highways england

Highways England
Strategic Road Network
Initial Report

December 2017

Connecting the country

We believe that connecting people builds communities, creates opportunities, and helps our nation thrive.

We care about your journey

We aim to provide all our customers with safe and reliable journeys through the way we operate, maintain and enhance one of the most advanced road networks in the world.

Safety. Customer service. Delivery

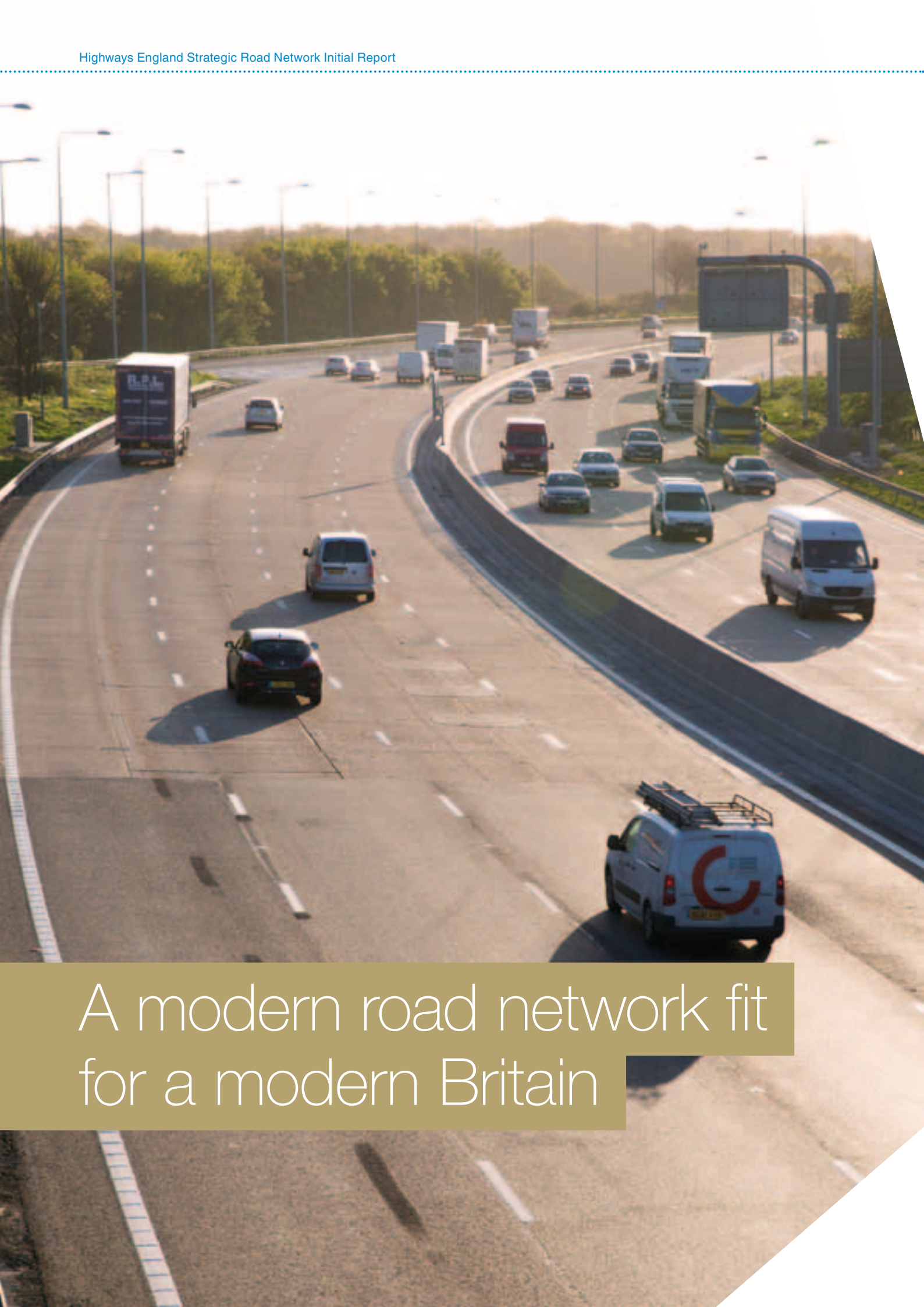
Our imperatives guide all our activity and remain our focus – keeping people moving today, and moving better tomorrow.

Safety. Teamwork. Ownership. Integrity. Passion

Our values are who we are.

We are **Highways England**

Contents



A modern road network fit for a modern Britain

Foreword

Roads matter immensely to our society. The Strategic Road Network (SRN), which comprises the country's motorways and major A-roads, is vital in connecting the country, driving economic growth and creating prosperity. It brings families together and enables businesses to thrive. So it is essential that we continue to invest in the SRN in a way that meets the needs of our customers and delivers best value now and into the future.

We are over half way through the first road period (2015-2020) and Highways England's drive to deliver on our commitments, safely and efficiently remains as strong as ever. We are all proud of the progress Highways England has made in delivering the government's first Road Investment Strategy (RIS).

Looking into the future, we know the SRN and road users' experiences will be significantly different. Technological changes will dramatically change not only our roads, but also the wider transport network, and even our concept of mobility. New generations of electric, connected, and autonomous vehicles will offer our customers, and the country, a new era of safer, easier, and less polluting travel – a roads revolution.

Our thoughts and recommendations on investment priorities for the next five-year road period are now maturing. This Initial Report sets out our proposals and recommendations for the network for Road Period 2 (2020-2025), and is based on our research, evidence base and our understanding of the needs of customers and stakeholders.

This report represents a key stage in developing the investment proposals for Road Period 2. We want everyone to take the opportunity to contribute to the development of these proposals through the consultation process.

We have been listening to our customers and strengthened our stakeholder engagement throughout Road Period 1. We intend to keep on listening and encourage everyone to provide feedback on our investment proposals, which will be taken into consideration in helping the government shape its next Road Investment Strategy.

Together we can ensure England has the strategic road network it aspires to and needs.

Jim O'Sullivan
Chief Executive, Highways England

Key facts and figures

4,400 **miles** of **motorways** and major **A-roads**

Carrying over **30%** **of all traffic** and **4 million** **vehicles use the SRN every day**

In **one year**, **1 billion** **tonnes of freight** transported on **SRN**: more than all other roads and transport modes combined

92 billion **miles** were driven on the **SRN** last year

Traffic on motorways has **grown** by over **50%** since **1993** and is forecast to **grow** another **31%** by **2041**

Almost **75%** **of businesses** say tackling **congestion** on the **SRN** is **important or critical** to their business

Our major schemes **deliver** **£3** **benefit** to the economy for every **£1** **invested**

Executive Summary

We connect the country.

Highways England was created to deliver the government's ambition to create a modern road network fit for a modern nation. Our role is to plan, improve, manage, operate and maintain England's Strategic Road Network (SRN): over 4,400 miles of motorways and major A roads. We believe in a connected country and aim to operate one of the most advanced road networks in the world with expertise, experience and care.

While it may only make up 2% of the UK's roads, 4 million vehicles are driven on the SRN every day. The network brings people to work; connects places, towns and regions; and allows people to travel to leisure activities, friends and families. Pedestrians, cyclists and horse riders use our roads, whether as part of a journey, connecting to other transport, or safely crossing our roads. The SRN is arguably the largest and single most important piece of infrastructure in the country. It enables more journeys than ever before – more safely, more efficiently, and bringing more benefit to our customers and the nation's economy.

With so much depending on the performance of our network, we want to ensure that it works for each and every road user, now and into the future. We're currently delivering the biggest investment in our road network in a generation: £11 billion over the 5 years of Road Period 1 (2015-2020). We've completed 18 schemes on or ahead of schedule, adding more than 190 lane miles of much-needed motorway capacity. We have a further 15 major projects currently in construction. As well as road-building schemes, we're working 24/7 operating and maintaining the network in real time. Meanwhile, we're planning for the long term by researching and developing the road technologies of the future. All to ensure that our customers can continue to get to their destination quickly and safely.

Initial Report

We're determined to do even more to improve SRN safety and journey experiences, and positively impact the economy, environment and communities.

While we are currently delivering the first Road Investment Strategy (RIS), we are also in the process of helping to shape the second RIS for Road Period 2 (2020-2025). The RIS will be decided by the government and our role is to support its development with advice and expertise.

This Initial Report comprises the first stage of that process, and sets out our views and recommendations on the key challenges and investment priorities for the SRN in Road Period 2. In particular, it sets out:

- The results of extensive research and feedback, including user needs, route strategies and a review of the condition and performance of the network
- Our high level view of the key challenges facing the network over the medium term
- Where we think resources should be focused to operate, maintain and enhance the network over the period 2020-2025.

This report is one of a suite of documents produced by Highways England comprising:

Strategic Road Network Initial Report Overview

Strategic Road Network Initial Report

Connecting the country: Planning for the long term

Highways England's analytical methods to inform our proposals for the second Road Period

All documents are available on online at GOV.UK

Research and findings

In creating this report, we have listened to our customers and stakeholders, gathered a detailed understanding of the condition of our infrastructure, and measured our performance to-date. Furthermore, we have considered the wider priorities of the government – our funder and shareholder. We have also sought to understand more about what the future could hold.

We believe that it is vital that we continue to develop our network over Road Period 2 not only to meet the challenges that we will encounter, but also so that we can take advantage of the many opportunities that may arise. Over the next road period, we aspire to:

- **focus on operations, maintenance and renewals** – Recognising that these areas are essential to our customers and provide the foundation for a safe, reliable, and resilient network. We want to do this in a way that minimises disruption for road users now and in the future, and spends taxpayer money most efficiently
- **build the smart motorway spine of the network** – Enhancing capacity between our major cities through a stable, continued smart motorway programme
- **rollout expressways** – Driving forward the ambition from the first Road Investment Strategy to develop an expressway network
- **undertake transformational investments** – Implementing the next generation of transformational schemes, following on from the A303 and Lower Thames Crossing, and prioritising the areas with greatest need
- **deliver a balanced programme** – Ensuring sufficient funding for medium-sized schemes, for example junction and capacity improvements

- **renew focus on small schemes** – Ensuring dedicated funding for small, regional schemes to address safety and congestion hotspots
- **deliver through refined designated funds** – Continuing to invest, with an increased focus on roadside facilities, more flexibility, and new ways of working with partners
- **prepare for the future** – Responding to longer term developments that could transform our roads, such as electrification and autonomous vehicles, and enabling this through pilots and appropriate investment

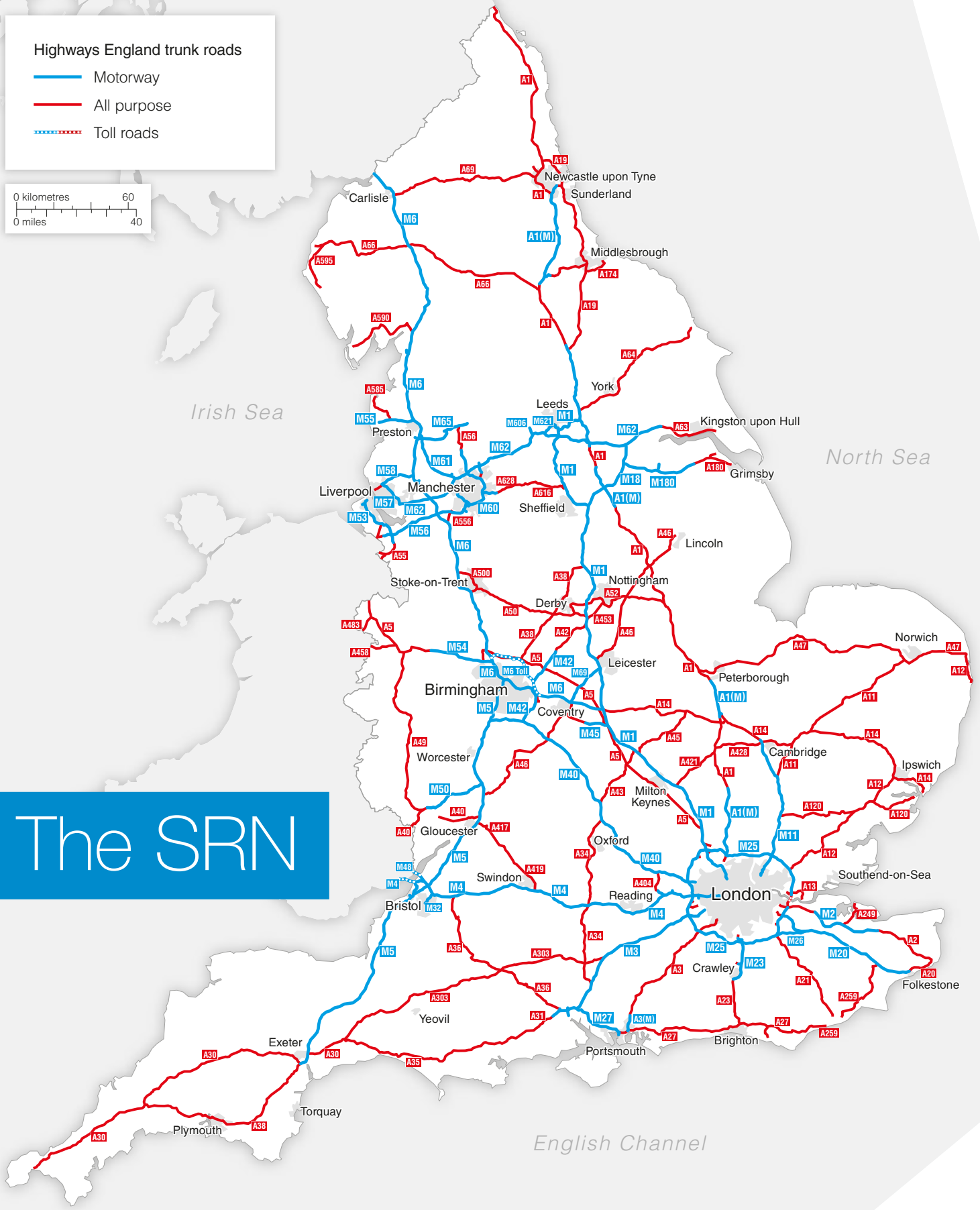
Have your say

The Department for Transport will hold a public consultation on this Initial Report. We want to hear the views of our customers and users, as well as those of the wider public, local government, and any other groups with an interest in the programme for Road Period 2. We believe that there is a big debate to be had on the future of roads investment, and we welcome all participation in shaping the future of England's strategic road network.

Once all feedback has been considered, and the findings published in 2018, the Department for Transport will develop the Road Investment Strategy. In tandem, we will develop our Strategic Business Plan, which will set out how, as a business, we intend to deliver our commitments between 2020 and 2025. The next Road Investment Strategy and our Strategic Business Plan are due to be published in 2019.

To find out how you can participate in the consultation, please visit GOV.UK

The SRN


Highways England trunk roads
Motorway
All purpose
Toll roads
0 kilometres 60
0 miles 40
Irish Sea
North Sea
English Channel
Newcastle upon Tyne
Sunderland
Carlisle
Middlesbrough
York
Leeds
Kingston upon Hull
Grimsby
Preston
Liverpool
Manchester
Sheffield
Lincoln
Stoke-on-Trent
Nottingham
Derby
Norwich
Leicester
Peterborough
Birmingham
Coventry
Cambridge
Ipswich
Worcester
Milton Keynes
Gloucester
Oxford
Swindon
Reading
London
Southend-on-Sea
Bristol
Crawley
Folkestone
Yeovil
Exeter
Portsmouth
Brighton
Torquay
Plymouth

1. The strategic road network (SRN) – connecting the country

The SRN is the economic core of the country's road network, and is made up of our motorways and major A-roads. It connects the country, carrying a third of all traffic and two thirds of all freight. A safe, high-performing SRN is essential for everyone's daily travel and enables the economy to grow and businesses to flourish.

It is also probably the single most important piece of infrastructure in the country. It links the most populated centres and areas of economic activity, providing access to all regions and international gateways. It is one of the safest road networks in the world. We aim to maintain and modernise the SRN in our customers' and the nation's interests.

As the operator of the SRN, our 3 imperatives are:

- **Safety:** This is our top priority. This means safety for all who use or cross our roads (motorists, pedestrians, cyclists and horse riders), for our workers, and for the communities who live and work alongside them.
- **Customer service:** We are committed to making our customers' journeys as safe, fast, reliable and smooth as possible.
- **Delivery:** We're delivering the biggest upgrade to the road network in a generation. Our approach will always be to work in an efficient and effective way that provides value for money and minimises disruption. We aim to provide an improved service for our customers, positively impact the economy and leave a positive lasting legacy on communities and the environment.

We connect England. More than 95% of the population uses the SRN at least once a year, either as a driver or passenger. Nearly half of the country's residents use the network at least twice a week. The SRN is vital in helping people do business, get to work, the shops, and enjoy leisure.

At a local level, the network connects communities. Around a fifth of the population lives within a mile of our roads. Pedestrians, cyclists and horse riders use our roads, whether that's as part of a journey, using a stretch of an A-road, waiting for a bus, or having to cross a busy road safely. We manage around 350 miles of pavements and cycle paths on some urban A roads, and over 2,500 crossings.

In spite of the volumes that use the SRN daily, we know that almost no journey starts or ends on our roads. The SRN is part of a wider transport network which should:

- effectively link to and work with the local road network
- support sustainable travel choices by connecting to public transport and providing safe, high quality facilities for pedestrians and cyclists
- provide reliable and resilient access to international gateways
- play a fundamental role in the UK's economic success.

Businesses rely on the SRN – for their workers, suppliers and customers. The SRN moves more freight than all other roads and transport modes combined. Sectors such as logistics, retail, manufacturing and construction depend on it to move materials and goods around. The SRN's performance impacts on production costs, as well as the competitiveness and attractiveness of England as a place to invest in.

The UK economy's reliance on the SRN is demonstrated by:

- 9 out of 10 businesses in England are located within 10 miles of the SRN and 47.5 miilion people (90%) live within 6.2 miles of the SRN.
- Almost three quarters of businesses regard tackling road network congestion as either critical or important to their future business operations.
- Sectors heavily reliant on the SRN employ 7.4 million people and contribute £314 billion in Gross Value Added to the economy.

Our first strategic economic growth plan, *The Road to Growth*, presents new evidence about the SRN's relationship with the economy and sets out our plan for maximising the SRN's economic impact. Published in 2017, the plan identifies four strategic economic roles that the SRN and Highways England play in supporting the economy. These are summarised opposite:

We have identified 4 strategic economic roles that the SRN and Highways England can play in supporting the economy:

Economic role 1 – Supporting business productivity and competitiveness, and enabling the performance of SRN – reliant sectors

As part of a wider and integrated transport system, a safe, reliable and efficient road network enables businesses to access customers, suppliers and labour markets. A significant proportion of businesses are heavily reliant on the SRN. These SRN-reliant sectors employ more than 7.4 million people and contribute over £314 billion GVA to the UK's economy. Current projections suggest the cost of congestion to the freight industry will be £14 billion in 2040.

Economic role 2 – Providing efficient routes to global markets through international gateways

The SRN plays a key role in enabling international connectivity and trade by providing reliable and resilient access routes to global markets, via the country's network of international ports, airports and the Channel Tunnel. More than three-quarters of imports and exports leave and arrive at these international gateways by road. A quarter of businesses cite the quality of connections to international gateways as a barrier to exporting.

Economic role 3 – Stimulating and supporting the sustainable development of homes and employment spaces

There is a strong correlation between the SRN and patterns of development across England. But the development of new employment spaces and homes cannot happen without the right road connections and capacity. The SRN underpins and stimulates the development market. Each year, Highways England is consulted on more than 3,500 planning applications and local plans.

Economic role 4 – Providing employment, skills and business opportunities within our sector

As an employer and significant investor, we directly provide nationwide employment, skills and business development opportunities within our own supply chain and sector. We also support research and innovation in our sector and road-related industries, boosting the UK's export potential.

The Road to Growth draws upon extensive engagement with all Local Enterprise Partnerships across England as well as a new comprehensive economic evidence base.

Our activities in the current road period (2015 – 2020) are already supporting the economy. It is our aim to further contribute to the economic prosperity of the country in the second road period.

