Motoring towards 2050

Roads and Reality

Banks, Bayliss and Glaister

RAC Foundation

The Royal Automobile Club Foundation for Motoring Limited is a charity established to promote the environmental, economic, mobility and safety issues relating to use of motor vehicles.

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In association with Arup

The research for this report was carried out by Nick Banks, David Bayliss and Professor Stephen Glaister.

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Foreword

Royal Automobile Club Foundation

The future of the road network is essential to the economy of the UK and indeed to the personal mobility of individuals.

The main road network is a highly valuable asset. Its value is being undermined by failure to develop it effectively to deal with growing demand. The Royal Automobile Club Foundation has been concerned that the importance of its future has been understated by governments, politicians, some transport experts, and indeed the population at large.

We felt that the Eddington study was a positive report, which started to address some of these issues, and recognised the economic importance of the network. However, we also felt that the report did not look far enough ahead and we were encouraged by Sir Rod Eddington to initiate our own study to look beyond 2025.

In order to undertake this important task we put together a research consortium combining some of the best minds in the business. We are most grateful to the main researchers Nick Banks, David Bayliss and Professor Stephen Glaister for undertaking this task. They have conducted extensive modelling to try to get a feel for how our road network will look in the future taking account of demographic changes such as population growth and ageing, and housing development.

This report is the result of two years of intensive study. The researchers modelled the future with and without road pricing. Some commentators have suggested that road pricing would remove the need for road improvements. Some politicians are against national road pricing. Hence we felt it was more useful to consider both scenarios.

At a late stage in the production of this report the Department of Transport published its response to the Eddington and Stern reports in the White Paper *Towards a Sustainable Transport System*. We welcome the recognition by Government of the need for long term planning for transport. A final judgement must wait on how the ideas in the document are further developed. We hope this report will be studied as an input to the Government's planning and that action will be taken on its findings before it is too late.

David Holmes CB
Chairman
Royal Automobile Club Foundation

November 2007

Executive Summary

Executive Summary

Road congestion is already seriously harming the environment and the economy and it will get worse. There is no effective policy in place which will improve things, and popular single solutions are often mere wishful thinking. This report objectively examines what is happening, the realistic policy options and the combination of actions most likely to work.

The road network is the principal national transport asset. Roads carry over 90% of motorised passenger travel and 65% of domestic freight movement. Growth in population, numbers of households and incomes will drive rising demand for travel. Official estimates predict that by 2041 the number of cars will be 44% higher than today and that car trips will increase by 24%. We estimate that traffic (the distance travelled by cars) will grow by 37%. So investment in, and efficient management of, our national roads should be a high priority. But it is not.

Congestion is an everyday experience, and it is growing and spreading more widely over the road network. There has been substantial underinvestment in transport systems over many years; although this is now being slowly put right on the railways. Low levels of road building have led to higher congestion and more greenhouse gases. Unless congestion is tackled, not only will journeys on the roads become even slower and less reliable than they are today, the country's international competitiveness, and hence economic growth, will be damaged. Businesses will look to locate abroad for better connections to markets, suppliers and workforces. Quality of life will suffer as the increasingly diverse variety of journeys which are an important part of modern life become more difficult and time-consuming.

In 2002 the report of our independent inquiry, *Motoring towards 2050*[1], argued that, for as far ahead as we can see, the car will remain the main means of personal mobility and road transport the main carrier of goods. Noting that congestion was already severe, and that any significant initiatives for improvement would take a long time, it pressed for action to meet the challenges to start straight away. The situation is now more acute.

The Eddington Report of December 2006[2] emphasised the importance to the economy of good transport links – for growth, international trade, the efficient distribution of goods, and for making the best use of skilled labour. The Government's White Paper *Towards a Sustainable Transport System*[3] supports this judgement. Eddington also highlighted the very large economic returns to be gained from well-targeted investment. But an efficient transport system is important also for the citizens of this country to have access to the whole range of activities and services which make up modern living, such as jobs, education, leisure, medical services, and cultural and social events.

Road building is not popular with governments, central or local. So a number of initiatives and policies for transport and related land use planning are being pursued or considered with the objective of reducing the demand for roads, including

- improvement of public transport systems,
- cost-effective investment to enable the railways to overcome some of the capacity problems that inhibit their growth,
- making use of the opportunities offered by electronic technology to substitute for some travel,
- car sharing and travel plans, and
- encouragement of walking and cycling.

We considered the contribution that improving public transport could make to relieving congestion in *Motoring towards 2050*. We concluded that it would have some effect in reducing the expected growth in road traffic but that this would not be substantial. Our assessment of the potential contribution of the other measures noted is similarly relatively small. The scope is particularly limited for the main inter-urban routes with which this study is principally concerned. For these roads various

[1] RAC Foundation for Motoring (2002) Motoring towards 2050 (London: RAC Foundation)
[2] HM Treasury, Department for Transport (2006) The Eddington Transport Study: The Case for Action. (London: TSO)
[3] Department for Transport (2007) Towards a Sustainable Transport System Cm 7226 (London: TSO)

measures are being used or investigated aimed at managing traffic to make better use of the existing capacity. Although these are expected to make a contribution to easing congestion and should be pursued vigorously, on their own they will be insufficient to provide for present needs – let alone future traffic growth.

Against this background we have examined how the road network might be developed and managed cost effectively to deliver improved performance in support of economic and quality of life requirements. We conclude that, to achieve this objective, Britain needs a long term strategy for road transport based on a road building programme on a scale similar to that achieved in the early 1990s. The strategy should include national road pricing which would make the roads work more efficiently and, if properly regulated, would be a fairer way of charging for their use. Ministers have consistently said that we cannot build our way out of congestion. Of course not, and no-one would seriously advocate such a policy. But that does not mean increasing demand should be ignored, or that inactivity or repression is the right response to growing demand.

Environmental concerns

The adverse environmental impacts of road transport are important and must be taken seriously. They include emissions of pollutants and greenhouse gases, visual intrusion and noise. All these can and must be dealt with. Proper long-term planning, adequate and balanced investment, and targeted research and regulation can ensure that we meet our environmental objectives without sacrificing economic prosperity or our modern way of life.

Chapter 2 shows that improved vehicle and fuel technology has made huge progress in reducing or eliminating harmful emissions and that there are good prospects for taking this further. The recently published King Review[4] concludes that, possibly by 2050 in the developed world, decarbonisation of road transport could lead to reductions of around 90% in per kilometre emissions. On this basis, if road use approximately doubles by 2050, an 80% reduction in total road transport carbon dioxide could be achieved.

It is mistaken to argue that constraining road-building and massive investment in public transport will cut greenhouse gases. Congestion wastes fuel and so adds to the production of carbon dioxide. Chapter 5 looks at the effects on carbon dioxide production of road building and road pricing. It demonstrates that road building on the scale we envisage would increase carbon dioxide by no more than 5% assuming no other change: but in reality improvements in fuel and vehicle technology will achieve much greater reductions by then, and road pricing would more than counteract any effects of road building. Even if the use of public transport were doubled, it would make only a small difference either to the demand for car travel or to carbon emissions.

Though the building of the motorways and other main roads has made a profound contribution to the development of our modern economy, opposition to road building has grown over the past 20 years. This is to some extent attributable to insensitive planning of some of the earlier motorways, which has damaged important stretches of countryside and severed communities. Considerations of cost have too often prevailed over good planning. Any future programme must be planned much more sensitively. Routes must be chosen which avoid areas of environmental or historic importance, even if they are longer than a direct route; much more attention should be paid to the design of roads and structures; and more use should be made of tunnelling, for example, to reduce visual intrusion and noise. The benefits of the right road schemes are so great that they will still be good value for money despite the extra cost.

General objections to road building are often based on beliefs which are sincerely held and not to be dismissed out of hand, but they are sustained by over-simplifications and misconceptions. We examine some of these beliefs in Chapter 3 where, for example, we note that:

[4] HM Treasury (2007) The King Review of low-carbon cars. Part I: the potential for CO2 reduction (London: TSO)

- The suggestion frequently made that new road capacity 'simply fills up with traffic' fails to recognise the benefits supplied by the new capacity. New roads are built primarily to provide better, safer alternatives to inadequate or unsuitable existing roads (for example by-passes). They also provide the opportunity for greater access for more people.
- Road users are not subsidised. On the contrary, they currently pay more than enough tax to meet the full cost of road transport, including all environmental costs. Among all energy uses, only road users pay in tax more than the full price of carbon emissions.

The analysis

This study has examined the need for road building with and without road pricing. Our conclusions relate to the strategic road network – motorways and other major routes which link the regions and principle cities of Britain – even though our approach has required that we model the complete network. We have not examined in any detail the problems of suburban or urban areas, which deserve separate investigation.

We have explored the relationship between road building and road pricing to gain greater understanding of the costs, benefits and income, and the scale of new road building that would be necessary and justified.

The Eddington Study undertook a similar analysis to ours. Our work has been more detailed in looking at road transport needs, and it has used a longer timeframe – up to 2041 instead of 2025. We have applied mostly the same source data and the same type of road pricing – a national scheme based on the cost of travel to society, including the delay to other road users and environmental damage. We have called this 'efficient pricing'[5]. In the main, we have also used the same or similar assumptions, appraisal conventions and forecasts as Eddington.

The Eddington study, for which the analysis was carried out by officials from the Treasury and the Department for Transport (DfT), came to a similar conclusion that both road investment and road pricing are necessary, but with a different and lower assessment of the level of road building that would be economically justified. The reasons for the differences are discussed in more detail in Chapter 5 and in the Technical Report[6]. In summary they are that our study looked further ahead than Eddington, we used regional variations in values of time, and we separated out the benefits and costs to the economy and individuals from the benefits and costs to the Treasury by way of changes in taxes and charges. We consider that our method gives a clearer picture of the real implications for the economy and people: how the Treasury raises the money it needs in later years is a separate issue.

In summary, the choices for the inter-urban and strategic[7] road network are

- to do nothing and let **congestion** and wasted time match demand to the supply of road space,
- to build or widen **more roads** without pricing,
- to introduce some form of **road pricing** without additional road building and use the price mechanism to determine who should use the roads where there is insufficient capacity, or
- to employ a **combination of road building and road pricing** – the building to provide for the growing demand for travel and the pricing to ensure efficient use of road space.

[5] *Efficient pricing* - is based on the additional cost to society of every extra trip. A charge would be paid for vehicle use in relation to the costs imposed, comprising a standard rate for each type of road to cover the cost of providing the road and of additional accidents and adverse environmental effects, and a variable rate to reflect the increased delay to other road users, depending on place and time. It would, so far as possible, be objectively determined in relation to costs actually imposed in those circumstances.

[6] www.racfoundation.org/roadsandreality/technicalreport

[7] In this study 'strategic' roads are defined as the roads under the responsibility of the Highways Agency in 2003 (when the speed and flow data was collected), and the trunk network in Scotland and Wales. It comprises almost all the motorways and the trunk A roads. Since 2001 the Highways Agency has been implementing a programme of 'detrunking' strategic A roads- i.e. responsibility has been transferred to local highway authorities. When it is completed the English strategic road network will be reduced by a third. In 2003 the Agency was approximately midway through the programme.

The analysis shows that

- there is a strong economic case for more strategic road building in Great Britain at an annual rate of around 600 lane kilometres a year (Lkmpa), or more, whether or not road pricing is introduced. This is about the average level of road building achieved in the 1990s. The current level of construction is low by comparison,

and further that

- road building combined with efficient pricing would result in a higher economic return because mobility would be enhanced while congestion is reduced. It would also be fairer. The extra capacity would reduce the price needed to contain congestion, and travel by car would be affordable for more people on lower incomes.

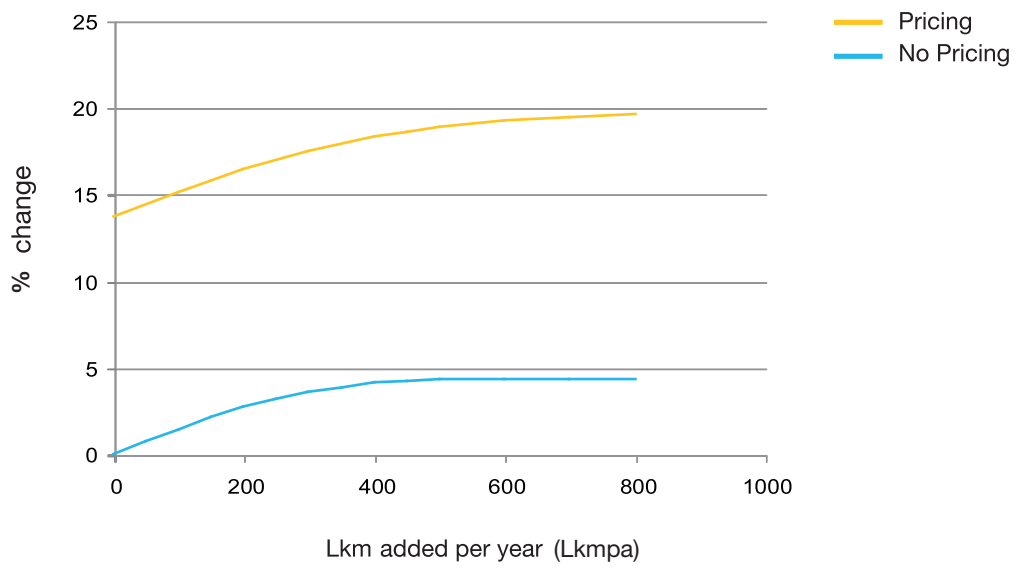
Key elements in the results of the analysis are as follows: (changes in speeds are used as an indicator of changes in congestion, speed reductions indicating worsening of congestion and increases improvement)

- In the absence of any interventions traffic would increase by about 37% between 2010 and 2041. There would be greater delays. The Eddington Report estimated that in the absence of action, the cost of congestion would rise by £25 billion between 2003 and 2025. It would, of course, go on growing thereafter.
- Adding a significant amount of strategic road capacity allows for an increase in traffic. However, without pricing or other measures, motorway speeds would still be 16% lower (ie delays caused by congestion would be greater) than in 2010.
- Efficient pricing on its own would cope with only 85% of forecast growth in traffic. Compared with the 2041 'do minimum' base case, speeds on motorways would be 12% higher (ie delays would be less) but its main effect would be in conurbations where traffic would be substantially reduced and speeds increased. Pricing in conurbations and other congested urban areas would need to be implemented with a complementary package of additional road capacity, public transport and

Figure 1 summarises the effects of additional capacity and pricing.

Figure 1

Effects of additional capacity and efficient pricing on average speeds on strategic roads in Great Britain in 2041 relative to "do minimum" base scenario



other measures. Without this the reduction of congestion would be limited, charges would be higher and mobility would be reduced for many.

It should be noted that the figures given above for increases or reductions in speeds are averages over the course of a day, including the times when traffic is very light. So, if average speeds reduce by a given percentage (ie average delays increase), the effect at peak periods would be much greater.

Costs, revenues and affordability

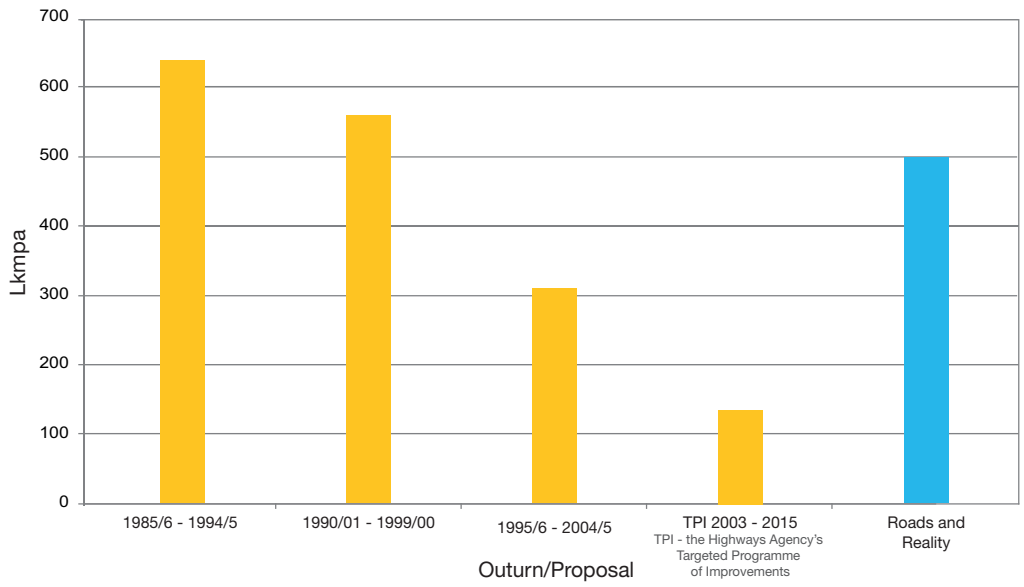
We have estimated the cost of providing an additional 600 Lkmpa of capacity to the strategic network as around £4.5bn a year, considerably more than current expenditure. Our recommended programme would provide good value for money with scheme benefit-cost ratios above 2:1. We recognise that there are pressures on public expenditure. But the programme we advocate is capital expenditure, producing a higher rate of economic return than most other forms of public spending.

We estimate that the annual financial yield from efficient pricing in association with a 600 Lkmpa programme would be £25-30bn. This would be payment from users additional to fuel duty and road tax at the present rate. We argue in Chapter 6 that public acceptability of pricing requires that some of this money must be seen to be directed to projects addressing relief of congestion. Our estimate of the cost of setting up and operating the pricing system itself is around £4.5bn a year. The pricing yield would be able to cover this together with the cost of 600 Lkmpa additional capacity and leave a substantial balance, £15-20bn. We argue, again on acceptability grounds, that all or most of this should be used to reduce the existing taxes on road users.

Thus efficient pricing, as well as increasing the benefits from the new capacity, would provide the means to finance it.

Figure 2

Actual and proposed rates of road construction – England



Towards a long term national roads strategy

Government policy has for some years been to reduce the size of the strategic network for which it is responsible by handing major routes over to local authorities. This leaves central Government responsible for only the motorways and very few other major roads. Its policy is to widen the most congested sections and make minor improvements. Motorway widening is highly necessary as a short-term measure, but it can create only a once-for-all increase in capacity which would be insufficient to meet continuously growing demand. The Government has also been exploring the feasibility of national road pricing, though no decision has yet been taken. Our study has shown that road pricing could not on its own cope with the increase in demand. Without a substantial programme of road construction, the Government would have to rely on using higher and higher road charges to choke off demand particularly from those least able to pay. This would seem to be an unattractive prospect from both the economic and social points of view.

A fundamentally new approach is required. To deliver a programme of road building on the scale we conclude is necessary and to realise the benefits in the process will require a fully scheduled plan with a long term horizon showing which links should be developed and how and when. To establish this will require comprehensive assessment of forecast patterns of demography and economic activity, and the new and more extensive patterns of travel that economic growth and social change create[8].

Figure 2 shows for the strategic road network in **England** how our conclusions compare with past rates of construction and the Highways Agency's current Targeted Programme of Improvements (TPI) which should be substantially completed by 2015. The Department for Transport has given no indication of what the programme after that will look like.

Following the approach of the Eddington report, the Government has now proposed a new approach to strategic transport planning on a multi-modal basis, based on Eddington's proposals. We welcome an approach which starts from what people need and want, rather than the wishes of the providers of transport. But we would counsel against following the pattern of the local multi-modal studies set in hand in the late 1990s. These took a long time, were very expensive in consultants' fees, and produced little by way of useful results. What is needed now is a brisker, more focussed piece of work, examining genuine alternatives but concentrating on the urgent problems.

