

# EXECUTIVE SUMMARY

## CHAPTER I – INTRODUCTION

The task of reducing the adverse social and environmental impacts of car use has to be tackled in a variety of ways, including changes to the cars themselves. Important improvements in efficiency, especially engine efficiency, have been and are being made, but in two major respects the trends in car design are in the wrong direction.

In 1991, the European Conference of Ministers of Transport (ECMT) unanimously passed a resolution that the increase in the power of cars was undesirable and unacceptable for reasons of safety, the environment, and energy conservation. The ECMT recommended that the EC (now the EU) and the UN/ECE urgently draw up regulations on maximum power-to-weight ratios. Despite other similar official pronouncements, the average power of new cars sold in Europe has increased steadily year by year, and it no longer seems to be regarded as appropriate for governments to attempt to limit power. The desirability of reducing weight has been recognised for an equally long time, but the average weight of new cars sold in Europe has also increased steadily year by year, and car manufacturers, the EU and the British Government all expect this to continue. Although some policies would affect weight indirectly, weight is not regarded as a feature which should be subject to explicit governmental intervention.

All the hopes for reducing fuel consumption and emission rates and for making cars safer have therefore been placed on technological advance. Until now, however, lower rates of fuel consumption brought about in this way have been offset by increased vehicle mileage, so that CO<sub>2</sub> emissions from road transport have remained fairly constant. This trend is expected to continue on all but the most optimistic assumptions about new technologies. Road casualties have indeed been going down, although how much changes in car design have contributed to that is not clear, but road safety cannot be measured by casualties alone. Danger on the road also distorts travel behaviour and deters street life and social interaction. To the extent that the travel and other activities still take place, they are accompanied by anxiety to the participants themselves or to others on their behalf. Intimidation by traffic has increased greatly over the years.

The purpose of this study is to see how the adverse impacts of car use could be reduced by reducing power and weight, and how appropriate reductions in power and weight could be brought about. Bigger gains could be achieved by combining reductions in power and weight with new technology, and it is to be hoped that other researchers will investigate that possibility. The present need, however, is to ensure that lower power and weight are put on the political and research agenda. For the purpose of the study it is assumed that cars will be powered by diesel engines of the present type, and that the materials and methods of production will either be the same as at present or changed in relatively minor ways known to be feasible.

Only three impacts of car use have been studied: fuel consumption, CO<sub>2</sub> emissions (which for a given type of engine are so closely linked to fuel consumption as in effect to form a single topic) and road danger. Reducing CO<sub>2</sub> emissions is essential in order to combat climate change. If climate change was not a problem, it would still be very important to cut fuel consumption, both to reduce the rate of

depletion of a vital non-renewable resource, and to reduce our dependence on countries with regimes that could become politically unstable or unfriendly. Danger is a major preoccupation in many people's lives. Although other impacts have not been studied, it is very likely that action which would reduce these three impacts would help to reduce others too, such as noise and gases other than CO<sub>2</sub>.

## CHAPTER 2 – THE ECOLOGICAL ALL-DISTANCE CAR

The ecological car is defined as a car which minimises its adverse social and environmental impacts while still performing its transport function. The term "transport function" requires some discussion.

Some people require a car only for short, local travel, and it could be that their and society's interests would be best served by a car specially designed for local use. That possibility requires a separate study. This study is about cars designed, as almost all cars are at present, to be able to perform journeys of any length, from very short to very long.

Ecological all-distance cars (eco cars for short) should be able to cruise comfortably at or near the national, i.e. motorway, speed limit, with adequate allowance for headwinds, loads and gradients. They should have enough acceleration to be able to cope with the traffic situations in which rapid acceleration is most required. There should be a range of car sizes, as at present, to ensure that people's differing needs for carrying capacity are catered for. Eco cars should be safer than present cars, having regard to the safety of the other road users with whom they may collide as well as that of their occupants. Eco cars should be comfortable, and there should be a choice of styles and features. Although eco cars would be cheaper to run than present cars, they might be more expensive to manufacture and to buy. Any extra costs imposed on motorists should not exceed what the gains to third parties and the environment are worth.

Some things which may be essential to marketing cars at present, including display, status, feelings of power, the excitement of fast driving, are not considered part of a car's transport function. In return for the loss of these non-functional satisfactions, drivers could experience gains such as reduced stress, more opportunity to appreciate their surroundings, and a more harmonious relationship with other road users. Some drivers would consider that these gains outweighed the losses; others would not.