Supporting productivity

In 2016, the Confederation of British Industry (CBI) reported that the plan for the first road period "has the overwhelming backing of business, with 97% of firms describing it as important and 41% calling the programme 'critical' in attempts to boost capacity and resilience" (CBI/ AECOM, Thinking Globally, Delivering Locally: Infrastructure Survey, November 2016)

We will always put safety at the core of our work

2. What we do

Highways England was established by government to operate, maintain and enhance the SRN in the interests of our customers and stakeholders – to be the custodian of the network. Our role includes:

- day-to-day operation and management of the SRN, keeping it safe and open for traffic
- keeping the infrastructure in good condition at the lowest possible cost
- designing and building enhancements to the SRN
- creating a positive impact on the surrounding communities and environment.

2.1 Safe and open for traffic

We know that our customers need fast, reliable journey times and to reach their destinations safely. Similarly, a well-functioning road network is vital to the economy. We also want to minimise our impact on our neighbours and the environment.

Our roads need to be actively monitored and managed to keep them open for traffic. Every day, a small army of people are working behind the scenes (and in the cases of our on-road workers, front of stage) to ensure that our customers' journeys on the SRN are as safe and easy as possible. Traffic officers help clear incidents and remove debris, suppliers respond quickly and flexibly to repair damaged infrastructure, control room operators put messages on motorway signs to keep road users informed: these are just some of the many functions we carry out to keep road users moving, all day, every day.

Improving safety

We will always put safety first and at the core of everything we do. We continue to develop innovative programmes to improve road user behaviour and will look for new ways to make our own people safer when they work on the roads. Our on-going investment programmes will modernise and maintain the network; they include a range of measures which improve road safety through work to upgrade junctions, lay-bys and central barriers, providing safer verges, better road signing and markings. Our programmes also target sections of our network with higher incident rates and those where the safety rating is lower, for example single carriageways.

Alongside this work to improve our road infrastructure, we are developing our understanding of the causes of collisions using vulnerable user insight studies. These reports provide a detailed understanding of the demographics of vulnerable road users who have been involved in a collision. This then helps us target safety interventions more effectively.

At the heart of our work to improve safety is our focus on ensuring that we have a strong safety culture across our organisation and our supply chain. Keeping our workforce safe is a critical priority and we are making progress in embedding new ways of working to keep everyone safe, including our zero crossing initiative which aims to eliminate the need for our workers to cross the carriageway, for example, by using vehicle mounted signage.

Tackling wrong way driving

The term 'wrong way driving' is used to describe a vehicle being driven in the opposing direction (against the flow of traffic) along a one way street or carriageway. In order for this to occur, the vehicle must have first turned the wrong way onto the network. We have recently undertaken research into the scale of this problem on the SRN. We found that while instances of wrong way driving on the SRN are rare, the consequences can be severe: when a collision is caused by wrong way driving, it is twice as likely to result in someone being killed or seriously injured.

To tackle the problem we need to reduce the risk of drivers turning the wrong way onto the network. To do this, we have developed a wrong way driving mitigation toolkit. This provides a process to help Highways England and our supply chain prioritise sites, assess risk and select an appropriate level of mitigation at each site. This can include making improvements to existing junctions. The toolkit can also be used to inform the design process of new schemes and major projects, and help ensure that the risk of wrong way driving is mitigated as far as is practicable.

We are progressing this work this year at our highest priority locations.

Dealing with incidents on the network

At Highways England, we aim to manage activity and events on the network, dealing with each incident effectively to minimise disruption and delays.

Our National Traffic Operations Centre in the West Midlands is the information hub of the network, from where we look to keep our customers informed about road conditions. We collect and process data from thousands of roadside sensors and cameras, staff or contractors working on the roads, and around 250 operational partners, including police and local authorities. Through these, we can determine the most appropriate response to incidents and inform customers.

Role of Traffic Officers

Highways England's 1,500 Traffic Officers are our presence on the ground, and provide a front line response to breakdowns, debris and incidents. They patrol England's motorways, helping to keep people safe and traffic flowing smoothly.

Our Traffic Officers:

- Manage traffic to help reduce congestion and keep everyone safe
- Stop and direct traffic and pedestrians, close lanes and carriageways, place temporary traffic signs and signals and reopen roads safely
- Arrange for the recovery of damaged or abandoned vehicles, and for inspection and repair of the network if necessary
- Clear debris from the roads
- Coordinate emergency services and support the police
- Keep road users informed through electronic message signs and by supplying information for local travel reports
- Help if road users break down or are involved in a collision or incident.

Providing information

We help road users plan or amend their journeys by providing real-time information through the use of our Variable Message Signs (VMS) and by providing data to partner organisations, such as broadcast radio, traffic bulletins and journey planning services. These channels provide up-to-date information on roadworks, traffic and incidents. Information can also be found on our website, social media, and mobile app.

We aspire to provide an even better service to our customers. According to Transport Focus research, road users would like extra information to be available to them when planning their journeys. Only a third of drivers have used one of our information sources, and 60% of road users who experienced a delay on the network did not know about it before they reached it.

We are already working to improve our communications with customers by presenting information as accurately and accessibly as possible, and striving to ensure that everyone is aware of the information services we provide. This way, our customers are able to better plan their journeys.

Innovating traffic management – use of technology

Technology is fundamental to how we operate and monitor the SRN and, as demand increases, is becoming increasingly critical as we seek to inform and serve our customers in new ways.

We use a variety of detectors, including loops, radar and CCTV to monitor traffic. These work alongside our National Roads Telecommunications Services (NRTS) and our computer systems to manage traffic by automatically setting signs and signals in response to traffic slowing down due to congestion and other incidents.

We are upgrading more of our motorways to smart motorways in Road Period 1. As well as increasing capacity, smart motorways enable us to actively manage the roads and keep everyone moving as traffic increases. We also plan to make use of current and emerging technology on future expressways.

We are continuing to keep track of new technologies which will, in future, change the way people travel and use the road network. Electric vehicles, driverless vehicles and vehicle detection systems (automatic braking and avoidance technologies) will require us to evolve. To achieve this we are investing in research on how we can best meet these changing demands and make the most of these technologies to provide an improved service to road users.

Managing planned events and routine issues

To help accommodate traffic peaks, we try to lift as many roadworks as we can whilst keeping road users safe. Our control centres help us to be ready for peaks in traffic and respond quickly to disruptions.

Our severe weather service helps keep the network safe and free-flowing. We monitor weather conditions and forecasts and carry out pre-emptive activities when severe weather is imminent. These include providing information on road conditions and protecting and clearing roads using our fleet of 500 salt spreaders and snow blowers. We also undertake preventative work, encouraging drivers to take precautionary measures and travel safely.

Litter

Litter is unsightly and a key issue for our customers, so we are focusing on litter reduction through route inspections and collaboration with our contractors. In order to satisfy customer needs (such as reducing litter at the roadside) and meet legal requirements, we have increased our flexibility, undertaking planned routine maintenance while reacting to individual occurrences (for example, fly tipping).

> *Smart motorways increase capacity and provide faster, safer and more reliable journeys, and keep motorists well-informed.*

2.2 Keeping the infrastructure in a good condition

The SRN is made up of a huge and varied range of physical assets, including:

- almost 10,000 miles of carriageways
- over 20,000 bridges and other structures
- over 25,000 miles of ditches and drainage assets
- over 8,000 miles of cuttings and embankments
- over 8,000 miles of fences and barriers
- over 100,000 street lights
- over 150,000 signs
- over 3,500 electronic messaging signs
- over 70,000 sensors including traffic sensors, cameras and weather stations.

Every day we carry out maintenance on the SRN, either directly or through our contractors. All parts of our network have a role to play in keeping traffic flowing and our customers safe. Maintenance and renewals help to keep the network safer. For example, our drainage systems are largely invisible to our customers, but if they become blocked, water can overflow onto road surfaces and structures, weakening them over time.

Maintenance and renewals have wider benefits too. More modern forms of road surface technology produce lower levels of traffic noise, so replacing old surfaces with new ones reduces the noise impact on neighbouring communities and the environment. Well-maintained drainage systems ensure that dirty water from road surfaces is channelled away from surrounding land, and doesn't contaminate local water sources and ecosystems.

In the past, Highways England has managed maintenance and renewals of road assets through contractors. We have divided the network into areas, and for each of these we have appointed a single contractor to monitor asset conditions, and plan and conduct routine repairs and renewals.

Since 2016, we have been improving how we manage our network, through a programme called Asset Delivery. Across almost half of our operational areas, where existing contracts have expired, we have replaced them by taking on these roles ourselves. These include:

- gathering and recording asset condition data
- making decisions about which assets to repair or renew
- planning and co-ordinating repair works.

Under the new arrangements, we still use our suppliers for specific services. For example, when we need to make a repair to an asset, we'll use a contractor to carry out the work. However, unlike previously, we will have identified the need for the repair and taken the decision to improve it ourselves.

By taking on direct responsibility for managing, maintaining and improving our assets, we are able to co-ordinate these works in the most efficient way and minimise disruption. This will mean that we can:

- drive down cost and waste, providing the best possible value for money for tax payers and service for our customers
- better understand how the network is performing, and make improvements based on what the network needs
- better understand the costs of maintaining our network
- make long-term investment decisions to further develop and improve our network.

By transferring the decision making process from contractors back to ourselves, we will be able to develop plans for a more stable renewals regime, with a smooth, predictable, long term profile of work. We are implementing a range of asset decision support tools to help us better utilise the data we collect, to predict the long term asset condition and associated investment need. Building on the information and intelligence we gain through this programme, we will be able to:

- prioritise intervention more accurately based on asset needs, making optimal use of the resources available to us
- be more integrated in our approach to planning works, so that they can be completed more quickly and efficiently, with less disruption for our customers
- establish a smooth cycle of infrastructure replacement, creating greater certainty for our supply chain, enabling the optimisation of contracts, lowering costs and maximising opportunities for innovation
- focus on longer term planned renewals, rather than ad hoc, temporary repairs that cost more, require more interventions and negatively impact our customers.

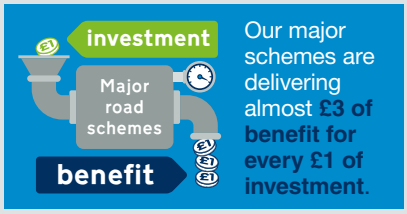
2.3 Enhancing the network

We're over halfway through our £11 billion Road Period 1 capital programme, which will increase capacity, transform connectivity, and improve the condition of the network. In this road period, we plan to invest £7 billion on the development and construction of major road improvement projects. Details of key dates for each of these schemes are set out in Annex A.

Through the implementation of these projects we will:

- ensure we take opportunities in every enhancement scheme we deliver to make the network safer for all road users
- deliver more smart motorways on key routes. Smart motorways use automated traffic monitoring systems to provide extra capacity by managing the speed of traffic, preventing or delaying the onset of stop-start congestion, giving more predictable journey times, reducing collisions and reducing the environmental impact compared with traditional widening
- take forward a number of expressway schemes, including the A14 and A303/A358. The aim is that over time, an expressway will provide a motorway-like experience for our customers
- reduce congestion on some of the nation's busiest roads, bringing benefits to our customers and the wider economy.

Analysis of investment has shown:



[1] The £15 billion funding allocated to Highways England includes £11.4bn that relates to the first five-year road period. The remaining funding has been committed to the first year of the next road period.

Case Study M62 J25 to J30 – making better use of the current network

- This smart motorway scheme created 15 miles of extra road capacity without any further land take.
- Traffic flows on the M62 have increased by up to 7% on weekdays.
- Journey time savings up to 3 minutes on each of the sections from J29 to J26 at the PM peak periods and higher average speeds.
- Reliability for the worst 10% of journeys in the AM and PM peak periods has improved in both directions.
- 34% reduction in collision rates in the opening year.
- The investment cost of building the scheme was 17% less than forecast.

We're also committed to improving connectivity on and around the network for non-drivers by delivering safe and accessible routes.

Improved cycling routes can provide far-reaching advantages - helping to reduce the congestion caused by motor vehicles and improving public health, lowering NHS costs (right).

We plan to deliver 150 cycle facilities and crossing points on or around the network by 2021 and more than 20 schemes are starting construction in 2017-18.

Our major highways construction projects factor in improvements for cyclists. For example, the A1 Leeming to Barton scheme provides enhanced access for equestrians, pedestrians and cyclists through a new continuous local access road and 11 new or upgraded crossings.

As we build toward transforming our busiest A-roads into expressway corridors, such provision will allow us to safely segregate these vulnerable road users from high speed motor vehicles.

Other initiatives include cycle lanes and crossings that are safe and separated from traffic, such as the new link road on the M5 J29. This link road will provide separate cycling and pedestrian lanes and upgrades to the pedestrian/cycling bridge on the A30.

Our efforts are supported by local highways authorities' Local Cycling and Walking Infrastructure Plans, which help us to ensure our plans are focused on network areas with the greatest needs.

2.4 Our environment and the SRN

We know that the SRN has an impact on the surrounding environment and that we have an important role to play in minimising any negative impact across everything we do.

Our environmental ambition

While our roads create significant economic benefits, we believe it is also important to invest in environmental mitigation. Our aspiration is not just to minimise harm, but for "a strategic road network working more harmoniously with its surroundings to deliver an improved environment."

To achieve our ambition the first thing we need to do is to fully understand our current estate and its relationship to valuable aspects of its surrounding environment, and we have made significant progress assessing and recording this.

Furthermore, we have also started to embed new ways of thinking and acting on environmental issues, not least through our Strategic Design Panel. The Strategic Design Panel comprises members from the Chartered Institution of Highways and Transportation, the National Trust, the Campaign to Protect Rural England, Royal Institute of British Architects, the Campaign for Better Transport, the Landscape Institute, Prince's Foundation, the Institution of Civil Engineers, Natural England, Design Council, Transport Focus, the Institution of Structural Engineers and Historic England. While our past efforts have always been focused on delivering safe, efficient and affordable roads, it is hoped that the ten principles that follow will develop a culture where good design is at the heart of everything we do.

Highways England Strategic Design Panel

The Strategic Design Panel comprises stakeholders and experts from the fields of architecture, environment, heritage, design and engineering, representing many of the organisations we work with in planning, designing and developing schemes, standards and processes.

We have agreed a design vision with the Panel, "We aim to put people at the heart of our work by designing an inclusive, resilient and sustainable road network, admired for its functional elegance and usefulness, reflecting in its design the beauty of the natural and built environment through which it passes, and enhancing it where possible."

To achieve this vision of good road design, the Panel developed ten principles of good road design, which we aim to embed in our design culture and process.

Good road design:

1. makes roads safe and useful
2. is inclusive
3. makes roads understandable
4. fits in context
5. is restrained
6. is thorough
7. is environmentally sustainable
8. is innovative
9. is long-lasting
10. is a collaborative process

More information can be found in the panel's first Progress Report.

Wellbeing of communities

Our concern is not just to support the UK economy, but also to support the quality of life for people and communities across the country. Since the environment is integral to quality of life, we are working hard to support the health and wellbeing of communities affected by our roads.

Thanks to concerted efforts over recent decades there has been an improvement in air quality across the UK. A tightening of vehicle emission standards has helped further reduce the emissions from vehicles travelling on our network, and the government is keen to ensure vehicles continue to meet emission standards to deliver greater benefits.

We are also establishing a national air quality monitoring network, which will comprise approximately 60 continuous monitoring stations, with 33 already commissioned. Using the intelligence provided by this system, we will be able to take air quality into account earlier in the planning process.

We are also seeking to mitigate the noise impact of our network through insulation, noise barriers or low noise surfacing on schemes near Noise Important Areas.

Natural, built and historic environments

The SRN contains a range of protected habitats including species-rich grasslands, woodlands and wetlands, and supports and impacts upon a number of rare and protected animals and plants such as barn owls, peregrine falcons, dormice, rare orchids and other wild plants.

Our sizeable “soft estate”, about half of which is woodland, provides an opportunity for us to impact positively on biodiversity and the environment. Being linear by nature, road schemes tend to break up habitats, but if designed well, they can also be used to enhance and connect habitats across large distances. We are also landscaping and planting to visually screen our network and reduce the impact on natural landscapes and neighbouring communities.

Elsewhere, we work with other stakeholders such as Historic England, the National Trust, National Parks and members of our supply chain to identify sites that can improve the appearance of our roads. We plan to spend £4.5 million on schemes in 2017 to reduce the network’s visual impact and improve the landscape.

Road transport is one of the main sources of carbon emissions. The UK has a legally-binding commitment to achieve an 80% reduction in its greenhouse gas emissions by 2050. The infrastructure sector is responsible for almost one-sixth of total emissions and therefore has a key role to play in contributing to the national reduction. We consider the carbon impact of road projects and factor carbon into design decisions that are consistent with the government’s plans for a low carbon future.

The Highways England corporate carbon footprint is on target to better the Greening Government Commitment to reduce greenhouse gas emissions by at least 32% from a 2009-10 baseline (in line with individual departmental targets). Significantly, some 87% of our corporate carbon footprint is attributable to electricity used to power the lighting, signing and signalling to improve safety and operation on the SRN.

We are balancing how we use our lights alongside other safety features in some places to help protect the environment. For example, we may dim the lights when there are fewer vehicles on the network.

We are currently focused on reviewing and confirming the influence of the network on the condition of heritage assets close to it (including impacts on their setting). We will then be able to implement conservation measures for those heritage assets which are currently at risk, and to identify and deliver enhancement projects..

Case study: A556 Knutsford to Bowdon Dual Carriageway

The new four mile A556 link between the M56 and M6 south of Manchester has been described as “Britain’s greenest road”. On this £192 million scheme, opened in March 2017, we pulled out all the stops to not just minimise the road’s impact, but make a net positive contribution to the environment.

We put environmental considerations at the heart of the project from the outset. The route was chosen to divert traffic away from the villages of Mere and Bucklow Hill, which had experienced noise and air quality issues due to increasing traffic over many years.

We spent over £2 million on mitigating environmental impacts and promoting biodiversity, including construction of a green bridge to provide a crossing for cattle. We provided extra habitats for local wildlife in the form of bat roosts, barn owl boxes and newt ponds. For badgers displaced by the scheme, we built an entire sett nearby and connecting tunnels made from plastic tubing.

The road crosses several wooded areas in which bats have established foraging routes. There was a risk that as bats flew low across the road they would be hit by vehicles. We solved this by building fences (called “hop-overs”) on either side to force the bats to fly up high enough to avoid traffic.

Fences direct animals away from the road and towards mammal tunnels running underneath it, allowing badgers, voles and hedgehogs to cross safely.

We enhanced flora as well as fauna, completing “greening work” along the route. This included planting 280 semi-mature trees, 60,000 saplings, nearly 117,000 sqm of shrubs and over 7,000m of hedgerow. We built a green corridor, including a bespoke underpass, maintaining connectivity with local footpaths and bridleways, for use by cyclists, walkers and horse riders.

A drainage network ensures that contaminated water running off the road surface is diverted into four filtration ponds, instead of the local environment.

The scheme won a silver award at the Green Apple Environment Awards.

We will continue to monitor the environmental impact of the A556 over the coming years, and apply the lessons we’ve learnt to future road projects.

2.5 Designated funds

In this road period, we have designated (ring fenced) funds for:

- Growth and housing
- Environment
- Cycling, safety and integration
- Innovation
- Air quality

These funds have allowed us to start to address a range of issues by retrofitting the existing road network and taking advantages of opportunities to benefit communities, the environment and the economy. Our ring-fenced funds have helped us to:

- unlock the development of 36,000 new homes and enable 39,000 jobs
- build or improve 61 cycle paths and footways since 2015
- start to reduce noise impacts at 1,150 of the worst affected parts of the network
- install sufficient rapid charging points with 95% of the network planned to be within 20 miles of a charging point by the end of 2018-19
- take forward more than 100 schemes to improve biodiversity, a large number of which are happening this year
- fund 73 innovation projects including the first motorway to motorway traffic management scheme (M6/M62 Croft Interchange) and new incident detection technology within the Southwick Tunnel on the A27 in West Sussex
- deliver new communications infrastructure on the M42, M40, A45 and A42 around Coventry to support testing of connected vehicles, working with Jaguar Land Rover and Coventry City Council.

2.6 Protocols

In addition to the work we do to operate, maintain, renew and improve the SRN, we carry out a range of additional activities and functions. These are managed through protocols with DfT rather than included in the RIS.

Abnormal loads

We manage the movement of the largest and heaviest abnormal loads within Great Britain and plan routes across England and Wales.

Dartford free-flow charging

Crossings between Dartford and Thurrock are made via two chargeable routes: the Dartford Tunnel (northbound traffic) and the Queen Elizabeth II Bridge (southbound traffic). In November 2014 free-flow payment (known as Dart Charge) was introduced to reduce delays at the crossing. Highways England manages the contracts for Dart Charge, enforcement and customer interactions.