So far as the strategic road requirements are concerned, only government has the resources to develop a detailed plan, but our indicative proposals for corridors where new strategic roads or other major capacity enhancements should be considered are

- substantial extra capacity to serve growing demand between London, the Midlands and the North,
- capacity to relieve congestion and serve population growth in eastern England, the South Midlands and the South West,
- East-West routes between conurbations in the Midlands and between those in Yorkshire and the North West,
- radial routes from London, and
- orbital capacity round the main conurbations.

Additional capacity can be provided by widening existing roads, both part of and outside the present strategic network. As widening proceeds, however, the scope for further improvement by this means will diminish and an increasing need to provide some completely new roads can be expected. Considerations of planning may also point towards completely new roads, to reflect, for example, changes in location of population and economic activity or establishment of new major transport facilities like airports. Provision of parallel alternative route capacity would not only relieve the major motorways, but would provide diversionary routes when accidents or other events cause disruption.

[8] The Government has recognised the importance of redressing underinvestment in public infrastructure: see Productivity in the UK para E9: http://www.hmtreasury.gov.media/E4/71bud06_productivity_513pdf

Where new roads are necessary, they should be planned with 21st century standards and technology, with the most modern safety features and more effective environmental mitigation including more use of tunnels and cuttings. Consideration should also be given to new roads confined to cars and light vehicles where these parallel and relieve existing routes. They would be cheaper to build and maintain, could be less intrusive and would be more pleasant and safer to drive on since cars would be separated from heavy lorries. Private finance would be an option, with or without tolls.

Implementation

Public policy, especially in the last fifteen years, has increasingly failed to address effectively long term road transport issues. The road network is of variable quality and is already under strain from sustained traffic growth. But there is currently no national plan for the whole road network. Nor are there long term congestion reduction targets, despite the widespread introduction of targets in other public service areas. There are no statutory obligations at national level to reduce congestion. Following the recent reorganisation of the Department for Transport, there is now no part of the Department , and no Minister below the Secretary of State, with responsibility for the network of roads as a whole. In recent years there has been a progressive weakening of the political support for road improvement, and an increase in the complexity and difficulty of obtaining approval and funding for road schemes. The latter difficulties should be eased by the proposals in the Planning White Paper, but only if there is available an authoritative, coherent and substantive long term plan for the strategic roads.

At the heart of these problems is a lack of leadership and of long term thinking to address growing demand and an ageing network, and a pretence that growing congestion is beneficial in working to help the environment by deterring traffic. Without some fundamental changes there will be no prospect of achieving either congestion reduction or a more efficient use of the highway network, or indeed providing essential support to a continuingly prosperous economy.

In its Planning White Paper[9] the Government is proposing to prepare National Policy Statements for major infrastructure, including transport. We support this provided they can be prepared quickly, and would argue that for transport such Statements should include a comprehensive long term strategy for the road network as discussed above. We also support the proposals for speeding up the planning process.

Road pricing

Our analysis shows that road pricing can increase the benefits yielded by an improved road network. It shows also that, without additional investment in new road capacity, many road users would lose from the change and the additional cost to the motorist on average would be considerably greater than the advantage. With an investment of 600 additional lane kilometres per year, there would be a substantial gain for the motorist as well as a new source of funds for investment in transport and mitigating its adverse effects.

We conclude that national road pricing in association with new capacity offers the means to

- make more efficient use of the network,
- ensure that road users pay no more nor less than the actual cost of road travel including external environmental costs,
- indicate through the level of charge where investment is needed, and
- provide sufficient funds from a reliable source for continuing investment in transport so as to improve accessibility and reliability and reduce congestion.

To introduce road pricing successfully would require a number of crucial concerns to be addressed. On recent experience substantial opposition must be expected and overcoming this will require

[9] HM Government (2007) Planning for a Sustainable Future (London: TSO)

reassurance that motorists and other road users are not merely expected to pay even more tax for little or no benefit, that the charges do not impact disproportionately on poorer people, and that civil liberties and data protection are safeguarded.

A crucial issue not covered by the Eddington Study is how the income from pricing should be spent. There is a need for clarity on this issue. We suggest that the following principles should be incorporated:

- the component of the charge levied to cover the **cost and damage imposed on the wider community** (e.g. carbon dioxide emissions or noise) should be for government to spend as appropriate, using at least part to mitigate these impacts,
- the element of the charge **for road management and maintenance and the cost of administering the scheme** should be retained for these purposes,
- the **congestion** element of the charge should be allocated for schemes to reduce congestion and improve accessibility, including public transport projects to the extent that they contribute to road congestion reduction, and
- the proceeds from congestion charging should be allocated broadly in proportion to where it is collected. Such a formula would target the parts of the network where congestion and the price of travel are highest, where additional capacity is most needed and where the people who would lose from introduction of efficient pricing will be most concentrated.

Organisation

We believe that the first, most urgent steps we recommend can be carried out without the delay that major change in organisation would cause. We recommend that:

- The Department for Transport should set up a transport planning capability which will enable it to make an assessment of the country's road needs for the next 30-50 years. It should not be restricted to the network of strategic roads which the Highways Agency manages at present: it should cover other major national and regional routes. This capability should in principle also cover planning for the national railway network. The Department already has an impressive analytical economic and statistical capability, to which needs to be added a planning and engineering component.
- The relationship between the Department and the Highways Agency needs to be clarified and adapted. The Nichols Report's[10] recommendations on this subject have been accepted by the Government. The Highways Agency should progressively take over responsibility for, or at least the power to influence and fund, the development of a wider network of major routes which would be relevant to dealing efficiently with congestion.

The most important ingredient is the recognition by Government of the urgency and scale of the tasks.

The introduction of national road pricing would require changes in organisation and would bring new opportunities. A new organisation would be needed to plan and operate road pricing. It would need to be responsible for the development and implementation of the technology, for the setting and application of charges, and all the customer-facing and back office functions of billing, consideration of appeals, enforcement and security of personal data. It would also be responsible for the allocation of the revenue collected, in accordance with approved policies. To secure the trust of the public, such an organisation would need to be at arm's length from government, and subject to transparent and independent regulation.

Establishing an independent agency to operate pricing would be a major exercise and should not be compromised by extending its role initially. But in due course consideration could be given to widening its responsibilities to incorporate the use of the pricing revenue for the benefit of road users, including

[10] The Nichols Group (2007) Report to the Secretary of State for Transport. Review of the Highways Agency's Major Roads Programme (London: The Nichols Group)

- managing and maintaining the strategic road network,
- collecting and distributing revenues from the scheme for use of the strategic road network, on behalf of government for its share, and for local highway authorities in respect of their share,
- strategic road planning, and
- preparing and implementing network enhancement projects in consultation with the regional planning bodies and other interests.

Such a body, which might be called the National Roads Corporation, would have an assured source of revenue and a statutory responsibility for using it to plan, improve and maintain the system of national roads, guided by the pricing signals from user charging, on which the prosperity of the country depends. It would report to Ministers and to Parliament.

This is one model. Others are of course possible. In particular, road pricing could be the responsibility of a separate authority, alongside the National Roads Corporation and the local transport authorities. Whatever the precise form of organisation, we would argue the importance of maintaining the link between charges and investment in the strategic road network.

Conclusions

Congestion on the road network is having major adverse effects on the economy and the quality of life in Britain. We have investigated the implications of current forecasts and policies and concluded that without a substantial increase in investment there will be severe deterioration in the situation. The Eddington Study estimated that congestion costs could grow by £25bn between 2003 and 2025[11] unless action is taken.

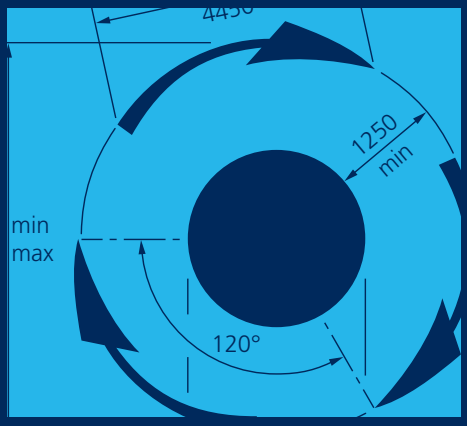
Our analysis shows that a rate of investment of around 600 lane kilometres a year, well above levels currently planned but in line with past rates, would yield substantial benefits in journey times and reliability and do so cost effectively. It shows further that introduction of national road pricing in addition would increase these benefits and provide revenue some of which could and should be used to finance the additional capacity. We would press that programmes for these changes should be commissioned as a matter of urgency.

To do this effectively we believe that the timeframe for planning must be extended and a long term strategy developed to establish where, how and when new road capacity and pricing should be delivered. We have indicated an outline of the form a strategy might take but only Government has the resources to develop a comprehensive plan. It should also address other key areas of concern such as environmental implications.

The lack of a long term strategy highlights the lack of leadership and muddled responsibility in addressing this major area of deficient performance. We argue that this should be put right by the development of a coherent long term roads strategy combining substantial new building with efficient pricing; together with changes in organisation to ensure delivery and safeguards so that road users get value for their money. All four elements must be included in a comprehensive approach to ensure effective implementation and allay the fears of those who oppose pricing. The alternative is growing congestion and deteriorating level of service – higher costs, more wasted time on more crowded roads, and damage to the economy and the quality of life.

[11] Defining the Challenge, table 3.8.

1
Trends and forecasts to 2041



Travel trends

Travel in Great Britain has been growing at approximately the same rate as the national income (see Figure 1.1). It is doing so because people are choosing to enjoy modern lifestyles in a modern economy. Increased economic activity has led to more movement of people and goods. More money has allowed people to travel further to a wider range of activities outside the home. It has also enabled them to buy the cars that provide them with convenient and flexible transport which, for many journeys, is far beyond the capability of public transport.

There has been a continual process of development, with economic growth stimulating both passenger and goods travel, and improvements to transport systems enabling new ways of working and patterns of leisure – which in turn contribute to subsequent expansion of the economy.

Figure 1.2 shows that the increasing shift towards car use has resulted in longer journeys, rather than more journeys. In 1955 the average Briton travelled about 13km per day by road or rail, but by 2006 average daily travel had increased to over 31 km. This large increase in distance travelled has taken place without a significant change either in the total number of trips or the time spent travelling.

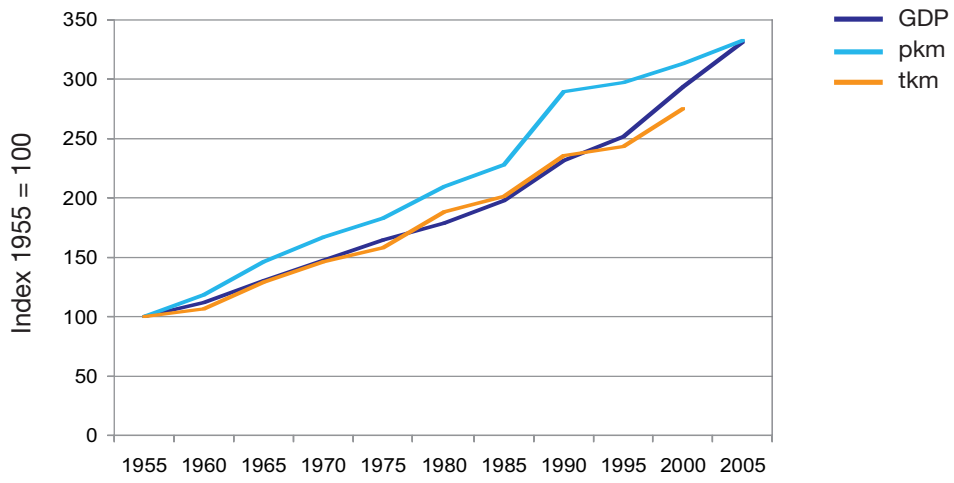
The most significant factor in increasing accessibility has been the growth in car ownership, and the vehicles themselves have also improved enormously over the last fifty years. Driving is safer, noise levels are lower, exhaust emissions are much reduced, fuel consumption has improved and on-road performance is much better. Riding in cars is also much more comfortable than it was fifty years ago and, with modern communications, to be in a car is no longer to be isolated.

Road improvement, and particularly construction of the motorway network, has also contributed to the transformation in road travel. The result of these changes in travel behaviour is a large growth in private personal transport and a much smaller reduction in the use of public transport, most of which has taken place on buses and coaches as is shown in Figure 1.3.

Figure 1.1

Growth of passenger travel, freight movement and Gross Domestic Product 1955-2005

Source: Transport Statistics Great Britain (TSGB) 2006, National Statistics Online, ABMI: Gross Domestic Product chained volume measure



Forecasts

To forecast travel demand we have used the Government's TEMPRO[12] trip forecasts to 2041, which are based on forecasts for population[13], households and employment. By 2041 Britain is expected to have 11% more people than at present. It is forecast that the average person will enjoy an income 70% higher in 2030, over twice as high in 2041 and perhaps 2.5 times higher by 2050[14]. However, how they spend their money will probably change significantly, with proportionately more for leisure, travel, education and health services.

The TEMPRO forecast suggests that there will be a continuation of differential growth between regions, both in population and income. The fastest growing areas will be cities with strong financial and business services economies – such as London, Manchester, Leeds and Edinburgh – and more widely in eastern England south of the Humber, the South Midlands and the South West. In the period to 2021, the largest growth area will be in a band from Cornwall to the Wash, with other growth areas on the south coast, in central Scotland and in the more prosperous areas around conurbations. After 2021 the forecast is for Scotland's population to decline by around 8%, and for the fastest growth to occur on the east coast and in the South Midlands and South West.

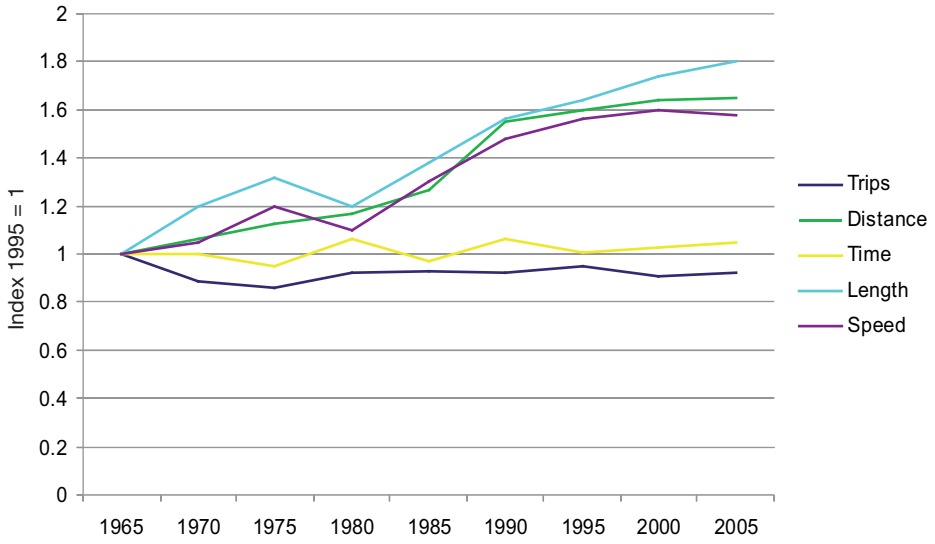
For Great Britain, a 12% increase in total trips by all modes including walking and cycling is predicted between 2005 and 2041. The key driver for this is population growth as the trips per person are not expected to change. There are, however, some significant variations by region and by mode.

The forecast increase in car traffic (measured in vehicle kilometres) is shown in Table 1.2. Actual growth will generally be less where there is insufficient capacity to serve the demand and travel delay deters people from making car trips, particularly in areas such as London. The scale of this reduction will vary with the extent to which these factors are addressed by road building and/or road pricing and other measures.

Figure 1.2

Changes in per capita personal travel 1965-2005

Source: National Travel Survey 2005, table 2.1. 1965 numbers are the authors' estimates based on limited data in the report of the 1989/91 National Travel Survey



[12] http://www.tempro.org.uk/

[13] TEMPRO relies on official 2003-based population projections. These forecast considerably lower growth than those in the recently published 2006-based projections.

[14] Oxford Economics

The overall traffic demand forecast, including road freight, for the period 2005-2041 used in our analysis is shown in Table 1.3. The basis for these figures is explained in the Technical Report.

Figure 1.3

Changes in modal use for personal travel in GB 1955-2005 (bn passenger kilometres)

Source: TSGB 2006, Table 1.1

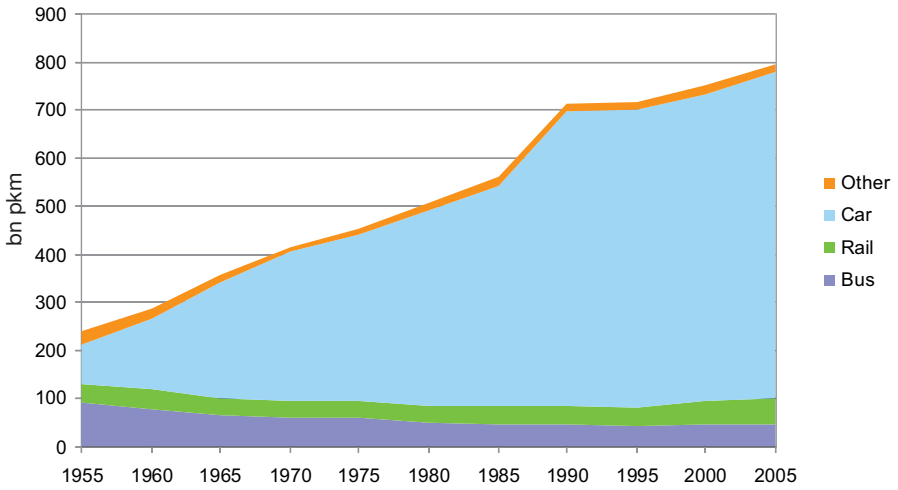


Table 1.1

Regional distribution of population growth

Source TEMPRO 5.3

	% of Great Britain population	Population growth 2001-41 (%change)	% of population growth
Scotland, northern regions, West Midlands and Wales excluding conurbations	26.6	3.3	7.4
West Midlands and northern conurbations	21.4	2.4	4.2
East Midlands and southern regions excluding London	39.2	21.0	69.0
London	12.8	18.1	19.4
Great Britain	100	11.9	100.0

Table 1.2

Average weekday growth in car trips and distance travelled 2005-41 (% change)

Source: trips TEMPRO V5.3 database; vehicle kilometres Arup

Area	Car trips %	Vehicle kilometres %
GREAT BRITAIN	23.7	37.2
Scotland	10.8	23.4
North East	15.5	31.1
North West	19.8	33.6
Yorkshire & Humber	25.4	40.0
West Midlands	20.7	31.8
East Midlands	27.1	41.4
East of England	28.4	45.7
London	31.4	41.3
South East	24.8	38.7
South West	28.0	43.5
Wales	18.6	31.3

Table 1.3

Traffic growth forecasts 2005-41

Traffic measured in vehicle kilometres. Source: TEMPRO, Arup, NRTF 1997

	% increase 2005-41
Car trips	24
Car traffic	37
Van traffic	73
HGV traffic	27
Articulated vehicles	66

2
Transport and the environment

Concerns about the environment are central to discussion of policy about transport, particularly roads. Because the increase in the number of cars and lorries is one of the most obvious manifestations of changes in the way we live and earn our living, there is a temptation to see them as a root cause of environmental problems, and to advocate halting all road building and imposing heavy restrictions and costs on the use of cars as a way of creating a cleaner, greener society. That would be dangerously simplistic.

