author has used the approach of the Shell report to gauge the relative take-up of new vehicle fuels/technologies by each early adopter segment. This was accomplished by assessing the degree of match between each of the 18 combinations of early adopter value curves and technology profiles as shown in Table 4.7 (see Section 4.3). For each combination, the degree of match was found by summing the occurrences of ‘added value’ and subtracting the sum of ‘compromises’ made (see Figure 6.8 in Section 6.3). The total match score for each early adopter segment was then found by summing all combination scores allowed for that segment. Dividing the match rating by a constant produced a decimal score (out of 1.0) to denote each segment’s relative acceptance of new vehicle fuels and technologies – these are shown in Table 7.1.

The next step in the exercise was to estimate the size of each segment should the total early adopter market meet the low carbon sales cars target of 10% of all car sales (the Government’s target for 2012). This is achieved by first multiplying the relative numbers in each segment by the segment’s relative acceptance score. The results are then divided by an appropriate constant such that the total equals 10% of total UK annual car sales – the figures are shown in Table 7.1.

Table 7.1 Size of UK early adopter segments for 10% low carbon car market penetration (2012)
(Speculative exercise based on Shell 2004)

Annual sales *Max=1.0 **1000s / %	Total	Stars	Green papas	Ms Fast-tracker	Mr Fast-tracker	Individualists	Long hauler	Fleet buyers
Relative acceptance*	<i>n/a</i>	0.5	0.2	0.4	0.8	0.5	0.3	0.2
Total UK car sales**	257	2.0	4.1	3.5	13.5	11.1	7.0	215.4
	10%	0.08%	0.16%	0.14%	0.53%	0.43%	0.27%	8.39%

The results of this exercise are that:

- Fleet buyers (as expected) account for the vast majority of early adopter sales – this segment accounts for around 8.4% of the 10% sales target;
- The three most important private early adopter segments (in terms of size) are Mr Fast-tracker, Individualists and Long haulers – these three segments around 1.2% of the 10% sales target;
- The three least important private early adopter segments (in terms of size) are the Stars, Green papas and Mrs Fast-tracker – these three segments less than 0.4% of the 10% sales target.

The results suggest that a strategy specifically designed to target early adopter groups should focus on four early adopter segments (Fleets, Mr Fast-tracker, Individualists and Long haulers). Noting the similarities in timing and characteristics between Fleets and Long haulers, and between Mr Fast-tracker and Individualists (see Section 4.3), this approach also suggests that Fleet and long hauler early adopters should be targeted first, followed by Mr Fast-tracker and Individualists that then act as bridge to the wider, more general, early and late majority market segments.

Although only speculative, this strategy leads to the conclusion that vehicles should be priced and/or incentivised in such a manner that increases the consumer acceptance within these targeted segments in turn. If correct, based on the table of segment definitions (see Table 4.5), this suggests a two-stage promotional targeting of incentives:

- Firstly to address Fleet and Long hauler segments that: have high annual mileage and frequent vehicle use; are extremely sensitive to costs; are particularly receptive of incentives; are less sensitive to environmental concerns; and who consider reliability as a key issue in the decision to switch to using new vehicle fuels and technologies;
- Secondly to address Mr Fast-tracker and Individualist segments that: have medium annual mileage and frequent vehicle use; have an emotional view of vehicles; use cars primarily for private use; are urban dwellers; are interested in technology and are either performance or style driven when deciding to switch to using new vehicle fuels and technologies.

7.4 Promoting low carbon vehicles in the UK – LowCVP workshop

At the LowCVP Annual Conference (held on 10th February 2005) several workshops were held to gain industry views on a range of issues including: the EU Emission Trading scheme, fiscal incentives design, marketing low carbon cars, the low carbon vehicle supply chain and traffic demand reduction (LowCVP 2005b).

The marketing workshop, entitled ‘Enthusing the Consumer’, focused on how to stimulate demand for low carbon vehicles by influencing consumer perceptions and attitudes. Almost fifty participants took part in the 75-minute session. Issues raised included: consumer attitudes to vehicles and the environment, car buyer priorities, reception of existing price signals, and increasing the amenity value of low carbon vehicles.