M6 Toll

The M6 Toll was built, and is currently operated and maintained, by Midland Expressway Limited (MEL). We work with MEL on behalf of the Department for Transport, advising them on any operational matters.

Dartford and Local Authority Pension Schemes

Separately from running the crossing we also manage the Dartford and Local Authority Pension Scheme. We monitor the existing fund, make payments to maintain the fund value if required, and ensure that it is properly managed and that records are maintained.

Historical Railway Estate

Highways England manages and maintains the Historical Railways Estate, 3,500 former railway structures including legacy bridges, tunnels, abutments and viaducts.

National salt reserve

We manage a salt stock in excess of 280,000 tonnes stored at various locations across England. In the event of a prolonged and severe winter when domestic supplies are unable to meet demand this salt would be made available and distributed to Local Highway Authorities.

Severn Crossings up to the end of concessions

We currently maintain the Severn Crossings, providing Traffic Officer patrols and a vehicle recovery service. We also manage Concessionaire Severn River Crossings Plc. In January 2018, the concession on the Severn Crossings will end, the bridge will pass back into public ownership and work will begin to prepare for decommissioning tolling from the end of 2018.

Technical regulations

Highways England maintains up-to-date guidance, standards and specifications for all works on the motorway and all-purpose trunk road network. The two most significant documents are the Design Manual for Roads and Bridges (DMRB) and the Manual of Contract Documents for Highways Works (MCHW).

3. Progress in Road Period 1

Being a Government-owned company with increased financial delegation means we can deliver road enhancement projects and services more quickly and efficiently than before. Having clarity on our funding through to 2020 and a five-year funding cycle also enables us to take a longer-term approach to planning and delivery. The first Road Investment Strategy set out the government's long-term ambition to modernise the SRN so that it is fit for a modern Britain. Our activities are providing the foundations for this. Over half way through our first five-year road period (2015-2020), we have already made good progress across our organisational imperatives: safety, customer service and delivery.

Safety

England's SRN is currently one of the safest in the world, and we have made strides in our aim to create a zero-harm network. The numbers of road users killed or seriously injured (KSI) has shown a general decline over the last few years even as traffic volume has increased. In the last year, there was a further decrease in both collisions and casualties, although there was a small increase in KSIs, in part due to changes to the how these are reported[2]. This has reinforced our determination to continue efforts to improve safety and reduce harm on the network.

The accident frequency rate (AFR) for road workers has improved over the last 18 months, although we want to hold ourselves to the highest standards and so the rate of improvement needs to increase further if we are to meet our future aspirations.

The Traffic Officer Service AFR has reduced by a third in the last 12 months but we aim to reduce it by 52% by 2018, and a further 16% by 2020. Our supply chain AFR has fallen by 27% in the last 12 months, but we aim to reduce it by another 28% by 2018 and a further 38% by 2020.

By looking at safer roads, safer vehicles and safer people we want to move toward incident prevention and pre-emptive safety interventions with greater partnership working. We have improved road safety through a range of activities, for example:

- our on-going investment programmes will modernise and maintain the network - they include a range of measures which improve road safety. Our future expressway corridors are expected to be up to six times safer than the A-roads they replace. Our programmes also target sections of our network with higher KSI rates and those where the safety star rating is lower than others

[2] More information on how reporting has changed is provided in Chapter 4.2.3

- engagement activities, with a particular focus on high risk groups to reduce KSI rates. We have undertaken successful TV and radio campaigns to target the key risks associated with driver behaviour, known as the 'Fatal Four': inappropriate speed, distractions such as mobile phone usage, alcohol and drug driving, and not wearing a seatbelt
- working with our partners and stakeholders, for example our Driving for Better Business programme which is a business to business outreach programme providing information to companies to raise the standard of occupational road risk with businesses operating car and van fleet.

Further information on our progress towards a zero-harm network is available in our Health and Safety 5 Year Plan update.

Customer service

The increasing scale of investment and the committed improvements to the network mean that there are now more roadworks and more potential for disruption to journeys. We already work hard to minimise their impact where we can but we aspire to do even more, including minimising the length of roadworks, increasing the speed of delivery, managing the flow of traffic through works, and providing better information.

The government set us the target of improving customer satisfaction to 90% by the end of March 2017 and maintaining it at this level or higher throughout the remainder of the investment period[2]. Our 2016-17 result, 89.11%, is slightly below our target. To improve customer experience in the last year, we:

- improved the way we use our variable message signs to provide more relevant and up to date information; provided much more roadside information and signage about our biggest schemes, including details about benefits, project timescales, delays to journey times
- developed an online roadworks calendar to make it easier for customers to check the timing of road closures
- undertook three pilots on the impact of raising the speed limit in roadworks to 60mph and analysed our customers' experiences. This has given us confidence that 60mph can be a safe and appropriate speed limit in certain roadworks. We also undertook one pilot of 55mph and are continuing to analyse this as a potential future speed limit
- sought to minimise journey disruption from incidents, with 85.93% cleared within the hour
- continued use of user data from Transport Focus and evidence gathered via our customer panel, regional insight surveys and scheme engagement forums to understand where and how we can deliver better customer service
- held over 600 customer audits, where we asked road users to drive through our roadworks and tell us about their experience, cascading this information to our suppliers.

[2]Satisfaction is currently measured using the National Road User Satisfaction Survey (NRUSS). As of 1 April 2016, Transport Focus took responsibility for managing the survey and now provides us with monthly data

Delivery

Since the start of our first road period in April 2015, we have delivered almost £4 billion of improvements and completed 18 schemes on or ahead of schedule. We have also added more than 190 lane miles of much-needed capacity to our network. Key improvements to the network include:

- increasing capacity on the A1 between Coal House and Metro Centre near Newcastle, to the benefit of the 116,000 drivers that use this part of the A1 every day
- easing congestion at the busy junction 30 of the M25, helping unlock the multi-billion pound regeneration of the Lower Thames Valley
- starting work on one of the UK's biggest road upgrade schemes - the £1.5 billion A14 improvement between Cambridge and Huntingdon – and creating a dedicated training and apprenticeship course with West Anglia Training Academy
- upgrading the strategically important interchange between the M1, M6 and A14 at Catthorpe, which is used by more than 45,000 vehicles every day
- continuing to roll out smart motorways on key routes, for example on the M1, junctions 39-42
- delivering 264 new and upgraded cycle, pedestrian and equestrian crossings points

As well as the improvements we have made to roads, we have continued to innovate to reduce the environmental impact of the network by:

- encouraging uptake of ULEVs (Ultra Low Emission Vehicles) through the provision of more charging points with 95% of the network planned to be within 20 miles of a charging point by the end of 2018-19
- completing a number of air quality pilot studies determine how we invest our £100m designated fund for air quality in the remainder of this road period. These pilot studies include:
  - a trial of a 200m long barrier incorporating a mineral polymer material with potential to absorb nitrogen dioxide (NO_2) to determine if this is an effective way to help improve the air for our neighbours
  - a project designed to help us find ways to help accelerate the uptake of these cleanest vehicles
  - real world emission testing for diesel engine vehicles using a paraffinic fuel to ascertain if this is a cleaner fuel than diesel
  - exploring how we can better use information to help change our customers' behaviours to improve air quality.
- mitigating over 1,200 Noise Important Areas by the end of Road Period 1.

Delivering more efficiently

We are also delivering more efficiently. We mainly measure efficiencies through financial savings. Savings in time, reduction in the duplication of effort, and minimising work during incompatible weather periods (for example when rain and snow may halt progress in the winter) all translate into financial efficiencies. At the end of 2016-17, we were ahead of our cumulative efficiency targets for the first road period, with £169 million in efficiency savings realised versus our £139 million target.

This approach is also reflected in our continuous work to base decisions on costs across the life of an asset including construction and maintenance, driving long term value for money.

Identification of efficiencies is reliant on Highways England adopting a continuous improvement culture and the continued implementation of Lean as a methodology to drive improvements in Highways England and our supply chain will play a significant role in this area. We continue to work across a range of programmes (including capital renewals, smart motorways, and widening/ bypass programmes) to accelerate delivery timelines. We combine schemes to optimise the use of resources and logistics.

£169 million savings in the first two years through working more efficiently - 21% ahead of target.

Partnerships and supply chain collaboration are also part of our approach to efficiency. Our Supplier Engagement Council helps identify efficiencies without impacting the sustainability of suppliers' businesses. Supplier performance and behaviour are also monitored through our Collaborative Performance Framework and reinforced by a programme of audits and assurance to ensure efficiency requirements for various schemes are met. Meanwhile, supply chain collaboration secures efficiencies through packaging schemes together. This improves the design and reliability of schemes and allows us to combine renewals and maintenance.

All efficiency efforts are intended to reduce spend, work and disruption to road users. We continue to seek out new efficiencies with a view to creating greater value for tax payers', minimising the impact on taxpayers during improvement schemes and essential works, and benefiting our other objectives. For example, we can reduce logistical requirements by packaging projects together, simultaneously reducing emissions and positively impacting the environment.

More information about how we are delivering in RP1 is outlined in our Delivery Plan Update 2017-18.

Our activities in the first road period are creating the foundations for the SRN that our country will need in the future. We know there is much more to do. The following section sets out the various ways in which we are assessing and informing future priorities for the network.

4 Informing future investment

We believe future investment in the SRN should be shaped by:

- Listening to our **customers and stakeholders**
- Understanding our **assets and performance**
- Considering our **shareholders' priorities**
- Planning for the **long term**

The following sections set out how each of these factors is influencing our future investment priorities.

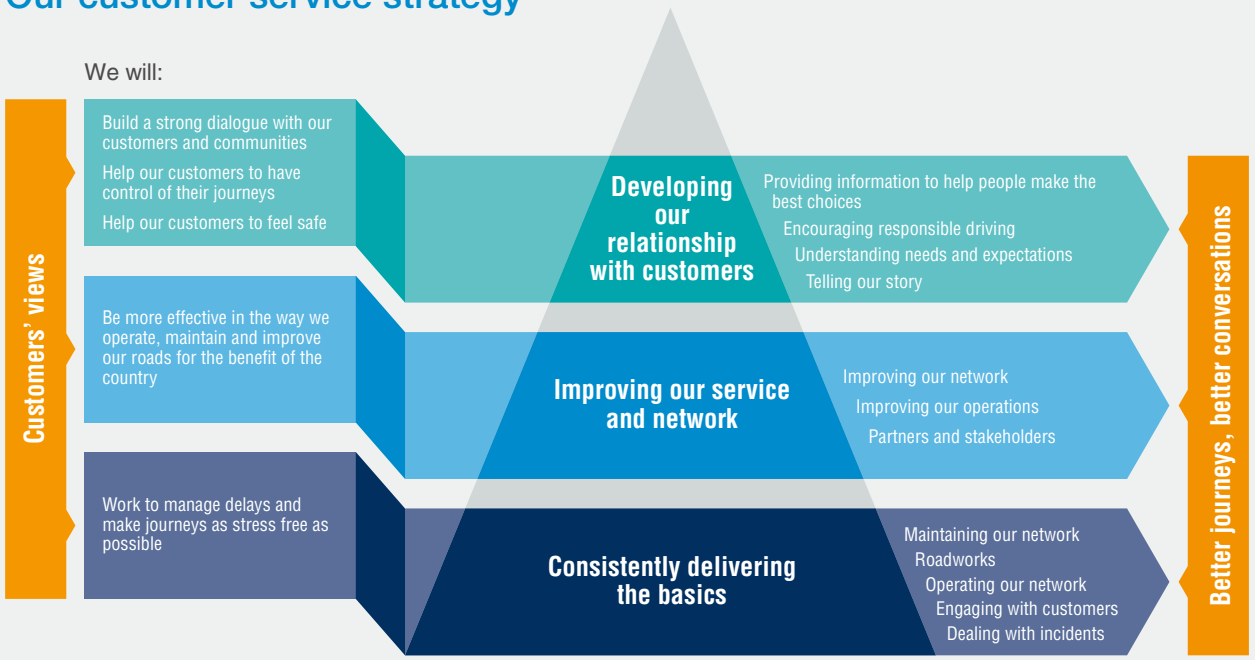
4.1 Listening to our customers and stakeholders

To deliver a fit-for-purpose network for our customers and stakeholders, we need to listen to, understand and respond to their needs. During this early phase of planning for the next road period, we have been doing just that – and we will continue listening throughout the forthcoming consultation process and beyond.

Developing our customer service strategy

One of the reasons Highways England came into existence was to increase the focus on customers' needs and to make sure that our investments and activities reflect those requirements. Customer service is one of our three imperatives, and by 'customers' we mean all those who use or are affected by our roads, including motorists, pedestrians, cyclists, horse riders, neighbouring communities, businesses, and the various stakeholder groups that represent them.

Our customer service strategy



We want to have better conversations and enable better journeys, and to this end we have developed our customer service strategy. With this strategy, our aim is for customers to feel that we are consistently delivering the basics they expect, that we are improving our service to them and enhancing the network they use, and that there is a strong relationship and two-way communication between us.

To support the strategy and improve the service we provide to our customers, we are developing a customer service outline plan. A key element is our customer service standards, bringing together and formalising guidelines across the business, to ensure that everyone within Highways England will consistently do the right thing in areas such as roadworks, provision of information, incident management and network condition.

Working with the road user watchdog, Transport Focus

Transport Focus is the independent road user watchdog, acting as the voice of our customers. They conduct research and gather evidence on the experience and views of road users, and use that to influence decisions, secure improvements and make a difference.

By producing valuable insight, Transport Focus helps us improve our service for customers. We work closely with them to ensure that our activities and investments are focused on achieving what road users want.

Transport Focus commissioned and published research focusing on our customers' priorities in the period 2020-2025 which supports and echoes themes we have identified. Their research has highlighted nine key areas, all of which have informed our views on future SRN investment priorities:

1. *Enhanced safety*
2. *Improving journey times*
3. *Improved surface quality, signage and lighting*
4. *Better information*
5. *Improved roadside facilities*
6. *Better integration with other roads*
7. *Meeting the needs of bus and coach operators and their passengers*
8. *Improved provision for cyclists, pedestrians and equestrians*
9. *Future-proofing new investment*

We also asked Transport Focus to undertake research as part of the development of our Route Strategies (see below). The research process included 4,422 face-to-face interviews with SRN users across our 18 routes and a separate survey of 250 fleet managers across all seven regions. The findings, published in their Road to the Future report in November 2016, provided detailed feedback and enabled us to understand customer experiences, priorities, and areas for improvement.

In addition to these reports, Transport Focus regularly produces and publishes research on specific aspects of our network and service, which we will continue to engage with and take into account as we develop our plans for Road Period 2.

Engaging directly with our stakeholders and customers

We have also sought to ensure that this Initial Report and its inputs have been informed by an understanding of the priorities of stakeholders.

As an example, whilst developing The Road to Growth, published in March 2016, we contacted over 700 organisations as part of the research and spoke with every Local Enterprise Partnership in England, the sub-national transport bodies, business representatives, local authorities, government bodies, and national infrastructure providers. This research helped us to identify locations across the country where we can unlock development and growth, and has injected strengthened economic sensitivity into the way we work.

We held our first Stakeholder Conference in 2016, where we focused on understanding what our national stakeholders and partners need from us. Those attending included Transport Focus, the Freight Transport Association, and other highways authorities. We also held a series of regional events with our stakeholders across England in 2017, where we discussed the preparations for the next road period, and listened to feedback, concerns, and thoughts about future priorities. We continue to listen to the views of our customers through our regular engagement groups, including our Customer Panel which has over 1,000 members, and through insights drawn from research reports and customer contact centre information.

We also work closely with the emerging sub-national transport bodies (Midlands Connect, England's Economic Heartland, Transport for the North, and Transport for the South East). These bodies will be statutory partners in both road and rail investment processes in their geographical areas. We have sought to gain their insights on regional priorities to ensure they are reflected in our considerations for the second road period.

We have engaged with environmental bodies, including as part of our designated funds advisory groups. The Campaign for Better Transport (CBT) has worked with a broad range of environmental groups to articulate their shared green vision for RIS2 in their report, Rising to the challenge, published in August 2017. We believe we can continue to deliver a greener road network and, for example, will look to reflect many of the views outlined in this report in our recommendations for designated funds in the next road period.

During our research phase, we have used a range of initiatives to find out people's views on the SRN.

In summer 2016, we launched an online mapping tool and asked the public to let us know of the issues, challenges and future opportunities they had noticed on the network. Users could zoom into a map, select the exact place to which their evidence related and attach supporting files.

In March 2017 we published a series of route strategies, setting out the challenges and opportunities across the SRN. As part of preparing those strategies, we also liaised with a wide range of stakeholders to provide a high level view of the current performance of the SRN as well as issues reported by our stakeholders that affect the network.

During summer 2017 we held events across the country to talk about our progress during this current road period, and how we are preparing for the next one. These were attended by more than 340 stakeholders. We heard their views about the investment priorities and discussed emerging issues.

Continuing to listen: public consultation

Our Initial Report is just the start of the journey. We continue to engage with stakeholders both face to face and through webinars. We remain committed to keeping them informed throughout the RIS2 process and beyond.

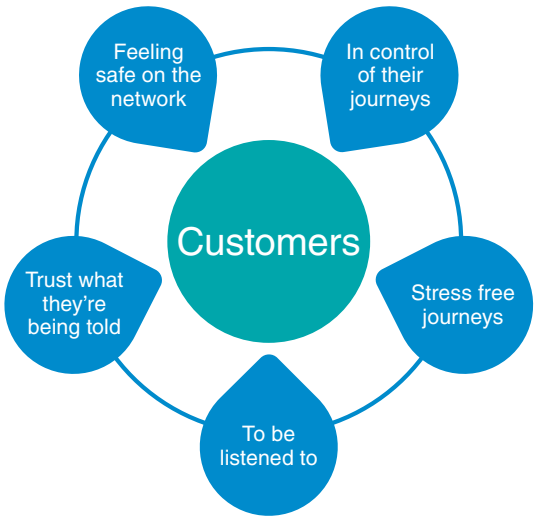
We will work with the Department for Transport on a public consultation on the Initial Report. This is a key part of the listening process, and we want to hear the views of our customers on the contents of our report, as well as the views of the wider public, interested groups, and local government.

4.1.1 What we've learned so far about our customers' needs

We know our customers' and stakeholders' needs differ - depending on whether they're a motorist, pedestrian, cyclist, horse rider, lorry driver, road haulier or part of the communities that live alongside the roads.

Using customer insights drawn from research reports, customer contact centre information and customer panel insights, we have identified five key elements that our customers and stakeholders feel they most need to have a good driving experience. These are:

- Feeling safe on the network
- Being in control of their journeys
- Having stress free journeys
- Trusting what they are being told
- Being listened to



Motorists

We know that one of motorists' biggest concerns is the behaviour of other drivers – from the speedy to the steady. Middle-lane hogging, tailgating and distracted or impaired drivers are other frustrations.

Our customers expect their journey to be safe. But we hear that our customers want to feel safe on our roads too. We know that roads being lit make them feel safe even though our evidence doesn't demonstrate that it always makes a road any safer.

We understand the frustration about slow, unpredictable journey times and stop-start congested traffic. Drivers want to feel in control of their journeys and for them to be stress-free. With the biggest investment in our roads in recent years well underway, drivers are encountering roadworks – with narrow lanes and speed limits – and this can be both stressful and frustrating.

We worked with the Office of Rail and Road (ORR) earlier this year to look at what can be done to improve the driver experience in roadworks. 75% of customers indicated if they encountered speed restrictions through roadworks they expect to see work taking place but only 38% saw work being carried out. Often there are legitimate reasons for this, such as work being undertaken overnight to minimise its impact, however, we want to do better at communicating this to our customers. We are also looking at other ways to reduce the impact of roadworks: for example, we have successfully trialled raising speed restrictions through roadworks, including detailed monitoring and innovative use of biometrics, and are now looking to introduce this in as many roadworks as possible without compromising safety. This does not mean that all roadworks will run at 60mph, but those where it is safe and appropriate to do so – an approach supported by our customers.

When we give information, whether that's information about how the roads are running and what roadworks or delays road users might encounter, it's important that it is information they can trust, is helpful, and is provided at times that allow road users to make effective decisions.

Roadside facilities like motorway service areas are a vital facility to help take breaks when tired, contributing to safer roads.

