Less Traffic Where People Live: How local transport schemes can help cut traffic

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Foreword

Bumper-to-bumper traffic is one of the biggest problems we face in towns and cities. Opinion polls show that people are more and more concerned about the noise, pollution, danger and congestion caused by growing car use.

Policy-makers say they aim to reduce congestion, but without trying to cut traffic. But it is simply not credible that congestion will fall, and continue to fall, while traffic volumes go up. Road widening and bigger junctions may ease traffic jams in the very short term, but in the long term they will contribute to yet more car-dependent lifestyles, more traffic and more congestion.

But what is the alternative? This report shows, with convincing evidence based on schemes now in place, that it is possible to cut traffic in towns through intensive application of local transport improvements. Measures such as workplace travel plans and incentives to cycle are all too often viewed by transport planners as fashionable "extras". Yet if these schemes were applied intensively, and on a large scale, they could be powerful tools to cut car travel demand. If we pulled all the stops out, providing a safe route to school for every child, traffic-light priority so buses ran on time, targeted personal information for people about non-car options, and other measures, we could transform our towns and cities from places dominated by traffic noise into high quality places which are a pleasure to live in.

As this report argues, politicians have shied away from tackling traffic growth because they fear the political consequences of the cure will be worse than the political consequences of the disease. The evidence here suggests there may be a gentler form of treatment which could help cut traffic with less pain.

Stephen Joseph
Director, Transport 2000

Executive Summary

This report deals with local transport schemes, such as bus improvements, workplace travel plans and better cycling facilities. It looks at whether they could help cut traffic, and how much. These small-scale, local measures do not require heavy capital investment in infrastructure, and they do not create acres of new tarmac or miles of new rails. Because of this, they have been seen by some as less important – nice to have, but not likely to make much contribution to solving transport problems.

The report analyses the following measures:

- Bus improvements
- Local rail and tram schemes
- Workplace travel plans
- Teleworking
- School travel plans
- Individual marketing (that is, targeted information based on an understanding of people's personal trip patterns)
- Car clubs (that is, schemes which enable people to have access to a car when it is needed, without having to own one)
- Better cycling facilities
- Incentives to walk more

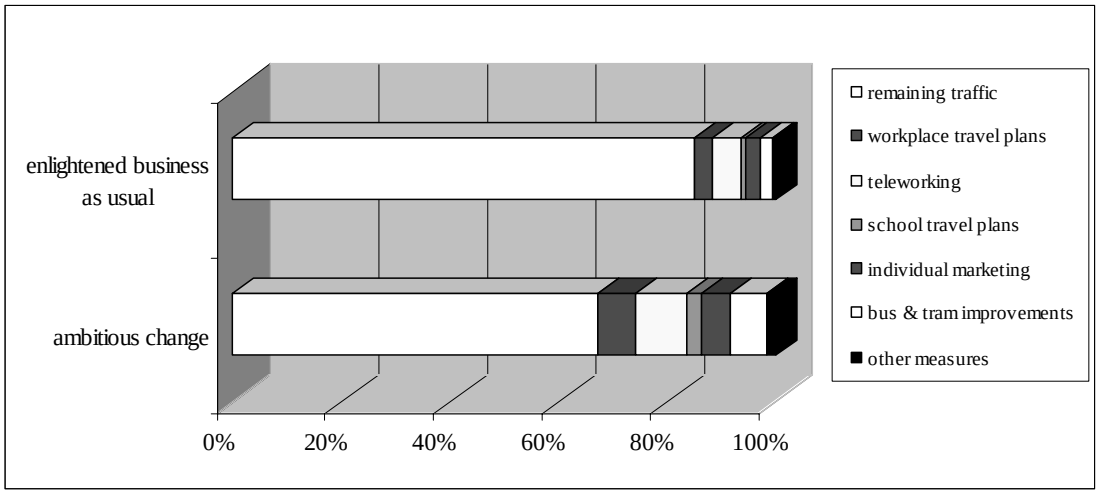
Local success stories show that if applied intensively, together, and over a large area, these schemes could reduce car travel demand by significant amounts, especially during the rush hour and in urban areas.

The report develops two scenarios for national application of local measures: "enlightened business as usual" and "ambitious change". The enlightened business as usual scenario assumes most local authorities do what the best ones are doing already. Ambitious change assumes national and local government pull out all the stops to achieve the maximum behaviour change, in line with the best that is being achieved internationally. Both scenarios estimate the impact of the measures listed above between now and 2010.

Under the enlightened business as usual scenario, car travel demand could be reduced by 12 per cent during peak hours, or by 15 per cent in a typical large urban area such as the West Midlands conurbation. The national impact on car travel demand could be 5 per cent.

Under the ambitious change scenario, car travel demand in peak hours could be cut by 26 per cent. The impact in a typical large urban area could be 33 per cent. The national impact could be 10 per cent.

Local schemes could cut traffic in urban areas*. Under an "enlightened business as usual" scenario, travel demand could be cut by 15 per cent; under an "ambitious change" scenario, 33 per cent.*



These figures do not include potential synergistic effects if several measures are applied in the same place at the same time. An example of such an effect would be that *both* a workplace travel plan *and* safe routes to school are required for parents to be able to give up driving their children to school and then driving on to work.

Local measures would need to be coupled with traffic restraint to prevent their benefits being eroded by induced traffic. They may however increase the effectiveness of traffic restraint policies so that lesser amounts of traffic restriction achieve greater modal shift.

Although local measures have the potential to deliver significant behaviour change, they are not a panacea, and not necessarily easy, or inexpensive, or uncontentious. Widespread implementation would require increased resources, appropriately trained staff, and possibly some legislative change. Nevertheless, the evidence presented in this report suggests that they are important tools for every transport planner.

Contents

1. Introduction

This report evaluates whether so-called "small-scale" or "soft" schemes can be effective in reducing car travel demand. "Small-scale" is in a sense a misnomer, since some of the measures explored would, if applied across a whole town, be comparable in cost and complexity to major infrastructure schemes. The term "soft" is similarly open to confusion: it is sometimes taken to mean non-infrastructure measures such as marketing and publicity, and sometimes interpreted more broadly as including infrastructure such as cycle lanes and bus lanes. A more appropriate description might be "locally implemented", and in general the term used in this report is "local transport schemes".

The measures examined – travel plans, travel awareness programmes, cycle facilities, quality bus partnerships, car clubs – are mostly fairly new to the UK, although some of them have been common practice in other countries, particularly in Europe, for many years. Because they are so new, we have tended to assume that we do not know enough about their potential effectiveness to draw conclusions about what impact they might have upon levels of traffic. Saying "we do not know what impact these measures may have" is clearly not the same as saying "we do not believe these measures will have significant impact", but – perhaps for understandable reasons – there has been a tendency to jump from the first of these statements to the second. However, experience of these local transport schemes is now just sufficient for us to assess their current impact, and to attempt to forecast what impact they *might* have in future.

The report estimates the potential contribution of each measure in comparison to national (English) traffic levels. This gives a sense of the relative significance of local transport schemes compared to nationally-applied measures such as rail improvement programmes, and indicates the potential contribution to CO_2 reduction targets. However, any reduction in national car travel demand will *not* be uniformly spread across all types of roads (congested and uncongested; urban, interurban and rural), nor across all times of day. The local impact of these measures is likely to be significantly greater at peak times and on the most congested roads. The impact at peak times is estimated at about 2½ times the overall national impact, and the impact in a metropolitan area is estimated at about three times the national figure.

1.1 Why does it matter? The problem of traffic growth

Transport 2010, the government's ten-year transport plan, set out a strategy for cutting the growth in traffic and congestion. When first published, the plan predicted overall traffic growth between 2000 and 2010 could be cut by five percentage points, from 22 per cent to 17 per cent. In other words, traffic levels will continue to worsen. Even in conurbations and large urban areas, where capacity constraints mean that traffic growth is less, the ten year plan forecast an increase in traffic of 10 per cent. The progress report on the ten-year plan in 2002 suggested that the situation may be worse than this, with levels of congestion higher than believed in 2000 and likely to be worse than originally forecast in 2010.

The government argues this growth in traffic does not really matter, and it is the *impacts* of traffic – particularly congestion and pollution – which must be tackled. But it is clearly not a satisfactory state of affairs. There are several reasons why traffic growth gives cause for concern:

- It is not credible to argue – as government policy has – that congestion will go down at the same time as traffic volumes go up. Even if increases in road and junction capacity are used to reduce congestion at specific sites, any benefits will be short-lived. If the broad trend of traffic is upwards, congestion will inevitably get worse.
- More traffic makes for less liveable streets. "Liveability" – described in a speech by the Prime Minister to the Groundwork Trust (2001) as "all the things which improve our daily experience of life where we live" – requires high quality public spaces, less danger from traffic, and a clean, well-managed, safe and secure street environment. High traffic volumes make public spaces noisier, smellier, and more stressful.
- Increased traffic will lead to more road casualties and deaths.
- Traffic growth outside urban areas – whether on local roads or trunk roads and motorways – destroys rural tranquillity and creates pressure to build more roads and widen existing ones through environmentally sensitive landscapes.
- More traffic implies a greater dependency on cars as a means of transport, which in turn implies much lower levels of walking and cycling. Yet walking and cycling are the most important forms of physical activity to improve public health.
- Traffic growth offsets any climate change benefits arising from more fuel efficient vehicles. The large scale of reductions in carbon dioxide emissions necessary to avert catastrophic climate change is such that every sector of the economy must play its part in reducing emissions, including transport.

While policy makers may distinguish between adverse traffic impacts and adverse traffic growth, the public do not: the "common sense" reaction of most people is that traffic growth is in itself a bad thing. For example, national opinion surveys show the proportion of people thinking the amount of traffic on the roads is "one of the most serious problems for Britain" has risen steadily from 58 per cent in 1993 to 73 per cent in 1999 (Office for National Statistics 2001). A survey carried out by City of York Council found that local residents thought traffic congestion was the single most important issue facing York, and nearly three quarters of local people wanted to see traffic levels reduced to 1991 levels or lower (City of York Council 2000). A survey in Perth, Australia – a city built around the car, and arguably one which represents "the future" for Britain if car dependency continues to grow – found 82 per cent of people believed that traffic would continue to increase over the next twelve years and that this was a negative occurrence (Government of Western Australia 1999).

Faced with these concerns, one response is to argue that traffic reduction may be desirable, all other things being equal, but that the policies necessary to cut traffic would themselves have unacceptable consequences. In other words, the medicine is worse than the disease – or at least the patient believes it to be so – and traffic volumes can only be reduced through a combination of higher fuel prices, charging for use of road-space, reductions in traffic capacity and so on that would be unpopular and unacceptable to voters.

But is it correct to argue that traffic reduction can only be achieved by such extreme intervention that it is refused by the patient? This report presents the evidence so far that there may be a gentler form of treatment which could help cut traffic with less pain.

This is not to say that the measures discussed here will on their own be adequate to cut travel demand. Local transport schemes are no panacea. But – as will be argued later – local schemes to increase the appeal of non-car options deserve to be taken seriously *alongside* other measures, and they may increase the effectiveness of restraint policies so lesser amounts of traffic restriction have greater impact.

1.2 Some important tools omitted from national and local transport policy-making

This report makes the case that local transport schemes could have a significant impact both on local transport problems (congestion, pollution, road casualties, "un-liveability"[1]), and on national traffic levels and carbon dioxide emissions. But how much has the contribution of local transport schemes already been taken into account in national traffic modelling?

The ten-year transport plan, and before that the work reported in "Tackling Congestion and Pollution" (DETR 2000a and b), modelled the impacts of a comprehensive range of interventions on traffic growth:

- Local authority action, including promoting alternative modes; reducing highway capacity; parking constraint; promoting awareness and individual action
- Road-user charging and the workplace parking levy
- Land use planning policies to shift household growth towards denser urban settlements
- Sustainable distribution policies
- Passenger rail improvements
- Changes in motoring costs
- Underlying factors which increase car ownership and use (economic growth, population growth and household growth).

The information on which the ten-year plan modelling was based was necessarily limited by what was available at the time. In the case of local authority action, the subject of this study, the plan's assumptions were based on analysis of provisional local transport plans drawn up by local authorities in 1999. The proposals in these plans were rated according to their intensity (low, medium, high) and funding requirements, and these ratings were translated into traffic change factors using a "ready reckoner" developed by WS Atkins (1999).

The WS Atkins "ready reckoner" is derived from transport models, rather than from observed behaviour change. Although the transport models on which it is based will at some stage have been calibrated against actual behaviour change arising from particular policy interventions, the calibration is likely to have been some time ago, when experience of measures such as quality bus partnerships or workplace travel plans was extremely limited or possibly non-existent. Since then, our knowledge of the degree to which local transport schemes can affect demand for travel by car has increased. The effectiveness of such schemes has also probably increased, as local authorities have gradually found out what works best, learning from their own and others' successes and failures. This learning process is likely to be particularly significant for new areas of policy intervention, and quality bus partnerships, travel plans, car clubs, and individualised marketing are *all* relatively new to the UK.

The forecast traffic impact of local schemes in Transport 2010 thus has some important limitations:

- It is only indirectly based on observed changes in behaviour
- It does not allow for the possibility that local transport schemes may become better over time, as local authorities learn how to do things better

[1] "liveability" is here taken to mean the quality of the local street environment, particularly as a space for human interaction and enjoyment of such activities as sitting, talking, walking, cycling, and playing.

- Because it starts from the aspirations in local authorities' provisional local transport plans, it is modest in its estimates of intensity of application of local schemes. It does not tell us by how much traffic could be reduced if every child had a safe route to school, or if every bus service had priority at traffic lights and hence ran to time. Transport 2010 looks at what is probable, not what might be possible.
- WS Atkins state that their ready reckoner does not allow for the synergistic effect of the different combinations of local schemes which could be applied.

It is not possible to assess how much of the difference between the Transport 2010 baseline forecast (22 per cent traffic growth) and the adopted forecast (17 per cent growth) is due to local authority action. However, Transport 2010 states that all components are important in delivering the plan forecast, so it is probable that the assumed contribution from local transport schemes is no more than one or at most two per cent. As will become clear, this is about five to ten times less than their potential contribution as estimated by this report.

1.3 State of the debate on the effectiveness of local transport schemes

Three previous studies have sought to estimate the impact of local transport schemes. A study commissioned from Halcrow by DTLR assessed the effectiveness of soft measures in multimodal study areas (DTLR 2002a). This was the subject of a review by James (2002). Another study, by Mackett (2001), looked at what people say would attract them to use their cars less for short trips of under five miles.

A summary of these studies is provided in an appendix. Briefly, the key conclusions are:

- The main factors which could have a material effect on travel demand in multimodal study areas are teleworking, videoconferencing, workplace travel plans, public transport fares and ticketing, individual marketing campaigns, and bus quality partnerships (DTLR 2002a).
- Although the Halcrow report does not suggest what the combined impact of these measures might be, adding together the figures it suggests for different measures gives a total of around five per cent by 2015 (DTLR 2002a).
- The review by James (2002) suggests DTLR (2002a) underestimates the potential impact of soft measures, and that overall national reductions of the order of 15 – 20 per cent are achievable, based on current evidence.
- Measures targeted at short journeys (less than five miles) could cut national traffic levels of traffic by up to five per cent (Mackett 2001). This does not include the potential impact of local measures on longer journeys.

1.4 Developing scenarios for the impact of local schemes

The findings of this report are based are a series of analyses of the impact individual measures might have on reducing demand for travel by car. The measures covered, in sections 2 – 10, are:

- Improving bus services
- Local rail and tram schemes
- Workplace travel plans
- Teleworking

- School travel plans
- Individual marketing
- Car clubs
- Measures to increase cycling
- Measures to increase walking.

This is not a comprehensive list of the tools available to local authorities. It does not cover the full range of measures to restrain traffic, such as reducing the availability or increasing the price of parking; re-allocating road space from cars to other modes; or the workplace parking levy or road user charging. Nor does it deal with major projects, such as major rail improvements, or large scale changes in land use to increase the viability of alternatives to the car. Nor does it look at innovations such as door-to-door or demand-responsive transport, which may be very important in rural areas but are not yet sufficiently established to draw conclusions about impacts. Most of the measures under examination are normally implemented at quite a small scale; do not require large scale infrastructure; but *could* be "scaled up", or applied at much greater intensity than at present.

The potential impact of each measure depends on three factors:

- Its effectiveness
- Its potential "market share" both overall and at specific times or in specific places
- The scale or intensity at which the measure is applied.

The effectiveness of the measure is assessed from a range of published studies of observed changes in behaviour, in the UK so far as possible, but elsewhere if UK experience is limited.

The measure's potential "market share" is the proportion of car mileage which it may influence. For example, school travel plans and workplace travel plans mainly affect car use for those specific journey purposes; because the journey to work accounts for a much higher proportion of total car travel its potential impact or market share is greater. (However, school travel plans might still have significant influence on total car travel during the morning rush hour, and in congested urban areas, and the presence of a safe route to school might enable other changes in travel patterns: for example a parent who no longer had to escort their child to school might be able to take the bus to work instead of driving.)

Finally, there is the scale or intensity with which the measure is applied. For example, is it possible to develop quality bus partnerships on every bus route in all urban areas, or can we realistically only achieve a quarter or a tenth of this, over a specified time scale? Here the analysis considers two possible scenarios. In the first scenario, termed *"enlightened business as usual"*, it is assumed that the majority of local authorities start practising what the best ones are already doing, and that there is a process of continuous learning so that the effectiveness of implementation of measures gradually improves. The second scenario, *"ambitious change"*, is one in which both national government and local authorities pull out all the stops to achieve the maximum possible behaviour change. This might involve legislative change, would certainly imply increased funding, and would require a high degree of political and professional commitment at all levels, but would not be out of line with what is currently being achieved in other countries.

For both the *enlightened business as usual scenario* and *ambitious change*, estimates are made of the likely impact on national car travel demand between now and 2010. The impact

of each measure is likely to vary a great deal from place to place, and between peak and non-peak periods. Section 11 therefore examines the possible impact of each measure in a typical urban conurbation (the West Midlands) and at peak hours.

In some cases, the impact of a measure will not be fully realised by 2010. This is particularly true for new initiatives such as car clubs, which are currently at an early stage of development and even with very high levels of institutional commitment, will take time to grow. Where this is the case, an estimate is also made of the longer term maximum impact.

Although the two scenarios are notionally for the year 2010, no attempt has been made to base calculations on the traffic volumes forecast for that year. This is for two reasons. First, any forecast of traffic volumes in 2010 is precisely that: a prediction, which may or may not be accurate, and which depends on an array of underlying factors, from economic growth rates and oil prices, to political change and resulting decisions about fuel tax and road user charging. Second, in order to estimate the impact of a particular measure under either of the two scenarios, it is necessary to have concurrent information about total traffic volume, average trip distances, mode share for different journey purposes, and a host of other factors. This information is only available for the present, not the future. Thus, all calculations are based on current levels of traffic, but they enable us to estimate approximate traffic reduction factors for 2010.

The scenarios give an upper and lower estimate of the potential impact of each individual measure on demand for travel by car. Unfortunately, working out the sum total of all the measures is more complicated than adding these figures together. This is for three reasons, discussed in more detail in section 11 but summarised here:

- combinations of several measures may lead to synergistic effects, and more behaviour change than would be predicted simply by summing their individual impacts
- there might be some circumstances in which combinations of measures are less than the sum of their parts. This might arise if several measures were all targeting the same journey purpose, and there were insufficient journeys susceptible to change
- changes in travel behaviour arising from local measures may be eroded by induced traffic filling the road space that is released, unless other actions, such as re-allocation of road capacity or congestion charging, are introduced in parallel.

The policy actions that would be needed to deliver the *enlightened business as usual* and *ambitious change* scenarios are outlined in each section, and summarised in section 12.

2. Attracting new passengers to travel by bus

Summary

In an *enlightened business as usual* scenario, bus improvements could cut national car travel demand by 0.5 per cent. In an *ambitious change* scenario, the reduction is 0.9 per cent. The potential impact is greater in urban areas.

Bus use has been in gentle decline for more than a decade in much of Britain outside London[2]. A combination of deregulation, withdrawal of unprofitable services, policy neglect, rising real-terms fares, unreliability associated with growing congestion, and inattention to the often low quality of services has, not surprisingly, led many people to view the bus as a means of travel of last resort.

But this need not necessarily be so. There is growing evidence that partnerships between local government and bus service providers to improve service quality can have striking impact. The first of these so-called "quality bus partnerships" was developed in Birmingham in the early 1990s. Since then, more such partnerships have been set up, and, in metropolitan areas especially, Passenger Transport Executives and Transport for London are adopting strategies for wholesale improvement of bus services on many corridors extending across the whole urban area.

Outside the UK, several European cities – most notably Freiburg, Zurich and Dublin – are demonstrating that co-ordinated public transport strategies can reap dividends in passenger numbers. Re-allocation of road space to enable buses to bypass congestion, coupled with ticketing initiatives that encourage regular travel, have brought substantial increases in bus use to these cities.

This section looks first at the success of quality bus partnerships in the UK. It then considers what we can learn from elsewhere in Europe.

2.1 Impact of quality bus partnerships

Three documents give an overview of the success of recent quality partnerships: a survey by LEK for the Commission for Integrated Transport, which looked in detail at 11 schemes (LEK / CfIT 2002); a report by the TAS Partnership, which surveyed all the quality partnerships in Britain in 1999, and again in 2000 (TAS 2001); and a report from the Confederation of Passenger Transport (CPT 2002), which includes examples of patronage growth not reported by TAS or LEK.

The essential feature of a quality bus partnership is summed up in the name: it is a joint initiative between the bus operator and the local authority or passenger transport executive to

[2] source: Transport Statistics Bulletin: A Bulletin of Public Transport Statistics, Great Britain 2001 edition, DTLR 2001

improve the overall quality of the experience of travelling by bus. The key elements of a quality partnership may vary, but could include bus priority measures, information and marketing, better passenger infrastructure, improvements to vehicles and service quality, and enhanced services, fares and ticketing (table 2.1). In practice, few quality partnerships are likely to incorporate all of these elements, and some elements are more important than others in their effect on passenger numbers. However, ambitious and comprehensive quality partnerships with across-the-board improvements seem to yield greater increases in patronage than narrower projects which deal with only a few aspects of the bus journey.

Table 2.1 **Key elements of a quality bus partnership**

Bus priority	• Bus-only sections of highways (bus lanes, bus-only roads, guided busway) • Bus gates, bus-only turns at junctions, changes to traffic calming so as not to disadvantage buses • Priority at junctions (bus vehicle detection systems, advanced signals for buses); area-wide urban traffic control along key bus routes • Enforcement (by police, bus lane cameras); bus-activated access to areas physically closed to other vehicles
Information	• Displays at stops / vehicles with times or frequency of services; maps of local area around bus stops; named bus stops; interchange information • Real-time displays at stops or on vehicles • Branding of vehicles with service details, and branding services at stops • Individual timetables, booklets and maps • Phone enquiry lines • Internet information
Passenger infrastructure	• Shelters, seating, kerbing / bus boarders, tactile surfaces, lighting, security cameras (at stops and on board) • Improving positioning of bus stops, and pedestrian access to them
Vehicle and service quality	• New vehicle designs (including low floor vehicles) and refurbishing existing vehicles • Staff training: customer care, disability awareness and equal opportunities • Vehicle cleaning and repair of damage • Dedicated fleet for each service
Services, fares, ticketing	• Changes to service frequency, hours of operation, routeing, journey times • New services • Changes to fares levels or structure • Joint ticketing for different services; tickets for specific passenger groups or for journeys at certain times or to certain locations

Source: TAS (2001)

So how much passenger growth can be delivered by a good quality partnership? The LEK research examined 11 un-named urban quality partnerships, and found that most schemes (nine out of the 11) delivered increases in patronage of between seven and 30 per cent. These

schemes incorporated a variety of measures: bus lanes, other bus priority measures, low floor buses, more frequent services, real time information, marketing, and higher parking charges. One scheme performed much better than any of the others, with an increase in patronage of over 90 per cent. This was the only scheme to include a guided bus-way, and was also the only one to be associated with a park and ride service. One scheme had much less impact than the others, with patronage rising only about four per cent. This was the most limited of all the schemes, involving introduction of low floor buses and some bus priority measures but no new bus lane.

The TAS research suggests that differences in passenger growth figures are linked to the level of ambition of a quality partnership scheme. It finds that quality partnerships involving only minimal investment in new infrastructure will on average deliver revenue and patronage increases of 5%. Where a comprehensive route upgrade is carried out, patronage and revenue can be expected to rise by around 15%, and with very high quality schemes the average increase will be around 30%, with some schemes achieving increases in revenue as high as 45%. However, other factors outside a quality partnership will also affect its impact: for example the level of parking charges or availability of parking; levels of congestion; or competition with other modes such as cycling or light rail. Table 2.2 shows the TAS analysis of the possible range in passenger growth according to these external factors and the level of ambition of the quality partnership itself.

Table 2.2 **Expected increases in revenue and patronage for quality partnerships**

Improvement type	**worst case**	**average**	**best case**
Minimal infrastructure improvement	-25%	5%	10%
Comprehensive conventional route upgrade	5%	15%	50%
The 'X' factor: something better than a conventional route upgrade	20%	30%	45%

Source: TAS (2001)

Although some growth in bus use is usually seen quite quickly after improvements are made, passenger numbers typically take up to two years to peak. It takes time for improvements to "bed in" and for passengers to change their existing travel behaviour and try the new service. For example passenger numbers on Line 33 in the West Midlands increased by a fifth shortly after the quality partnership began, but 18 months later bus use had increased by 40 per cent. TAS suggests that after two years patronage increases may level off, or even decline, if no further improvements are made. They argue that in a climate of continually rising consumer expectation, local authorities and bus operators must "refresh the quality bus product" every five years in order to achieve continuing increases in passenger numbers.

Table 2.3 shows the patronage increases achieved by a variety of quality bus partnerships, as reported by LEK, TAS, CPT and others. The highest performing schemes (patronage +75 per cent), in Leeds and Ipswich, involved construction of dedicated guided bus-ways. The next highest passenger increase (+63 per cent) was achieved in Perth, Scotland, where the bus operator doubled bus frequencies, introduced low floor buses, simplified the fares structure and carried out a door-to-door marketing campaign at the same time that the local authority introduced bus priority measures and new bus shelters. This scheme was part of a "Kick Start" trial project by Stagecoach.

Table 2.3 **Impact of quality partnerships on patronage in individual corridors**

Location	Description	Short-term patronage increase[3]	Medium-term patronage increase[4]	Proportion switched from car	Source
Review of 11 bus quality partnerships	Bus lanes, low floor buses, more frequent services, real time information, marketing		Most in range 7 – 30% (guided busway 90%; one scheme only 4%)[5]	Estimate 10%	LEK / CfIT (2002)
Birmingham	Line 33	20%	40%	10%	TAS (2001)
Birmingham	Superline	18%			TAS (2001)
West Midlands	Primeline		5%		TAS (2001)
Birmingham	three Showcase routes			29%	CENTRO, in Mackie et al. (2002)
Cheltenham	Service 2	5%			TAS (2001)
Edinburgh	Greenways schemes		7 – 15%		TAS (2001)
Hertfordshire	Lea Valley Green Route	20%			TAS (2001)
Hertfordshire	Elstree and Borehamwood Network		20%	3%	TAS (2001)
Ipswich	Superoute 66 (guided busways)		75%	33%	First, in CPT (2002)
Leeds	Scott Hall Road (guided busway)		75%	20%	First, in CPT (2002)
London	Route 220 (Harlesden – Wandsworth)		approx 30%[6]		Daugherty et al. (1999)
London	Uxbridge Road		26%[7]		Daugherty et al. (1999)
Nottingham	Cotgrave Connection		10 – 15%		TAS (2001)
Nottingham	Calverton Connection	29%	48%	25%	TAS (2001)
Perth, Scotland	Stagecoach Kickstart pilot		63%		Stagecoach (2002)
Portsmouth	Portsmouth – Leigh Park service	25%			Stagecoach, in CPT (2002)
Rotherham	Rotherham – Maltby services		17%		First, in CPT (2002)
Sheffield	X33 to Bradford		nearly 50%		Arriva, in CPT (2002)
Telford	Redline		46%		Arriva, in CPT (2002)
Telford	Blueline	12%			Arriva, in CPT (2002)
Woking	Route 91		22%		Arriva, in CPT (2002)
AVERAGE		**18%**	**36%**		

[3]Patronage increases are considered short-term where they are described as "initial increases" or are for a period of 15 months or less.
[4] Patronage increases are taken as medium-term if the time period quoted is 18 months or longer, or if it is unspecified.
[5] LEK / CfIT (2002) data are not included in calculation of average patronage increase, since the unnamed schemes analysed by them may duplicate the named examples.
[6] Daugherty et al. quote "an increase of an average of about 7 to 15 per cent per annum compared to the fleetwide total from about the middle of 1994 until the end of 1996." Taking a middle figure of 11 per cent per annum over 30 months gives an increase of 30 per cent.
[7] Daugherty et al. quote an increase in patronage of "almost 30%" compared to a 4% patronage increase on control routes.