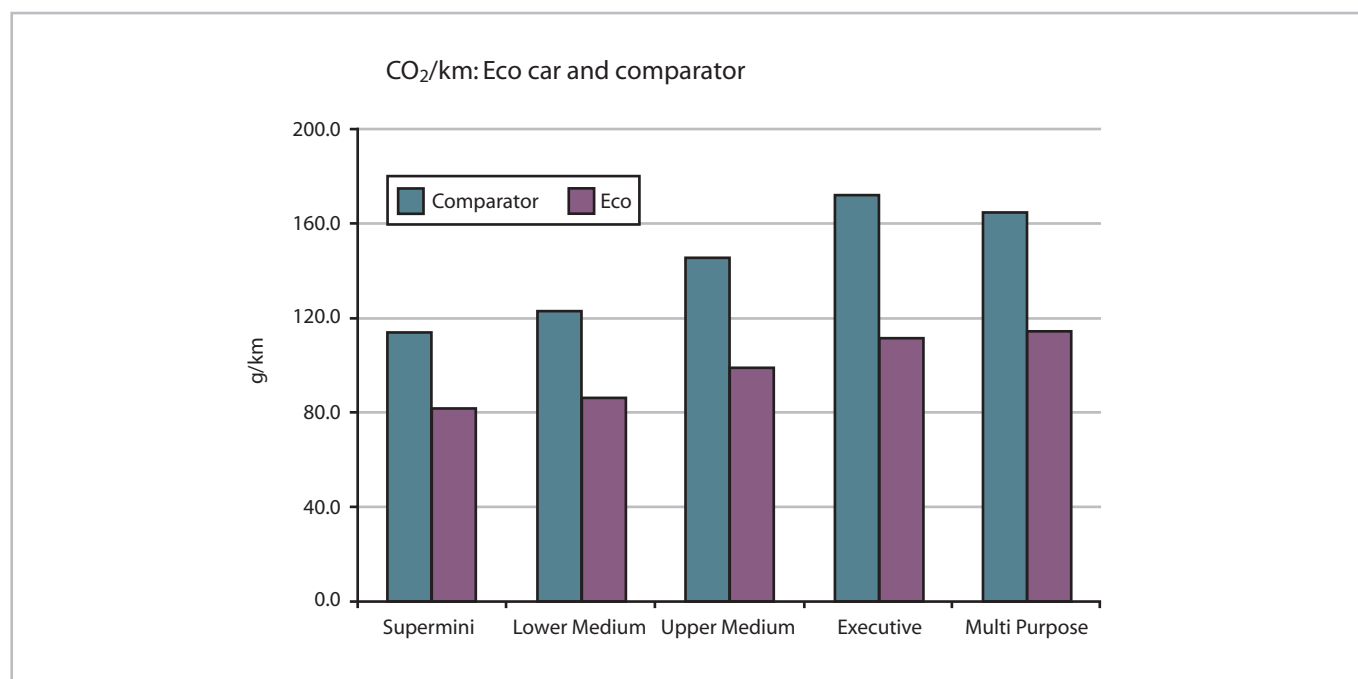
## CHAPTER 3 – FUEL CONSUMPTION AND CO<sub>2</sub> EMISSIONS

The reduction in fuel consumption that eco cars would bring about has been estimated for five sizes of car. For each size, a comparator was chosen in the form of a relatively low-polluting car of that size now on the British market. Each eco car was assumed to weigh 40% less than its comparator, and it was specified that eco cars should have enough power to accelerate from 0 to 60mph in 20 seconds. A 40% reduction in weight was deemed to be feasible, since eco cars would still weigh more than the prototypes which several manufacturers made in the early 1980s and other prototypes which have been produced more recently. It would take some time to achieve this reduction, however. Both for this reason, and to explore the importance of weight as a factor in fuel consumption, reductions ranging from 10% to 50% of the comparators' weights were explored in sensitivity tests. The London taxi TXII model, which takes 24 seconds to accelerate from 0 to 62mph, can cope with all the traffic situations, such as joining

motorways, where acceleration is required, so the acceleration suggested for the eco car should be adequate. Different acceleration capabilities were explored in sensitivity tests.

A conventional engineering model was used to determine the power that eco cars would need in order to be able to accelerate as specified. Each eco car was assumed to have the same values as its comparator with respect to the other characteristics of a car which determine its fuel consumption: frontal area, coefficient of drag and coefficient of rolling resistance. Calculations were then made of the fuel consumption of eco cars and comparators according to the New European Driving Cycle (NEDC), which is the driving cycle on which the official figures for the fuel consumption and CO<sub>2</sub> emissions of new cars are based.

The results in terms of CO<sub>2</sub> emissions are shown in the following chart. On the NEDC combined test, eco cars' emissions are 29% to 35% lower than those of the comparators. Eco cars would easily meet the target of 130 g/km now being considered by the EU. Greater proportionate reductions are achieved on the urban part of the NEDC cycle than on the extra-urban, and by large cars than by smaller ones. Although these calculations are only approximate, it is more likely that the savings that eco cars would bring have been underestimated than overestimated.



The sensitivity tests show that half or more of the savings in fuel consumption (and therefore emissions) that would be achieved by reducing weights by 40% would be achieved by reducing them by 20%. Lower weights continue to bring savings, both on urban and on extra-urban roads, even after reductions of 40% vis-à-vis the comparators have been achieved. Reductions in acceleration capabilities help to reduce fuel consumption on urban roads but hardly at all on extra-urban roads. These findings, are, however, based on a test cycle which is known to be unrealistic. In the real world, reductions in power would lead to greater savings.

The NEDC test on which these results are based is known to be unrealistic in important ways. It does not allow for gradients, heavy loads or headwinds. Driving is steadier, and the maximum speeds attained are

lower, than in real life. These calculations should be repeated using test cycles, such as Artemis, which represent present driving behaviour more accurately, and also using new test cycles designed to represent the driving behaviour that could be expected if speed limits were reduced and properly enforced.