Litter on roadsides and verges is a priority issue for many users. As part of the governments Litter Strategy for England, we are working closely with the Department for Transport, Defra and local authorities to tackle the problem. As well as managing littering generally through our maintenance contracts, we have identified 25 Littering Hotspots, developed a specific plan to tackle each one, and made excellent progress, resulting in a reduction in the number of complaints about these sites. We also support initiatives such as the Great British Spring Clean: during the last event, we removed over 8,000 bags of litter from the SRN.

Pedestrians, cyclists and horse riders

Our roads aren't just for motorists. We manage around 350-miles of pedestrian footways and cycle paths on some urban A roads, and over 2,500 crossings to support pedestrian, cyclist and horse rider journeys.

Those who walk, cycle or ride on our roads feel more vulnerable to incidents than the average motorist, and we hear that staying and feeling safe is of huge importance to them and is arguably a greater concern for them than for other road users.

We hear that they want us to do better at considering their needs as we design, plan and operate road improvements and roadworks.

They also tell us that they want well-maintained paths and crossings, that are good quality and that overgrown verges cause problems, either by reducing visibility or space for vehicles to pass.

We also hear that where the SRN is a main street through a town or village, and scheduled buses stop on our roads, that there is more we could do to improve bus stops and make them safer at night.

Road hauliers

Our roads carry two thirds of all heavy goods traffic by mileage. Freight companies work to tight timeframes and need to meet strict deadlines in order to reach customers on time or connect with other transport modes such as air and sea. Minutes can make a difference and traffic delays cost the freight industry money.

To help manage logistics efficiently, we know that reliable journey times are vital. This isn't just about improving our roads to become more reliable, but also about useful and accurate information about scheduled roadworks and unplanned disruption. They want high quality information about diversion routes so they can plan when these are used.

Roadside facilities are important to lorry drivers; not least because they need somewhere to take their statutory rest breaks. And not only on motorways: we also recognise that provisions on A-roads should be improved.

Communities living alongside our roads

Our responsibilities do not stop with the road user. We have a duty to not only the 12.7 million people who live within 1 mile of our roads (that's over a fifth of the English population), where our roads are a part of their lives, but also to the nation as a whole and wider environment.

As a responsible steward of the network it is vital that we ensure that activity on our roads is undertaken in a way that meets existing environmental legislative requirements and not only avoids or minimises harm, but ultimately improves the environment.

We know that noise is of great concern to residents – whether that's from day-to-day traffic, or those times when we have construction and maintenance work nearby.

We are concerned about the effects of poor air quality on those who live nearby. We know that we will make a greater difference by working in partnership with others to drive improvements in air quality and reduction in emissions of greenhouse gases. Roads, signage and lighting can be designed in greater harmony with the landscape to help reduce the visual impact. We also know that the presence of wildlife and vegetation can help foster a greater sense of wellbeing, as well as being good for the environment.

4.2 Understanding our infrastructure and performance

In planning future investments we need to understand the road network. We currently do this via:

- our Route Strategies (published this year)
- assessments of the infrastructure's condition
- assessments of performance.

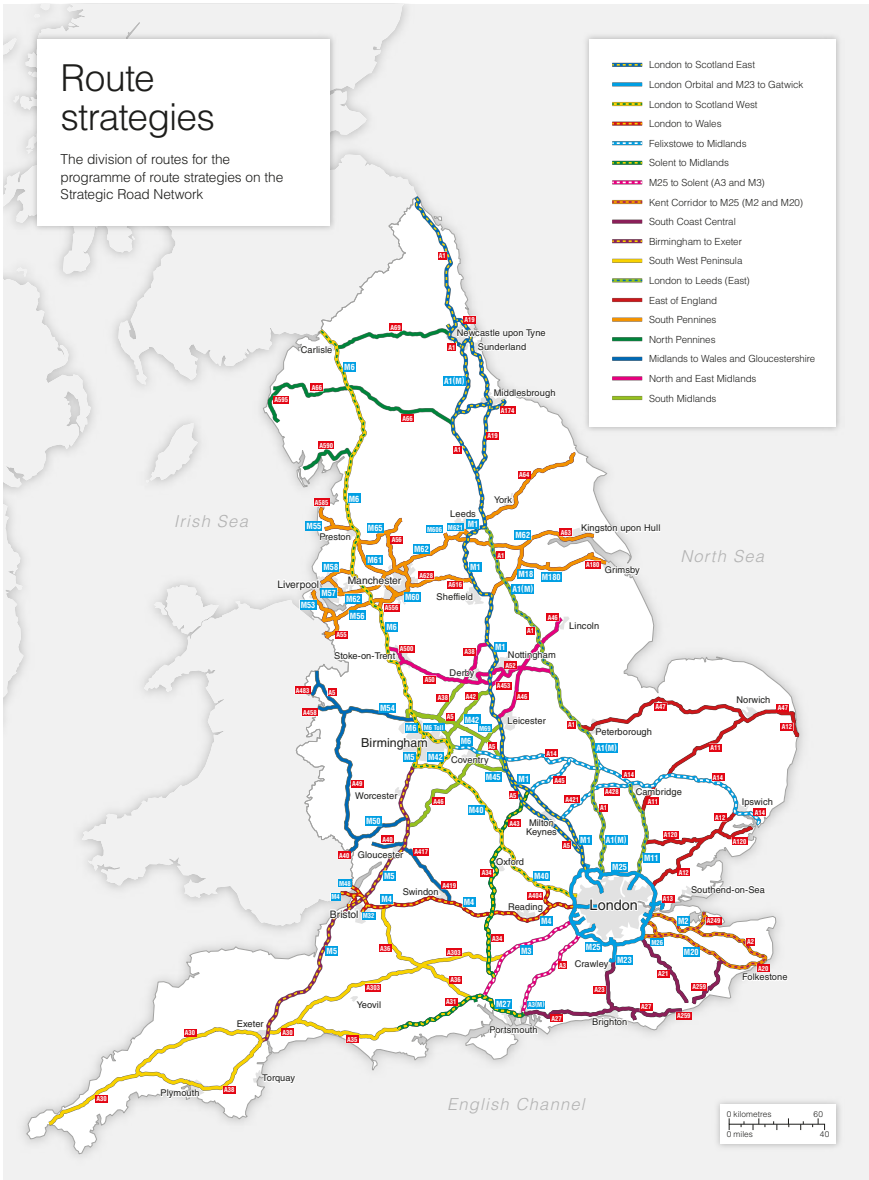
4.2.1 Route Strategies

The Route Strategies were published in March 2017 and provide a high level overview of the SRN's current performance as well as of any issues reported by our stakeholders that affect the network. Each of the 18 strategies covers a key strategic route, describing its key characteristics, current performance and constraints and indicative locations where further study is recommended.

We drew on a variety of sources in developing the Route Strategies, including:

- data from the day–to–day running of the network
- roughly 2,700 contributions from stakeholders and road users via an online tool
- on-going engagement with stakeholders
- Transport Focus research into our customers' experiences.

Each Route Strategy report contains a detailed analysis of the challenges each route faces and highlights areas where potential improvements should be investigated.



Common themes in Route Strategies

A safe and serviceable network

Safety remains paramount to Highways England and our stakeholders. Safety challenges across the network are predominantly focused on:

- all-purpose trunk roads and single carriageways
- large conurbation areas
- areas with congestion
- short distances between junctions.

More free-flowing network

According to Transport Focus research, customers tell us that congestion is their biggest worry, and believe that better on and off road information could improve their journey experience. Congestion is an issue across the network and is most prevalent where:

- multiple routes meet, in large urban areas
- demand outweighs capacity (for example single carriageways with no overtaking provision).

A more accessible and integrated network

We recognise that customers need a reliable end-to-end journey, across local and national roads. The following are some key considerations to achieve this:

- a review of current diversionary routes
- we need to be responsive to and integrated with large infrastructure projects, such as HS2
- we need to continue to connect communities and support wellbeing by providing better journeys for cyclists and other non-motorised users
- we must ensure we continue to support access to other transport modes.

Supporting economic growth

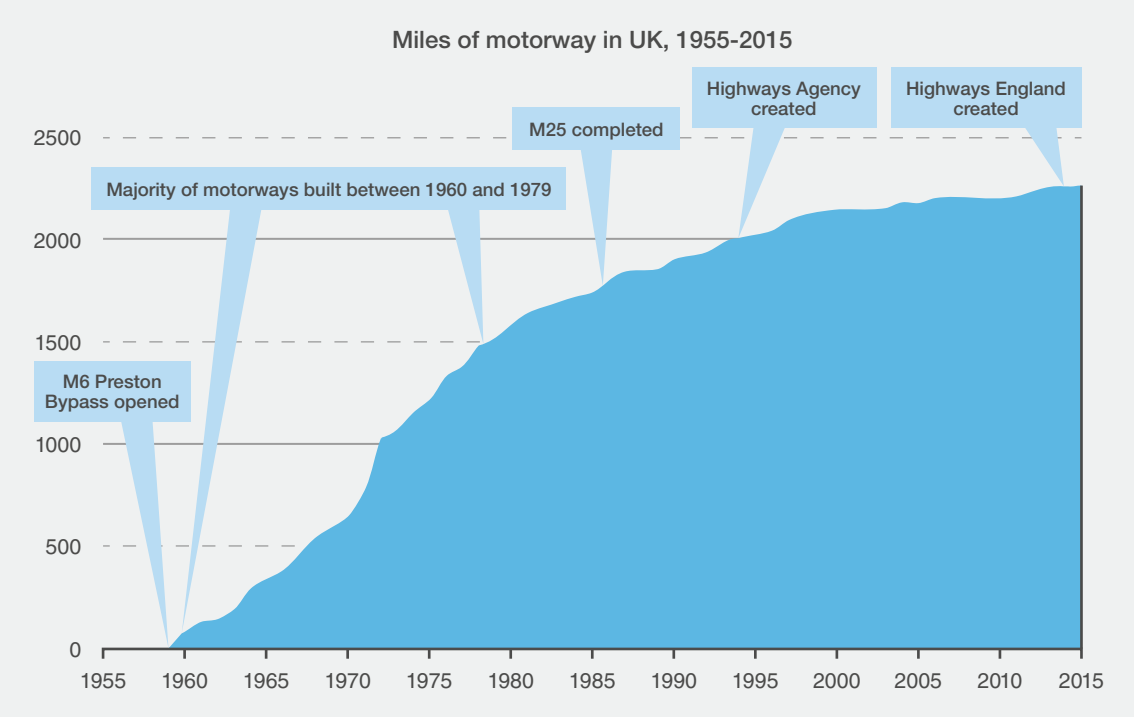
Evidence collected through Route Strategies corroborates the SRN's important role as a driver, or potential barrier, to housing supply, job creation and other economic growth as set out in our Strategic Economic Growth Plan, The Road to Growth. This identifies 400 'economic hotspots' and includes maps that show those hotspots mostly closely aligned and supported by their supporting routes.

An improved environment

Air quality, noise and flooding are key environmental issues which are important to both Highways England and our stakeholders. More information can be found in Chapter 3 of each Route Strategy report about specific network locations. The Route Strategy reports also reflect how future investment must fully consider the impacts on areas of outstanding natural beauty and national parks.

4.2.2 Infrastructure condition

We face a challenge in keeping our infrastructure in good condition. Many elements of our network were built in the peak road-building decades of the 1960s and 1970s. Without intervention and investment to repair them – or in some cases to replace them – at the right time, they will deteriorate in the coming years and might no longer meet the standards we require for safe and serviceable operation.



During the current road period, we have prioritised improving our asset data, since understanding our network is critical to everything else we do. Asphalt road surfaces, concrete bridges and solid rock cuttings all have different life expectancies, rates of deterioration and special considerations which affect their condition. Even within one asset type, the behaviour of assets can vary hugely over time.

We understand that the quality of our forward maintenance programmes and investment decisions will only be as good as the quality of asset data and information we use to develop them. We are making a number of improvements to the data and information we hold, to better assure its quality and completeness, so that we can confidently use the better information to identify and develop the right interventions.

As part of our Asset Delivery programme, we have been bringing in-house the asset inspection, monitoring and management functions from our suppliers. We have improved the way in which we collect and verify condition data. As a result, we have a much better picture of the state of our infrastructure now than we did at the beginning of Road Period 1. However, this has also revealed a greater requirement for maintenance and renewals than previously anticipated.

Road surfaces

Road surfaces deteriorate as a result of the weather and wear and tear. Even surfaces free of potholes still have issues that we need to manage. Skid resistance reduces over time, which means incidents can become more frequent and severe. We are therefore committed to always investing in repairing and renewing our road surfaces.

Reactive 'patching' is essential to keep the network safe and serviceable in the short term and minimises disruption to road users. But the time comes when more significant maintenance is required. When this point is reached, it is better to do it sooner to avoid major costly repairs rather than allow the road surface to continue to deteriorate. It is a fine judgement, but by bringing asset monitoring and maintenance decisions in-house we can strike that balance to the benefit of all our customers.

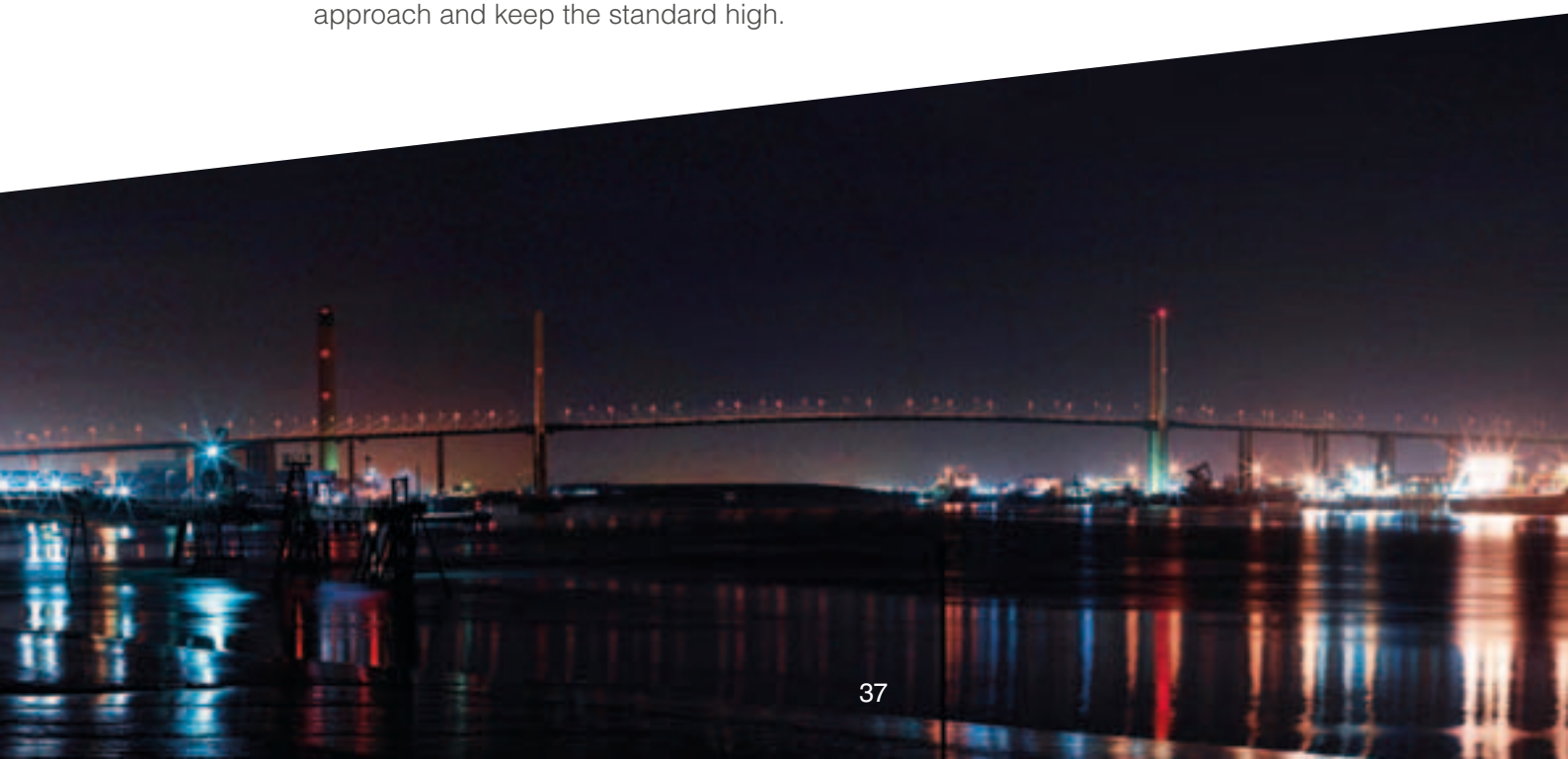
To maintain the network, we expect to continue to undertake immediate, targeted maintenance where the road surface requires it, together with planned resurfacing programmes. We anticipate the technology for monitoring and repairing roads to advance substantially over the next decade and we are committed to seizing these opportunities to improve the efficiency and effectiveness of our maintenance approach and keep the standard high.

Structures

Our portfolio of structures includes some very large and complex objects such as the elevated sections of the M6 around Birmingham, the Tinsley and Thelwall Viaducts and the Dartford Crossing. Such structures tend to deteriorate slowly. Climate and environmental factors (for example salt and water ingress) can dramatically reduce their service life, especially if they're affected by chemical reactions which degrade concrete and reduce their structural integrity.

Many of our structures date from the original creation of the motorway network over 60 years ago and so are increasingly in need of maintenance and life extension works.

During the current road period, there have been a number of major renewal works which occurred when structures were inspected and found to be in significantly worse condition than anticipated. These resulted in large, unexpected expenditures and service disruptions. We consider it important to implement more proactive management and innovative technologies in future road periods, to reduce overall maintenance costs and maintain service levels.



Drainage

Drainage assets play an important role in the wider infrastructure system. A failed drain can impact other assets, accelerating their deterioration.

Drainage assets are all items that remove water from the SRN, or prevent water from flooding or polluting adjacent areas. Drainage is vital for the safety of motorists, and for preserving the quality of surrounding habitats. Our drainage infrastructure includes pipes, channels, ditches, chambers, gullies and balancing ponds.

These elements of the network are largely unseen and we have variable levels of data on their condition. As we've surveyed our drainage, we've discovered that the level of maintenance required is increasing.

We also need to ensure we can continue to remove surface water quickly and safely from the roads in the higher and more extreme rainfall we might expect as the climate changes.

By 2020, we will be planting half a million native-species trees a year.

Geotechnical

Geotechnical assets are engineered landscape features, such as cuttings and embankments. They include a diverse range of natural geological features and manmade materials, which can be supported, strengthened or drained to aid stability or reduce subsidence.

We plan interventions using a risk-based approach of inspections and investigative work, which has proven successful in the past. Risk factors include weather, length of the asset inspected each year, deterioration in structural stability and external influences such as drainage maintenance. It is important that we continue this inspection regime to monitor risks. We also know that innovative sensor technologies are becoming available to allow us to understand the condition of these assets much better and we will be looking to implement these over the coming roads periods.

Vehicle restraint systems

Most central reservation barriers consist of steel safety fences. Concrete safety barriers provide increased safety, as they are better at stopping vehicles and containing incidents, and also last much longer than steel, requiring less maintenance. We would like to replace steel, where it needs renewal, with concrete. However, this is not cost-effective to do across the whole network and we will therefore have to make site-specific decisions on where the network needs this investment most.

Lighting

We aim to have lighting along our roads that is socially, economically and environmentally sustainable. At present, we currently provide lighting along about a third of our network.

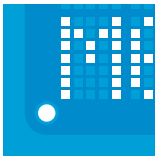
We know that lit roads make our customers feel safe. We will take a pragmatic approach to considering lighting for each location along with other safety features and broader factors. For example, we already consider approaches such as dimming the lights when there are fewer vehicles on the network.

Road markings

Road markings are essential for users' safety. The road marking's condition is distinguished by its luminescence, which we measure using reflectivity surveys. Good condition road markings are also likely to become more important with the rise of autonomous vehicles.

Tunnels

Tunnel renewal needs are also considered on a case-by-case basis. There is no direct correlation with age. Interventions can be structural, mechanical or electrical. The timing and trade-off between refurbishment and renewals is often a function of available funding and the willingness amongst stakeholders to deal with the associated service disruption.



Technology

Our highways technology allows us to actively manage our network, provide information to our customers and achieve additional capacity in a cost-effective manner. This is fundamental to our smart motorways and future expressway corridors.

Technology assets include message signs and signals, roadside sensors and control systems used to operate and manage our network. The remote asset monitoring systems discussed above will also add to our technology portfolio in the future.