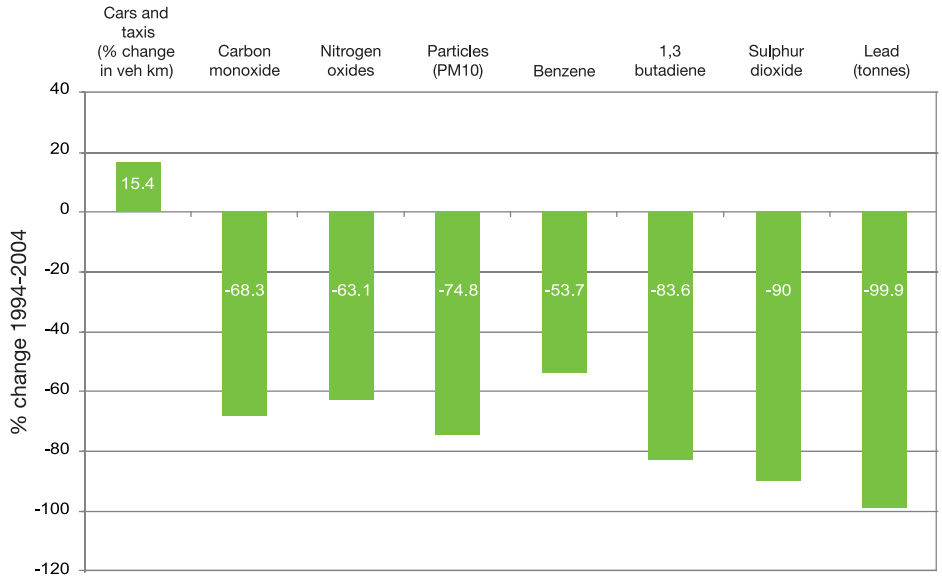
The greater mobility that cars bring goes hand in hand with many other changes, such as the ability to commute from attractive but remote villages, and to have weekends away: the ability for mothers with young children to take their children to school and also to participate in the workforce and do the myriad of other things that families require: the ability of older people to continue to get about; and the ability of everyone to do more things in the day than was ever conceivable in the past. Reducing the effect of transport on the environment requires not blanket bans but the targeted application of technology and the intelligent management of assets. That is the message also of the Stern report[15].

Motoring towards 2050 described how the impact of road transport emissions on air quality has been steadily reducing, and can be expected to do so in the future through improvements in vehicle and fuel technology. As harmful emissions reduce, the emphasis of the debate is likely to remain focussed on greenhouse gas emissions, but with some shift towards congestion reduction, and to mitigation of noise, severance and visual intrusion.

Figure 2.1

Reductions in harmful emissions from cars and vans 1994-2004

Source TSGB 2006, table 3.9.



[15] Stern Report - Stern Review on the Economics of Climate Change (2006) (Cambridge University Press) www.sternreview.org.uk

Harmful emissions

Reducing emissions and other adverse environmental impacts of road transport must be a central part of the long term strategy. In the recent past there has been more progress in some areas than in others. Figures 2.1 and 2.2 show the reduction in harmful emissions from cars & vans and from heavy goods vehicles (HGVs). In the last ten years

- lead has been all but eliminated,
- sulphur dioxide and most carcinogens have been reduced by four fifths or more,
- carbon monoxide and nitrous oxides from cars have reduced by over two thirds, and
- particulates have been cut by more than half.

Further substantial reductions are in prospect over the next decade as a result of new technologies and European regulation.

The European Parliament is proposing to lower the emission standard for particulates from new diesel cars by 80% in 2009; and of nitrogen oxides (NOx) from new cars and vans by 68% in 2014. These standards will lead to progressive reductions in harmful emissions as the older and 'dirtier' vehicles are replaced. By 2015, nitrogen oxide and particulate emissions from transport are projected to be around half 2005 levels, and 'non-methane volatile hydrocarbons', are projected to reduce by a third.

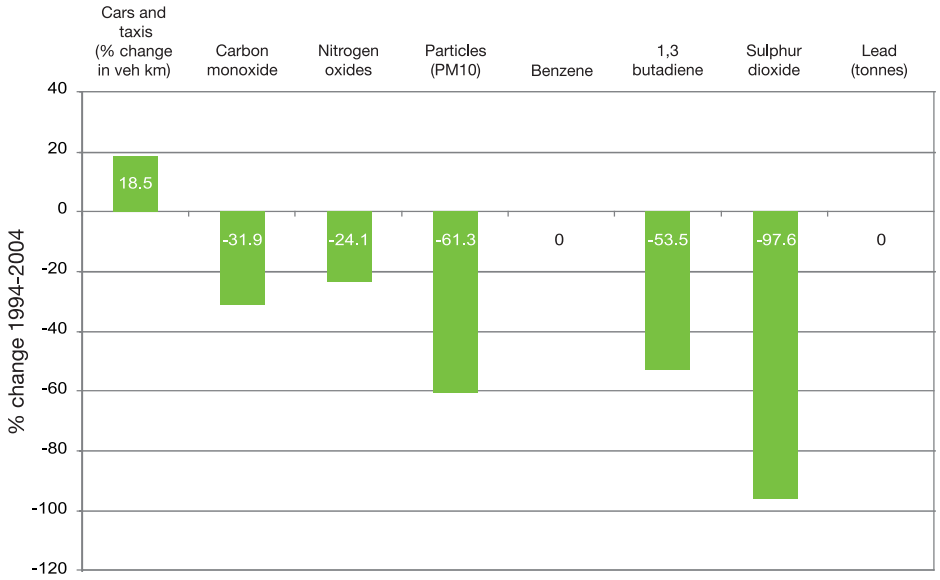
Carbon emissions

There has been less progress in reducing carbon dioxide emissions. Total CO_2 emissions from cars, vans and taxis have increased by 2-3% since 1996, during which time traffic grew by 9%. There were greater increases for freight traffic. Total greenhouse gas emissions from transport are expected to increase until around 2015 before gradually reducing (See Figure 2.3).

Figure 2.2

Reductions in harmful emissions from heavy goods vehicles 1994-2004

Source TSGB 2006, table 3.9.



This is an issue that Government is rightly taking very seriously, but it must be addressed with a sense of proportion. The aim is to reduce CO_2 in the atmosphere overall. The Stern report concludes that stabilisation requires that annual emissions be reduced by 25% below current levels by 2050 and ultimately by over 80%. It should be noted that the responsibility for reaching these abatement targets should be shared cost effectively across all sectors and fairly between all nations. UK transport contributes just 0.6% of total global CO_2 emissions, and transport emissions are increasing worldwide, not just in the UK. To be effective UK solutions must be capable of being replicated in most other countries.

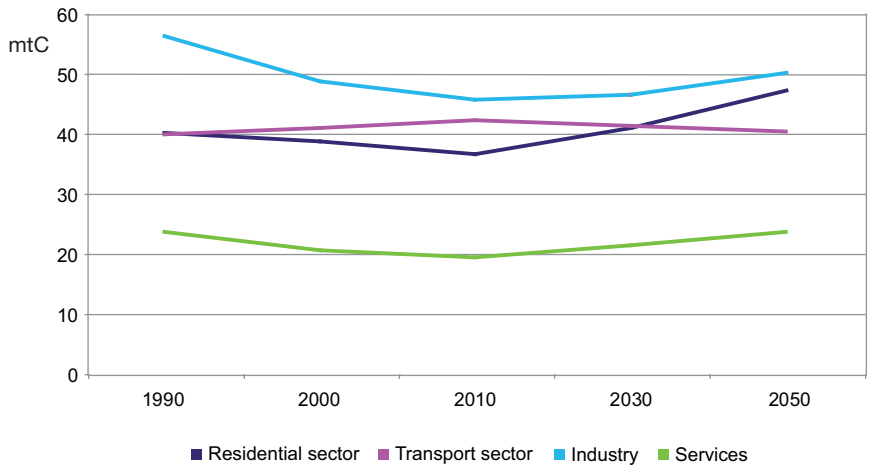
Of the options for reducing road transport CO_2:

- A significant **reduction in traffic** is impractical in a growing economy whether in the UK or elsewhere.
- **'Smart measures'**, such as changes in travel behaviour and more responsible driving may be sensible in their own right, but they will have only a small effect on CO_2 emissions.
- **Speed limits** – reducing speed limits to below 80km/hour (50mph) would reduce carbon emissions (See Fig. 2.4), but the graph is relatively flat between 40 kph and 100 kph, and even a reduction in motorway/dual carriageway speed limits would only reduce per kilometre emissions of traffic travelling at the speed limit by around 20%. It would only be an economic proposition if the value of the reduced emissions were greater than the cost of longer journey times, and would be likely to be very unpopular and difficult to enforce.
- **Mode shift to public transport** – Though on average rail travel produces less than half, and bus travel only 70%, of the emissions per passenger kilometre of car journeys, the figures depend heavily on the numbers of passengers in the vehicles. The scope for mode shift to reduce carbon emissions is limited, except where there is a dense concentration of trips, particularly in peak periods and in and around city centres. Simply expanding public transport services is not likely to result in a reduction in carbon emissions.

Figure 2.3

Projected end user carbon emissions – millions of tonnes of carbon (mtC)

Source: UK energy and CO_2 emissions projections (DTI: July 2006)



- Increasing **fuel duty** can make a substantial difference, but at levels that affect demand it is a very blunt instrument, bearing particularly heavily on people in rural areas and those on low incomes. At current rates of road fuel duty, the implicit price of carbon is several times the cost of the damage caused by its contribution to climate change. Increasing **Vehicle Excise Duty** on vehicles with high fuel consumption would send a useful signal and would have some effect on manufacturers and purchasers provided a reasonable period of notice was given.

Although other policies have a role to play, only new technologies and design in fuel and vehicles can achieve substantial reductions in greenhouse gases worldwide – sufficient to make a significant difference to the amount of carbon in the atmosphere. There are major advances in prospect, but they will take time to be developed commercially and become enshrined in industry standards. There is also a time lag while the existing fleet is replaced by new 'cleaner' vehicles. The energy and automotive industries are dominated by a relatively few multi-national companies, so technology once applied can spread quickly across the globe.

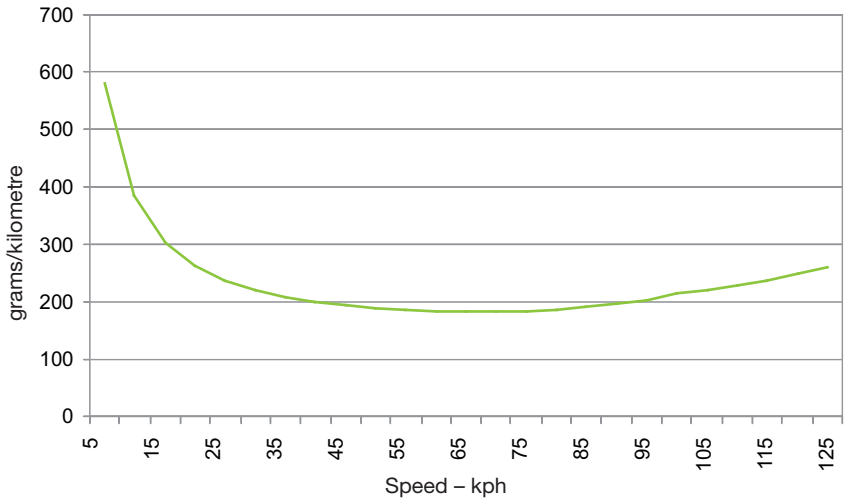
The recently published King Review concludes that, possibly by 2050 in the developed world, decarbonisation of road transport could lead to reductions of around 90% in per kilometre emissions. On this basis, if road use approximately doubles by 2050, an 80% reduction in total road transport carbon dioxide could be achieved.

Because technology can reduce greenhouse gas emissions very substantially over the medium to long term, and because it is the only option for making a significant difference on a global scale, a framework of incentive and regulation must be in place to ensure that it does so. At national and international level, the issue is how to introduce progressively tougher emissions standards and to encourage technological changes in step with their realistic capabilities.

Figure 2.4

Relationship between Traffic Speeds and CO_2 Emissions

Source: Design Manual for Roads and Bridges.



There has been considerable progress in developing 'greener' and more fuel efficient vehicles over recent years. Some current trends, for example towards larger vehicles and provision of air conditioning, have reduced the effects of this but only to a limited extent. Figure 2.5 shows how the CO_2 distribution of the new car market altered between 1997 and 2005. The average level of carbon dioxide emissions for a new car in 2005 was 169.4g/km compared with 187.5g/km in 1997 (down 10%). This is a very significant improvement, though it will not be sufficient to meet the current government short term target for 2008 of an average of 140g/km.

Much greater improvement will come from more radical innovations that will usually take several years before they are installed in the majority of vehicles on the road. The most promising technologies in the pipeline are hybrid electric vehicles, and in the longer term, hydrogen powered fuel cell vehicles. Further development of the technology will be needed before investment in fuel production and distribution infrastructure is commercially viable. It is estimated that 'renewable hydrogen' will not be available for use by fuel cell cars for 30 years[16]. In the meantime, there are also promising opportunities for fuel technology to contribute to reducing greenhouse gases, including some types of biofuels and liquefied petroleum gas.

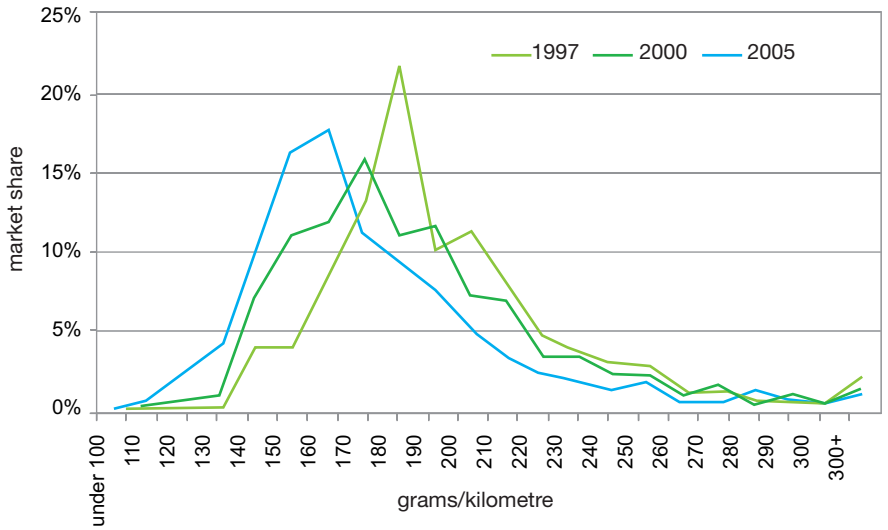
Traffic noise, severance and visual intrusion

Other adverse environmental impacts of road traffic, such as noise, severance and visual intrusion, also require higher standards, new technology, better design, more tunnels and more extensive mitigation, such as noise barriers, fences to stop light pollution, and quieter road surfaces. Often this will entail an increase in the cost of road building and/or vehicles to ensure that mitigation contains the impacts within acceptable limits. But the economic returns on road schemes are sufficiently high for more generous environmental standards to be accommodated while still being good value for money.

Figure 2.5

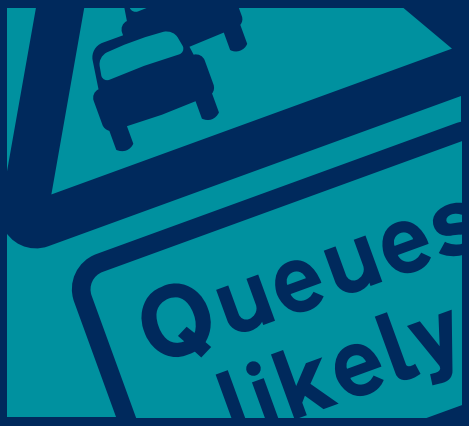
CO_2 distribution of new car registrations in the UK (1997 - 2005)

Source: UK New Car Registrations by CO_2 Performance: Report on the 2005 Market (April 2006) – The Society of Motor Manufacturers and Traders.



[16] EST, Institute for European Environmental Policy and the National Society for Clean Air (2003) 'Fuelling Road Transport – Implications for Energy Policy'

3
Myths and misconceptions



3 Myths and Misconceptions

Although road traffic has been growing steadily new capacity has not been added at a rate sufficient to stem growing congestion, let alone reduce it. Even with demand management and other measures in place, more road capacity is needed. But policy is influenced by a range of public concerns about the consequences of adding capacity. As well as a belief that increasing road capacity cannot keep pace with demand there are concerns that it will result in unacceptable increases in pollution, carbon emissions and damage to urban and rural environments. This line of argument is often accompanied by the suggestion that restraining road traffic will lead road users to adapt their travel behaviour and that this can be done without adverse effects for the economy and society.

It is important to be clear about the validity or otherwise of these concerns. The facts on some of the most commonly raised issues are as follows.

- **In many circumstances new road capacity can keep pace with growing demand**

On many transport corridors it is appropriate to build sufficient capacity to serve growing demand and reduce congestion in the long term; but not in all areas. Our analysis summarised in Chapter 5 shows that a programme of investment in strategic road capacity at an annual rate similar to that achieved during the 1990s would provide for growing demand on most of the strategic network to 2041, with or without efficient pricing. A matching programme on other rural road types could be expected to produce similar results, though there will be places where the environmental consequences would be such that it would be undesirable to do so. Road building in congested urban areas is generally more difficult and a more varied combination of measures will be necessary to accommodate growing mobility needs.

- **New road capacity does not simply 'fill up with traffic'**

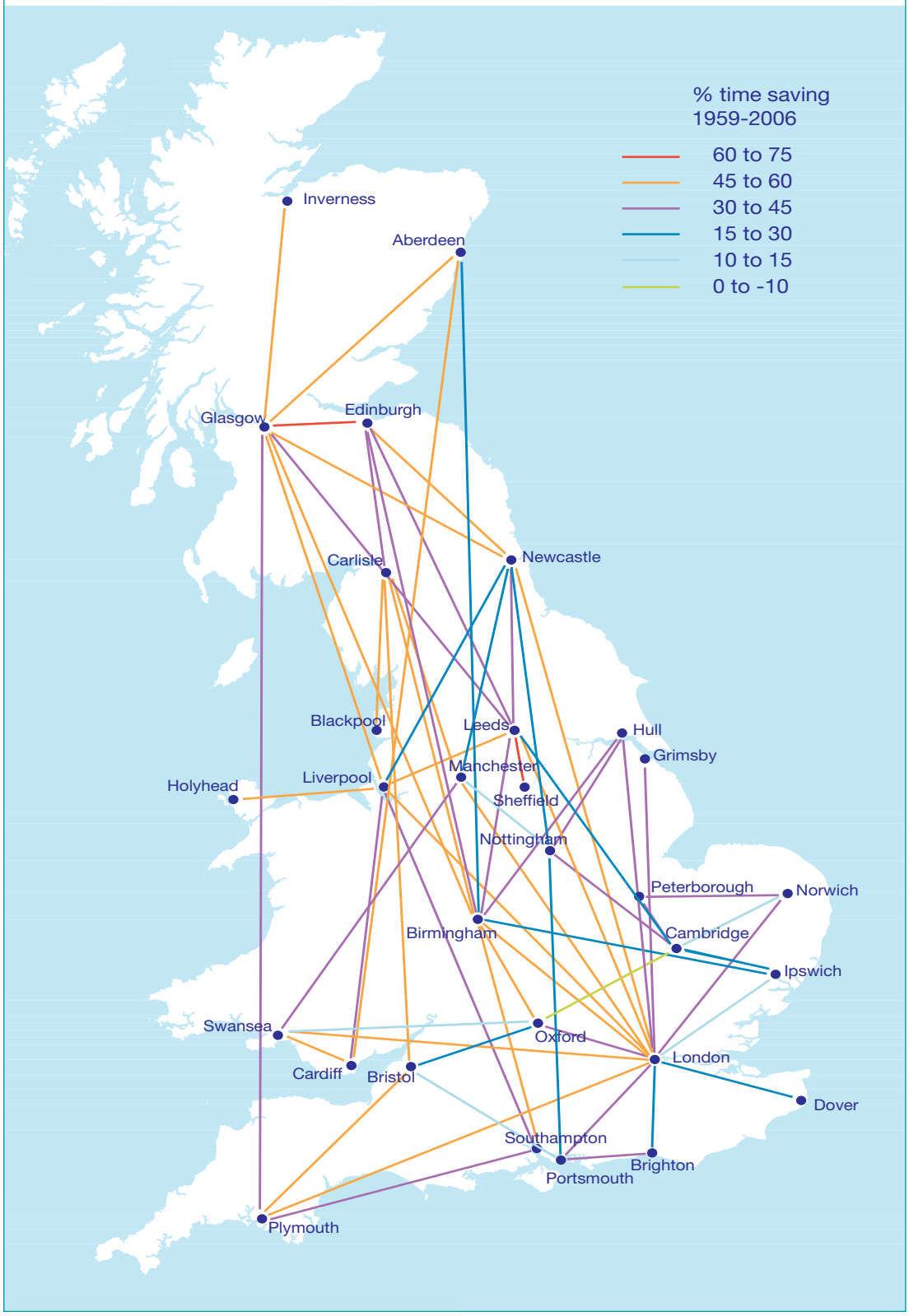
New road capacity in appropriate locations generally relieves congestion, though by reducing travel times and costs, it may lead to more traffic. Some of this is traffic transferring from adjacent roads that are slower or more congested, but there will be some new traffic. However, this does not simply 'fill up' the additional capacity or move the traffic jam down the road to the next bottleneck. Instead, there is a new balance between supply and demand in which there is more traffic than before, but less congestion. In the long run this relief may be reduced with rising demand, but more users will still be enjoying the benefits of less congested travel.

