



Rees Jeffreys Road Fund

A Major Road Network for England

A Rees Jeffreys Road Fund Study

David Quarmby
Phil Carey
October 2016



The **Rees Jeffreys Road Fund** has, since its inception in 1950, provided support for education and research in all forms of transport. It helps to fund projects that improve safety, the roadside environment and rest facilities for motorists and other road users. The Fund has nine Trustees, all with considerable transport experience. This study has been overseen by a Steering Group drawn from the Trustees, comprising David Bayliss, Stephen Glaister and David Tarrant, and chaired by David Hutchinson. For further information, please see www.reesjeffreys.co.uk

The study has been led by David Quarmby, with Phil Carey as co-author. The study administrator was Frances Leong.

David Quarmby CBE has had a long career in policy, planning, management, operations and research, mostly in transport, with 38 years' board-level experience in government, public agencies and the private sector. For the past 18 years he has had an extensive portfolio of chairman and board appointments in transport, railways and tourism, and in transport research and consultancy. David was Chairman of the RAC Foundation to 2013, a member of the **London Mayor's Roads Task Force**, and an Adviser to the Airports Commission. He led the **Government Review of Winter Resilience of England's Transport Systems** in 2010 and was a member of the A12 Commission in 2008. Prior to 1996 he was a main board director and joint Managing Director of Sainsbury's; up to 1984 he was a board member and Managing Director (Buses), London Transport after a period as Head of Research and then Chief Planning Officer.

Phil Carey has been working as an independent consultant specialising in roads strategy challenges since leaving the Department for Transport (DfT) in 2011. He is the Road User Policy Advisor to **Transport Focus**, which now has the role of statutory consumer representative for users of the Strategic Road Network in England; he is also Vice-Chair of the **Transport Associates' Network**. In a series of Deputy Director roles in DfT and elsewhere in the Civil Service, he led projects ranging from the Transport Strategy Review for the Cabinet Office in 2001-02 and the Ports Policy Review in 2006-7, through to the road pricing research programme in 2007-9, and the cross-cutting transport security and contingencies team after that.

Contents

Executive Summary	iii	5 The Fit-for-Purpose Major Road Network What's needed for the Major Road Network to deliver its potential.....	22
Foreword	vii	6 Making It All Work Planning, managing and funding the Major Road Network.....	36
1 The Challenge A new approach for planning and developing England's major roads.....	1	7 Ensuring A Sustainable Major Road Network The challenges of technology and future demand.....	42
2 The Growing Gulf Roads reform is exacerbating the divide between the Strategic Road Network and local major roads.....	5	8 Conclusions and Next Steps	57
3 Defining our Major Road Network Designating the roads that deliver most value.....	11	A: List of Supporting Documents	60
4 Supporting Growth Spatial and economic planning and the Major Road Network.....	18	B: Acknowledgements	61
		C: Sources	63

This study report should be read in conjunction with the series of Supporting Documents, listed at Appendix A, and available at www.futureroadsengland.org and at www.reesjeffreys.co.uk/transport-reports, where the Report Summary may also be found.



Executive Summary

1: A Major Road Network that is more than Highways England's SRN

Roads are vital to the economy and for mobility to support quality of life. Roads account for 89% of all personal travel – by car, bus, coach, cycles and motorbike – and 86% of all inland freight movement.

England's economy – nationally and regionally – needs a designated, coherent network of major roads with good connectivity and geographical coverage. We conclude that the 4,200 mile Strategic Road Network (SRN) of motorways and trunk roads run by Highways England – important though they are, carrying a third of the nation's traffic – is not sufficient for this. With a major increase in investment now lined up, we must focus too on the more important local authority

'A' roads, which also play a crucial role in meeting the needs of business at both national and regional level.

We have identified another 3,800 miles of 'strategic' local authority-controlled 'A' roads – also heavily trafficked, especially with commercial transport, providing essential connectivity by filling the gaps in the SRN. Together, these constitute an 8,000 mile **Major Road Network (MRN)**, carrying 43% of England's traffic on 4% of its roads.

See page 14 for a map of the MRN.

2: A consistent approach to planning, management and funding of the network

The whole MRN needs to be planned, managed and funded in a consistent

way – to fulfill its potential in supporting economic growth, through providing the effective service that users need. Consistency does not mean uniformity, though: we recognise three different tiers of road within this MRN, reflecting the diversity of the network.

We are not proposing any changes in the existing split of responsibilities between Highways England and local authorities – this is to avoid unnecessary upheaval, and to retain local accountability for the local authority roads on the MRN.

A high degree of collaboration between Highways England and the relevant local highway authorities (LHAs) would be needed for planning and managing the MRN in each area. The current momentum of devolution in England could facilitate this, with new sub-

national transport bodies, combined authorities and Local Enterprise Partnerships (LEPs) able to inject a strategic view of need in their region.

With connectivity underpinning the MRN, this network should help 'join the dots' of spatial planning and economic development at a regional level. Achieving this alignment can be elusive, where various institutions with differing jurisdictions hold the respective responsibilities. LEPs have an increasingly important role in facilitating this process of integrating land use and economic growth plans. Meanwhile, clear spatial planning policies are essential to head off any adverse development pressures generated by otherwise beneficial transport improvements.

Roads are crucial, but can only perform well if managed as the core infrastructure in an overall transport strategy, to support economic growth and improve the quality of life and mobility. This must recognise the wide range of transport modes which use roads, as well as the role of rail, and embrace a willingness to consider options for demand management to contain road traffic congestion over the longer term.

The funding challenge

Government is already committed to substantial and rising investment in Highways England's SRN, to underpin the growth agenda, and in the face of traffic levels already at their highest to date, and expected to climb further. A £15 billion programme of improvement and renewal is in train over the six years to 2020/21.

But the problem is the gulf between this funding for the SRN (and the planning regime which supports it) and the unsatisfactory arrangements still in place for the 98% of roads that are run by over 150 LHAs – this includes nearly half the MRN as we have defined it. They face declining revenue support and a patchwork of capital funding pots. There's a pressing need to avoid focusing the roads investment programme too narrowly. The local authority sections of the MRN deserve a better deal.

Any new funding arrangement should enable prioritisation of need and value for money irrespective of administrative boundaries, and should provide stability, certainty and continuity of funding over a reasonable planning period. An opportunity may come with the

prospective National Road Fund (NRF), due to start in 2020 and fed by Vehicle Excise Duty receipts in England, from users of all roads. This is expected to fund the SRN. Now is the time for government to consider whether local authority Major Roads should also be eligible for contributions from a new NRF.



3: The Major Road Network must be fit for purpose

The MRN will only succeed if it is 'fit for purpose' – putting service for its users, as well as the wider needs of communities and the environment, at the heart of its planning and management, while ensuring the fitness of the asset itself and the way it is managed.

- **Fit for the user** means understanding users' expectations for a decent level of service – and then setting out to deliver on aspirations for the speed and time taken for their journeys, and their reliability and predictability. Roads in the MRN will vary by topography and current standard – so we have grouped them into three tiers according to the function they perform and the standard they offer.
- **Fit for communities and the environment** means tackling noise, air quality and severance, and integrating mitigation measures into the ongoing management of the road and its traffic.

- **Fit-for-purpose management** means making the best use of capacity and the resilience provided by the network; exploiting technology to give road users the information they need to make better decisions; controlling traffic speeds and flows through the network; and, where possible, expanding capacity at pinchpoint locations to address shortcomings in the service provided. The asset itself must be well maintained, following best practice, on a whole-life basis.
- **The safety management regime** for the network must be fit for purpose: this should include adopting over time predictive risk assessment to make the infrastructure safer and more forgiving, rather than relying only on data on past crashes to guide safety interventions.
- **Fitness for purpose of Major Roads in cities and conurbations** needs to reflect the more complex transport, planning and traffic management policies needed there, and the greater exposure and risk faced by vulnerable road users.

- **A fit-for-purpose planning regime** assesses performance against service level aspirations and other measures mentioned, and generates options for improvement or mitigation, to be evaluated for effectiveness and value for money.

These requirements for making a Major Road fit for purpose could be expressed in a high level Code of Practice,



developed in collaboration by all the network operators, and adapted as needed for the distinct tiers and other subsets within the MRN. Much is already reflected in Highways England's licence conditions and performance targets.

But achieving a fit-for-purpose MRN is not just down to the network operators. Alongside them, those authorities setting the strategy (the 'strategic clients') have a clear responsibility for making this fit-for-purpose framework effective, to ensure the MRN can perform its central role within the transport system.

The longer-term challenges

Technology and rising demand present two major longer term challenges for those collectively responsible for the Major Road Network – how best to monitor, adapt to and exploit broad and rapid technology-led change, and how to deal with rising demand for road space and consequent increasing congestion.

New technology provides network operators with much better, integrated information to manage traffic and maintain their assets, while influencing

how people and businesses make travel decisions as well as providing new choices; it brings rising penetration of 'greener' vehicles; and increasing levels of vehicle automation with prospects of improving safety, enhancing network capacity and increasing mobility. But it also brings many uncertainties, challenging network operators to judge when and how best to respond.

Given a growing population with rising mobility expectations, many of our major roads will be under ever more pressure. Investment will be needed – across the Major Road Network, not just the SRN – to address the most congested sections. But in the longer term, higher demand, in whatever form it takes, is likely to outstrip the acceptability and affordability of commensurate additions to capacity; it follows that more users will experience regular congestion as it spreads over the day and the week, with greater unreliability of journey times. Technology alone will not solve this problem – some means of demand management should, in time, feature as part of the toolkit for operating the network and maintaining service levels. There are no easy answers, but government should ensure that

it remains on top of the alternatives available.

And finally

Rather than a detailed blueprint for the future road network, this report presents instead a toolkit for taking forward the essential concepts of this report:

- the idea of the 8,000 mile Major Road Network as providing the vital accessibility and connectivity to underpin the economy at national and regional level.
- the need for a coherent and consistent approach for planning, managing and funding the whole MRN, enabled by collaboration of the key national, sub-national and local bodies.
- the need for the MRN to become fit for purpose, starting with being fit for the user.

We hope the report will help those responsible join forces to plan and deliver a better service from our major roads, that more closely matches the needs of users, business and communities.

Foreword

The Rees Jeffreys Road Fund has a long-standing interest in the future of Britain’s road system, recognising that the vast majority of travel takes place on roads. Both the health of our economy and our quality of life depend on the mobility provided by the road network – whichever modes of travel we use.

We can easily take our roads for granted – someone has to maintain them, to manage the traffic that flows on them, and to improve them when they get congested. What is far from straightforward, however, is the planning and evolution of our road system to meet future demand, to support new development, to play its part in the complex transport policies of our cities, and to provide the connectivity needs of business.

In commissioning this study, the Fund’s Trustees wanted to focus on the major roads that are so critical in supporting national and regional economies, as well as in meeting expectations about mobility and quality of life.

The focus of the study is England; over the 15 years since devolution of transport and roads to Scotland and Wales, the planning, funding and governance regimes for roads have diverged significantly between the three nations, and the Trustees did not wish to dissipate the team’s effort in trying to study three increasingly different sets of arrangements.

The Trustees endorse the report’s central idea that the definition of ‘Major Road’ must include the more important local authority ‘A’ roads as well as Highways England’s Strategic Road Network, and we agree that such a Major Road Network needs coherent and consistent planning and funding arrangements. In addition, the Trustees support the need for them to be made



'fit for purpose', geared to meet the users' needs, safe, well maintained, able to make best use of capacity, and a good neighbour to the communities that they pass through.

We wanted to explore the extent to which new technologies could transform our major road system and how they might best be used in the decades to 2040. The Trustees believe that greater awareness of the challenges and opportunities ahead will make for better short- and medium-term decision-making.

This report is aimed at all those with a responsibility for or interest in England's major roads. We believe it merits serious consideration by central and local government, the new emerging devolved bodies, Highways England and other organisations in the sector. At a time of great change, and

with the long-term commitment to infrastructure renewal, a consistent approach to the road network is much needed.

The Trustees join me in thanking our authors David Quarmby and Phil Carey for their hard work over the last two years and for this immensely valuable report.



**David Hutchinson, Chairman
Rees Jeffreys Road Fund Trustees**

October 2016



1

The Challenge

A new approach needed for planning and developing England's major roads

- England's economy, at both national and regional levels, needs a balanced network of major roads with good geographical coverage that meets the needs of business and society.
- Investment in the Strategic Road Network (SRN) is now being stepped up, but we need to determine if the focus should be extended, beyond the SRN to include a number of key local authority 'A' roads.
- Given the very different regimes between Highways England and the scores of local highway authorities (LHAs), the next challenge is to create a consistent framework for planning, managing and funding these major roads, and for facilitating effective collaboration between the different bodies to enable this to happen.
- Only in this way can the available resources be spent most effectively and the Major Road Network (MRN), as we call it, made 'fit for purpose'.
- Continuing devolution of powers to local authorities and sub-national bodies provides an opportunity to help make this collaboration work.
- Two further challenges over the longer term are:
 - to exploit to the full the capability of transformative changes in technology that will affect vehicles, travel options and infrastructure management; and
 - to find the right balance between managing traffic demand and enhancing capacity, so as to maintain reasonable levels of service on the network in the face of rising congestion.

1.1 The challenge of ensuring a well-performing road system that supports the economy

A well-performing road system meeting the needs of its users must be central to government's focus on strengthening England's economy. At a national and regional level, achieving and sustaining growth depends to a huge extent on good accessibility – and accessibility in turn is overwhelmingly provided by the road network: 89% of all personal travel and 86% of freight movement takes place by road.ⁱ And it is the main roads within that network that are the arteries for commercial traffic on which businesses across the country rely.

But roads can only perform well if managed as the core infrastructure within an overall transport strategy that delivers the desired objectives. This must recognise the wide range of transport modes which use roads, but must position that alongside rail, which also plays a crucial role for passengers as well as freight.

Road traffic is now at its highest level ever.ⁱⁱ Forecasting is difficult at this time, but the most recent forecasts estimate

further growth in the range 19–55% between 2010 and 2040ⁱⁱⁱ – at the higher end of this range for vans, and for traffic on motorways and rural 'A' roads – meaning that many of those arteries would be at risk of simply clogging up. Growth on urban roads is forecast to be rather lower, but chronic congestion is already a feature of some main roads in and around towns and cities – not merely in London.

Government recognises the challenge of ensuring that England's transport infrastructure overall is up to the task. A very substantial transport investment programme is well under way, with more than £70 billion having been committed to it over the six years to 2020/21, mostly to rail.^{iv} Of that expenditure, £15 billion is now being channelled into the SRN,^v through the newly autonomous Highways England. And a National Road Fund is expected to come into being in 2020, funded by Vehicle Excise Duty receipts, to support 'strategic roads' in England and consolidate that funding stability.

But this commitment addresses only part of the challenge. The 4,000 or so miles of the SRN, critical though they are in carrying a third of England's total traffic, fall well short of the full set of economically important roads, particularly at the regional level. Across the country, significant local authority 'A' roads play a crucial role as well, complementing the SRN to provide the network that matters.



1

And herein lies the nub of the problem: there exists a great gulf between the planning and funding regimes for the SRN and the less effective arrangements for the vast bulk of England's roads, managed by 153 LHAs. These local roads are significantly less well funded, on most counts, than the SRN, and are still for the most part subject to annual budget-setting, with declining revenue support and a patchwork of capital funding arrangements; what is more, they lack a comprehensive performance regime.

The challenge, therefore, is to:

- define the full network of significant roads that provide the backbone of England's economy, at a national and regional level, exploring how far beyond the SRN that network needs to go – that then constitutes our Major Road Network; and
- devise an integrated planning and funding regime for both the SRN and the local authority parts of the MRN, to maximise the potential of this MRN and to get best value for money from it; even a substantial roads investment programme, if it is focused largely on the SRN alone, will fail to provide the necessary support for economic growth.

To fulfil its potential, such an MRN needs to be planned and managed in such a way as to:

1. place current and prospective road users at the heart of investment and operational decisions – whilst requiring value for money at all times;
2. quickly become fit for purpose, and managed well so as to deliver a decent service to users and to meet the wider needs of communities and the economy;
3. ensure alignment with the objectives of sustainable growth in housing and business development, linked with spatial planning policies;
4. fully recognise the more complex, multimodal role that major roads play in our cities and conurbations; and
5. establish the consistency and long-term stability in planning and funding that infrastructure of this importance deserves.