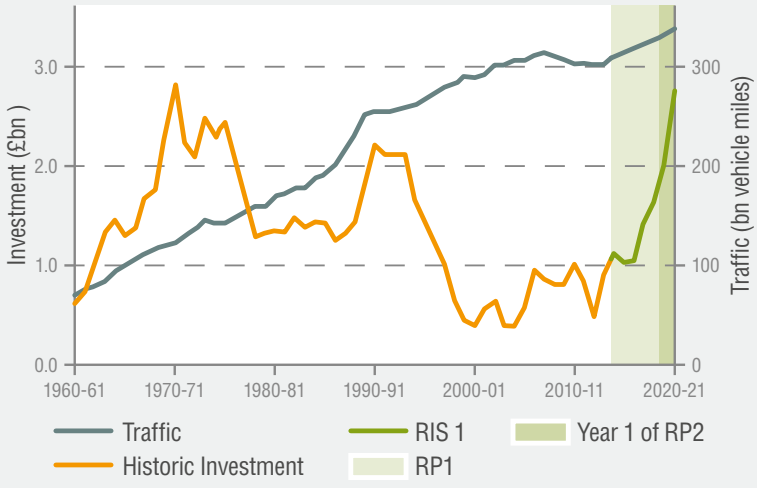
Technology is rapidly improving over time, and we aim to keep up with developments and continuously improve our designs. In managing our portfolio, we aim to balance the costs of replacing items with the benefits of upgrading to new models.

Soft estate

In addition to our engineered assets, we have a "soft estate" of almost 30,000 hectares of land alongside our roads, on which we have established a range of plantings and habitats. These diverse and multi-functional landscapes screen the road and integrate it into the wider landscape, as well as contributing to biodiversity and the beauty and value of our national estate.

4.2.3 Understanding the performance of our roads

We have been making significant progress in developing the road network during the current road period. The following graph illustrates the historic level of investment from 1960 until the end of RP1. It shows how the five-year financial commitment during RP1 represents much needed new investment in our roads, given that the level had previously dropped considerably since the beginning of the 1990s.



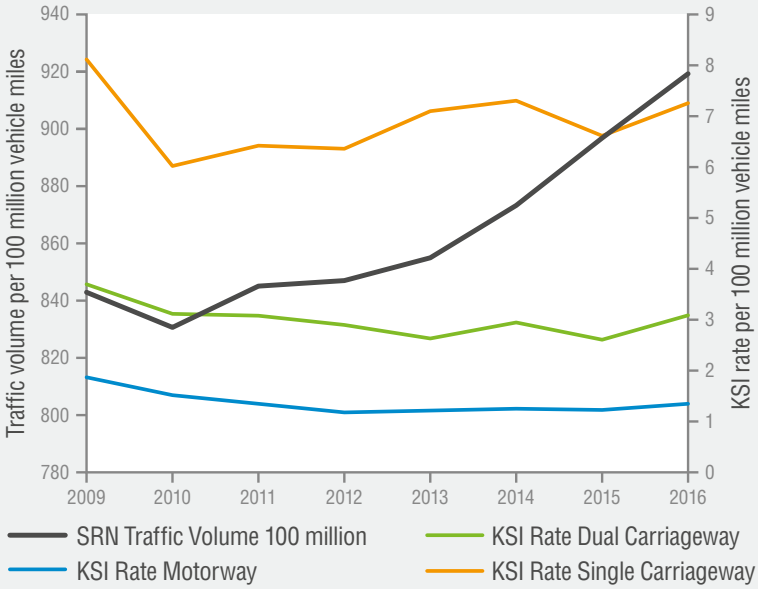
The increase in funding enables us to support more journeys than ever before, improving safety and efficiency, and providing greater benefits to the economy and individual users.

Safety

Safety remains our first imperative.

While our road network is amongst the safest in the world, we are determined to meet our target to reduce the number of people who are killed or seriously injured (KSI) on the SRN by 40% against the 2005–09 average baseline by the end of 2020.

The results for 2016 show that while overall collision and casualties have continued to reduce on our network, the number of seriously injured casualties has increased. This increase is, in part influenced by the new Collision Recording And Sharing (CRASH) initiative now being adopted by police forces and the Department for Transport (DfT). The system now records injuries suffered by the casualty and automatically converts them into a severity classification, rather than relying solely on police officer judgment. We are working with DfT and ORR to develop a better understanding of the impact of this change and how we can strengthen our casualty recording approach to provide more accurate and consistent data.

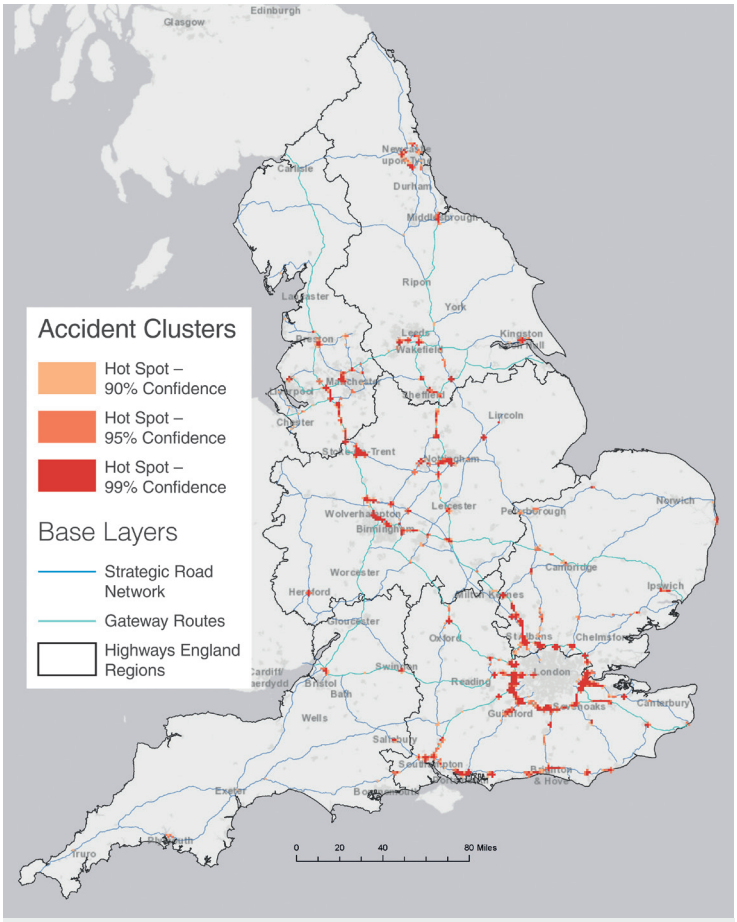


The KSI Casualty Risk Map (overleaf) reflects the risks on our network, highlighting the danger seen on single carriageway roads. While they experience fewer accidents than the busier motorways or dual carriageways, their lower traffic volumes mean that the rate of accidents is much higher.

The long-term reduction in KSIs is attributed to safer road design, on-going education programmes (such as Operation Tramline for commercial vehicles, Bikesafe and Think!), and more robust and technologically advanced vehicles.

The below collision cluster analysis highlights the frequency and geographic distribution of collisions across the SRN. A high confidence level (for instance, 99%) means that the observed pattern is probably too unusual to be the result of random chance. For the hotspot analysis, unusual means statistically significant although, generally, our roads are very safe.

Across the network we work hard to encourage responsible driver behaviour. We aim to influence their behaviour through education (e.g. road safety campaigns), intervention (e.g. letters when people ignore red X signs on smart motorways) and by supporting the police in their enforcement activities. Our on-going investment programmes target sections of our network with incident hotspots, higher KSI rates and those where the safety rating is lower, for example single carriageways.



Frequency & distribution of KSI Incidents on the SRN 2015-16

User satisfaction

Our user satisfaction objective is aimed at reaching and maintaining 90% satisfaction (as measured through the National Road Users' Satisfaction Survey: NRUSS). Currently we are close to our target with just over 89% satisfaction for 2016-17.

At present, we're making efforts to increase this figure to the desired 90% target, helped by several initiatives put in place during RP1 as described earlier in this report. Progress in RP1 around customer satisfaction includes:

- creation of a team committed to customer insight and developing our strategic partnerships
- setting up an online customer insight panel via IPSOS Mori
- creation of the Customer Insight Survey (regionally based, supporting the NRUSS)
- mystery shopping to review the service provided by our Customer Contact Centre, the electronic charging system for using the Dartford Crossing (Dart Charge), and customer correspondence
- a dedicated team who have developed new messages based on road user feedback.

These improvements underline our current approach to gathering and using customer insight data to make informed decisions.

Through compiling data from the NRUSS, Transport Focus research and our own insights, we are seeking to understand the key factors that influence customer satisfaction and the relationship between them so we can decide how best to drive improvements.

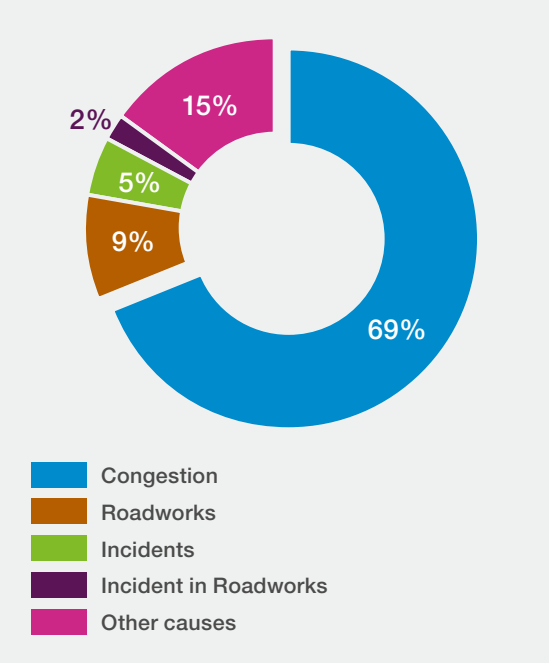
Traffic flows and delays

The research we have undertaken has revealed that one of our customers' biggest concerns is delays. The research highlights that the majority of delays are caused by congestion resulting from network demand. Whilst efforts in developing network capacity are likely to reduce delays to some extent, these are long-term projects.

We can, however, aim to minimise delays more immediately through maintaining 97% of lanes available across any rolling year, and clearing 85% of motorway incidents within an hour.

During 2016-17, we have maintained more than 98% of lanes available to use through implementing a range of measures, including completing road works at night. We've also managed to clear 86% of motorway incidents within the hour (with March to June 2017 showing further improvement, 88% of motorway incidents were cleared within an hour during this period).

Our efforts in clearing incidents and maintaining lane availability are vital to maintain traffic flow and minimise delays.

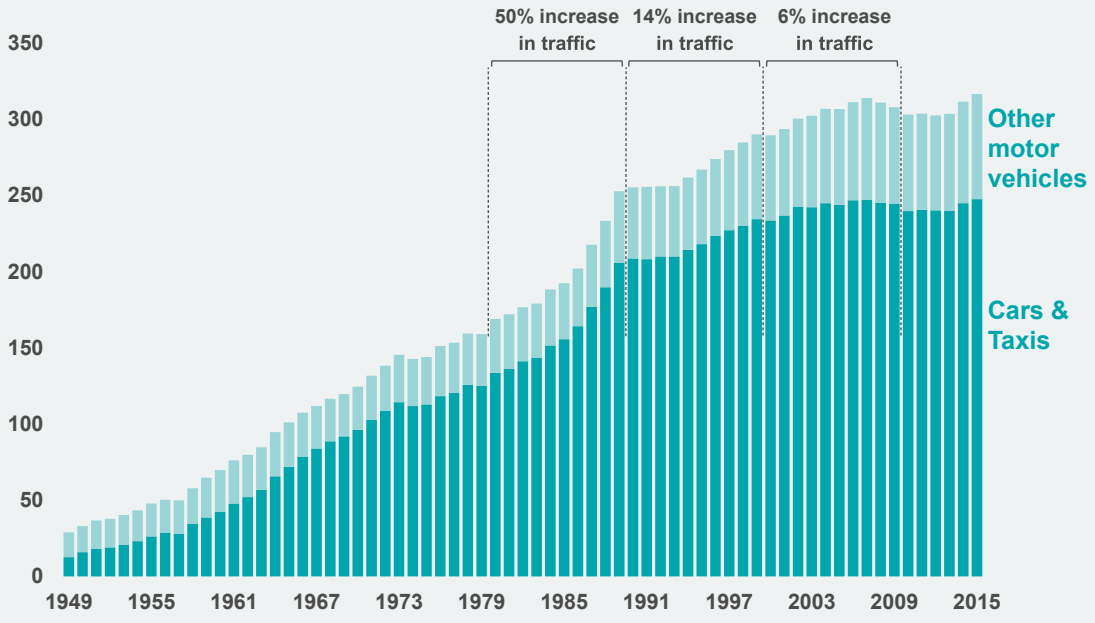


It's essential that we continue building on RP1 successes to ensure the network's capacity can accommodate predicted increases in traffic volume.

The chart below shows an overall increase in traffic volume over time, with a minor reduction in 2008 in line with the recession.

Road traffic trends

Annual motor vehicle traffic, billion vehicle miles: Great Britain 2015

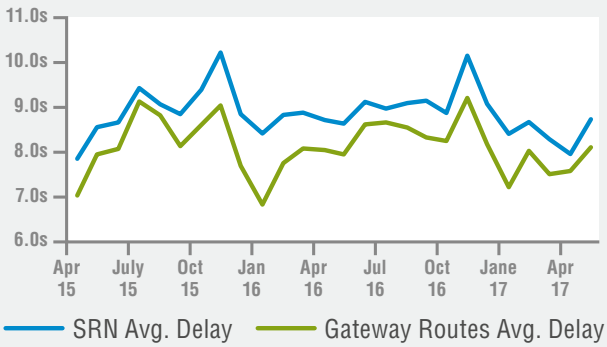


Economic growth

Our road improvements have a profound positive economic impact. UK businesses are dependent on the SRN to transport goods between sites, ports/airports and to clients. Our major improvements programme typically delivers £3 of benefit to the economy for every £1 spent. This means that SRN improvements aimed at commercial users are likely to result in increased productivity and business competition. They will also improve agglomeration (the geographical clustering of businesses) and facilitate economic growth through easier access and greater export potential.

We are currently evaluating the link between our success in reducing delays in RP1 and economic growth. Any delays to freight vehicles can compound problems through delays delivering to clients, missed connections and general implications for highly restrictive schedules.

To date, we've been able to ensure that delays on gateway routes (connecting to ports, airports and other transport modes) are shorter than those on the rest of the network. Building on the success we've experienced during RP1, we continue to develop new ways of reducing delays as we explore opportunities for the future network.



4.3 Considering the priorities of our shareholder

Highways England is owned and funded by the government, our shareholder, and the government's priorities play a critical role in shaping our views about future investment.

4.3.1 Government's aims for our roads

The Department for Transport has outlined the government's high level aims for the next road period in the 'Road Investment Strategy post 2020: Planning Ahead' report, and in the Transport Investment Strategy. The five aims, and their implications for the SRN, are summarised below.

Economy: Improving productivity and building a stronger economy

The government recognises that a strong transport infrastructure is a driver of economic growth and increased productivity.

In shaping the next Road Investment Strategy, the government has said that it will also be alert to opportunities to create new opportunities for housing and development by providing the transport capacity for towns and cities to grow.

The government's Industrial Strategy sets out how the government will build a Britain that is fit for the future. Our activities underpin this by:

- **Upgrading infrastructure** – investment in the SRN as one of the UK's largest publicly–owned infrastructure assets will be critical in supporting both national and local growth priorities.
- **Encouraging trade and inward investment** – enabling businesses to connect with global markets and facilitating inward investment in the UK.
- **Cultivating world-leading sectors** – supporting innovation and enabling sectors to efficiently connect with their supply chains and markets.
- **Supporting start-up and growing business** – creating the conditions to facilitate business growth across a range of sectors.
- **Investing in science, research and innovation** – recognising the rapid changes that are taking place in mobility and the SRN for future travel needs, including the advent of connected and autonomous vehicles.
- **Optimising our engagement of small and medium sized enterprises** – supporting the many small and medium businesses that form part of our supply chain.
- **Developing skills** – working within our sector to support capacity and capability.
- **Driving growth across the whole country** – businesses in all areas require good connectivity to other parts of the UK and international gateways to facilitate access to markets, suppliers and the labour market.

Network capability: A road network that can support future needs

With a growing population, we expect more drivers to be on our roads resulting in more traffic. We aim to tackle this by:

- tackling bottlenecks – providing reliable journey times and free-flowing traffic are important priorities. They impact on production costs, competition and therefore the UK's economic attractiveness
- helping freight – we move more freight than any other transport mode. Congestion on key roads can mean empty supermarket shelves or factories left idling without raw materials, so we need to continue to work closely with freight organisations to resolve issues
- using technology to:
  - support the uptake of electric vehicles. We are working on increasing rapid/ultra-fast charging points on our network to facilitate increased use of electric vehicles
  - deliver high quality mobile communications on our roads, in support of connected and autonomous vehicles (CAVs) to support network safety and efficiency
  - support trials of CAVs that should improve safety and help the government's economic, industrial and environmental aspirations
  - provide accurate information to customers, stakeholders and in-vehicle devices through better use of data and analysis.

Safety: Keeping everyone safe

The government is committed to reducing the number of people killed or seriously injured (KSI) on our roads, aiming for a zero harm network. We are:

- investing in the design of the network, such as junctions, carriageways and crossings
- using more technology (robotic maintenance, signage, smart motorways, expressways) and information (in car and pre-journey)
- providing a front line response, through our Traffic Officers, to breakdowns, debris and incidents, helping to manage traffic, reduce congestion and keep everyone safe on motorways, A-roads and future expressway corridors,
- promoting appropriate driver behaviour.

Integration: Seamless end-to-end journeys

We are increasingly focusing on our customers' end-to-end journeys. Whilst our roads are a crucial part of how people travel, their journeys rarely start or end on the SRN and can include various modes of transport.

Linking our roads with other modes (airports, ports, railway stations) and parts of the wider transport network (local roads and cycle paths) is essential to keep local areas, regions and the whole country connected. It's also important for international links.

Wider network designs include better designs for cyclists, pedestrians and equestrians as well as developing crossings, tunnels and cycle paths.

Environment: A network that is environmentally positive

The environment is high on the government's agenda and deserves close attention when planning and maintaining our road network.

The Paris Climate Agreement unites the world's nations in a single agreement on tackling climate change. The UK has introduced a carbon budget that places a restriction on the total amount of greenhouse gases the UK can emit over a 5-year period. The carbon reduction actions in our strategies will contribute to this.

The government expects us to not only meet existing environmental legislative requirements but to improve the environment when developing our roads.

In taking action to improve air quality, among other options, the government looks to reduce the impact of diesel vehicles, and accelerate the move to cleaner transport.

4.4 Planning for the future

The future is inherently uncertain. As the pace of social and technological change increases, in 30 years' time the world is likely to be more different to today, than today is to the world of 30 years ago.

As the custodian of the SRN, we're responsible for ensuring our roads are fit for purpose, both now and in years to come. That's why it's essential that we try to understand how the needs of the network will change, both in the short and long term, when planning our activities.