The extent to which new road building has increased accessibility can be seen by comparing coach journeys over time. Figure 3.1 shows the change in inter-urban coach journey times since commencement of the motorway programme. Of the 174 services between major cities included in the analysis, the average journey time reduction between 1959 and 2006 is approximately 40%, and is due mainly to motorways and faster vehicles. This has taken place despite huge increases in long distance road traffic over the last fifty years. Because the services and times are between city centres, it also demonstrates that the inter-urban road building programme has not merely transferred the congestion into the urban areas. It has resulted in genuine reductions in overall journey times, and as a consequence has allowed most people to enjoy much more varied lifestyles than was possible in the 1950s. It is also worth noting that the transformation has been achieved because the motorway construction programme provided a national network benefiting almost all of the then most densely trafficked corridors.

Figure 3.1

Coach journey timetable differences 1959-2006

Source: Arup from National Express timetables



- **Roads do not occupy large areas of land**

Despite being depicted in road maps as occupying large areas of land, roads occupy about 1.75% of the surface of Great Britain and most of these are local streets providing access to houses, offices, factories and farms. In total, the main roads occupy around 0.4% of the national surface area and the strategic roads, which carry a third of total traffic, occupy only 0.16%. Almost all the growth in road space in recent years has been for local access roads, mainly to serve new developments.

- **Railways are not more efficient users of space than main roads**

Trunk roads occupy less than twice as much space as railways but carry almost five times as much passenger traffic and over five times as much freight traffic as the railways. As a consequence trunk roads are on average at least twice as efficient users of space as the national railways, although crowded commuter lines to city centres are much more space efficient at peak times. Both rely on minor roads at the start and end of journeys. Local roads also provide space for many facilities and activities other than motor traffic and much of the space they occupy would be needed for these purposes in any event.

- **Expanding the road network will not have a material effect on climate change**

New road capacity will sometimes result in a slight increase of greenhouse gas emissions, but this effect is likely to be very small, as the extent to which it encourages more traffic is partly offset by lower emissions from free flow conditions compared with congestion (See Figure 2.4). The balance between these two effects depends on local circumstances.

For the Eddington Study, the DfT estimated that, for an illustrative strategic road programme, a 5% increase in capacity (measured in lane kilometres) would result in a traffic volume increase of only 0.6% and a 1.0% increase in CO_2 emissions[17]. Our estimate is that for the 2041 traffic demand, efficient pricing will reduce carbon emissions by 14%; and even a 20% increase in the strategic road capacity would increase carbon emissions by no more than 5%. These figures do not include the effect of improvements in technology, which, irrespective of how the road system is developed, will need to be deployed to reduce carbon emissions from vehicles very substantially over the next 35 years.

- **Traffic pollution is not getting worse**

As Figures 2.1 and 2.2 show, a combination of better vehicle and fuel design and stricter regulation has produced large reductions in the most harmful emissions from motor vehicles during the last ten years or so.

- **Public transport is not a general alternative to the private car**

Bus and rail serve particular parts of the travel market but their ability to provide an attractive alternative to most car trips is limited by a combination of network sparsity, slowness, inconvenience and price. As a result, public transport (bus and rail) presently carries only 13% of motorised personal travel. The railways are busier than they have been for decades and have little spare capacity on most routes, and the network generally serves only a fraction of total journeys along the routes they travel. Bus services, whilst being more widespread, are slow and rarely offer the comfort and convenience of cars. They are mainly used for short distance travel. Moreover both bus and rail fares are usually higher than direct car running costs for most types of travel, despite substantial public subsidies on many services.

[17] Eddington Study, Transport Demand to 2025 & the Economic case for Road Pricing and Investment pages 37 & 38.

- **Road users do pay their way**

In addition to their general taxes road users (cars and lorries) are currently paying a net £3bn or so annually to the Exchequer, as well as covering all the external environmental and safety costs, including carbon emissions. Road users in Great Britain pay almost £28bn a year in fuel duty and road tax in addition to the general taxes to which they are subject as individuals and companies. This dwarfs the direct cost of running the road network, which is no more than £10bn annually. Road traffic is the only energy consuming sector that pays the full cost of carbon emissions, and it accounts for 80% of all carbon taxes currently collected.

- **Britain is no more reliant on road transport than its European neighbours**

Though Britain relies on roads for transport to much the same extent as its European neighbours, provision of roads is markedly lower than in the rest of Europe.

Reliance on road transport is the result of national geography as well as transport and other policies, so there is a limit to the value of international comparison. However, Table 3.1 indicates that Britain's use of roads is not very different from our major European neighbours. Passenger travel by road is slightly greater than in the EU and freight movement is rather less, but the UK has significantly less road space per head of population, particularly motorways, and a very small network under the jurisdiction of central government.

Table 3.1

Some Indicators of Roads Dependence in Selected EU15 Countries 2005

Source: European Commissions EU Energy and Transport in Figures 2006, tables 1.1, 3.2.4a, 3.3.4, 3.3.5, 3.5.1 & 3.5.2.

COUNTRY	Road Travel	Motorways	State Roads	All Roads	pkm by Road	Road Freight[1]
	pkm/cap/yr	(km/million population)			%	Tkm/cap/yr
Italy	13,887	111	778	11,383	94.0	2,920
France	12,767	170	436	16,397	89.8	2,905
UK	12,021	60	157	6,892	93.4	2,557
EU15	**11,583**	**144**	**5752**	**10,026**	**92.2**	**2,824**
Germany	11,362	148	497	7,817	91.2	2,882
Netherlands	9,669	143	407	7,707	90.7	1,949
Spain	9,329	246	404	3,773	93.8	3,802
Greece	8,053	67	772	10,225	96.4	1,373
Portugal	7,361	199	999	7,539	94.5	1,650

[1]National haulage by vehicles registered in that country
[2] Estimate based on data from 13 of the 15 member states
pkm/cap/yr – passenger kilometres per head per year
Tkm/cap/yr – tonne kilometres per head per year

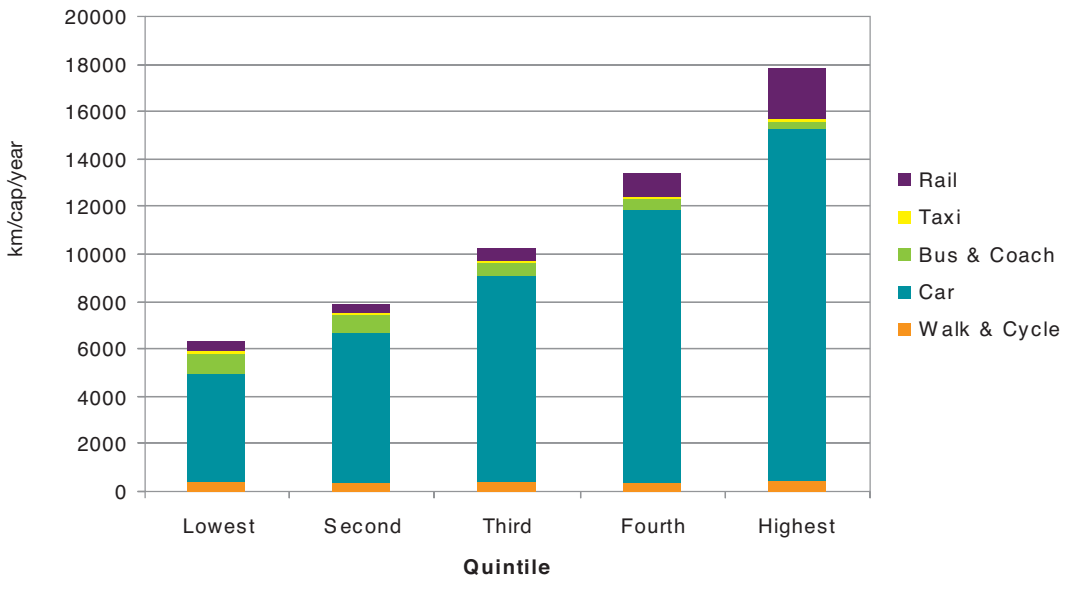
- **Cars are not just for rich people and public transport is not just for poor people**

Figure 3.2 shows information on use of travel modes by people in different income quintiles. Car travel accounts for 72% of motorised trips of the poorest 20% of households. Wealthier people spend more on transport overall and on the purchase and use of cars. Though wealthier people make more absolute use of roads, all income groups rely on roads (car and bus) for about 91% of their surface travel – except the wealthiest twenty percent who make 89% of their travel by road. The wealthier people also make considerably more use of rail travel than those on lower incomes.

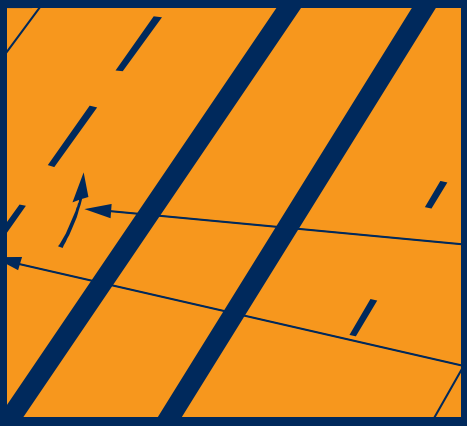
Figure 3.2

Personal travel by income quintile, Great Britain 2005.

Source: National Travel Survey 2006 table 5.4.



4
Reducing congestion



4 Reducing congestion

There is a wide range of measures available for reducing congestion. They fall into three main categories,

- changing travel behaviour,
- traffic management measures to improve the operation of the network, and
- providing additional road capacity.

Most of the measures noted below are already applied to differing extents with varying degrees of success. They are often used in combination, and sometimes to achieve social, environmental and safety objectives as well as those for transport. It is important that such wider aims are taken into account when planning improvements. It should be recognised that, after years of stretching the capacity of existing transport assets, the scope for further application of many of these measures will produce diminishing returns. All may present problems of public acceptability.

Changing travel behaviour

Road users adapt their behaviour to achieve better journeys. Where they can, many try to choose their time of travel to minimise delay. This has resulted in the progressive spreading of peak periods such that the scope for further adaptation is becoming more limited.

The level of demand overall might be constrained by raising fuel duty or road tax to increase the cost of motoring. The approach would cause users to prioritise their journey decisions but would address congestion only in general terms. Road pricing with charging related to the incidence of congestion would provide for much more focussed influence on travel decisions. This is discussed further in Chapter 5.

Other measures aimed generally at reducing car use include

- improvement of public transport systems,
- cost-effective investment to enable the railways to overcome some of the capacity problems that inhibit their growth,
- making use of the opportunities offered by electronic technology to substitute for some travel,
- car sharing and travel plans,
- control of parking at workplaces and elsewhere, and
- encouragement of walking and cycling.

All have potential for reducing road use cost effectively in suitable locations and circumstances but the actual reduction is small in relation to total road use. Suitable locations for many of these measures tend to be in urban areas and on local roads so that they do not greatly affect traffic on the main road network.

An important element in promoting and supporting some changes in travel behaviour is land use planning through decisions on location of major movement origins and destinations and provision of transport facilities.

Traffic Management

Again there is a wide range of measures available, with the value of application depending on conditions in particular locations. For main roads, principally motorways, they include

- controlling use by signals – ramp metering where access to motorways is controlled in relation to traffic levels, or controlled motorways in which speed limits are adapted to conditions (M25 south west quadrant),
- managing lane use – high occupancy vehicle or bus priority lanes, narrow lanes, tidal flow, and
- providing real time information on conditions and possible alternative routes.

Advanced Traffic Management, currently being trialled on the M42 in the West Midlands, combines several of these.

As with changing travel behaviour, these measures can improve operation and reduce congestion cost effectively in appropriate circumstances but their impact on the overall situation is relatively small.

Providing additional road capacity

Additional physical capacity can be provided by extending hard shoulder running, widening existing roads and junctions or building new ones. At a suitable level of investment these offer scope for much more substantial improvement in the operation of the network and for relief of congestion. A number of concerns need to be addressed if new capacity is to be delivered successfully, particularly opposition on environmental or other grounds.

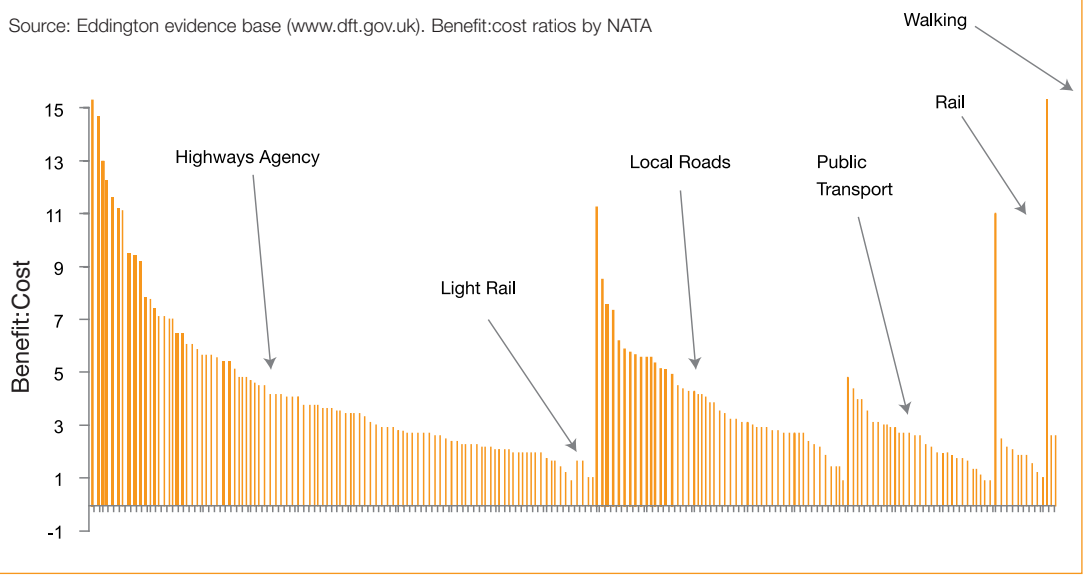
Our analysis shows that a rate of investment of around 600 lane kilometres a year, well above levels currently planned, will yield substantial benefits in congestion reduction and hence journey times and reliability.

The Eddington Study proposed a combination of sustained and targeted infrastructure investment in schemes that demonstrate high returns together with road pricing. Our work strongly supports this recommendation in relation to road improvement. Figure 4.1 shows a comparison from Eddington's work of the relative economic performance of transport infrastructure projects. In the figure the vertical lines represent the benefit to cost ratios of individual projects in descending order. A substantial number of road projects, both on the strategic network (Highways Agency) and local roads, offer good returns, better than those from most heavy and light rail and public transport schemes.

Figure 4.1

Benefit:Cost ratios for different forms of transport investment

Source: Eddington evidence base (www.dft.gov.uk). Benefit:cost ratios by NATA



4 Reducing congestion

The Eddington Report emphasised that the transport networks need to be adapted to meet key economic priorities and identified three strategic priorities for infrastructure investment, growing and congested urban areas and their catchments, key inter-urban corridors, and key international gateways.

It is estimated that 89% of current congestion is on urban roads[18], and it tends to be worst in the inner and central areas of the largest conurbations, particularly London. However, these are the locations where a combination of mode shift to public transport, traffic management and pricing have the most to offer, as the densities of destinations favour high capacity services. They are also locations where road building is most difficult and expensive. In London, the scale of the demand and the density of the destinations justify expansion of existing public transport capacity and major projects such as capacity enhancements to the national rail network, Crossrail and new Underground lines.

These arguments are less relevant to suburban and surrounding areas where growth in demand is high, densities lower, and trips more dispersed. There has been some suburban road capacity increase in many cities, without which traffic congestion would be worse. But more is required, and it will need to be planned sensitively and imaginatively to minimise disruption to communities. The cheapest solution is not necessarily the best.

Traffic engaged in longer distance trips or journeys relies to a large extent on the motorways and trunk roads, which have become progressively more crowded. Here additional capacity generally offers the best means of improvement. As current opportunities for widening and junction improvements are implemented, the potential for increasing the capacity of existing strategic roads will diminish, and consequently the case for building more new roads will strengthen.

[18] Eddington Transport Study p.79

5

Road building and road pricing – the analysis

5 Road building and road pricing – the analysis

This chapter examines the economic and other implications of increasing road capacity on the strategic network, and of introducing road pricing, in relation to the forecast demand for road use in 2041. In essence, the options considered are

- to do nothing and let **congestion** and wasted time match demand to the supply of road space,
- to build or widen **more roads**, without pricing,
- to introduce some form of **road pricing** without additional road building and use the price mechanism to determine who should use the roads where there is insufficient capacity, or
- to employ a **combination of road building and road pricing** – the building to provide for the growing demand for travel and the pricing to ensure efficient use of road space.

The initial sections outline the model and the scenarios used for the analysis. The principal results of the modelling are then reported

- Speeds and traffic flows
- Carbon effects
- Charges and revenue
- Costs and benefits

Three key questions are then addressed

- Would efficient pricing reduce the requirement for additional road capacity?
- How much additional capacity is justified?
- Affordability?

This is followed by a short comparison of our work with that carried out by Eddington. The conclusions of the chapter are summarised at the end.

A detailed description of the model and the results of the analysis is contained in the Technical Report.