Although the workshop presentation led the structured discussion with three issues (attitudes of consumers to: the environment and technology, economic incentives and image and amenity), the eight workshop groups were diverse in their responses to the key issues. However, during the plenary discussion, a discrete set of issues emerged, detail of which are now given. (*The issues are presented under similar headings to the previous section.*)

Education and Promotion

The first key issue was one of education. The workshop attendees recognised the low level of consumer understanding (predominantly private car sector) regarding environmental, cost and technology issues. The group agreed that there was a need to more fully communicate the environmental benefits of low carbon cars and link these to costs benefits (eg link CO₂ to mpg, an area around which there is poor consumer understanding). In addition to the introduction of the new environmental car labelling scheme (which is a step in the right direction), a number of suggestions were made to increase consumer knowledge including:

- Schools campaigns – to ensure that transport technology and relevant environmental issues are part of the National Curriculum.

- Clearer and simpler information regarding economic benefits should be made available to potential low carbon vehicle purchasers (eg use of websites to provide information of impact on capital and running costs). Show-room sales staff could also be involved.
- The need for more highly-publicised low carbon vehicle demonstrations. Low carbon fleets using a variety of technologies could be set up around the country as a promotional tool (possibly using existing/emerging Car Clubs that allow potential consumers to experience low carbon cars for the first time). These could be linked to a national ‘mpg challenge’ event that demonstrates the performance of the cleanest production cars.
- The use of the media and high-profile celebrity endorsement to promote low carbon vehicles. It was noted that care needs to be taken in use of media so as not to reinforce existing preconceptions and stereotypes (egs electric vehicles are like milk-floats, hydrogen linked to Hindenburg).

Economic incentives

Secondly, many of the workshop sub-groups were of the opinion that more long-term economic incentives were required for both the consumer and manufacturer (one comment was that “*PowerShift not enough*”). Several groups proposed new incentive mechanisms that went beyond, but used aspects of, the existing graduated VED CO₂ banding. These included:

- Introduce VAT incentives for lower-carbon cars – on a sliding scale (eg using CO₂ VED bands)
- Increase CO₂ band differentials – although there was some question over whether this was the most effective fiscal lever.
- Link CO₂ banding to congestion charging and parking fees – this would extend the banding approach to parallel incentives.
- Enhance local incentives such as congestion charge discounts – extend to others that are used across the UK.

Image and Amenity Value

The third general issue was whether low carbon vehicles should appear ‘normal’ or be more ‘sexy’ than the average car. The group consensus was that these attributes need not be in opposition – low carbon cars simply need to have as high a standard of design as ‘normal’ cars with as much attention given to styling as for any production vehicle. A good example of this is the Ford Escape hybrid that has been called “*the automotive equivalent of the iPod*”. To improve the image of low carbon vehicles, the group also supported the introduction of low carbon technologies at the top end of the market – as is already beginning to happen (eg launch of the Lexus RX400h SUV).

The issue of consumers’ concerns regarding longevity and reliability of new technologies was also raised (whether valid or misplaced) and it was noted that, in the majority of cases, low carbon vehicle owners concerns reduce post-purchase.

The use of additional non-fiscal incentives were also recognised as a method of increasing the consumer appeal of low carbon vehicles. This could be through the preferential use of ‘green lanes’ or bus lanes for low carbon vehicles – much in same way that High Occupancy Vehicle (HOV) lanes give preference for shared car users. Other suggestions included more dedicated parking and (free) recharging points for low carbon cars.

Sector Targeting

An issue that was raised several times was the fact that fleets have very different buying priorities than do private buyers and more highly sensitised to overall lifecycle costs. Given their buying-power, fleets were also seen as a key sector to target to promote low carbon vehicles. Private buyers were also important, but private car sector was more complex in its reception of cleaner cars (more suited to those with high mileages etc).

Regarding fleets, the majority view was that the economic incentives of low carbon cars are recognised by fleet buyers, but status barriers remain. Suggested approaches to reduce this barrier were to get chief executives more interested in fleet purchasing by targeting them as a key player in the decision-making process (similar to what has been done to get travel plans accepted by large organisations). This could be accompanied by identifying several key companies who would most benefit from switching existing fleets to low carbon vehicles.