Taken together, the listed schemes have increased bus use by an average of more than a third (36 per cent). If the guided bus schemes in Leeds and Ipswich are excluded, the average increase in bus use is slightly lower but still substantial at 30 per cent. Although guided busways are clearly the gold standard in terms of bus improvements, simpler schemes can still make bus travel more attractive to passengers.

These figures do not necessarily imply that patronage increases of a third are "typical". It is hard to judge how much bias towards good schemes there may be in the reported patronage data, but less successful schemes are probably less likely to be reported. Nevertheless, the evidence is that a good number of quality partnerships have achieved increases in bus use of around a third, and it should be possible to learn from this so that future quality partnerships achieve similar results.

Table 2.4 shows the results of *city-wide* initiatives to increase bus use in Oxford, Brighton and Cambridge. These cities have successfully increased bus use across the board, partly as a result of corridor-specific measures such as bus lanes, but also because of wider policies including a simplified fares structure in Brighton, city centre car access restrictions in Cambridge, and park and ride in Oxford. The experience of these cities underlines the importance of other policies to support and promote bus use, discussed in the next section.

Table 2.4 **Impact of quality partnerships on town-wide patronage**

Location	Description	Short-term patronage increase	Medium-term patronage increase	Source
Brighton and Hove	entire network		5% per annum since 1994; 25% over five years	TAS (2001); CPT (2002)
Cambridge	city network	25% in four months following launch		Stagecoach, reported in CPT (2002)
Oxford	city network (all operators, inner cordon)		52% (between 1991 and 2001)	CPT (2002)

2.2 Broader strategies for promoting bus use

Although bus operators, Passenger Transport Executives and local authorities in Britain have successfully increased bus use in targeted corridors, evidence from the few UK cities discussed above and from other countries suggests that still more patronage growth is possible, particularly if buses are promoted and improved through a city-wide comprehensive programme. Cities such as Freiburg, Zurich and Dublin provide models for what urban public transport in Britain *could* be like, with continued investment and improvement. Freiburg and Zurich are especially interesting because they have used fares reductions and integrated ticketing to stimulate public transport use.

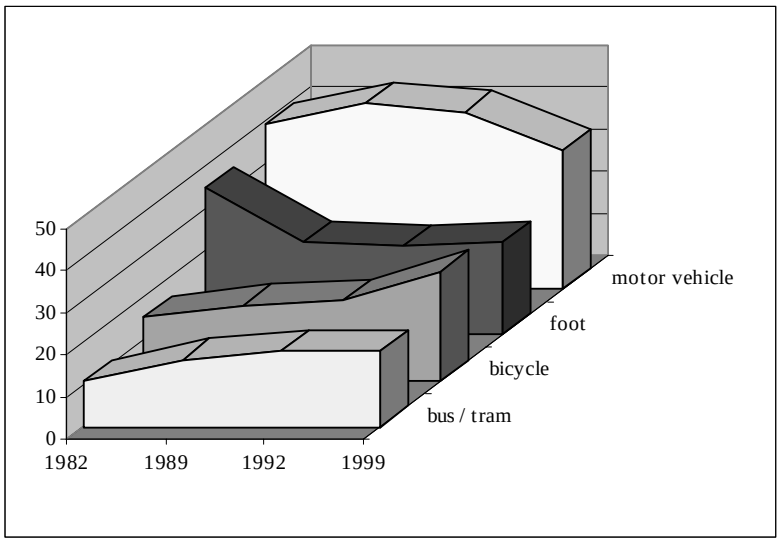
Freiburg, Germany

Over twelve years between 1983 and 1995, public transport patronage in Freiburg, Germany, increased by an average 7.5 per cent per year, rising from 27.7 million trips per year to 65.9 million trips per year (FitzRoy et al.1998). Over the same period, the population of the region grew by 13% and car ownership grew by 26%, and yet car modal share remained constant and public transport's modal share increased (figure 2.1). FitzRoy et al. ascribe this success to the introduction of a cheaper and more flexible environmental travel card in 1984.

Public transport demand in the fifteen years before 1984 had remained roughly constant at around 30 million trips per year. This was despite growth in bus and tram services (as measured by bus and tram vehicle kilometres) of about 1.6% per year. The new "environmental protection" ticket (Umweltschutzkarte) introduced in 1984 was three-quarters the cost of the old monthly card it replaced, and for the first time could be used by friends and family members as well as the ticket holder. Its price was held constant for the next six and a half years. In 1991 it was replaced by a region-wide environmental travelcard (Regio-Umweltkarte) which offered similar benefits over a larger area.

In the first year of operation of the environment card, an estimated 3000-4000 regular car drivers switched to public transport. The environmental card also benefited the local transport operator, with ticket revenues rising steadily throughout the 1980s despite the price of the card remaining unchanged.

Figure 2.1 Trip modal shares for the city of Freiburg (per cent)



Source: Verkehrsgemeinschaft Freiburg (1993), quoted in Fitzroy et al. (1998); and Haag (2002)

Zurich, Switzerland

Public transport in Zurich has enjoyed similar success to that in Freiburg. Following a period of relative stability, passenger trips grew by a third between 1985 and 1990 (from 210 million to about 280 million trips a year), and now stand at about 300 million trips a year (Fitzroy et al. 1994 and Ott 2002). Including rail services as well as buses, Zurich has almost twice as many public transport trips per capita as London, despite being only a tenth the size (Pucher et al. 1996).

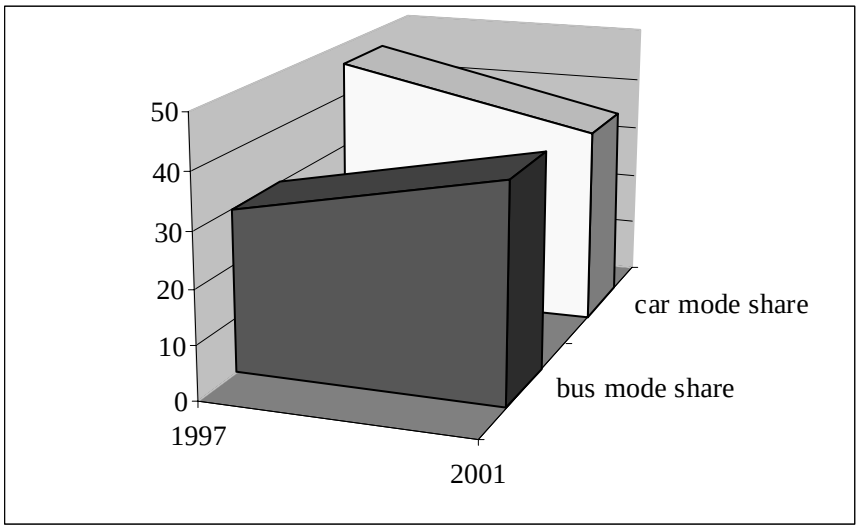
Zurich's success is partly the result of extremely high service quality, with dedicated road space for buses and trams enabling 80 per cent of all vehicles to arrive at stops within 30 to 40 seconds of schedule. However, ticketing and fares policies have also played a crucial role, and Fitzroy et al. believe the introduction of a transferable "rainbow card" (Regenbogenkarte) season ticket was the main factor responsible for stimulating passenger growth in the late 1980s. The rainbow card can be used on all modes of public transport throughout the city, and, as in Freiburg, it is transferable to family members and friends. Between 1985 and 1990, the average fare paid by passengers in Zurich fell by 25 per cent, as a result of passengers switching from single-trip tickets (which increased in price over that period) to monthly, annual, weekly or multiple-trip tickets. The price of a monthly ticket approximately halved.

Dublin, Ireland

In the last four years the city of Dublin has invested in a major programme of quality bus corridors. Nine radial routes have been completed so far, covering a total distance of 98 km, at a cost of €56.4 million (£35 million) (Dublin Transportation Office 2002). The specification for the corridors is ambitious, with segregated lanes wherever possible, coupled with other traffic management techniques to cut delays caused by traffic congestion. Service frequencies are high: guidelines specify that the average waiting time for a bus should be no more than three minutes at peak hours and four minutes off-peak. Real-time passenger information, high quality waiting areas (with level boarding, phones, ticket vending machines and cycle parking), and landscaped, direct pedestrian walkways to bus stops, are all intended to improve the experience of catching a bus.

As a result of these improvements, passenger numbers have increased by 38 per cent on the nine corridors. On the most successful route (N11 Stillorgan) six out of ten new bus passengers had previously travelled by car. As figure 2.2 shows, bus mode share on the quality corridors has increased by ten per cent (from 29.7 to 39.4 per cent), while car mode share has fallen by ten per cent (from 46.3 to 36.1 per cent).

Figure 2.2 Change in bus and car modal split during morning peak hours on quality bus corridors in Dublin (per cent)



Source: DTO (2002)

Transferability to the UK

The evidence from Freiburg and Zurich suggests that lower fares and integrated ticketing should play a larger part in public transport strategies in the UK. Fares reductions and integration across all public transport providers are difficult in Britain because of competition rules and the deregulated framework. London, however, is different, and here the power of the Mayor to set fares has been used to positive effect. A fairly complex zoned bus fare system has recently been replaced by a flat £1 fare for journeys in central London and flat 70p fare outside central London. In the twelve months following this change, passenger numbers grew at nine per cent a year (higher even than the annual growth in Freiburg). Other factors, such as higher tube fares, overcrowding on the tube, increased economic activity, more bus services and the London Bus Initiative priority measures are all likely to have contributed to this patronage growth, but it seems likely that the bus fare simplification, and subsequent fares freeze, attracted many more passengers to take the bus.

Research by Dargay and Hanly (1999) suggests that the effect of fares reductions on patronage increases over time. They found that the short-term effect of a ten per cent fall in bus fares was to increase passengers by about three per cent; but that over a period of six to seven years passenger numbers would go up by about six per cent. This suggests that the full benefits of lower bus fares in London may not yet have been reached.

The Dublin experience shows that very high quality bus services can make a major difference to modal split during peak hours, when congestion is greatest. The scale of investment required to deliver the passenger increase achieved in Dublin is comparable to the level of funding planned over the next five years in a similarly sized urban area in Britain, West Yorkshire. It would be reasonable to expect that quality bus partnership schemes in the UK will start to deliver substantial shifts from car to bus over the next few years, as the increased funding through local transport plans starts to have effect.

2.3 What proportion of new bus passengers previously travelled by car?

Clearly not all the increase in patronage in the schemes described above can be attributed to people who would otherwise have made their journey by car. Some new journeys may be made by people who previously did not travel at all (for example people with limited mobility for whom new accessible buses enable completely new trips). If there is a parallel rail corridor some users may switch from that, especially if journey times become more reliable; and some pedestrians and cyclists may be attracted too (this may have been the case in Freiburg, where increasing public transport use coincided with fewer journeys on foot).

Mackie et al. (2002) quote research based on surveys of 2000 travellers which found that 32 per cent of urban bus users were abstracted from the car, and TAS (2002) report that surveys of quality bus partnerships show around 33 per cent of new bus users had previously travelled by car. Data from the quality bus partnerships listed in table 2.3 suggests a range of 10 – 30 per cent of new bus passengers were former car users (although in one case the figure is just three per cent).

It seems reasonable to conclude that on average around a third of new passengers would previously have travelled by car, either as driver or passenger. The figure of ten per cent seems improbably low, leaving one wondering where the remaining 90 per cent of new

journeys have come from. Although the diversion factor from car to bus will vary depending on the corridor concerned and the "before" modal shares, it is likely that surveys intended to measure diversion factors produce systematic underestimates because of the natural variability in travel patterns. They cannot take account of bus passengers who did not make their current journey previously (for example people who have moved into the area or got a new job), who if the service had been unchanged might have travelled by car.

2.4 Scaling up: can bus improvements be offered everywhere?

As the techniques involved in developing quality bus partnerships become more widely used, local councils, Passenger Transport Executives and bus operators will be able to develop them more quickly and effectively. The proportion of low-quality schemes will decline, and current best practice will become the norm. What sort of increase in bus use might we reasonably expect to result?

The answer to this question probably varies across the country:

- In London, recent real-terms fares reductions, simpler ticketing and bus priority measures have delivered rapid growth in bus passenger mileage of nine per cent in the past year, compared to growth rates of less than three per cent in the late 1990s (Transport for London 2002c). If current policies are sustained, and the growth trend continues, bus use in London will double by 2010. The introduction of congestion-charging will give an additional boost to bus travel.
- In other metropolitan areas, a historic decline in bus use seems now to have levelled off, with Greater Manchester and West Yorkshire showing slight increases in bus use of 3 – 5 per cent in the latest year for which there are figures, but bus use still declining by 3 – 4 per cent in Merseyside and Tyne and Wear. If bus use now starts to increase at, say, three per cent per year across all metropolitan areas, it would rise by 30 per cent by 2010. To achieve more rapid growth, comparable to that in London, would require a step change in current policy and practice.
- In the English shire counties, bus passenger numbers are still falling, despite the success of towns such as Brighton, Oxford, Cambridge, and Nottingham in attracting more passengers. A hopeful but cautious view might be that the decline in bus use will now level off. Nevertheless, a step change in policy might deliver a 30 per cent increase in bus use by 2010.

This leads to the following two scenarios for bus passenger growth to 2010:

Enlightened business as usual, in which bus patronage doubles in London, increases by 30 per cent in metropolitan areas, and remains unchanged in shire counties. Under this scenario, bus use increases by 8.39 billion passenger km per year. Assuming one-third of this additional bus travel would otherwise have been by car, the effect is to reduce national car travel demand by 0.5 per cent.[8]

[8] Bus passenger kilometres in England are estimated at 18.52 billion km per year, based on average distance travelled by local bus of 377 km per person per year (National Travel Survey 1999/01). Within England, 36 per cent of local bus travel is in London; 31 per cent in metropolitan areas; and 33 per cent in shire counties (Bulletin of Public Transport Statistics, Great Britain 2001). Average car occupancy is 1.59. Car and taxi traffic in England is estimated at 323.6 billion vehicle km per year (Road Traffic Statistics 2000).

Ambitious change, in which bus patronage doubles both in London and in metropolitan areas, and increases by 30 per cent in shire counties. Under this scenario, bus use increases by 14.24 billion passenger km per year, and demand for travel by car falls by 0.9 per cent.

Some ideas about changes in policy and practice that would be necessary to achieve these scenarios are discussed in section 2.5. Figure 2.3 shows what these two scenarios would look like for London, shire counties, and two metropolitan areas, South Yorkshire and the West Midlands.

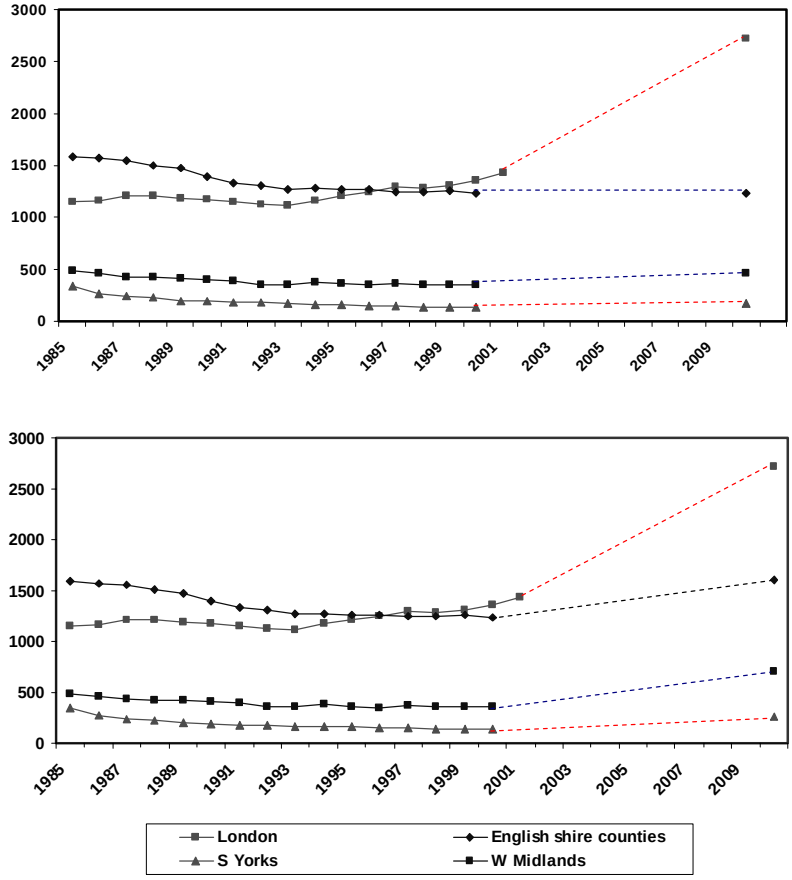


Figure 2.3
Scenarios for growth in bus passenger journeys compared to historic data: *enlightened business as usual* (above) and *ambitious change* (below).
Data are millions of passenger journeys per year.

2.5 What policies are needed to achieve this?

The increases in bus use assumed under these two scenarios are greater than the government's target to increase bus and tram travel by 12 per cent overall by 2010. They would require substantial investment in bus facilities and higher levels of revenue support than at present.

In London, the new flat structure for fares has helped deliver good passenger growth, but for this growth to be sustained fares may have to be either frozen or to grow at below the rate of inflation. This would need to be coupled with an ambitious programme of quality bus improvements. Major barriers to delivery include the complexity of the negotiations between Transport for London and the London boroughs, and local concerns about re-allocation of road space and loss of parking for small retailers.

In other metropolitan areas, bus use is no longer declining but only Greater Manchester, South Yorkshire and West Yorkshire are showing passenger growth. Major rolling programmes of

quality partnerships, covering the entire bus network over a period of five to ten years, would probably be required to deliver 30 per cent growth in patronage overall. Current funding through local transport plans provides at least the basis for beginning such a programme, but a step up in funding and scheme implementation may be necessary. For the metropolitan areas to achieve increases in bus use comparable to London (as in the ambitious change scenario) would require further change. One option – which would entail significant additional resources - would be to apply the lessons from Zurich and London, and to introduce simpler flat fares, multimodal travelcards, discounts for multiple use, and fares reductions.

In shire counties, we need to understand why some cities are succeeding in increasing bus use (Oxford, Brighton, Cambridge and Nottingham) and apply those lessons everywhere. Quality partnerships, a strong focus on passenger requirements, clear route branding, and willingness to re-allocate road space from cars to buses are identified by operators and local authorities as important elements in the success of these towns.

2.6 Summary

Under the enlightened business as usual scenario, bus service improvements could cut demand for travel by car by 0.5 per cent. In the ambitious change scenario, the reduction is 0.9 per cent. In both scenarios, the potential impact is greater in urban areas.

3. Local rail and tram schemes

Summary

In an *enlightened business as usual* scenario, new light rail schemes in Britain's cities could reduce national car travel demand by 0.03 per cent. In a city such as Manchester, planned light rail expansion could reduce car travel demand by at least 0.5 per cent and probably more. The *ambitious change* scenario is the same.

Community rail partnerships on rural lines might reduce national car travel demand by 0.1 per cent in an *enlightened business as usual* scenario, or 0.3 per cent in an *ambitious change* scenario.

Rail and light rail schemes may play an important role in reducing car travel demand, particularly on corridors with heavy traffic flows such as radial routes into city centres. Although major infrastructure schemes are not the primary focus of this report, upgrading rail lines and opening new light rail services can have a significant impact on modal split, and examples of these are therefore briefly reviewed below. This section also looks at the potential impact of minor rail infrastructure improvements coupled with increased service frequencies and better marketing, often undertaken through community rail partnerships.

3.1 Impact of light rail schemes

There are six tram or light rail schemes in British cities. Four of these, all of which have opened within the last decade, are reviewed below. The impact of recent light rail schemes has generally been positive: they have attracted large passenger numbers and travel surveys suggest that in the corridors they serve light rail lines can deliver substantial modal shift. The government's ten-year plan aims to support 25 new light rail lines in cities and conurbations by 2010, and predicts that light rail passenger journeys will double.

Manchester Metrolink

The first phase of Manchester Metrolink opened in 1992, running from Bury through Manchester city centre to Altrincham. The trams ran on former heavy rail lines, replacing suburban rail services, but switched to run on the street through the centre of Manchester. Patronage on this line was monitored by the Metrolink Impact Study. The former suburban rail lines between Bury and Manchester and Altrincham and Manchester had previously carried 7.6 million passengers a year; this increased to 12.06 million two years after the tram service opened. In contrast, passenger numbers on other suburban rail services into Manchester declined by five per cent over the same period. Knowles (1996) believes there are three reasons for this patronage growth: Metrolink's six-minute service interval, which is much better than frequencies on the previous rail services; the penetration of Metrolink into the heart of Manchester city centre; and the fact that fares were generally cheaper on Metrolink than they had been on former British Rail services.

Metrolink was much more successful than had been anticipated at attracting car users. A survey in 1993 found that over a quarter of Metrolink passengers (3.3 million people per year)

had previously made the same journey by car. Allowing for the fact that Metrolink replaced rail services on the Bury and Altrincham lines, well over half of new passengers attracted to Metrolink were former car users. This modal shift appears to have caused a reduction in traffic volumes in parallel road corridors. Off-peak traffic fell by four per cent on the Bury – Manchester corridor and by ten per cent between Altrincham and Manchester between 1990 and 1993. Peak hour traffic fell by ten per cent in the Bury corridor, and remained unchanged in the Altrincham corridor. Over the same period, other roads into central Manchester experienced strong traffic growth (Knowles 1996).

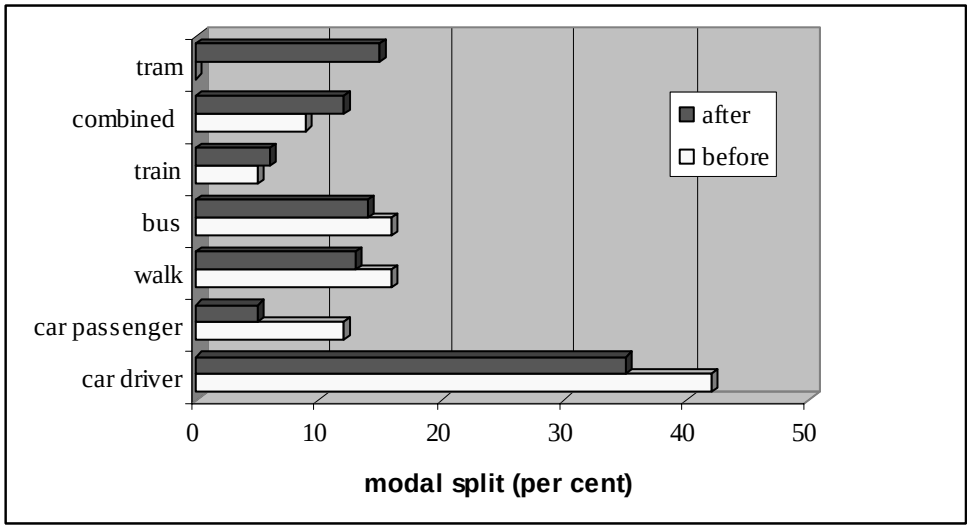
Household travel surveys in areas within one kilometre of Metrolink stations showed marked changes in travel behaviour. Use of rail or tram doubled to eight per cent of recorded journey stages, and car use declined from 58 per cent to 55 per cent.

Croydon Tramlink

The three Croydon Tramlink routes opened in 2000. As in Manchester, these run on a combination of former rail lines and on-street lines. In the year to September 2001 Tramlink was used by an estimated 17.3 million passengers. Surveys demonstrate that a fifth of Tramlink passengers previously travelled by car (16 per cent as driver and 3 per cent as passenger). For households living within 800 metres of a Tramlink stop, 15 per cent of all weekday trips are now made by tram, and the proportion of "combined" trips made by more than one mode (including tram) has increased. Car modal share has dropped from 54 per cent to 40 per cent of trips (figure 1) (Transport for London 2002a).

As in Manchester, there is some evidence that the Croydon tram system led to a fall in traffic volumes. Annual average daily traffic flow into central Croydon fell by four per cent between 1999 and 2000, compared to year-on-year variations between -3 per cent and +2 per cent over the previous five years. Demand for car parking also fell, with entries into publicly owned off-street car parks declining by six per cent.

Figure 3.1 Modal split for weekday trips before and after Croydon Tramlink, amongst households living within 800 metres of a Tramlink stop.



Source: Transport for London (2002a)

Sheffield Supertram
In Sheffield, the Supertram initially failed to meet expectations, showing much lower patronage figures than had been forecast. A review commissioned by South Yorkshire Passenger Transport Authority concluded this was a result of several factors, including city centre economic decline, competing bus services, poor service reliability as tram priority measures had not been put in place, premium fares on the tram, and the absence of anticipated park and ride sites. As these problems were tackled, Supertram patronage has risen. Developments adjacent to the Supertram route, including an entertainment complex and a new site for Sheffield College, are attracting increased passenger numbers (House of Commons ETRA Committee1999-2000). A survey of Supertram users in 1999 found that 22 per cent of passengers previously made their journey by car (16 per cent as driver, and 6.3 per cent as passenger).

Midland Metro
The first line of the Midland Metro opened in 1999 between Birmingham and Wolverhampton. Passenger surveys three months after it opened found that 13 per cent of passengers had previously travelled by car (12 per cent as driver and one per cent as passenger). A survey twelve months later found a further seven per cent of car users had switched to the metro (West Midlands Joint Committee 2002).

3.2 How much could light rail systems reduce car use?

Taken together, what do these data from Manchester, Croydon, Sheffield and the West Midlands tell us about the potential for light rail systems to attract car users? Surveys of these four light rail systems suggest they have attracted somewhere between a fifth and a third of their new passengers from the car, but this is probably an underestimate of their full impact because:

- New tram systems influence land development. If new office developments, leisure centres, colleges and other traffic-intensive land uses are preferentially located close to tram routes (as is happening in Sheffield), less car-dependent travel patterns will arise.
- Tram systems working together with bus networks may create a reliable, rapid public transport system that is better able to compete with the private car than a bus system alone. A city with a well-integrated bus and tram system may do better in terms of overall public transport mode share than one which relies solely on buses.

Assessing the car miles saved by Manchester Metrolink or any of the other tram systems is thus very difficult. At the minimum, a tram system such as Manchester Metrolink will reduce demand for travel by car by about 47 million vehicle kilometres by 2010, which equates to 0.5 per cent of total car traffic in Greater Manchester.[9] In practice, the actual impact may be greater than this, for the reasons given above, and perhaps considerably so.

[9] This assumes Manchester Metrolink's target of 372.1 million passenger km by 2011 is achieved (GMPTA 2001-2002), and conservatively assumes a fifth of these passengers would otherwise have travelled by car, with an average car occupancy of 1.59. Car traffic in Greater Manchester is taken at the level for 1998 of 8.8 billion vehicle km (Transport Statistics for Metropolitan Areas 2000).

Nationally, an ***enlightened business as usual*** scenario might assume that light rail passenger travel will double by 2010, from 771 million kilometres to 1542 million kilometres, as a result of growth on existing tram lines and construction of 25 new ones promised in the ten year plan. The additional light rail trips could reduce demand for travel by car by around 97 million kilometres, or 0.03 per cent[10]. This estimate does not allow for the effects of land use changes along tram corridors, or for additional benefits from existence of an integrated network of several tram lines.

The time required for planning and construction of new light rail lines means that it is unlikely more than 25 lines will be open to passengers by 2010, and thus the ***ambitious change*** scenario is the same.

3.3 Local rail improvements

Since the mid-1990s rail travel (measured in passenger kilometres) has been growing at about five per cent a year. This growth has been observed for all types of rail journey (long distance, commuting and leisure) and across services in London and the South East, intercity trains, and regional services (Steer Davies Gleave 2002; SRA 2002). Modelling carried out as part of the ten-year transport plan suggests this growth may be explained by a combination of strong economic growth; road congestion; lower car ownership growth than in previous periods of economic growth; and a slight real-terms fall in rail fares.