The model

The model used in this study is based on one developed by Glaister and Graham for the Independent Transport Commission[19]. Using information from the DfT FORGE database of roads and traffic conditions in 2010 and the forecasts described in Chapter 3 it examines how speeds and flows change with increasing traffic up to 2041 for a number of levels of increase in capacity measured in Lane km[20] per year (Lkmpa). For each such level of increase the effect of road pricing is considered. The analysis looks at the English regions individually together with Scotland and Wales. It identifies separately motorways and trunk roads in relation to their locations – conurbations, outer London, urban, rural. It does not consider other roads.

The scenarios

The various scenarios for capacity increase with and without road pricing are compared with a **base scenario** which assumes completion of the present Targeted Programme of Improvements (TPI) projected forward to 2015 (an extra 1,594 lane kilometres in England), no increase in road capacity after that, and no pricing.

Increments of capacity for the period 2010-41 are examined in scenarios with and without a national efficient pricing scheme – 200, 400, 600 and 800 Lkmpa.

[19] Glaister, S. and , Graham, D. (2003) Transport Pricing and Investment in England, Department of Civil Engineering, Imperial College, for the Independent Transport Commission, May 2003.

[20] Lane kilometre is a standardised unit of capacity applicable to any kind of road. Thus 60 lane kilometres describes 60km of additional lanes added in widening, 30 km of two-way single carriageway road, 15 km of two-lane dual carriageway, or 10km of three-lane dual carriageway road.

For the 200 Lkmpa scenario, increases in strategic road[21] capacity are allocated approximately 60% to motorways and 40% to trunk roads with a 30:70 split between conurbations[22] and other areas[23]. However, there are considerable variations between regions and for conurbations, following the pattern used in the Eddington study. This study assumes, as did Eddington, that the capacity of junctions would be improved to match the increase in capacity on the links. All scenarios assume no significant change to the rest of the road network.

The 400 Lkmpa and 600 Lkmpa scenarios are pro-rata increases in capacity by road type and region on the same basis as the 200 Lkmpa scenario, but in the 800 Lkmpa scenario the extra 200 Lkmpa is applied to the fastest growing regions only – East Midlands, East of England, London, South East and South West.

For the pricing scenarios, we have applied a national charging scheme described as 'efficient pricing' where the charge for using roads is set at a rate that reflects the 'marginal cost to society' of the trip. This includes

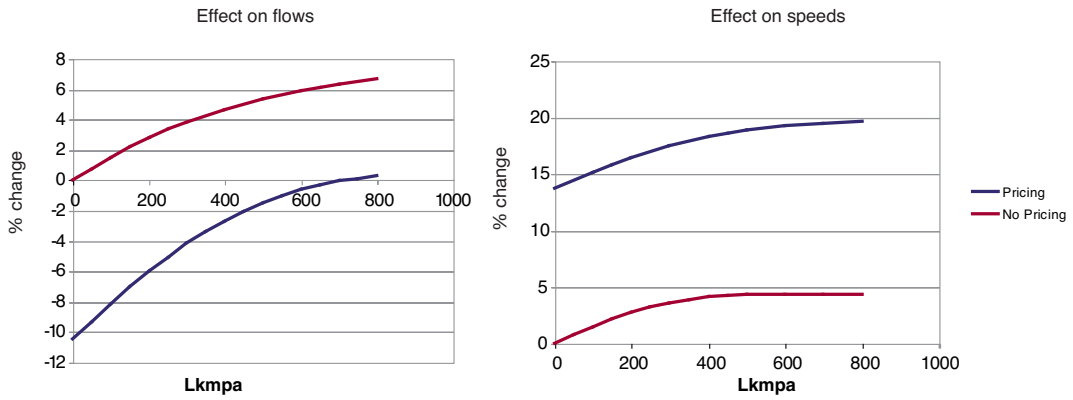
- a rate per vehicle kilometre for the cost of providing and maintaining the roads and for environmental and safety impacts which vary by vehicle type, road type and the degree of urbanisation, and
- a rate for congestion which varies with traffic conditions, time of day and day of the week, to reflect the additional delay imposed on other road users and carbon emissions. At times or places where there is no congestion; there is no charge for congestion.

Efficient pricing and some of its implications are discussed in Chapter 6.

Speeds and traffic flows

Figure 5.1 shows our estimate of the overall national effects in terms of traffic flows and speeds in 2041 of capacity increases with and without efficient pricing. Speed indicates the average travel time per vehicle kilometre, rather than the speed of a particular vehicle. It is assumed throughout that all vehicles keep to the speed limit. The higher the speed, the more freely the traffic flows and therefore the less the delay. The charts compare performance in the increased capacity scenarios with the

Figure 5.1
Effects of additional capacity and pricing on flows and speeds on the strategic road network in 2041 relative to the base scenario



[21] i.e. the strategic network in 2003 - see footnote 6 on page 10

[22] Conurbations comprise London, West Midlands, Greater Manchester, Merseyside, West Yorkshire, South Yorkshire, Tyne & Wear and Glasgow

[23] This compares with the Eddington Study's ratios of 74:26 motorway:trunk; and 25:75 conurbation:other.

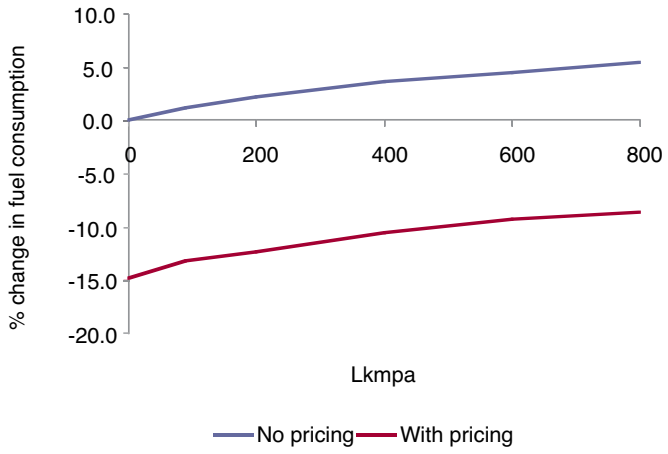
base scenario and show the differential increasing but at a diminishing rate. Without pricing the journey time differential is smaller and levels off after the 400 Lkmpa scenario.

Without pricing, the better mobility offered by the 600 Lkmpa of additional road capacity, for example, leads to an overall increase in traffic of around 6%, though at this rate of build the effect on the volume of traffic is diminishing. With a national efficient pricing scheme and no capacity increase beyond the base scenario, total strategic road traffic would reduce by 11% (by 10% on motorways and by 19% on single carriageway trunk roads) and would result in a significant loss of mobility for some people. It is not until the 600-800 Lkmpa scenarios that traffic on the strategic network would reach the volume in the base case.

For each level of capacity efficient pricing reduces congestion and thereby increases average speeds. The second chart in Figure 5.1 shows that, with pricing, national average trunk road speeds would increase by around 14% compared with the base case (by 8% on motorways and by 17% on single carriageway A(T) roads). At times and places where the roads are most crowded, charges will be highest and additional capacity will have the greatest effect. Up to the 400 Lkmpa scenario, extra capacity results in substantially reduced average journey times, but less thereafter as additional capacity accommodates traffic growth.

A more detailed breakdown of regions and conurbations is set out in the Technical Report. The effects of efficient pricing on congestion are greatest in London and the other conurbations. Outside the conurbations, road building has a greater effect on both traffic flows and congestion in the midland and south eastern regions[24] than in the North and West[25]. In the former, population and traffic growth forecasts are higher and the strategic road network is more often congested. Capacity is inadequate to serve the long term growth. Here, a road building programme similar to the 800 Lkmpa scenario or more will result in considerable increases in both speeds and flows. The northern and western regions are generally characterised by less congested roads and lower forecast traffic growth. In most of these regions additional capacity has only a limited effect on aggregate average traffic flows or average journey times, although at local level there will nevertheless be many specific situations where the effect of capacity and/or pricing would be substantial.

Figure 5.2
Effect of road building and pricing scenarios on road transport fuel consumption in 2041



[24] East and West Midlands, East of England and South East.

[25] North East, North West, Yorkshire and Humber, Wales and South West.

Carbon effects of additional strategic road capacity

Figure 5.2 shows that, as compared with the base scenario, road building without pricing would lead to small increases in fuel consumption in 2041 but that, where capacity increase is accompanied by pricing, less fuel would be used because of the reduction in travel. However, as explained in Chapter 2, feasible reductions in carbon and other emissions from road transport will predominantly come from more advanced vehicle design reducing consumption together with improvements in fuels cutting emissions. Provided suitable measures are developed and adopted emissions per unit of fuel should fall over the forecast period.

Charges and revenue

Our analysis shows that, at the most economically efficient price in 2041, the **average** charges would be around 9p/km at 2005 prices in northern and western regions and 11p/km in midland and south eastern regions. It would be higher in conurbations, 40p/km in London and 21p/km elsewhere. The average charge would be much lower on motorways and rural dual carriageway roads than on other roads. In all areas peak charges will usually be much higher than the average. Charges would vary with vehicle type, for example, with an average of 40p/km in London, cars would pay 35p/km, light goods vehicles 60p and HGVs about £1.20.

Table 5.1 shows how the income from efficient pricing would be spread geographically in relation to population and between different types of roads. The table shows that 37% of pricing income would accrue from motorways and trunk roads and 25% from non-trunk roads in London and the conurbations.

Costs and benefits

Evaluating the implications of the speed and flow analysis shows that well-targeted investment in roads at the various levels we have considered would be strongly justified on cost-benefit grounds. The Eddington Study also pointed to the very high returns from road improvements. The costs and benefits of the scenarios compared with the base case are set out in Table 5.2. The marginal benefit:cost ratio is the extra benefit of each additional 200 Lkmpa increment of capacity divided

Table 5.1
Geographic distribution of population, traffic and source of income from efficient pricing

	Efficient pricing (% of total charge income)				
	North & West regions	Midlands and south east regions	London	Other conur-bations	Great Britain
Percent of GB population	*30*	*35*	*13*	*21*	*100*
Percent of 2041 traffic (pricing alone)	*35*	*46*	*5*	*14*	*100*
Motorways and rural dual A roads	5	12	4	1	22
Other A roads	11	15	9	11	46
Other roads	8	11	8	4	32
ALL ROADS	**24**	**38**	**22**	**15**	**100**
All Highways Agency roads	8	17	7	6	37
All other roads	16	22	16	9	63

Note: Regional groupings exclude conurbations

by the additional cost. The ratio for the +800 Lkmpa case is higher than that for +600 because the increase in the former is concentrated in those regions where traffic and congestion are greatest.

The general picture is that

- efficient pricing has a high overall benefit:cost ratio to society even if high charging operational costs are assumed,
- at all levels of capacity expansion considered the marginal benefits of increasing capacity are higher with efficient pricing,
- up to 800 Lkmpa of capacity expansion the marginal benefits of additional capacity remain above 2:1 without efficient pricing, and
- with efficient pricing the 2:1 threshold is crossed towards 800 Lkmpa.

The ratios show that there is a strong economic case for efficient pricing in combination with increasing road capacity. It should be recognised that extra capacity can sometimes be secured without new or widened roads. In some circumstances capacity increases may be provided more cheaply by using motorway hard shoulders, junction improvements, or capacity enhancing traffic management, though in these cases the gains are usually not repeatable and the network's resilience to major incidents may be reduced.

Would efficient pricing reduce the requirement for additional road capacity?

Part of the current interest in road pricing is due to its potential to reduce the need to build extra capacity. Efficient pricing would reduce the requirement because it would both secure a more efficient use of road space and discourage some journeys from being made at all. Fewer vehicles need less road space.

Table 5.2
Costs and benefits of road building and efficient pricing (figures in £ billion p.a. Great Britain)

	No extra capacity	+200 Lkm pa	+400 Lkm pa	+600 Lkm pa	+800 Lkm pa
No pricing					
Gross benefit to society	Base	7.5	12.8	16.4	19.6
Cost of additional capacity	Base	1.5	3.0	4.4	5.6
Average benefit:cost ratio of scenario	Base	5.1	4.3	3.7	3.5
Marginal benefit:cost of additional capacity	-	*5:1*	*3.5:1*	*2.6:1*	*2.7:1*
Efficient pricing					
Gross benefit to society	22.3	28.3	32.7	36.1	38.4
Cost of additional capacity	0	1.5	3.0	4.4	5.6
Cost of charge collection	4.5	4.5	4.5	4.5	4.5
Average benefit:cost ratio of scenario	5.0	4.7	4.4	4.0	3.8
Marginal benefit:cost of additional capacity and collection	*5.0:1*	*4.0:1*	*2.9:1*	*2.4:1*	*1.9:1*

However, if no extra capacity were provided, the charge necessary to regulate congestion would need to continue to increase as population, demand and disposable income all increased. The more severe the price or capacity constraint, the greater would be the loss of mobility and of benefits of this to the economy and to society. The actual reduction would depend on the relationship between capacity and congestion in particular locations and on the responses of individuals to particular levels of charge.

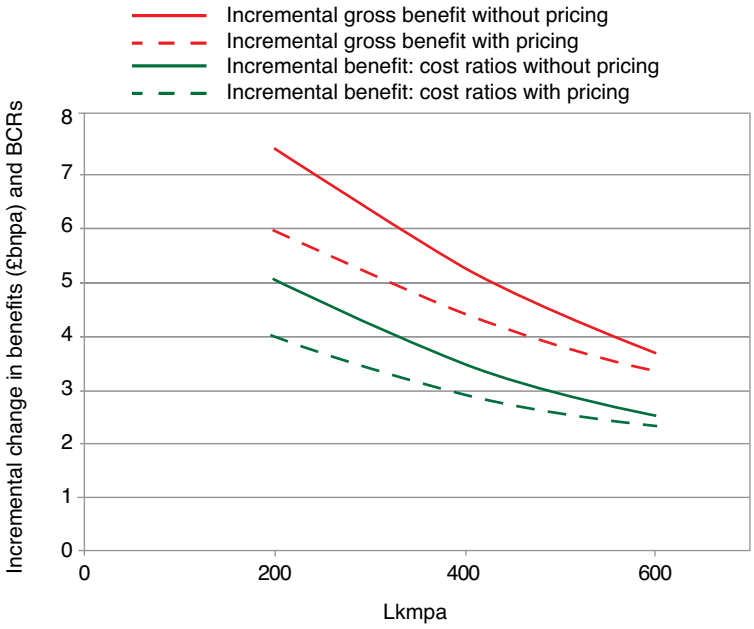
We have estimated the additional benefits resulting from each 200 Lkmpa increment of capacity in the scenarios that we have tested, comparing with and without efficient pricing[26]. The results are shown in Figure 5.3.

The additional benefit resulting from road building would be greater without pricing because there would be more congestion and therefore more to be gained from congestion relief. At 200 Lkmpa, pricing would reduce the benefits resulting from the extra road building by around 20%. This suggests that, applying a given minimum benefit:cost ratio to justify schemes, around 20% less road building would be justified with pricing.

But this level of road building would be considerably below the optimal level to maximise economic and mobility benefits, because capacity would fall far short of the need and desire to travel. At 600 Lkmpa, the extra benefit compared with the 400 Lkmpa scenario would still be more than enough to justify the extra cost (with an average benefit:cost ratio of 2.5:1), but at this level of road building there is less congestion, and the difference in benefits with and without pricing would be reduced. Here pricing would reduce the additional benefit by less than 10%, and the effect on the economic justification for more road capacity would be reduced by a similar amount.

These findings are in contrast to the Eddington Study which estimated that, between 2015 and 2025, 290-325 Lkmpa of additional strategic road capacity in England could be justified without pricing, compared with only 50-85 Lkmpa if efficient pricing is introduced. This equates to an 80% reduction in requirement for road building resulting from an efficient pricing scheme.

Figure 5.3
Effect of efficient pricing on the benefits of extra capacity



[26] We have not included the 800 Lkmpa scenario as the extra capacity was applied to southern regions only.

However, the benefit:cost ratio used in the Eddington Study assessed benefits and costs to government. In this approach income (and therefore benefit to government) from road pricing would be reduced by building more capacity because the charges for using the road would be reduced as there would be less congestion.

A more appropriate and fairer approach is to assess the benefits and costs to society as a whole, as we have done. A recent report to Congress on the national highway system by the US Department of Transportation, based on the overall effect to society, estimated that in the United States efficient pricing would reduce the requirement for road building by a more modest 27.5%[27].

This analysis demonstrates that efficient pricing is not, as it is sometimes presented, simply an alternative to building additional road capacity. There are great benefits to be gained in more efficient use of the roads by introducing pricing, but more road space will gain even greater benefits, not least because using the roads will be more affordable to people on low incomes. Determining the balance would be a matter for detailed technical assessment of specific circumstances, tempered by political judgement. A key message is the importance of planning road pricing and road construction programmes together to produce the best result for the area concerned.

How much additional capacity is justified?

Neither our study nor the Eddington analysis can determine definitively the rate of road building that is justified in economic terms. Both studies were looking at the general case for particular directions of policy, and were not able to look at individual projects. So much will depend on the particular content and circumstances of each individual project. Nevertheless, our analysis does show that without pricing there are large benefits to be gained from additional road building – as indeed does the Eddington 'evidence base' of the benefit:cost ratios of past and pipeline schemes (see Figure 4.1), and also the experience of the 1990s. With pricing, there is a strong economic (and social) case for more capacity to serve the growing demand for choice and travel, as well as a source of income to fund the investment.

The fact that the incremental benefit:cost ratio remains high even in the 800 Lkmpa scenario indicates, but does not prove definitively, that this level of building would be justified, as these ratios are averages and each 200 Lkmpa tranche may include some schemes with very high ratios and some others with uneconomic benefit:cost ratios. Much will depend on which projects are chosen, their relationship with other projects, and how the case for them is affected by pricing. This underlines the case for proper long-term transport planning at national, regional and conurbation levels.

So far as can be judged from the regional and conurbation evidence, at least 600 Lkmpa of strategic road building is needed for the period 2010-41 to capture the economic benefits and support growing national prosperity. Our modelling does not include wider benefits to the economy, such as encouraging new business growth that would not otherwise take place, which in some areas could be very significant. This suggests that projects totalling an average throughout the period of rather more than 600Lkmpa (including junction improvement, public transport or traffic management schemes offering equivalent increases in capacity to road building) should be prepared. This would equate to the annual average rate of road building actually achieved during the 1990s.

Affordability

We have estimated the cost of providing an additional 600 Lkmpa of capacity to the strategic network as around £4.5bn a year, considerably more than current expenditure. Unit costs of road construction have been growing more rapidly than general inflation but, if measures recommended in the Nichols Report are adopted successfully, the cost of a programme of the size we recommend could be reduced, although it would still be well above current spending. Our recommended programme would provide good value for money with scheme benefit:cost ratios above 2:1. We recognise, however, that potential claims on public investment greatly exceed available resources and that selection according to political priorities is necessary.

[27] 2006 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance: Report to Congress: U.S. Department of Transportation et. al. March 2007

A major innovation over the last ten years has been private funding of schemes using the Design, Build, Finance and Operate (DBFO) approach under which private sector promoters prepare, deliver and manage schemes, funding the investment and maintenance themselves. They are reimbursed progressively over a period by way of payments from the government. These are used to reflect use and management performance, for example in terms of availability and safety. Although the investment cost is not counted as public expenditure, the repayments which cover ultimately all the costs of building and operating are. Increasing the scale of DBFO activity will over time increase the claims on public funds.

In the case of the M6 Toll road, investment and operation funding is private and payments are made directly to the operators by users so that no public expenditure is involved. This approach, however, is not appropriate for efficient pricing which must cover the whole network and reflect conditions comprehensively. If efficient pricing is introduced, the M6 Toll will have to be brought within the system.