The current momentum of devolution of powers to local government and new sub-national bodies in England may be relevant here: the emerging institutions seem well placed to exploit the MRN concept, helping to fulfil the above five conditions, and providing a basis for better and more accountable decisions that stand a chance of being taken on board owned locally.

This study takes the same 2040 horizon as the Strategic Vision underpinning roads reform^{vi} – which helps us focus on two major challenges for the longer term:

- The first relates to the effects of rapid and disruptive technology-led change on travel choices and demand, on the increasing automation of driving tasks, and on the way that road networks will need to be managed. The impacts

of autonomous vehicles are just one aspect – one that is particularly difficult to gauge – of the long-term transition to a more technology-led system of vehicle movement and management.

- The second challenge is how to deal with the expected rise in traffic congestion over this period. Whatever the uncertainties about future travel patterns, and the

prospects for growth in rail's share of total travel, the rising demand for movement due to population and economic growth may well outstrip the rate at which major road capacity can be affordably and acceptably increased. This requires a willingness over the longer term to consider methods of demand management.

1.2 How this study tackles these challenges

This report sets out how these various challenges can be best addressed, and to guide decisions about the designation, management and development of the MRN. It is not a blueprint for the future road network itself – that is for government, central and local, to determine alongside their partners and communities.

The report first analyses the growing gulf between the regimes for the SRN and for local authority roads; it then develops a proposal for an MRN designed to support

national and regional economies. We also explore the link between the processes of economic and spatial planning, and the planning of the road network.

At the heart of the report is a proposition for what a 'fit-for-purpose network' should provide – centred on what its users, and all of us in our communities, should reasonably expect.

We then consider how to make it work, creating a collaborative planning regime, and identifying the opportunity for a consistent approach to funding.

Finally, we survey the outlook for the longer term, given the technology and congestion challenges.

The mechanisms needed to put all this in place and to deliver what England needs lie within reach: an MRN that meets the needs of its users and society, serves the country's economy, and is sustainable for the longer term, through to 2040 and beyond.

2

The Growing Gulf

Roads reform is exacerbating the divide between the Strategic Road Network and local major roads

- The contrast between the planning and funding regime for the Strategic Road Network (SRN) and that for local roads is stark.
- The roads reform agenda has put in place an effective and well-resourced regime for planning and delivering successive five-year programmes of investment on the SRN, through Highways England, with associated user-focused performance targets.
- No such regime exists for local highway authorities (LHAs), who have had to cut routine maintenance as part of the Government's austerity programme, and who face complex capital funding arrangements, without the certainty of comprehensive five-year commitments.
- Greater maintenance backlogs exist on the local authority road network than on the SRN, and the quality of service to users is generally not as good.
- The coverage of the SRN varies considerably across England, exacerbating the consequences of the contrast in regimes.
- If some of the more important local authority roads are to be put alongside the SRN to create a more integrated and geographically coherent network of Major Roads, this gulf between the two planning and funding regimes needs to be addressed.



2.1 The regime for the Strategic Road Network

The Roads Reform agenda has put in place for the SRN a carefully constructed, well-resourced regime, one which makes the most of the autonomy now granted to the government-owned company Highways England. It has been given a clearly defined remit, and guaranteed funding over a five-year Road Investment

Strategy (RIS) period, which aligns well with the longer timescales entailed in delivering infrastructure projects. In addition to maintenance and operations, annual investment in improving the network alone will more than double over this first five-year period, reaching £2.2 billion in 2019/20.

2.2 The regime for local roads

The governance and funding regime for local roads has had no such overhaul. It doesn't enjoy the same clear focus on outcomes, and has increased in complexity of late: there are now some 15 different funding pots, most determined year by year, and all having different criteria and business case requirements.^{vii}

In the 2015/16 year, outside London, only 4% of funding for capital expenditure was formally ring-fenced; little more than half is now allocated according to funding formulae, and this much is based mainly on road length and the

number of bridges needing works. The balance of funding is either scheme-led, or (increasingly) based on the LHA's performance. Total local authority capital expenditure on roads is set to change little over the period to 2019/20.¹

The revenue side of local roads is particularly difficult to assess, as only part of the funding comes from central government; receipts locally from Council Tax and parking services top this up, but the exceptional pressure on local authority budgets in recent years has pushed road maintenance revenue spend



down 16% in the three years to 2013/14; this decline is set to continue.

The uncertainty is growing: major institutional changes are emerging with the spread of combined authorities and of sub-national transport bodies, and new funding arrangements are being set up as part of the 'deals' negotiated in each case. The planned move to a regime under which local authorities retain 100% of business rate receipts by 2020 means a revolution in local government finance; its implications for central government grants are, as yet, unclear.

¹ See Supporting Document 1 (Appendix A) for the data and analysis behind this chapter.

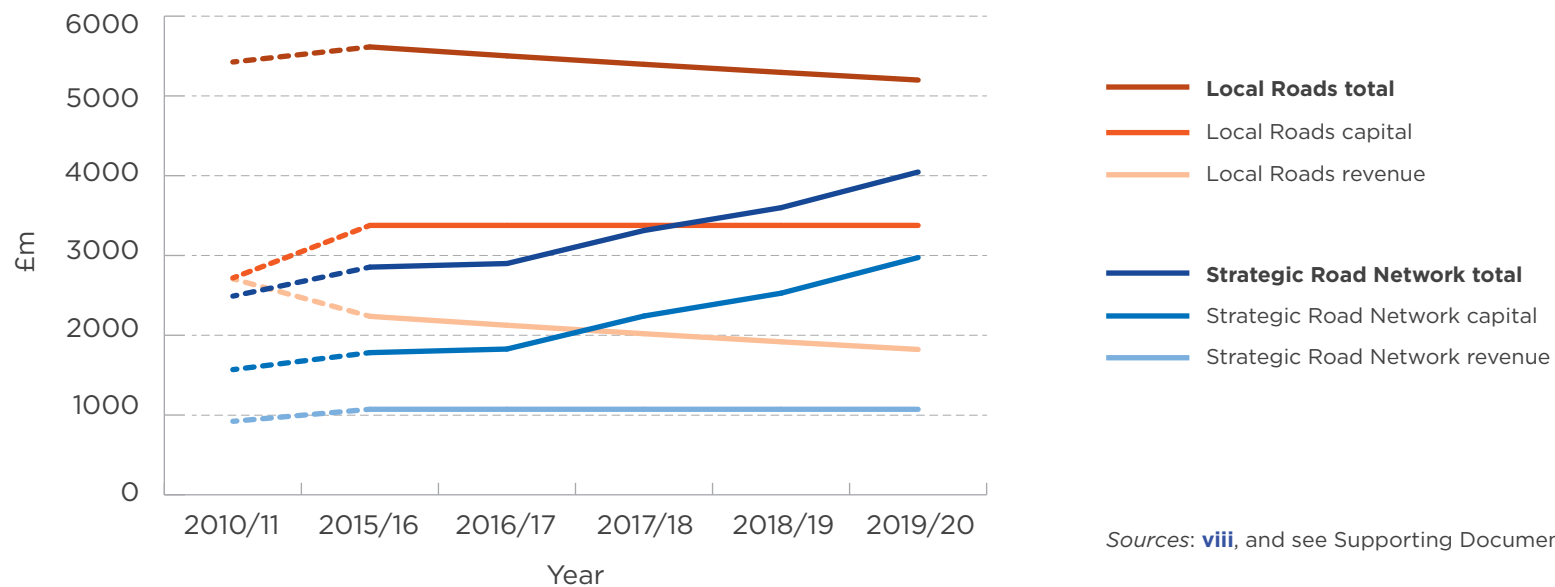
2

2.3 Comparing expenditure

The most prominent feature that comes to light when planned expenditure for the SRN and for local roads are compared is the contrast between the 67% increase in capital provision for

the SRN for the first Road Investment Strategy period (RIS1) through to 2020/21 on the one hand, and the squeeze on local roads funding on the other (Figure 2.1).

Figure 2.1: Current and forecast capital and revenue expenditure (£m) for the Strategic Road Network and all local roads



Sources: [viii](#), and see Supporting Document 1

The picture on total local roads expenditure, and on the share that goes on LHA 'A' roads (from which the subset of Major Roads will be selected), is complex. Supporting Document 1

attempts a comparison of spend, capital and revenue, between the SRN and LHA 'A' roads; this is summarised in Table 2.1.



Table 2.1: Summarised comparison of relative spend on the Strategic Road Network and on local highway authority 'A' roads

Total spend in 2015/16	£'000 per route-mile	£'000 per lane-mile	£'000 per million vehicle-miles*
Strategic Road Network	643	146	16
Local authority 'A' roads	117	51	12
Forecast spend in 2019/20			
Strategic Road Network	911	207	16
Local authority 'A' roads	108	47	11

*Per vehicle miles figures are for maintenance spend only

Source: Supporting Document 1, based on just over a third of 2014/5 maintenance-only spend for all LHA roads being on LHA 'A' roads and the small length of LHA motorway.

Total spend per SRN-mile, at £643k, is already more than five times higher than per mile of LHA 'A' road (or three times higher per lane-mile, taking account of the typically wider carriageways on the SRN). By the end of RIS1, planned spend by Highways England will have increased by more than 40%, whilst spend on local roads is more likely to have fallen. We estimate that spend per mile by then will be eight times higher on the SRN than on LHA 'A' roads.

The usual rationale for focusing resources on the SRN is the greater volume of traffic that it carries: whilst comprising only 2% of all roads, it carries 33% of all vehicle mileage (and 66% of heavy goods vehicle mileage). As an illustration, and focusing only on maintenance spend, which is the element most closely related to traffic levels, spend per *vehicle-mile* on the SRN and LHA 'A' roads is much less far apart (one third

higher on the SRN). But traffic volume is only one basis for comparing levels of spend: much of the need arises regardless of traffic flow, and local 'A' roads face additional costs arising from their more complex environment, having to:

- facilitate a wide range of non-motorised journeys not counted in traffic data;
- accommodate the consequences of utility services under their carriageways and footways; and
- provide a liveable street environment – supporting 'place' as well as 'movement' functions.

About a third of LHA A road mileage is located in towns and cities, where these considerations are most important, whereas this is true of only 7% of 'A' roads on the SRN.

2

2.4 Comparing outcomes

Despite the diversity of roads, we can draw some provisional conclusions on how lower relative funding feeds through into a poorer-quality network, or a worse experience for users:

- **Asset condition:** the Department for Transport (DfT) recognises that with currently planned budgets it is not possible to clear the backlog of maintenance for local roads in England, estimated as requiring up to £8.7 billion; by contrast, plans for the SRN include fully meeting its maintenance requirement of £3.7 billion.^{viii} Whilst the headline indicator of carriageway asset condition shows approximate parity (4% of LHA 'A' roads should be 'considered for maintenance', compared with 3% of motorways and 5% of SRN 'A' roads²), this is only one part of the total road asset: account must also be taken of the more diverse legacy on local roads of bridges, foundations and general street furniture. The public certainly notice this: they see local highway condition as the second most important aspect of local transport (just surpassed by safer roads), but it causes by far the most dissatisfaction.^{ix}
- **Safety:** the EuroRAP risk rating, based on accident records, is over 50% higher for LHA rural roads than it is on equivalent SRN roads that carry a comparable traffic mix (see section 5.6).

- **Performance:** even allowing for the different standard of much of the infrastructure, the contrast in average delay experienced by users is striking: on the SRN as a whole, journeys take 14% longer on average than free-flowing traffic would permit;^x on LHA 'A' roads, the average delay is a 35% time penalty, on journeys that are already expected to be much slower.^{3 xi} The disparity is set to grow: average delay on trunk roads⁴ is forecast to increase by a little over a third by 2040, but by nearly half on the already slower LHA 'A' roads.^{xii}

So, the regime for local roads is more complex, less certain, and less well funded. There is evidence of poorer outcomes on LHA 'A' roads, but minor local roads may be the real losers, given that many local authorities feel obliged to concentrate their limited maintenance resources on their 'A' roads.

² This compares with 9% of B- and C-roads 'considered for maintenance', and 18% of unclassified roads, indicating how LHAs are focusing resources on their 'A' roads.

³ We have assumed average speeds of 55 mph on the SRN and 30 mph averaged across rural and urban LHA 'A' roads.

⁴ Trunk roads - 'A' roads which are the responsibility of Highways England - are part of the Strategic Road Network, alongside motorways

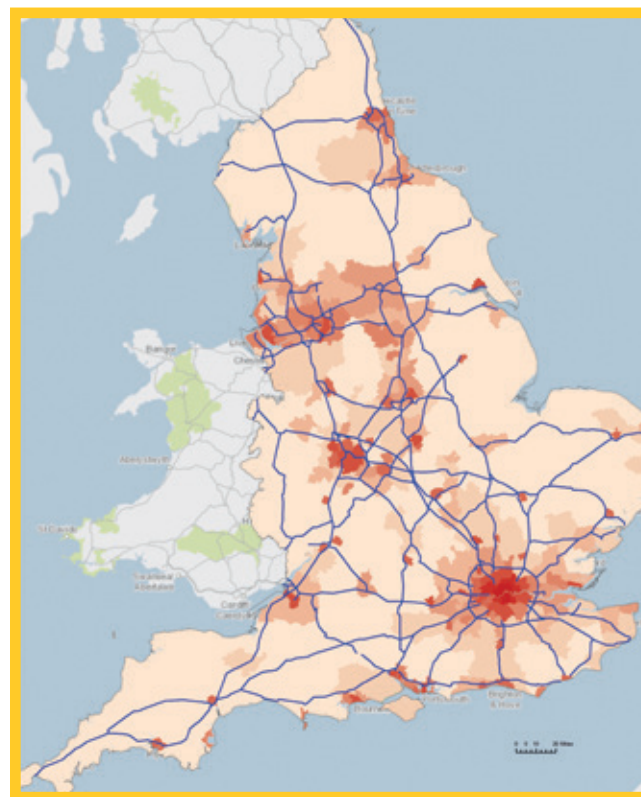


2.5 Uneven spread of the Strategic Road Network

The coverage of the SRN varies considerably across the country (Figure 2.2). The legacy of history, and the exemption of motorways when 30% of the total SRN was de-trunked after 1998, has left uneven coverage region by region. In South Lancashire, for example, it is a relatively dense network, almost all motorway; it is much thinner in West and South Yorkshire, and also to the south and west of London, where the development of the road network has not kept pace with economic and population growth. Highways England's Route Strategies exercise, reviewing needs across its network for the second RIS period, from 2020, might lead to recommendations for small-scale trunking or de-trunking, but there appears to be no work under way to assess more systematically whether the SRN is correctly determined.⁵

⁵ Some of the six Strategic Studies – notably on the Oxford–Cambridge Expressway – may result in some significant additions to the SRN, using corridors also picked up in our Major Road Network.

Figure 2.2: Comparison of Strategic Road Network with population density by district in England



It is this unevenness, and the fact that the SRN does not embrace all the major roads essential to underpin the national and regional economies, that makes this disparity of funding between the SRN and local authority 'A' roads so critical; it makes it all the more important to seek a definition of the network that can fulfil that task.

3

Defining our Major Road Network

Designating the roads that deliver most value

- An indicative Major Road Network (MRN) has been designated, applying objective criteria based on future traffic levels and vehicle mix to identify important main roads across England. These are the motorways and 'A' roads which most support economic activity, and provide connectivity for business and communities.
- The result is a network of some 8,000 miles, consisting of 4,200 miles of the Strategic Road Network (SRN) and a further 3,800 miles of the more important local authority 'A' roads.
- This MRN accounts for 4% of England's road mileage and 43% of all traffic.
- We have set three tiers of roads within the MRN, to reflect their different physical characteristics (limited-access highways vs common access roads), and the distinct roles they play in varying contexts (rural vs urban).
- The designation of this network does not imply that it has to be brought under the responsibility of a single body - but there will have to be an integrated and consistent regime for planning and managing it.

3.1 Introduction

A key feature of the service provided by roads is that, with the exception of a few toll roads, they form a single seamless national network, and road users are unaware of switching from the SRN to a local authority road. But they also expect a different driving experience on through routes from that on local access roads. It makes sense for users, as well as encouraging effective governance and accountability, to draw a line somewhere in that continuum of roads. The distinct, government-run 'trunk road' network (now the SRN) has its origins in the 1930s, and was supplemented by the growth of motorways, a distinct category of road. But since the 1990s it has been pared back, with the result that many major, formerly trunk, roads are now

treated in the same way as the great mass of genuinely local roads.