The growth in rail travel is beyond the focus of this report, as it is primarily related to national factors outside the control of local authorities. However, it is worth noting that if current trends were extrapolated, rail passenger travel would increase by a third from 38.2 billion kilometres per year in 2000 to slightly over 50 billion kilometres in 2010. This does not allow for any increase in rail travel arising from service improvements, such as better punctuality or improved station facilities. The ten-year transport plan estimated that with such improvements and associated capacity enhancements rail travel could increase by 51 per cent by 2010, although the Strategic Rail Authority has doubts that such growth is deliverable. However, assuming for the moment that the ten-year plan represents a reasonable enlightened business as usual forecast, this growth might reduce car travel demand by around 8.2 billion kilometres per year, or 2.5 per cent[11]. This figure should not be included in any assessment of the contribution of local measures to reducing travel demand, as it relates to policies and action which are determined nationally, but it is interesting as a comparison with the potential contribution from local measures.

One potential concern is that the growth in rail travel could be related to people making longer journeys, for example commuting greater distances into London and other conurbations. However, this does not so far appear to have been the case. Average rail journey length has remained constant since the mid-1990s at about 40 kilometres, and the growth in rail travel appears to be because people are making more journeys by train rather than because they are making longer journeys.

[10] This assumes a fifth of passengers would otherwise have travelled by car, with average car occupancy of 1.59. A doubling of light rail passenger kilometres is in line with assumptions in the ten year plan.

[11] This assumes a 51 per cent increase in rail travel from a base of 38.2 billion passenger kilometres in 2000/01. Two-thirds of new passengers are presumed to have transferred from car (in line with research supporting the ten year plan), and car occupancy is taken as 1.59.

What about local initiatives to increase rail travel? Alongside the national upward trend in rail use, there is some evidence that local rail initiatives may deliver additional passenger growth, even on rail corridors which initially have stagnant or declining passenger numbers. So far, the evidence in the UK is limited to a few lines, but there are examples from Europe which demonstrate local small-scale rail initiatives may have untapped potential. Such local initiatives are within the scope of this report, although their newness makes it difficult to estimate the scale of their impact.

In Britain, local initiatives to increase rail use have been spearheaded by community rail partnerships, involving train operators, local authorities and voluntary organisations. There are now more than 30 community rail partnerships affiliated to the national Association of Community Rail Partnerships (for example, the Settle-Carlisle Line, and the Penistone Line). These partnerships have sought to improve rail services through small-scale initiatives such as marketing; attractive branding (many lines are given a name reflecting the area through which they pass); increasing service frequency or changing to a regular "clock-face" timetable; refurbishing stations; introducing feeder bus services; and offering special ticket deals.

An example of the increase in patronage that may be achieved through such small-scale local improvements is the Bittern Line, the rail line between Norwich and Sheringham in Norfolk. After a period of steady decline, a community rail partnership was established for the line in 1996. A combination of effective marketing, upgrading and repair of stations, new signalling, a more frequent (hourly) service, a bus / rail link and other improvements has turned the line around, and led to year-on-year growth of over seven per cent a year, totalling over 40 per cent over five years (Meades 2002). Critical to the success of the line has been the active involvement of the local community, the county council, and the train operator. The success of the Bittern Line has prompted other community rail partnerships to be established in the region, including the Wherry Lines between Norwich, Great Yarmouth and Lowestoft, where a partnership established in 2000 is starting to generate growth of between five and seven per cent a year.

Elsewhere in Europe, there are examples of far more dramatic rail passenger growth as a result of local initiatives. In Nordrhein-Westfalen, the Regiobahn network which serves towns and villages around Dusseldorf has seen passenger numbers grow from 500 per day in 1998 to 12,000 people per day two years later (Salveson 2002). Under Deutsche Bahn the line had only five trains per day. The line was taken over by a local-authority owned enterprise, Regiobahn, financially supported by the regional passenger transport authority, which purchased new trains and began operating services every 20 minutes. Refurbished stations and integration with bus services helped attract more passengers.

Any assessment of the potential in Britain for community rail partnerships to achieve significant passenger growth (even a fraction of that achieved in the German example) is fraught with uncertainty at every stage. Tentatively, we might estimate that in an ***enlightened business as usual scenario*** fifty local rail lines would establish successful community rail partnerships by 2010, each increasing their passenger trips from an average 100,000 per month to 140,000 per month. This growth might reduce car travel demand by around 400 million kilometres, or 0.1 per cent of traffic[12]. In an ***ambitious change scenario,*** a similar

[12] This assumes average passenger trip length of 40 kilometres; two thirds of new passengers switch from the car; car occupancy of 1.59.

number of community rail partnerships might be established, but passenger use would on average double. In this scenario, car travel demand would be cut by around 1 billion kilometres, or 0.3 per cent. It should be emphasised that the uncertainty surrounding these estimates is high. However, we can say that the evidence from Germany and from early community rail partnerships in Britain suggests investment in improving rural and suburban branch lines could make a potentially valuable contribution to rail passenger growth. While many of the measures discussed in this report are likely to have greatest impact in urban areas, community rail partnerships offer an opportunity to achieve modal shift from the car in small towns and villages. Unlike the urban and suburban commuter rail network, which may require heavy investment to overcome capacity constraints, rural rail lines have much of the infrastructure in place and great potential for an expansion of services at relatively lower cost.

3.4 What policies are needed to achieve this?

Funding to support the introduction of more tram schemes is already in place through the ten year plan, with 13 new tram lines in eight cities or urban areas either under construction, approved or provisionally approved and more schemes being developed.

Local schemes to increase rail use through community rail partnerships are attracting increasing interest from train operators and local authorities, but difficulties in the rail industry and the problems caused by the foot and mouth crisis in rural areas have so far meant most partnerships have struggled to deliver passenger increases. To be able to attract increasing passenger numbers over the next ten years, local rail partnerships will need sufficient funding for new, high quality trains on some lines, and for small-scale infrastructure schemes such as track upgrades, passing loops on single track lines, re-signalling and station refurbishments. As well as funding, it will be important that sufficient priority is attached to managing and implementing these schemes by Network Rail.

3.5 Summary

In an enlightened business as usual scenario, new tram and light rail systems in Britain's cities could reduce national car travel demand by 0.03 per cent. The impact in the cities where new systems were introduced would be much greater. The ambitious change scenario is the same because a ten-year horizon is too short to build more light rail schemes than already planned.

If passenger rail travel increased by 50 per cent as a result of major rail enhancements, as forecast in the ten year plan, this could reduce national car travel demand by 2.5 per cent.

The passenger increase assumed to arise from these mainstream rail enhancements could be supplemented by passenger growth on branch and rural lines as part of community rail partnerships. In an enlightened business as usual scenario these might reduce demand for travel by car by 0.1 per cent; and in an ambitious change scenario by 0.3 per cent, although these estimates have high uncertainty.

4. Cutting car use for the journey to work

Summary

In an *enlightened business as usual* scenario, workplace travel plans could cut national car travel demand by 1.0 per cent. Peak hour car travel demand could be cut by 3.4 per cent.

In an *ambitious change* scenario, national car travel demand could be cut by 2.1 per cent, and by 7.1 per cent at peak hours.

Commuting to work by car accounts for just over a quarter of all car traffic in England. However, growing experience of employer travel planning in the UK, the Netherlands and the US suggests that workplace travel plans can be highly effective at cutting the number of cars driven to work, through a combination of incentives to use public transport, walk, cycle or car-share, "push" measures such as parking management, and recruitment and re-location policies. Recent research offers the first robust estimate for the effectiveness of travel plans. Two factors affect the potential impact of travel plans on traffic volumes: first their individual effectiveness and second the level of take-up. These factors are explored below.

4.1 How effective are workplace travel plans?

Research for the Department for Transport by Transport 2000, ESRC Transport Studies Unit (UCL) and Adrian Davis Associates provides the first clear evidence of the impact of employer travel plans on car commuting (Department for Transport 2002a). This research analysed the "before" and "after" car use of staff at twenty companies and public sector employers where travel plans had been implemented. The number of staff covered by each travel plan ranged from 245 to 7700, with a total for the twenty employers of over 69,000.

The results of the study are reproduced in table 4.1. The study found that travel plans had reduced the number of commuter cars arriving by more than 14 per 100 staff. Overall there was a reduction in the proportion of commuting journeys made as a car driver of over 18%.

These results are comparable to experience from the Netherlands and the US, where travel plans have been in use for a longer period. The DfT (2002a) study includes a literature review of a number of studies:

- A review of Dutch studies and survey of 40 Dutch organisations found that plans with "basic" measures (such as car-sharing schemes) could reduce vehicle kilometres by 6-8 per cent. Plans with "luxury" measures (e.g. works buses) and / or "push" measures such as parking management achieved reductions in the range 15-20 per cent (Ligtermoet 1998).
- Another review of Dutch travel plans found plans involving communication / marketing, basic measures such as car pooling and car leasing, and organisational measures such as flexitime achieved an average reduction of eight per cent in kilometres travelled by employees driving alone to work. Plans that also included luxury measures such as company buses and disincentive measures such as parking management achieved reductions of about 20 per cent (Touwen 1999).

Table 4.1 **Changes in commuter car use following employer travel plans**

Organisation	Cars per 100 staff[13]		Change in cars per 100 staff	% change
	before	after		
Orange (Temple Point)	79	27	-52	-66
Bluewater	69	31	-38	-55
Plymouth Hospitals NHS Trust	>78	<54	>-24	>-31
Computer Associates	89	74	-15	-17
Buckinghamshire County Council	71	56	-15	-21
Addenbrooke's NHS Trust	<74	<60	>-14	>-19
Wycombe District Council	77	65	-12	-16
Orange (Almondsbury Park)	92	80	-12	-13
Nottingham City Hospital NHS Trust	73	61	-12	-16
Marks and Spencer Financial Services	<95	<83	>-12	>-13
BP	84	72	-12	-14
Vodafone	<84	<75	>-9	>-11
University of Bristol	44	35	-9	-20
Egg	62	53	-9	-15
AstraZeneca	<90	<82	>8	>-9
Government Office for the East Midlands	<45	<38	>7	>-16
Pfizer	75	68	7	-9
Agilent Technologies	71	65	6	-8
Stockley Park	<88	<84	>4	>-5
Oxford Radcliffe Hospitals NHS Trust (JR site)	58	54	4	-7
Boots	65	62	3	-5
Average	**74**	**61**	**>-14**	**>-18**
National Travel Survey comparison	**59**			

Source: reproduced from Department for Transport (2002a)

- In the US a study of travel plans implemented by 49 employers found an average vehicle trip reduction of 15.3 per cent. Employers who provided only information saw no reduction in car use; those supplying alternatives to the car (such as van pools) reduced car use by an average 8.5 per cent; those with financial incentives (such as transit subsidies) saw a reduction of 16.4 per cent; and those providing both financial incentives and services (such as van pool / ride share matching) saw a reduction of 24.5 per cent (TCRP 1994).
- A comparison of 20 paired case studies from the Netherlands and the US found very similar car travel reductions in both countries. In the US, vehicle trip reduction rates ranged from 6.4 per cent to 49.4 per cent with an average of 19.03 per cent. In the Netherlands, reductions in vehicle kilometres ranged from six per cent to 32 per cent, with an average of 19.83 per cent (van der Knaap et al. 1996).

[13] Note from DfT (2002a): "cars per 100 staff" is the number of commuter cars arriving per 100 staff. An organisation which started with 50 commuter cars arriving per 100 staff and finished with 40 commuter cars arriving per 100 staff would have experienced a decline of 10 commuter cars arriving per 100 staff, and a 20% reduction in the proportion of commuter journeys made by car.

Another study in the US, by Shoup (1997), focussed on the role of financial incentives (in this case required by law) in changing employees' travel behaviour. Californian law requires employers with over 100 staff to offer the option of a cash allowance as an alternative to a free parking space at work (similar to the voluntary parking "cash out" offered by pharmaceutical company Pfizers in Sandwich, Kent.) The cash allowance or "cash-out" must be of at least equivalent value to the cost of the parking space. The law applies only to employers who rent parking spaces from a third party. Shoup studied eight employers with between 120 and 300 employees, and found the cash-out program reduced the proportion of people driving alone to work by between 22 per cent and three per cent, with an average reduction of 13 per cent. The average reduction in vehicle miles travelled was 12 per cent. The cash-out program was regarded as fair by employees, and was popular, simple to administer and nearly cost-neutral, although spending by some employers increased because they voluntarily raised the cash bonus to a higher level for non-driving staff.

Both Shoup (1997) and DfT (2002a) suggest that the full potential of travel plans may not yet have been realised, and that greater modal shift is likely to be achievable. Shoup points out that the 12 per cent average reduction in miles travelled in his case studies is a conservative estimate of impact, as it measured only short-term effects. For one firm, monitoring data was available for three years after the cash-out program began, and single-occupancy driver mode share fell in each of the three years. The DfT (2002a) research included three employers where monitoring data was available over several years. One showed a steady fall over time in staff driving to work. The others showed an initial fall, followed by an increase, followed by a further decline. The benefits of travel plans may grow over time for three reasons:

- as new employees arrive they are less likely to have fixed ideas about how to get to work and will be receptive to support such as cheap public transport, encouragement to cycle, or car-share matching;
- as staff see their "early adopter" colleagues adopting new travel patterns, the idea that they could try these too will gradually take root;
- the longer a travel plan goes on, the more incentives can be put in place.

This is not to say that the benefits of travel plans are in any way automatic: a successful travel plan requires determination and sustained commitment.

In a review of the obstacles to implementation of travel plans, Wixey and Ruiz (2003) point out that in countries where travel plans are being developed in a supportive regulatory framework, they are able to achieve greater modal shift. They point out that Italy now requires large employers to employ a mobility manager, and suggest other ways the regulatory and legislative system could help encourage travel plan development in Britain, including independent assessment of travel plans to ensure they meet a sufficient standard.

The DfT (2002a) research concludes that there is no natural maximum level of use of sustainable modes, and that any employer, whatever their starting point, can achieve reductions in staff car use. It also finds that there is still scope for improvement in the implementation of travel plans, and that therefore the potential for modal shift is likely to be greater than the reported average figure of 18 per cent.

Some observers argue this amount of modal shift is unlikely to be achieved everywhere, and that the figure is an average of good travel plans, rather than an average of all travel plans: in other words it "cherry picks" the best results and generalises from them (Coombe 2002). Studies such as DfT (2002a) include travel plans with a wide range of results, and the quoted average modal shift of 18 per cent is not based exclusively on "good" travel plans. However,

it would be fair to argue that this amount of modal shift will not be achieved automatically, and will require effort from government, local authorities and employers, which may take some time. As experience of travel plan implementation grows, it seems reasonable to suppose that employers (and local authority travel plan co-ordinators) will learn from each other what works, and that more travel plans will be effective, rather than paper exercises.

4.2 Extent of likely take-up of employer travel plans

Travel plans are still relatively new to the UK, but are being developed by increasing numbers of employers, particularly in the public sector. A survey by Steer Davies Gleave for DTLR (2001a) asked all English local authorities and a representative sample of businesses, hospitals and higher education establishments whether they had, or were developing, a travel plan. It received responses from 293 local authorities; 554 businesses; 45 hospitals; and 29 colleges of higher education. Implementation of travel plans was greatest amongst hospitals, which are required under guidelines from the NHS Executive to consider their traffic impact, and least amongst businesses. Table 4.2 shows the proportion of each type of employer which had or was developing a travel plan. In addition to these employers, more than 1000 buildings occupied by government departments, executive agencies and regional government offices have drawn up travel plans.

Table 4.2 **Percentage of different types of employer with a travel plan in 2001**

	Have a travel plan %	**Developing a travel plan %**	**Thinking about a travel plan %**	**Considered a travel plan but taken no action %**	**Not considering a travel plan %**
Local authorities	24	45		22	8
Businesses	7		4		89
Hospitals	62		22		16
Higher education	52		10		38

Source: DTLR (2001a)

The 24 per cent of local authorities with a travel plan is considerably higher than the three per cent found in an equivalent study three years earlier (DETR 1998).

Although take-up of travel plans amongst businesses appears low overall, the DTLR (2001a) study found this varied with the number of employees, with bigger companies much more likely to have, or be developing, a travel plan. Larger companies are more likely to experience parking congestion, and therefore to have an incentive to draw up a travel plan. They may also be more concerned to be seen to be a "good neighbour" to their local community, and wish to avoid creating traffic and parking problems off-site. Smaller businesses may find it more difficult to justify the time and resources needed for a travel plan. Table 4.3 shows the DTLR (2001a) estimates of the proportion of companies with a travel plan, according to size.

The DTLR (2001a) study found that 22 per cent of the businesses surveyed would be encouraged to develop a travel plan if the local authority offered support. It also found that fiscal incentives (such as allowing employers to pay staff for surrendered parking spaces without having to incur tax) would increase interest in travel plans. Although some fiscal changes to encourage travel plans had already been introduced at the time of the survey, it is likely that awareness of these was still fairly low amongst employers. Eleven per cent of the

businesses surveyed had not heard of travel plans, suggesting take-up can also be increased by continued publicity. Only seven per cent of businesses said that they were not interested in travel plans or did not believe them to be a priority.

The main incentives for higher education colleges to draw up a travel plan were to secure planning permission to expand the site, or because of existing parking pressures.

Table 4.3 **Percentage of businesses with a travel plan, by size**

Number of employees	Have a travel plan %	Thinking about a travel plan %
<50	2	-
50-149	4	2
150-299	3	5
>300	21	10

Source: DTLR (2001a)

4.3 Potential to reduce car use

The DTLR (2001a) survey provides the basis for estimating take-up of travel plans between now and 2010. The estimates below include those employers who already have or are developing a travel plan, based on the figures in tables 4.2 and 4.3, plus half of the number who are currently considering one:

- For local authorities, 80 per cent
- For hospitals, 73 per cent
- For higher education colleges, 57 per cent
- For businesses with over 300 staff, 26 per cent
- For businesses with 100-299 staff, seven per cent
- For businesses with less than 100 staff, three per cent

For government and executive agencies, a figure of 100 per cent is taken, since the Government undertook to develop travel plans for all its main offices by 2001.

These are conservative estimates for the take-up of travel plans by 2010. Using these figures, table 4.4 shows that under an ***enlightened business as usual scenario***, travel plans might cover 3.2 million employees, around 15 per cent of the total workforce in England. It is likely that initially some plans will be basic in scope, and have limited impact on car commuting. By 2010, though, it is reasonable to suppose that employers will have learnt what works and what does not work, both from their own experiences and from those of other companies, and that travel plans will reflect the data reported in DfT (2002a), cutting single occupancy car trips to work by an average of 14 per 100 staff, or 453,800 every weekday. The average two-way distance for a car commuting journey is 29.6 kilometres, so 3.22 billion car kilometres will be avoided each year out of a total 323.6 billion car kilometres, or 1.0 per cent.

The impact of travel plans could be increased if there was greater take-up within the private sector. Table 4.4 shows that more than half of the workforce in England is employed in private sector companies with less than 300 hundred staff, where take-up of travel plans is currently low. Under an ***ambitious change scenario,*** we assume 30 per cent of private sector companies overall are persuaded to introduce travel plans by 2010 (this level of take-up could

be achieved in a variety of ways, but most likely is that take-up would be greater than 30 per cent amongst the largest companies, and less than this amongst smaller firms). Since 22 per cent of companies were reported in the DTLR (2001a) study as saying they would be encouraged to develop a travel plan if offered support by their local authority, this is not overly ambitious, but it would probably require additional fiscal incentives or other regulatory change. Using the same assumption about the effectiveness of travel plans as in the previous scenario, 6.79 billion car kilometres, or 2.1 per cent of total car mileage, will be avoided.

Table 4.4 **Projected number of employees working for an employer with a travel plan by 2010, under different growth scenarios**

		Enlightened business as usual scenario		Ambitious change scenario	
Employer	**Number of employees in England**	**Employees covered by travel plan (per cent)**	**Number of employees affected**	**Employees covered by travel plan (per cent)**	**Number of employees affected**
Hospitals	1,040,000[14]	73	759,200	73	759,200
Higher education	283,000[15]	57	161,300	57	161,300
Local authorities	734,000[16]	80	587,200	80	587,200
Government	314,000[17]	100	314,000	100	314,000
Private sector workplaces with 300+ employees	3,487,000[18]	26	906,600	70	2,440,900
Private sector workplaces with 100 – 299 employees	3,015,000[19]	7	211,100	25	753,800
Private sector workplaces with less than 100 employees	10,069,000[20]	3	302,100	18	1,812,400
TOTAL	18,942,000		**3,241,500**		**6,828,800**
Total workforce in England	**21,744,000**				
Percentage of total workforce covered by travel plans		**15**		**31**	

[14] Source: NHS hospital and community health services non-medical staff in England: 1991-2001, Department of Health 2002. The quoted figure includes medical, dental and non-medical staff, but excludes staff employed by contracted out services, and hence is likely to be an underestimate.
[15] Source: The independent review of higher education pay and conditions (the Bett report) 1999. The report quotes total academic and non-academic staff in higher education (in England and Wales) as 300,780, of which 99,000 (33 per cent) are academic staff. From data supplied by the Higher Education Statistics Agency, 94 per cent of academic staff in higher education in England and Wales work in English institutions. Thus an estimated 283,000 academic and non-academic staff work in higher education institutions in England. This figure is for staff only. Higher education institutions which introduce a travel plan are also likely to reduce car travel by students, so the figure is an underestimate.
[16] Source: Local Government Employment Survey 2001. The total number of local authority employees in England is 2,004,000. Of these, 464,000 teachers and 656,000 "others in education" plus half the 300,000 in social services (who may be based in care homes or work as home helps) are excluded.
[17] Source: Civil Service Statistics 2001. The figure is for full-time equivalent staff in England, excluding London.
[18] Source: Annual Business Inquiry 2000. Figures are for the number of people employed at workplaces with 300+ staff. Employees working in public administration, education and health are excluded. Thus employees of private sector health-care and education businesses are not counted.
[19] Ibid. Data are not available for number of people employed at workplaces in the size categories used in DTLR (2001a) and reported in table 3.
[20] Ibid.

Travel plans are particularly effective at reducing congestion during peak hours. Around 29 per cent of all car kilometres are travelled during a few hours in the weekday morning and evening rush hours, between 7 – 9 am and 4 – 7 pm[21]. Under the enlightened business as usual scenario, weekday rush hour car travel would be cut by 3.4 per cent. Under the ambitious change scenario, the reduction would be 7.2 per cent.

4.4 What policies are needed to achieve this?

Action is needed both to encourage wider take-up of travel plans, and to make them more effective. The DfT (2002a) study found few private sector companies were prepared to tackle the issue of parking restraint in their travel plans, and this limited their effectiveness.

The introduction of DfT bursaries for local authority travel plan co-ordinators will increase the take-up and effectiveness of travel plans in all sectors. Local authority travel plan co-ordinators can assist businesses in negotiating joint deals with public transport operators, encourage robust monitoring, and use the land use planning system to ensure new developments draw up effective travel plans. Existing programmes offering site-specific travel plan advice to employers can also help improve travel plan quality.

In order to deliver the quality and quantity of travel plans assumed in the enlightened business as usual scenario, travel plan co-ordinators will need continued pro-active government support. More travel plan co-ordinators will be needed: the current model in which most local authorities have just one travel plan officer, sometimes covering school travel plans as well as workplace travel plans, severely restricts the number of businesses who can be actively supported to draw up a travel plan.

To achieve greater private sector uptake of travel plans, as in the ambitious change scenario, further policy change will be required. A universal, or near-universal, workplace parking levy would act as a powerful catalyst for private sector travel plans. However, this is not the only way to encourage greater uptake. Other options include removing the tax paid on voluntary parking cash-out payments; requiring all companies which lease parking space from a third party to offer a cash alternative to their staff, as in California; or legislation requiring large companies to employ a mobility manager, as in Italy. Further tax breaks to encourage public transport travel or cycling to work would also make travel plan measures more attractive. Direct grants to employers could help meet the up-front costs of new infrastructure. Finally, the next section will show that policies to encourage teleworking could provide an entry point for discussions with private sector employers about travel plans.

4.5 Summary

Under an enlightened business as usual scenario, workplace travel plans could cut demand for travel by car by 1.0 per cent. Under the ambitious change scenario, the reduction could be 2.1 per cent. The impact on traffic volumes during peak hours would be substantial, at 3.4 per cent under the first scenario, and 7.1 per cent under the second.

[21] source: Transport Statistics Bulletin: Road Traffic Statistics 2000, DTLR 2001

5. The impact on travel of information and communication technologies

Summary

In an *enlightened business as usual* scenario, teleworking could cut national car travel demand by 1.6 per cent. Peak hour car travel demand could be cut by 5.4 per cent.

In an *ambitious change* scenario, national car travel demand could be cut by 2.8 per cent, and by 9.7 per cent at peak hours.

The internet enables us to carry out many tasks from remote locations without physically travelling to them, making it possible to work from home instead of commuting, or to shop online and have groceries or other goods delivered. For at least the last thirty years it has been predicted that information technology will transform our travel behaviour, but until recently there has been little sign of this actually happening. However, recent surveys suggest that behaviour patterns such as teleworking are on the increase. Although this is not an IT-prompted *revolution* in travel behaviour, there is evidence that teleworking could have a marked impact on demand for travel by car, particularly during rush hours. Evidence for the impact of internet shopping is thinner, and it is difficult to judge the positive and negative impacts of this technology on travel (to what extent might additional delivery van miles occur as people order more luxury, one-off or specialist goods, offsetting falling car miles as households abandon the weekly supermarket shop in favour of on-line ordering and home grocery delivery?). Similarly, it would be fair to say the jury is still out on whether communication technologies such as video-conferencing will significantly reduce car travel for face-to-face business meetings.

Experimental data on the impact of these technologies on travel behaviour was comprehensively reviewed for DTLR by HOP Associates and the Transport Research Group at University of Southampton (DTLR 2002b), and their report and extensive database of reviewed research provide the basis for the analysis presented here. Since the evidence for the potential contribution that could be made by video-conferencing or internet shopping is thin, this section concentrates on the evidence related to teleworking.

5.1 Does teleworking cut travel by car?

Intuitively it seems obvious that if someone works at home or at a nearby telecentre rather than driving to the office, their car mileage will fall. However, the debate about the potential contribution of teleworking to reducing travel demand is not quite as simple as this. If an employee starts teleworking all or (more likely) some of the time, the following changes in household travel patterns may result:

- The employee may make other journeys by car during the day (for example to take the children to school or to visit the shops). These journeys might have been made as part of a linked trip if she or he had been driving to work.

- Another family member may take advantage of the fact the car is available, for example to drive to work when he or she would previously have taken the bus.
- In the longer term, researchers in the US have argued that teleworking could encourage people to live further from their work. The benefit of reduced travel time on teleworking days would be offset (in part or even in whole) by increased travel on days when the employee travelled to work.

Much of the extensive US literature on teleworking has tended to suggest that these effects either balance or outweigh the first-order travel benefits of not driving to work. However, this seems to be largely based on speculation rather than empirical evidence, and the DTLR (2002b) researchers concluded that:

> *"Literature that looks at the wider effects of teleworking and other online activities and their relationship to personal travel (mainly in the US) have tended to suggest that travel substitution effects are balanced or outweighed by new trip generation. The studies, however, do not persuasively show anything beyond the observation that both traffic and telecommunications use are growing.*
>
> *An influential school of thought in the US (Ben Akiva, Mokhtarian, Niles) seem to have formed the view that while the direct effects of teleworking may be to reduce travel, the wider effect of telework and other ICT use is to generate a sufficient number of new trips to eliminate the benefit (which is seen as marginal in any case) or even to increase traffic levels…*
>
> *The problem is, however, that the evidence for the traffic-generation effects of teleworking is partly anecdotal, partly speculative modelling, but mostly repeated assertion by experts. We have not found any compelling evidence (or much evidence at all) in empirical studies for the speculated generative effects. This is not to say that there are no such effects, as common sense would indicate that there are likely to be. But they have not as yet been measured."*

The results of some of the studies evaluated by the DTLR (2002b) team are summarised below and in table 5.1.

State of California Telecommuting Pilot Project
A detailed travel diary study of 40 participants in the State of California Telecommuting Pilot Project found that on average, telecommuters made 27 per cent fewer trips in total on days when they worked at home, made up of a reduction in car trips to work and an increase in car trips for other purposes. They travelled 77 per cent fewer miles by car (down from 44.8 miles to 10.2 miles) on teleworking days, compared to their behaviour before they began telecommuting (Koenig et al. 1996). Interestingly, although non-work trips increased, non-work mileage *fell*: that is, the teleworkers made shorter but slightly more frequent non-work car trips on teleworking days. The mileage reduction was the sum of fewer miles driven to work (a saving of 29.3 miles) and fewer miles driven for other trips (a saving of 5.3 miles).

The results of this study are similar to an earlier survey of participants in the California Telecommuting Pilot Project, which studied 219 people and found average total mileage reductions of 75 per cent (Pendyala et al. 1991). Pendyala et al. also found evidence that teleworkers chose non-work destinations that were closer to home, exhibiting "contracted action spaces".