We estimate that the annual yield from efficient pricing in association with a 600 Lkmpa programme would be £25-30bn. This would be payment from users additional to fuel duty and road tax at the present rate. We argue in Chapter 6 that public acceptability of pricing requires that some of this money must be seen to be directed to projects addressing relief of congestion. Our estimate of the cost of setting up and operating the pricing system itself is around £4.5bn a year. The pricing yield would be able to cover this together with the cost of 600 Lkmpa additional capacity and leave a substantial balance, £15-20bn. We argue, again on acceptability grounds, that all or most of this should be used to reduce the existing taxes on road users.

Thus efficient pricing, as well as increasing the benefits from the new capacity, would provide the means to finance it and in this way help to justify its introduction.

Comparison with the Eddington Study

There are many differences in detail between our analysis and the assessment undertaken by the DfT for the Eddington study, though the forecasts and the general approach are broadly similar. Both are high level and consequently have some limitations. A more detailed explanation of the differences is set out in the Technical Report. The main differences are:

- **timescales** – 2041 compared with the Eddington medium term perspective to 2025. Amongst other consequences, we have higher values of time and higher traffic levels but the traffic growth profiles are much the same;
- **appraisal methodology** – our B:C ratios are expressed in terms of benefit to society as a whole, and do not include the effect of different options on the taxes and charges collected by the Treasury. This particularly affects the low estimate of road building justifiable with efficient pricing, as an increase in capacity leads to less congestion and therefore less charge income;
- we have varied **values of time** to reflect differences in regional earnings, whereas DfT/Eddington has national rates for costs and time for all areas. The effect of flat rates is to underestimate the value for money of extra capacity in southern regions;
- the DfT/Eddington appraisal includes **wider economic benefits** whereas our study does not;
- we have used higher **fuel and environmental costs** than DfT/Eddington;
- the DfT/Eddington **additional capacity** includes only widening or by-passes on existing strategic roads and cannot take account of the potential for entirely new roads.

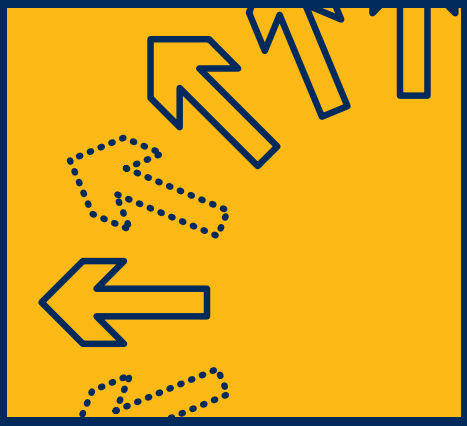
Despite these differences in perspective and assumptions, on many issues we have come to similar conclusions. The effects of efficient pricing on tax income to Government, public transport, environmental impact and climate change are generally of similar orders of magnitude. However, there remains a substantial difference between the two studies on how much additional strategic road capacity can be justified: our estimates are of the costs and benefits to society: unlike Eddington, we consider that how the Treasury raises money is a separate matter.

Conclusions

The analysis compares possible road building and pricing strategies with doing nothing beyond what is currently planned. It shows that:

- Increasing capacity on the strategic network by up to 800 Lkmpa as compared with doing nothing after completing current programmes would produce substantial benefits in terms of carrying more of the forecast traffic demand at lower journey times, yielding benefit:cost ratios greater than 2:1.
- Such capacity increases without pricing would lead to more travel, and therefore higher carbon emissions but the effect would be small. With pricing, emissions would be lower than in the base case.
- Average charges in 2041 would be around 9p/km at 2041 prices outside conurbations, and higher charges inside. They would vary substantially between locations and types of road.
- Efficient pricing would enable better use to be made of the greater capacity by providing additional benefits. It would also provide substantial revenue some of which could and should be used to finance the additional capacity.
- In terms of meeting demand effectively pricing is only a limited alternative to providing new capacity.
- Our work suggests that a minimum increase of the order of 600 Lkmpa from 2010 to 2041 would be needed to capture the potential economic benefits and avoid compromising the growth of national prosperity. This is about the same level as the average for the 1990s.

6
Efficient pricing



6 Efficient pricing

In this chapter we give some more information on the efficient pricing approach, set out some of the effects of introducing such a system and note the importance of securing public acceptability.

There are various ways of charging for use of the roads. Parking charges apply to stationary vehicles, the London congestion charge is a levy on vehicles crossing a cordon into the central area and vehicle excise and fuel duties are forms of pricing applied nationally for the use of the roads. Tolls, such as those on the Dartford Crossing and the M6 Midland Expressway were intended to recoup the cost of construction and operations. In all cases, with the exception of the M6 Toll, the charges are politically determined and are often only weakly related to costs. If pricing is to be used to improve the overall performance of the road network, a much more sophisticated and targeted system is required.

The system on which our analysis is based – *efficient pricing* – is the same as that proposed by the Eddington Study, one based on the additional cost to society of every extra trip and reflecting the difference in costs between different locations. (We would note that there are some differences in the cost rates used in the two studies.)

Under this system, a charge would be paid for vehicle use in relation to the actual costs imposed on the road network itself and on other road users together with the wider costs on the rest of the community – including climate change costs. This would comprise

- a tax on transport fuels to reflect their contribution to climate change,
- a standard rate for each type of road to cover the cost of providing and maintaining the road, of additional accidents and adverse environmental effects due to use, and
- a variable rate to reflect the amount of delay, depending on place and time.

The charge would, as far as possible, be objectively determined in relation to costs actually imposed at every location. To work effectively the system would have to be comprehensive, covering all roads.

A key feature of such a system is that it would identify the locations at which congestion is worst and hence the priorities for improvement.

A road pricing system in this form would be complex, requiring advanced technology and possibly involving substantial cost. There would also be major governance issues, which are discussed in Chapter 8.

To achieve a full efficient pricing scheme would be a medium to long term undertaking. In the short to medium term, local or sub-optimal schemes are likely to be implemented. Nevertheless, in order to be able to move towards a basis for a national scheme, the Government is requiring that the current round of Transport Innovation Fund projects should be subject to national guidelines[28].

Effects of efficient pricing

Road pricing would not reduce the desire to travel, but it would influence decisions about whether to travel, where and when. Its main effect is likely to be to discourage travel on the most congested roads at the most congested times. In some places it would also encourage mode shift to public transport, walking and cycling for local trips in urban areas, and to rail and air for longer journeys. The remaining users of the road would then benefit from shorter and more reliable journey times.

The overall effect on land use is very difficult to judge and would vary between cost sensitive and time sensitive activities. There may be some effect on patterns of population and employment. Pricing would reduce the attractiveness of car commuting to or through congested areas, but better bus services and a more attractive inner urban environment would to some extent have the opposite effect. Employment uses and visitor attractions that are car dependent would be less likely to locate in areas where the charges are highest.

[28] http://www.dft.gov.uk/pgr/roads/roadpricing/multitifbuscase

People may well choose to drive further on uncongested roads where the charge is relatively low rather than to make shorter journeys on roads subject to a high charge. In the absence of increases in urban road capacities this may lead to further decentralisation of some traditionally urban activities such as retailing and leisure facilities.

Lastly, the locations in which charging income accrues would mostly be concentrated in larger towns and conurbations, and on key inter-urban corridors. Unless road pricing is seen as just another way of raising money for government, there would be an expectation that the money should generally be spent in the areas where it is raised – indeed a central premise of efficient pricing is that the proceeds of charging should be applied to solve the problems that give rise to the charges. If so, they would be likely to have a very significant effect on local government finance in these areas as the sums would be considerable – possibly even large enough to affect the financial arrangements between central and local government.

Public acceptability

It is clear from recent experience that public resistance to any pricing system would be a major concern. The main elements of this are worries about

- comprehensibility and confidentiality,
- pricing being just an additional tax, and
- different effects on different individuals, particularly the implications for social equity.

Comprehensibility and confidentiality

All users must be able to understand how the system works and how it affects them. They must be able to predict with reasonable confidence the costs of prospective journeys. The system must not be too complicated to use. Worries about confidentiality and other potential concerns must be addressed.

As noted above, progress towards a comprehensive efficient pricing system is likely to be by way of local schemes. One possible model to start the process is the voluntary scheme introduced by the Oregon Department of Transportation to prepare the way for universal application in the future. Users pay a mileage based charge and are relieved of fuel duty which gives them an inducement to join. The system is simple to use – all payments are made when buying fuel – and easy to understand. Providing charging in this form such that users have an incentive to participate offers a means of easing introduction of a more complex system. The RAC Foundation has suggested that a similar introductory approach, ‘UK Drivetime’, should be developed here.

Pricing as an additional tax

Users would need to be to satisfied that the revenue produced by the charges is not simply an addition to general taxation. The congestion element should be invested in relevant improvements to the transport system to reduce congestion. Fuel duties should be reduced to the level which reflects greenhouse gas costs. It would be consistent also to reduce or eliminate conventional vehicle excise duties, thus replacing a tax on ownership with one on usage.

As part of our analysis, we examined the balance between the mobility benefits (particularly the value to the motorist of the time saved and the additional distance travelled) of charging and the additional charges paid. Figure 6.1 gives a broad indication of the costs and gains to users of the strategic network of pricing and additional road capacity. If there is no road building after 2015, the value of road pricing to trunk road users would be £18.5bn p.a. – from time saving, safety and public transport benefits. But the extra payment to government in user charges would be £33bn p.a. Assuming there is no mechanism for recycling the income for the benefit of trunk road users (such as reduced taxes elsewhere or investment in congestion relieving transport projects), the government would gain £33bn, but the road user would have a net loss of £13bn p.a.

However, if some of the charge payment were spent on road building, the benefits to road users would increase and the charges would be reduced because there would be less congestion. At 400 Lkmpa (at a construction cost of approximately £3bn p.a.), the additional benefits would be worth the extra cost to trunk road users, despite the the government gaining £25bn p.a. At 600 Lkmpa, the road user gains £4bn p.a. and Government still has over £20bn p.a.

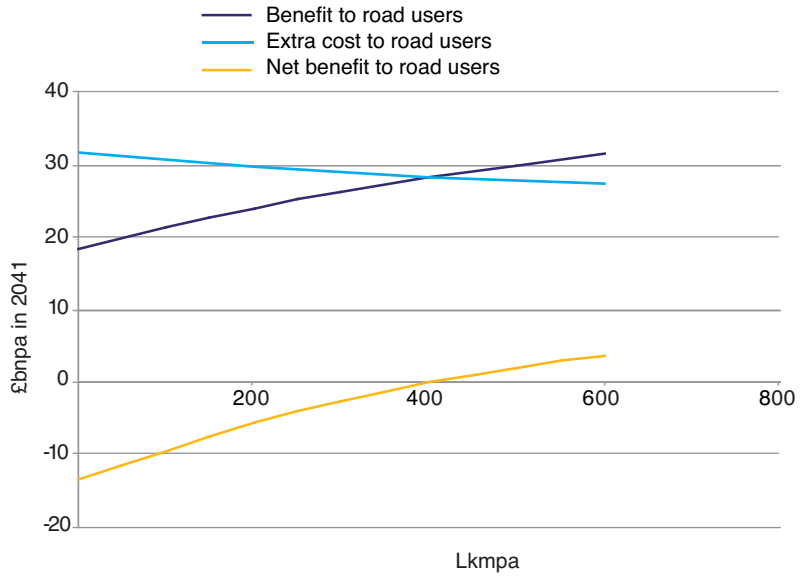
The above figures underline the importance of proposals for allocation of the income as part of the road pricing package on public acceptability as well as economic efficiency grounds, including safeguards to reserve a large part of the funds raised for congestion relief and projects to increase accessibility.

Different effects on different individuals

Introduction of pricing would result in a fundamental shift from paying for roads through general taxation to largely paying according to where, when and how much use is made of roads. This would raise issues of social equity, as some people with limited resources to spend on travel will find themselves less able to afford to use busy roads. These people would potentially be losers unless either alternative transport that is just as good is provided, or else extra road capacity is built to reduce the cost and allow them to go when and where they want. This would be a major practical and political issue in planning and implementing any road pricing scheme.

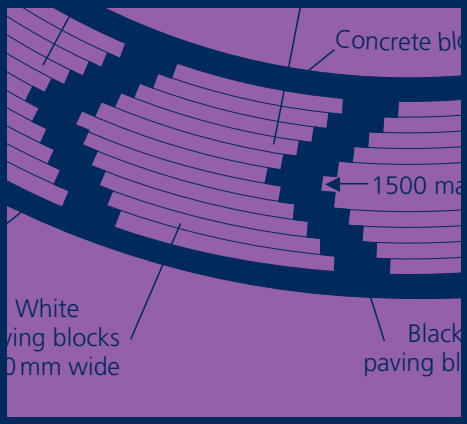
Pricing alone addresses congestion at the expense of mobility but, in association with additional capacity, it will reduce congestion at the same time as facilitating mobility for a larger number of travellers. A good strategy must get this balance right.

Figure 6.1
Benefits and costs of additional capacity and efficient pricing to road users – strategic roads Great Britain



7

Towards a long term national roads strategy



7 Towards a long term national roads strategy

Our modelling provides a broad indication of the effect of building additional road capacity on traffic volumes and congestion, and on the amount of strategic road building that would be economically justifiable. The key conclusions that can be drawn from the analysis in Chapter 5 are that

- with or without efficient pricing, it would be value for money to expand the capacity of the strategic road network by at least 600 Lkmpa and probably more. Conversely, a choice not to increase capacity to serve growing demand will be to forego these benefits and the consequent increase in accessibility and prosperity,
- efficient pricing would add very large benefits,
- less new road capacity would be needed if an efficient pricing scheme were introduced, but only about 10-25% less, and still at least 600 Lkmpa
- greater benefits could be obtained by concentrating a higher proportion of capacity increases in and around urban areas – particularly London, and in the fastest growing areas in the South and East.

We argue that a programme of this order should be pursued. We would argue further that to deliver such a programme effectively over a long time period requires detailed planning of individual projects within a strategic framework. It takes many years to plan and implement road building projects and a steady programme of schemes in preparation is essential if implementation is to be matched to need.

These concerns point to the need for a long term strategy to

- set out aims for the development of the strategic network over the plan period of 30-50 years, with greater precision for the earlier period,
- identify which transport corridors will need additional capacity,
- schedule the timing of the necessary programme of improvements,
- indicate the annual levels of funding required, and
- be co-ordinated with other planning exercises, taking into account, for example, forecast changes in levels and location of population and economic activity. Over the period of the strategy, changes in forecasts and other factors will require the strategy to be reviewed, revised and rolled forward progressively.

Although focussed on the motorway and trunk road network, the strategy must take into account changes in local roads, and indicate where improvement of these may be needed to achieve the objectives. This is essential to ensure that each part of the road system plays its appropriate role. The non-strategic network must link the strategic system to adjacent areas, provide for those movements that are not suitable for strategic roads and minimise through traffic in the smaller towns and villages that trunk roads do not serve directly. The strategic network must also be planned and developed to improve its robustness against accidents and other incidents on individual routes.

To develop such a strategy is beyond the scope of this study but we have attempted to indicate how it might begin to take shape. To do this we have considered projections of population and of stress on the strategic road network, on the basis of which we have indicated how the national network might be developed.

Population growth

Most of our modelling has apportioned the increase in road building in fixed ratios for motorways and trunk roads, and for conurbations and other areas that are broadly similar to those used in the Eddington study. However, around 40% of the forecast traffic growth will be due to the forecast increase in population (the remaining 60% is due to increasing demand for travel). Figures 7.1 and 7.2 map the population change between 2001 and 2021 and between 2021 and 2041. As 88% of the forecast net population increase is in the East Midlands and southern regions, including London, these will be the areas where new roads are most needed. In many cases these are already the areas where strategic roads tend to be more crowded.