Road hierarchies in many other countries start with a proportionately much more extensive 'national' network: Germany has a federal network almost eight times larger than England's SRN, serving an economy that is only some 25% larger. The Netherlands' national road network is only around 20% shorter than the SRN, in an area less than a third of the size of England.

Designating our network of interest should be based on those roads that add most value, and provide greatest connectivity. This is not necessarily the same as being most heavily used by long-distance traffic, which doesn't

in itself add more value per mile than other journeys: even on motorways, only 28% of journeys (but of course a bigger proportion of total traffic) are longer than 25 miles.^{xiii} Instead, we should focus on road corridors that:

- (1) play the biggest role in local and regional economies, using the simple proxy of traffic volumes coupled with volumes of commercial traffic; and
- (2) connect the largest number of possible origin and destination pairs, also evidenced by volume of traffic, but also by ability to link up all key nodes – for example urban centres, ports and airports, and logistics hubs.

3

3.2 An objective approach

We have developed an analytical tool to test possible traffic thresholds in defining our MRN. This provides an objective basis for singling out a network of national interest. As explained in Supporting Document 2, we tested a range of options, but have settled on an intermediate level based on (a) motorway and A-road links with average daily traffic flow greater than 20,000 vehicles, along with (b) roads with as few as 10,000 vehicles, provided that at least 5% of that flow is heavy goods vehicles (HGVs) or 15% is light vans.

The raw output needed adjustments to: (1) produce a coherent network connecting all towns with population greater than 50,000; (2) remove isolated links; and (3) reflect the differential pattern of growth by region and road type that is forecast by 2040. This process of judgment has also brought in a small number of additional links, which, although falling just below those thresholds, increase the reach of the network to peripheral areas, or provide valuable resilience by backing up the most heavily trafficked corridors.

The resulting Major Road Network of just under 8,000 miles therefore puts 3,800 miles of local authority A-road alongside virtually all of the SRN, 4,200 miles⁶; it represents 4% of road mileage in England and carries 43% of all traffic (see Figure 3.1). This is significantly less than the 12,000 or so miles of Primary Route Network in England, connecting up the full set of 'primary destinations' defined by government, but not otherwise determined by traffic flow.

⁶ This is less than the 4,442 miles reported in DfT road lengths statistics, mainly because it excludes the length of slip roads and junctions; see Supporting Document 2.





Figure 3.1: The indicative Major Road Network

A key feature of the MRN is that it is determined at national level, based on objective criteria. Nonetheless, local knowledge will need to be applied across the country to validate the selection of some routes, and propose the inclusion of others. We do not envisage that this process will lead to any significant net change in the scale of the network: selected stakeholders have already expressed the view that this MRN, whose 'A' roads embrace some 30% of all 'A' roads in England, 'feels' about right.

We believe this is close to the optimal scale of network: large enough to incorporate flexibility to maintain service to users and take enough pressure off unsuitable local roads, yet small enough to concentrate investment and aspire to a clear set of standards and decent level of service.

The MRN as designated will need to be subject to periodic review, amongst other things validating the minor changes arising from differential traffic growth to 2040 by area and road type. And, as part of that dynamic process, the network should be seen as comprising corridors providing connectivity, rather than the specific alignments that the road links currently take.

Source: own analysis—see Supporting Document 2

3

3.3 Three tiers

We envisage three separate tiers within the network (plus a subset of the first), based on physical distinctions but focusing on the different function which each tier performs:

- **Tier 1: limited-access:** not restricted to motorways, and largely devoted to ‘movement’⁷; these roads provide links between major urban areas and facilitate the highest average speeds, so are well suited for longer-distance traffic in particular; there is a subset of:
 - **Tier 1A: limited-access – urban:** with more frequent junctions and very heavy traffic flows, which need to be more subject to the wider transport policy

⁷ See Section 5.5 for further discussion of ‘movement’/‘place’ conflicts on urban roads

framework and traffic management strategies set by the city or regional authority;

- **Tier 2: multiple-access – rural:** mainly all-purpose rural ‘A’ roads, with frontages and local access, providing links between secondary urban areas but also sometimes serving the ‘place’ needs of communities they run through; and
- **Tier 3: multiple-access – urban:** Major Roads in urban areas, with the greatest mix of user types and conflicting movements, and on some of which significant ‘place’ functions will need to be acknowledged.

Table 3.1, and the map at Figure 3.2, show an initial indicative classification of road links in the MRN.

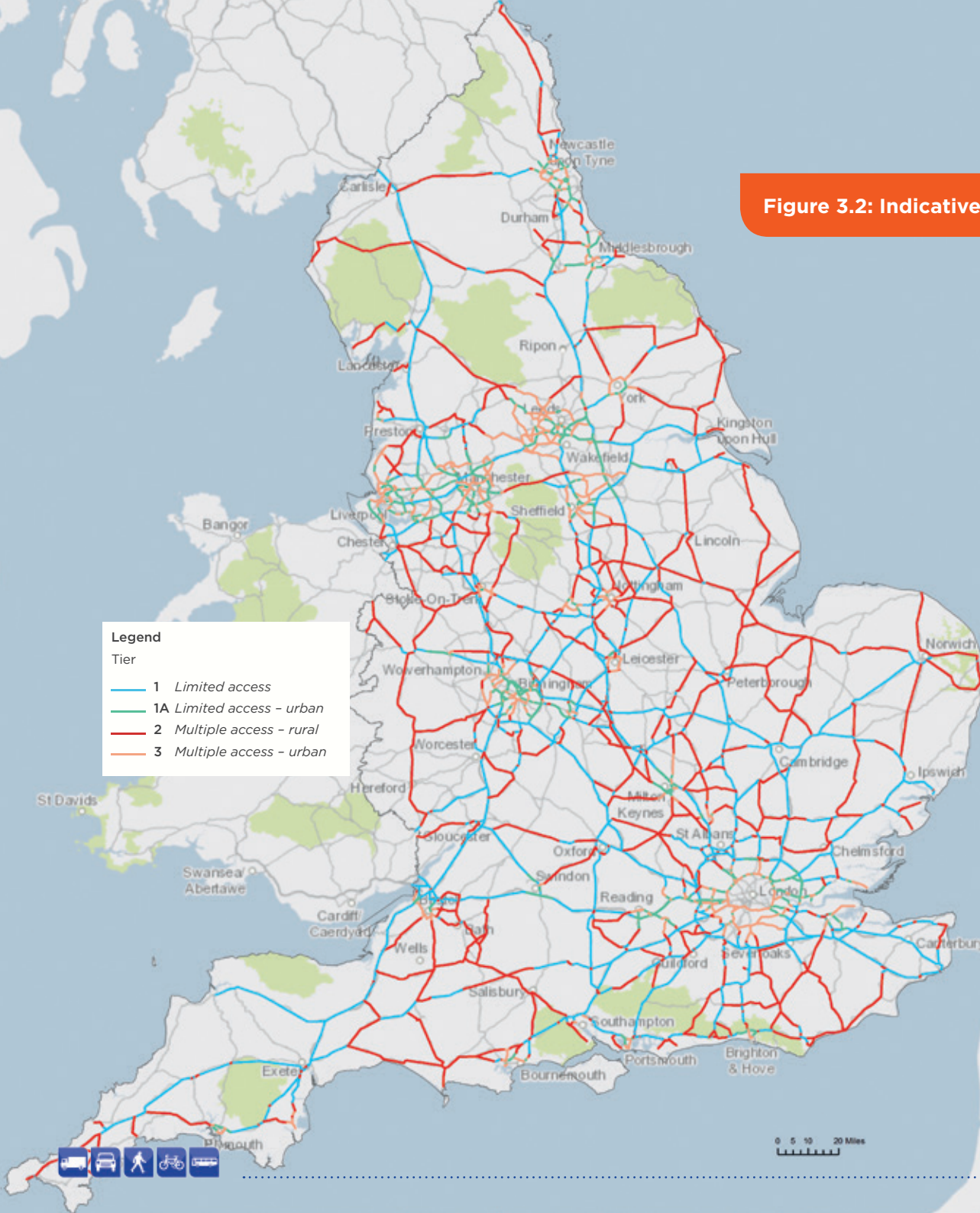
Table 3.1: Summary statistics for composition and traffic flow on the Major Road Network

	MRN total	By SRN / LA MRN		By tier			
		SRN	Local authority MRN	Tier 1		Tier 2	Tier 3
				Non-urban	Tier 1A		
Approximate length in miles	8,000	4,200	3,800	2,900	800	3,300	1,000
Percentage of total	100%	53%	47%	36%	10%	41%	13%
Average daily flow (all vehicles)	50,032	76,068	32,439	78,613	89,576	29,913	38,804
Average % HGV	6.4	9.4	4.4	9.5	7.5	6.0	4.1
Average % vans	14.1	14.3	14.1	14.0	14.0	14.5	13.9
Indicative total traffic (billion vehicle-miles)	113	86	27	58	19	26	10

Source: Calculated using analytical tool, as described in Supporting Document 2



Figure 3.2: Indicative breakdown of the Major Road Network by tier



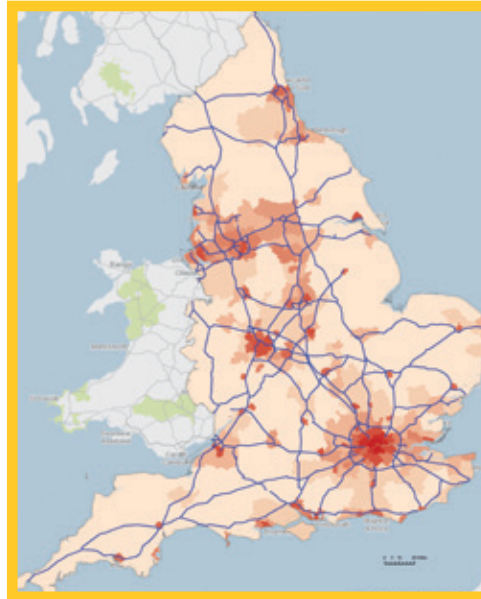
The Network has a significant presence in **urban areas** – Tier 3 combining with Tier 1A to make 23% of the MRN essentially urban, whereas little more than 10% of the SRN alone is urban.^{xiv} These urban major roads are the key connectors within conurbations, rather than main streets within cities and towns, but must still be subject to locally determined cross-modal transport policies; section 5.5 addresses how the MRN needs to adapt to this more challenging urban environment.

Source: own analysis – see Supporting Document 2

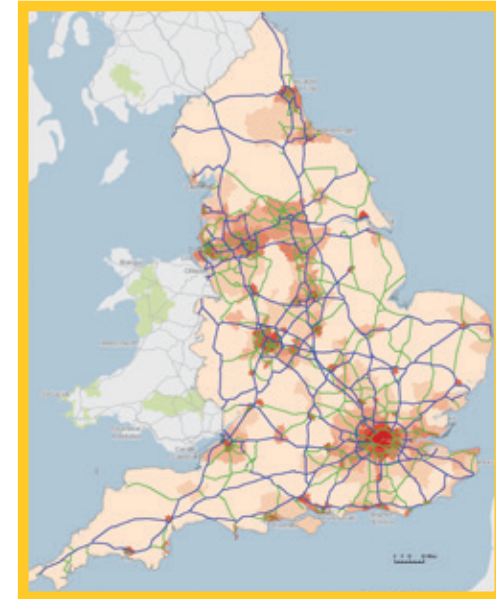
3

Figure 3.3: Comparison of coverage of Strategic Road Network and Major Road Network

And Figure 3.3 shows how the MRN serves the more densely populated parts of England much more comprehensively than can the SRN.



Strategic Road Network and population density



Major Road Network and population density

3.4 Multiple ownership

Defining a single MRN does not mean all those roads need to be under the responsibility of one body – we believe this isn't required. Most local authority roads on the MRN, as well as fulfilling national and regional roles, are embedded in their local networks and

communities, and local responsibility should be retained. We believe that achieving effective collaboration between Highways England and existing local highway authorities (LHAs) is the right and least disruptive way to proceed.

But the current levels of coordination between LHAs and Highways England do need to be stepped up – in terms of forward planning as well as day-to-day operation. Chapter 6 sets out how to meet the MRN's need for an integrated and consistent regime for its planning and management.

4

Supporting Growth

Spatial and economic planning and the Major Road Network

- Establishing connectivity and a good level of service from the MRN doesn't automatically generate economic growth: a process of 'joining the dots' of spatial planning, economic development and transport improvements is needed to capture the benefits.
- The process is not straightforward, especially in parts of the country where varying institutions - often with differing jurisdictions - hold the respective responsibilities.
- Local Enterprise Partnerships (LEPs) are tasked with bringing this together. Across the country their capabilities and degrees of integration with different parties vary; there are concerns about capacity and accountability, but the concept is valid and is already working well in many areas.
- On the basis of our consultations, the Major Road Network (MRN) - by integrating the Strategic Road Network (SRN) and important local roads - is seen as a logical tool for this planning process.
- With the establishment of combined authorities (CAs), and the prospective sub-national transport bodies (STBs), new regional mechanisms integrating spatial, economic and transport planning are beginning to emerge.
- Clear spatial planning policies are needed to head off adverse consequences that may result from transport improvements which, whilst promoting changes in the public interest, generate new pressures for development.

4

4.1 Roads and growth

The connectivity offered by major roads is crucially important in sustaining national and regional economies and in supporting economic growth, especially in peripheral areas where rail service is less able to play to its strengths. Major roads underpin productivity by helping firms and public enterprises reach the markets for their goods and services, receive supplies, access labour markets, ease journeys to work, and facilitate business travel.⁸ A higher proportion of this 'commercial transport' is carried on the SRN and on the local authority roads designated for the MRN than on the road network as a whole.

Equally, those locations with better connectivity and service provided by the MRN are likely – other things being equal – to offer better prospects for growth, both through existing firms and new development. Sustainable economic growth requires a good level of service to be available at locations on the MRN which are deemed both suitable for this growth in land-use planning terms, and suitable by business – for example, in allowing for possible clustering with similar or complementary businesses.⁹

⁸ Recent evidence of business user appetite for transport improvements includes *Going the Extra Mile: Connecting businesses and rural communities*, Federation of Small Businesses, May 2016.

⁹ See Supporting Document 3 (Appendix A).



4.2 The planning process

‘Joining the dots’ of spatial planning, economic development and transport interventions is best carried out as an iterative process, progressively identifying locations which meet land-use planning requirements, satisfy business location criteria and provide sufficient connectivity. This process will also reveal what transport interventions may be needed to make it all work, and which provide sufficient value for money.

The process is far from straightforward, especially in parts of the country where different institutions (often with differing jurisdictions) hold the different responsibilities. For example, in two-tier counties, districts hold the planning responsibilities, and counties hold the transport portfolio for their wider area; LEPs are tasked with bringing those responsibilities together with what will work for business, and leading the applications for funds to improve the infrastructure (usually transport) to facilitate growth. Many LEPs cover a wider area than individual local transport authorities, and most embrace several local planning authorities.

The LEPs’ geography had a chaotic start in 2011, and several local authorities still have to work with two overlapping LEPs. Inevitably LEPs’ capabilities and degrees of integration with their

partner local authorities vary across the country. Moreover, concerns have been expressed about their capacity to carry out the tasks assigned to them, and the effectiveness of the accountability arrangements for expenditure.^{xv} But we believe that the concept is the right one: they work well in many areas, and as the LEP movement matures it will grow in effectiveness, enabling conversations at local and regional level, getting agreement on priorities, and securing the required resources.

Separately, there is progress, too, in combined authority areas (now expanding considerably beyond the original six former metropolitan areas): all are different, but a more coherent and integrated process of aligning spatial, economic and transport planning is beginning to emerge. None yet have the statutory duty to prepare and ‘join

up’ plans of the kind that the Mayor of London is obliged to fulfil; it is the clarity and certainty of these plans over the last 15+ years that has helped to underpin London’s continuing success in business investment and housing delivery, and their integration with transport plans.



4

Informal consultation during our study with representatives of three different areas – usually involving the counties as Local Transport Authorities and one or more LEPs – has suggested that the MRN concept is relevant to them, and could help the required iterative process by bringing together their part of the SRN and the most important local authority roads.

We recognise that not all interventions to improve the MRN would necessarily lead to the intended economic growth – for example, if the barriers to growth in a particular area were not related to connectivity or decent service levels on the network. But we could be more confident of success if the planning processes were better ‘joined up’.