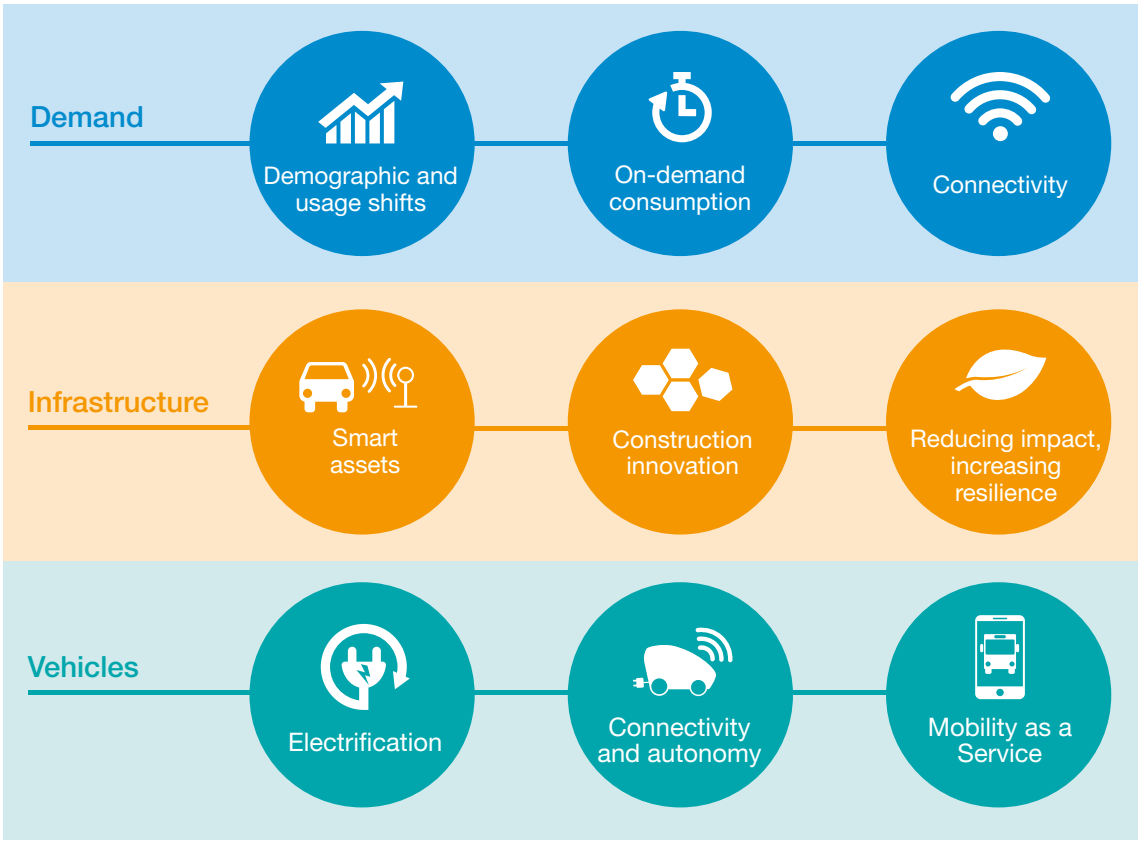
Short-term trends can be modelled and predicted with a good degree of confidence, based on past and present data. But prediction becomes more difficult where there's greater short to mid-term uncertainty or as we attempt to look further out. Through our robust research and analysis of trends we make every effort to anticipate and prepare for the changes that the future may bring.

4.4.1 Long term trends

There are 9 key trends which we believe are likely to have a major impact on the roads of the future. We believe the changes to the way we travel and transport goods on our road could be fundamental, and, together, these trends could lead to a road revolution.

We have identified these trends through extensive research, both our own and external, into the likely developments relevant to road travel in the coming decades.

This work has enabled us to envisage what we think the SRN might look like in the future. The research covers the trends that are most likely to impact the road network, the critical uncertainties within these and how we may need to respond to some of these trends. It is detailed in our report Connecting the Country: Planning for the long term, which is published alongside this Initial Report. A summary of this is provided below:



Demand trends

Demographic and usage shifts

Over the coming decades, the UK population is likely to experience a shift in demographic location, size and habits. This social change is expected to change demand on the SRN. Car ownership is decreasing among younger people. However, while the UK's population is aging and older people traditionally drive less, autonomous vehicles and other solutions will increase their mobility. We predict that the total population will increase by 16% from 2014 to 2039 and that, in combination with the other demographic trends, will have the impact of continuing to increase demand on the network.

On-demand consumption

Changes in the volume of goods consumed and their sources of origin affect the level of freight on the SRN. This trend is driven by wealth, population and society's demand for new products. The boom in the digital economy, e-commerce and consumers' expectations of rapid delivery are putting greater demands on supply and logistics chains. Global and regional forecasts indicate continued growth in economic outputs which will fuel continued consumerism, trade and therefore demand for transportation, particularly on the SRN.

Connectivity

Improving connectivity between and within regions is vital for driving economic growth as well as supporting social mobility. The rise of city regions is enabling stronger local planning to complement national strategic planning. Connectivity, however, is not just about regions – it is also about linking and integrating our different forms of transport. Nobody is simply a car driver, or a train traveller, or a pedestrian. Transport modes that work in isolation are unlikely to remain feasible, and we will need to reflect this need for integration.

Infrastructure trends

Smart assets

Smart infrastructure combines physical assets with digital technology to enable faster response times and proactive management. Better use of our data presents an opportunity for greater understanding and smarter interactions with our customers.

Smart assets concept

We are developing asset-monitoring technologies using sensors embedded within individual Highways England structures and assets to provide on-going condition information for the life of the asset. With the current level of technology, this can now be done with a live feed from each site giving dynamic data about each structure.

This could highlight and prevent major issues occurring from things such as major weather events or other severe incidents. Sensors could detect concrete degradation, or monitor vibrations during nearby demolition or construction works. Connected vehicles could report potholes, uploading data on the location and severity of the pothole, which is then shared with the local maintainers and even other connected vehicles, to help them avoid it.

Construction innovation

Construction methods and materials have not developed as rapidly as, for example, digital technologies over recent decades. However, construction innovations are now rapidly emerging, including modular and pre-fabricated components, digital technology and automation, and smart, lightweight materials. If realised, these could result in more efficient and less disruptive construction and maintenance, improved levels of productivity and safety, reduced dependence upon manual skills and enhanced certainty in delivery timescales and costs. We need to understand how our supply chain is developing these technologies, and where it would be beneficial to us to promote development more actively.

Reducing impact, increasing resilience

Roads and construction have significant impacts on the environment and natural resources, both from the consumption of materials, and their effect on the wider natural environment. In the future the construction and transport sectors will increasingly conserve the resources they consume, and adapt to new ways of operating which reduce carbon emissions, improve land-use and biodiversity, and increase resilience against increasing demand and a changing climate.

Vehicle trends

Electrification

Electrification of vehicles is expected to bring widespread benefits including improved air quality, reduced carbon emissions, and reduction in road noise. While fossil fuels have dominated the transportation sector for the last century, electricity and alternative fuel sources are playing an increasingly important role in personal, public and freight transport. Forecast advances in battery, fuel cell and other energy storage technologies, reductions in costs and improvements in efficiency will make these technologies more affordable for ordinary people.

The shift towards electric vehicles is already underway and will accelerate. The government will end the sales of new petrol and diesel vehicles by 2040. Infrastructure has an important role in enabling this change, and during this road period we are already rolling out electric vehicle chargers across the SRN.

Connectivity and Autonomy

The rise of connected and autonomous vehicles (CAVs) is widely seen as one of the most significant and potentially disruptive changes in future personal mobility.

Modern vehicles already contain a lot of digital technology to help optimise their internal functions. Increasing attention has now turned to developing vehicles' ability to connect with the outside world.

Whilst connected systems promise integrated, safer and quicker travel, autonomous vehicles offer greater mobility for users, particularly those who are currently less able to drive. They could also reduce incidents and increase national productivity.

Both technologies provide promising opportunities to meet existing challenges. However, they will require changes to infrastructure and driving protocols which we need to be at the forefront of.

Connected vehicles are vehicles which communicate electronically with each other, or with the road infrastructure itself.

For example, a connected vehicle could receive information about incidents from the network, informing the driver's satnav system. The vehicle could also inform the network about its own presence, helping with traffic monitoring.

Connected vehicles could help us communicate better with road users, and respond more quickly to traffic problems and incidents. However, it will require us to invest in digital infrastructure.

Autonomous vehicles are vehicles which drive themselves.

These range from assisted driving systems (for example, cruise control and parking assist systems, which have been common for some time) through to fully driverless vehicles (which are not yet legal on UK roads, but are undergoing road trials in the UK and elsewhere).

Autonomous vehicles are safer and more efficient than human-driven vehicles. However, there is work to do to gain public acceptance for them on our roads.

Combining the two technologies gives us **connected and autonomous vehicles (CAVs)**.

One example is freight... Freight vehicles, travelling in convoy autonomously and in communication with each other, would allow a much greater volume of freight traffic to travel together, increasing the capacity of the network. This is known as "platooning" and is currently being trialled.

Mobility as a Service

The future of personal transport is likely to be driven by enhanced mobility and choice. Car ownership is reducing among the urban populations in developed economies, supported by the improved provision and uptake of alternative transport options including public transport and cycling, and "mobility as a service".

Flexible options such as lift-sharing, car pools and new digitally-enabled models of transport offer the potential for real change in how customers use and interact with their transport infrastructure. To anticipate this, we need to understand what new information requirements there will be to enable mobility services and how they may change patterns of usage and demand.

Case Study: Mobility as a Service (MaaS)

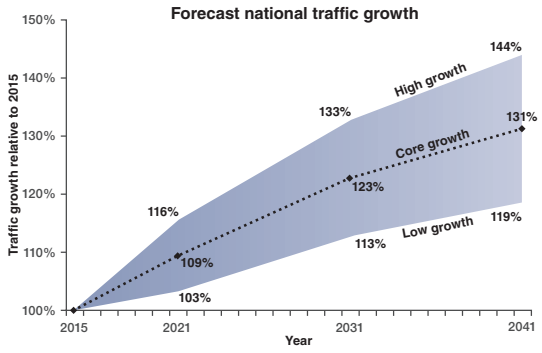
Helsinki is attempting to rethink urban mobility by transforming its transport network into a door-to-door mobility on demand system. A commercial app called 'Whim', heralded as the world's first MaaS offering, is now available in the city and offers personalised travel plans based on pay-as-you-go or monthly subscription tariffs. These travel plans are designed to be flexible for the individual and to integrate the city's public transport and private options - be it train, taxi, bus, car share, or bike share.

The aim is to make it unnecessary for any city resident to own a private car by 2025. The key success will be making this MaaS offering competitive with traditional ownership - not only on price, but on convenience and simplicity for the customer.

While Helsinki is a front-runner, many other cities have piloted embryonic versions, ranging from modest peer-to-peer offerings and integrated public transportation to combined mobility services which include private sector players.

4.4.2 Future network demand

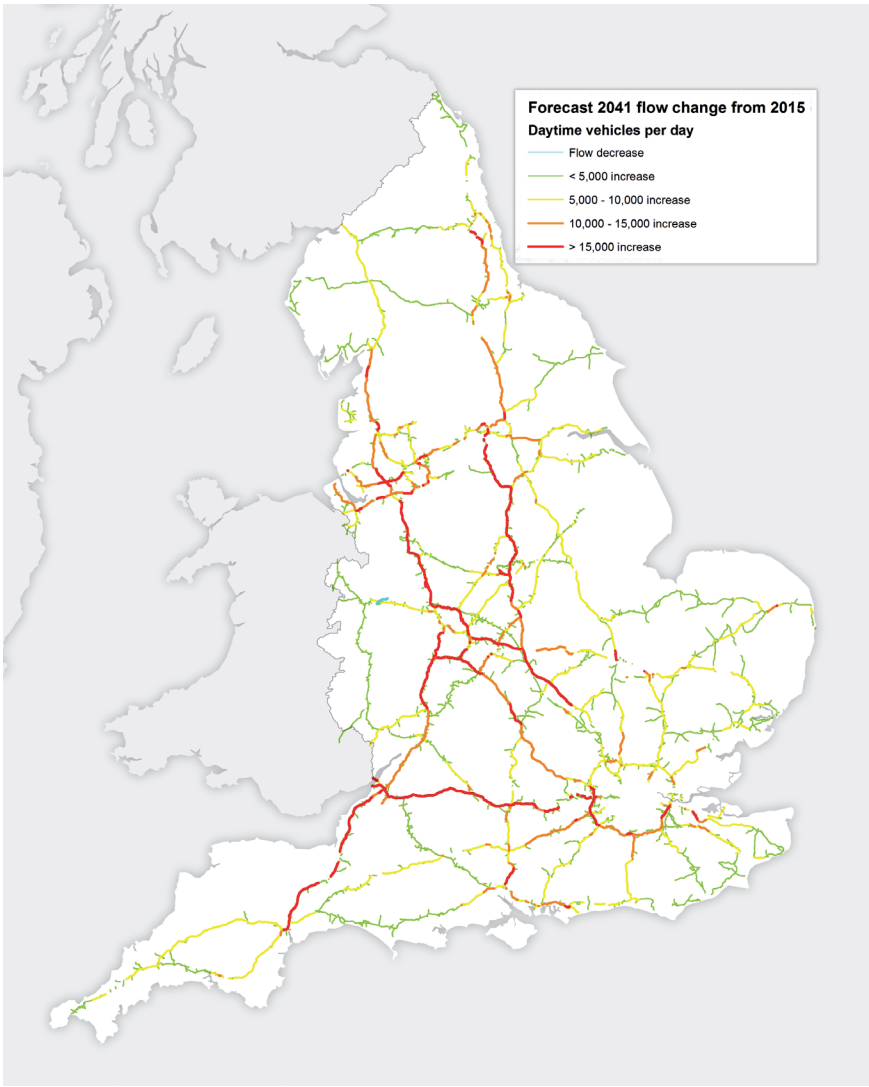
While we recognise the inherent uncertainty in how these trends will play out, we have sought to forecast how demand on the network will change over coming decades. We believe that traffic levels on the network are very likely to grow in the future. Traffic growth is driven by a number of trends, including population and economic growth, car ownership and travel behaviour. By analysing and extrapolating from these trends, we can forecast traffic growth in the coming years.



Our forecast predicts that traffic on the SRN will grow by an additional 9% by the start of RP2, relative to 2015 levels, and by an additional 31% by 2041, at the start of RP6. The forecast national traffic growth is aligned with a central Department for Transport estimate and run through Highways England's detailed regional models.

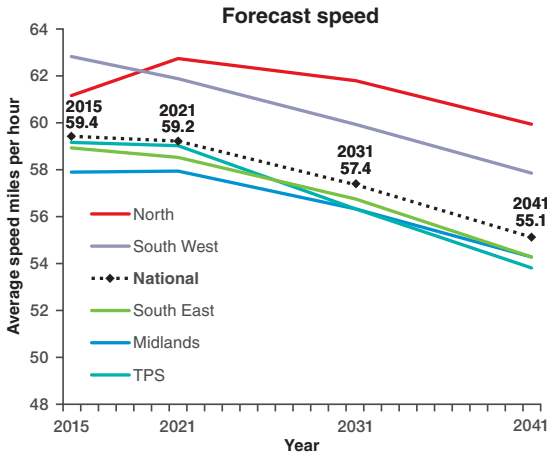
As with any forecast, this is subject to a high degree of uncertainty and traffic growth could be higher or lower. However, even in the low growth scenario, traffic on the network is likely to increase over future road periods.

This increase in traffic levels is expected to be concentrated in hotspots across the whole road network, corresponding to areas of high population and economic activity and along the key routes which connect them. The map below shows where these hotspots are predicted to occur in the core growth scenario..



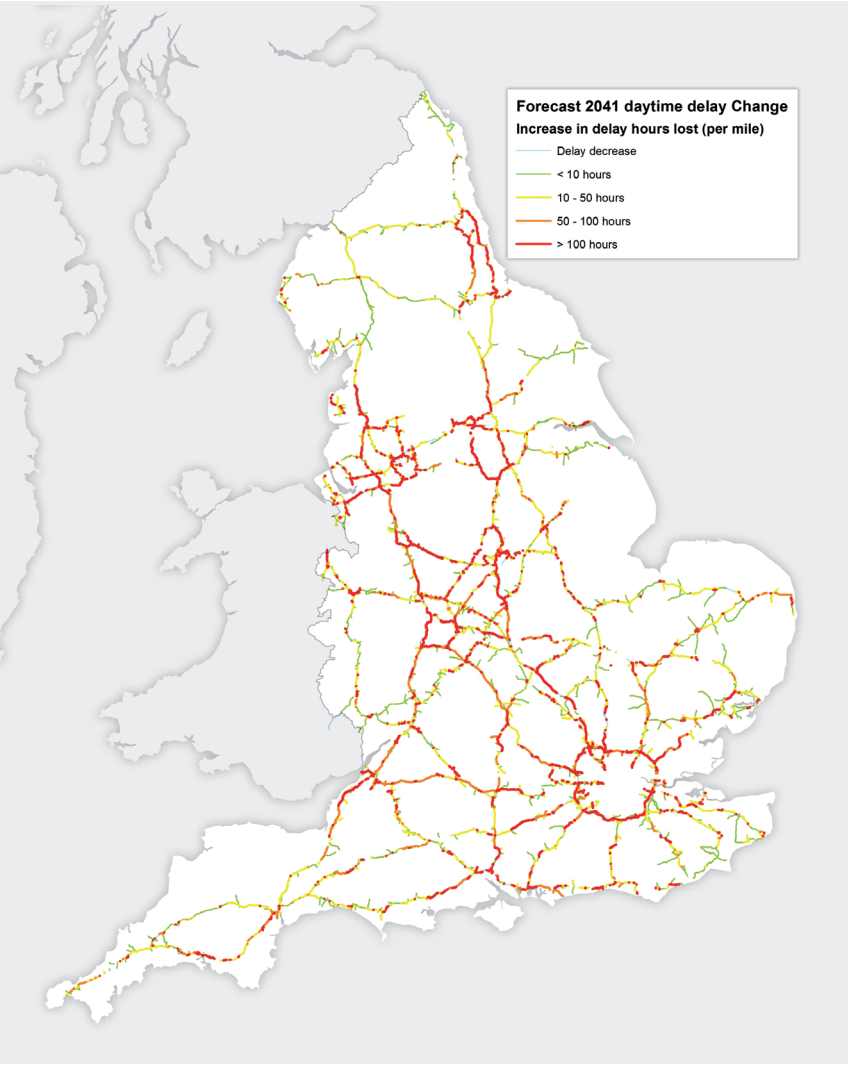
Further investment in delivering strategic improvements to the network and how we leverage technology to keep traffic moving can help mitigate the effects of increased traffic on our network which would otherwise lead to reduced speeds, more delays and increased journey times for our customers.

Without further investment or innovation to increase the capacity of the SRN average speed on the network will gradually decline. The chart (right) reflects how we expect average vehicle speeds to change over future road periods without further investment in capacity beyond the enhancements announced in RIS1. The investment that is being made in RP1 is mirrored in the majority of the regions' average vehicle speeds broadly being maintained or increased; with the exception of the south east and the south west. This is largely due to a disproportionately high amount of traffic growth in these regions.



The average speed travelled along our roads is expected to decrease as the network becomes busier. This is true for all regions except the north, which is forecast to experience an increase in speed in 2021 relative to 2015 levels, reflecting the indicative results of the investment in that region during RP1. This demonstrates how targeted investment can positively impact the SRN's performance, despite demand increasing.

The map on the right shows where the greatest change in delay is likely to occur in future, with the greatest increases around our key towns and cities and busiest motorways.



4.4.3 Developing the network for the future

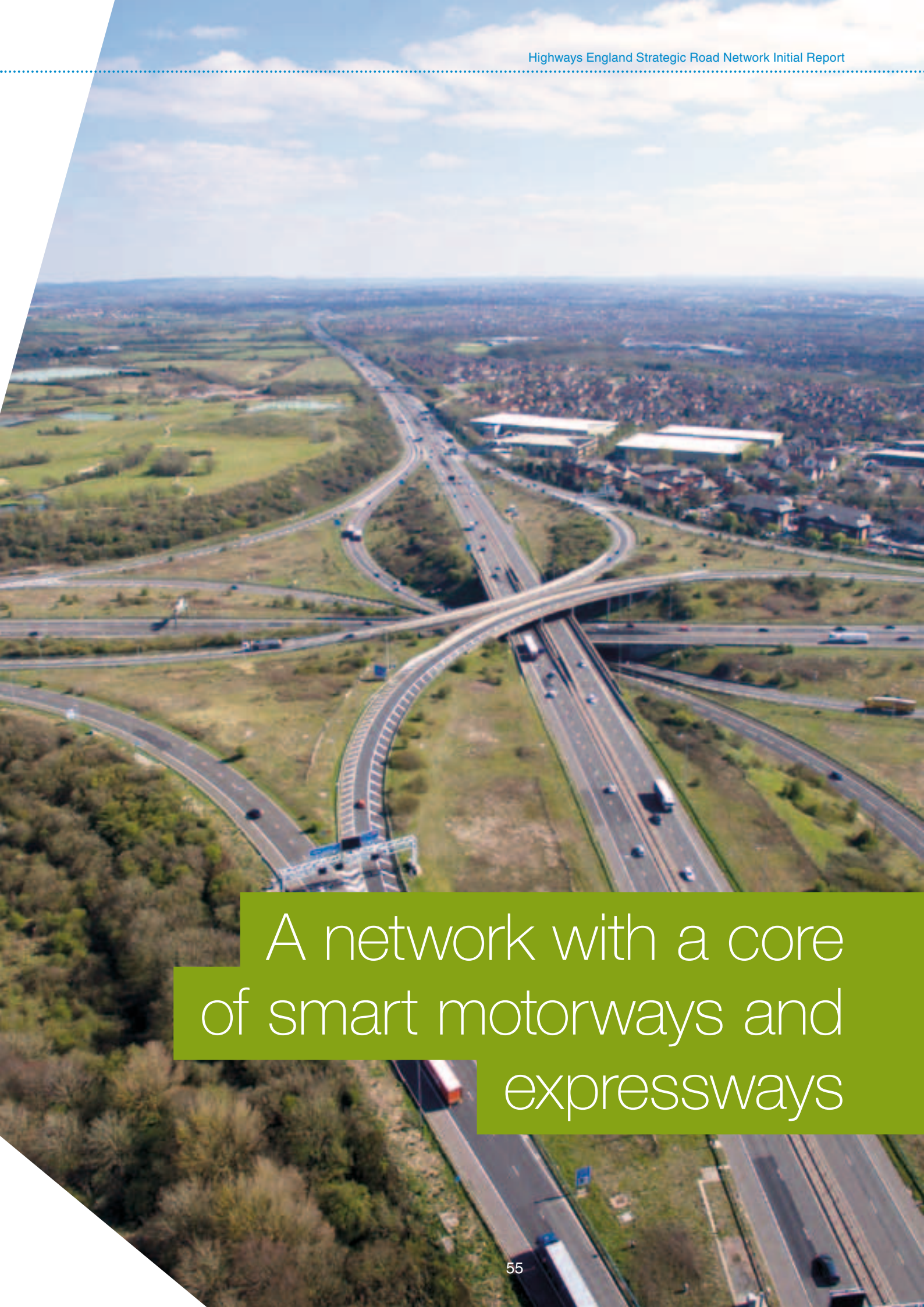
Looking to the future, it is important to understand what form the SRN is likely to take to cope with the demands of our customers and the economy. The future SRN we envisage will need to cope with the traffic demands of our core growth scenario and forecasts. It will continue to enable the economy and provide connectivity between major population centres and other modes of transport, and it will be resilient against shocks and stresses such as security incidents and extreme climate events.