California Residential Area-Based Offices Project

Other Californian studies have evaluated the impacts of telecentre-based commuting, where the worker travels to a neighbourhood telecentre (Balepur et al 1998; Mokhtarian et al. 1998). These studies found slightly lower but still significant reductions in car mileage on teleworking days, of 53 – 65 per cent. Workers generated additional car mileage by driving home in the middle of the day for lunch and back to the telecentre in the afternoon. However, the number of non-commuting trips on teleworking days either fell or remained constant. Balepur et al. calculated that when the reduction in car mileage was weighted by the frequency of teleworking, the overall reduction in car mileage was 17 per cent of total weekday commuting travel. Mokhtarian et al. (1998), with a slightly larger evidence base, concluded that the reduction in car commuting mileage was 11.5 per cent over the week (on average teleworkers used a telecentre about 1¼ days per five day working week).

Teleworking in the Netherlands

Hamer et al. (1991) analysed travel diaries of 30 employees of the Dutch Ministry of Transport who spent between 20 and 60 per cent of their time teleworking. They found that teleworkers made 17 per cent fewer trips and that peak-hour car travel was cut by 26 per cent. The study also surveyed the travel activity of members of the teleworkers' households, and found that household members also appeared to travel less than before the experiment.

Teleworking in the UK

Studies of the travel impact of teleworking in the UK are less sophisticated than the US studies, but provide an indication of the magnitude of change in travel behaviour resulting from teleworking. Hopkinson et al. (2001a) analysed self-completion questionnaires from BT employees who were about to register with the BT Options 2000 teleworking programme. Some employees were already working at home an average of 1.9 days per week and, taken overall, respondents anticipated that in future they would work from home an average of 3.6 days per week. The average car mileage "saved" by pre-existing teleworking was 95 miles per week per teleworker. If future increases in employees' frequency of teleworking were in line with their predictions, the authors estimated further savings of 76 miles per week car commuting per teleworker.

The research by HOP Associates and the University of Southampton also reports a study by Hopkinson et al. (2001b) which looked at the changed travel patterns of 103 AA call-centre staff who moved to home-based working. Before the shift to working at home, 88 per cent of commuting trips were by car, and journey length was on average 9 miles. By almost completely eliminating commuting trips, 3680 vehicle miles were saved per year. This was offset by occasional employee visits to the office and home visits by managers, which came to about 30-40 per cent of the miles saved. Of 29 employees who gave information about their non-work travel, most said that this had also reduced but nine said they now made longer or more frequent journeys.

From these and other studies it seems clear that teleworking *does* reduce car mileage amongst teleworkers, even allowing for some extra non-work trips by car. As the authors of the DTLR (2002b) study point out, trips which can no longer form part of a trip chain with the journey to work (shopping on the way home; dropping the kids off at school) do not necessarily continue to be made by car. Eliminating the commute creates the time and opportunity for use of other modes – such as walking – for activities such as taking a child to school or visiting the shops.

The evidence about the impact of teleworking on other members of the household is thin, but points towards their car mileage remaining the same or perhaps even falling slightly, rather than increasing. There is no evidence either way about the long term impacts of teleworking, and whether it leads people to move further away from their work.

Table 5.1 **Summary of key research findings on behaviour change as a result of teleworking**

Study	**Key findings**
Koenig et al. (1996)	Teleworkers travel 77 per cent fewer miles by car on teleworking days. They drive shorter distances for work *and non-work* purposes.
Pendyala (1991)	Teleworkers choose non-work destinations closer to home, exhibiting "contracted action spaces"
Balepur et al. (1998) and Mokhtarian (1998)	Teleworkers using neighbourhood telecentres drive 53 – 65 per cent fewer miles on teleworking days
Hamer et al. (1991)	When an employee begins teleworking, other members of their household also appear to travel less
Hopkinson et al. (2001b)	Where employees are largely home-based, some of the reduction in car commuting is offset by occasional trips to the office, and home visits by managers

5.2 Potential for teleworking to reduce car use

The research described in the last section gives some sense of the possible effects of teleworking at the individual level. In order to scope the possible impact on car travel demand we need to estimate what proportion of the working population might already be teleworking or might do so in future, and how often on average a teleworker would work from home. We also need to know more about the travel characteristics of that group of people most likely to become teleworkers.

What proportion of the working population might telework?
We know that the proportion of the working population that is teleworking is growing fast. In 1993 it was estimated that about half a per cent of the workforce in Britain (130,000 people) sometimes teleworked (DTI 2002). By 2001, data from the Labour Force Survey shows that 2.2 million people in the UK (7.4 per cent of the labour force) worked from home at least one day a week using a telephone and computer. Since 1997 the number of teleworkers in the UK has increased by on average 13 per cent a year, giving an overall increase between 1997 and 2001 of 65 per cent.

Clearly not everyone works in a job where teleworking is possible. Teleworking is currently dominated by professionals, managers, senior officials, and technical occupations. Based on an analysis of the proportion of these occupations in the total workforce, DTI (2002) quotes research by the Institute of Employment Studies suggesting that 22.6 per cent of the UK workforce could potentially telework; that is, about three times the number that are currently doing so. However, this estimate does not allow for the fact that improving technologies may make it easier to work remotely and may open up the option of telework for people in other information-based occupations, such as the AA call centre staff described earlier. Not does it allow for the possibility that occupations not presently seen as appropriate for teleworking

may involve a proportion of tasks which could perfectly well be carried out away from the main workplace, and that attitudes to working at home in these occupations may change.

A study for DTLR by HOP Associates (Lake et al. 1997) gives us some insight into the potential for teleworking in occupations where it is currently low. Lake et al. looked at the "teleworkability" of tasks carried out by 2300 employees of Cambridgeshire County Council, and concluded that, of the tasks carried out by different types of employee:

- 5-20 per cent of tasks carried out by support staff were location-independent
- 30-60 per cent of tasks by service delivery staff, including field workers, were location-independent
- 30-50 per cent of tasks by managers were location-independent.

These figures show that occupations which are not presently seen to have much teleworking potential (such as support roles and service delivery) involve a significant proportion of tasks which could be carried out away from the workplace. Since teleworking can bring benefits to both employers and staff (greater productivity; lower stress; less office space; better work-life balance; and greater staff commitment to their organisation are all reported in the literature) it is plausible that teleworking one or two days a week will cease to be the preserve of managers and professionals and become increasingly common in a wider range of occupations.

How often might an average teleworker work at home?
The DTLR (2002b) review of published literature concludes that on average teleworkers work about 1½ days a week away from the main office. A similar estimate is made by NERA (2000). Given the nature of the available information in published studies, this figure is inevitably a best guess based on relatively small survey samples and current practice, and is perhaps a conservative estimate of the potential for teleworking. The Cambridgeshire County Council study by Lake et al. quoted above indicates that amongst the managers and service delivery staff they studied, there was the *potential* to work at home between 1½ and 3 days per week: in other words 1½ days telework per week would represent the lower limit of the amount of time that is actually spent on location-independent tasks.

What are the travel characteristics of teleworkers?
To estimate the impact of teleworking on car travel demand, we need to know more about the travel characteristics of the people most likely to become teleworkers. What proportion of their journeys to work are by car, and what is the average distance they travel to work?

For several reasons, teleworkers are more intensive car users than the national average. Two thirds of teleworkers in the UK are male; they are concentrated in managerial and professional roles and hence likely to be on higher than average incomes; and they tend to have above-average journey distances to work (Mitchell et al. 1994 found the teleworkers they studied had average commute journeys of 21 miles compared to the national average at the time of 8.3 miles).

The national average is that 70 per cent of employees travel to work by car. This figure is higher for men (74 per cent) than for women (65 per cent), and increases with income, so amongst *present* teleworkers it is probably slightly higher, say 74 per cent. The average length of a car commuting trip is 14.8 kilometres. Again, present teleworkers seem to commute longer than average distances to work, both from the evidence of experimental studies and as would be expected from their socio-economic profile. However, there is not

enough information available to deduce with any degree of confidence how much further teleworkers may presently be driving to work.

The experimental studies of teleworking described earlier yielded no evidence of teleworkers travelling further by car for non-work trips, or of changes in household use of the car on teleworking days. If anything, the evidence points tentatively towards teleworking encouraging less travel and what Pendyala et al. (1991) termed "contracted action spaces". In the absence of larger-scale and long-term household studies, it seems wise to assume for the time being that teleworking neither increases nor reduces car use for non-work journey purposes.

From these data we can estimate the car travel demand that could be saved by teleworking. These figures do not include car travel already being avoided by existing teleworkers:

In an ***enlightened business as usual scenario***, teleworking continues to grow at 13 per cent per year, leading to an additional 14.8 per cent of the labour force working at home 1.5 days a week by 2010. Car travel saved as a result is 5.1 billion kilometres per year, or 1.6 per cent of total car travel in England[22].

In an ***ambitious change scenario,*** an extra 20 per cent of the labour force starts teleworking (an arbitrary figure, but not unreasonable based on evidence from the Cambridgeshire County Council study), as a result of accelerating demand for teleworking and its spread to a wider range of occupations. This level of teleworking could be achieved by 16 per cent growth per year. The average teleworker works from home 2 days per week. In this case, car travel saved is 9.1 billion kilometres per year, or 2.8 per cent of total car travel.

These estimates are comparable to other attempts to gauge the potential for teleworking to reduce car travel. For example:

- NERA (2000) estimated teleworking could lead to a reduction in car commuting of 10 per cent by 2005 and 15 per cent by 2010, which translates into a reduction in total demand for travel by car of approximately 2.5 per cent by 2005 and 3.7 per cent by 2010.
- Lake et al. (1997) suggested from their study of Cambridgeshire County Council that if teleworking was adopted for suitable tasks, demand for travel by car could be cut by 4-8 per cent, with greater reductions in the morning and evening peaks.

Most of the benefit of teleworking in terms of congestion relief will be felt in the morning and evening rush hours. About 29 per cent of all car kilometres are travelled during the hours of 7 – 9 am and 4 – 7 pm during the week. Thus we can estimate that the enlightened business as usual scenario would reduce demand for car travel during the rush hour by 5.4 per cent; and under the ambitious change scenario demand could be cut by 9.7 per cent.

[22] Assuming 74 per cent would previously have driven to work, with an average two-way commute of 29.6 km, and a total workforce of 21,744,000.

5.3 Cumulative impact of teleworking and workplace travel plans

Like travel planning, teleworking targets the journey to work. Adding travel demand "savings" from teleworking to savings from workplace travel plans might imply unrealistic amounts of behaviour change, and run the risk of double counting.

However, teleworking is mainly a private sector habit (three quarters of all teleworkers work in the private sector according to DTI 2002), whereas take-up of travel plans is mainly in the public sector. Teleworking can, and should, be part of an employer's travel plan, but the case studies reported in DfT (2002b) suggest this is not always recognised. Of twenty case studies, teleworking was a significant part of the travel plan in four workplaces.

In the *private sector*, the ambitious change scenario assumes:

- just over five million employees would be covered by a travel plan, of which only a proportion (perhaps half) would change their commuting habits
- about three million private sector employees would begin to telework two days a week.

With a total private sector workforce of over 16 million, this scenario implies some large but not implausible changes in working practices and culture in the private sector.

In the *public sector*, the ambitious change scenario assumes:

- most workplaces will develop travel plans
- up to a fifth of public sector workers will begin teleworking.

Again, it is plausible that these changes could be additive.

5.4 What policy changes are necessary to achieve increased teleworking?

As we have seen, telework is a growing trend, largely because of its perceived advantages in terms of work-life balance rather than because it reduces commuting. Nevertheless, growing evidence of the transport benefits suggests teleworking should be promoted through workplace travel plans, and that information for employers about advantages of telework and how they can enable it should be more widely available. Options for employers include providing employees with laptops or computers at home; offering the option of work from a satellite office where this is feasible; introducing a nine-day fortnight; encouraging staff to work at home when appropriate; and reviewing staff roles to identify a wider range of jobs where telework may be feasible.

5.5 Summary

Under an enlightened business as usual scenario, teleworking could cut demand for travel by car by 1.6 per cent. Under the ambitious change scenario, the reduction could be 2.8 per cent. The impact on traffic volumes during peak hours would be substantial, at 5.4 per cent under the first scenario, and 9.7 per cent under the second.

6. Reducing car trips for the journey to school

Summary

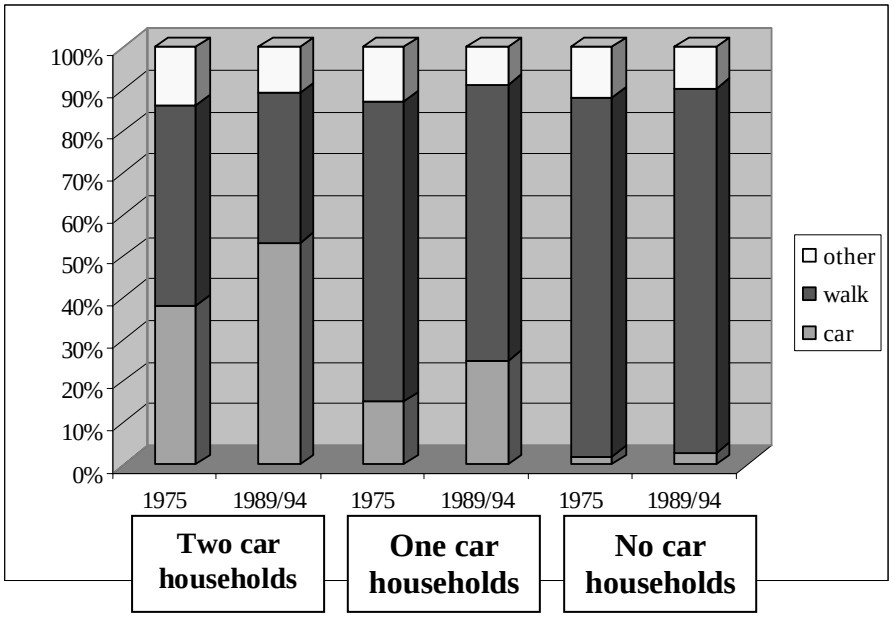
In an *enlightened business as usual* scenario, school travel plans could cut national car travel demand by 0.4 per cent. Travel demand could be cut by 1.4 per cent during the morning and evening peak hours.

In an *ambitious change* scenario, national car travel demand could be cut by 1.3 per cent overall, and by 4.5 per cent at peak hours.

The proportion of children being driven to school has gone up steadily over the last twenty-five years, from around ten per cent in 1975 to 29 per cent in 1999/2001. Partly this is related to increasing car ownership, and in particular the rise in the number of two-car households. However, research by Bradshaw and Atkins (1996) shows this is only a partial explanation, and the tendency to drive children to school has risen within each category of car ownership. Amongst two-car households the proportion of children being escorted to school by car rose from 38 per cent to 53 per cent, and amongst one-car households from 15 per cent to 25 per cent, over the 16 year period they examined (figure 6.1). Bradshaw and Atkins suggest other factors influencing whether parents decide to drive their children to school may include:

- Parental choice of school. If parents choose not to send their children to the nearest school, they are unlikely to qualify for free school transport
- Linked trips. Parents may drop a child off at school on their own way to work
- Parents who never use public transport themselves may be unaware of bus services to their child's school
- Parents may feel it is not safe to allow their child to walk or cycle to school, either for reasons related to traffic danger or personal safety.

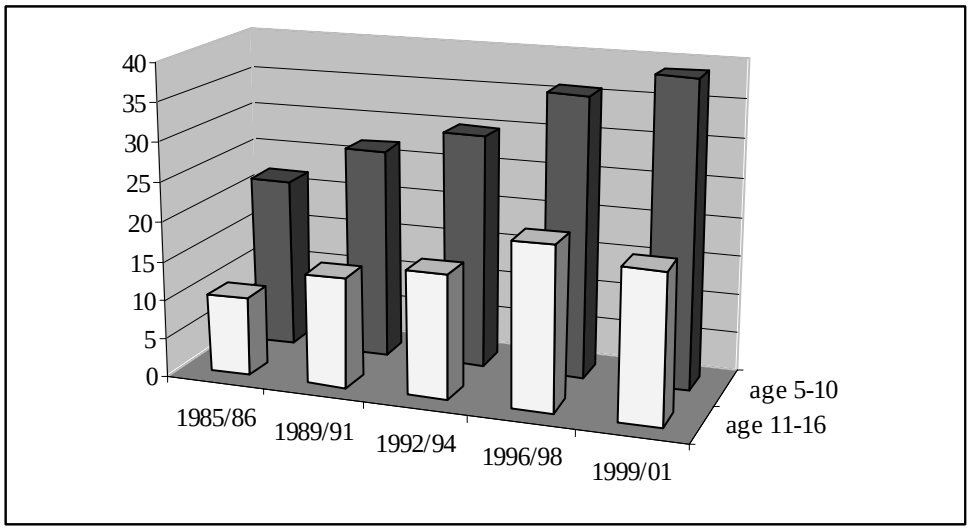
Figure 6.1 Journeys to and from school for 5 to 10 year olds by main mode (per cent)



Source: Bradshaw and Atkins (1996)

Encouragingly, there are some signs that the increase in car escort trips may be about to turn around, or at least stabilise. National Travel Survey figures for 1999/2001 show that the proportion of trips to school being made by car has fallen slightly for secondary school pupils, although not for primary school pupils (figure 6.2). However, school escort trips still make a major contribution to traffic congestion during the morning peak, with 14 per cent of cars on urban roads at the peak traffic time of 8.35 a.m. being on the "school run".

Figure 6.2 Change in proportion of trips to and from school by car, for primary and secondary age children (per cent)



Source: National Travel Survey 1999/2001 update

The potential to influence the car escort trip should be significant, as both parents and children often say they would prefer not to travel to school by car. A survey for the Department for Transport (2002c) found that 65 per cent of parents would prefer not to drive, but feel that they have no alternative. A survey of children's preferred mode of travel carried out by City of York Council (2001) found that as children reach the upper years of primary school they want to walk or cycle to school: in year six only 7.8 per cent wish to travel by car, whereas 24.1 per cent actually do so. Older children tend to be less enthusiastic about walking or cycling (probably because distances are greater) and are also less likely to favour travelling by bus, but, as discussed later, surveys for DfT suggest they would be interested in using a high quality dedicated school bus service.

6.1 School travel plans

Many local councils are now working with schools to reduce car use for the school run. A survey by TRL (DTLR 2001b) found that 79 per cent of local authorities said they had implemented some sort of travel initiative with at least one school. However, this gives an over-rosy impression of the level of activity, since resource constraints mean that most local councils may only have started work with a few schools. Overall, TRL estimated that four per cent of primary schools, four per cent of middle schools and 5.5 per cent of secondary schools have implemented a school travel plan, and a comparable proportion has a school travel plan "firmly planned". The main practical barriers to implementing school travel plans are lack of time in schools (mentioned by 87 per cent of local authorities) and lack of staff time within the local authority (mentioned by 72 per cent). At the time of the TRL survey, the majority of

local authorities had less than one full-time officer working on school travel plans. This situation is likely to improve following the appointment of school travel plan officers funded by Department for Transport bursaries, and so it is likely that the number of school travel plans will increase over the next two to three years.

Where they have been implemented, the best school travel plans have shown substantial shifts in the number of journeys to school being made by car. This is not always the case, and the change tends to be smaller for schools where a high proportion of trips are already made by other means (as would be expected). Some schools lack "before" monitoring data so it is impossible to measure the impact of their travel plans. Table 6.1 shows before and after monitoring data for those schools where it is available, mainly drawn from evidence collated for a report to DETR in 1999. Much of this information relates to school travel plans which concentrated on walking and cycling, since this was the focus of the early pilot projects.

It is clear from the data available so far that successive improvement over time in facilities for walking and cycling to school may lead to continued modal shift. For example, surveys at Priory School, Shrewsbury, show that car use fell from 45 per cent to 34 per cent between 1997 and 1998, and then fell further to 32 per cent in 1999 (Sustrans 2002a). At Wheatfields Junior School, St Albans, car use fell from 44 per cent in summer 1996 to 31 per cent in summer 1998, then fell to 21 per cent in December 1998 (at a time of year when it might be expected that fewer children would be walking and car escort trips would rise).

Most school travel plans have concentrated on measures to make it safer to walk or cycle to school (new crossings, traffic calming, lower speed limits, cycle lanes) coupled with awareness-raising and incentives to pupils to walk or cycle, of which the most widely known has been the walking bus. However, research by Jones and Bradshaw (2000) found that improvements to public transport offered greater potential to reduce car traffic, because most car mileage is on escort trips too long to be walked or cycled (over two miles for 5 – 10 year olds and over three miles for 11 – 15 year olds). West Sussex County Council found that measures to encourage bus use can be highly effective. The County Council underwrote the cost of a special student fare card, entitling school pupils at its secondary schools in Bognor Regis and East Grinstead to travel at a quarter of the adult fare. The council also paid for new bus services where parts of a school catchment area were poorly served, and school pupils received tailored information about bus services. In Bognor Regis, the initiative led to a five-fold increase in the number of pupils travelling to secondary school by bus, from a maximum of 30 to over 150 (Cross and Thornthwaite 1997).

The Department for Transport is currently looking at the potential for dedicated school buses to reduce car trips to school, and will be monitoring pilot school bus services run by First Group in Surrey, West Yorkshire and Wrexham. Research carried out for DfT (2002c) suggests dedicated school buses are likely to be popular among both parents and children. An "improved" school bus, with features such as a seat for every child, seatbelts, a smoking ban, on-board escorts and drivers trained in supervising children, would be attractive to 93 per cent of secondary school parents living between two and three miles of school, and to 90 per cent of parents living between one and two miles of school. Even amongst parents living less than a mile from school (where a high proportion of children are likely to walk), over 50 per cent said they would be very or fairly likely to use an improved school bus. For children living more than three miles from school, statutory home-school transport is already provided, but even among this group there was interest in the new service, reflecting concern about overcrowding and lack of seatbelts.

Table 6.1 **Car mode share before and after implementation of school travel plans or initiatives**						
School	**Secondary / primary school**	**Car mode share (before)**	**Car mode share (after)**	**Per cent decrease in car use**	**Additional information**	**Source**
Priory School, Shrewsbury	S	45	32	29		Sustrans (2002)
Horndean Community School, Hampshire	S	43	37	14		DETR (1999)
Sandringham School, St Albans	S	40	28	30		DETR (1999)
Gilberd School, Colchester	S	23	19	17		DETR (1999)
Imberhorne School, East Grinstead	S	20	10	50		Sustrans (2002)
Huntington School, York	S	9	11	(22)		DETR (1999)
Kesgrave High School, Suffolk	S	8	8	0	Proportion cycling to school increased from 45 per cent to 61 per cent	DETR (1999)
Burnholme Community College, York	S	5	5	0	Proportion cycling to school increased from 13 per cent to 25 per cent	DETR (1999)
Admiral Lord Nelson School, Portsmouth	S		18		New school opened in 1996, with commitment to promote sustainable travel	DETR (1999)
Royal School for Girls, Hampstead, London	P + S	76	55	28		DETR (1999)
Holmer Green First School, Buckinghamshire	P	70	54	23	Car mode share includes “park and walk”	Buckinghamshire County Council (2002)
Hamilton Primary School, Buckinghamshire	P	62	57	8	Car mode share includes “park and walk”	Buckinghamshire County Council (2002)
Walter Evans School, Derby	P	61	56	8		DETR (1999)
County Primary School, Dorset	P	47	37	21		Dorset County Council / T2000 (2002)
Abbey Primary School, Dorset	P	45	31	31	School travel plan coincided with shift to new school building closer to main catchment	Dorset County Council / T2000 (2002)
Wheatfields Junior School, St Albans	P	44	21	52		DETR (1999)
Highwoods School, Colchester	P	32	32	0		DETR (1999)

6.2 International experience

Evidence from cities such as Odense in Denmark shows that sustained effort to encourage walking and cycling to school can bring dividends. In the last twenty years Odense has implemented more than 200 projects to improve safety for children travelling to school, spending roughly £100,000 per year on traffic calming, traffic islands, and cycle lanes. As a result of this they have an exceptionally high modal share for cycling: between 24 per cent and 73 per cent at different schools (Andersen, undated).

In the USA, dedicated school buses carry 54 per cent of children under 12 to school (First Group 2002).

6.3 Potential to reduce car use

It is clear from the achievements of individual schools that a school travel plan can have a major influence on car journeys to school, in some cases halving car use. Although most local authorities feel it is too early to estimate the potential impact of school travel plans, research on their take-up for DTLR (2001b) included estimates of possible impact from four areas. In Hertfordshire, the local authority estimated school travel plans could reduce car journeys to targeted schools by thirty per cent. Derby City Council gave a figure of 20 per cent; Manchester City Council 11 per cent and North Tyneside Council ten per cent.

These figures probably reflect the councils' short term experience. As is clear from Wheatfields School in St Albans and Priory School, Shrewsbury, sustained effort is likely to yield greater longer-term benefits. The potential to influence mode choice for the journey to school may be enhanced because a new cohort of children and parents, receptive to information and encouragement to walk, cycle or travel by school bus, arrives every year.

However, even at schools with excellent facilities to encourage non-car transport (such as Kesgrave in Ipswich and Burnholme Community College in York), between five and ten per cent of pupils still arrive by car. Once schools get down to this level of car use, further mode shift (under present circumstances) seems difficult. This is a higher car mode share than in towns such as Odense, Denmark, where around one per cent of school pupils travel by car.

It seems reasonable to assume that local authorities *could* deliver effective school travel plans at every school by 2010, so long as they continue to receive support for staff posts (at a higher level than at present), and so long as funding for physical measures such as cycle lanes and safe crossings is increased.

Under an ***enlightened business as usual scenario,*** the impact on car mode share for the journey to school might be to cut it by a fifth (the mid-point of the local authority estimates quoted in DTLR 2001b). Car escort trips to school account for just under two per cent of total car mileage[23], so this order of car trip reduction might cut car travel by 0.4 per cent nationally.

[23] According to National Travel Survey 1999/2001 update, the total distance travelled per person per year as a car driver is 3526 miles, of which 69 miles per year (1.96 per cent) is for education escort. The proportion of journeys to school made by car shows little variation with journey distance for trips longer than one mile (below which the vast majority of trips are already on foot), and it seems reasonable to assume that mode shift from car would occur equally across all trip lengths.

Under an ***ambitious change scenario,*** school travel plans might cut average car mode share from the current 29 per cent to 10 per cent, replicating the achievement of schools such as Burnholme Community College and Kesgrave. Introduction of high quality school buses would help achieve this. This would cut car travel by 1.3 per cent.

The impact of school travel plans during the rush hours would be greater. In the periods between 7 – 9 am and 4 – 7 pm, car travel demand would be cut by 1.4 per cent in the enlightened business as usual scenario, or by 4.5 per cent in the ambitious change scenario.

6.4 Cumulative impact of school travel plans and other measures

For some car commuters, no longer having to do the school run (because your child can walk or cycle or take the school bus on their own) may enable a shift to another mode for the journey to work, so safe routes to school, walking buses and school buses could reduce driving to work. Equally, the opportunity to work from home a few days a week may give parents time to walk or cycle to school with their child, so increased teleworking could help reduce the school run.

Safe street conditions which enable children to cycle to school could play an important part in re-building the culture of cycling which has almost been lost in Britain, and this could over time help increase cycling among people of all ages. Conversely, if we do not create the right conditions for cycling to school, it will be very difficult to achieve the target set by the government to triple cycling by 2010.

6.5 What policy change is necessary to tackle the school run?

The actions needed to reduce car escort trips to school include physical engineering measures (traffic calming, cycle lanes, pedestrian crossings); 20mph zones; walking buses; tailored public transport information; new public bus services; and dedicated school buses.

It would seem a reasonable ambition that every child should have a safe route to school by 2010. However, this will only be achieved if there is a more intensive programme of work within local authorities, which will in turn require many more school travel plan officers and substantially increased funding for small-scale street improvement schemes.

Subject to the outcome of the current pilot projects, wider use of dedicated school buses may play an important role in cutting car escort trips to school.

6.6 Summary

Under an enlightened business as usual scenario, school travel plans could cut demand for travel by car by 0.4 per cent. Under the ambitious change scenario, the reduction could be 1.3 per cent. The impact on traffic volumes during peak hours would be 1.4 per cent under the first scenario, and 4.5 per cent under the second.

7. Individual marketing

Summary

In an *enlightened business as usual* scenario, individual marketing could cut national car travel demand by 0.8 per cent.

In an *ambitious change* scenario, national car travel demand could be cut by 1.6 per cent.