And it needs to be recognised that transport improvements may substantially change the patterns of travel and transport of *existing* households and businesses, as they respond to changes in accessibility; or successor occupants may be attracted who have a greater propensity to travel. This may cause more road traffic, and an increase in demand for development on the edges of towns, potentially leading to second-order consequences

of dispersal and yet more traffic. While the primary purpose of investing in major roads will be clear and justified – whether for the relief of congestion or to improve connectivity and support economic growth – clear spatial planning policies alongside it are also needed, to anticipate such second-order effects, and to head off their more adverse consequences whilst still promoting changes that are in the public interest.



5

The Fit-for-Purpose Major Road Network

What's needed for the Major Road Network to deliver its potential

- The Major Road Network (MRN) needs to be 'fit for purpose' to deliver its potential.
- First, it must be fit for all users – meeting their needs and their expectations for a decent and safe overall service, including aspirations for the speed and reliability of their journeys, varying according to tier.
- Fitness for purpose means making best use of capacity, expanding it where necessary, and maintaining the asset condition in the most cost-effective way.
- It also means fit for the communities that the network passes through, mitigating adverse impacts of noise, air pollution, severance and visual intrusion.
- Making Major Roads fit for urban areas means addressing 'movement'/'place' conflicts, and working with wider transportation policies for the urban area such as traffic and demand management measures, and priorities for certain modes.
- A fit-for-purpose safety management regime for the MRN should increasingly use predictive risk assessment methods to ensure that action and resources are focused in the most cost-effective way, with particular regard for the risks faced by vulnerable road users.
- A fit-for-purpose planning regime is one in which the network operator (or the 'strategic client') plays a lead role in generating options for improvement, identifying deficiencies in delivering the service proposition, and engaging in multi-objective assessment and evaluation.
- Highways England and the local highway authorities should consider working up a high-level Fitness For Purpose code suitable for the whole MRN, perhaps working through the UK Roads Liaison Group.

5

5.1 Fit for the user¹⁰

The MRN has to be consistently fit for purpose, enabling the effective service the country needs. It needs to operate safely, making the best use of its capacity; it needs to be a good neighbour to the communities it passes through; and it needs to be properly maintained over the longer term. But pre-eminently it must be fit for its wide range of users not just car users. The needs and characteristics of the Strategic Road Network's (SRN's) users are being increasingly understood, but local highway authorities (LHAs) have rarely been resourced to know their customers better. To bridge the gap we commissioned a literature review from the University of the West of England (UWE),^{xvi} recognising that users' characteristics don't change when they leave the SRN. This work, and other research findings around the SRN from Transport Focus and DfT^{xvii} leads us to propose six components of what users ought reasonably to expect from the MRN:

- a comfortable journey, minimising stress from, for example, a poor-quality road surface;
- a safe journey, with minimal risk of personal injury or damage to vehicles;
- reasonable expected journey time and reliability;
- accurate and relevant information on routing, hazards and delays, enabling the journey time to remain more or less predictable;
- availability of fairly priced rest and catering facilities along the road; and
- safe and seamless connection and signage to the rest of the local road network.



The priority attached to each of the above components will vary by journey length and user type, amongst other factors. The expectations of leisure users may lead to a different balance from that which is relevant to business users or commercial traffic. And the priorities and needs of the increasing proportion of older drivers¹¹ will make it essential to adhere to the highest standards of road design, needed to facilitate safe driving by all.

¹⁰ See Supporting Documents 4 and 6 (Appendix A) for more information on these issues.

¹¹ The Older Drivers Task Force report (Road Safety Foundation, July 2016) notes that there will be an 80% increase in the number of drivers in the UK over 70 between 2014 and 2035.

With the economy at the heart of the MRN's rationale, a fit-for-purpose network needs to serve the freight and service sectors well, recognising the distinction between the priorities of fleet operators and those of their drivers. Heavy goods vehicles in particular, representing only 6.4% of traffic on the MRN, have disproportionate importance and impact. They need a network that is:

- **robust** – ensuring adequate headroom at over-bridges and protection from cross-winds on exposed stretches, and maintaining across the MRN unrestricted access for vehicles up to 44 tonnes, as currently applies on the Primary Route Network;
- **reliable** – majoring on predictability of journey time, including overnight when freight flows are strong but maintenance work which closes lanes and roads is often scheduled; and
- **liveable** – given that the MRN is the 'workplace' for a substantial workforce of drivers, truck stop facilities need to be available by collaboration between the market and planning authorities.

The UWE review found that, the more defined the expectation that a road user has, the lower the resultant satisfaction subsequently reported. Currently, with no expectations set out, 89% of users report they were satisfied with their most recent SRN journey^{xviii}. But we believe road users should have clear and reasonable expectations of their journeys, so that they can plan their business activity or personal routine with some confidence – even if the reported satisfaction level then falls. Not all needs can be met, of course, and there will have to be trade-offs, particularly in respect of 'reasonable expected journey time', where the constraints are greatest.

We identify three components of journey time:

- **Expected average speed:** the average speed safely achievable over a length of road reflects both the inherent free-flow design speed and, for Tiers 2 and 3, localised speed limits, traffic signals, junctions and interaction with other traffic. As with journey times calculated by satnav devices, it is built up from the speeds normally achievable on individual sections of

the road, and forms the baseline for the journey time proposition.

- **Predictable variation from average speed:** the wide variations in traffic volumes over the course of the day, week and year are often known, and can generally be forecast, and hence the effects on journey times estimated. Thus the user's expectation would be qualified by an expected variation due to congestion.
- **Unpredictable variation from average speed:** irregular disruption (not solely accidents and infrastructure failings, but also planned roadworks and unexpected levels of traffic) also needs to be allowed for; many freight operators already make some additional provision to reflect the likelihood of unexpected delays.

This reliability standard could be quantified as the percentage extra time the user needs to allow in order to arrive on time for a set percentage of trips – a 'buffer time' index.

5

The three indicators combine to produce **a service proposition for the MRN**, but this must vary by tier; for example, the greater control which the network operator has over the limited-access Tier 1 and 1A roads means that unpredictable variation there should be much lower. We propose the following matrix of expected service levels for the four tiers, in respect of average speed (ranging from + to +++)¹², as then qualified by the extent of predictable and unpredictable variation (ranging from – to ---).

¹² The average speed banding of '+++/++/+' could be expressed approximately as 60 mph/40 mph/20 mph, but more work is needed to develop the other indicators, exploiting valuable new analytical opportunities now arising from the wealth of mobile phone data on vehicle movements.

Table 5.1: Matrix of expected service level by tier

	Average speed baseline	Predictable variation: extent of congestion	Unpredictable variation: extra time needed
Tier 1	+++	–	–
Tier 1A	++	– – –	–
Tier 2	++	–	– –
Tier 3	+	– – to – – –	– – to – – –

Section 5.2 below provides an illustration of how actual performance – significant shortfalls against expected service levels in particular circumstances – may generate options for intervention.



5.2 Making best use of capacity¹³

Utilising existing capacity as efficiently as possible is a central task for the network operator, requiring 24/7 overview and engagement with users, to meet performance benchmarks derived from this framework. The performance regime set for the MRN should build on progress now being made for the SRN and should:

- recognise the complexity of traffic flow: on busy roads, flow falls once an optimum average speed is exceeded; in congested conditions the network operator should regulate speed down to the optimum to avoid instability and maximise traffic flow, as is already now well-established practice on Smart Motorways on the SRN; on multi-lane carriageways, there is scope to increase separation of traffic types moving at different speeds;
- apply primarily to area networks rather than individual stretches of road: the more extensive MRN makes greater resilience possible than can be found in the SRN alone, opening up more options for managing traffic

¹³ See Supporting Document 7 (Appendix A) for more information on this and other network operator responsibilities.

flow during disruption; this requires operating procedures, including traffic control centres, to be better integrated across the MRN; and the ability to deal with longer-term disruption caused by, for example, flooding or infrastructure defects; and

- develop a focus on maximising the number of people travelling or of total goods being transported, rather than just vehicle flow: network operators can, for example, support the development of bus and coach services through facilitating interchange hubs.

Demand for travel on the MRN – at least on Tiers 1 and 2 – is likely to increase over the longer term at a faster rate than capacity can be increased, even with a proactive approach to network development (see section 5.7 below). Network operators can still strive to meet the service aspiration by making full use of developing technologies, such as sophisticated information services for users, and by being geared up for the opportunity and challenge of

Connected and Autonomous Vehicles (see section 7.4).

Highways England's *Concept of Operations*^{xix} provides a valuable set of principles that should apply across the MRN; it aims to use the opportunities arising from technological developments to improve utilisation, availability and demand management on the SRN. Comparable guidance for the network management role of LHAs^{xx} is focussed more on the legal framework and operational responsibilities, rather than on effective capacity utilisation and the quality of the user experience. It will be important to ensure that guidance for MRN operation covers all the components of fitness for purpose that are covered in this chapter.



5

5.3 Maintaining the asset

The MRN concept is about service to the user, but underlying it all must be infrastructure that is fit for purpose – well managed so as to underpin safe, reliable and cost-effective operation. Good asset management focuses on the whole life of the asset and seeks the optimal mix of maintenance (both preventative and reactive) and improvement work.

Asset condition is about more than just carriageway quality, although that is a principle focus of user concern – it also concerns geotechnical works, drainage, structures and installed technology. This represents a complex challenge, particularly for hard-pressed LHAs.

Extensive best-practice guidance forms part of the Highways Maintenance Efficiency Programme (HMEP),^{xxi} helping all LHAs to build up their capability and achieve more with less. Self-assessment against HMEP efficiency principles is, increasingly, a criterion for allocation of maintenance block grant to LHAs

by the Department for Transport (DfT); adherence to the HMEP should in future be a precondition for an LHA operating part of the MRN.

Notwithstanding the above, guidance that is MRN-specific needs to be developed, centred on its distinctive feature of heavy traffic flow; this could bring together elements from Highways England's forthcoming Integrated Asset Management Strategy with the HMEP guidance that already focuses on roads less likely to be purpose-built and having a broader mixture of structures and carriageway standards. Supporting Document 7 sets out some of the innovative approaches to maintenance management which could bring efficiency gains across the MRN.

Timely maintenance work would be required to sustain the quality of service from the MRN, but roadworks can significantly impair that service in the short term. Whilst LHAs have already

had to prioritise A-roads over the rest of their network, MRN status, with appropriate funding, would be expected to lead to more improvement work than has been possible so far. Users are generally tolerant of roadworks where they can see better outcomes ahead – but that doesn't reduce the need for network operators to minimise the adverse impacts of roadworks where traffic flow is heaviest. Construction sites also increase the safety hazard: Highways England has recently trialled a response to this, seeking to change the mindset of drivers as they enter roadwork zones.^{xxii} If successful, such approaches, along with lessons from abroad¹⁴ could valuably be applied across all of England's major roads.

¹⁴ One example is the Dutch 'Minder Hinder' (meaning 'less delay') approach, which boosts funding for selected major roadwork schemes by around 5% in order to minimise delays for users: a package of measures tailored for each scheme brings together more user-focused traffic management, joint working with adjoining highway authorities, and better communication with users throughout the process.



5.4 Fit for communities and the environment

Fitness for purpose entails more than just the user interest. The impacts of major roads and their traffic include noise, air pollution, severance, visual and landscape intrusion, and in some cases ecological impacts. There are also positive impacts of proximity to the MRN: greater accessibility is most relevant for businesses, and for the three out of four households with access to a private car; but the Major Roads will be public transport corridors too, particularly in cities. Nevertheless, for most people living or working adjacent to major roads, the negative impacts are perceived as outweighing the positive.^{xxiii} As a result there may be equality concerns in that poorer households are less able to afford the higher prices of a better environment located away from the major roads.

Noise is one of the most troublesome of the impacts directly related to traffic volume. The network operator can significantly mitigate its intrusion by the application of noise-reducing road surfaces, noise barriers and in some cases through noise insulation of adjacent buildings – all at a cost. Under the first Road Investment Strategy plan, Highways England is committed to a programme of action in over 1,000 designated ‘noise improvement areas’ of which half will be subject to ‘quiet noise resurfacing’.^{xxiv}

On roads maintained by local authorities, some noise reduction results as a by-product of using ‘thin surfacing’ proprietary products for road maintenance, but this does not achieve the maximum noise reduction possible with today’s materials. We believe that there should be a more concerted effort by LHAs to achieve substantial noise reduction in areas known to be particularly affected as a result of residential proximity and high traffic volumes, either by use of noise-reducing surfaces during maintenance or through noise insulation of adjacent buildings.

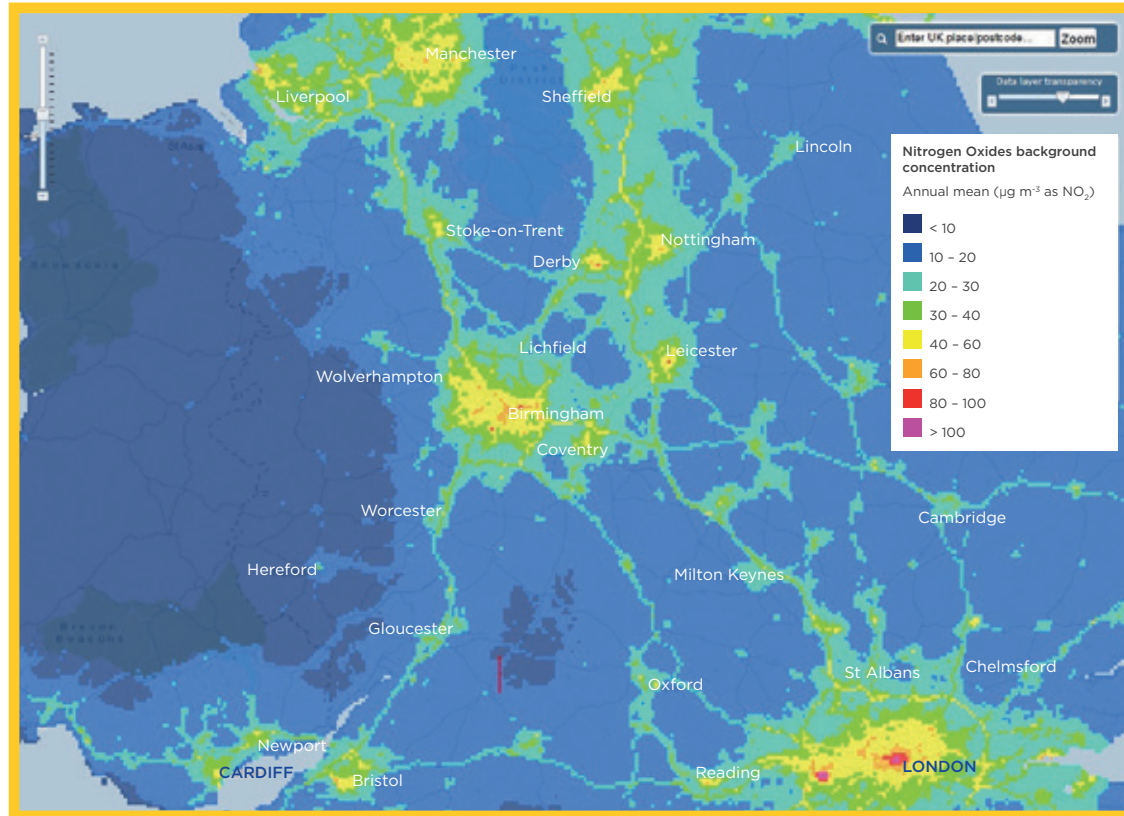


5

Air quality¹⁵ in larger cities and along some major road corridors is affected by emissions from diesel engines of NO_x (nitrogen oxides) – and NO₂ (nitrogen dioxide) in particular – and of fine particulate matter (PM_{2.5} – particulate matter of median diameter 2.5 microns or less), and is becoming the critical environmental hazard as better understanding is gained about the link between atmospheric concentrations of NO₂ and health. England currently experiences substantial breaches of the UK’s air quality regulations^{xxv} for NO₂ in London and several other cities (breach areas shown in yellow, orange and red in Figure 5.1); and some key SRN corridors (yellow in the map) are also just above the regulatory limit.

¹⁵ See Supporting Document 5 (Appendix A) for more information on this subject.

Figure 5.1: Background concentrations of NO_x London - Midlands - North corridor



Source: Annual mean NO_x (as NO₂) concentrations (background) 2014 England, Defra. Screen shot taken from <https://uk-air.defra.gov.uk/data/gis-mapping>. Breach level is 40 µg/m³



The UK Government's action plan in response to the breaches envisages that the combination of new vehicle emissions standards, coupled with the introduction of some exclusion zones for the more polluting vehicles in the most sensitive urban locations, will sufficiently lower background concentrations across the country by 2025.