## CHAPTER 4 – ROAD SAFETY

Theoretical considerations suggest that reducing the power and weight of cars would have the following consequences:

1. The number of crashes involving cars would be reduced
2. The severity of the casualties suffered by non-car road users in crashes with a car would be reduced
3. Provided that heavier cars shed proportionately more weight than lighter ones, the occupants of the lighter cars would suffer fewer, less severe casualties, in crashes between cars of different weights. Despite some offsetting increases in the casualties suffered by the occupants of the heavier cars, there would also be fewer, less severe casualties in total
4. Car occupants would be less well protected in single-vehicle crashes and in crashes with heavier vehicles, so, other things being equal, there would be an increase in the number and severity of their casualties

Information on the weight and power of cars is not normally provided in crash statistics and traffic surveys, which makes it difficult to check on this theoretical reasoning. However, a special analysis by the TRL of the national crash data bank for the years 2001 to 2003 enabled some limited checks to be made. Cars were divided into broad categories based on weight, but since weight and power are correlated, some of the findings may be explained by differences in power rather than by differences in weight.

It was found that the severity of the casualties suffered in crashes with cars by all road users who were not car occupants did indeed increase with the weight of the car. This effect was especially marked for pedestrians. In crashes between cars, which account for about half the injuries suffered by car occupants, and for more than a quarter of the deaths, the great majority of the deaths and serious casualties were suffered by the people in the lighter car, just as would be expected. But in single-vehicle crashes, which account for almost a quarter of deaths to car occupants, drivers of heavy cars were killed or seriously injured more often than drivers of light cars, which is the opposite of what theory would suggest. It is well known that when drivers feel safe they tend to take more risks, so the most likely explanation is that the heavier cars were being driven at higher speeds.

In crashes between cars and light goods vehicles, people in heavy cars were killed or seriously injured less often than people in light cars, so it seems that weight did indeed provide the extra protection suggested by theory. But people in heavy cars did not fare better than people in light cars in crashes between cars and heavy goods vehicles. This may be because the heavy cars were being driven faster, or it may be that a heavy lorry weighs so much more than even the heaviest car that differences in the weights of cars become irrelevant.

A general reduction in the power and weight of cars would lead to fewer casualties, especially the more severe casualties. The risks would be more equitably shared, both between people in cars and vulnerable road users, and between people in heavy and light cars. More people would become less at risk than would become more at risk. If, as is very likely, the changes led to more careful driving, the number of people becoming more at risk might be very small. If risks were reduced, some reduction in intimidation could be expected as well.

## CHAPTER 5 – RESPONSIBILITIES AND INSTRUMENTS

The substitution of eco cars for cars of the present type would be very advantageous to society. The ideal way for it to come about would be for people buying cars to ask for eco cars. That would require a reversal of the recent trends in demand, which in present circumstances is unlikely. Even people who in more favourable circumstances might prefer a light, low-powered car will be reluctant to buy one if it makes them and their passengers more vulnerable, or puts them at a disadvantage in competitive traffic situations.

Car manufacturers have to please their customers, not society at large. A manufacturer who tried to sell eco cars in today's market would face commercial failure. Manufacturers acting individually cannot change this situation. What they can and should do, however, is to join together to ask governments to set rules which would allow them to combine profitability and social responsibility.

Only governments can bring about the necessary changes and it is their duty to do so. A central role of governments in a market economy is to set and enforce rules such that firms can compete for business only in ways that respect the environment and the interests of third parties. That is not now happening in the car market.

Many people have advocated personal carbon rationing as means of combating climate change. That might be enough to change consumer demand in favour of eco cars. But unless and until personal carbon rationing is introduced, and perhaps even then, policies related more specifically to the car market are required.

Governments can influence car design either by taxation or regulation. The high premiums that some people are prepared to pay for features that are irrelevant to a car's transport function suggest that taxation by itself would be ineffective. It would also be morally offensive to allow people to buy the right to cause unnecessary danger and pollution. Regulation by itself would be too inflexible, however, since it would not allow for people's varying needs.

The following way of combining regulation and taxation seems appropriate. Cars would be divided into classes according to their carrying capacity. Limits would be set on the power, weight and CO<sub>2</sub> emissions of cars in each class. Taxes would be higher for larger cars than for smaller so as to encourage people to think carefully about how large a car they needed. Taxes would also vary within each class so as to encourage people to consider whether they really needed all the comfort and accessories that designing up to the maximum would permit.

Until recently, the EU relied on voluntary agreements with manufacturers to limit CO<sub>2</sub> emissions. The need for mandatory measures is now accepted, but the measures suggested are not of this type. Instead,

it is proposed that each manufacturer should be set a limit on the average CO<sub>2</sub> emissions of the cars it sells each year, with higher limits for the manufacturers selling heavier cars. An arrangement of this sort may have to be accepted as a political necessity for the time being, but it is not appropriate for the longer term. It is neither logical nor fair and there is no guarantee that it will work. The EU has set a target that by 2012 the average emissions of new cars sold in Europe should not exceed 130g/km. However, car manufacturers have the option of paying a fine rather than meeting their own targets. If they choose that option, the industry-wide target will not be met. The EU should make it clear that it intends to replace this approach as soon as possible by one based on setting limits which all vehicles of a particular class would have to comply with. CO<sub>2</sub> emissions would then be regulated by the same methods as have always been used to regulate other vehicle features, such as noise emissions.