Figure 7.1

Population change 2001-2021

Source: TEMPRO Planning Guidance Note

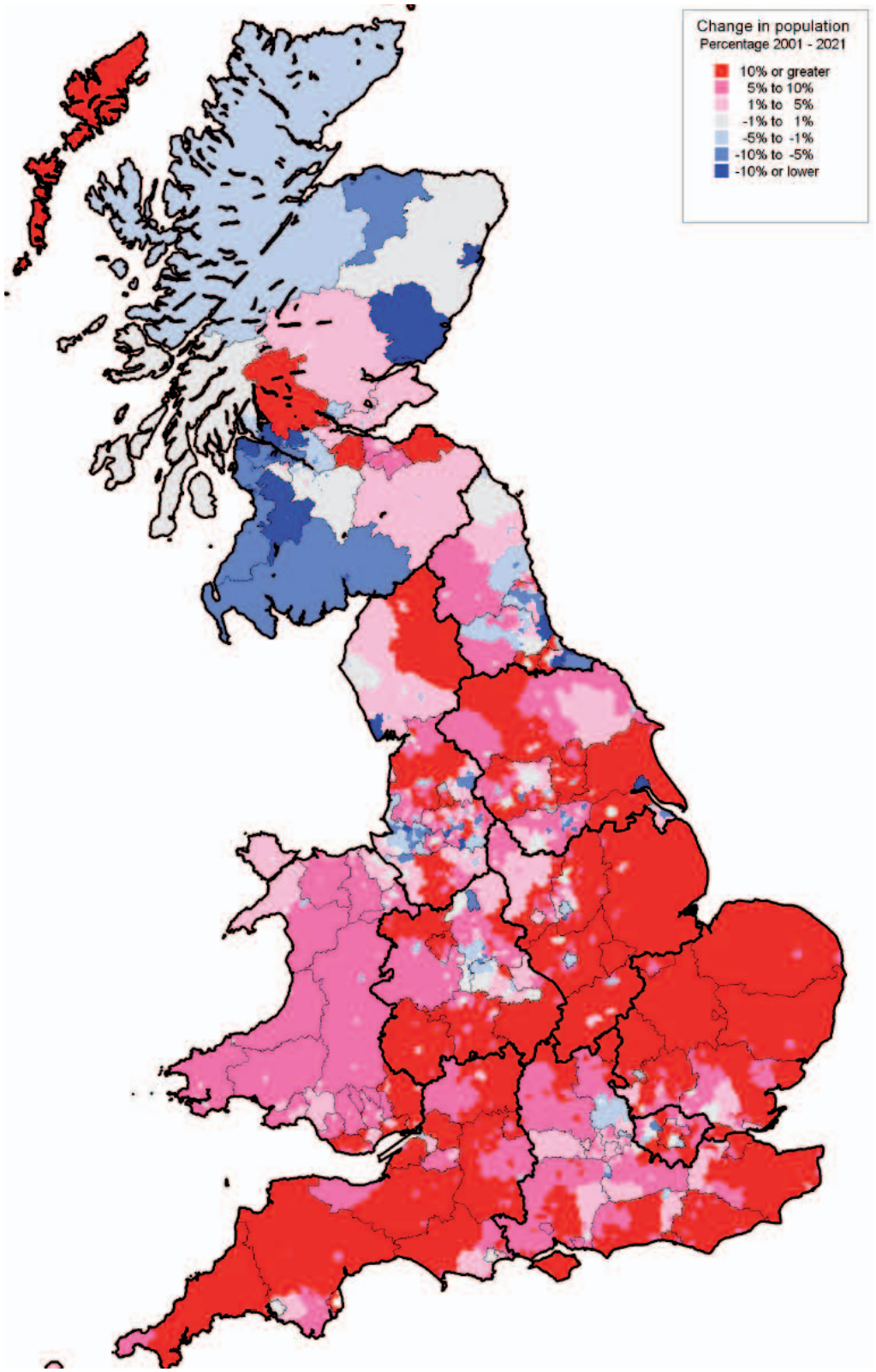
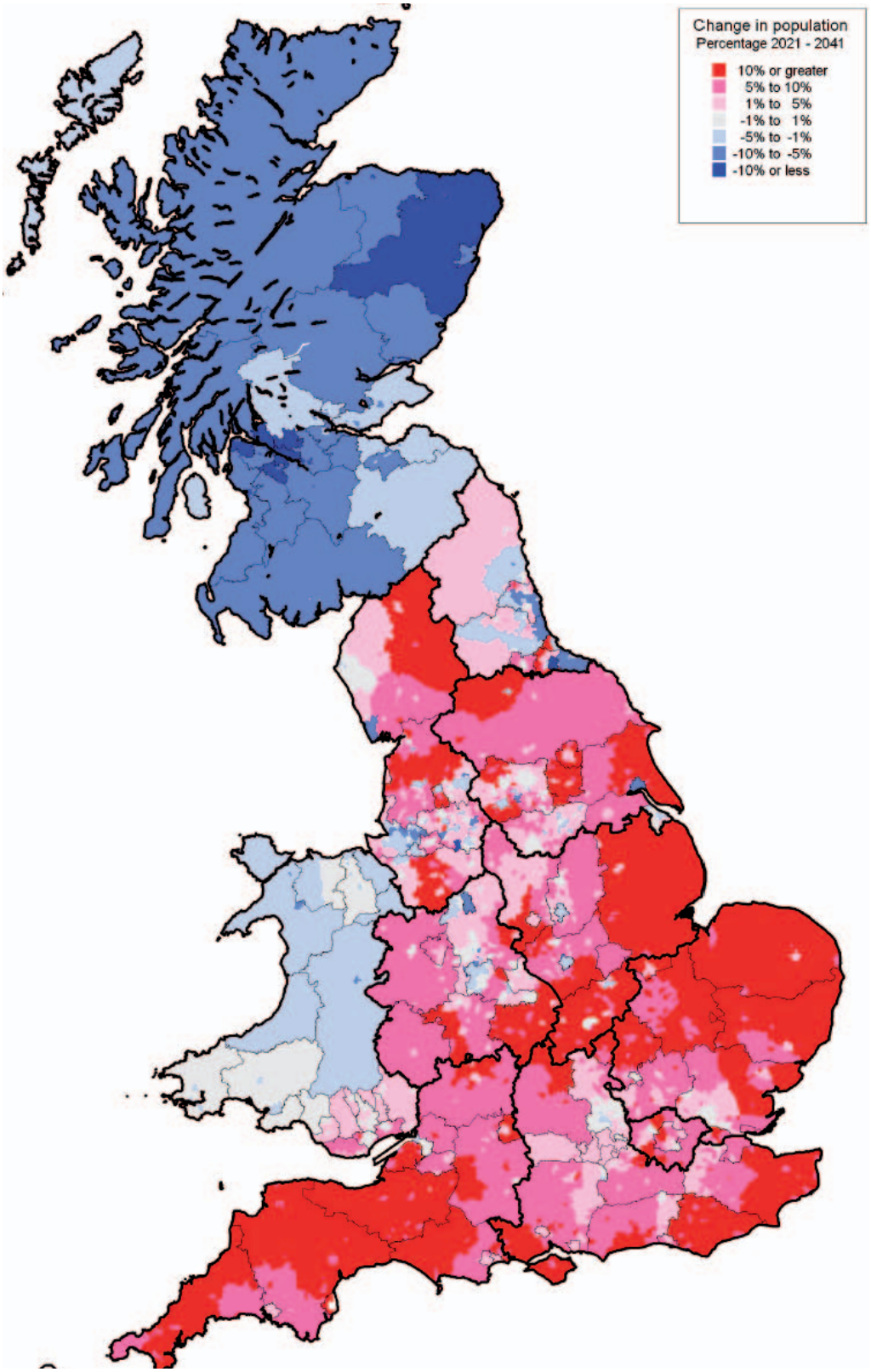


Figure 7.2

Population change 2021-2041

Source: TEMPRO Planning Guidance Note



Stress on the strategic road network

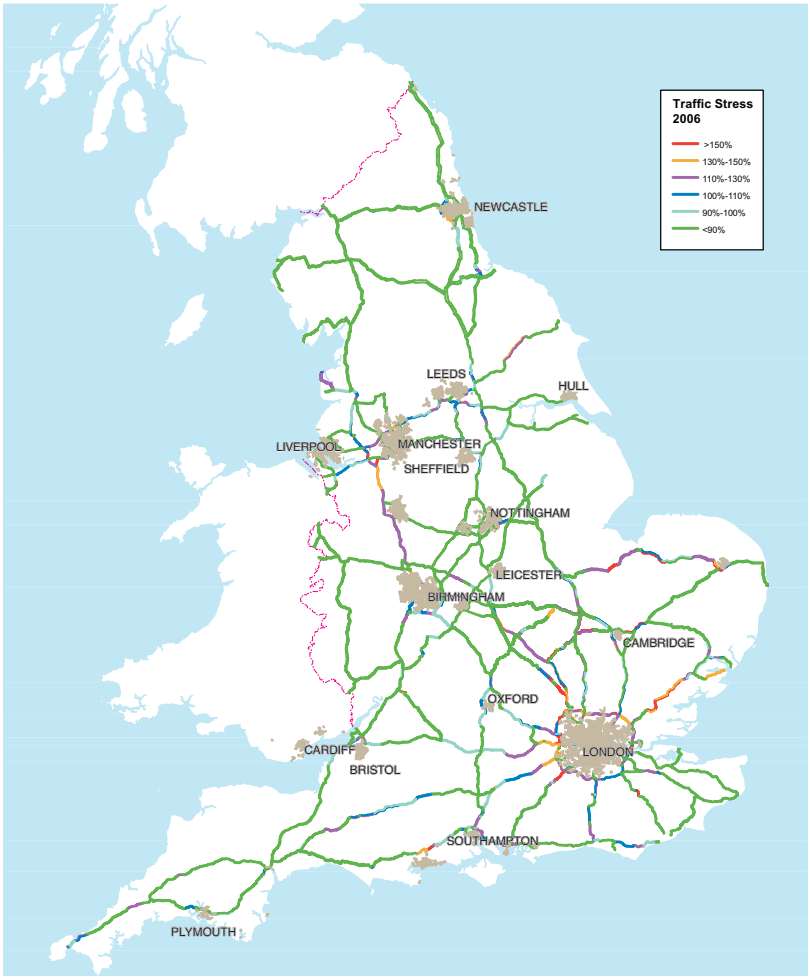
Measuring available capacity is complex, as junctions and other bottlenecks affect overall route capacity and traffic flows vary greatly depending on time of day, day of the week, and seasonally in areas such as the far South West and coastal resorts.

The Highways Agency models 'traffic stress' to give a broad indication of where average flows are reaching the effective capacity of the strategic roads and where congestion therefore occurs. Traffic stress is a measure of the actual average daily traffic flow relative to capacity. However, higher stress will mean worse congestion in the peaks and in the highest cases congestion will extend into off peak periods.

The Highways Agency models "traffic stress" to give a broad indication of where average flows are reaching the effective capacity of the strategic roads and where congestion therefore occurs. Traffic stress is a measure of the actual average daily traffic flow relative to capacity. Stresses exceeding 100% do not indicate more peak traffic than a road can accommodate, but rather that these roads are likely to be operating at or close to capacity for longer periods of the day. However, higher stress will mean worse congestion in the peaks and the highest congestion extending into off peak periods.

Figure 7.3 shows the level of stress that would arise on the 2015 network assuming current flows.

Figure 7.3
Traffic stress on the strategic network at current flows.



On this measure there is already a capacity shortfall on much of the M1/M6 route from London to Manchester; on most of the London radial routes as they approach the M25; on parts of the M62, the A47, the route from Newmarket to Milton Keynes and the A12 in the East of England, and parts of the South Coast route. There are also orbital/by-pass capacity shortfalls around major conurbations, most notably London, but also Birmingham, Manchester, Leeds and Newcastle. Nevertheless, although in many places busy, most of the network is currently operating at traffic levels below maximum capacity.

In order to identify the availability or shortfall of spare capacity, we asked the Highways Agency to model traffic stress on the 2015 network assuming uniform increases in traffic of 20% and 40% above current levels. The resulting stresses are shown in Figures 7.4 and 7.5.

Figure 7.4
Traffic stress assuming 20% increase in flows

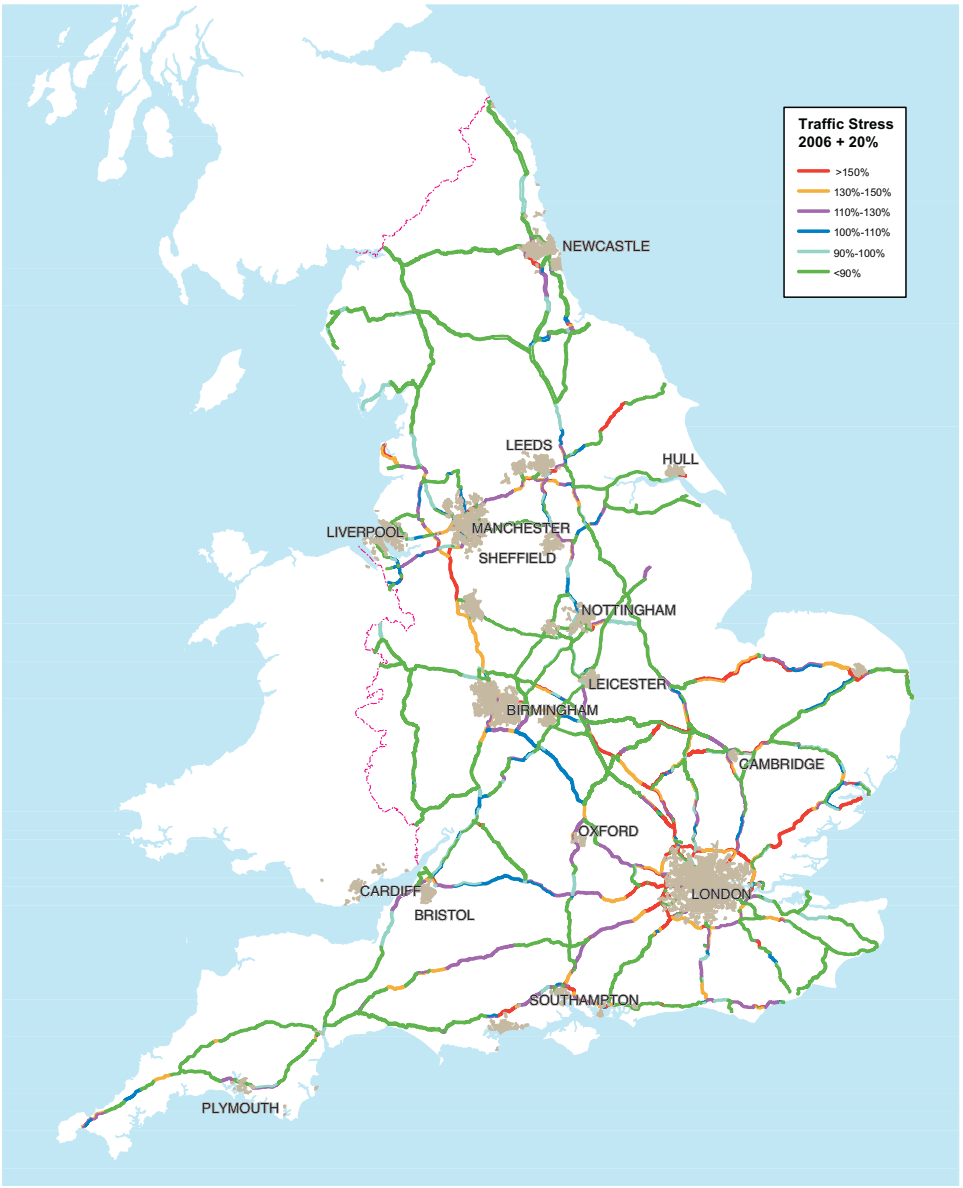
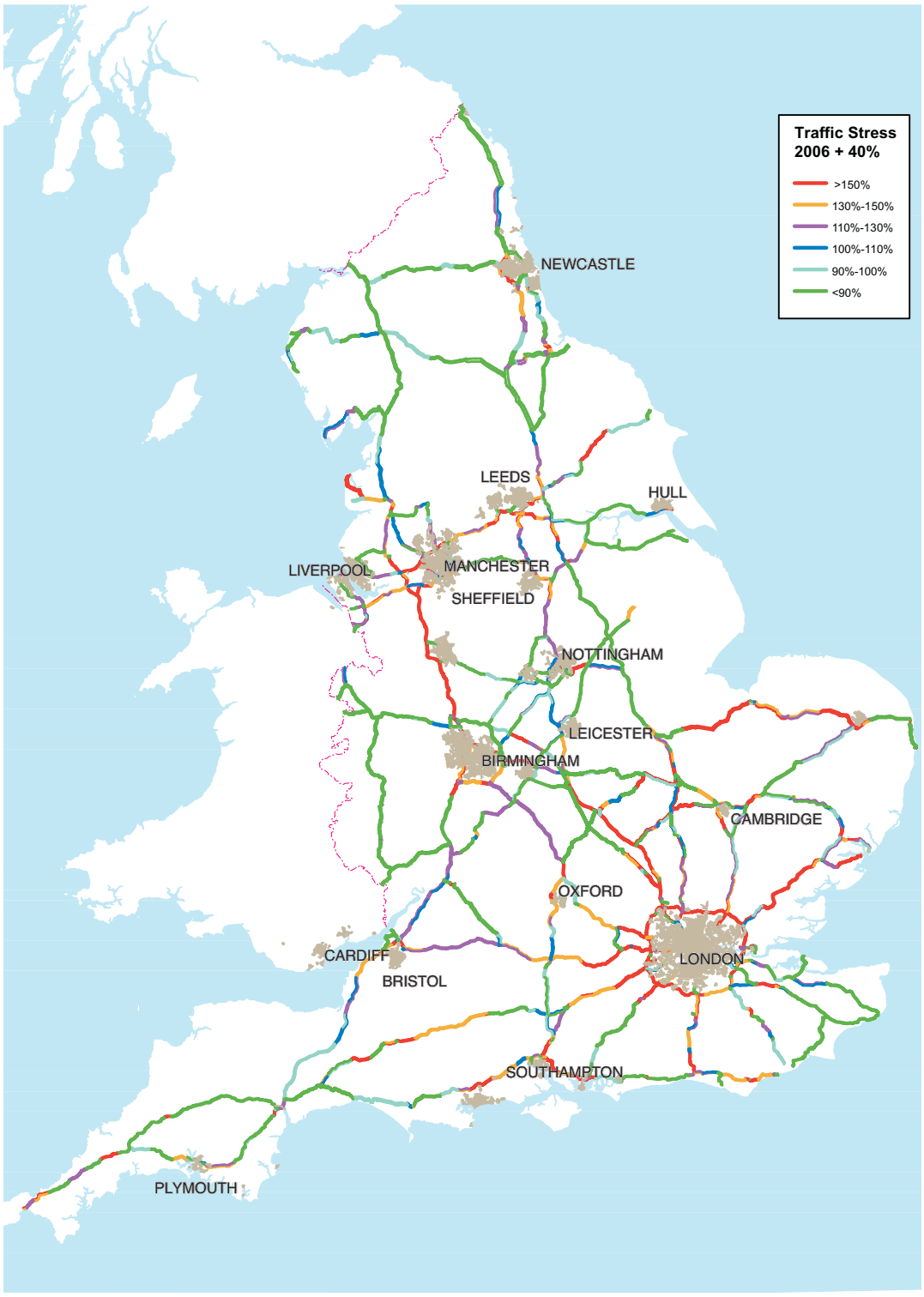


Figure 7.5
Traffic stress assuming 40% increase on flows



Nationally, we forecast that without road pricing, by 2041 there will be a 39% increase in traffic on motorways, 33-34% increase on dual carriageway rural A roads and 18-19% on single carriageway roads. The +40% map therefore gives a broad approximation to the overall stress for motorways and the +20% map an indication of the effect of growth on single carriageway trunk roads. It is only a general indication as the actual picture will vary considerably at regional and local level.

- At 20% extra traffic the areas of stress are spread throughout most of the South East and the near South West as well as round the conurbations in the Midlands and the North.
- 40% more traffic on the motorways would stress almost the entire motorway network: the main exception being the M6 north of Lancaster. Further, most of these roads are 50% or more above the stress level that indicates peak congestion.

In practice, congestion will tend to suppress demand on the most crowded roads, so this illustration represents a worst case scenario. Efficient pricing alone would reduce demand on motorways by about 3% in southern and eastern regions, though by much more in London and the conurbations.

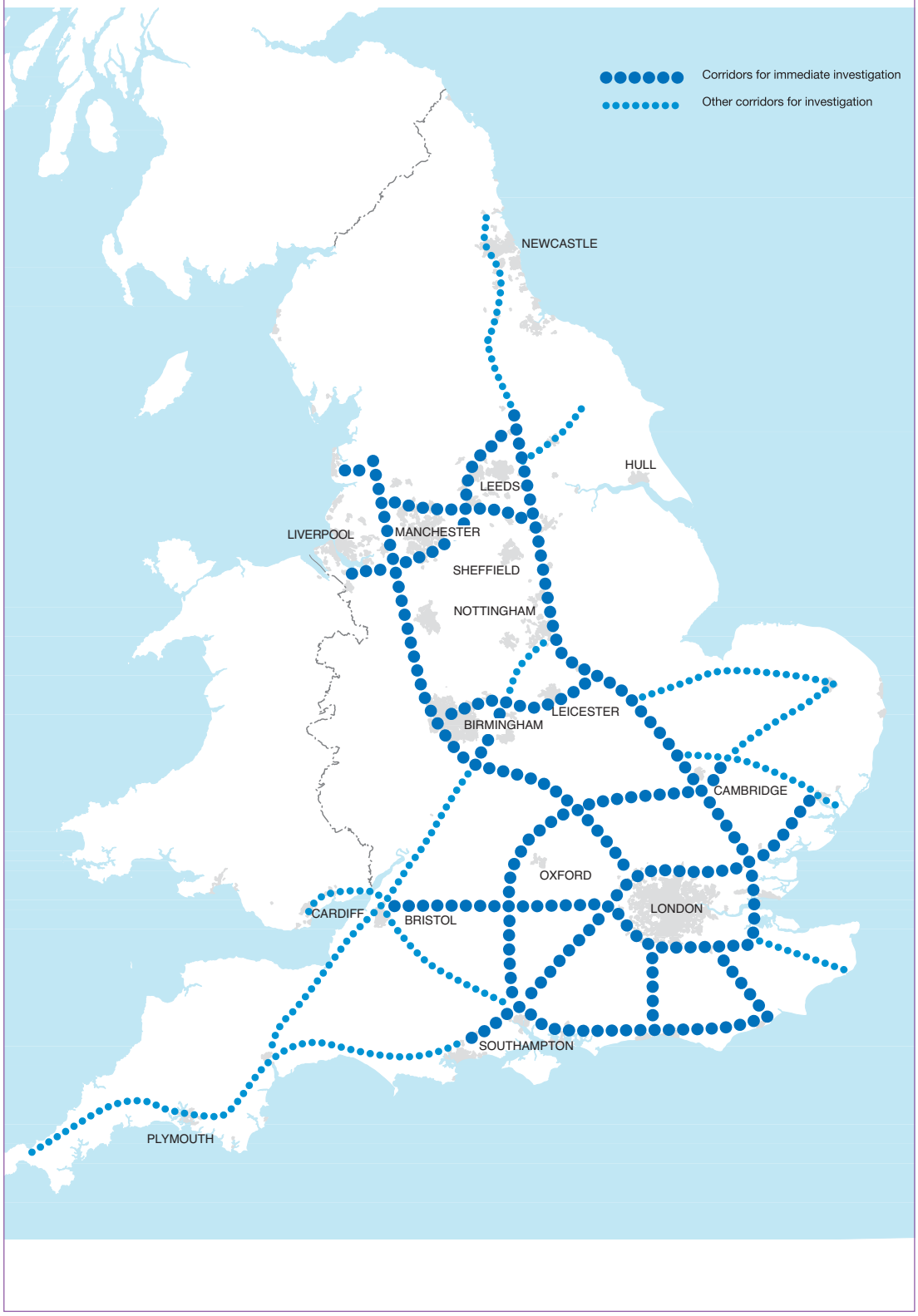
Where the scale of forecast demand is 30-50% above the stress benchmark, it is appropriate to consider new roads because of the scale of the long term mismatch between supply and demand. Table 7.1 summarises the main routes and roads where this is the case.