Nevertheless, achieving compliance with the statutory limits by that deadline still presents a real challenge, especially in London, and given recent concerns about real-world emissions of diesel vehicles. However, the improvement in air quality expected to be achieved during the 2020s means that it is unlikely to be an issue in the evolution of the MRN over the longer term, to 2040. But in the meantime, network operators should be encouraged to mitigate localised concentrations through traffic management and speed limits, and if necessary by extending exclusion zones.

Severance is most acute for busy dual carriageway roads, especially those with high speeds, dividing communities and limiting mobility for those living adjacent to them. Mitigation of severance often involves bridges and underpasses for pedestrians and cyclists; in cities these can be grim for the user. The need for better solutions is now widely recognised, from less brutal design aimed at improving the sense of personal safety, to more frequent at-grade crossings, or even of building a deck over arterial roads, part-funded by housing or retail development on it.

On the related challenge of visual intrusion, there are several practical measures which can improve the visual impact of major roads at low cost.^{xxvi} The principles of fitness for purpose should go further, encouraging major roads to make a positive contribution to the landscape or townscape, and contributing to the well-being of users and those alongside the road.



5

5.5 Fit for urban areas

A distinct approach is needed for Tier 3 (and to some extent Tier 1A) roads in urban areas: they will need to reflect the following additional considerations not applying to Tier 1 limited-access roads or Tier 2 rural roads:¹⁶

- There must be recognition of the degree of place as well as movement that may apply to any section of a Tier 3 road, and which must guide interventions to make the road more fit for purpose in both respects.
- There must also be recognition of the wider transportation policies of the surrounding urban area, which for major roads may involve:
 - traffic management schemes which give priority to more efficient users of road space, including well-managed freight movement;
 - traffic management strategies – both individual schemes and area control systems – aimed at optimising the capacity and use of the local network; and
 - for demand management, control of parking supply and price, and the potential to charge for road use (see section 7.6 for the wider context).

A comprehensive approach for addressing the movement/place conflict is set out in the DfT's *Manual for Streets* series.^{xxvii} Subsequent to its publication, the London Mayor's Roads

Task Force^{xxviii} addressed this conflict on a network basis, establishing a 'typology' of streets and roads using a 3x3 'Street Types' matrix (Figure 5.2); the method analyses a road or street according to its relative degree of significance for movement and for place, and presents a toolbox of measures that may be applied in each box to mitigate the conflicts.

Figure 5.2: Street Types Matrix (Transport for London)¹⁷



Source: Transport for London

¹⁶ Some of these considerations may also apply where Tier 2 roads pass through smaller settlements.

¹⁷ See an explanation of street types and their use at <https://tfl.gov.uk/info-for/boroughs/street-types>



This method helps to systematically identify significant place functions of a Tier 3 Major Road – for example as a suburban ‘High Road’ – and can help justify traffic management measures, speed limits and public realm enhancements to sustain the quality and vitality of that centre, while ensuring that the movement function can still be fulfilled. It is a valuable tool, tested and refined in London, which could be used for addressing potential movement/place conflicts and improving public realm in other cities and conurbations.

5.6 Managing safety¹⁸

All these dimensions of fitness for purpose must not detract from the fundamental requirement to provide a safe service. The MRN – 4% of England’s road network – carries 43% of all traffic, but has only 16% of those killed or seriously injured (KSI) in crashes. The network includes the country’s safest roads – motorways and limited-access dual carriageways (Tier 1) – but also many busy single-carriageway A-roads, especially in rural areas, where users face much higher risks of crashes, deaths and injuries.

The risk of crashes on Tier 2 rural A-roads is related to aspects of road design and geometry as well as speed limits and the behaviour of drivers (including motorcyclists). The Road Safety Foundation’s annual reports^{xxix} highlight persistently high-risk roads, as well as featuring the most improved roads and how these results have been achieved. There are many ways in which

¹⁸ See Supporting Document 8 (Appendix A) for a more detailed treatment of this subject.

network operators can influence driver behaviour – road design, markings, signage, speed limits and enforcement; they can also make the infrastructure as ‘forgiving’ as possible to driver error, for example by installing barriers and removing the most hazardous trees.

Safety management action is informed mostly by data about collisions (mainly the STATS19 national database of police-reported injury road collisions in Great Britain), after the event (*ex post*); effective at addressing hotspots, this has brought down crash rates. But best practice is moving towards more predictive (*ex ante*) risk assessment, forensically assessing road infrastructure for its inherent crash and injury risk. The iRAP (International Road Assessment Programme) method¹⁹ is known in the UK, but little used except by Highways England, who have committed to assessing the entire SRN and acting to ensure that by 2020 more

¹⁹ See Supporting Document 8 (Appendix A).

than 90% of travel on the SRN is on roads with a 3-star iRAP rating or better. ^{xxx} A recent TRL report^{xxxi} has assessed 21 safety management models and made recommendations to DfT about encouraging and advising local authorities on using screening and predictive methods.

We believe that best-practice safety management should now be incorporating the use of predictive risk assessment methods, to help ensure that action and resources are focused in the most cost-effective way – with particular regard for the risks faced by vulnerable road users.



5

About a quarter of all KSI crashes on the MRN involve motorcyclists, who face exceptionally high risks – up to 40 times the average risk per mile faced by other road users; targeted measures, including installation of average speed cameras, can be effective.^{xxxii} On Tier 3 urban Major Roads, vulnerable road users – cyclists, pedestrians and motorcyclists – account for the majority of KSIs. Methods such as the Street Types nine-box matrix developed for London can, by framing the resolution of movement/

place conflicts, provide a rationale for protective measures even on Major Roads – such as road redesign, speed limits, segregated cycle lanes and signal modifications. With this methodology firmly in place in London, we believe that conurbations and larger cities should now be considering the use of the Street Types matrix to help frame their approaches to safety interventions, as part of the wider use of this method for addressing movement/place conflicts.

Automotive technologies already widely available in new cars, such as autonomous emergency braking, and a range of other driver-assist features, are likely to achieve significant reductions in crashes; these beneficial effects should become more significant as levels of vehicle automation increase, although we have not seen any quantified predictions of these benefits. See section 7.3 for a more detailed discussion of the latest autonomous vehicle technologies.

5.7 Developing the network

A fit-for-purpose MRN has to be a dynamic concept; investment in improving or expanding it should, as well as benefitting the user, also take opportunities to mitigate the wide range of impacts on non-users.

The network operator has the lead role in identifying options for enhancing the network. The matrix of expected service levels in Table 5.1 can provide the context for considering additional capacity or other measures to improve performance. Candidates for intervention should be brought forward where:

- there is an obvious bottleneck preventing even the average speed baseline from being met, and a cost-effective solution is practicable; or
- a high congestion factor on that stretch could be brought down through value-for-money investment to increase capacity – or perhaps by prioritising provision for usage types that maximise throughput; in such cases, and particularly on Tier 3 (urban) Major Roads, the network operator should consider possible localised demand management tools

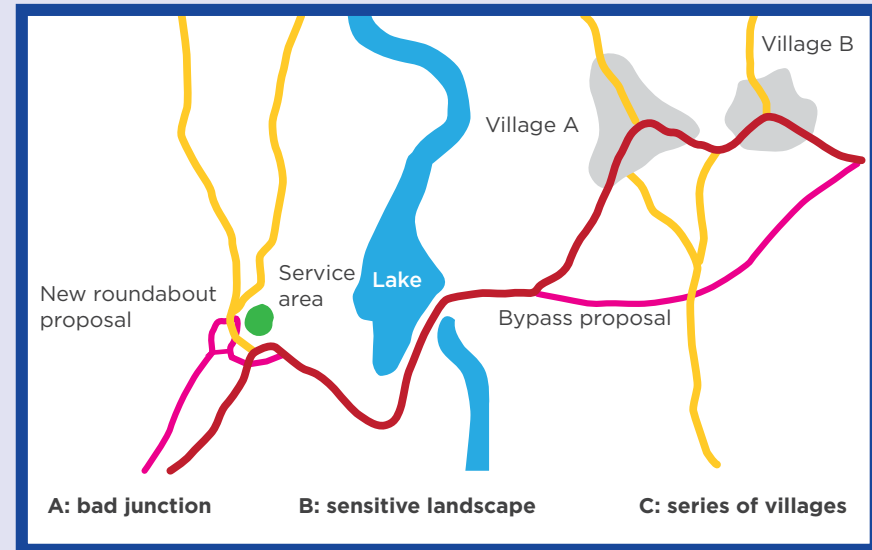
as well as improving integration (where appropriate) with rail services, and facilitating more sustainable modes where possible.

Where the strongest need for such investment in the network is identified, it could result in the upgrading of a link to Tier 1 or 1A, or exceptionally the addition of a wholly new link. More often, shortfalls below the benchmarks will persist, but users would at least be able to understand where this is the case, how large the shortfall from the benchmark is, and why it is persisting.



Example of where service level shortfalls can generate options for possible interventions

Let us take as an example a stretch of Tier 2 MRN road (in red), passing, from west to east, through (A) an overloaded junction with two local roads (in yellow) and added movements generated by a service area; (B) a scenic descent through protected countryside to cross a river near a lake; and (C) a stretch of more built-up road, through two large villages with multiple side roads. Intervention is feasible at (A), through construction of a new roundabout and a better-graded approach road from the west; and at (C), through construction of a bypass for the two villages. Both interventions would bring performance of that stretch up to the benchmark level for Tier 2. The existing road also performs below the benchmark at (B), but the protected landscape means that the only feasible intervention might be to address safety problems rather than improve traffic flow.



	A: Bad junction			B: Sensitive landscape			C: Series of villages		
	Average speed baseline	Predictable variation	Unpredictable variation	Average speed baseline	Predictable variation	Unpredictable variation	Average speed baseline	Predictable variation	Unpredictable variation
Current performance	+	---	--	++	-	---	+	---	---
Potential future performance	++	-	--	++	-	---	++	-	--

Red: road performing below benchmark for Tier 2; Green: road performing at benchmark for Tier 2

This is a logical process of option generation, to be considered within the usual business case evaluation for public capital investment.^{xxxii}

5

5.8 Fit for purpose – summary

- **Fit for the user** means understanding users' expectations for a decent level of service – and then setting out to deliver on aspirations for the speed and time taken for their journeys, and their reliability and predictability. Roads in the MRN will vary by topography and current standard – but we have grouped them into three tiers according to the function they perform and the standard they offer.
- **Fit for communities and the environment** means tackling noise, air quality and severance, and integrating mitigation measures into the ongoing management of the road.
- **Fit-for-purpose management** means making the best use of capacity and the resilience provided by the network; exploiting technology to give road users the information they need to make better decisions; controlling traffic speeds and flows through the network; and, where possible, expanding capacity at pinchpoint locations to address

shortcomings in the service provided. The asset itself must be well maintained, following best practice, and on a whole-life basis.

- **The safety management regime** for the network must be fit for purpose: this should mean adopting over time predictive risk assessment to make the infrastructure safer and more forgiving, rather than relying only on ex post data on crashes to guide safety interventions.
- **Fitness for purpose for Major Roads in cities and conurbations** needs to reflect the more complex transport and planning policies needed there, and the greater exposure and risk faced by vulnerable road users.
- **A fit-for-purpose planning regime** assesses performance against service level aspirations and other measures mentioned, and generates options for improvement or mitigation, to be evaluated for effectiveness and value for money.

This list of components of fitness for purpose of the MRN constitutes a demanding specification. In view of the firm foundations already in place for the SRN, we suggest that the network operators, perhaps under the auspices of the UK Roads Liaison Group, collaborate in developing a high-level Fitness For Purpose code appropriate for the broader Major Road Network. This could draw in particular on Highways England's knowledge and experience, given the firm foundation already contained in the company's licence conditions and performance targets.



6

Making It All Work

Planning, managing and funding the Major Road Network

- Fulfilling the potential of the Major Road Network (MRN) requires a consistent approach to its planning, management and funding.
- As we do not advocate changes of responsibility for the different parts of the MRN, delivering this consistency requires a strong collaborative approach between Highways England and the relevant local highway authorities (LHAs).
- On planning, Highways England's Route Strategies should evolve to adopt a genuinely network approach, embracing local authority Major Roads as well, and the consideration of needs and network options as a whole.
- Collaboration on network planning can be greatly assisted where devolved arrangements such as sub-national transport bodies, combined authorities (CAs) and Local Enterprise Partnerships (LEPs) are in place.
- Collaboration on network management is needed to put in place deliverable resilience strategies for managing the consequences of incidents and closures.
- Ensuring the MRN's 'fitness for purpose' falls primarily to the respective highway authorities, but there is a clear role for the 'strategic client' to translate users' expectations into service level targets and aspirations, and to plan capacity and manage demand so as to maintain that service – integrating with the surrounding network of local roads and rail as appropriate.
- The plans for a National Road Fund (NRF) raise the possibility of extending its 'strategic roads' remit to include contributions to local authority MRN roads, as well as funding the Strategic Road Network (SRN).

6

6.1 Introduction

This MRN will only fulfil its potential of supporting regional economies and enhancing accessibility for all if the *whole* of the network is fit for purpose and able to deliver the appropriate standards. This requires a consistent approach to the planning, management and funding of the whole MRN.

6.2 Planning

Collaboration on network planning on a regional basis is an essential foundation for an effective road system. Nowhere does the SRN operate in isolation from the A-roads which complement and feed it. Such collaboration would require future Route Strategies by Highways England (see section 2.5) ^{xxxiv} to evolve and adopt a true network approach, embracing the local authority Major Roads as well, area by area, and considering with the LHAs the needs and network options as a whole – rather than focusing only on the SRN route itself. The essential feature of this approach is to explore not only how improvements to local authority Major Roads can benefit the SRN, but also, conversely, how changes to the SRN can benefit local Major Roads and their users.

Current developments in the devolution of decision-making about economic, spatial and transport planning to local and sub-national bodies could make such collaboration between Highways England and LHAs more coherent and effective.

The two key types of new players are:

The **sub-national transport bodies** (STBs), enabled under Clause 21 of the Cities and Local Government Devolution Act 2016, bring together local authorities and other stakeholders to bid for transport powers – some, such as the planning of important roads, voluntarily ‘uploaded’ from the participating local authorities, or other roles added, for example the ability to address issues such as rail integration or smart ticketing.

The **combined authorities** (CAs), bodies created (under the Local Democracy, Economic Development and Construction Act 2009) by a group of local authorities for an area, who upload to them a wider set of powers than they would to an STB. Originally an initiative of leaders in Greater Manchester, the CA concept has been adopted across the English metropolitan areas, and the Government has been encouraging adoption of the CA model elsewhere in England too. CAs are the subject of ‘devo deals’ with government, most of which include the transfer of some transport powers and/or funding.



The MRN would be the logical network of regional and national roads for an STB to concentrate on, providing as it does a more broadly based connectivity than the SRN alone can. Each STB, on behalf of its local authorities, who remain the statutory highway authorities, would then lead the collaboration with Highways England on the operation and strategic planning of the MRN in their area.

One prospective STB – England’s Economic Heartland Strategic Alliance, running west and east across the South Midlands – is ready to adopt the MRN as the ‘strategic’ network for its area; and work with Highways England and the member counties on its future evolution.

Midlands Connect, another prospective STB, has been considering the MRN concept for roads in its area which runs east-west from the Welsh border to the North Sea, embracing the West Midlands Combined Authority.

Transport for the North (TfN), envisaged to become the first STB in 2017, is already designating what it calls a Key Route Network selected from the county ‘A’ roads across its area, closely based on the MRN concept. Working with the

combined authorities and counties, TfN is likely to lead the conversation with Highways England about the ‘strategic’ roads across the north of England. This partnership will oversee the strategic planning of roads, helping to ensure connectivity across the north of England, and guiding the development of priorities for investment.

The MRN, as proposed in this study, adds value as an objectively determined, nationally designated network of major roads across England. Were there to emerge special funding arrangements for the local authority parts of the MRN, alongside the SRN funding regime, then these could be accessed by STBs and by combined authorities.

Where there is neither an STB nor a combined authority, the LEP, or an appropriate grouping of local authorities, could provide an effective basis for regional transport planning. As described in Chapter 4, the MRN provides the essential main road connectivity at this level.