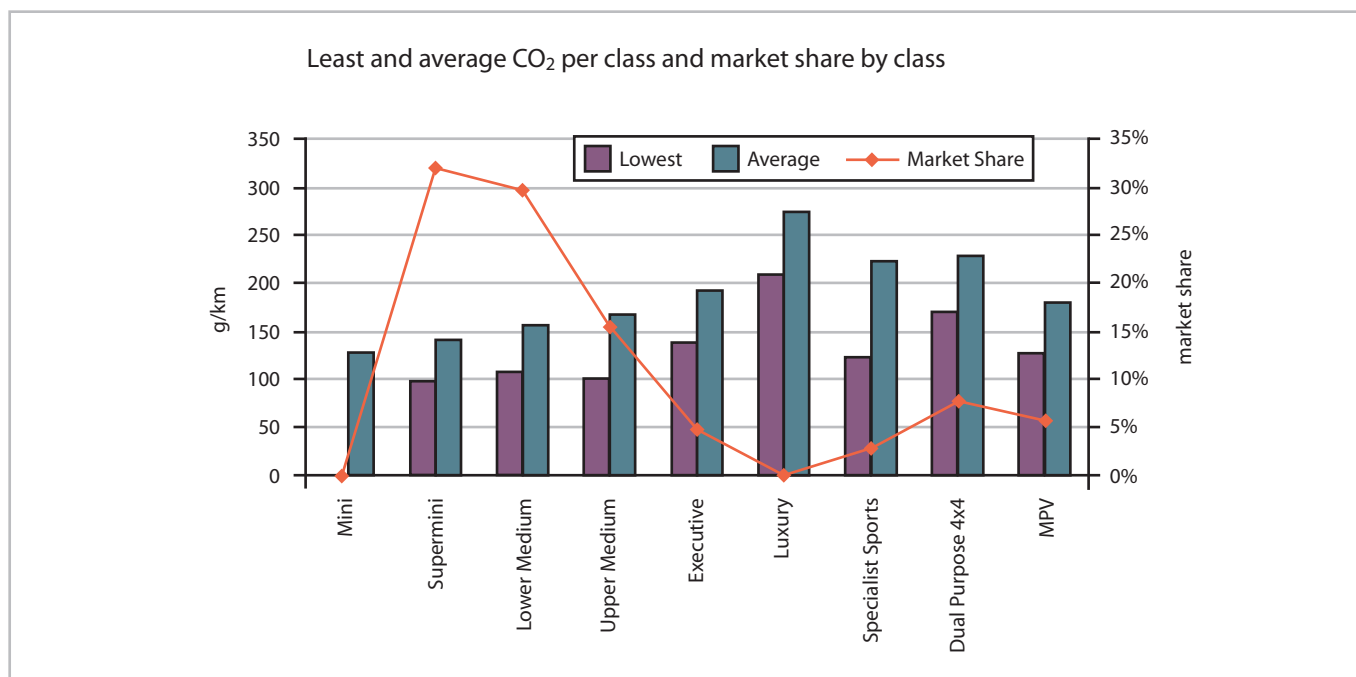
Vehicle regulation is now the responsibility of the EU, not of member states. Although the international nature of the car industry and the fact that cars are often driven across national boundaries make it appropriate for car design to be regulated at the European level, this does not mean that there is no place for national regulations. In the United States, individual states have to comply with the standards set by the federal government but can also set more stringent ones. A similar system in Europe as between the EU and member countries would have several advantages. European countries are too diverse for the same regulations to be optimal in all of them. Individual countries could try out arrangements which other countries, or the EU itself, might want to adopt later. These advantages are more important than the fact that allowing individual countries a degree of freedom to set their own standards could be regarded as creating a barrier to trade.

One of the considerations determining the specifications of the eco car is that it should be able to cruise at or near the highest permitted speed. There is no European speed limit at present, but for this and other reasons it would be desirable to have one. Studies are needed to determine what it should be. This limit would be the highest allowed on any European road, and it is likely that some countries would like to retain lower national limits. That creates a problem of how to ensure that drivers of cars built with much higher speeds in mind could be made to comply with these lower limits. The solution is to fit cars with variable speed limiters, which would also be the best way of ensuring compliance with other lower speed limits, such as those in towns.

The EU and national Governments should commit themselves to the principle that all cars should be fitted with variable speed limiters. They should undertake research to determine what types of limiter could be approved for new cars and to examine the feasibility, costs and benefits of a programme to retrofit cars already on the road. The cost of limiters on new cars would be borne by the manufacturers and their customers, but governments could if necessary help with the cost of retrofit.

## CHAPTER 6 – PREPARING THE WAY FOR THE ECO CAR: PROMOTING THE USE OF THE MOST SUITABLE CARS NOW ON THE MARKET

The CO<sub>2</sub> emissions of new cars vary widely within as well as between market segments. The Government can use various inducements to influence buying decisions in favour of the cars now on the market with relatively low adverse impacts. If successful, such action would also help with the balance of payments.