Table 7.1
Heavily congested routes and roads at 40% traffic growth

Routes	Roads
London-Ipswich	A12
London-Cambridge-Peterborough	M11/A14
London-Peterborough	A1
London-Birmingham-North West	M1/M6
London-South West	M3, A35, A303
Other London radial routes	M20, A3, M23, M4, M40, A12
Peterborough-Norwich	A47
Nottingham-Leeds	M1, A1
Teesside-Tyneside	A1, A19
Liverpool-Manchester-Leeds	M56, M62
London orbital	M25
Birmingham orbital	M42, M5, M6
Manchester orbital	M56

Figure 7.6

Inter-urban routes and corridors to be considered for major capacity expansion



The strategic framework

The stress maps show the corridors where there is likely to be most pressure on existing capacity, and the transportation and economic analysis shows in broad terms the likely quantum of road building that would be justified. On this basis we have developed an indicative framework for the largest strategic roads in the longer term. Figure 7.6 shows the concept. The routes are divided into an 'A' list where investigation of the long term options should commence immediately, including the implications and desirability of building entirely new roads, and a 'B' list for which routes also merit investigation, but which are generally less central to the overall concept, and often more likely to be candidates for incremental upgrades or later stage new road building.

The key features of the pattern of additional strategic road capacity are that it provides

- substantial extra capacity to serve growing demand between London, the Midlands and the North,
- capacity to serve population growth in eastern England, the South Midlands and the South West,
- East-West routes between conurbations in the Midlands and between those in Yorkshire and the North West,
- improved radial routes to/from London, and
- orbital capacity around the major conurbations.

For the demand between London, the Midlands and the North, one option could be to concentrate the capacity on the existing roads or corridors, especially the M1. However, by mid-century demand on all the North-South motorways is in places likely to be substantially above 100% stress levels – with or without road pricing – with the growth in demand spread over a wide area. Two strategic routes are therefore proposed for major capacity enhancement.

On the western side the route would be in the M1 or M40 corridors to Birmingham, or in between, and in the M6 corridor further north. But on the eastern side the capacity shortfall on existing routes is more fragmented, population growth generally is forecast to be greater, and the London-Stansted-Cambridge-Peterborough designated growth corridor extends over 80 miles. Here we propose a new East of England route be examined. It could start on the M20, cross Thames Gateway east of Dartford relieving the M25, and thence to Cambridge and the conurbations in the East Midlands and Yorkshire, providing more capacity in the M1 corridor and possibly extending as far north as Newcastle.

For the South West, the M3 and M4 corridors will need a substantial increase in capacity by mid-century, as will the London radial routes and the East-West corridors from Birmingham, Manchester and Leeds/Sheffield.

The remaining routes on the 'A List' are not only to serve growth and relieve congested roads, but also to provide strategic connections in important corridors currently lacking high quality roads such as

- Oxford-Milton Keynes-Cambridge and possibly to Norwich, and
- the South Coast route.

What sort of capacity enhancement?

Before any investment decisions are taken, all the options for providing more capacity should be examined in sufficient detail so that the most cost effective and environmentally acceptable solutions can be implemented. This is a major task.

The choice between building new roads and widening existing roads must reflect local circumstances and needs. Over recent years national policy has been mainly to widen and this has led to some very high capacity routes such as the western side of the M25. Building new roads has a number of advantages over widening including

- causing less disruption to traffic flows on existing roads,
- having lower costs,
- minimising the need to construct multi-level intersections on existing roads,
- operational simplicity compared with large multi-lane roads with heavy weaving requirements and heavy loads on feeder routes,
- extending improved accessibility to new areas,
- providing opportunities for the best modern design and construction methods, and
- reducing dependence on a few critical links whose disruption can cause chaos.

An effective strategy for the longer term must, where appropriate, make the most of these advantages.

It must also be recognised that new roads generally raise greater environmental concerns than improvements to existing ones. Even away from urban areas, the construction of new roads can be disruptive and environmentally damaging and past examples in Britain have not always been as well executed as they should have been. However there are examples – particularly in other European countries – of how to minimise environmental damage.

Well chosen routings, careful landscaping, use of tunnelling where the cost can be justified, the sensitive use of materials for surfaces and barriers, imaginatively designed structures and reparation of any severance can limit visual and other impacts and, in some situations, enhance the landscape as well as opening up new attractive views to large numbers of motorists.

All this adds cost to road construction, but a part of the large economic benefits that an efficient road system brings should be used to make their design and routing acceptable.

At this stage we are not proposing that all the additional capacity needed should be new roads. In reality there will be some new building and some widening or other capacity enhancement on existing roads. On many of these routes preparatory work has been undertaken in the past. Where appropriate this should be used, but it will need to be reviewed and re-appraised in the context of the long term perspective and assuming a national road pricing scheme is in place before the end of the next decade.

In the longer term timeframe to mid-century, there will be many changes in vehicle technology and construction techniques that will affect highway design and operations. For example, the ventilation requirements of road tunnels today are less demanding than thirty years ago as a result of less polluting vehicle exhausts. It would be a mistake to plan to build 20th century standard roads for the future. Exactly what advances in technology will offer is difficult to predict, but it should include more efficient construction techniques and new materials, and sophisticated traffic information and control systems that may allow significantly higher capacities.

In addition, at least some of the new roads could be light vehicle only ‘superhighways’ which would be cheaper to build and maintain, and, should improved vehicle and road safety permit, could also eventually have significantly higher maximum speed limits. A clear advantage with new routes is that imaginative solutions such as this are possible. They should be explored.

8 Implementation and institutional proposals

8 Implementation and institutional propopsals

This study argues the need for a long-term strategy for the strategic road network with a horizon 30-50 years ahead and indicates some elements of the form this should take. In this Chapter we look at some of the implications for organisation of planning and delivering such a strategy.

The Department for Transport's current strategy for roads, set out in the 2004 White Paper *The Future of Transport: a network for 2030*[29], may be summarised as improving the management of the road network, to get more out of it, and, for the longer term, planning for the introduction of road pricing.

The Eddington Study called for a 'rigorous and systematic approach to policy-making … focussing on objectives and delivering high-return schemes'. In our view a long-term planning framework is essential to achieving Eddington's priorities and we are pleased to note that the Government's response in the recent White Paper *Towards a Sustainable Transport System* has indicated an intention to look towards a strategy for the longer term. We hope that this report will be seen as an input to that and would press the need to take a broader look at the longer-term needs of communities and the economy. This will require a new approach based on preparing a comprehensive set of proposals which together will provide for travel demand not only in the medium term but over a 30-50 year timescale. It will also require organisations that can deliver and a long-term commitment to funding.

Planning White Paper

In July 2007 the Government published its White Paper *Planning for a sustainable future* which includes proposals for 'National Policy Statements' (NPSs). The Statements will 'provide clear direction by setting out strategic direction for infrastructure capacity and development' (para.2.13), and 'Where government has a large degree of influence over which investment projects go ahead … national policy statements are likely to be relatively prescriptive and detailed in identifying what infrastructure is needed to deliver national objectives'.

We strongly support the principal of preparing long term national policy statements but note that it is very important that they should not be over-complicated and time consuming to prepare. They must not become just another tier of planning that needs to be reconciled with regional and local plans prepared by different agencies at different times. Otherwise the result will be further confusion and delay.

The Eddington Study proposed a clarification of roles where Ministers would set strategic objectives and promoters would develop project proposals within a clear strategic framework. This is an excellent principle. In line with the discussion above, we believe that the NPS for the strategic road network should set out a long term (30-50 years) strategy for development. This should aim to specify, in terms of location and standard, proposals for improvement of existing links and provision of new roads. It will then be for the promoters to work out in detail whether better management of existing capacity, widening, junction improvements, by-passes or a new road are the best way of achieving the objectives and output requirements in accordance with the NPS and other government policy.

The White Paper suggests review of NPSs every five years. We agree with this in principle but argue that the possible need for revision should be kept under continuous review to ensure that any indications of major changes in levels and location of economic activity and population, or key relevant specific developments like provision of new airport capacity, are taken into account as soon as possible.

The strategic network

The present English strategic network – that for which central Government is responsible and which

[29] Department for Transport (2004) The Future of Transport: a network for 2030 Cm 6234 (London: TSO)

the Highways Agency manages – which has always been smaller than the corresponding networks in other modern economies, has been further substantially reduced as primary national routes have been transferred to local authorities for them to manage with local needs in mind.

In our view there is a strong case for a more extensive network managed and developed for a primarily national role – perhaps about the 10% of busiest roads forming a coherent network outside the largest towns and cities – related principally to the needs of inter-regional and international traffic. This should connect directly to all major economic and population centres and to transport interchanges – airports, ports etc. It should also include, as far as feasible, alternative routes to the principal links in order to have capacity available when these are interrupted. We believe that a fundamental review should be undertaken to establish the appropriate national strategic network. Once established, an NPS should cover the whole of this system.

For the purpose of reviewing the strategic network we suggest that regard should be had to the Primary Route Network (PRN) distinguished by green-backed direction signs. This network of main roads is extensively used for longer journeys because of the signing and because it is identified in atlases and other navigation aids. In principle it links most major transport destinations but it is not kept up to date by regular review. We would press that the PRN itself should be reviewed and that this exercise should be a key input to the review of the strategic network.

Developing and implementing the strategy

Delivery will be in circumstances where large parts of the road network are under stress. It will require

- comprehensive and continuing monitoring and review of the present and longer term needs of the network in the light of anticipated developments,
- provision of additional road capacity on the basis of a long term plan at a substantially higher rate than at present,
- the introduction of a comprehensive national road pricing system,
- promotion of acceptable and cost effective measures to reduce road use where it can be done equitably and without unacceptably compromising people's ability to travel,
- a clear and comprehensive management framework covering all aspects of operation and improvement of the network,
- long term commitment, and
- some degree of assurance for financial provision.

This will be a major challenge. To be pursued successfully and with minimum disruption it will need

- to be progressed within a comprehensive framework for managing all aspects of the operation and improvement of the road network, strategic and local, which provides for all relevant areas to be addressed, including safety, environmental aspects and implementation of other cost-effective measures for reducing congestion, and
- clear and effective leadership and co-ordination.

Organisation

The Eddington Report has underlined the importance of overcoming the difficult challenges which those responsible for planning and developing the transport systems must face if transport is to support economic growth and provide for the increasing demand. For this job to be done successfully there must be clarity of responsibility at all levels for the bodies involved in planning and delivery with simple and effective arrangements for liaison. Present arrangements do not meet these criteria with uncertainties over the roles of DfT, regional planning bodies and the Highways Agency. Some of these were highlighted in the recent Nichols report.

The planning frame for the strategic network must reflect a national perspective. Recent moves

towards devolving decisions about investment in strategic roads to regional bodies have meant that the national dimension is not adequately recognised, and work against the objective of ensuring that the investments with the highest returns get the highest priority.

Ten years of a much reduced roads programme, while traffic has continued to increase, have resulted in increasing congestion on many roads. There are very few schemes in the pipeline and it will therefore be some years before the level of road building can increase sufficiently to catch up with increases in traffic, during which time the gap between supply and demand will continue to widen. The immediate imperative is to expand the programme. At this stage, major institutional change might be a diversion from the task in hand.

Reorganisation of the present DfT structure, in particular to set up a transport planning capability, and clarification of the respective roles of the Department and the Highways Agency are essential whatever the longer term institutional arrangements. But efficient implementation of a long-term programme of major capital investments requires commitment of adequate funding for a substantial period.

Institutional structures for efficient pricing

Introduction of efficient road pricing on the lines discussed earlier in this report would make a dramatic difference to transport policy and planning in a number of ways. First, as Eddington perceived, it would enable rational pricing to be introduced over the whole of transport, with users of each form of transport meeting the full costs of their journeys. Second, road pricing would give automatic signals about where investment in additional capacity was justified – a vital feature too often ignored in discussions – in exactly the same way as in any other economic activity. The capacity to be provided could, of course, take the form of an enhancement of a public transport facility or a road; whichever provided the most cost effective congestion relief. Third, efficient road pricing would generate substantial sums of money, which could be applied either to a reduction in road taxes or to additional investment, or both.

In these circumstances, there is a powerful case for setting up a National Roads Corporation with an assured source of income from roads charges, and with a clear duty to develop and manage the strategic road network to meet the needs of users in the context of clearly stated national transport and planning polices. It would be responsible for both planning and implementation of a strategy for the national arterial roads.

New institutional arrangements would also be needed to collect and disburse the revenues from a national road pricing scheme – allocating relevant shares to local transport authorities and the Exchequer. This could be a responsibility of the National Roads Corporation, or a separate organisation. Given the complexity of setting up arrangements for pricing and the crucial need to establish and maintain public confidence, creating a body with responsibility confined to pricing would probably be a sensible first step. Once up and running it might be merged with the Corporation.

Either way there would have to be clear arrangements for revenue allocation, consumer protection and data security. We believe that a core requirement to reinvest the relevant share of pricing revenues in improving the road network is essential to making such a fundamental change to the way the road system is managed acceptable to the travelling public.

Conclusions

Road improvements vital to future economy and environment

The Government has some tough choices to make to avoid inter-urban gridlock around conurbations by 2040. The forecasts are for

- population to grow by 11% between now and 2041,
- car ownership to be 44% higher, and
- car traffic to increase by 37%.

The tough choices for Government on the inter-urban and strategic road network are outlined as

- do nothing and let **congestion** and wasted time match demand to the supply of road space,
- build or widen **more roads** without road pricing,
- introduce some form of **road pricing** without additional road building and use the price mechanism to determine who should use the roads where there is insufficient capacity, or
- rely on a **combination of road building and road pricing** – the building to provide for the growing demand for travel and the pricing to ensure efficient use of road space.

The study shows that there is a strong economic case for more strategic road building at an annual rate of around 600 lane kilometres, irrespective of whether road pricing is introduced. However, road building combined with efficient pricing would result in a much higher economic return because mobility would be enhanced as well as congestion reduced.

It will also allow the benefits of increased mobility to be enjoyed by a wider range of income groups rather than being weighted towards the better off in areas where there is insufficient capacity. The main conclusion is therefore that the greatest economic benefit is to be gained by introducing an efficient pricing regime at the same time as building substantially more road space than the limited amount envisaged by the Eddington Study.

However, the Foundation agrees that public acceptance of 'efficient pricing' could still be a major political obstacle and that, in order to convince motorists of the value of such a scheme, safeguards covering reductions in other taxes, and charges being fairly set by an independent body, would need to be in place. The Foundation has also suggested that a form of efficient pricing could be introduced on a voluntary basis.

These conclusions reflect earlier findings in the 2002 RAC Foundation report *Motoring Towards 2050* which advocated a package including more roads, better public transport, longer term local transport planning and some traffic restraint.

Roads and Reality is not only about the relationship between road pricing and road building. It also explores some of the common myths that surround road transport planning and it sets out the case for a long term roads strategy and considers what such a strategy might contain, as well as what institutional change might be necessary to implement it.

The exploration of the relationship between a national efficient road pricing scheme and a long term road building programme has covered similar ground to the Eddington Study. In many respects, we come to similar conclusions to Eddington, though we have a longer timeframe, a different benefit:cost methodology and regional variations in income and values of time. Where the difference between the two studies is greatest is in the assessment of the amount of new road capacity that will be needed, both with and without pricing.

Our main conclusions can be summarised as follows:

- An average of 600 lane kilometres a year, or equivalent, extra capacity is likely to be needed on Britain's strategic road network between 2010 and 2041 together with associated junction and feeder road improvements, irrespective of whether a national road pricing scheme is introduced.

- There are strong regional variations in the need for new road capacity with the greatest requirement in and around conurbations and in the East and West Midlands, East of England and South East regions.
- The requirement for additional capacity is reduced somewhat by efficient pricing; but not by that much – as additional capacity would still be needed if much of the loss of mobility that efficient pricing of Britain's congested main road network would result in is to be restored.
- In order to achieve this level of building an average throughout the period of somewhat more than 600 Lane km p.a. should be planned to allow for schemes that fail to gain approval or funding, and for the risk that the forecasts are too low. In the early years a much higher level of construction should be planned to replenish the almost empty pipeline of schemes and to catch up, not only on the current backlog, but also on the backlog that will build up over the next five to fifteen years while the new schemes are going through the long process of planning, consultation, approval and construction. If there are more schemes than can be justified, it is much easier to slow the programme down than to increase it.
- One of the most crucial issues will be convincing road users that pricing is a sound way of improving road transport and not 'just another tax'. A key requirement for this will be that the congestion element of direct receipts should be applied to reduce the congestion giving rise to these charges.

The Government should not use the possible future introduction of road pricing as an excuse for not improving the strategic road network. More effort needs to be made to mitigate some of the adverse environmental effects of road improvements, for instance more tunnelling and quieter road surfaces.

The study clearly shows that road improvements will be essential with or without road pricing. Those improvements need to start now.

Bibliography

Roads and Reality Technical Report – www.racfoundation.org/roadsandreality/technicalreport

Motoring towards 2050 – RAC Foundation for Motoring 2002

The Future of Transport: a network for 2030 Cm 6234. Department for Transport (2004) (London: TSO)

Towards a Sustainable Transport System Cm 7226 Department for Transport (2007) (London: TSO)

Eddington Report – The Eddington Transport Study: The Case for Action. HM Treasury, Department for Transport (2006) (London: TSO)

Investing in Roads: Pricing, Costs and New Capacity, Archer, C and Glaister, S. Independent Transport Commission (2006) http://www.trg.soton.ac.uk/itc/iir_main.pdf

Transport Pricing and Investment in England, Glaister, S. and Graham, D. (2003)Department of Civil Engineering, Imperial College, for the Independent Transport Commission.

Review of the Highways Agency's Major Roads Programme. The Nichols Group (2007) Report to the Secretary of State for Transport (London: The Nichols Group)

Environment

Stern Report – Stern Review on the Economics of Climate Change (2006) (Cambridge University Press) www.sternreview.org.uk

King Review – The King Review of low-carbon cars. Part I: the potential for CO_2 reduction. HM Treasury (2007) (London: TSO)

Road Pricing

Feasibility Study of Road pricing in the UK. A report to the Secretary of State for Transport. (2004) (London: Department for Transport)

Planning

Planning for a Sustainable Future. HM Government Cm 7120 (2007) (London: TSO)

The Royal Automobile Club Foundation for Motoring Limited is a charity established to promote the environmental, economic, mobility and safety issues relating to the use of motor vehicles.

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