The five combined authorities in the north of England, and the West Midlands CA, are also designating their own Key Route Networks – a concept originally pioneered by Greater Manchester – which embrace the more significant roads within their conurbation. Each conurbation Key Route Network will be more granular and extensive than the MRN as we have defined it, as it serves a different purpose, but it will generally include the MRN roads.



6

6.3 Responsibility for ensuring the Major Road Network is fit for purpose

The dimensions of fitness for purpose for the MRN are set out in Chapter 5. The front-line delivery responsibility rests with the *network operator*, be it Highways England, a local highway authority or a combined authority. Each would ensure that their part of the MRN is:

- fit for the user, aspiring to meet specified levels of service – this means making best use of capacity, ensuring resilience and minimising stress for the user;
- fit for communities and the environment – leading to a distinct requirement to be fit for urban areas, meeting the particular challenges of Tier 3 and Tier 1A roads in the MRN;
- structurally fit – the asset maintained effectively for the longer term; and
- sufficiently safe – for users, neighbours and road workers.

In Greater Manchester, and potentially in other conurbations where the SRN is a vital part of the urban road network, the need for collaboration on the operational management of the network as a whole is being addressed in Memoranda of Understanding between Highways England and the relevant CAs. More generally, experience suggests that there is a need for stronger collaboration between Highways England and relevant LHAs on maintenance and, also with police, on the

management of incidents and major closures,²⁰ ensuring that resilience planning is more comprehensive.

But that is only part of the required regime: a higher-level body has to take the responsibility for setting the parameters for the network operator's work. Either the Department for Transport (DfT), an STB or a CA – or in some cases the local highway authority itself – fills the role of 'strategic client', responsible for securing funding, and completing fitness for purpose by ensuring that:

- user expectations overall are met and managed;
- target service levels are specified; and
- aggregate network capacity and demand are managed strategically.

Finally, and recognising that the MRN will not exist in isolation, the network operator and strategic client together need to ensure that service provided by the MRN is effectively integrated with that provided by other local roads and the rail network.

²⁰ See, for example, Highways England's statement about the M6 closure in the West Midlands in February 2016 <https://www.gov.uk/government/news/m6-junction-5-to-6-closure-4-feb-2016-highways-england-response> and the report on the same incident of the West Midlands Police and Crime Commissioner following an inquiry <http://www.westmidlands-pcc.gov.uk/media/423675/11-SPCB-07-June-16-M6-Inquiry.pdf>



6.4 Putting funding in place

A consistent approach to funding is needed, for both the SRN and the local authority parts of the MRN, to make a success of the more collaborative and integrated planning process. As Chapter 2 explains, we are a long way from that at present. Ideally, a funding regime would (a) enable prioritisation of need and value for money irrespective of administrative boundaries, and (b) provide certainty and continuity of funding over a reasonable planning period.



In 2015, the Government announced plans for the hypothecation of Vehicle Excise Duty from 2020 to create a National Road Fund, to fund ‘strategic roads’ in England.^{xxxv} So far that has been interpreted to refer to Highway’s England’s SRN. But it seems to us that the definition of ‘strategic roads’ could be extended; some flexibility already exists for Highways England, through their ability to fund “projects on local roads close to the SRN where it can be clearly demonstrated that this would help the SRN”.^{xxxvi}



With the broader MRN arguably better aligned than is the SRN to the investment objective of supporting England’s national and regional economies, there is some attraction in the idea of a future Fund more systematically contributing to the local authority parts of the MRN. It would be a logical adjunct to the integrated planning and management regime for the MRN – applying the same processes for the local authority parts of the MRN as for the SRN.

We suggest that, were a local authority’s Major Roads considered eligible for some funding contribution, either from a National Road Fund or from some other source, this should be conditional on the ability of the authority to demonstrate how it would meet the fit-for-purpose standards set for the MRN.

6

Our analysis suggests²¹ that there could be headroom in such a National Road Fund to contribute towards local authority MRN roads – if, that is, Highways England’s annual budget beyond 2020 (in the second Road Investment Strategy period, RIS2) remains similar to the level planned for 2019/20 (the highest year in the first Road Investment Strategy period). We have identified a possible surplus of £1.5 billion p.a., which would go a long way towards meeting the needs of local authority Major Roads. There may of course be several legitimate and large SRN claims on that headroom in the next road investment period, such as the Lower Thames Crossing, and other proposals arising from DfT’s Strategic Studies – but the NRF contribution to such major projects up-front could be much less than the total scheme cost given the potential for tolling and/or private financing.

²¹ England’s share of VED for 2020/21 is estimated at £5.7 billion, compared with £4.2 billion for Highways England’s annual budget for 2019/20, leaving a surplus of some £1.5 billion (from OBR Economic and Fiscal Outlook (July 2015) and Fiscal Sustainability Report (July 2014), Table 4.16 and Supplementary Data Series, plus HM Treasury Summer Budget 2015, Table 2.1.) .

In the end, it would be a policy decision by government as to whether to part-fund local authority roads on the MRN from the NRF, or whether to provide funding support for these roads from another source. Either way, the case for a systematic long-term funding commitment would recognise that the MRN:

- is the more balanced, objectively determined network, with the geographical coverage that supports the strategic goals for England’s economy better than can the SRN on its own;
- would provide a clearer and more systematic basis than the current approach of Highways England investing ‘beyond the SRN’ in preparing for the next road investment period;
- would help consolidate the role of STBs, as the MRN is the logical framework for their roads planning responsibilities; and

This move would provide a stronger basis for investment in the MRN as a whole in the coming decade, but may not necessarily provide a sustainable solution through to 2040. Section 7.5 considers policy responses to the longer-term challenge.



7

Ensuring A Sustainable Major Road Network

The challenges of technology and future demand

- There are two longer-term challenges for sustaining a ‘fit-for-purpose’ Major Road Network (MRN) for the next 25 years: first, how the huge – and in part unforeseeable – changes in technology over this period can best be exploited to help the MRN provide a better service to its users; and second, how best to deal with the expected rise in traffic congestion on the network.
- Technological change will continue to transform the travel and transport landscape – with potentially profound impacts on how people and firms make their journey decisions, on the options available in a world of ‘mobility as a service’, on how they use vehicles, and on how road networks are maintained and operated.
- Longer term prospects and timescales for autonomous vehicles remain highly uncertain. Meanwhile, with strong government support of R&D and regulatory adaptation, in the shorter term progressive implementation of ‘driver assist’ and related technologies will bring some capacity and significant safety benefits.
- Forecasting future traffic levels has become more challenging because of observed changes in personal travel behaviours and attitudes over the last 15 years which are difficult to comprehend and take account of, especially for shorter-distance travel in towns and cities.
- Meanwhile population is set to grow by 19% to 2040, and traffic volumes nationally are expected to increase in the range 19-55% on 2010 levels, according to DfT forecasts.
- Trends in traffic on inter-urban and rural roads are clearly diverging from trends on urban roads, with the former – more relevant for the MRN – showing more growth at this time.
- The demand for movement by road is likely to increase at a faster rate than capacity can be affordably and acceptably increased; congestion will therefore increase, and in time will strengthen the need to consider some form of demand management. There are no simple solutions, but government should remain informed about the alternatives available.

7

7.1 Outlook for a sustainable Major Road Network

We finish where we started – the two fundamental challenges at the heart of sustaining a fit-for-purpose MRN through to 2040. The first is how best to exploit the technology-led changes that are set to transform how people and businesses use the MRN, and how the network can be managed. The second is how best to deal with the expected rise in congestion on the network, given the likelihood that the demand for movement will increase at a faster rate than capacity can acceptably be increased.

There are great uncertainties as to how these changes will play out – and how fast – over the next 25 years, so this section goes on to consider how to embed the necessary flexibility in the regime for the MRN to ensure that it can continue to do the job required of it.



7.2 The impacts of technology

The pace of technological developments is increasing – in automotive technology, road and traffic management systems, information available to travellers and the greater focus on ‘mobility as a service’ – with the potential to bring about transformative consequences for travel choices, for the safety and capacity of networks and for network maintenance and management.

Table 7.1 considers five types of technology changes and briefly plots the transport system changes they are expected to cause, the likely effects on demand and travel behaviours, and the resulting effects on the road networks and the environment, together with a commentary on possible timescale²². It illustrates how all-embracing the effects of technology already are, with the scope of further change – particularly in the field of Connected and Autonomous Vehicles (CAVs) – being potentially considerable, but with much uncertainty attached to its end point and to its timing.

²² For further background to this table and to this topic as a whole see Supporting Document 10 (Annex A)

It is important to note that

- Most changes are likely to ease and de-stress the driving task over time (or even remove it); such changes will prove particularly responsive to the needs of an ageing cohort of drivers, and will perhaps make congested conditions marginally more tolerable. This in turn is likely to stimulate additional demand, and may increase the pressure for some form of demand management in some areas.
- Apart from a reduction in vehicle emissions (both greenhouse gases and pollutants), which is driven entirely by regulation, much of this change is being driven by the market, and regulated where appropriate. One area which depends on action by the public sector is the way in which technology is applied to the management of networks. There will in time be pressure on all highway authorities to ensure that CAVs can operate appropriately and safely (see section 7.3).

What are the implications for the Major Road Network?

Richer and more accessible information can improve the experience of road users, by optimising journey planning and increasing the predictability of journey times – as long as good-quality data, preferably soon through 5G connectivity, is available along the whole network. The opportunity for network operators to communicate in real time with vehicles on their networks, and for enhanced vehicle-to-vehicle communication, raises the prospect of a new, more sophisticated, concept of traffic management^{xxxvii}. The emergence of CAVs with differing but growing levels of automation may see the application of capacity-enhancing initiatives. But it is not clear at this stage how extensive these are likely to be, nor, taken in context, how beneficial they will turn out to be in practice.

Other developments are likely to have their greatest effects within urban areas, particularly in larger towns and cities where sufficient critical mass can be generated. These include the disruption of established means of access to car travel (owning a car, or hailing or booking a taxi) by web- and smartphone-based applications offering more flexible models (car-clubs, car-sharing, the Uber model of taxi service, and the like). And CAVs, when successfully introduced, are expected to provide new groups of users with their own access to car use – whether owned or not – as well as making it more attractive for existing user groups. This ‘mobility as a service’ concept could reduce the effect that parking scarcity has on demand, currently an important constraint which gives public transport alternatives the edge.



7

Table 7.1: Summary assessment of the impact of technology types

Technology changes	Changes in the transport system	Demand impact - travel choices and behaviours	Effect on the networks and environment	Timescale
Wide range of non-transport technologies reducing the need to travel or ship goods (eg video conferencing, 3D printing)	(No direct changes in system)	May remove some journeys altogether	Some reduction in traffic flow	Many of these technologies already well-established; further potential remains uncertain over coming decades
Better, more integrated information for travel choices, routes, journey-times, congestion, incl. for delays and incidents	Network operators can influence driver choices	Enables optimisation of travel arrangements and times; mitigates congestion effects; may stimulate new demand	May mitigate some delays and congestion, especially that related to incidents, and on interurban networks	Well established developments, continuing under market pressures
Levels of automation of vehicles (Connected and Autonomous Vehicles-CAVs)	Vehicles with progressively higher levels of automation entering into the UK vehicle parc. Uncertain rate of adjustment by network operators to accommodate change and realise benefits	Impact uncertain but probably positive response to increasing automation, raising demand especially in later stages of autonomy. Some demand likely to be stimulated by less stressful journeys, and eventually from non-drivers	Uncertain outcomes depending on how risk levels are set and the behaviour of drivers in mixed flows. Studies suggest some modest capacity benefits for urban and inter-urban roads. Big improvement in accident rates and road deaths.	Higher degrees of automation - but still with driver in control (up to Level 3) - may be widespread by 2025; Beyond that, uncertain rate of progress and market penetration, towards full automation. Governed by a range of behavioural, legal and other factors



Technology changes	Changes in the transport system	Demand impact - travel choices and behaviours	Effect on the networks and environment	Timescale
'Mobility as a service' – emergence of tailored transport, travel-on-demand	Digitally-facilitated new services emerging (eg Uber, car-2-go) which do not require car ownership. Change generally unforeseen and disruptive to existing markets	Evidence so far suggests increased use of new services, and may lead to reduced car ownership	Likely that supply will increase in response to demand where density is viable; mostly an urban effect, likely to worsen congestion	Innovation already visible today, mostly confined to larger cities. Likely to become more widespread in 2020s, but viability may be limited by population densities
Changing how road networks are managed	Optimisation of capacity, and influencing driver behaviour; improved efficiency of asset maintenance	Smoother network performance experienced by drivers: may stimulate demand; better driver information from network operators	Ability to increase capacity and throughput, reduce unpredictability, from influencing drivers' decisions. More cost-effective asset management	Network management methods are mature, but will be more widespread; extensive engagement with drivers from mid-2020s
Improved emissions of vehicles	Vehicles with reduced carbon emissions and emergence of hybrids and non-fossil fuel vehicles. Reduced NOx and particulate emissions, coupled with controlled access zones (CAZs) excluding or pricing out non-compliant vehicles	Pricing and regulatory measures will nudge drivers towards the take-up of these cleaner and less-polluting vehicles	Contribution towards greenhouse gas emissions targets; better air quality and compliance with air pollution limits, leading to better health outcomes	Some uncertainties still about the degree of carbon emission reduction by the 2030s. Air pollution limits expected to be achieved from 2025, conditional on effectiveness of CAZs

7

But the impacts go beyond demand and supply to service levels, safety and the effect on the environment:

- increasing levels of vehicle automation are already set to greatly reduce crash risk and consequential death and serious injury; and
- a steadily growing number of petrol-electric hybrid cars, and a growing but much smaller number of battery electric vehicles, along with a decade or more of regulatory squeeze, is continuing the trajectory of higher vehicle fuel efficiency with falling carbon emissions; and



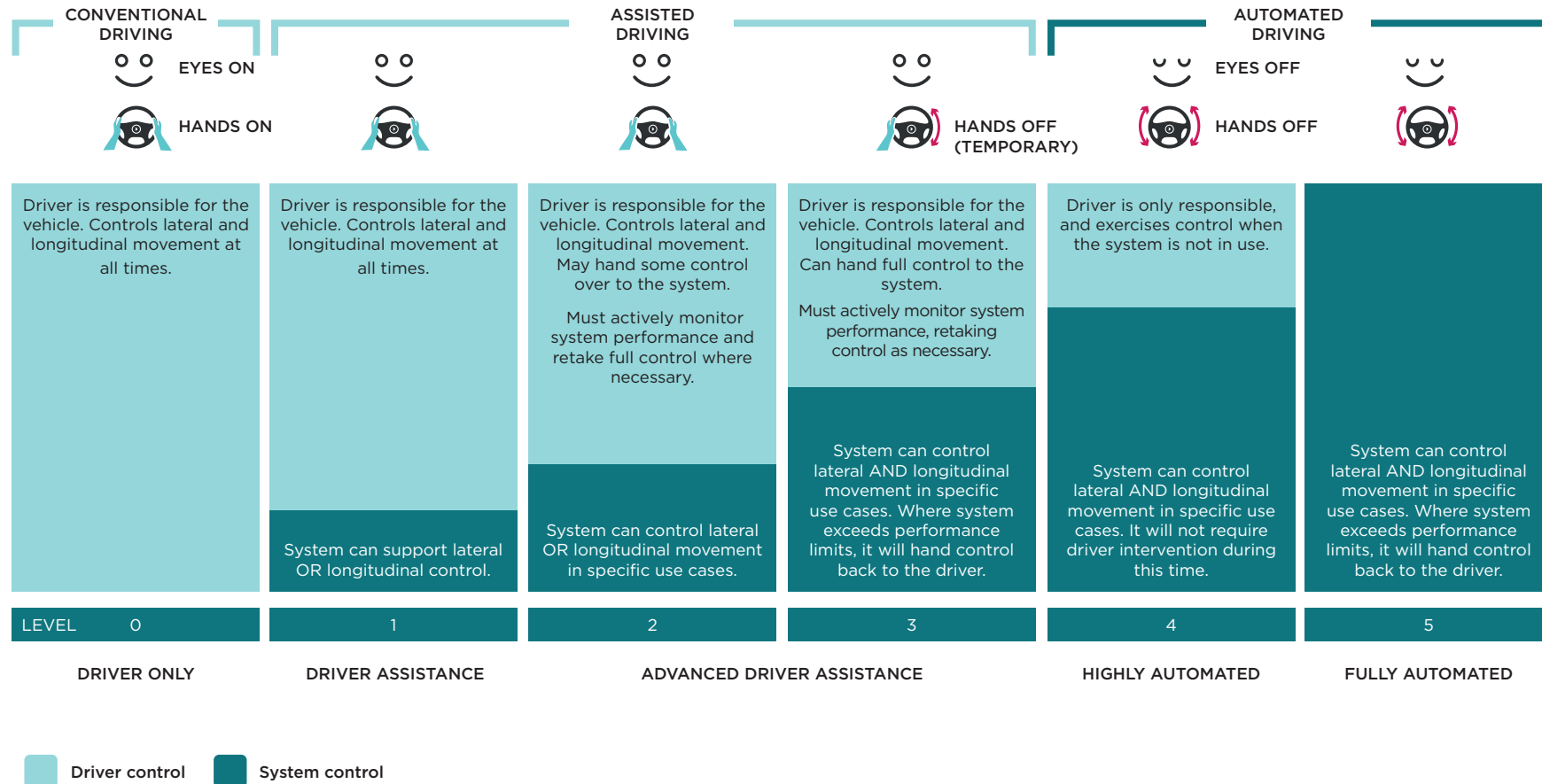
- innovation in the use of materials for road construction and surfaces is extending life and improving maintainability, with technology helping to improve intelligence about pavement condition and enabling maintenance to be planned more efficiently.