Fuel prices are an important consideration influencing people in their choice of car. The Government is committed to raising fuel duty at least in line with inflation. A more effective arrangement would be to increase the total price of fuel each year in real terms according to a previously stated programme. For this to work, frequent adjustments to fuel duty would be required to compensate for fluctuations in the pre-tax prices of petrol and diesel. The administrative feasibility of such a system should be examined.

In most countries, the most effective tax on cars would be some form of purchase tax. But since more than half the new cars sold in Britain each year enjoy company car tax concessions, or other similar arrangements, changing the rules governing these concessions may offer the best opportunities here. The current rules do now give some advantage to cars with low CO<sub>2</sub> emissions, which is a start. Tax concessions should be available only for cars with a high score on the Euro NCAP test for pedestrian safety. The concessions should be related to a standard car of modest size and performance. Only in the case of proven need would higher concessions be available for larger or more powerful cars.

Many car dealers have agreed to display information on the fuel consumption and CO<sub>2</sub> emissions of new cars in their showrooms. This could be made mandatory, as it already is in some countries, and similar arrangements could be applied to second-hand cars sold through dealers.

Euro NCAP is a semi-official organisation which tests new cars for the protection they would give in a crash both to their own occupants and to pedestrians. One problem is that people may use the information more to protect themselves than others, or even to protect themselves at the expense of others. Another is that the more that people believe they would be well protected in a crash, the more they may be tempted to take risks in the first place. The following rules would act as some safeguard. Euro NCAP would publish scores for occupants' safety only for cars which achieved a high score on pedestrian safety. Manufacturers would be obliged to give the scores for pedestrian safety in all their car advertisements, but would be allowed to give the score for occupants' safety only for cars with a high pedestrian score.

The DfT's road safety campaigns urge drivers to behave responsibly on the road. There is also a need for

campaigns to persuade them to be responsible in their purchases. Since cars are so bound up with status, leading figures in the worlds of politics, business, sport, arts and entertainment could help put across this message both by the example of the cars they buy and by appearing in the Government's publicity.

## CHAPTER 7 – PREPARING THE WAY FOR THE ECO CAR: THE IMPORTANCE OF CONTROLLING SPEED

**Lower speeds on high-speed roads outside towns** would reduce car mileage in two ways. The tendency for car journeys to increase in length would be checked and, over time, reversed, and there would be some shift from road to rail. Enforcing the existing 70mph speed limit properly could, over time, reduce car traffic on motorways by some 4% to 5%, and enforcing a 55mph limit could reduce it by up to 20%.

The danger, fuel consumption and other costs associated with any given volume of traffic would also be reduced. Enforcing the existing speed limits should reduce the fatal casualty rate by some 24% on motorways and 20% on dual carriageways, while enforcing a 55mph limit should reduce the fatal casualty rate by more than 60% both on motorways and on dual carriageways. Enforcing the existing 60mph speed limit on single carriageway roads should reduce the fatal casualty rate by about 9%, while enforcing a 45mph limit should reduce it by more than 40%. On roads of all classes, lower speeds would bring smaller, though still very worthwhile, reductions in serious and slight casualty rates.

Enforcing the present 70mph speed limits would reduce rates of fuel consumption and CO<sub>2</sub> emissions by about 12% on motorways and 8% on dual carriageways, while enforcing a 55mph limit would reduce them by about 30% and 26% respectively. Lower speeds on single-carriageway roads would, however, have very little effect on these rates, since the average speed of cars on those roads is already only slightly more than the speed at which fuel consumption is minimised.

The only consideration militating against lower speed limits on high-speed roads is the resulting increase in journey times. A study in the mid 1990s concluded that, despite the time penalty, speed limits should be reduced, but that controlled trials with lower limits, leading to studies based on more refined calculations and taking account of a wider range of effects, were needed to determine precisely what the new limits should be. The trials have not been undertaken, but a recent study for DEFRA comparing the present 70mph motorway speed limit with a 60mph limit concluded that the 70mph limit should remain. This study assumed that reducing the speed limit would have no effect on traffic volumes, which is not correct and must have exaggerated the time penalty. As far as can be told from the scanty accounts given in DEFRA's consultation documents, the study contained other major errors which would also have understated the case for a lower limit. More accurate and comprehensive studies are now required.

**Lower speeds on urban roads** would also reduce car traffic, but for different reasons. Because most urban car journeys are quite short, the convenience of the car is likely to outweigh any small increases in journey time. Lower speeds would, however, make walking and cycling much safer and so bring about a shift to those modes. A comparison between the amount British and Dutch people cycle suggests that there is a huge suppressed demand for cycling in Britain.

A study by the TRL of Britain's first 20mph zones found that they reduced crashes by about 60% and fatal or serious crashes by about 70%. A later study of 20mph zones in London found somewhat smaller



but still very large reductions, while in Hull deaths were reduced by 90%.

While acknowledging the importance of lower speeds in improving safety, the DfT has resisted the idea of changing the default urban speed limit from 30mph to 20mph on the grounds that CO<sub>2</sub> emissions would increase markedly. This objection is not valid. Continental experience, which is more extensive than British, shows that the changes in fuel consumption and emissions brought about by traffic calming are small and can be in either direction, but are more likely to be down than up. It seems that steadier driving more than compensates for a greater use of lower gears.