In the first Road Investment Strategy, the government announced its ambition for a network with a core of smart motorways and expressways by 2040. We support this ambition, and have started to consider how the SRN will build on the planned and committed programme of schemes for RP1 to respond to these challenges.

We think that to provide a road network that is easy to navigate and where users know what quality of service to expect, we should look to harmonise the types of road as users make their journeys. So, we propose that over the next 20 years or so, investment in the SRN should work towards standardising routes around 4 classifications of road:

- Smart motorways – to serve our highest demand areas. These will continue to evolve, taking advantage of new technologies.
- Motorways – which will continue to function in their current form, providing resilience and capacity to our network and customers.
- Expressways – to bring the safety and congestion advantages through better design, on-road response and technology to our busiest A-roads while keeping road layouts and driving practices familiar for motorists.
- All-purpose trunk roads – which will continue to provide a vital service and connectivity to significant parts of the country, particularly the more remote areas.

We will continue to develop our view of how the network might need to respond to meet future expectations around demand, economic growth, integration with the wider transport network and resilience. To ensure that our vision considers regional aspirations, we will continue to work with our regional and national stakeholders.



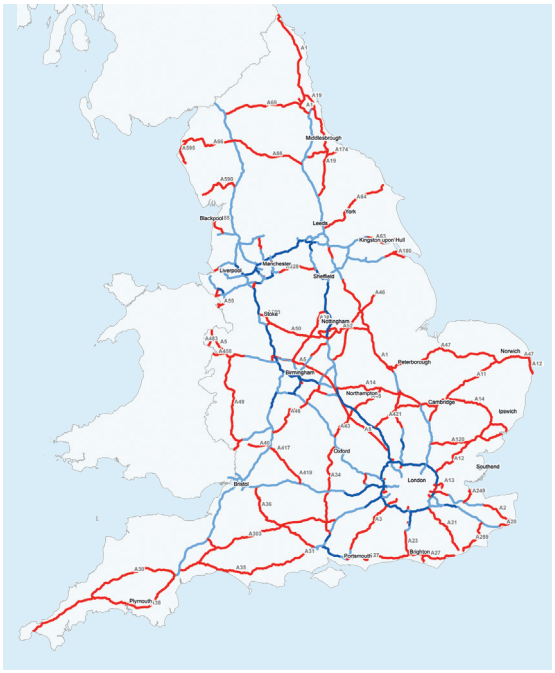
A network with a core of smart motorways and expressways

The current network, classification

Smart motorway
Motorway
APTR

- The country is connected through an established network of motorways
- The APTRs stretch across the length and breadth of the country, with widespread use of dual carriageways to provide capacity and connectivity
- There is an emerging presence of smart motorways, but they currently only count for a small amount of the overall network

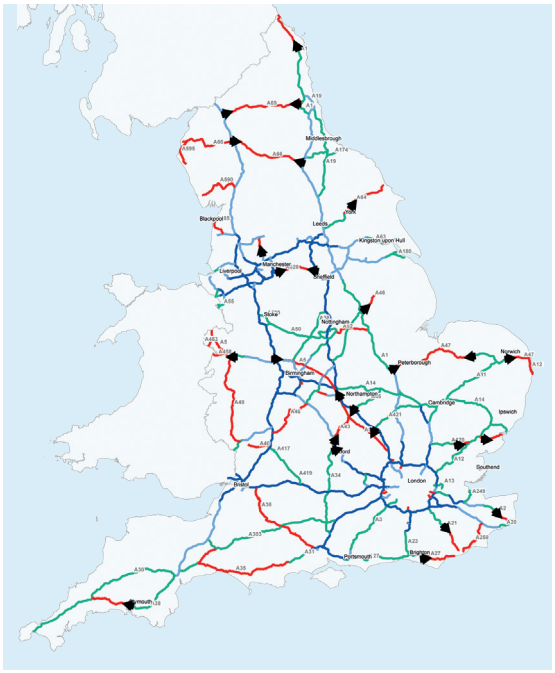
The network classification at the end of RIS 1,



Smart motorway
Motorway
APTR

- Our programme of upgrades will begin to yield benefits, with the improvement of free-flow, particularly on APTRs
- The smart motorway network will continue to expand to support the areas where demand is the highest, as per the commitments in RIS 1
- The APTRs will continue to play a vital role in connecting the country - While not yet present on the network, the end of this period will see expressway-ready stretches of the network

The network classification over the medium term

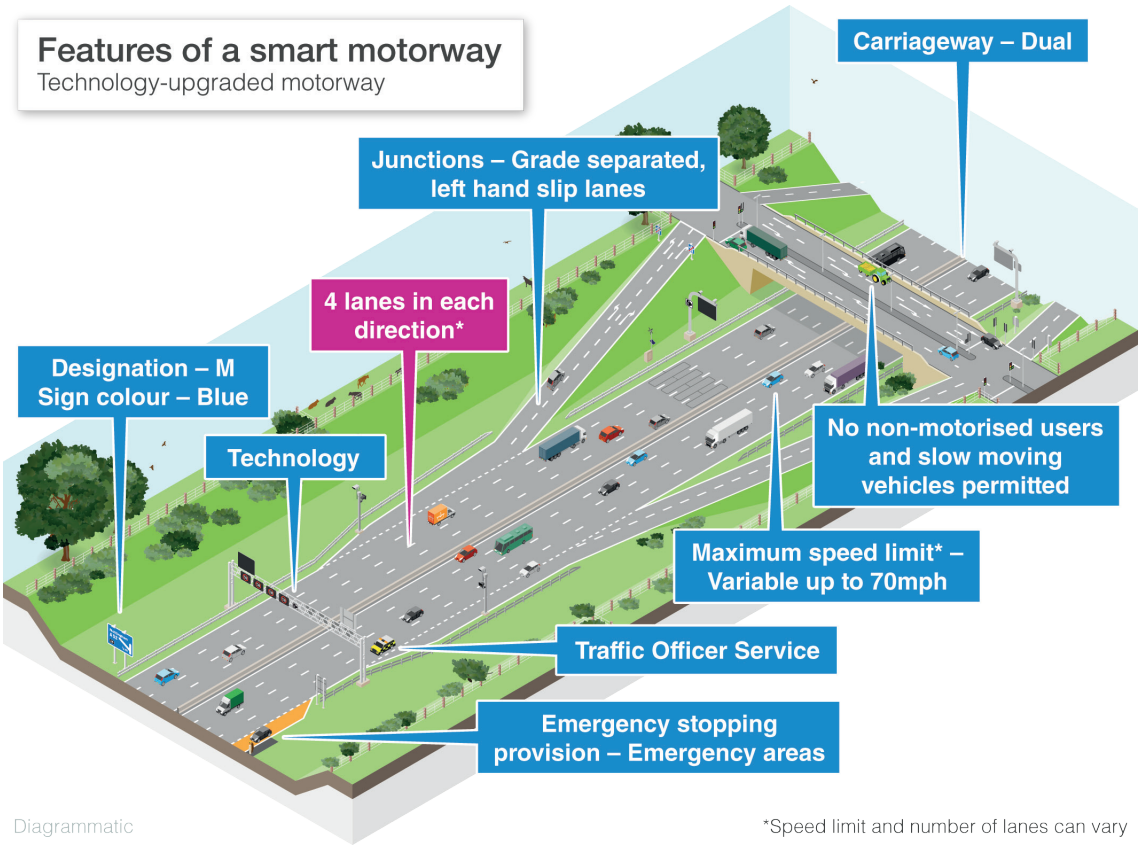


Smart motorway
Motorway
Current, planned, and potential expressways
APTR
Options for further expressways

These maps do not constitute a plan but provide an indication of how the network could develop. The medium term view of the network was outlined by DfT in the first Roads Investment Strategy, and we aim to review and develop this in consultation with customers and stakeholders, over coming months.

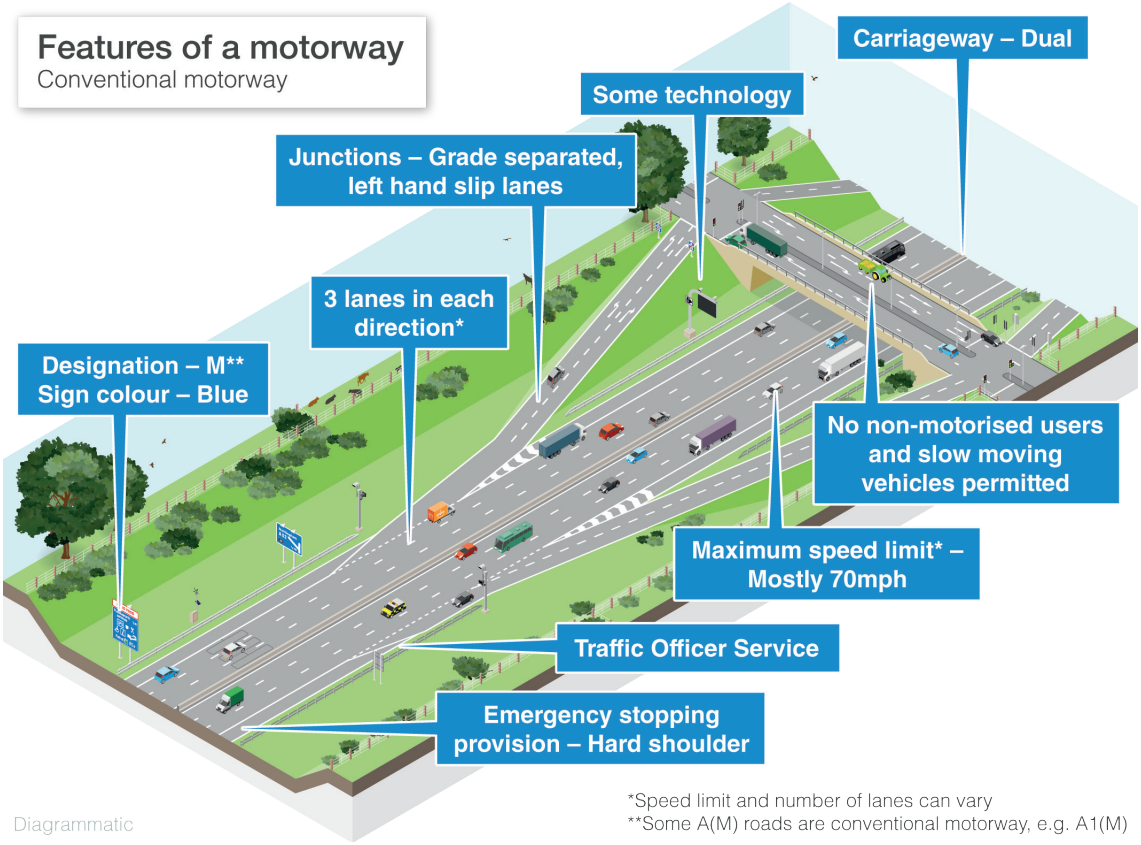
- The major development will be the presence of the expressway network across the length and breadth of the country
- Expressways will 'feel' more like motorways, with comparable levels of information, monitoring and response
- Possible new corridors will be investigated and potentially built to relieve congestion and improve connectivity
- There will be further extension and evolution of smart motorways, creating a smart motorway spine to the network that connects our largest cities, in line with the ambition outlined in RIS1
- The APTRs still provide connectivity to more remote areas

The diagrams below provide an indication of the common features we expect that each of the four classifications of roads to have:



Diagrammatic

*Speed limit and number of lanes can vary



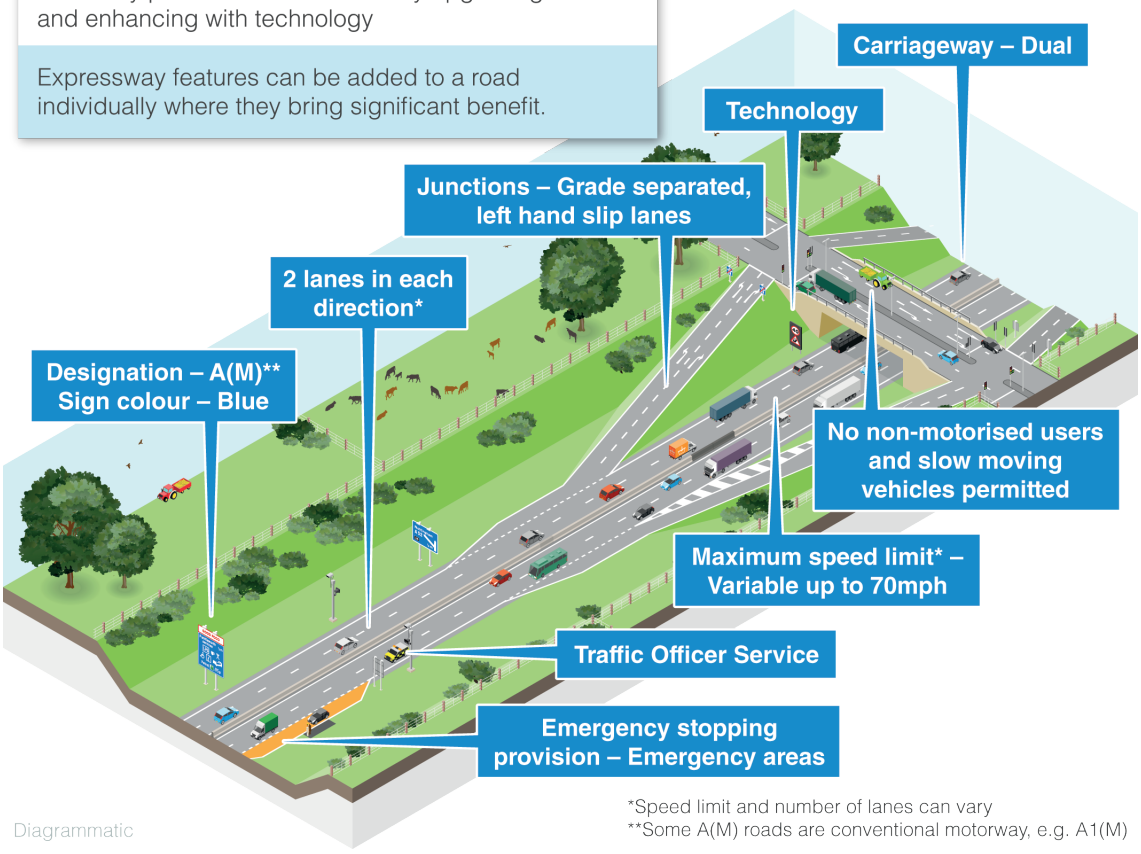
Diagrammatic

*Speed limit and number of lanes can vary
**Some A(M) roads are conventional motorway, e.g. A1(M)

Proposed features of an expressway

Motorway performance achieved by upgrading A-roads and enhancing with technology

Expressway features can be added to a road individually where they bring significant benefit.

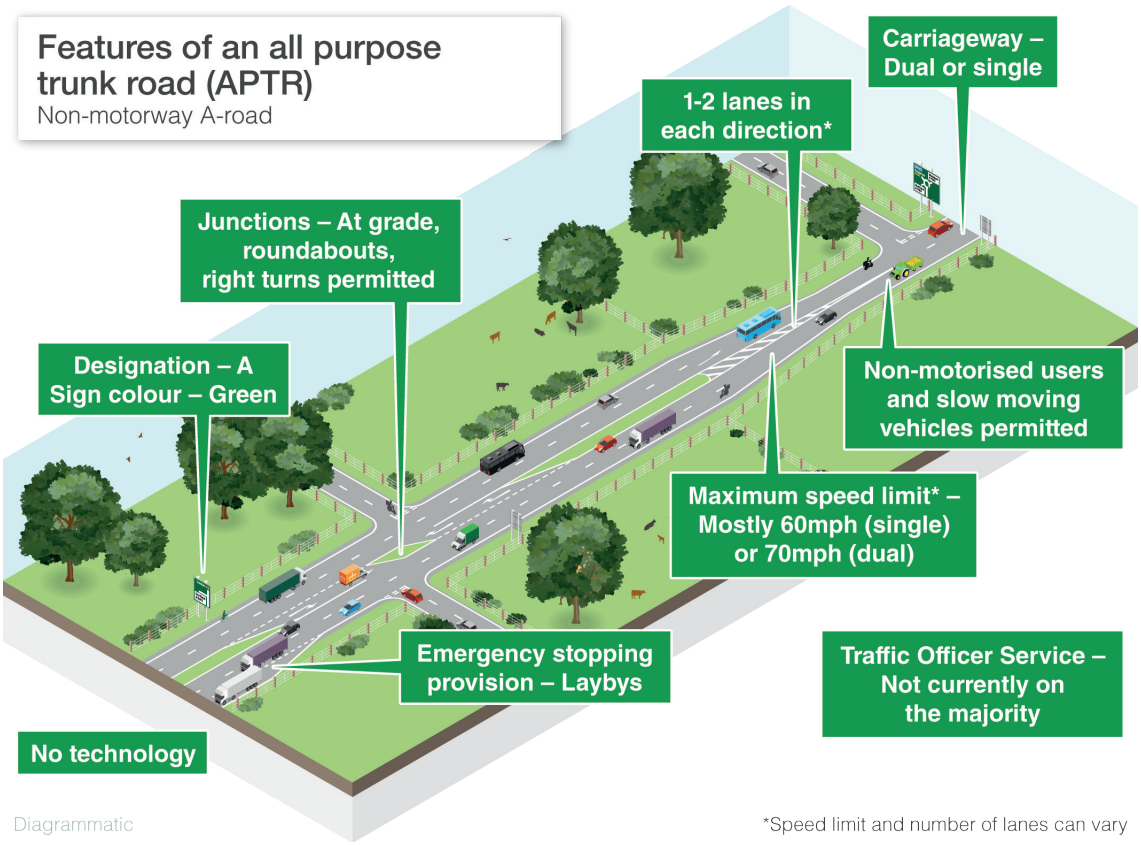


Diagrammatic

*Speed limit and number of lanes can vary
**Some A(M) roads are conventional motorway, e.g. A1(M)

Features of an all purpose trunk road (APTR)

Non-motorway A-road



Diagrammatic

*Speed limit and number of lanes can vary

4.4.4 Planning for a future network

We have also looked at the practical next steps we will need to undertake to realise this modernised network, including and changes to operation and practice likely to be required. These fall into five themes, with safety and environmental issues not as separate themes but underpinning all activity.