Key Actions

Although it is impossible to design detailed action plans within a one-hour workshop, the facilitator proposed four action points based on the issues raised by the workshop discussions. These are all based on the outputs of the workshop activity, but selected for impact and in the light of existing/emerging promotional mechanisms.

1. Introduce new purchase incentives for low carbon vehicles through the use of VAT or ‘feebates’²⁴

Current economic incentives are necessary but not sufficient. Further incentives are required over the longer-term. With the uncertainty surrounding the PowerShift programme, new innovative fiscal incentives should be introduced which are technology independent. Two strong contenders are to introduce a graduated VAT (banded by CO₂) and/or a ‘feebate’ scheme whereby vehicles cleaner than a pre-set average receive a cash incentive (or ‘rebate’) on purchase, those more polluting than average must pay a ‘fee’.

2. Increase promotion of low carbon vehicles through fleet demonstration and national ‘mpg challenge’

To promote low carbon vehicles to private and fleet sectors, the benefits of low carbon vehicles need to be continually reinforced through demonstration of real vehicles that have reached the market. These fleets would increase awareness of the range of cleaner vehicles available, provide information about the potential to reduce environmental impacts and overall costs, provide information about grants/incentives available and reduce uncertainties regarding performance and reliability.

The emerging network of Car Clubs (for private and business users) could provide national micro-fleet support to allow potential consumers to experience low carbon cars for the first time. A national ‘mpg challenge’ would also raise and maintain the media profile for low carbon vehicles. In addition, to support fleet promotion, company chief executives need to be targeted as key players to raise the profile of, and increase use of, low carbon vehicles within company fleets.

²⁴ See reference ‘Towards a new fiscal framework for transport’ which gives details on use of VAT and feebates to promote cleaner vehicles across EU (Potter, Parkhurst and Lane 2004).

3. Extend incentives for low carbon vehicles through preferential access to city-centres and LCV lanes

In addition to purchase subsidies and fuel duty differentials, other ‘amenity’ incentives have been successful in promoting sales of cleaner cars. Existing measures include some free parking and congestion charge discounts in London. These measures need to be extended in scope and range. New measures include use of preferential ‘low carbon vehicle (LCV) lanes’ in appropriate locations (used in much the same way as HOV lanes). Congestion charge discounts should also be extended to all congestion charge zones across the UK.

4. Survey existing consumer preconceptions and misconceptions regarding low carbon vehicles – private and fleet sectors.

To promote low carbon vehicles to a general public audience, education campaigns using the media and formal education need to be increased. However, to design effective education and media campaigns, a more detailed understanding of existing consumer preconceptions and misconceptions is required (regarding environmental and economic impacts). This will provide insight in to how new messages are received and interpreted. A national study could be completed through established omnibus type surveys and conducted within a relatively short length of time (12 months).

7.5 Research questions 10-11

RQ10 - What marketing methods, or other approaches, could motivate the purchase of low carbon or cleaner fuel cars by customers who currently show no or little environmental interest?

The direct answer is that the low level of environmental interest can either be addressed directly or circumvented by using strategies that promote the non-environmental benefits of cleaner cars (where appropriate). The research findings discussed suggest that attitude management strategies can be loosely grouped into four categories. These strategies could be adopted singly, in parallel or phased as part of an overall approach to sequentially target different market segments.

Improving information provision and educational campaigns: The research by Walton shows that providing information can increase environmental knowledge. In turn this increases concern, reduces fatalism and increases the *intention* of the consumer to change behaviour (Walton 2004). Therefore, information campaigns such as the new car label are a move in the right direction. However, information is necessary but not sufficient to change consumer behaviour (Eden 1996). While educational tools continually need to be developed to provide the consumer with up-to-date relevant information, attitudinal barriers also need to be addressed. This is because existing attitudes and misconceptions affect how new information is *interpreted* by the consumer who, therefore, may not receive the message as intended.

Increasing economic incentives and reception of price signals: The advantage of using price signals to effect change is that it circumvents the need for consumers to understand complex environmental and technological issues. Consumers also appear (on first inspection) to be highly receptive to fiscal incentives – 80% of car buyers say they would buy a greener car if financial assistance were available (EST 2004). However, the barrier to the use of effective price signals is that car buyers are already confused about conventional car costs (they underestimate overall costs by a factor of two) and are resistant to change even if price signals strong (RAC 2004). There is, therefore, an argument for either improving the effectiveness of existing incentives or for introducing new purchase incentives/disincentives for low carbon/polluting cars (eg use of ‘feebates’).