The Government should accept the case for the 20mph urban default speed limit and should undertake studies to establish which roads should have higher limits and what the limits on those roads should be.

In the absence of variable speed limiters, existing methods of enforcing speed limits, such as cameras and speed humps, give good value for money and should be used more often. Eco driving has been shown to reduce fuel consumption and to improve road safety. Following its decision to include eco driving in the driving test, the Government should consider how to encourage other drivers to learn these techniques. The oil companies would be suitable partners in that endeavour, which the Government should discuss with them. Ways of encouraging cars to be fitted with equipment such as econometers, more visible speedometers, and devices that would give an auditory signal when some pre-set speed was exceeded should also be examined.

## CHAPTER 8 – PREPARING THE WAY FOR THE ECO CAR: FURTHER WAYS OF CREATING A MORE FAVOURABLE DRIVING ENVIRONMENT

Many people might be put off the idea of buying a light, low-powered car by the prospect of driving one on roads shared with lorries. This reinforces the need for action to curb the danger and other nuisances that lorries cause.

Speeding by lorries on motorways used to be a serious problem, but fitting lorries with top-speed speed limiters has almost completely eliminated it. On other roads, however, lorry speed limits are virtually a dead letter. More than half the crashes in which car occupants are killed by lorries take place on single-carriageway, non-built-up roads. The DfT's 2006 speed surveys showed that at any one time in free-flow conditions, 76% of articulated lorries on these roads were breaking their 40mph limit, while 83% were breaking their 50mph limit on dual carriageways, and 50% were breaking the 30mph speed limit on urban roads. The figures for rigid lorries were only slightly better.

All new heavy lorries should be fitted with variable speed limiters and a study should be made of the feasibility of retrofitting existing heavy lorries. The British Government should seek the permission of the EU to oblige British heavy lorries to be fitted with variable speed limiters. The experience gained would benefit other countries as well as Britain, so it would be sensible for the EU to grant permission. The fact that foreign lorries operating in Britain would not be equipped with variable speed limiters is not a serious problem. Foreign lorries account for only about 3.5% of the lorry mileage driven in Britain, and most of their travel must be on motorways, where the limit is enforced by the top-speed speed limiters which foreign lorries, like their British counterparts, already have.

Even if speed limits and other rules governing lorry operations were properly observed, the external costs

of road haulage would still be very large, so ways of reducing them while still maintaining high standards of efficiency should be sought. By far the greater part of the increase in lorry mileage that has taken place in recent decades has come from longer hauls rather than from an increase in tonnes carried by road. The faster speeds made possible by the motorway programme have reduced the difference in cost between long and short hauls, which has led to the substitution of long hauls for short and has also attracted some loads to go by road which might otherwise have gone by rail. The Civic Trust report *A New Framework for Freight Transport*, published in 1995, recommended reforms to bring about some reversal of these trends and to encourage the better utilisation of more suitable lorries, especially in towns.

The report recommended that VED on lorries should be reduced to the amount required to pay for lorries' share of running the DVLA, and that a new system of road pricing for lorries should be introduced. The charge per mile would depend only on the physical characteristics of the vehicle, which would make the system very easy to administer. The largest and most intrusive lorries would be confined to a limited network of motorways and selected 'A' roads. There would be exemptions for access to premises on other roads, but exemptions would not be granted automatically and most would be phased out over time. Once these reforms were in place, local authorities should try to find ways of giving lorries priority in traffic, for example by allowing them to use some bus lanes. The Government should now look carefully at these ideas.

Although even a heavy motor cycle is lighter than a very light car, the speed and acceleration of motorcycles might make drivers of light cars feel threatened. There is also a risk that if the speed and power of cars were restricted, some car drivers might turn to motorcycles instead, which from society's point of view would be a change for the worse. Such considerations apart, there is already an urgent need to reduce the excessive danger and nuisance that motorcycles now cause to other people as well as the risks they bear themselves. Per mile ridden or driven, motorcycles kill or seriously injure four times as many pedestrians as cars do.

A study of the feasibility of fitting motorcycles with speed limiters is urgently required. There is also a need to restrict the power and weight of the motorcycles allowed on the public highway and to introduce a graduated system of driver licensing. Riders would be eligible to take the test to ride a motorcycle of a given grade only after they had held a licence to ride a motorcycle of the grade one below with a clean record for a specified time. Local authorities should consider using their powers of traffic limitation to ban motorcycles, or the heavier and more powerful ones, from some places, such as town centres, where good conditions for pedestrians are especially desirable.

One reason for the lack of progress on policies concerning traffic speed and vehicle specifications may be that safety and the environment are now the responsibility of different divisions in the DfT. The divisions should be brought together and given a high status.

At present, no information on the weight, power or other attributes of cars is available from crash data banks, traffic surveys or speed surveys. This makes it difficult to establish the importance of these factors in causing crashes or contributing to emissions. The DVLA records do not contain this information either, but it would be fairly straightforward to add it to them. Since vehicle registration numbers are collected on the crash report form, the information kept by the DVLA could then be transferred to crash data banks. Traffic surveys and speed surveys do not now record vehicle registration numbers, but modern cameras have made it possible for them to do so.