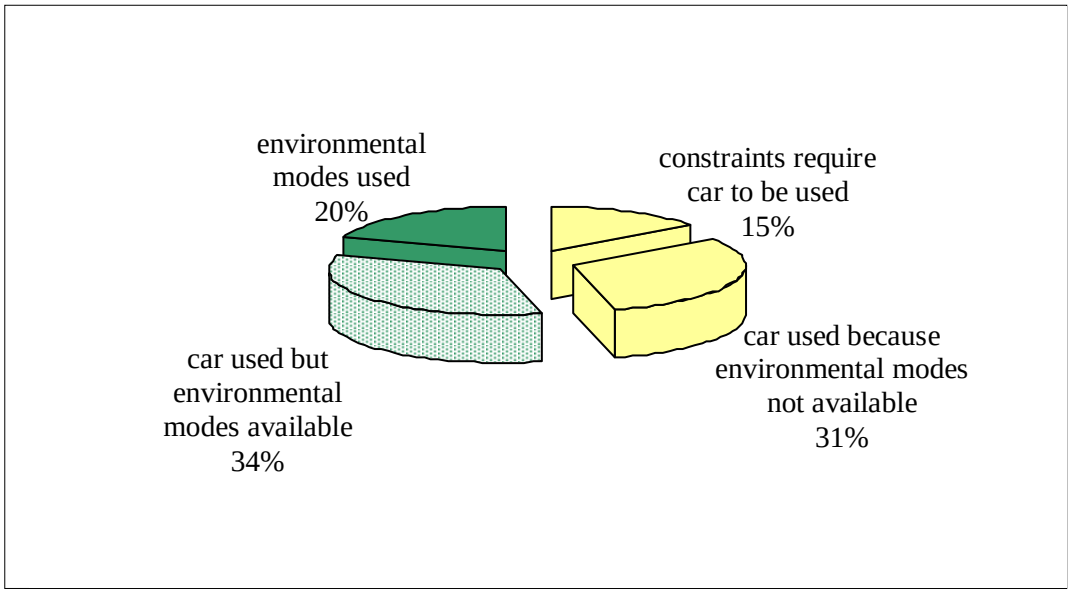
The impact in urban areas would be greater, and potentially as much as 5 per cent.

Individual marketing provides transport advice and information to people, based on an understanding of their personal trip patterns. It works because many people make journeys by car for which a reasonable alternative (public transport, walking or cycling) already exists, of which they are unaware. By offering information tailored to the individual's travel needs, individual marketing techniques encourage modal shift away from the car.

This type of targeted information programme has been developed by the German consultancy SocialData under the name IndiMark, and widely applied in Germany, Austria, Sweden, Australia and recently in Frome and Gloucester in the UK. Steer Davies Gleave has used similar techniques under the name Travel Blending in Australia, the USA, Chile and the UK. Both methods were reviewed in a report for DTLR (2002c).

The role of individual marketing in filling the "information gap" about alternatives to the car is illustrated by figure 7.1. This draws on data from a suburb of Perth, Western Australia, collected by SocialData (Brög 2002). The researchers found that although 80 per cent of trips were made by car, adequate alternatives *already existed* for almost half of these trips.

Figure 7.1 Potential for environmental modes to replace car trips (Perth, Western Australia)



Source: Brög (2002)

For 15 per cent of trips a car was essential; for example because a heavy load was being carried or the car was required for business reasons. For 31 per cent of trips, no adequate alternative to the car existed. Improvements to the transport system, such as a better bus connection or better cycling facilities, were needed to enable mode shift. For 20 per cent of trips, environmental modes (walking, cycling or public transport) were already being used. But for 34 per cent of trips (and more than 40 per cent of car trips) a car was being used where adequate alternatives already existed.

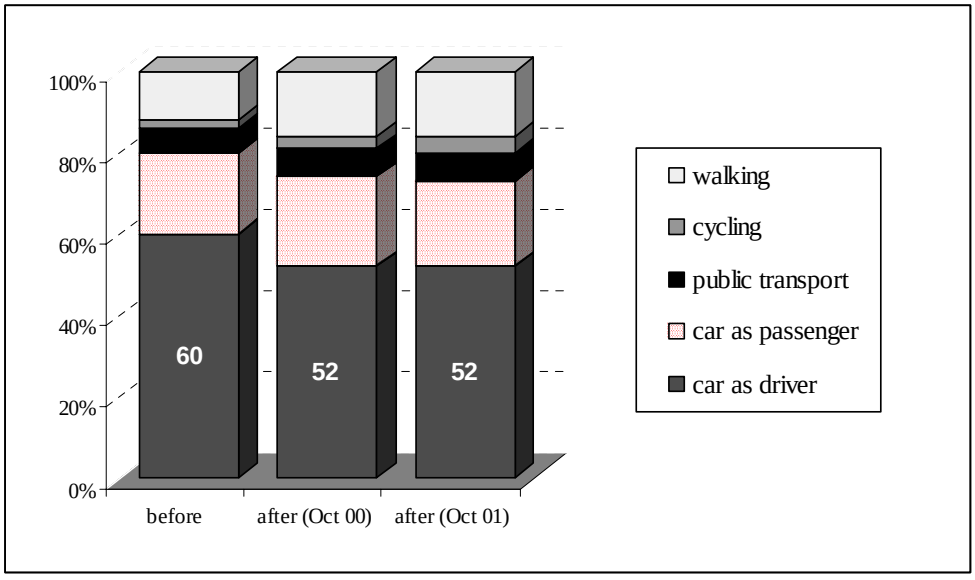
Research on car dependence by the RAC Foundation (1995) reached similar conclusions for the UK. It estimated 10-30 per cent of car trips were necessarily and unavoidably by car, and 50-70 per cent did not have to be made by car but were unattractive by other modes. However, 5-30 per cent of car trips were "marginal", and either hardly had to be made at all or could be made by perfectly good alternatives which were already available. It is these car journeys that are targeted by individual marketing.

7.1 Evidence of the effects of individual marketing

South Perth, Western Australia

The largest trial of individual marketing so far carried out was in the suburb of South Perth, Western Australia, and involved contact with just under 15,000 households. Households that were not using environmentally-friendly modes regularly but were interested in doing so received personalised packages of information, including public transport timetables, free public transport "test tickets" valid for a month, and information about walking and cycling. Random sample surveys before and after the project show car driver trips fell from 60 per cent to 52 per cent (a 14 per cent fall in car use). Car passenger trips rose from 20 per cent to 22 per cent and trips by foot, cycle or public transport rose from 20 per cent to 26 per cent. Vehicle kilometres fell by 17 per cent (John 2002a). Although use of environmentally-friendly modes increased, the number of trips made by each person was unchanged. Follow-up monitoring a year later found the mode shift was sustained (figure 7.2).

Figure 7.2 Mode share before and after large-scale individual marketing project in South Perth, Australia

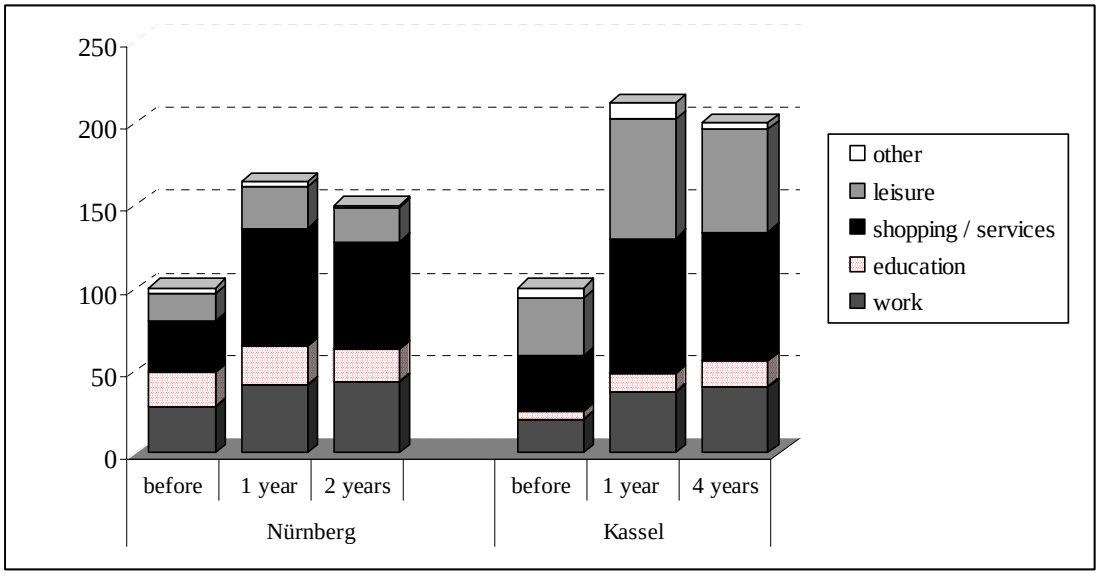


Source: John (2002b)

IndiMark in Europe

The South Perth project was the first to promote walking and cycling as well as public transport. Earlier trials concentrated on increasing public transport market share. In SocialData's project in Kassel, Germany, in 1991, the mode share for public transport increased from eight per cent to 17 per cent and car driver mode share fell from 48 to 44 per cent. In Nürnberg, a pilot study in 1993 increased public transport mode share from 14 per cent to 23 per cent, while car driver trips fell from 44 to 38 per cent (UITP undated). In both towns, the growth in public transport use was greatest for shopping and leisure trips, which accounted for more than 70 per cent of the increase (figure 7.3).

Figure 7.3 Growth in trips by public transport in Nürnberg and Kassel, one, two and four years after IndiMark programme. Public transport growth is greatest for shopping and leisure trips. Base: public transport trips before programme started = 100



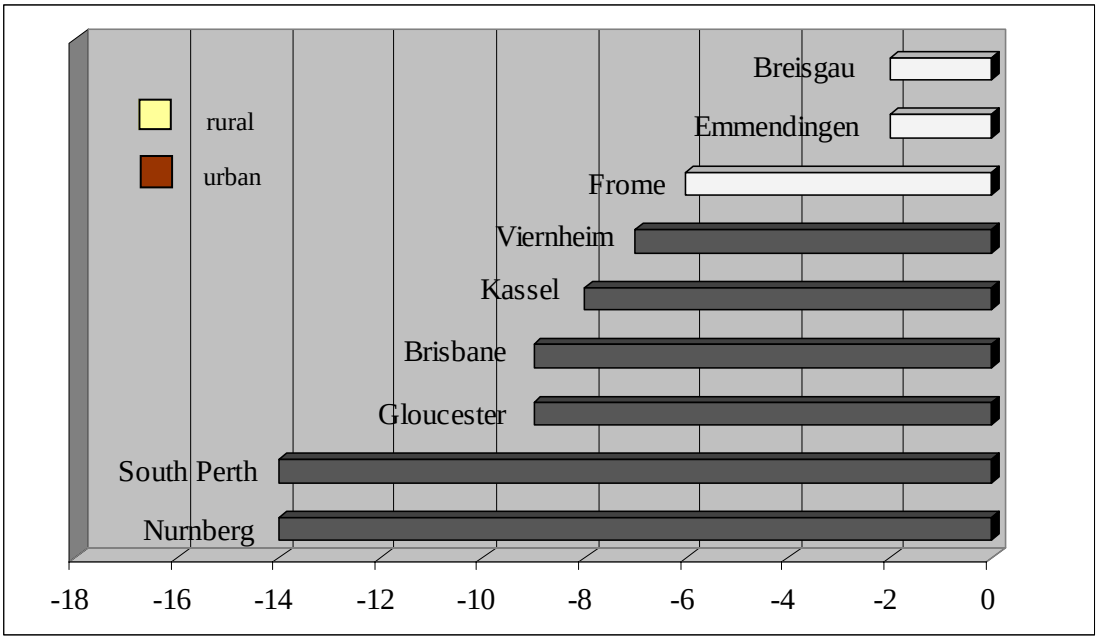
Source: UITP (undated)

SocialData advised on a series of individual marketing experiments undertaken by public transport companies in 27 European towns which approached a total of over 12,000 people. Each experiment involved between a few hundred and over a thousand participants. Taken overall, the experiments increased public transport use from 17 per cent of all trips to 21 per cent, a greater increase than that observed in South Perth. These experiments are reported in UITP (undated).

Most recently, SocialData and Sustrans have completed pilot projects in Frome, Somerset and Gloucester. These resulted in net reductions in car trips of six per cent (Frome) and nine per cent (Gloucester). In Gloucester, car mileage for the target population fell by nine per cent. About half the car trips were replaced by a walk, a quarter by cycling, and a quarter by public transport (Sustrans 2002b).

It is intuitively likely that individual marketing will have greater impact in areas where the alternatives to a car are good, and that its potential in rural areas may therefore be less. Figure 7.4 shows that this does indeed seem to be the case, with three pilot projects in rural areas showing a smaller, but still perceptible, shift away from the car.

Figure 7.4 per cent change in car driver mode share before and after IndiMark projects, comparing effect in urban and rural areas



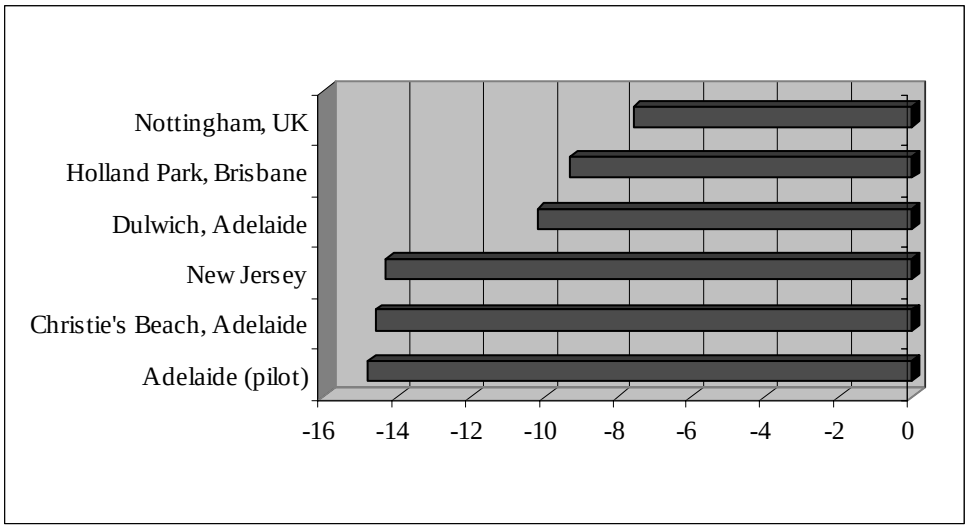
Source: information supplied by Socialdata; UITP (undated); Sustrans (2002b)

Travel Blending in the UK, USA and Australia

Ampt et al. (1998) and DTLR (2002c) report on several individual marketing projects developed under the name "Travel Blending", in which households are asked to complete travel diaries. Based on analysis of personal journey patterns recorded in the travel diaries, household members are provided with information about how to reduce their car mileage, and reasons why they might wish to do so. Some weeks later an "after" diary is completed and analysed, and feedback is given about changes in the household's travel patterns. Travel Blending emphasises that car mileage can be cut by combining or "chaining" car trips, as well as by switching to greener modes. For this reason it may lead to reductions in numbers of trips as well as increases in use of environmental modes.

Figure 7.5 shows the results of Travel Blending experiments in New Jersey, Nottingham and Australia. These data should be interpreted with caution because they give the reduction in car *trips*, not car miles. Because households are encouraged to combine car trips, the fall in car mileage may be lower than the fall in car journeys. For example, in New Jersey car driver trips fell by 14 per cent, but car driver miles only fell by three per cent. However, in Nottingham the opposite seems to have happened: car trips fell by 7.6 per cent but car miles fell by 14.2 per cent. In interpreting the data in figure 7.5 it should also be borne in mind that the data are for households which completed both the before and after travel diaries, and exclude households which dropped out before completing the second diary.

Figure 7.5 Change in percentage of trips made by "car as driver" in Travel Blending projects



Note: figures are for participants completing both travel diaries only.
Source: DTLR (2002c)

Long-term impact of individual marketing

One concern about the techniques described above is that people may switch back to their previous travel patterns a few months later, so any impact is short-lived. However, this does not seem to be the case. The impact of individual marketing seems to be sustained, at least for periods of two to four years, and modal shift to environmental modes may even increase over a period of twelve months after the project, as it takes a while for people to "get around" to making all the changes they wish to make. For example, in the South Perth pilot project, car trips fell by 9.6 per cent immediately after the experiment, and were still at this level over two years later. Follow-up surveys in Nürnberg show two years after the project, public transport use was 50 per cent higher than before it had started. In Kassel, public transport use doubled as a result of the project, and remained at that level four years later (figure 7.3).

In the Adelaide pilot project, a small random sample of participants was followed up six months after the initial programme. The researchers found a further reduction in car kilometres of just over five per cent, which seems from interviews with participants to have been the result of a combination of factors: people "taking a while to get round to it"; developing other measures themselves; changing school or job; or moving house (Ampt et al. 1998).

Although the benefits of individual marketing seem to last several years, they are likely to be reduced over time in any one neighbourhood, as people who participated in the project move away and new people move in. In Perth, where there are plans to apply individual marketing across the entire city, there is acceptance that the benefits may require periodic "topping up".

Summary of effects of individual marketing on car mode share

Individual marketing typically cuts car trips by 7 – 14 per cent for participants in urban areas. From the Gloucester pilot project and the Perth large scale study, the reduction in car mileage appears to be about the same or slightly higher. In rural areas, where there are fewer alternatives to driving, individual marketing has less effect on car mode share.

7.2 Can individual marketing be applied on a large scale?

Most individual marketing projects so far have been on a small scale involving a few hundred people, with the exception of the South Perth project which contacted just under 15,000 households. There is no reason why larger, city-wide programmes cannot be developed, and indeed the government of Western Australia is planning to do just that. Over the next ten years their TravelSmart programme will be expanded to cover half the 1.3 million people who live in Perth. The cost over ten years will be A$29 million (£11 million), which represents a unit cost per person approached of about £17.

A comparable programme covering half the urban population of England (that is, people living in Greater London, metropolitan areas, and large cities with population over 250,000) would reach just over 11 million people at a cost of around £200 million spread over ten years.

Because individual marketing is relatively new to the UK, it is hard to judge how fast it could expand between now and 2010. Table 7.1 calculates the potential impact under two scenarios:

In an ***enlightened business as usual scenario,*** half of all large cities and metropolitan areas develop a programme covering half their population by 2010. Individual marketing programmes are not developed in rural areas or in towns with less than 250,000 inhabitants. Assuming an average car mileage reduction of 11 per cent, a programme of this size would cut car driver travel by 2.6 billion km, or 0.8 per cent.

In an ***ambitious change scenario***, all large cities and metropolitan areas develop a programme covering half their population by 2010. This would cut car driver travel by 5.2 billion km, or 1.6 per cent.

These are estimates of the impact on national travel demand. Within the cities and metropolitan areas where the programme was implemented, the effect would be greater, potentially up to about five per cent.

Table 7.1 **Potential reductions in car mileage under enlightened business as usual and ambitious change scenarios**

		London	**Built-up metropolitan areas**	**Large cities (>250,000)**	**TOTAL**
Average car km per person per year (driver + passenger)[24]		5677	6962	7530	
Estimated car *driver* kilometres per person per year		3577	4386	4744	
Population (million)		7.652	10.188	4.672	
Total distance travelled by car drivers (billion kilometres)		27.371	44.685	22.164	94.220
Car mileage saved (billion km)	**Enlightened business as usual scenario**	0.753	1.229	0.610	**2.591**
	Ambitious change scenario	1.505	2.458	1.219	**5.182**

[24] Average car kilometres from DfT factsheet 11, travel in urban and rural areas of Great Britain

7.3 Cumulative impact of individual marketing and other measures

Individual marketing will only cause mode shift for trips where an adequate alternative to the car is already available and there are no constraints preventing its use, such as the requirement to move a heavy load. In Perth, Brög (2002) demonstrated that more than 40 per cent of all car trips fell into this category, and in the UK the RAC Foundation (1995) suggested 5 – 30 per cent of car trips were "marginal". In other words, there is no shortage of car trips which individual marketing might change to another mode.

However, some other interventions to reduce car use, such as workplace travel plans, are in part targeting the same "market" of car journeys for which a viable alternative already exists. If individual marketing was applied intensively in an urban area which had already developed workplace travel plans for most employers, it is possible that the combined effect of both measures would be *less* than the sum if each measure was applied separately. Alternatively, it is plausible that the heightened awareness created by individual marketing might increase the take-up of car-sharing, works buses and other measures offered as part of a travel plan, making the combined impact *greater* than the sum of the parts. With current knowledge we can do no more than guess which effect is likely to be dominant. The most conservative assumption would be that individual marketing will only deliver mode change for non-work trips (all potential mode change for work-related trips having already been delivered through workplace travel plans). From the evidence presented in UITP (undated) it seems that around 70 per cent of the behaviour change arising from individual marketing projects is for shopping trips, leisure trips, or access to other services. Thus in this conservative scenario, the impact of an individual marketing programme involving half the population *in an urban area which already had comprehensive workplace travel plans* might be around 70 per cent of the impact that would be expected where workplace travel plans were less developed.

7.4 What policy change is necessary to encourage large-scale individual marketing?

The techniques described above are still at an experimental stage in the UK, and although early signs are encouraging it will be at least two years before we have sufficient evidence from UK trials to be confident that individual marketing can deliver mode shift here comparable to the changes seen abroad. The Department for Transport is currently funding 14 individual marketing projects, and these will help gain experience of how the techniques described here may be applied. Government can further assist the learning process by moving from small-scale to large-scale trials (comparable to South Perth) as soon as possible.

7.5 Summary

Under an enlightened business as usual scenario, a large scale individual marketing programme in half of all cities and metropolitan areas could cut national car travel demand by 0.8 per cent. In an ambitious change scenario, with individual marketing in all urban areas over 250,000 people, it could cut car travel demand by 1.6 per cent.

Within the urban areas which were the focus of such a programme, the impact on travel demand would be greater, and potentially up to about five per cent.

8. The potential for car clubs to cut car travel

Summary

In an *enlightened business as usual* scenario, car clubs could cut national car travel demand by 0.02 per cent by2010.

In an *ambitious change* scenario, car travel demand could be cut 0.04 per cent by 2010.

In the longer term, growth of car clubs might reduce national car travel demand by 1.6 per cent.

Car clubs are still at an early stage of development in the UK, with schemes operating in around a dozen cities such as Edinburgh, Oxford and Bristol, typically with two or three cars and less than 50 members. The idea came from Germany and Switzerland in the late 1980s, where several grassroots groups realised that car clubs could provide households with access to a fleet of vehicles whenever they were needed, without the high fixed costs of individual car ownership. Car club members are able to "mix and match" their transport patterns, using a car when that is the best option, but travelling by public transport, bike or walking at other times. Compared to car-owning households, car club households are able to travel more cheaply and with less damage to the environment. They also have a choice of sizes and types of cars – compact city runabouts, estate cars, or vans – an advantage not enjoyed by households with their own cars.

Although there are now plenty of working models of successful car clubs in Europe, there is a tendency amongst policy makers – and the public – in the UK to be sceptical about whether car clubs will ever be popular here. Arguments against car clubs are that "people are too attached to their cars"; that "car sharing might appeal to environmentalists but not to anyone else"; that "it might work in Germany and Switzerland where everyone is so neat and respectful of property and equipment, but not here"; and that "if it isn't working here yet, that shows it just isn't right for the UK" (adapted from Carsharing 2000). However, these arguments have recently become harder to sustain following the exponential growth of car-sharing in the US and its rapid growth in Canada, which suggests that car clubs can work in very different cultures and need not be confined to the orderly and ecologically-minded citizens of Germanic countries.

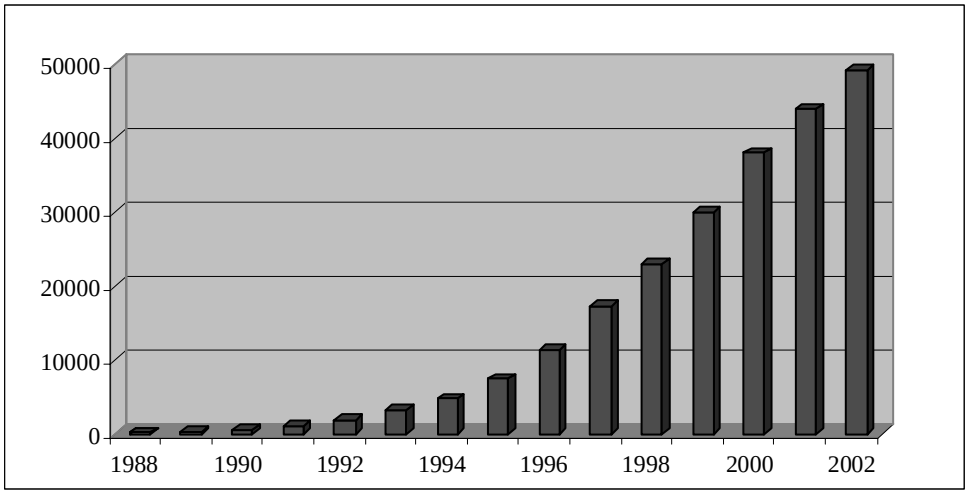
This section reviews the size of the car-sharing market in key European countries and North America, and estimates of the size to which it may grow; and looks at the effectiveness of car clubs in cutting car mileage.

8.1 The size of the car-sharing market

Car-sharing in Switzerland has been growing rapidly since the mid-1990s, helped by the various car-sharing organisations joining forces to form Mobility CarSharing Switzerland, and by initiatives such as a combined season ticket marketed with Swiss Railways. In 1990 the number of members of car-sharing organisations in Switzerland stood at about 500

(similar to numbers in the UK in 2002). By 1997 it had increased to more than twenty times this figure, and by 2002 it had grown nearly 100-fold to 49,200 people (see figure 8.1).

Figure 8.1 Growth of car-sharing in Switzerland since 1988: number of people belonging to car-sharing organisations



Source:Muheim (1998) and Mobility (2002)

Growth has also been rapid in Germany, although there the pattern has been slightly different with car-sharing services being provided by a number of organisations. The German umbrella association for car-sharing organisations reported a total membership of 55,200 in 2001, following growth of over 20 per cent a year for several years. Membership is conservatively estimated to reach over 200,000 people by 2010 (Bundesverband CarSharing 2002).

Car-sharing in North America took off in the late 1990s, and Shaheen et al. (2002) report that by mid-2002 US shared-use vehicle projects had between them approximately 11,500 members, and Canadian car-sharing organisations reported a total of 5065 members.

In both Germany and North America, most of the growth in membership has been a consequence of established car-sharing organisations getting larger or expanding to new cities, rather than new organisations being set up. For example, there are 14 car-sharing organisations in the US, but 92 per cent of US car-sharing members belong to three of them, City CarShare, Flexcar or Zipcar, all of which operate in several cities (Shaheen et al 2002). In Germany the largest 13 car-sharing organisations (out of 66 belonging to the German car-sharing association) serve 85 per cent of all members, but these are spread right across the country with almost all cities of over 200,000 people now having a car-sharing service (Bundesverband Carsharing 2002). In Switzerland, the single car-sharing organisation Mobility claims a presence in 390 communities (Mobility 2002).

Car-sharing organisations may be growing fast, but how much bigger can they grow before they exhaust their potential market? Estimates of the size of the car-sharing market vary, but all suggest that it has the potential to grow by an order of magnitude or more.

In Switzerland, Muheim (1998) estimates that approximately nine per cent of the population are potential car-sharers. This is based on an evaluation of the number of people whose

personal circumstances mean they could benefit from car-sharing, combined with survey data which found 36 per cent of potential users were very or fairly interested in the idea.

In the US, Shaheen found that 15 per cent of an experimental group in an area well-suited to car-sharing became members of car-sharing organisation CarLink after receiving information and participating in a drive clinic. She postulates that intense marketing of car-sharing to a carefully selected target population can elicit up to 15 per cent participation.

Both these estimates of the potential for car-sharing are broad-brush, but they are in line with estimates from a more detailed Austrian study (Steininger et al. 1996). Steininger surveyed 198 members of Austrian car-sharing organisations to identify the characteristics of "pioneer" car-sharing members, or early adopters, and from this developed a profile for people most likely to join a car-sharing organisation:

- Age 25-43
- Highly educated (university degree or university entry level)
- Own at least one car, but not in a high price bracket
- Yearly car mileage for one car below 15000 km
- Less than 33 per cent of trips currently made by car (based on car modal share for car-share members *after* joining car club)
- Currently involved in environment-protective action.