Of all the issues addressed in this report, technology is the one which is changing the fastest, in directions – and with impacts and consequences for major roads – which we cannot forecast with any confidence more than a few years ahead.

7.3 Connected and Autonomous Vehicles (CAVs)

There is currently widespread expectation that the progressive automation of vehicles, together with their connectivity, may in the long run have the most pervasive effects on travel demand and traffic behaviour, on network capacity and on users' attitudes to travel.

Figure 7.1 Defined levels of vehicle assistance and automation



The levels of assistance and automation are adapted from the Society of America Engineers J3016 Standard "Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems" (http://standards.sae.org/j3016_201401/). While these are not formally recognised by the UK Government or the United Nations World Forum for Harmonisation of Vehicle Standards, they are seen as a helpful guide to the technology.

Source^{xxxviii}

7

Figure 7.1 is adapted by the government's Centre for Connected and Autonomous Vehicles (CCAV) from the international standard determined by the Society of American Engineers (SAE), and sets out the discrete steps towards fully autonomous vehicles. It describes the ways in which an automated system is able to cover an increasing share of the driving and vehicle control tasks.

Already low levels of automation (1 and 2) offering various forms of driver assistance are commonplace in new vehicles. Automatic Emergency Braking Systems (AEBS) – a level 3 system – are increasingly available. Such features are already having a beneficial effect on road safety, and by reducing collisions will also mitigate the occurrence of unpredictable delays and congestion, particularly on Tier 1 and 2 Major Roads. These levels of automation will also deliver safety benefits in urban networks, particularly for vulnerable road users.

A report by KPMG for SMMT^{xxxix} suggests that vehicles offering level 3 may achieve significant penetration in the UK by 2025. Level 3 is a form of very advanced driver assistance, sometimes called

'conditional automation'. While drivers may hand over control to the vehicle for short periods of time, they do not hand over *complete responsibility*, and are required to take back control of the vehicle quickly if needed. Questions have been raised about the practical implications in human factors terms of this intermediate level 3, requiring as it does the driver to remain vigilant and to constantly monitor the driving environment while the system is in control of the vehicle. The requirements and timing of the critical 'handback' process from vehicle to driver is still under close consideration by regulators. Genuine driver disengagement may only be realistic at the more ambitious levels 4 and 5 of automation, for which there is currently little consensus about timescale for large scale market penetration.

The UK government recognises the potential of automated vehicle technology (AVT) to improve road safety, enable better road capacity utilisation, and ultimately enhance mobility by giving access to those who cannot drive. The pace of development is being driven by the automotive industry,

taking an incremental approach reflected in the levels of automation in Figure 1 (although some players outside the industry, such as Google, are promoting a step-change approach).

Government policy^{xl} is to position Britain as an attractive test-bed for real world developments in AVT – for practical benefit on our congested roads, but with potential advantage for British industry too. The DfT is facilitating progressive but proportionate reform in vehicle and traffic regulation, in insurance and liability issues, and in the education of drivers; and they have recently consulted on the next steps of this reform.^{xli} Government is also actively supporting technical development in AVT sponsored by the Transport Systems Catapult and through the new Intelligent Mobility Fund, as well as promoting a range of real-world trials.

As new developments come to market, reflecting progress up the levels of automation, there is likely to be a long transition period in which many different levels of vehicle automation co-exist on the road network. This brings to the fore the need to understand real-world



behavioural and other non-technical issues. Up till now there has been little study so far of the practical implications of this for network management and capacity, nor for pedestrians, cyclists and motorcyclists – especially in urban streets—who will be navigating this mix. We urge DfT to continue to research these issues and to publish their results.

On Tier 1 limited-access roads in the Major Road Network, AVT and vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications have the potential to bring significant net benefits. With sufficient penetration they could increase capacity and safety by facilitating more intensive network operation by the infrastructure manager. This could include the use of real-time communication, with and between vehicles or drivers, to optimise outcomes

in the event of congestion and other disruptions. The scope for platooning of vehicles on longer limited-access corridors – particularly HGVs with their professional drivers and similar performance characteristics – is to be investigated as part of the DfT's current programme.

In the context of making the MRN fit for purpose, network operators too will need to comprehend their role in maximising the potential of CAVs, in particular the reduction in collisions. They will need early clarity on how far CAVs will have to rely principally on 'reading the road' rather than 'reading the map'—the former requiring very high standards of marking and signing on the road; the latter an up-to-date database of the network to a much higher level of detail and definition than is required for satnavs.

Current thinking suggests that on-board computational limitations will lead to the latter approach, now being developed as 'HAD' (highly automated driving) maps.

The DfT's positive and comprehensive approach is to be commended. But the pace and direction of development and real-world application beyond the next 5 to 10 years remains uncertain. As progress is made towards higher levels of automation, resolving the non-technical and behavioural issues – user acceptance/adoption, the wider policy and regulatory environment, digital infrastructure – may well limit the pace of implementation beyond the time when the technology is fully deliverable, especially away from Tier 1 limited-access roads.



7

7.4 Long term demand forecasts and traffic congestion²³

Congestion already imposes substantial costs on users across many parts of the MRN at particular times of day—£2bn p.a. on the Strategic Road Network (SRN) alone.^{xliii} For the SRN, the current Road Investment Strategy (RIS) programme and the prospective RIS2 (the second Road Investment Strategy period) programme are designed to address the more significant deficiencies in capacity, both on links and at junctions. Before accounting for road improvements after the current RIS, congestion on the SRN would increase steadily as traffic demand is forecast to grow by 30-60% to 2040. Even with more ambitious schemes possible in the next decade, which could greatly improve connectivity and resilience, it is not yet clear whether congestion on the SRN as a whole could be kept in check.

The planning of major improvements on the local authority sections of the MRN is generally far less systematically structured, and without any changes to the planning and funding regime the user experience on those roads is likely to worsen. Outcomes may well differ between urban areas, where there is a wider range of policy options for influencing traffic demand, and interurban roads.

Forecasting future travel demand on major roads The context is set by the Department for Transport's (DfT's) Road Traffic Forecast (RTF) through to 2040,^{xliiii} the latest version having been published in 2015. Uncertainties surrounding forward forecasts have grown, as changes have become evident in

the last ten to 15 years in people's lifestyles, attitudes to car ownership and their travel behaviours. These changes are not easy to comprehend and it is difficult to forecast their implications for car travel over the longer term—particularly for journeys in larger cities in many of which travel options have been changing most quickly. However, one of the most important drivers of future traffic growth is the forecast 19% increase in population from 2010 to 2040. Nevertheless, recent events may have increased uncertainty about macro-economic trends as well as forward population forecasts.

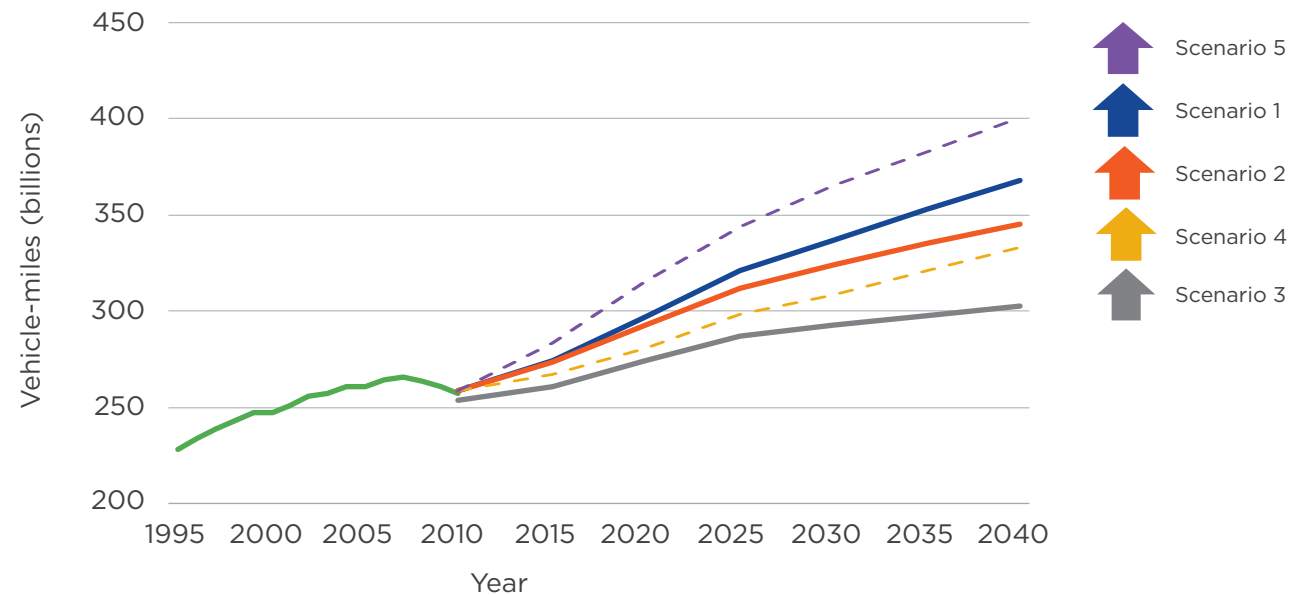
It is for this reason that DfT presented a wide range of traffic forecasts in the 2015 RTF (Figure 7.2), each of the five Scenarios reflecting different assumptions about future household travel behaviour or external economic factors. DfT advises against using any specific scenario as a core forecast for travel by car, and that the range of possible outcomes should be acknowledged.

There are also particular challenges in forecasting future freight and light van volumes: HGV traffic has historically tracked GDP, but discontinuities in the trend have arisen since 2008 and remain unexplained. Light vans have shown consistently and surprisingly strong growth, and this is forecast to continue, evenly across road types and areas.

Figure 7.2 shows the range of forecasts of road traffic – all vehicles on all roads—by scenario.

²³ See Supporting Document 9 (Appendix A) for more detailed treatment of this subject

Figure 7.2 Traffic growth by scenario (billion miles, all vehicles)



Source: Road Traffic Forecasts, DfT, March 2015.

Comparison with recent traffic trends

The 2008 recession caused noticeable discontinuities in trends, and any longer-term impacts on travel behaviours will take time to comprehend. But it seems from the latest data that familiar trends may have re-emerged since then. Traffic statistics for 2015^{xliv} confirm that growth has continued to pick up consistently

since 2010: car traffic growth has averaged 0.7% per year a over the last five years, HGVs 0.4% per year and light vans 2.7% per year. These are within the range of the scenarios, resembling most closely Scenario 2 which suggests car traffic growth at 0.8% per year, HGVs 0.6% per year and light vans 2.0% per year.

Critically important for the MRN is how forecasts vary between road type (motorway/A road/ minor road) and by area type (London/conurbation/ urban/rural). While the RTF publication and supporting data contain such disaggregation by scenario, DfT again advises using ranges rather than specific scenarios.

7

Forecast growth ranges of traffic demand on SRN and local authority A roads are illustrated in Table 7.2. The figures for the SRN are based on no further network improvements beyond the RIS1 programme.

Table 7.2 Forecast traffic demand growth by road type (billion miles, all vehicles)

	SRN (motorways and trunk roads)	Local Authority 'A' roads
% Forecast growth 2010 to 2040	+29% to +60%	+13% to 51%
Average % per annum	0.9% to 1.6%	0.4% to 1.4%

Source ^{xiv}

In this table, local authority 'A' roads include both urban and rural roads. Actual traffic statistics for 2015^{xlvi} show growth of 9% on motorways over the five years 2010 to 2015 and 5% growth on rural 'A' roads. These contrast strongly with flat-lining on urban 'A' roads (and a

9% fall in London), which continues the urban trends which have become evident since the millennium.

The RTF breakdown by area type shows much less growth in urban areas than rural, but only at the bottom of the ranges. DfT recognises the concern that

has been expressed by the transport planning community at the realism of the higher urban forecasts, particularly for London; we would strongly urge DfT to continue to research this, so as better to comprehend the well-established growth differentials between types of area.

Table 7.3 Forecast traffic demand growth by area type (billion miles, all vehicles)

	London	Conurbation	Urban	Rural2
% forecast demand growth 2010 to 2040	+13% to 47%	+14% to 54%	+6% to 50%	+29% to +59%
Average % per annum	0.4% to 1.3%	0.4% to 1.5%	0.2% to 1.4%	0.9% to 1.6%

Source ^{xlvii}



Such wide ranges of forecasts at the national level make it difficult to be precise about the levels of demand likely to be faced on the Major Road Network over the coming years; in any case specific routes and local networks would always be the subject of local studies and analysis to develop the case for particular interventions.

The range of forecasts of traffic growth for the SRN reflect the fact that 90% of it lies outside urban areas. A similar, though lower, range could be imputed to the rural Tier 1 and Tier 2 roads on the local authority parts of the MRN, given the prominence of commercial transport on the MRN as a whole.

We note the uncertainty whether the traffic forecasts at the national level take sufficient account of the factors underlying the different trends in urban areas. We believe that the urban roads on the MRN (Tier 3 and Tier 1A), which are the most congested today, will see significantly less growth; it will continue, however, in those areas where population growth is strong, and with the forecast rise in van traffic.

Delays and congestion Average delays on motorways are currently low and account for a reduction from free-flow speed of only a few miles per hour – although with substantial and regular delays continuing to be a feature of certain motorways such as the M25 and the M6. Overall, however, forecast delays on motorways are set to double by 2040. Congestion on trunk roads – currently increasing journey times by 12% on average – is set to worsen delays by half as much again on average; similar patterns are to be expected on the local authority Tier 1 and 2 roads.

The existing levels of congestion on urban Major Roads – particularly in larger cities – mean that even with lower expected growth, the delays due to congestion will be significantly increased over the period to 2040, possibly by as much as 50% on average.

And as noted above, it remains uncertain how far increasing levels of vehicle autonomy may change effective capacity—or indeed may generate additional demand.

In summary, in spite of the uncertainties of travel projections in urban areas,

congestion is expected to worsen significantly across much of the MRN to 2040 if no effective measures are taken to combat it. Some mitigation will come from enhancement schemes to increase capacity or make better use of the existing capacity, and by the greater opportunities to influence travel behaviours in larger towns and cities. But if a serious impact is to be had on congestion, other demand management approaches will have to be considered.



7

7.5 The policy response – sustainable funding and demand management

The governance regime for the MRN has to be robust enough for it to become – and, most importantly, remain – fit for purpose through to 2040 and beyond. The regime has to deliver four components:

1. sufficient funding for operation of the existing network, and for improvement or extensions which are agreed to be worthwhile – without diverting resources from the rest of the local road network;
2. certainty in that funding and the specification, so that efficient, cost-effective planning and procurement is supported;
3. accountability to the user, as the key mechanism for driving service improvements by the network operators; and
4. an ever clearer strategy for demand management, one that provides longer-term solutions to congestion and avoids undesirable dispersal of economic activity and housing.