Promoting image and amenity value of low carbon cars: The car as a status symbol has been shown to be a key factor in reinforcing anti-environmental car travel behaviour (Golob and Hensher 1997). This suggests that one effective strategy to effect (consumer) behavioural change is to improve the style and status of low carbon cars. Fortunately, new cleaner cars are already being designed to standards equal or higher than conventional cars. For example, the Ford Escape hybrid has been called the “*automotive equivalent of the iPod*” (HybridCar.com). The appeal of low carbon vehicles could also be improved by increasing their ‘amenity value’. This could be achieved by either designing cleaner cars with capabilities not seen by ordinary vehicles (eg acting as mobile power units), or by giving them preferential access to key areas of the road network (eg in city-centres, ‘low carbon vehicle’ lanes).

Targeting of early adopter segments: Rather than addressing the average buyer, early adopter consumer can be targeted in the initial stages of low carbon vehicle market development. The Cambridge MBA report identifies seven early adopter segments for new car fuels/technologies within the UK (Shell 2004). These include fleets, the largest segment (comprising around half of the total car market) and six private market segments that account for 10%-20% of *private* UK car market. Of these, fleets play a key role in the early stages of market development, acting as drivers of infrastructure, vehicle development and raising awareness (Shell 2004). A speculative exercise based on the Shell study suggests that, assuming 10% low carbon car sales target for 2012 is achieved, fleets alone are likely to account for >8% sales of low carbon cars. The most significant *private* early adopter segments (Mr Fast-tracker, Individualists and Long haulers) are estimated to account for around 1.2% sales (Ecolane 2005).

RQ11 - How do vehicle purchasers source information and what would encourage the purchaser to source information from a manufacturer, Government or environmental organisation?

As was discussed in Section 5.3, the popular sources include: manufacturer brochures, the Internet, car magazines, sales staff, family and friends, consumer guides, TV programmes, radio and newspaper advertising and test-drives. There is little evidence that car buyers source information directly from environmental organisations or the Government (the existing car-label information is not used by the vast majority of car buyers).

However, a wide variety of sources are now used by car buyers to inform the car buying process. Of these, the Internet is becoming increasingly important. As noted by the report *Cars Online*, “*UK consumers...accord greater importance to the ability to research automotive information on the web than do respondents in many other European countries*” (Capgemini 2004).

While the evidence does not suggest *how* consumers can be encouraged to source more information, the Capgemini report notes that UK car buyers visiting websites are seeking: product information, price information, vehicle configurations and cost calculators. Of the prospective consumers who are satisfied by a company’s website, 46% are ‘more likely to purchase’ from that car manufacturer.

An important development that affects information provision (one that has occurred during the writing of this report) is the launch of the new car-label due for introduction from July 2005. It remains to be seen what the impacts turn out to be – however, this is obviously an issue that is worthy of monitoring and future research.

8 Further research – research question 12

RQ12 - Provide an outline of further field-based behavioural research that would assist manufacturers, Government and other stakeholders accelerate the market for low carbon vehicles.

As can be seen by the evidence presented, for some attitudes of UK car buyers and the general public, a great deal of research has already been done. This includes work conducted in preparation for the new car-labelling scheme (DfT 2003a; 2003b) and national surveys such as the *Survey of public attitudes to quality of life and to the environment* (DEFRA 2002). However, these studies tend to focus on awareness and concerns. Far less research has focused on assessing consumers' level of knowledge and understanding of vehicle technologies, environmental impacts, car costs and economic incentives. In addition, few studies attempt to identify UK early adopters of low carbon cars or assess the impact of cultural values on consumer behaviour.