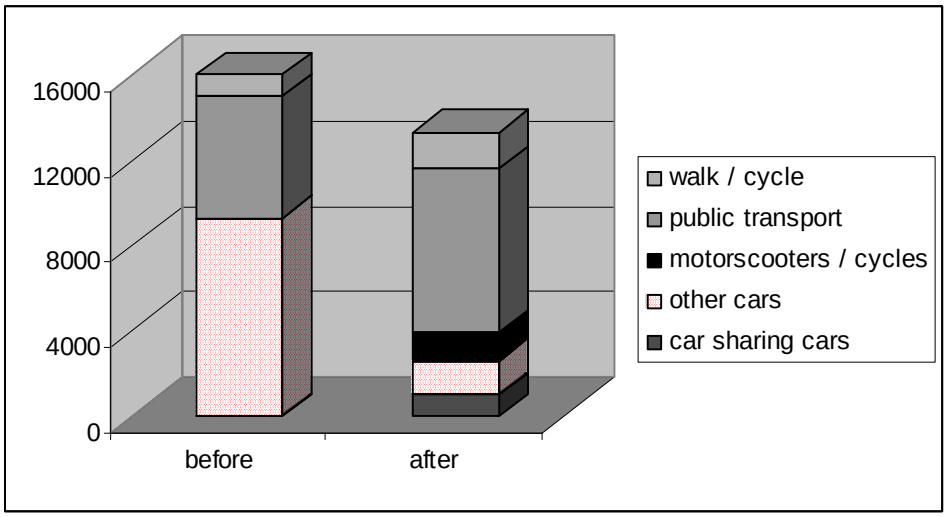
He then surveyed 350 non-car-sharers in two urban residential areas of Graz, and found that in one area, deemed an "average" urban residential area, 8.8 per cent of residents had the right profile to be car-sharing early adopters. In the second area, with a high academic population, the figure was 16.0 per cent. Steininger argues these figures are probably an underestimate. Some residents in the areas surveyed were excluded because they made more than a third of trips by car, and yet their car modal share could be expected to fall once they became car-sharers. Taking account of these extra people, the pioneer potential in the first residential area rose to 17.7 per cent and in the second area to 37.6 per cent. Steininger further argues that this is not the absolute upper limit for car-sharing: once it becomes a familiar concept it may expand to other groups and social segments, and its attractiveness will also grow if the "complementary good" of public transport becomes better.

8.2 Does car-sharing reduce car use?

Several studies have evaluated "before" and "after" levels of car use amongst people who join car clubs. Briefly, these studies demonstrate that car-sharers who give up their car on joining a car club are able to reduce their car mileage by 60 – 70 per cent. Car club members who do *not* give up a car (either because they never had one or because they are treating car club membership like a second household car) seem not to significantly alter their travel patterns.

Muheim (1998) analysed the travel patterns of 511 car-sharing clients and 340 potential clients in Switzerland, and found that car-sharers who gave up their own car were able to reduce their car mileage by an average of 72 per cent, from 9300 km per year to 2600 km per year (see figure 8.2). This brought their level of car use into line with non-car owners, who, despite not owning cars, still travel about 3100 km a year by car (for example getting lifts or borrowing vehicles from friends or family). Muheim reports that people who did not own a car before joining a car-sharing scheme, or who used car-sharing in addition to their own car, only slightly changed their travel behaviour.

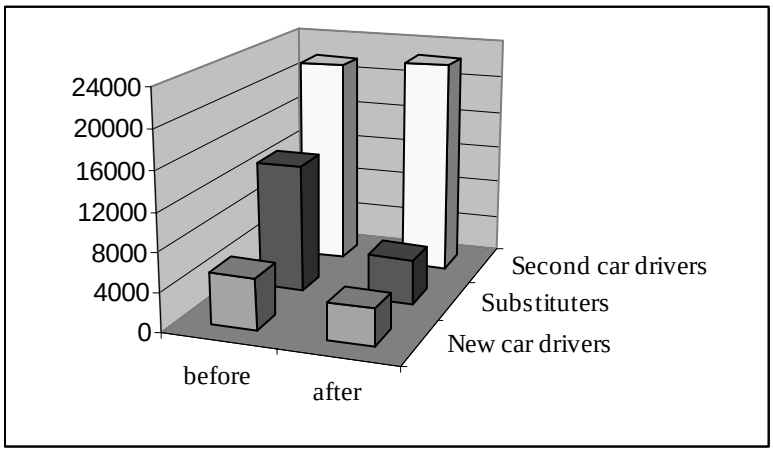
Figure 8.2 Travel patterns of people who give up their car on joining a car club (before and after) in kilometres per year



Source: Muheim (1998)

Meijkamp et al. (1997) undertook a similar analysis of reported mileage before and after joining a car club amongst 337 members of Dutch car clubs. Their findings are illustrated in figure 8.3. For car club members taken overall, the *average* reduction in car mileage was 33 per cent (from 8450 to 5660 km per year). However, this masked substantial differences according to whether or not people had owned a car before joining, and whether they kept it once they were members. People who gave up their car on joining the car club ("substituters") reduced their car mileage by 65 per cent. Those who used the car club in addition to their own car slightly increased their overall mileage by three per cent. Interestingly, Meijkamp et al. found that car club members who had previously been without a car ("new car drivers") *reduced* their car mileage by 29 per cent on joining.

Figure 8.3 Car mileage of people before and after joining a car club in the Netherlands (kilometres per year)



Source: Meijkamp et al. (1997)

Given these substantial differences in behaviour, it becomes important to know what proportion of car club members fall into each of Meijkamp's three categories. Amongst the sample they surveyed, 71 per cent had not owned a car prior to joining the club ("new car

drivers"); 21 per cent were substituters; and 9 per cent had retained their car after joining ("second car drivers").

Meijkamp et al. did not investigate how many non-car owners had chosen a car club as an alternative to buying a car. This issue is explored by several German studies, reviewed in Sperling et al. (2000) and summarised in table 8.1. Although there is a lot of variation in the figures reported, it seems that between 35 and 68 per cent of car club members previously did not own a car: either they had never owned one, or they had sold it some time earlier. Although the evidence from Meijkamp's study suggests this group might reduce their car mileage, it seems safer to assume that they will *not* do so. A much smaller percentage, between three and six per cent, continued to own a car after joining a car club. From the evidence presented by both Muheim and Meijkamp it seems likely their car mileage will go up a little, but they make up such a small proportion of car club members that this will have little impact on total "after" mileage. The remainder, between 26 and 58 per cent, either gave up a car when they joined a car club, or chose car club membership instead of buying a car. For this group, highlighted in table 8.1, it seems reasonable to assume a substantial reduction in car mileage, of the order of two-thirds, compared to what would have happened if a car club had not been available.

To sum up, it is reasonable to expect somewhere between a quarter and a half of members will give up their cars as a direct result of joining a car club, and as a consequence of this will reduce their car mileage by a substantial margin of around two-thirds.

Table 8.1 **Vehicle ownership patterns before and after joining a car club (per cent)**

	Study		
	Wagner (1990)	Hauke (1993)	Baum and Pesch (1994)
Would never buy a car	37.2	35.7	12.9
Gave up car independent of carsharing	31.1		29.7
Foregone planned car purchase due to carsharing		**15.6**	**31.5**
Gave up private car because of carsharing	**26.2**	**42.4**	**23.0**
Continue to own private car	5.5	6.3	3.0

Source: Sperling et al. (2000)

8.3 The potential for car clubs to reduce car travel

Where does this leave us in England? The development of car clubs here is maybe ten years behind Switzerland, but there is no obvious reason why they should not be successful here, and as we have seen the pattern elsewhere is for small beginnings to be followed by rapid growth.

Let us assume for an ***enlightened business as usual scenario*** that car clubs in England will follow the growth trajectory seen elsewhere. Car club membership currently stands at 500 – 600, based on membership data reported by Carplus[25]. At Swiss rates of growth, car club

[25] Data on the Carplus website www.carplus.org.uk suggested there were 532 members of operational car clubs in October 2002. The car clubs ranged in size from Edinburgh (with 157members) to Lewes (with 18 members). Car clubs reporting fewer than 10 members are not included in this figure.

membership would reach 24,000 by 2010. Assuming around a third of car club members gave up their car and reduced their car mileage by two-thirds[26], total demand for travel by car would be cut by 67.1 million km per year or 0.02 per cent of total car mileage.

In an ***ambitious change scenario,*** we would learn from the Swiss and German experience of car clubs, and achieve higher rates of growth. If car club membership reached 50,000 by 2010, total demand for travel by car would be cut by 140 million km per year or 0.04 per cent of total mileage.

Even with rates of growth greater than those achieved in Switzerland and Germany, car clubs will play a minor part in our travel patterns by 2010. Over a longer timescale, however, Swiss and Austrian research examined earlier indicates that 10 – 20 per cent of adult driving-licence holders might join a car club, at least in large urban areas where public transport is good enough to make car club membership feasible. This suggests a potential market of around 1.9 million people.[27] With membership at this level, total demand would be cut by 1.6 per cent.

8.4 What policy change is needed to encourage car clubs?

Car clubs in other countries have benefited from proactive support from public agencies, including funding. Shaheen et al. (2002) point out that in the US approximately 60 per cent of car-sharing organisations received public money for start-up costs, and 30 per cent receive public funding after their first year of operations. The sums of money involved are sizeable: for example City CarShare received $750,000 start-up funding from the US Department of Transportation and a second-year grant of $478,000. Shaheen comments that Canadian policymakers have not taken as active a role in supporting car-sharing, and suggests this may be one reason why car-sharing has grown more rapidly in the US than in Canada.

In Switzerland, partnership between car-sharing organisation Mobility and Swiss Railways has been an important factor in the growth of car-sharing. Many Mobility cars are based at stations, and Swiss Railways offers a combined travel-card giving discounted public transport travel and car-sharing membership.

Tax breaks could help give car clubs a competitive edge over individual car ownership. One option would be to give car clubs some form of fuel duty rebate, in line with rebates available for public transport.

8.5 Summary

In an enlightened business as usual scenario, car clubs might reduce demand for travel by car by 0.02 per cent by 2010; in the ambitious change scenario travel demand might be cut by 0.04 per cent. Because car clubs are at an early stage in their development, their full potential will not be realised by 2010. In the longer term, reductions in travel demand of 1.6 per cent might be achieved if around 15 per cent of drivers in urban areas were attracted to become car club members.

[26] Car mileage by main driver in car-owning households is 12580 km per year, according to National Travel Survey data.
[27] 22.512 million people live in urban areas with a population of more than 250,000 in England. Of these, approximately 80 per cent are adults. 71 per cent of adults possess a driving licence.

9. Action to increase cycling

Summary

In an *enlightened business as usual* scenario, increased cycling could cut national car travel demand by 0.3 per cent.

In an *ambitious change* scenario, car travel demand could be cut 1.2 per cent.

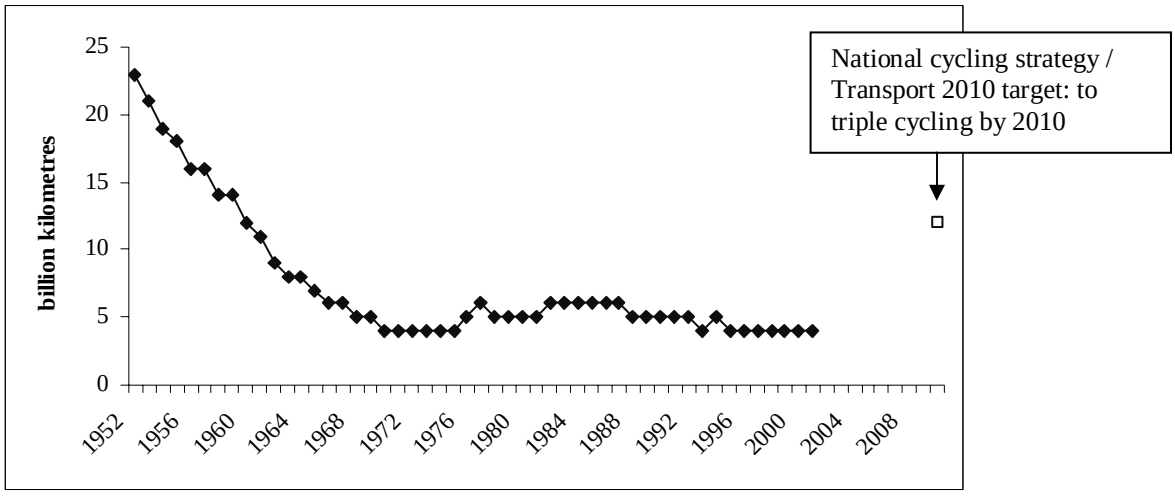
In the longer term, many short trips could switch from car to bike, potentially cutting car travel demand by 5 per cent or more.

Cycling is perceived to be a minority mode of transport in Britain, despite the fact that many journeys are of such a length that they could easily be made by bike, and despite evidence from continental Europe that cycling can command a significant modal share.

The National Cycling Strategy, published in 1996, led to optimism that levels of cycling in Britain would be increased, but until recently the actions necessary to create cycle-friendly roads have been pursued by only a minority of local authorities and, not surprisingly, levels of cycling have remained low. However, this is not universally the case, and in those towns where positive action has been taken, cycling is increasing. Evidence from other European cities shows there is no natural limit to levels of cycling; even in places where many journeys are made by bike, its mode share is continuing to rise. The challenge for us is to get out of the situation we are in, "bumping along the bottom" with low cycling mode share (figure 9.1). This will only happen if cycle-friendly environments are made the norm, not the exception.

This section examines how successful towns have encouraged cycling, and asks what proportion of car mileage could potentially be transferred to bikes.

Figure 9.1 "Bumping along the bottom": the distance travelled by bike in Britain has been low since the 1970s (billion person kilometres)

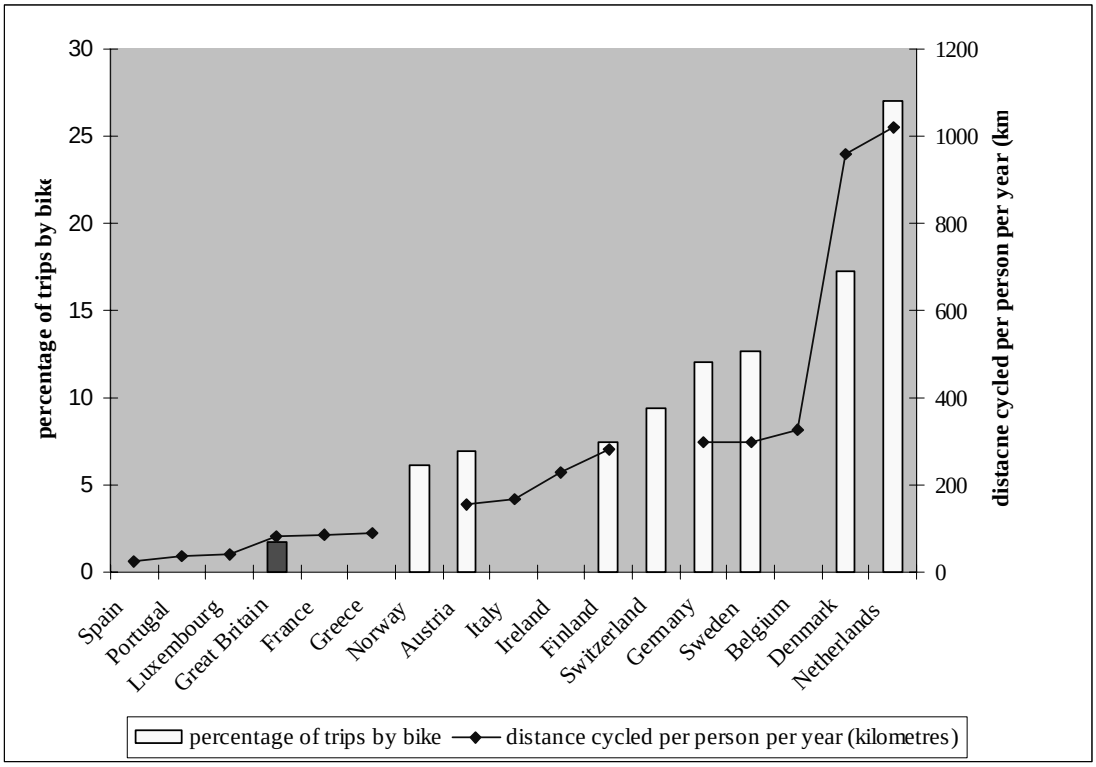


Source: Transport Statistics Great Britain (2002)

9.1 Learning from other European countries

Britain is near the bottom of the European cycling league table. It is not just the often-quoted Netherlands and Denmark which exceed us in terms of cycling mode share, but Belgium, Sweden, Germany, Switzerland, Finland, Ireland, Italy, Austria and Norway (see figure 9.2). However, these countries have not always had such high levels of cycling. For example, Maddox (2001) reports that cycling declined to a low modal share of five per cent in Germany at the end of the 1960s. As a result of strong public campaigns for cycling, coupled with government and local authority investment in physical infrastructure, the proportion of trips made by bike increased to eight per cent in 1972. By 1982 this had risen to 11 per cent and by 1995 to 12 per cent. This increase in mode share is an impressive achievement, since car travel was rising over the same period. Germany has recently published a national cycling plan for the period between 2002 and 2012, and is aiming for further increases in the mode share for trips by bike.

Figure 9.2 Proportion of trips made by bike in European countries (per cent) and distance cycled per person per year (kilometres)



Source: Solheim and Stangeby (1997) and European Commission (1999)

Reviews of German cities and towns which have successfully encouraged cycling identify several common features: a preparedness to invest substantial sums of money in high quality cycle facilities over one or two decades; extensive use of 30kph zones in residential streets; good provision for cycle parking; and good links from outlying villages into town centres (CfIT 2001; ADONIS 1998).

In Freiburg, for example, sustained support and investment in cycling resulted in an increase in its mode share from 15 per cent to 26 per cent of all trips between 1982 and 1999 (see figure 2.1). Important features of cycle provision in Freiburg include the "Bicycle Highway",

a major east-west route for bikes; bike lanes connecting surrounding villages to the city centre; a "bike and ride" cycle park next to the main train station with space for 1000 bikes, bike rental, a bike shop and mobility centre; around 5500 bicycle parking spaces spread throughout the city centre; and speed limits of 30kph or less in all residential areas. Investment in cycling in Freiburg peaked in the mid 1980s at over €3 million. Between 1985 and 1990 spending was typically €1-2 million per year, a spending per head of €4 - 8.

It is instructive to compare this level of investment with that in York. York has a population roughly half that of Freiburg, and plans to spend an average £675,000 per year (€420,000) on walking and cycling over the next five years. This amounts to about €3.40 per head. In other words, even the level of investment in cycling in one of the UK's most cycling-committed cities is rather less per head than that in Freiburg during the period when that city was installing the infrastructure to develop a high mode share for cycling. Funding in Freiburg has now fallen back to around €400,000 in 2002, but the experience of that city suggests that high levels of funding for a short period can help "kick-start" creation of cycle-friendly infrastructure.

It is particularly interesting that the increase in cycling in Freiburg was not at the expense of public transport (which, as discussed in section 2 increased from 11 per cent to 18 per cent of trips over the same period). It *was* at the expense of walking, which declined from 35 per cent of trips to 22 per cent. However, experience in other German cities suggests this is not always the case.

For example, Troisdorf successfully increased cycling from 16 per cent to 21 per cent of trips over an eight year period between 1988 and 1996. Over the same period, car mode share (driver and passenger) fell from 56 per cent to 51 per cent, and levels of walking and public transport use remained the same. This town of 75,000 people (roughly the size of Bedford) is regarded in Germany as a town without a strong cycling tradition. The mode shift was the result of an intensive programme of improvements and publicity costing roughly €13 million.

In Münich (comparable in size to Manchester) around 13 per cent of trips are by bike, up from around eight per cent in the early 1980s (CfIT 2001, Monatzeder and Franzl 2001). Measures to encourage cycling in Münich include 650 kilometres of cycle paths; parking for 41,250 cyclists at stations; and 30 kph zones covering three quarters of the city. The cycle paths include 16 major cycle routes (of which 13 are complete and three will be completed by 2004) which radiate outwards from the city centre, plus a fine network of local routes. The strategic cycle network is to be complemented by an inner and an outer city cycle ring-route. Between 1990 and 1999, the city spent €26 million on cycle infrastructure.

Not all German cities have a high cycling mode share. A typical mode share is 9 - 13 per cent, but in some towns (for example Saarbrücken, Solingen, Wuppertal and Chemnitz) less than two per cent of trips are by bike. This suggests that Germany may be a good role-model for action to increase cycling in Britain.

9.2 Limited success in Britain

Although levels of cycling in Britain are generally low, some cities such as Cambridge, Oxford, York and Hull have succeeded in maintaining a high cycling mode share. In York, cycling to work has increased from an estimated 15 per cent in 1991 to 19 per cent in 2000. In

the last five years morning peak hour cycle flows have increased by ten per cent, and more than this in the centre of the city (Harrison 2001; City of York Council 2000).

Cities without a cycling tradition are also successfully increasing bike use. In Greater Nottingham, around 2.5 per cent of all trips are by bike. A cycle network developed in the south-west of the city in the late 1980s and early 1990s increased levels of cycle use on the network by 17 per cent, while levels of cycle use off the network have gone up by 11 per cent (Greater Nottingham Annual Progress Report 2000/01). In Edinburgh, cycle use for the journey to work has increased from 1.9 per cent of trips in 1991 to 3.1 per cent in 2000 (Cross 2001). Journeys to work by bike are also increasing in London. Across the whole of London, cycling accounts for 1.2 per cent of trips to work. For journeys into central London during the morning peak (7 - 10 am), cycling increased by a third between 1990 and 2000 (Transport for London 2002b).

There is some evidence that national data cycling in Britain may be systematically underestimating a possible recent rise in cycle trips. Travel diaries completed for the National Travel Survey exclude trips made by bike on off-road paths. The growth of the national cycle network means that increasing numbers of people are choosing to cycle on these paths (Sustrans estimates an increase in cycling on traffic-free routes of 15-20 per cent in one year), but because their trips are not recorded we may be missing crucial evidence.

Although these increases in cycling are good news, the rate of increase over the *last* ten years (between a fifth and two-thirds) is much less than the aim of tripling levels of cycling over the *next* ten years. It is possible that other forms of cycling (for example for leisure) may increase faster than cycle commuting, but nevertheless it is difficult to avoid the conclusion that current policies are unlikely to achieve the National Cycling Strategy and Transport 2010 targets. Most urban areas lag behind cities such as Nottingham, Edinburgh and London – and far behind cities such as York - in providing for cyclists, and as yet are able to demonstrate little or no increase in cycling mode share.

9.3 How much change is possible?

Although overall levels of cycling in Britain have remained stagnant since the National Cycling Strategy, the experience of the towns described above suggests that change *is* possible. So far, most local authorities have been slow to put in place the appropriate measures to increase cycling, and the lack of measurable change is a result of inaction, rather than because effort has been made but has been ineffective. From comparison with the German experience, it is clear that British efforts to improve cycling facilities are too little, and often not of adequate quality. To increase cycling mode share here, we will need to invest larger sums of money in high quality, continuous cycle routes; cycle parking; and cycle promotion.

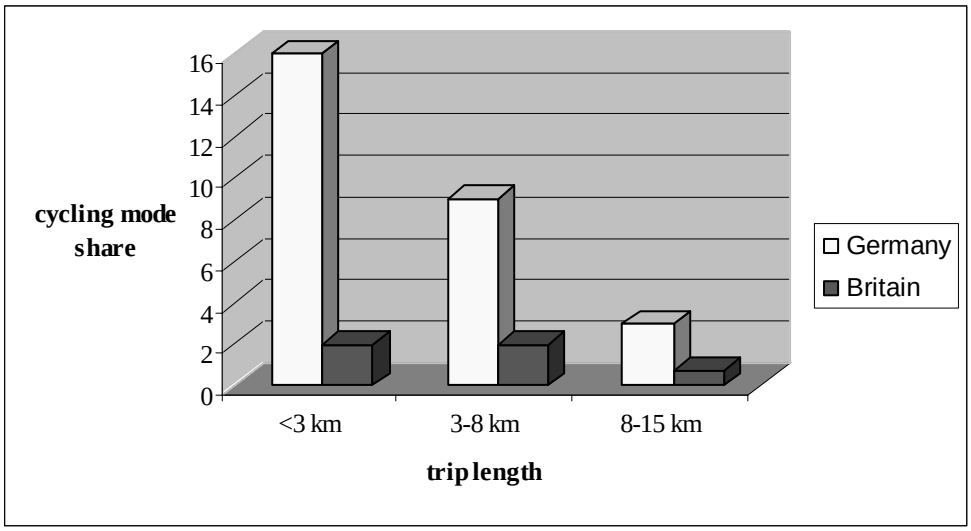
In an ***enlightened business as usual scenario,*** local authorities would learn from and apply the experience acquired in other British towns where cycling is increasing. This might lead to an increase in cycling levels of around fifty per cent (typical of the sort of increase in cycling mode share for journeys to work observed over the last ten years). Under this scenario cycle mileage would increase by two billion kilometres per year. For the short trips for which a shift to cycling is most likely, most but not all of these new cycle trips would switch from car,

rather than from public transport or walking. This would reduce car travel by about 0.94 billion kilometres per year, or 0.3 per cent[28].

In an ***ambitious change scenario,*** a step-change in commitment to cycling might enable Britain to triple levels of cycling (this would still be lower than German levels). Cycle mileage would increase by eight billion kilometres per year, reducing demand for car travel by about 3.77 billion kilometres per year, or 1.2 per cent.

In the longer term, more cycling could make a significant impact on car traffic. Only two per cent of short trips (less than three kilometres) are by bike, while around 36 per cent are by car. For journeys between three and eight kilometres, nine per cent are by bike and 79 per cent by car. Figure 9.3 shows how our cycle mode share for short trips compares with that in Germany. Although some short trips may require a car - for example because it is being used to move a heavy load, or to escort an elderly relative with mobility difficulties - it is likely that many more short trips could be cycled, if the conditions were right. About 16 per cent of total car mileage is on trips of less than eight kilometres, and if just a third of these trips were made by bike (or walking), total car traffic would be cut by more than five per cent.

Figure 9.3 Cycle mode share for short trips in Germany and Britain



Source: BVBW (1999) and National Travel Survey 1999/01

9.4 What policies are needed to increase cycling?

The German cities described above made a concerted effort over a period of a decade or more to put in place continuous, high quality cycle route networks. This required high levels of investment, up to about €10 million per city (and more for large cities such as Münich). Many continental cities which have successfully increased cycling have exactly the same problems as the UK with limited road space, or with severance of key routes, but have addressed them through ambitious schemes. On the whole, British cities have adopted a piecemeal approach to providing cycle facilities, partly because of lack of ambition but also because there has not

[28] For trips of up to 16 kilometres, car travel accounts for roughly 77 per cent of total mileage; public transport and walking together account for most of the rest. The calculation assumes around three quarters of new cycle mileage would previously have been by car, with average car occupancy of 1.59.

been a clear message from government that large-spend cycle schemes are acceptable and sometimes necessary. One way forward would be for the government to encourage proposals for development of major cycling projects through the Local Transport Plan.

A further problem in Britain is that our design standards for public spaces are too heavily dependent on outdated and inappropriate guidance aimed largely at speeding the flow of traffic on trunk roads. Imaginative cycling schemes are regularly ruled out because they are inconsistent with the Highway Agency's Design Manual for Roads and Bridges, even though this design guidance is intended for trunk roads and quite inappropriate for most other mixed-function roads. New design guidance for mixed-use roads is needed, to enable local authorities to develop good cycling schemes.

Continental cities have also introduced many more low-speed 30 kph residential areas than we have in Britain - and in some cases have reduced speeds to 30kph on main roads. These low-speed streets play an important part in local cycle route networks.

9.5 Summary

Under an enlightened business as usual scenario, increased cycling could cut demand for travel by car by 0.3 per cent by 2010. In the ambitious change scenario, the reduction is 1.2 per cent. In the longer term, there is the potential for many short trips to switch from car to bike, potentially cutting traffic by five per cent or more.