In order for intimidation from traffic to be given its due importance in transport planning, systematic ways of measuring and evaluating it are required. This could be done by social surveys, preferably of a kind which would allow intimidation to be compared with intangibles such as travel time and noise to which money values have already been attached.

Governments are unlikely to commit themselves to eco cars or to measures such as making it mandatory for cars to be fitted with variable speed limiters if they believe that they would make them unpopular with the electorate. Social surveys are needed to explore (i) people's attitudes towards cars, and towards related topics such as speed limits and their enforcement, (ii) their knowledge and beliefs about the relationships between the power, weight and speed of cars and their various adverse impacts, and (iii) what they think about the importance of each of these impacts. The surveys should be repeated at regular intervals to allow changes in the public's attitudes, knowledge and beliefs to be monitored.

The public highway is not the place where the excitement and release of aggression which some people seek from driving should be satisfied, but those impulses must have an outlet somewhere. The question of how best to provide for them in a modern, urban society is difficult and important. It deserves serious study.

## PRINCIPAL RECOMMENDATIONS

Various people have suggested that the best way to tackle climate change is through some form of personal carbon rationing. It is pointed out in Chapter 5 that this would give a tremendous impetus to the development of less environmentally intrusive cars, to the extent that it might become possible to dispense with most other suggestions for encouraging their introduction. But attractive though we find this suggestion, we do not feel entitled to recommend it, since it raises issues both of principle and of administration which go far beyond the scope of this study. Moreover, since it is unlikely that any such scheme will be introduced very soon, it is important to press on with other complementary policies in the meantime. The more that can be done to reduce CO<sub>2</sub> emissions by other means, the easier it will be to introduce carbon rationing.

Unless otherwise stated, these recommendations are addressed to the British Government.

### **The basic principle and related issues**

1. The EU should make a formal commitment to base its policy for the motor manufacturing industry on the following principle:

*No motor vehicle should cause more danger or environmental impact, or consume more non-renewable resources, than is necessary for the performance of its transport function.*

(Chapter 5, page 63)

2. National governments should endorse this principle. (Chapter 5, page 63)
3. Car manufacturers should also endorse this principle and should press for governmental authorities to set a legal and fiscal framework which would enable them to compete for custom in ways which respected the environment and the interests of third parties. (Chapter 5, page 63)
4. The main policy instrument which the EU and national Governments should use to ensure that cars are designed in accordance with this principle should be regulation, with taxation playing a supporting role. Cars should be divided into classes based on their carrying capacity, and limits should be set on the maximum weight, engine power and emissions of cars of each class. The limits should be revised periodically in line with technological advances. Taxes should be higher for larger than for smaller cars and should also vary within classes according to the car's CO<sub>2</sub> emissions. (Chapter 5, pages 64 and 65)
5. The method of regulation that the EU is now minded to adopt is based on setting each manufacturer a limit on the average CO<sub>2</sub> emissions of the cars it sells each year, with a higher limit for manufacturers of heavier cars. Although there are strong political reasons for adopting this approach for the time being, it is not a suitable method for the longer term. All other vehicle features are regulated by setting limits with which all the vehicles of a given class have to comply. The EU should make it clear that it will change to this method of regulating CO<sub>2</sub> emissions as soon as possible. (Chapter 5, page 67)
6. The EU should give national Governments powers to set their own vehicle regulations so long as they are more stringent than those set by the EU. (Chapter 5, page 67)

7. The EU should set a top European speed limit, but individual countries would retain the right to set lower national limits. Studies are required to determine what the European limit should be, but for the time being it should be set at 130kph. (Chapter 5, page 68)
8. The EU should immediately commit itself to the principle that all cars should be fitted with variable speed limiters. Both the EU and national Governments should give high priority to research on what type of variable speed limiter would be best for new cars and to a feasibility study and cost-benefit evaluation of retrofitting cars already on the road with speed limiters. Speed limiters on new cars would not be subsidised, but the possibility of subsidising retrofit should be considered. (Chapter 5, page 68)

### **Encouraging the purchase and manufacture of the most suitable cars now available**

9. The Government should commit itself to ensuring that the price of fuel increases in real terms year by year. It should undertake a study to see whether it is possible to vary fuel duty to compensate for fluctuations in the pre-tax price of fuel in such a way that people will know in advance what price they will have to pay in each future year. (Chapter 6, page 72)
10. More use should be made of the principle that the VED paid on new cars in the first year would vary according to their CO<sub>2</sub> emissions, and the possibility of lowering VED rates paid in subsequent years should be considered. (Chapter 6, page 72)
11. Company car tax concessions should be available only for cars with a high score for pedestrian safety on the tests conducted by Euro NCAP (New Car Assessment Programme). (Chapter 6, page 73)
12. Company car tax concessions should be based on a standard car of moderate size and power. Only people who could demonstrate a need for a larger or more powerful model would be able to claim tax concessions related to that model rather than to the standard. (Chapter 6, page 73)
13. Local authorities should consider how local taxation can be used to encourage less polluting and less dangerous cars. (Chapter 6, page 73)
14. The present voluntary scheme of labelling new cars in dealers' show rooms according to their CO<sub>2</sub> consumption should be made mandatory and where feasible should be applied to second-hand cars as well. (Chapter 6, page 73)
15. People with prominent positions in politics, business, entertainment and sport should set an example in the cars they own and drive. The DfT should enlist their help in publicity campaigns to promote socially responsible purchasing as well as socially responsible driving. (Chapter 6, page 74)
16. Euro NCAP should publish the scores for their tests on the safety of car occupants only for those cars which achieve a high score for pedestrian safety. Car manufacturers should be obliged to state the scores for pedestrian safety in their advertisements, and should be allowed to mention the scores for the safety of car occupants only for those models with a high score for pedestrian safety. (Chapter 6, page 74)