This report therefore recommends that further research is required to more fully ascertain the attitudes of UK car buyers to low carbon/fuel-efficient cars. The four types of attitude management strategies (identified in Section 7) provide a useful way to consider what further field-based research is required. Recommendations for further research include the following:

- **Improving information provision and educational campaigns:** To design effective education and media campaigns, a more detailed understanding of existing consumer misconceptions is required (regarding environmental and technological knowledge). Issues should include: vehicle technologies, environmental impacts, car ownership costs and cleaner car incentives. This would provide insights into how new messages are *interpreted* by consumers (private and fleet). A national study could be completed through focus groups and quantitative surveys and conducted within a relatively short length of time (<12 months).
- **Increasing economic incentives and reception of price signals:** It is already apparent that most car buyers do not understand the existing car cost structure. If the existing and future economic incentives are to be effective, a better understanding is required of how the current price signals for cleaner cars are received and understood. The types and levels of incentives and taxation measures that can be used to successfully promote sales of fuel efficient/low carbon cars should also be explored. This research could also form part of a national study completed through focus groups and established quantitative surveys.

As part of the research on information provision, level of knowledge and reception of price signals, the impacts of the new car-label should be monitored over the next 12 months.

- **Promoting image and amenity value of low carbon cars:** The evidence seems to suggest that (for the average consumer) cleaner cars need to have a performance equivalent to or better than conventional cars. There is also evidence that cost parity may not be enough to persuade consumers to adopt cleaner vehicles. Therefore, research needs to be conducted to identify how low carbon cars can be made more attractive to consumers through the use of non-fiscal incentives (such as dedicated cleaner vehicle lanes). This research could also form part of a national study completed through focus groups and quantitative surveys.
- **Targeting of early adopter segments:** Further research would be useful to confirm the role of UK early adopter segments and to identify how low carbon cars can be made more attractive to these groups through the use of *targeted* incentives (economic and otherwise). This research could form part of a national study completed through focus groups.

Fleets are the most important early adopter segment. As part of understanding fleets' apparent reticence to adopt cleaner cars, fleet managers' attitudes to low carbon and fuel-efficient cars should be investigated through structured interviews with key personnel. Companies could be

selected from those of a previous study *Company cars and business travel* (IDS 2004), which compared the company car policies of 25 large UK organisations (concerning issues other than cleaner fuelled cars).

The rationale for selecting companies from the Incomes Data Services study is two-fold. First, the published results from the study provide a valuable set of information on each company's existing company car policy – this data compliments the proposed research and forms a useful dataset with which to provide a context for new findings. Second, a recent paper *Benchmarking BAA's Business Travel Expenses Policy* (Potter 2004) has used the same report to develop a scoring system to rate business travel policy providing a method of categorising companies according to their travel policies. This system could be extended to rate fleet managers' purchasing policies regarding cleaner fuelled cars.

An important issue highlighted by the desk research is that the most significant insights regarding consumer attitudes are generated through the design of attitude surveys that *link attitudes with actual travel/consumer behaviour*. Therefore, all the suggested avenues for further research should incorporate this approach as central to their research methodology.

In summary, this report recommends that further field-based research (conducted using focus groups and national quantitative surveys) is required to more fully ascertain the attitudes of UK car buyers to low carbon/fuel-efficient cars. This should include (in order of priority, highest first):

1. A detailed survey of the existing levels of **consumer knowledge and understanding** of low carbon/fuel-efficient cars. Issues should include: vehicle technologies, environmental impacts, car ownership costs and cleaner car incentives. As part of this survey, the impacts of the **new UK car-label** should be monitored over the period of its introduction (July-September 2005).
2. Research to identify how low carbon/fuel-efficient cars can be made more attractive to consumers through the use of new **economic incentives** (eg feebates). The types and levels of incentives and taxation measures that could be used to successfully promote sales of fuel efficient/low carbon cars should be explored.
3. Further research to confirm the role of UK **early adopter segments** and to identify how low carbon/fuel-efficient cars can be made more attractive to these groups through the use of *targeted* incentives (economic and otherwise). Given that fleets are the most important early adopter segment, **fleet managers' attitudes** to low carbon and fuel-efficient cars should be investigated through structured interviews with key personnel.
4. Research to identify how low carbon/fuel-efficient cars can be made more attractive to consumers through the use of innovative **non-fiscal incentives** (eg dedicated cleaner vehicle lanes). The types and levels of non-economic benefits that could be used to successfully promote sales of low carbon/fuel-efficient cars should be explored.

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