10. Action to encourage walking

Summary

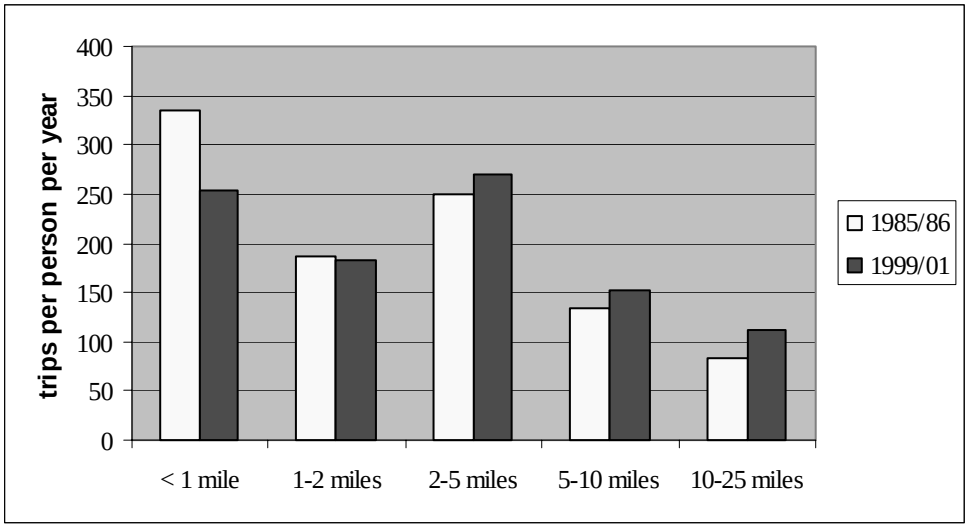
In an *enlightened business as usual* scenario, more walking could cut national car travel demand by 0.7 per cent. Most of this is accounted for elsewhere (as part of school travel plan or individual marketing programmes). The net additional impact would be 0.1 per cent.

In an *ambitious change* scenario, national car travel demand could be cut 1.6 per cent, of which the net additional impact would be 0.2 per cent.

Over a quarter of all trips are made on foot, and it is the main way people reach buses and trains. However, the distance we walk is declining each year, and has fallen by a fifth since 1985.

The main reason for the decline in walking is that we are not making as many short trips as we once did (see figure 10.1). Car ownership has given people a wider choice of destinations: we drive five miles to the supermarket whereas our parents would have walked round the corner to the local shop; we work further from home; and children may travel greater distances to school as a result of parental choice policies. As a result, we make fewer journeys of under a mile (down a quarter since the mid-1980s), and there has been a surge in the number of slightly longer trips (between two miles and 25 miles).

Figure 10.1 The trip length surge: short journeys are in decline, while medium-length trips are made more often.



Source: National Travel Survey 1999/2001
(Note total number of trips has remained the same, at about 1000 per person per year)

To encourage more walking, we need to create incentives for people to modify their journey patterns, and to make shorter trips instead of longer ones. One way of achieving this is to make sure that everyday facilities such as shops, pubs, schools and banks are close to where people live, so there is a good choice of destinations close to home.

We could also encourage people to use their cars less for those trips which *could* be walked. Although walking is the main mode for very short trips of less than a mile, nearly two-thirds of trips between one and two miles are made by car.

This section looks at the policies and actions which could encourage more walking.

10.1 Reducing the need to travel

Comparisons of travel patterns and land use in North America and Europe demonstrate that the pattern of land use, and the presence or absence of sprawl, has a strong influence on how much people walk, and indeed on mode choice and distance travelled more generally. There is good evidence that denser settlement patterns and mixed use both lead to shorter trip-making, and that sprawling, dispersed settlement patterns and separation or zoning of land uses cause longer trips and greater car dependence.

For example, research by Cervero and Radisch (1996) compared two neighbourhoods in the San Francisco Bay Area with different residential densities and land uses. One neighbourhood, Rockridge, was "an older, compact and mixed-use neighbourhood" with a grid-like street layout and a main street with shops which opened directly onto the pavement. The other, Lafayette, was a post-war neighbourhood of "suburban tract housing, spacious community designs, and auto-oriented retail strips and plazas". The street network in Lafayette was more curvilinear, streets were wider, and the main thoroughfare was 75 feet wide with four lanes and a median strip. In other respects – household income, car ownership, public transport access, road access, and distance from the city centre – the two suburbs were similar.

The researchers found that Rockridge residents were more likely to walk or cycle than Lafayette residents. People living in both places made about two non-work trips per day, but in Rockridge people made more of these trips by foot: about 1.07 per day compared to Lafayette's 0.33. Non-work car trips were the mirror image: in Rockridge about 0.90 per day, compared to 1.58 per day in Lafayette. People's willingness to walk was not simply related to trip distance: even for journeys of similar length people in Rockridge were more likely to walk. For example in Rockridge 28 per cent of non-work trips under a mile were made on foot, whereas in Lafayette just six per cent of these short trips were walked.

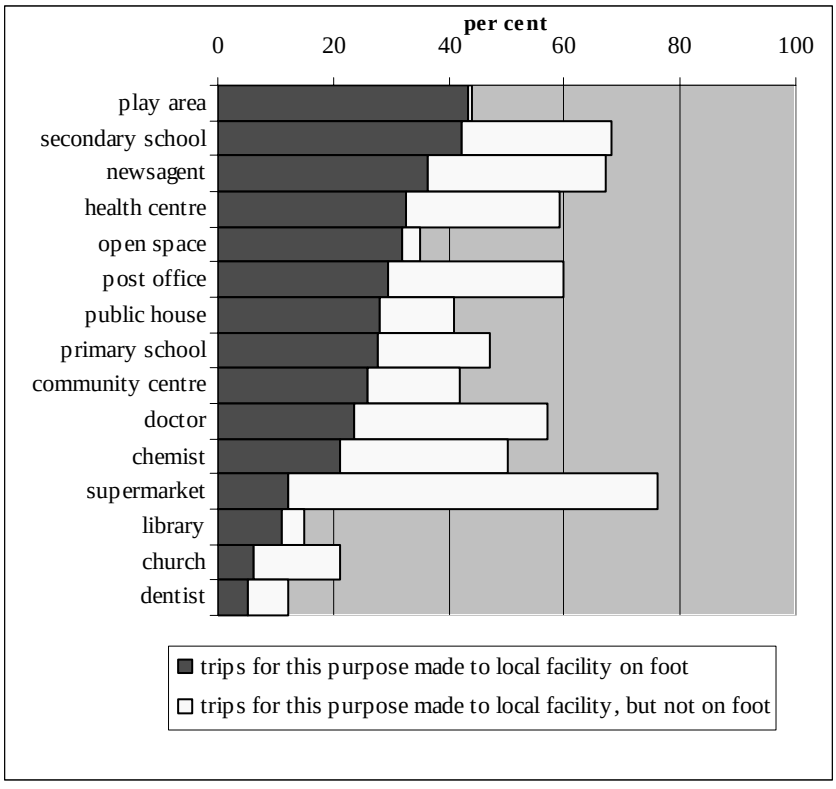
Cervero and Radisch concluded that in Rockridge residents were substituting "internal" (that is, shorter) walk trips for "external" car trips. Residents of such neighbourhoods were at least three times as likely to walk to a shop, nearby restaurant, or local park as their counterparts in more car-oriented suburbs, and correspondingly less likely to travel by car.

Other research has examined whether the presence of facilities such as schools, shops and health care close to home affects people's propensity to walk. Meurs and Haaijer (2001) examined the travel behaviour of over 700 people living in varying types of residential area in the Netherlands. They found that reduced car mobility occurred "when facilities for daily and other shopping and schools are located close to the home, the road network in the neighbourhood is laid out for slow traffic (by bike and on foot) and is therefore unsuitable for the car, and the accessibility of locations outside the neighbourhood (including the main road and places for shopping) discourage car use." They argued that the contribution of any one of

these factors on its own was small, but that the interaction between the various characteristics gave rise to greater change.

The importance of access to local facilities was also demonstrated in research by Winter et al. (1995). They looked at people's travel patterns in five large housing developments in SW England, and found that where schools, food shops, health centres and other facilities formed part of the development, some were particularly effective at encouraging access on foot (figure 10.2). For example, where newsagents existed within the housing developments they absorbed two-thirds of all newsagent trips, and slightly over half of these were on foot. A secondary school within the development had a similar effect: about two-thirds of all trips to secondary schools were absorbed by such schools, and most of these journeys were on foot. Other facilities were less effective at encouraging walking when provided within the development. Notably, provision of a supermarket within the development led to high levels of use (absorbing more than three quarters of all supermarket trips made by residents); but most of these journeys were by car rather than by foot. Nevertheless, local supermarkets were effective in reducing car miles travelled, as they encouraged shorter trip lengths. Facilities such as dentist, church and library were less effective, securing one-fifth or less of available trips.

Figure 10.2 Market shares of trips captured by local facilities within housing developments, and proportion of these on foot.



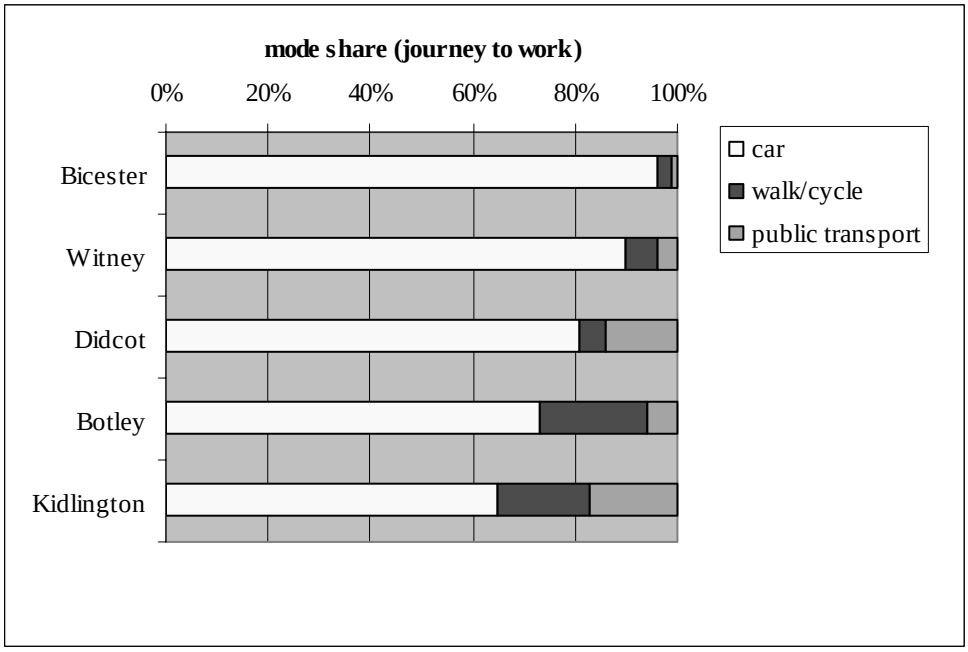
Source: adapted from Winter et al. (1995)

Winter et al. identified eight important "day-to-day facilities" which merited inclusion in all large housing developments because of their potential to reduce car travel: food-shop, newsagent, open space, post office, primary school, pub, supermarket, and secondary school.

The research described so far focuses mainly on the effect of the presence or absence of local facilities and the "walkability" of the neighbourhood. These factors seem to be important in influencing mode choice for non-work trips, especially trips to school, shops or for personal business.

For work trips, the *location* of residential development and its proximity to major transport routes is a more important influence on travel patterns. Research by Curtis (1996) examined five new housing developments in Oxfordshire, and found their location characteristics exerted a powerful influence on mode choice and travel mileage (figure 10.3). The development with the most car-commuting, at Bicester, lay alongside a new ring road and close to a junction on the M40 motorway. It was almost entirely car dependent, with 95 per cent of journeys to work by car and the highest average commute distances. Botley and Kidlington, with lower levels of car commuting, lay closer to the city of Oxford (Botley is a suburb of Oxford and Kidlington is about six miles out of the city), and were connected to it by good bus services. In between, Witney and Didcot are linked to Oxford by dual carriageway but do not have fast road connections to major centres of employment such as the Midlands and the area around Reading, although Didcot has a station on the London-Reading-Bristol main rail line.

Figure 10.3 Journey to work mode share in new housing developments in Oxfordshire



Source: Curtis (1996)

Taken together, this research confirms that housing developments which are close to a good range of schools, shops and local services, with road lay-outs and development patterns that facilitate travel by non-car modes are likely to engender more sustainable trip patterns than housing developments which are distant from services, with poor public transport. Proximity to motorways or other high speed roads will encourage more car use.

Government guidance now encourages forms of housing development which are likely to lead to greater mode share for walking (and cycling and public transport). The companion guide to

PPG3, Better Places by Design, emphasises the importance of shops and services near housing; permeable road layouts which provide direct routes for pedestrians and cyclists; low vehicle speeds so cars and other users can safely share street space; and good walking routes to public transport. Government targets to encourage brownfield development will help ensure more housing is in locations with good local access rather than high-speed road links. However, new developments are still being planned and built on sites where motorway access is much better than local access, like the Bicester development, and however good their micro-design it is doubtful that they will achieve high levels of non-car mode share. Stronger enforcement of the principles of sustainable housing location and design would help reverse the decline in walking.

In the next ten years the net housing stock will increase by around seven per cent (assuming rates of house-building, demolition and change of use are roughly the same as over the past decade), which suggests that there is some potential to develop housing that is more conducive to sustainable, less-car intensive travel patterns, at least for trips to everyday facilities. This new housing stock will only reduce levels of car use if it has significantly *better* than average land use characteristics. Nevertheless, this is an important policy area to address, as continuation of current practice will lead to less walking and more car use, undermining actions in other areas.

10.2 The influence of liveability on trip-making patterns

Although land use patterns are highly influential in people's trip-making patterns, other policies may also play an important role in determining destination choice and whether people make a short walk or a longer car journey. Intuitively, it seems possible that people make more short trips on foot, and correspondingly fewer long trips by car, when the "liveability" of the public realm is high. It also seems plausible that people will be willing to walk *further* if the route is interesting and attractive.

Unfortunately, few surveys have sought to measure the importance of liveability to mode choice. The work by Meurs and Haaijer (2001) discussed above is an exception, and they were able to show that:

- People moving house to a pedestrian priority area (home zone) or a street in a 30 kph zone reduced their car trips
- People living on a street where a home zone was constructed did the same
- Introduction of planting in a street led to more journeys being made on foot.

Interventions such as traffic calming, 20 mph zones, home zones, main road environmental enhancements, street safety initiatives and so on may not individually have demonstrable impact on trip patterns. However, policies which make it a positive pleasure to travel through an area on foot *may* cumulatively encourage patterns of trip-making which are more sustainable. The opposite may also be true: the cumulative impact of policies which require pedestrians to make detours and suffer noise and fumes from heavy traffic is likely to be to deter sustainable trip patterns.

It is also plausible that liveability enhances the viability of local services, which in turn encourages short trip-making patterns. If access to local shops or a park involves an attractive walk, the destination may be more popular. There is good evidence now that town centres prosper if they are attractive for pedestrians – for example York city centre experienced a

doubling of pedestrian footfall when traffic restrictions and Footstreets were introduced. The effect of local surroundings on use of neighbourhood destinations has not been researched, but it would be reasonable to suppose that attractive pedestrian-friendly surroundings would enhance their use too.

10.3 Promoting walking

Individual marketing techniques and travel plans can also help increase walking. As described in section 7, most individual marketing projects so far have primarily sought to increase public transport use, but evidence from South Perth (Australia), and Gloucester and Frome in the UK suggests individual marketing programmes which encourage walking lead to even more behaviour change.

The South Perth large-scale project cut car driver mode share from 60 to 52 per cent of trips, with half of this being due to more walking (mode share up from 12 per cent to 16 per cent of trips). Walking was similarly important in Gloucester and Frome. In Gloucester half of the car trips were substituted by walking, and in Frome more than eighty per cent (Sustrans 2002b,c).

Travel plans also offer opportunities to increase walking. This is clearly true of school travel plans, because the trip distance is generally low. But workplace travel plans can also be effective in increasing walking. For example, Buckinghamshire County Council's travel plan for its own staff led to a substantial shift from driving to walking: car modal share fell from 71 per cent to 56 per cent, and walking rose from 10 per cent to 16 per cent (Buckinghamshire County Council 2002).

Surveys suggest the main motivation for people to walk more is the health benefit. Over a third of people who have cut back on short car journeys did so because they wanted to get more exercise, and this was a much stronger motivator than congestion, desire to help the environment, or parking difficulty (Office for National Statistics 2001). This suggests that health-based campaigns to promote walking such as the Countryside Agency's "Walking the way to health" project could be helpful in encouraging behaviour change.

10.4 Potential impact of pro-walking policies

Assessing the potential impact of pro-walking policies on travel demand is complicated, and requires the following factors to be considered:

- What proportion of car mileage is for short trips (less than two miles) that might switch to walking, given the right policies?
- What proportion of car mileage is for longer trips that are susceptible to destination change and mode switch to walking (for example replacing a longer car trip to the supermarket with several shorter trips to more local shops)?
- How much might the pool of "walkable" car trips be reduced if people were cycling more?
- How much of the mode shift from car to walking is already accounted for in the assessment of the impact of school travel plans and individual marketing?

Very short car trips of two miles or less make up about three per cent of all car mileage. Some of these short car trips cannot be made on foot – for example because they involve escorting

someone with mobility difficulties, or carrying a heavy load. It is difficult to estimate the proportion of car trips conducive to destination switching (replacing a longer car trip by a shorter trip on foot), but it is assumed here that these might account for another three per cent of car mileage, and that the total car mileage potentially transferable to walking is therefore around six per cent.

However, given the right conditions and encouragement, some of these trips would switch to cycling. An ambitious programme to increase levels of *cycling* would thus reduce the pool of car trips available to switch to *walking*. Calculations suggest that if cycling tripled, the pool of car trips which could potentially switch to walking would fall to around five per cent.

Next we look at the risk of double counting from school travel plans and individual marketing. Some modal shift to walking has already been assumed to happen as a result of these actions. Under the ***enlightened business as usual scenario,*** school travel plans would cut car travel demand by 0.4 per cent and it is plausible that around half of this shift would be from car to walking. Individual marketing would cut car travel demand by 0.8 per cent, and again it is plausible that around half this would be people switching from car to walking.

If we assume tentatively that a further reduction in car travel demand of 0.1 per cent might be achieved through all other actions to switch car trips to walking, the total reduction in car travel demand arising from a switch to walking is 0.7 per cent. This figure is about a seventh of the available pool of short car trips of five per cent, which seems plausible. "All other actions" here means lower speeds on mixed-use roads, better crossings, traffic calming, 20mph zones and home zones, and new street designs which encourage shared enjoyment of street space by all road users.

In the ***ambitious change scenario,*** school travel plans and individual marketing might together switch 1.45 per cent of car mileage to walking, using the same assumption. A further reduction in car travel demand of, say, 0.2 per cent might be achieved through other actions to switch car use to walking. The total reduction in car travel demand arising form a switch to walking is 1.65 per cent, which is about a third of the available pool of short car trips.

Thus the additional impact on car travel demand (not already accounted for elsewhere) would be 0.1 per cent in an enlightened business as usual scenario, and 0.2 per cent in an ambitious change scenario. These are tentative estimates, based on the size of the potential pool of trips available for switching to walking rather than on evidence about the effects of actions such as changes to the street environment.

10.5 What policies are necessary to achieve this?

Policies to encourage a shift from car use to walking cover a wide spectrum. Initiatives such as school travel plans and individual marketing are discussed elsewhere in this report. Land use policies for new housing development include ensuring the key everyday facilities are provided as part of new developments; designing new neighbourhoods to be compact, with mixed uses; and laying out roads in a way that is attractive for walking (and cycling).

On existing roads, home zones, 20mph zones and main road environmental enhancements may all improve the liveability of the public realm and make walking more attractive. Proactive maintenance policies, including tackling graffiti and vandalism; ensuring pavements

are in a state of good repair; and removing street clutter and obstructions, may all help create walkable neighbourhoods.

10.6 Summary

In an enlightened business as usual scenario, more walking might reduce demand for travel by car by a total of 0.7 per cent, of which most is already accounted for elsewhere. The additional impact arising from measures not counted elsewhere would be 0.1 per cent.

In an ambitious change scenario, car travel demand might be cut by a total of 1.65 per cent through more walking. Again, most of this is already counted elsewhere and the additional impact is estimated at 0.2 per cent.

11. Combined impact of local measures

If the impact of all the measures analysed in the preceding sections is added together, we arrive at a total figure of just under five per cent in the enlightened business as usual scenario, or just over ten per cent under the ambitious change scenario (see table 11.1). This is not an estimate of the actual impact on traffic volumes, as it does not allow for synergy between measures, or for the offsetting impact of induced traffic. Over a longer timescale – beyond 2010 – the measures could be more fully exploited and have greater impact.

Table 11.1 **Reductions in national car travel demand under each scenario (per cent)**

	Enlightened business as usual	**Ambitious change**
Better bus services	-0.5	-0.9
Light rail systems	-0.03	-0.03
Community rail partnerships	-0.1	-0.3
Workplace travel plans	-1.0	-2.1
Teleworking	-1.6	-2.8
School travel plans	-0.4	-1.3
Individual marketing	-0.8	-1.6
Car clubs	-0.02	-0.04
More cycling	-0.3	-1.2
More walking[29]	-0.1	-0.2
Total	**-4.9**	**-10.5**

These estimates exclude a variety of measures which might have an additional effect on demand for travel, but where the evidence at present is less clear. These include:

- internet shopping and video-conferencing: new applications of communications technology whose impact has so far been little studied
- travel plans for journeys other than those to school or work, particularly leisure travel plans
- contributions from land-use planning policies including encouraging new office and retail development in town centre locations and discouraging developments in locations which are liable to be mainly accessed by car, and setting maximum parking standards for new developments.

The figures in the enlightened business as usual forecast are largely comparable to those made by Halcrow (DTLR 2002a). Those in the ambitious change forecast are comparable to the estimates made by James (2002).

The impacts of the various measures would be distributed across a range of journey purposes. For example, we know that individual marketing primarily affects journeys for shopping, leisure or personal business; measures to encourage cycling will mainly affect journeys to work, to school, for leisure and for shopping; and workplace travel plans and teleworking

[29] The estimate for "more walking" is a net figure, excluding impacts from school travel plans and individual marketing. If these are included, the total reduction in car travel demand arising from shift to walking is 0.7 per cent (enlightened business as usual) or 1.65 per cent (ambitious change).

primarily affect commuting. Figure 11.1 and table 11.2 illustrate one plausible way in which the effects might be distributed across the different journey purposes. It is assumed that:

- A third of the effect of bus improvements is on the journey to work, and a third on shopping trips; the rest is equally distributed between trips for the purposes of education, personal business, and visiting friends at home
- The demand reduction from teleworking and workplace travel plans is entirely concentrated on the journey to work
- The demand reduction from school travel plans is entirely concentrated on the escort journey to school
- Seventy per cent of the effect of individual marketing is on trips for shopping, personal business, or leisure; the rest is evenly divided
- The effect of car clubs is equally distributed between trips for the purpose of commuting, business, shopping and personal business
- The effect of measures to encourage cycling is distributed in proportion to the existing journey purpose split for this mode.

Figure 11.1 Ambitious change scenario: distance travelled as a car driver (per person per year), according to journey purpose

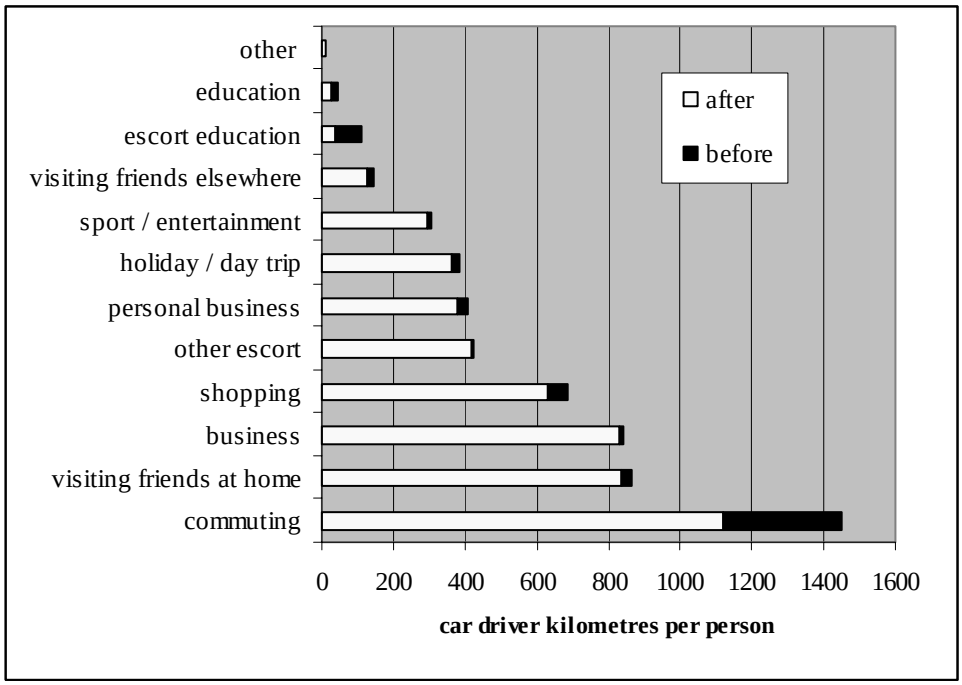


Table 11.2 **Ambitious change scenario: effect on distance travelled as a car driver (per person per year), according to journey purpose**

	Before		**Reduction in mileage in ambitious change scenario (as percentage of total car travel demand)**											**After**
	Car driver km per person per year	% of total car mileage	Bus quality partnerships	Light rail	Rail partnerships	Workplace travel plans	Teleworking	School travel plans	Individual marketing	Car clubs	More cycling	More walking	Total	Car driver km per person per year
Commuting	1450	25.6	0.3	0.01		2.1	2.8		0.2	0.01	0.4		5.82	1120
Visiting friends at home	864	15.2	0.1						0.3		0.1		0.50	836
Business	840	14.8							0.1	0.01	0.1		0.21	828
Shopping	686	12.1	0.3	0.01	0.1				0.3	0.01	0.2	0.1	1.02	628
Other escort	426	7.5							0.1				0.10	421
Personal business	406	7.1	0.1	0.01					0.2	0.01		0.1	0.42	382
Holiday / day trip	385	6.8			0.2				0.2				0.40	362
Sport / entertainment	307	5.4							0.1		0.1		0.20	296
Visiting friends elsewhere	145	2.6							0.1		0.2		0.30	128
Escort education	111	2.0						1.3					1.30	37
Education	42	0.7	0.1								0.1		0.20	30
Other	13	0.2											0.00	13
Total	**5674**	**100.0**	**0.9**	**0.03**	**0.3**	**2.1**	**2.8**	**1.3**	**1.6**	**0.04**	**1.2**	**0.2**	**10.47**	**5080**
								car driver kilometres saved per person per year						**594**

11.1 The potential for synergy between measures

These estimates of potential impact do not allow for any synergy between combinations of measures, but it is intuitively plausible that several measures working together might have more impact than the sum of their parts. It is also credible that local measures which improve alternatives to the car, or raise awareness of existing alternatives, might have a synergistic effect with restraint measures. Some examples of possible synergistic effects are explored below. These fall into four categories:

- Increasing the effectiveness of traffic restraint
- Influencing travel habits and attitudes
- Addressing the separate reasons for making linked trips by car
- One measure amplifying another.

Increasing the effectiveness of traffic restraint
Motorists respond to higher motoring costs in a variety of ways. Higher town centre parking charges may lead some motorists to switch destination to another town or out-of-town shopping centre, but still drive; while others may switch modes. If fuel prices go up, some motorists may respond by driving less, while others may adapt by buying a more fuel-efficient car (or driving more fuel-efficiently), or by cutting back their spending in other areas. It seems plausible that the measures discussed in this report may make drivers' responses to higher travel costs more elastic (Goodwin 2002). If this happens, a given amount of traffic restraint will achieve a greater modal shift: there will be more gain for less pain.

For example, if increased parking charges are preceded by the introduction of more frequent bus services on dedicated bus-ways, and high quality continuous cycle lanes alongside main routes into a town centre, more shoppers will be encouraged to go into town by bike or by bus. This may be further encouraged if it is possible to get off the bus close to shops, or park a bike right in the main shopping street, much closer to the shops than the car park was. Higher parking charges on their own would not have had so much effect, and nor would better bike lanes or bus services.

Influencing travel habits and attitudes: the "snowball effect"
We know the long-term effects of local measures are likely to be greater than the short-term effects. For example, Dargay and Hanly (1999) found the long-term effect (over six to seven years) of lower bus fares was about double the short-term impact (see section 2). Individual marketing programmes seem to lead some people to make further cutbacks in car use over the year following participation in the programme (see section 7).

There is also evidence that people may be more willing to try non-car options if they can already see these options work. For example, modal switch to cycling appears to play a greater role in workplace travel plans in cities which already have some culture of cycling, such as Nottingham, Cambridge, Bristol and Oxford (DfT 2002a; Cairns 2002). Growth in car-sharing in Switzerland appears to be exponential rather than linear (see section 8).

These observations suggest that local measures together might plausibly create a "snowball effect". That is, change may be very slow at first but accelerate as people see their colleagues and neighbours changing their travel behaviour; discover that the result seems to work; and consequently become more open to change in their own lives.