### **Setting and enforcing appropriate speed limits**

17. Studies, including properly controlled trials, should be undertaken to find the optimal speed limits on

main roads outside towns. The limits considered for motorways and dual carriageways should range from the present 70mph to 50mph. The limits considered for single carriageway 'A' roads should range from the present 60mph to 40mph. The studies should be based on quantifying and assigning money values to as many of the speed-related impacts of traffic as possible. The calculation of the costs of enforcement should take account of the introduction of variable speed limiters. Account should also be taken of the likelihood that technological advances will improve the fuel efficiency of cars, which means that optimal speed limits would be higher than they would be without such advances. (Chapter 7, page 83)

18. The default speed limit in towns should be changed from 30mph to 20mph. Studies should be undertaken to determine which urban roads should have higher limits and what they should be, and on which streets limits lower than 20mph would be appropriate. (Chapter 7, pages 85 and 86)
19. The possibility that the urban default limit should be lower than 20mph should be examined by studies in selected towns. (Chapter 7, page 86)
20. Until road vehicles are fitted with variable speed limiters, much more use should be made of existing methods of enforcing speed limits including speed cameras and traffic calming devices such as speed humps. (Chapter 7, page 86)
21. Drivers who already have a full driving licence should be encouraged to learn eco driving. Oil companies would be well placed to organise courses and the Government should discuss this possibility with them. (Chapter 7, page 87)
22. Studies should be made of how to encourage more cars to be fitted with aids to responsible driving such as event recorders and econometers. (Chapter 7, page 87)

### **Reducing the threat from lorries**

23. The existing rules on lorry operation should be strictly enforced. (Chapter 8, page 92)
24. The British Government should seek, and the EU should grant, permission for heavy lorries registered in Britain to be fitted with driver-operated variable speed limiters before variable speed limiters become mandatory generally in Europe. (Chapter 8, page 93)
25. Radical changes to lorry taxation should be considered, consisting of a drastic reduction of VED and the introduction of a simple system of distance-based road pricing with the charges based only on the physical characteristics of the vehicle. The charges should be set high enough to bring about some net increase in costs per lorry mile. (Chapter 8, page 92).
26. Consideration should be given to stricter lorry routing such that the largest and most intrusive lorries would be confined to a limited network of motorways and selected 'A' roads, with limited exemptions for access to premises not adjacent to this network. Apart from such exemptions, only lorries built in accordance with stringent environmental and safety standards would be allowed to operate on other roads. (Chapter 8, page 91)
27. Once these reforms had been instituted, local authorities should seek ways of giving priorities in traffic to the remaining lorries, for example by allowing them to share some bus lanes. (Chapter 8, page 91)

### **Reducing the threat from motorcycles**

28. The Government should urge the EU to put limits on the weight and power of motorcycles allowed on public roads. (Chapter 8, page 94)
29. A graduated system of driver licensing for motorcycles should be introduced such that eligibility to take the test to drive motorcycles of a given grade would depend on the candidate's having held a licence to drive motorcycles of one grade below with a clean licence for a certain length of time. (Chapter 8, page 94)
30. The feasibility of fitting motorcycles with variable speed limiters should be examined urgently. (Chapter 8, page 94)
31. Local authorities should consider making more use of their powers of traffic regulation to ban either all motorcycles or the heavier and more powerful ones from town centres and other areas with many pedestrians. (Chapter 8, page 94)

### **Organisation**

32. The divisions within the DfT responsible for road safety and for cleaner fuels and vehicles should be amalgamated and a high status should be given to the new combined division. (Chapter 8, page 94)

### **Statistics**

33. The DVLA data base should be expanded so as to give the weight, acceleration, top speed and installed power of all road vehicles. Speed surveys and traffic surveys should use cameras which would record vehicle registration numbers. The vehicle details kept by the DVLA, though not the vehicle's identity, would then be included with this survey information and also in crash data banks. (Chapter 8, page 95)

### **Measuring and evaluating intimidation**

34. Social surveys and other techniques should be used to allow the prevalence of intimidation to be traced and to make it possible to assign money values to intimidation so that it can be included in cost-benefit appraisals. (Chapter 8, page 95)

### **Public opinion research**

35. Social surveys should be undertaken to explore people's attitudes towards lighter, less powerful cars and related topics such as speed limits and enforcement, their knowledge about the relationship between speed, weight and power and the various adverse impacts of traffic, and their views on the importance of each such impact. The surveys should be repeated at regular intervals so as to monitor changes in attitudes and understanding. (Chapter 8, page 96)

### **Other ways of providing excitement and the release of aggression**

36. Research should be undertaken to help decide how to provide more suitable outlets for the excitement and release of aggression which some people now find in driving. (Chapter 8, page 96)