The regime now in place for Highways England and the SRN fulfils (1) and (2), and has made a good start on (3); little has been achieved yet on (4), demand management. The funding regime envisaged for the SRN from 2020 – hypothecating Vehicle Excise Duty (VED) receipts to a National Road Fund (NRF) – should provide stability and sustainability of a kind not seen since the original Road Fund, defunct since 1936. We have made the case in this report for the NRF to make a systematic contribution towards the local authority parts of the MRN as well, once the needs of the SRN have been met; the scale of that contribution would in part be determined by government decisions on VED rates. This would help to fulfil the first two requirements for the local authority parts of the MRN.

This hypothecation arrangement also potentially strengthens accountability by creating a customer-provider relationship between the user of the SRN and the organisation responsible for

its safe and effective operation and its development. But because VED payment doesn't depend on the use made of the roads, there is no price signal to the user about the cost of an individual journey, so this arrangement cannot support demand management.

The alternative approach of hypothecating a proportion of *fuel duty* instead of VED would mean the amount paid is related to the amount of road use (and the fuel efficiency of the vehicle). But to the average road user fuel duty is a largely hidden charge, and so doesn't provide much in the way of a price signal; fuel efficiency (and thus the fuel duty charge) is not sufficiently affected by congestion to make it a strong demand management tool either. Nevertheless, this is a progressive and easily collected tax that falls exclusively on road users.

However the tax base for fuel duty is set to decline as vehicles become more energy-efficient and a slowly growing proportion use alternative energy



sources: non-hydrocarbon energy sources are not currently subject to any fuel duty equivalent – a desirable policy incentive for a while, but not necessarily equitable in the longer term. Government is reluctant to raise the level of fuel duty or its reach, and so, if we accept that there are other overriding pressures on the Exchequer, hypothecating fuel duty is unlikely to provide sufficient longer-term certainty for planning the MRN or raising finance.

In the short term there is no reason for us to advocate any change from the use of VED receipts to feed an NRF – but that doesn't mean that current opportunities to explore alternative approaches for the longer term should not be explored

A direct form of road user charging – applying on all roads to avoid unintended distortions – could in theory raise sufficient funds, and also be used to manage traffic demand, subject to the pricing structure adopted. It could replace part of fuel duty, depending on how far the scheme needs to be fiscally neutral. And more finely tuned pricing could provide the impetus for

greater uptake of 'mobility as a service' solutions for personal and business transport. The proposals for road pricing in the 2000s fell in the face of public opposition: there was resistance to the perceived undermining of privacy and to the imposition of further burdens on motorists. There was also a lack of clarity about how charging would be set and where the revenues would be applied.

Major advances in charging technology since then could now enable such a system to be more reliable and less intrusive, with lower set-up and running costs; moreover, the public now seem to be used to the spread of tracking apps, such as telematics-based insurance, and large volumes of movement data are now being collected without apparently impinging on driver privacy. But there remain crucial questions as to practical policy on the acceptability of differential charging based on congestion, the extent of fiscal neutrality, and how pricing would be set and revenues used.

Alternative ways of ensuring that the MRN offers acceptable levels of service in the longer term are, if anything, less attractive. Managing demand through

physical constraints, such as controlling access to limited-access (Tier 1) roads, would have adverse consequences on other roads. Conceivably, congestion might be more readily tolerated if well-managed technology provided better information on what to expect and what to do, and enabled time spent in congested traffic to be used more productively – but this doesn't solve the underlying problem.

We are not offering a view as to which – if any – of these approaches might be adopted at some time in the future. It is important, however, that government keeps up to date in its understanding of the tools now available, and of public attitudes to change. The congestion problem is not going to go away, and neither will technology let us off the hook. The MRN will still need to be managed and developed to meet emerging needs, and made increasingly safe and environmentally benign. And the economy and our quality of life will continue to need a properly functioning Major Road Network that is fit for purpose.

8

Conclusions and Next Steps

8.1 Conclusions

- 1.** The Major Road Network (MRN), at nearly twice the length of Highways England's Strategic Road Network (SRN), provides a balanced and coherent network of motorways and 'A' roads with the geographical coverage to support England's national and regional economies, in a way that the SRN alone does not.
- 2.** Designated using objective criteria, the MRN cuts across the existing boundaries of highways responsibilities. No changes to those responsibilities are proposed, partly because of the upheaval it would cause and partly because there is a good case for the local authority parts of the MRN retaining - and increasing - local accountability.
- 3.** To be most effective in supporting economic growth and quality of life, the whole MRN needs to be planned, managed and funded in a consistent way. Therefore making the MRN concept work would require a high degree of collaboration in the planning and management of operations between Highways England and local highway authorities (LHAs) across England; the advent of sub-national transport bodies could make such collaboration both easier to achieve and more effective.
- 4.** The contrast in the current planning and funding regimes for the SRN and for local roads is stark. While there is an effective and well-resourced regime for Highways England to plan and deliver successive five-year programmes of investment on the SRN, no equivalent exists for LHAs. They have had to cut maintenance spending as part of the Government's austerity programme, and work with complex capital funding arrangements without sufficient certainty through five-year commitments.
- 5.** One approach to consistent funding could be for the

Government to use the prospective National Road Fund mechanism to part-fund Major Roads on the local authority network, as well as for the SRN.

6. The MRN provides a logical focus for integrating spatial and economic planning at a regional level, facilitated by Local Enterprise Partnerships working in partnership with local planning authorities and local transport authorities.
7. The MRN must be 'fit for purpose' – putting service for its users, as well as the wider needs of communities and the environment, at the heart of its planning and management. 'Fit for purpose' means making the best use of capacity and maintaining the asset effectively so as to achieve target service levels; keeping safety paramount; and adapting to the more complex transport and planning policies needed in cities and conurbations.
8. The licence requirements and performance metrics now in

place for Highways England capture much of what we set out as fitness for purpose; if the company delivers on these it will provide a vivid demonstration of how progress can be achieved. Formulated as best practice, it would help LHAs – in their own way – to aspire to similar standards. The UK Roads Liaison Group could have a role to play in supporting the network operators develop the 'fit for purpose' concept into a high-level code for the MRN.

9. Technology is having broad and transformative impacts: for example, on how people and businesses make their travel choices, on the emergence of 'mobility as a service', on the autonomous capabilities of vehicles, and on how network operators manage their traffic and asset maintenance.
10. The rising levels of automation in vehicles should significantly improve safety on the MRN, as elsewhere; but the potential for realising major increases in

capacity remains uncertain, as does the extent to which more stress-free driving may actually increase demand. The introduction of higher levels of vehicle automation on public roads depends on resolving a range of practical, legal, regulatory and other issues, and may hold back the pace of implementation for a long time after the technology itself is fully deliverable.

11. Over the longer term, and driven in part by 19% forecast population growth, we accept that the demand for movement by road is likely to increase 19 - 55% on 2010 levels by 2040 (but by less on urban roads). This is a faster rate than can be matched by affordable and acceptable increases in capacity; delays and traffic congestion will thus increase. Technology will not on its own solve this problem; there will be a need to consider demand management. There are no simple solutions, but government should remain informed about the alternatives available.

8

8.2 Next steps

Progressing this proposition will require:

- Government, Highways England and local authorities to embrace the concept of the MRN and its rationale – and for it to be adopted for their areas by the new STBs;
- Highways England and local authorities to take on the task of collaboration on a network basis, on planning, management and operations – with government incentivising this into the next decade, including possibly

incorporating it into the remit for Highways England for the second Road Investment Strategy period; and

- Government to consider whether the prospective National Road Fund could part-fund qualifying expenditure on local authority parts of the MRN.

We also suggest that the network operators collaborate in developing a high-level fitness-for-purpose code for the whole MRN.



A: List of Supporting Documents

SD1: The Gulf between National and Local Roads Regimes

SD2: Defining the MRN

SD3: Spatial and Economic Planning and the MRN

SD4: The Needs of Users

SD5: Air Quality

SD6: Service Levels and MRN Variation by Tier

SD7: Network Operator Responsibilities

SD8: Safety Management on the MRN

SD9: Demand in the longer term

SD10: Opportunities and Challenges of Technology

Available at www.futureroadsengland.org and www.reesjeffreys.co.uk/transport-reports

B: Acknowledgements

Over the two-year course of this study, we have benefited greatly from the expertise and constructive advice of a wide range of individuals, and organisations, in the field of transport policy, planning and delivery. We are particularly indebted to all the members of our Advisory Panel, past and present, who have steered us to a balanced report and have ensured that we remained focused on all key issues:

Paul Bird, formerly Director for Commissioning – Transport and Infrastructure, Essex County Council

Dr David Bizley, Chief Engineer, RAC Motoring Services

Prof Alan Braithwaite, Executive Chairman, LCP Consulting

James Byles, Asset Development Manager, Asset Management Directorate, Transport for London

Tony Gates, Director for New Business, Major Projects, Balfour Beatty

Steve Gooding, Director, RAC Foundation

Andy Graham, White Willow Consulting, and Chair ITS UK, Cooperative Vehicle Highway System Group

James Hookham, Managing Director, Membership and Policy, Freight Transport Association

Stephen Joseph, Chief Executive, Campaign for Better Transport

Prof Glenn Lyons, Professor of Transport and Society, University of the West of England

Sue Percy, Chief Executive, Chartered Institute of Highways and Transportation

Steve Salmon, Director, Policy Development, Confederation of Passenger Transport

Susan Sharland, President, CIHT and former Chief Executive, TRL

Martin Tugwell, Programme Director, England's Economic Heartland Strategic Alliance

Alan Wenban-Smith, Urban and Regional Policy Consultant

We are grateful to many others who gave us freely their time, knowledge and advice. John Dowie, Paul O’Sullivan, Graham Pendlebury and many others from the Department for Transport have been especially helpful as the study has progressed, as have, from Highways England, Nigel Edwards, Martin Fellowes and (until her retirement and subsequent appointment as a trustee of Rees Jeffreys Road Fund) Ginny Clarke. We have also much appreciated the guidance from Geoff Allister and Matthew Lugg, along with others whom we have met during the course of the Study.

The Steering Group of Rees Jeffreys Road Fund Trustees has worked hard to keep us on track: our thanks to David Bayliss, Stephen Glaister, David Tarrant and to the Chair, David Hutchinson; and to all the Trustees, for their advice and for making the study possible, and to the Chartered Institute of Highways and Transportation for providing meeting room facilities for the Steering Group. Finally, we give a special thank you to Sanjay Rana, who has provided invaluable GIS (geographic information system) expertise throughout, and to our administrator, Frances Leong, for keeping the study on the road with her unfailing support.



C: Sources

ⁱ *Transport Statistics Great Britain 2015 (Tables 0101 and 0401)*, Department for Transport, 2016; personal travel figure excludes walking

ⁱⁱ *Road Traffic Estimates: Great Britain 2015*, Department for Transport, Centre for Transport and Society May 2016

ⁱⁱⁱ *Road Traffic Forecasts*, Department for Transport, March 2015

^{iv} *Investing in Britain's Future*, Table 1A, HM Treasury, June 2013

^v *National Infrastructure Delivery Plan 2016-2021*, Infrastructure and Projects Authority, March 2016

^{vi} *Road Investment Strategy: Strategic Vision* Department for Transport, December 2014

^{vii} *The Condition of England's Local Roads and how they are funded*, David Bayliss, RAC Foundation, November 2015

^{viii} *Delivery Plan 2015-2020* Highways England, March 2015, and data used in Spending Review 2015.

^{ix} National Highways and Transport Public Satisfaction Survey 2014

^x *Highways Monitor-Annual Assessment of Highways England's performance*, ORR, July 2016

^{xi} *Analysis of travel times on local 'A' roads, England, 2014*, DfT, March 2016

^{xii} *Road Traffic Forecasts*, Department for Transport, March 2015

^{xiii} *Strategic Road Network Statistics*, Department for Transport, January 2015

^{xiv} Estimated from *Road Length Statistics* (Table RDL0101), Department for Transport, May 2016

^{xv} *Cities and Local Growth*, 6th Report of the House of Commons Public Accounts Committee, June 2016

^{xvi} *Network Users and their Characteristics, and Users and Community Expectations* Centre for Transport and Society, University of the West of England, February 2015:

^{xvii} *Road User Priorities for Improvement: Car and van drivers and motorcyclists*, Transport Focus, July 2015; *Road User Priorities for Improvement: heavy goods vehicle drivers*, Transport Focus, January 2016; *Understanding Strategic Road Network users' experiences and needs*, Department for Transport, November 2013

^{xviii} *National Road Users' Satisfaction Survey*, Highways England, November 2015

^{xix} *Strategic Road Network Concept of Operations*, Highways England, July 2015)



^{xx} E.g. *Well Maintained Highways* UK Roads Liaison Group (last update 2011)

^{xxi} *Highway Infrastructure Asset Management Guidance* HMEP / UK Roads Liaison Group (2013)

^{xxii} *A new approach to roadworks*, Highways England (website, June 2015) <http://webarchive.nationalarchives.gov.uk/20120810121037/http://www.highways.gov.uk/traffic-information/a-new-approach-to-roadworks/>

^{xxiii} *User and community expectations of the Major Road Network*, Centre for Transport and Society, University of the West of England, January 2015 (commission for this study)

^{xxiv} See <http://www.bre.co.uk/pdf/NIS.pdf> and <https://data.gov.uk/dataset/noise-exposure-data-england> Retrieved 30 July 2016

^{xxv} The Air Quality Standards Regulations, 2010 http://www.legislation.gov.uk/uksi/2010/1001/pdfs/uksi_20101001_en.pdf Retrieved 30 July 2016

^{xxvi} *Better not Bigger: why strategic roads need a green retrofit programme*, Campaign for Better Transport and the CPRE, September 2014 <http://www.bettertransport.org.uk/sites/default/>

[files/Roads_Retrofit_Proposals_FINAL_Sep2014.pdf](#) Retrieved 30 July 2016

^{xxvii} *Manual for Streets*, 2007; *Manual for Streets 2*, 2010, Department for Transport

^{xxviii} <https://tfl.gov.uk/corporate/publications-and-reports/roads-task-force> Retrieved 30 July 2016

^{xxix} E.g. *How much do road crashes cost where you live*, British EuroRAP results 2015, Road Safety Foundation, September 2015

^{xxx} Highways England (March 2015) *Delivery Plan 2015–2020*

^{xxxii} *Road Safety Models*, Report PPR 70, Transport Research Laboratory, 2015

^{xxxiii} See Page 7: British EuroRAP results 2015, *op. cit.*

^{xxxiii} *The Green Book: appraisal and evaluation in central government*, HM Treasury, July 2011

^{xxxiv} *Route Strategies*, Highways England, April 2016

^{xxxv} *Summer Budget 2015*, July 2015

^{xxxvi} *Road Investment Strategy post-2020: planning ahead*, Department for Transport, January 2016

^{xxxvii} *Traffic Management 3.0–Progress towards Utopia?* TomTom Maps paper for ITS Europe Congress, June 2016

^{xxxviii} *Pathway to Driverless Cars: Proposals to support advanced driver assistance systems and automated vehicle technologies*, Centre for Connected and Autonomous Vehicles, Department for Transport, July 2016

^{xxxix} *Connected and Autonomous Vehicles – the UK opportunity*, KPMG for the Society of Motor Manufacturers and Traders, March 2015

^{xl} *Pathway to Driverless Cars, op.cit.*

^{xli} *Pathway to Driverless Cars, op.cit.*

^{xlii} *National Policy Statement for National Networks*, Department for Transport, December 2014

^{xliii} *Road Traffic Forecasts*, Department for Transport, March 2015

^{xliv} *Road Traffic Estimates: Great Britain 2015*, Department for Transport, May 2016

^{xliv} *Road Traffic Forecasts, op.cit.*

^{xlvi} *Road Traffic Estimates, op.cit.*

^{xlvii} *Road Traffic Forecasts, op.cit.*



Rees Jeffreys Road Fund

The **Rees Jeffreys Road Fund** has, since its inception in 1950, provided support for education and research in all forms of transport. It helps to fund projects that improve safety, the roadside environment and rest facilities for motorists and other road users. The Fund has nine Trustees, all with considerable transport experience. This study has been overseen by a Steering Group drawn from the Trustees, comprising David Bayliss, Stephen Glaister and David Tarrant, and chaired by David Hutchinson. For further information, please see www.reesjeffreys.co.uk

The study has been led by **David Quarmby**, with **Phil Carey** as co-author. Sanjay Rana provided GIS expertise, and the study administrator was **Frances Leong**.

This study report should be read in conjunction with the series of Supporting Documents, listed at Appendix A. All are at www.futureroadsengland.org and at www.reesjeffreys.co.uk/transport-reports, where the Report Summary may also be found.

October 2016