Addressing the separate reasons for making linked trips by car
Many of our trips are multi-purpose: dropping the children off at school on the way to work, or picking up shopping on the way home. Cars offer a lot of flexibility for these linked trips, combining freedom of destination, flexibility of timing, and storage and transport of goods. One measure – better bus services, *or* workplace travel plans, *or* school travel plans – may have little impact on travel choice for these complex trips, but several measures in combination may have more effect.

For example, some parents drive their children to school and then drive on to work because it would take too long to walk to school and then catch the bus, so they would arrive at work late. A workplace travel plan on its own does not solve this problem. But safe walking and cycling routes to school, or a school bus, would enable more children to get to school on their own. Parents who no longer need to make a special escort trip would be able to take advantage of special "offers" in workplace travel plans (such as cut-price travel tickets) to get the bus to work. The school travel plan increases the effectiveness of the workplace travel plan.

Similarly, home delivery of shopping might increase the impact of workplace travel plans if it means a commuter no longer needs the car to drive home from work via the supermarket. Teleworking might make it possible to shop locally, cycling to the shops instead of driving.

One measure amplifying another
Individual marketing programmes are only effective for the forty per cent of car trips for which a viable alternative already exists. But if new bus services or bike lanes are introduced, their use may be encouraged by a targeted marketing programme. The Stagecoach "Kickstart" bus quality partnership project in Perth, Scotland, achieved one of the highest patronage increases of any of the bus schemes described in section 2 (63 per cent), possibly because service improvements were publicised through a door to door marketing campaign. Individual marketing is not routinely carried out as part of bus quality partnership programmes, but the Perth example suggests that it could significantly increase passenger numbers on new services. Marketing programmes raise awareness of new services among car drivers, who otherwise have no way of knowing that a service has got better.

Similarly, a car club will only be viable if other means of transport, such as good bus services and bike lanes, are available for regular trips. Once joining a car club becomes viable, many journeys previously made by car will be made by bus, bike or foot.

Although we do not know how important these synergistic effects may be, it is reasonable to suppose that they will be larger if many measures – travel plans, bus quality partnerships, cycle lanes and so on – are applied together within a limited geographical area.

11.2 The risk of double counting

Might there be some circumstances in which the combination of several measures is less than – rather than greater than – the sum of their parts? For example, if the entire workforce in a particular town has received information about bus services through their workplace travel plans, the same information received a second time through an individual marketing programme might have little effect. Under these circumstances, there is a risk that the scenarios presented in this report would include some double counting.

This risk has been considered at various stages. To re-cap, the following possibilities of double-counting were identified:

Workplace travel plans and teleworking. The pool of employees able to change their behaviour might not be large enough to deliver the forecast changes in travel patterns in the ambitious change scenario. Estimates suggested that in the private sector, workplace travel plans would affect perhaps 2 – 3 million staff and teleworking some 3 million, out of a workforce of 16 million. In the public sector, most workplaces would develop travel plans, and on top of this up to a fifth of employees would begin teleworking a few days a week. This scenario therefore implies some large changes in working practices and culture (section 5).

Workplace travel plans and individual marketing. Both these interventions target the "market" of car journeys where a viable alternative already exists (see section 7). As discussed above, there is a risk that if both were intensively applied their combined effect would be less than the sum of their parts because they would exhaust the available market. However, most of the effects of individual marketing seem to come from leisure, shopping and personal business trips. In a city which had exploited workplace travel plans to the full, individual marketing might have 10 – 20 per cent less impact because of the smaller pool of trips available to influence.

Walking, school travel plans, and individual marketing. In the ambitious change scenario, school travel plans cut car travel demand by 1.3 per cent, and individual marketing cuts demand by 1.6 per cent. Around half of this (1.45 per cent) might arise from a modal switch to walking. It seems unsafe to assume too much additional impact from other measures to encourage walking (traffic calming, home zones, 20mph zones, housing close to everyday facilities), since the pool of car trips potentially available to switch to walking makes up only five per cent of car traffic. Section 10 therefore assumed a low additional impact of 0.2 per cent.

Figure 11.1 shows that the demand reduction effects in the ambitious change scenario are distributed across a range of journey purposes, and that the impact on most is slight. The biggest reduction in mileage is for commuting journeys, and so this is the trip type where we need to be most cautious about possible double-counting.

11.3 What is the impact of local measures when congestion is greatest?

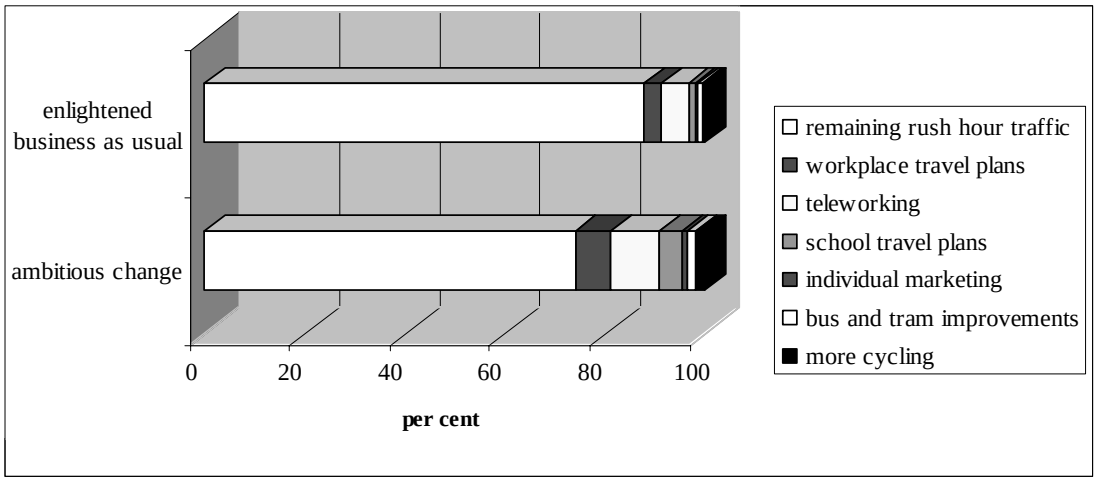
What impact might local small-scale schemes have on demand for car travel at the times when congestion is greatest – that is, during the rush hour?

The impact on rush hour travel can be estimated by assuming that:

- All the impact of workplace travel plans, teleworking and school travel plans is felt during the period between 7 – 9 am and 4 -7 pm.
- Around half the increased patronage arising from bus and tram improvements is for trips to work or college, which take place during peak hours. A small amount of peak hour modal shift for shopping and personal business trips is also allowed for.
- Slightly less than 20 per cent of the modal shift resulting from individual marketing is for peak hour trips. (Individual marketing mostly affects trips for purposes of leisure or shopping, which are more likely to be outside the rush hour).
- The rush hour contribution from community rail partnerships and car clubs is negligible.
- The contribution from non-education, non-work trips switching to walking is negligible.

About 29 per cent of car traffic is concentrated in the weekday morning and evening rush hours of 7 – 9 am and 4 – 7 pm. Using the assumptions given above, national demand for travel by car during these hours could be cut by between 12 per cent (enlightened business as usual) and 26 per cent (ambitious change). The contribution of the different measures is illustrated in figure 11.2.

Figure 11.2 Reduction in rush hour car travel demand contributed by small-scale measures



The figure assumes no induced traffic, and nor does it allow for any synergy between measures. As such it is a notional rather than an actual illustration of the contribution which might be made by the various measures. It is interesting, however, to note the relative scale of potential contribution from the different elements (table 11.3). Workplace travel plans and teleworking are dominant, together contributing between half and nearly three quarters of the reduction in peak hour car travel demand. Next most important are school travel plans, contributing between a tenth and just under a fifth. Measures to encourage cycling deliver comparable change to that from bus and tram improvements in the ambitious change scenario, although less in the enlightened business as usual scenario.

Table 11.1 **Reductions in rush hour car travel demand (per cent)**		
	Enlightened business as usual	**Ambitious change**
Bus and tram improvements	- 1.0	- 1.6
Workplace travel plans	- 3.4	- 7.2
Teleworking	- 5.4	- 9.7
School travel plans	- 1.4	- 4.5
Individual marketing	- 0.5	- 1.0
More cycling	- 0.5	- 1.8
Total	**-12.2**	**-25.9**

11.4 What is the contribution of local measures in the places most people live?

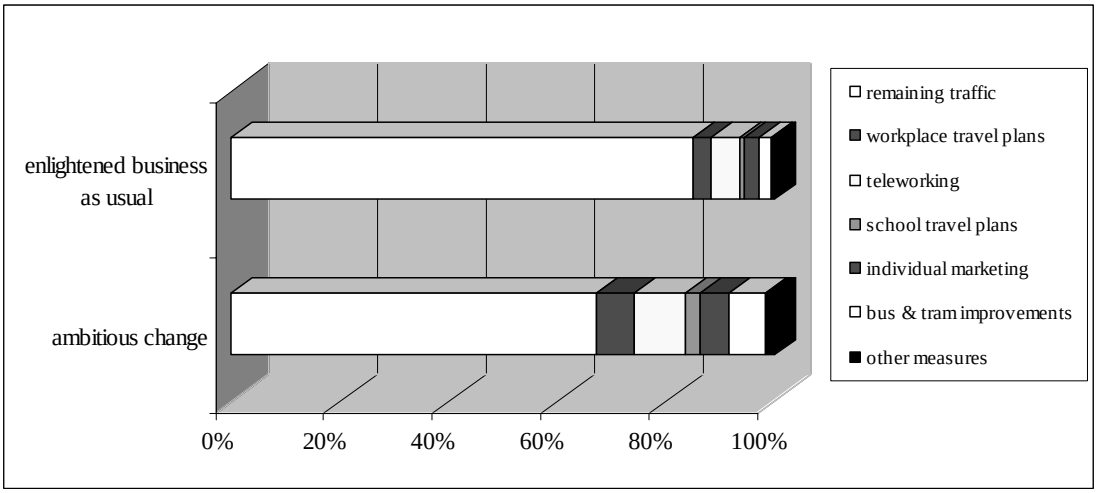
Most of the measures examined in this report are assumed to have greater impact in urban areas, particularly conurbations and cities with a population of over 250,000, and yet so far the assumed impact on demand for travel by car has been calculated for the whole country. Figure 11.3 and table 11.4 show the potential impact of local measures on an urban area, taking the West Midlands former metropolitan county (that is, the built-up area of the West Midlands) as an example. The potential reduction in demand for travel by car here could be between 15 and 33 per cent[30]. Because these estimates treat the West Midlands metropolitan area as self-contained, so that all journeys within the metropolitan area are made by residents, they over-estimate the potential contribution of individual marketing. However, even if the impact of individual marketing is halved, the cumulative impact of small-scale measures remains substantial.

As with calculations of rush-hour impact, these figures assume no induced traffic, and nor do they allow for synergy between measures. Again, they are a notional illustration of the contribution which might be made by the various measures.

[30] These estimates use data for the former West Midlands metropolitan county drawn from Transport Statistics for Metropolitan Areas 2000 and the 2001 census. Population 2,628,000; workforce 1,258,000; school-age population 464,405, of which 5-9 year olds travel an average 2.25km to school, with 37 per cent being escorted by car, and 10-16 year olds travel an average 4.67km to school with 23 per cent escorted by car; 22 per cent of car escort trips to school have no other purpose and return straight home; assumed car club membership in 2010 is 11.4 per cent of national membership, in proportion with West Midlands share of urban population in cities of over 250,000; bus passenger travel 1613 million km per year; increase in cycling and walking assumed to be such that all areas reduce car traffic by the same proportion; light rail in West Midlands currently accounts for 55.8 million passenger km per year; with additional tram lines this is assumed to increase fivefold; car traffic on all major roads is 5.6 billion km per year. Other data and assumptions are as for calculations of national impact.

Table 11.1 **Reductions in car travel demand in the West Midlands metropolitan area (per cent)**		
	Enlightened business as usual	**Ambitious change**
Bus and tram improvements	- 2.3	- 6.5
Workplace travel plans	- 3.4	- 6.9
Teleworking	- 5.2	- 9.4
School travel plans	- 0.9	- 2.8
Individual marketing	- 2.7	- 5.5
More cycling	- 0.3	- 1.2
Car clubs	- 0.14	- 0.3
More walking	- 0.1	- 0.2
Total	**- 15.1**	**- 32.8**

Figure 11.3 Reduction in car travel demand in the West Midlands metropolitan area



The West Midlands example shows that – not surprisingly – the impact of local measures is greatest in those places where most people live, and where traffic volumes and traffic congestion are most severe. While large cities and conurbations with well-developed public transport networks may have particular advantages in delivering traffic reduction, experience shows that smaller towns can also be effective in cutting traffic growth. Small historic towns have particular advantages because of their compactness and urban form which enable them to provide good quality public transport and mean that many journey destinations are accessible by foot or public transport. Examples of towns which have successfully applied many of the measures described in this report include York and Nottingham. Traffic in York fell by 4.6 per cent between 1999 and 2001, and the city council is hopeful that it may be able to revise its traffic growth target downwards from the current four per cent growth between 1999 and 2006 to zero growth, despite new edge-of-centre office developments which are likely to increase car travel.

In rural areas and in small towns, small-scale measures may have less potential to reduce traffic within the next ten years because the interventions needed to reduce traffic in these areas are less well developed. Measures such as individual marketing and car clubs have less impact where public transport is poor; and there is little experience so far of the potential for rural quality bus partnerships to reduce car travel. This does not mean it is impossible to reduce traffic outside large cities and conurbations; but rather that we are further from understanding what types of interventions might be scaled up to deliver significant amounts of traffic reduction, and need to develop that understanding through pilots and demonstration projects. Different packages of measures, including for example demand-responsive bus services; frequent local rail services supported by community rail partnerships; leisure travel plans to reduce car-based tourism; high quality cycle routes and pedestrian facilities to avoid conflict with high speed main-road traffic; home delivery services; and support for local facilities such as banks, shops, schools and post offices are all likely to have the potential to reduce rural traffic.

11.5 Will induced traffic erode the benefits of local measures?

This research has shown that local measures have the potential to reduce demand for travel by car – but is this the same as saying they can reduce traffic? One line of argument suggests any gains from these local measures will be eroded by induced traffic: that is, for every person who starts taking the bus to work, or teleworking, or walking their child to school, someone else will take advantage of the released road space to drive. Coombe (2002) argues that new traffic is induced "whenever the ratio of traffic volume to road capacity is reduced…either by reducing the volume of traffic, through travel reduction policies for example, or by increasing road capacity by whatever means, either traffic management or new infrastructure." In other words, we are playing a zero-sum game (or nearly so) – whatever we do, the large pool of latent demand for road space means that traffic will expand to fill the space available.

However, the ratio of traffic volume to traffic capacity is at least partly a function of the relative attractiveness of other modes, as hypothesised by Martin Mogridge in his discussions of the Downs-Thomson paradox[31]. As alternatives to the car get *better* (buses speed up and become more reliable, fares go down as passenger numbers increase, cycle lanes make cycling safer), the equilibrium level of traffic congestion may go *down*. If the average time taken to travel to work by bus is cut from 20 minutes to 15 minutes, a rational traveller considering whether to drive or take the bus will reject the driving option if congestion is such that it takes more than 15 minutes. Before bus services were improved, driving would have seemed attractive even if congestion meant the average journey time was 20 minutes. This suggests that local measures which improve the relative attractiveness of non-car modes, including bus quality partnerships, safe routes to school, cheaper fares as part of workplace travel plans, *could*, if implemented on a large scale so that their benefits were generally available to most people, reduce levels of traffic and congestion. The relationship between the impact of a particular measure on *demand for travel by car* (as estimated by this report) and

[31] Mogridge described a hypothetical situation in which an increase in road capacity leads people to shift from public transport to driving. As a result, public transport operators are forced to reduce service frequencies or increase fares to cover their costs. This shifts additional passengers from public transport to cars, so that congestion is worse than before highway capacity was increased.

its impact on *traffic volume* and *congestion* is not necessarily simple, but this theory implies that the measures discussed in this report would have an impact on traffic levels, not completely offset by induced traffic.

Some of the local measures described here include an element of traffic restraint by their very nature. Bus quality partnerships, light rail schemes, cycle schemes, traffic calming, pedestrianisation and safe routes to school all require re-allocation of road capacity. Workplace travel plans may include parking restraint, both at the work-site and in the surrounding area. While this inherent restraint may not be enough to prevent induced traffic, it is likely to mean that the amount of induced traffic is less than would be the case if road capacity remained unchanged.

The amount of induced traffic will also vary from place to place, depending on how congested roads already are. In congested areas, such as much of the south east of England, it is likely that much of the benefit of the local measures discussed here could be eroded in the absence of comprehensive restraint measures. In areas where roads are operating below capacity, benefits are less likely to be eroded by induced traffic.

However, as discussed in section 11.1, the impact of local measures *combined with* traffic restraint is likely to be greater than the impact of either on its own. If travel plans, individual marketing, and high quality public transport and cycle facilities are developed, *less* traffic restraint should be necessary to achieve a given level of behaviour change. This traffic restraint could take a variety of forms:

- Re-allocation of road capacity: closing roads to through traffic; creating more space for pedestrians and cyclists; installing bus lanes; re-phasing traffic lights to allow more time for pedestrians and buses; or replacing pedestrian subways with surface-level crossings.
- Parking management: low parking standards for new developments; higher parking charges; workplace parking levies; re-allocation of parking space for other uses (wider pavements; bus lanes; city-centre housing or retail development).
- Charging or taxation: congestion charging; higher fuel duty.

In summary, local measures are likely to reduce both traffic volumes and levels of congestion and their impact will not necessarily be nullified by induced traffic. Their benefits are more likely to be preserved when they are implemented as part of a package including restraint measures.

11.6 The contribution of local measures in multi-modal study areas

It is difficult to generalise about the potential effect of local measures on travel demand in the areas which are the subject of multi-modal studies, as these areas and corridors and the trip patterns within them are so diverse.

On corridors such as the M25, some of the measures discussed here – school travel plans, bus quality partnerships, measures to encourage walking and cycling - have limited potential. The Orbit multi-modal study (KBR 2002) found that journeys using the M25 tend to be long (the majority of peak hour trips are 30 – 100 kilometres) and to have widely dispersed destinations, many of which would be difficult to serve by public transport. A high proportion

of trips on the M25 are work-related, so interventions such as promotion of teleworking, workplace travel plans and video-conferencing may have the potential to reduce travel demand. The Orbit study argues that any benefits from these interventions would be quickly offset by induced traffic unless they were accompanied by restraint measures such as charging.

The multi-modal study of north/south movements on the M1 corridor in the East Midlands (WS Atkins 2002) concluded that workplace travel plans, awareness raising and quality partnerships could make an important contribution to reducing congestion on the M1 if implemented widely and at high intensity. WS Atkins suggests a programme of workplace travel plans costing £7.5 million over five years; investment in quality partnerships of £13.3 million; and awareness-raising of £4.2 million. These sums are much larger than the amounts normally spent on such measures, but this scale of ambition is probably necessary to achieve the sort of results predicted in the scenarios in this report.

In areas where a significant proportion of trips are local, small-scale measures are likely to have greater impact. The West Midlands Area Multi-Modal Study suggests – based on ball-park estimates – that measures such as travel plans, teleworking, walking and cycling improvements and more comfortable public transport with better image and branding might over the long-term result in modal shift of up to 15 per cent (ABC 2001). This is comparable to the enlightened business as usual scenario for the West Midlands presented in this report.

Few multi-modal studies – including those mentioned above – have yet attempted much more than a "guesstimate" of the impact of local measures on travel demand, as information on the effectiveness of local measures applied at different levels of intensity has not been generally available. As understanding of these measures grows, future multi-modal studies should be able to make a more thorough examination of the potential contribution from local measures.

Coombe (2002) argues that current appraisal methods for trunk road schemes involve forecasting demand for the opening year of a scheme and providing sufficient capacity to cater for this – in other words "predict and provide fully" for opening year flows. The multimodal studies provide an opportunity to model the medium term effect of applying many small-scale measures over a wide area and at high intensity and, at the very least, multimodal studies could be applying a range of "traffic change factors" to their forecast traffic demand figures, to allow for the impact of these local measures at varying levels of intensity. This would enable policy makers to choose between a scenario in which less action is taken to reduce travel demand through travel plans, better bus services and so on, and traffic growth leads to more congestion (or short-lived congestion relief through more road-building); and scenarios in which high intensity application of local small-scale measures coupled with traffic restraint measures lead to lower traffic growth or even traffic reduction.

12. Conclusions

The accepted wisdom about most of the measures explored in this report is that their impact on demand for travel by car is at best marginal, and that once any benefit has been eroded through induced traffic their net effect on traffic volumes and congestion is negligible.

This report suggests that the potential for local measures to affect car travel demand may be greater than previously thought, although this potential will only be realised if local measures are applied with greater intensity and on a greater scale than at present, such that they cease to be "small scale" schemes.

It suggests that the impact of local measures will be greatest in congested areas and at congested times. In an ***enlightened business as usual scenario***, car travel demand could be reduced by 12 per cent during peak hours, or by 15 per cent in a typical large urban area. The national impact in car travel demand could be 5 per cent (all figures are for the year 2010).

In an ***ambitious change scenario***, car travel demand in peak hours could be cut by 26 per cent. The impact in a typical large urban area could be 33 per cent. The national impact could be 10 per cent.

Throughout this report, policy measures have been identified which would support achievement of the *ambitious change* and *enlightened business as usual* scenarios. In summary, these were:

- Adequate funding for a major rolling programme of quality bus partnerships, covering the entire bus network over a period of five to ten years
- Widespread adoption of flat fares and multimodal travelcards, and real fares reductions targeted at encouraging repeat use of public transport
- Re-allocation of road space to enable effective end-to-end bus priority measures
- Support for community rail partnerships, including sufficient funding for and attention to small scale infrastructure schemes (e.g. passing loops, resignalling, station refurbishments)
- Pro-active government support for more travel plan co-ordinators in local authorities
- Incentives for private companies to develop travel plans, including workplace parking levies, a requirement for companies to offer "parking cash out" as an alternative to a free parking space at work, a requirement for large companies to employ mobility managers, and direct grants.
- Voluntary parking cash out benefits should no longer be taxed as a benefit in kind
- More active promotion of the benefits of teleworking to employers and their staff, though workplace travel plans
- A stated national policy aim that every child should have a safe route to school by 2010, with resources dedicated to small-scale street improvement schemes to enable this
- Roll-out of the current pilot programme of dedicated, high quality school buses

- Large scale trials of independent marketing, comparable to those developed in Perth, Australia
- Start-up funding for first generation car clubs, and tax breaks such as some form of fuel duty rebate to give car clubs a competitive edge over individual car ownership
- Partnership between public transport operators and car clubs to provide incentives for people to develop "mix and match" mobility patterns
- Sustained, increased investment in improving the infrastructure for cycling, to provide continuous, high quality cycle networks
- Revised design guidance for mixed-use non-trunk roads, to enable more pedestrian- and cyclist- friendly design
- Better enforcement of policy on location and form of new housing, to ensure new developments are compact, attractive for walking and cycling, have key everyday facilities nearby, and are not located where car-based long-distance commuting will be encouraged
- Effective street maintenance strategies to improve the quality and condition of the street environment.

To argue that local measures have the potential to deliver significant behaviour change is *not* to argue that they are easy, or inexpensive, or uncontentious. Widespread implementation of the measures discussed here is likely to require increased funding, both capital and revenue, sustained over a period of years; more local authority staff with the appropriate skills; and in some cases legislative change. Local measures may be less attractive to politicians wishing to champion a high-profile project. And local experience shows some elements of the measures discussed in this report may be contentious: bus lanes may be opposed by traders; and parking restrictions as part of workplace travel plans may be resented by employees.

Nor does this report argue that local measures are *on their own* a solution to traffic growth. To be effective, local measures must be accompanied by traffic restraint. It *does* argue that local measures may increase the effectiveness of traffic restraint, so that less traffic restraint becomes necessary to achieve a given level of behaviour change.

The merit of local measures lies in part in their potential to engage traffic generators (businesses, schools, leisure centres, and shopping centres) and the general public in taking more responsibility for their car use. From experience of travel planning, individual marketing, bus quality partnerships and the other interventions described in this report, it seems that people's travel patterns are less fixed, and more susceptible to influence, than we might imagine. Gentle interventions which make it easier for people to change their travel behaviour should surely have an important place in the toolbox of every transport planner.

13. Appendix: previous research on the effectiveness of local measures

Multi-modal studies: soft factors likely to affect travel demand
This study was commissioned from Halcrow by DTLR to assess how effective soft measures might be in reducing demand for travel by car, particularly in road corridors and areas which were the subject of multimodal studies (DTLR 2002a).

The Halcrow study was cautious about the extent to which soft measures might affect traffic levels, particularly on trunk roads where long-distance traffic predominates. However, it identified the following factors that could have a material effect on travel demand in multi-modal study areas:

- Teleworking, which could reduce car commuting traffic by up to six per cent by 2015
- Videoconferencing, which could reduce car business travel by about five per cent by 2015
- Workplace travel plans, which could reduce total traffic volumes by between 0.8 and 1.2 per cent by 2015
- Public transport fares and ticketing, which could have small but significant effects on urban radial corridor traffic
- Individualised marketing campaigns
- Bus quality partnerships, which could reduce car travel by 5 - 10 per cent in selected corridors and by ¾ per cent in urban areas.

The Halcrow study was in turn the subject of review by James (2002), which argued that Halcrow had underestimated the potential impact of soft measures, and that overall reductions of the order of 15 – 20 per cent were achievable, based on current evidence. Factors identified as particularly significant by James were:

- Teleworking (3.7 per cent)
- Workplace travel plans (2.4 per cent)
- Public transport marketing and ticketing (2 per cent)
- Land use effects (2 per cent)
- School travel plans (1.3 per cent)
- Internet shopping (1.2 per cent)
- Videoconferencing (1.2 per cent)
- Cycling (1.2 per cent)

Impacts of one per cent or less were suggested for car clubs, improved public transport interchanges, better public transport information, bus quality partnerships and promotion of walking.

Both the Halcrow report and the review by James use a similar methodology to this report, assessing available evidence about the likely impact of particular measures and their likely uptake. Although the Halcrow report does not suggest what the combined impact of these measures might be, adding together the figures it suggests for different measures gives a total of around five per cent by 2015, on the face of it a larger contribution than assumed in the ten year plan traffic forecasts.

Policies to attract drivers out of their cars for short trips

This research (Mackett 2001) looked at what people say would attract them to use their cars less for short trips of under five miles. Most trips (nearly three quarters) are less than five miles, and these trips account for 14 per cent of distance travelled by car nationally. Within urban areas short car trips are likely to make up a larger proportion of mileage. The study team carried out a detailed analysis of over 2500 short car trips made by people in five parts of the UK, both urban and rural. Using in-depth interviews to ask questions about specific car trips, they found that for more than three quarters of all trips, the driver could identify another way of making the journey. The main alternatives identified were taking the bus or walking, each of which was identified as an option for just under a third of trips. Cycling was a viable option for seven per cent of car trips.

The research then asked what changes would need to be made for people to switch from their cars to the alternatives they had identified. For a third of all trips, the driver was able to identify an alternative way of making the trip, but could suggest no specific action which might lead them to take it, or simply said it required them to take personal action. Many of these trips were ones which the respondent felt could be made on foot. Marketing or travel awareness programmes might be one way to influence these trips, although this type of action was not mentioned by respondents. In another fifth of cases, respondents said bus routes or frequencies would have to be improved for them to switch from their car. Other potential actions, such as improving walking or cycling facilities, or reducing the need to travel through home delivery or more local shops, generally had smaller effects.

The research found that a range of what were termed “collective” actions could together cut the distance travelled by car on short trips by about 39 per cent. These actions included improving bus services, making travel by bus and foot safer for children and older people, reducing the need to travel through home delivery and other initiatives, reducing the cost of travel, and improving walking and cycling facilities and rail services. This does not take into account any behaviour change resulting from marketing or travel awareness programmes. The impact of these collective actions on total traffic mileage (on trips of all lengths, not just short trips) would be to cut it by about five per cent.

The study emphasises that what people say they will do and what they actually do are not the same thing, and so bus service improvements and other actions cannot be expected on their own to deliver as much change as indicated by drivers’ responses to the survey. However, the research provides several useful insights:

- Short trips make up a sizeable proportion of all traffic mileage, so action to encourage modal shift for short journeys is worthwhile
- The proportion of short trips for which no adequate alternative exists or could be provided is small (about a fifth)
- There are many trips for which adequate alternatives already exist. Information, encouragement and marketing are needed to encourage modal shift for these trips, rather than infrastructure improvement.
- Better bus services are perceived by many drivers to be an important requirement for modal shift.

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