Steps to the future SRN

	Next Steps			Future ambition
Design, construction and maintenance	Deploying new materials and construction techniques	Increasing asset connectivity and digitisation	Automating construction to speed up delivery	Creating a network of self-sustaining, smart assets
Connected and autonomous vehicles	Providing network connectivity	Realising fully connected and safer roads	Preparing for a driverless network	Supporting CAV-only roads
Customer mobility	Providing for new mobility choices	Creating high quality connections for our customers	Enabling seamless journeys across integrated transport modes	Providing guaranteed customer journeys
Energy and the environment	Providing clean energy infrastructure		Phasing out internal combustion	Improving the environment, with a positive bio-diversity footprint
	Reducing impacts on our neighbours	Progress reduce, reuse and recycle		
Operations	Maximising data to inform operations	Integrating networks between the road, operators, and customers	Creating an intelligent, self monitoring and reactive network	Achieving a near zero disruption network

Theme 1: Design, construction and maintenance

We see increasing opportunities to modernise the design and construction methods used on our network. We will continue being bold in our ambitions to apply the principles of automation and repeatable digital techniques to the complex external environment of road design, construction and maintenance.

Some technology is already available and, in the short term, the potential benefits of automation will be considered. We will review how asset designs could be improved to aid automated construction, inspection and maintenance, and expect to see the first designs emerging which specifically supporting remote and robotic monitoring of structures, such as barriers. In the medium and longer term, we are planning for a new age of greater automation, with assets subject to smart monitoring, automation used extensively across routine maintenance activities, and an increasing level of technology in construction.

Theme 2: Connected and autonomous vehicles

The government's ambition is that fully self-driving cars, without a human safety operator, will be on UK roads by 2021. Looking beyond this, we will need to facilitate a staged transition as technology and infrastructure evolves. This transition will effectively take us from current day, when vehicles are only capable of limited connected or autonomous functions, through when many of our roads are made up of fully autonomous vehicles.

In the short term, we will prepare for these changes in driver and vehicle behaviour, by developing future operating procedures for CAVs, undertaking strategic pilot schemes and supporting the roll-out of Wi-Fi/ 5G on the network. In the medium and longer term, as the vehicle fleet on our roads becomes more connected, we will be able to change the design of roads and the way we interaction with customers: for example, gantries and VMS signs may not be required when we can engage with customers through their vehicles.

Theme 3: Customer mobility

Road users will expect smooth transitions between parts of the road network and between different transport modes. There is work to be done with local authorities to improve user experiences, in both directions: onto and away from the SRN. Customer mobility holds great uncertainty as new business models, such as MaaS, will influence how our network is used, but we do not yet know exactly what this will look like. Nevertheless, we see an inevitable change in the way that transport systems interact and provide for their users. We, too, must adapt to these changing relationships.

In the short term, we will explore the potential for greater joint planning with other modes of transport and regional transport bodies, such as HS2, London Heathrow and strategic park and ride schemes. Continuing with the work undertaken in RP1, we will look to invest off-network, where it has SRN benefits, such as supporting cycling and walking.

As MaaS becomes available, we will primarily seek to understand the changing nature of car use and its potential impact on the SRN. In the medium and longer term, we are interested in the opportunity that these platforms could offer to freight, and will work with partners to optimise freight movements across the network.

Theme 4: Vehicle energy sources

To play our part in supporting the government's air quality and decarbonisation aims, we will work with partners to support the end of conventional fossil fuel vehicles on our roads and to achieve a zero emission network. We will meet our RIS1 commitment to roll out charging points for electric vehicles. We will ensure that our on-road service has the tools and capabilities to support drivers of electric vehicles, and we will seek ways to promote the use of cleaner HGVs on the network.

In the longer term, there will be other alternative energy sources to consider. For example, some experts consider that hydrogen fuel cells are the most viable power source for clean HGV fleets. Other solutions include tram-like electric power lines. Since there is currently a high level of uncertainty about this, we will continue to explore the uptake of new types of vehicles and respond to their infrastructure needs as the picture becomes clearer. Where there is a role for Highways England we will also seek to play an enabling role, for example through use of our innovation fund.

Theme 5: Operations

Our operations will evolve as the road network becomes increasingly linked through telecoms networks and connected assets. We will enhance and simplify the network, and our traffic management and customer service will respond to changing business models and patterns of use. We aim to significantly reduce disruption caused by roadworks, extreme weather and serious incidents.

Smart motorways will provide critical capacity to a crowded network. We will develop the smart motorway and expressway infrastructure to engage with connected vehicles, and communicate in a more useful way with those driving on our roads. We are currently trialling drones to inspect structures, but such technology could also be used to improve response times, for example for a first assessment of incidents or for traffic monitoring. In the medium term, we expect the majority of expressway and smart motorway conversions to be completed. In the long term, we expect to introduce simulation of the network, and routine digital communications to vehicles, potentially allowing us to manage traffic flows directly.

We recognise that predicting the future is difficult, and that research and evidence is always evolving. We fully accept – and anticipate – this view of the SRN to evolve as time progresses and to be re-worked over forthcoming road periods.

As long-term planning continues to evolve, we believe that review and testing of this long-term vision and the key trends will become an integral part of the research stage in developing further Road Investment Strategies.

4.5 Summary of key challenges

Looking across the areas we expect to play a strong role in informing future investments in the SRN, it's clear that there are a number of challenges we need to address.

Increasing safety

Improving the safety of all of those who use our network or work on our roads, striving to meet our zero harm target

Providing better journeys every day

Operating and enhancing the SRN to increase capacity and unblock bottlenecks – delivering the reliable and fast journeys that customers need

Extending the life of the network

Maintaining and improving our infrastructure, protecting our network today and safeguarding it for the future

Supporting economic growth

Linking people, communities, businesses, and transport hubs, enabling regional, national, and international connections

Making roads work for everyone

Providing for the needs of all customers – not just those who are driving on our roads

Working more harmoniously with our environment

Making a positive impact on the environment, surrounding landscapes, and local communities

Planning for the roads revolution

Preparing our roads today to ensure that our network is ready for, and resilient to, the world of tomorrow

> *The Road Haulage Association has calculated the annual cost of road congestion to the nation as £31bn*

4 million vehicles use the SRN every day, our roads have to work for each of them

5 Investment priorities 2020-25

Highways England is the custodian of the SRN and as such fulfils the vital role of ensuring it is kept open for traffic. This role not only includes day-to-day operational management, but also maintaining and extending the life of the infrastructure which make up the network to avoid deteriorating condition becoming a factor in road closures, delays or safety. We also carry out major schemes to modernise, improve safety or build additional capacity to support the growing economy. We also invest in a range of specified areas via five designated funds, as well as ensuring that we manage and develop our organisation so that we can meet our delivery objectives.

The following pages set out our improvement and maintenance priorities for the 2020-2025 period.

5.1 Operational priorities

Our operational activities keep the SRN running. Given the level and nature of traffic on the SRN, its changing nature, and the increasing number of smart motorways, we believe it is critical to continue and, in some areas increase, funding for our operations. These activities are fundamental to the safety, reliability and resilience of the network, which are arguably the highest priorities for our customers. Looking forward to Road Period 2, we have identified a series of priority areas for investment.

Customer service ambition

One of our roles as Highways England is to operate the SRN to meet the needs of our customers. We therefore need to ensure that our customers trust us to do that. To do so we need to deliver against our five-year customer service outline plan.

Our objective is to ensure our customers trust us and the work we are delivering is beneficial to their journeys; recognise we care about them and their experience while travelling on the SRN, and value our contributions to the improvements they see in the level of service provided by Highways England staff and our supply chain.

We are developing a plan that details how we will deliver our customer service strategy. This will be revised annually and supported by a set of customer service standards outlining the service that customers can expect from us in a range of areas. Initiatives we expect to deliver through this plan include improving our management of road incidents, and developing one single view of customer service expectations throughout the company.

We are also looking at updating how we make investment decisions to expand on traditional economic analysis to properly capture scheme benefits which matter most to our customers. This will improve our ability to identify schemes which are priorities of all our customers, allowing us and the government to make more informed investment choices

To ensure we can track the level of customer service we provide and continue our drive for great customer experiences, we are currently developing a customer service maturity model through which we will be able to compare our customer service levels against other organisations with the aim to continue to drive continued improvements in customer service.

Better information

We know that our customers want us to give them more certainty when they use the SRN. That means managing incidents quickly, giving information about planned disruption, and giving live information about delays when they do occur.

These enhanced capabilities require operational investment, and some changes in the way things are currently done. For example, we would like to provide more useful information to road users through our Variable Message Signs (VMS). We regularly review and update our VMS policy to ensure it is as effective as it can be for safety and customer needs. However, existing restrictions on messages limit what we can achieve. We propose to continue working with the Department for Transport to investigate whether greater delegation of freedom of action would maximise the benefits VMS could bring.

To give the real time information our road users expect, we need to keep pace with advancements in communications technology. During Road Period 2, we want to continue proactive dissemination of real-time information directly to connected vehicles or via notifications to partner apps on mobile devices/GPS to rapidly and easily inform users of changes to their journey. We are working with Google, Garmin and others to experiment with how this might be done even more effectively and promote the use of such services.

We would also like to look at providing integrated travel information with public transport services, helping people to make better choices on how and when to travel. This cross-modal information might also enable mobility as a service. In order to collaborate with and deliver information to users through third parties, we will increasingly need to improve our IT to make sure we interface effectively and quickly.

Better roadworks

Roadworks are a key aspect of how we keep our network safe and effective. They allow us to maintain and improve our roads, whilst keeping the country moving. We know road users understand the need for roadworks but they see them as disruptive and inconvenient. We also know they sometimes have questions about how they are managed or whether they are avoidable. We have spent a long time talking in depth to motorists about how we can make this better - we know that they want roadworks which are dynamic and adaptive, and feel proportionate. Minimising disruption and irritation is important, but so too is telling motorists what we're doing and why.

It is our intention that when encountering roadworks, road users are always aware of the benefits the works will deliver, and can trust the information we give. In addition, our roadworks must be safe and efficient, and they should feel they are proportionate to the work taking place and the benefits being delivered.

It is also critical that we manage roadworks that ensure the safety of the people who are delivering them. We understand that some of the measures we put in place to protect our workers are a source of frustration to road users – especially if it is not clear that this is the reason for them.
We want to do more to communicate this critical element of well-managed roadworks.

We should be actively explaining what the purpose and benefits of the roadworks are. But to deliver road works that work for all motorists might mean completing roadworks in shorter sections than has been recent practice, as well as changing the working hours on some roads. This will come at a cost, which we must balance against the improved experience our customers will have as a result.

Reducing duration of roadworks through self-healing roads

Highways England has been working in collaboration with the University of Nottingham to develop an innovative self-repairing road surface. Dr Alvaro Garcia at the Nottingham Transportation Engineering Centre drew inspiration from MasterChef: watching a contestant jellify liquid into spheres gave him the idea that the same technique could be used to repair roads.

In the new material, the road asphalt has microcapsules of sunflower oil embedded in it. When the surface starts to crack with age, the capsules break open and release the oil, softening the asphalt around it. This helps the asphalt stick back together, effectively filling in cracks and preventing small defects from deteriorating further.

In trials, cracked asphalt was returned to full strength in two days, and the team estimate that it could increase the lifespan of the road surface by a third, from 12 to 16 years, reducing how often we need to undertake roadworks. By avoiding the conventional solution of re-surfacing patches of the road, the new technology could potentially significantly reduce the cost of major repairs and avoid road closures and disruption to traffic. We will soon be trialling this on our roads.

More reliable journeys

Having reliable and easy-to-use diversion routes is a vital part of our response to incidents and help keep everyone moving. We believe it's important that in Road Period 2, we continue to inspect the condition and signage on existing routes, identify where we don't have appropriate routes and bring them up to agreed standards.

We need to continue to improve our roads' resilience to weather, including issues that can arise where a road crosses rivers or flood plains. We continue to review our regime for winter maintenance to keep roads open and safe during snow and ice, and also make updates to design standards to take account of climate change in flood risk planning for roads, and greater extremes of temperature. Investment in replacing our fleet of winter vehicles will be a requirement during the next 5-10 years. And of course, our Traffic Officers will continue to play a crucial role in responding to incidents to help keep traffic moving. We would like to work with the government to investigate whether we can roll the service out to the busiest A-roads, meaning we can bring the benefits of the Traffic Officer service to larger network and to more road users.

Seamless journeys

We want all users to have stress-free journeys from their door to destination. We want to improve how we coordinate across regional boundaries to keep traffic moving, and look to coordinate traffic management with local authorities. Through a series of technology projects and hardware solutions, we can drive greater collaboration and sharing of data between ourselves and the neighbouring Local Highway Authorities to deliver traffic which flows better no matter who manages the road. This will include opportunities to integrate the traffic signal system with local authority systems.

In 2010, we piloted a project with Surrey County Council to co-ordinate the traffic management of the national road network, principally the M25, and the corresponding local road network. We are keen to explore opportunities for updated trials and potential wider rollout.

Managing more smart motorways and expressways

Greater investment in operations will be needed to keep pace as the provision of smart motorways and expressways expands and demand on the network increases, allowing us to keep the network open for traffic, providing journeys that are faster, safer and more reliable, and that keeping users well-informed throughout. Our increasing efficiency will allow us to make better use of the resources we do have, but without eventual additional investment in delivering the service, our Traffic Officers will be spread thinner, trying to manage more traffic and incidents. Our control centre staff will also be trying to manage a greater length of smart roads.

In order to improve our level of service in line with rising public expectations for a safe and reliable journey, we will need the right resources, innovation in the ways we work and investment in new technology. In order to get the most out of the expanding network of smart roads, and ensure their value for money, we think it should be a priority to ensure that we have the resources to run them effectively. That might mean more staff, better control room technology and more on road capability.

CCTV and inductive loops are already used to count vehicle numbers and to manage variable speed limits. However, we think this technology can be developed further to automatically detect broken down or stopped cars, allowing us to put up red X signs showing that a lane is closed and dispatching traffic officers to the scene. We will be starting to install this technology across the all lane running network from next year but as we build more smart roads, we will need to make sure stopped vehicle detection systems are installed.

Preparing for connected and driverless vehicles

Highways England supports the government's vision that fully self-driving cars, without a human safety operator, will be on UK roads by 2021, including by exploring how 5G technologies could best be deployed across the road network in order to maximise the productivity benefits for self-driving vehicles. This will include work to explore the role for private sector delivery of 5G infrastructure, as well as broader investigation of how we can best adapt our roadbuilding to support the vehicles of the future.

Connected and Autonomous Vehicles (CAVs) have different requirements on the SRN – communication between vehicles, vehicles and the infrastructure as well as vehicles and the control room. For example, we could improve cat's eye technology and line marking so that they can be detected by CAVs and vehicles with lane assist technology. Through the remainder of this road period and into the next we need to investigate and plan how we operate the roads as CAVs become a larger part of the fleet. During RP2 we would want to learn from trials in this road period. We want to collaborate more closely with car manufacturers, developers and other providers that are embracing the development of connected and autonomous vehicles. This collaboration will help us understand how mature the technology is and what is required on the network to cater for it in the future.

We recognise that our network is operating in a world of rapidly changing technologies, with innovations such as the Internet of Things (IoT) being more and more prevalent. We want to maximise the use of data and analytics to improve traffic management. We could analyse existing information to generate demand maps, hotspots which can be used for predictable or planned disruption or events. Additionally, we could learn to identify earlier signs of congestion which would allow us to use smart roads proactively to reduce delays.

By harnessing this data, we could potentially create a timetable for roads with expected journey times – something which is already in use in Japan. In order to capitalise on this opportunity, we need to store, track, analyse and make sense of a vast amount of data.

Supporting electric vehicles

The government is targeting a zero emission society. We must also support the Office for Low Emission Vehicles (OLEV) as the number of electric vehicles increase. We are aiming for our customers to be within 20 miles of a charge point on 95% of the SRN by the end of this road period, and to support the shift to electric vehicles, we would like to see even greater provision of charging facilities on the SRN in the next road period. We need to work with OLEV and stakeholders such as Road Haulage Association and Freight Transport Association to ensure we support the use of electric vehicles by logistics firms as well as car drivers.

We will continue to work with the government to ensure that we can support future policies in this area. For example, to jointly plan on how we provide or support the provision of charging points on our network.

Internet of Things (IoT)

The IoT is a giant network of "things" connected to each other able to collect and exchange data – smartphones, computers, sensors, building management systems... the list goes on. Imagine you're driving to a meeting, if your car's satnav has access to your calendar, it can tell you the best route to take to arrive on time. If you're delayed en route, your car could send a text to the attendees to let them know you'll be late. That is the power of the IoT.

5.2 Priorities for keeping infrastructure in a good condition

Our customers place a high priority on our assets, such as roads, bridges, and signs being in a good state of repair and working effectively. The state of our assets is also fundamental to our ability to provide safe, reliable, and high quality journeys.

Over 60% of our motorways in the UK were built during the 1960s and 1970s. Now, 40 to 50 years on, some of the structures on these roads need major work. We know that patterns of investment in the past means that we will face a particular need to focus on renewals in the future. Going forward, we will plan our renewals to either extend the life of existing assets, or replace those in need, in order to maintain the performance of the network.

We are rightly required by our licence to consider the whole life cost of constructing and maintaining our assets. Failing to consider whole life cost can result in infrastructure which doesn't meet the standards we require for safe and serviceable operation or lead to a need for expensive, reactive maintenance works to keep traffic moving. Historically, however, funding has not always allowed for a whole life approach.

We don't want to do minimal, reactive maintenance, so that we may be faced with managing a declining asset in the coming years. To inform the government's decisions on future investment in the SRN, we have developed a number of investment options for our different asset types, in which we could make positive progress over the course of RP2 towards improving the overall condition and extending the life of our assets. For example we could deliver an improvement in overall road surface condition, while making choices that favour lower whole life costs, or proactively invest in improving drainage condition, in order to be resilient against future stresses and to reduce the impact on other assets and the environment.

Asset type: Road surface
Preferred approach – Deliver an improvement in overall road surface condition, while making choices that favour lower whole life costs (i.e., we would invest more to intervene earlier, or renew to a deeper level if that gave the surface a longer life time)

Asset type: Structures
Preferred approach – Maintain safe structures, while making steady, positive progress in improving structure condition and strengthening where desirable

Asset type: Drainage
Preferred approach – Proactively invest in improving drainage condition, in order to be resilient against future stresses and to reduce the impact on other assets

Asset type: Geotechnical
Preferred approach – Regularly inspect all geotechnical assets to better understand their conditions and deliver timely interventions where needed

Asset type: Vehicle restraint systems
Preferred approach – Continue to replace steel with concrete as required

Asset type: Lighting
Preferred approach – Establish a sustainable portfolio of lighting assets, balanced against social, economic and environmental needs

Asset type: Road signs and markings
Preferred approach – Proactively maintain and repair these ancillary assets to enhance customer experience, including improving signage of diversion routes off the network

Asset type: Tunnels
Preferred approach – Maintain safe and serviceable tunnels, and move towards establishing a consistent standard of operation for all tunnels

Asset type: Traffic signals and roadside technology
Preferred approach – Maintain the condition of technology assets to the level required to support operational management of the network

Asset type: Soft estate
Preferred approach – Restore the estate condition in order to deliver landscape and heritage objectives, and support a net gain in biodiversity by 2040

We will work with our supply chain and the Department for Transport to determine the best approach and plan to keep our assets in the right condition. We will need to balance the availability of any funding to complete repairs, against the necessity of achieving the best value for money.

We also want to continue to work towards becoming a more efficient and effective asset steward during the next road period: further improving the way we measure the condition of our assets, using new technology to provide higher quality and more useful data to support improved asset information tools which will more accurately predict future asset behaviour. We would like to build on the work delivered by the Asset Delivery programme and move towards operating this way across all our regions.

This will enable us to make more evidence-based investment decisions, and to identify and deliver the right treatment at the right time, improving the lifetime and value of every asset, whilst minimising customer disruption.

We believe that by investing to adapt our network and ensure that its assets, both old and new, are more resilient to extreme weather events, we are preparing for the consequences we are likely to see in the future as a result of the changing climate. Building for resilience today will save money in the future.

With limited funding, we need to make difficult decisions about how we prioritise between extending the life of some of our oldest and busiest roads, and building new roads to ease congestion. We welcome a wide input to this debate through the consultation which follows.

5.3 Priorities for enhancing the SRN

As outlined in chapter 4, in determining our priorities for road improvements in Road Period 2, we want a portfolio of enhancements that:

- responds to our customers' and stakeholders' needs
- reflects the state of the network itself
- aligns to the priorities of our shareholder
- provides a foundation for the future.

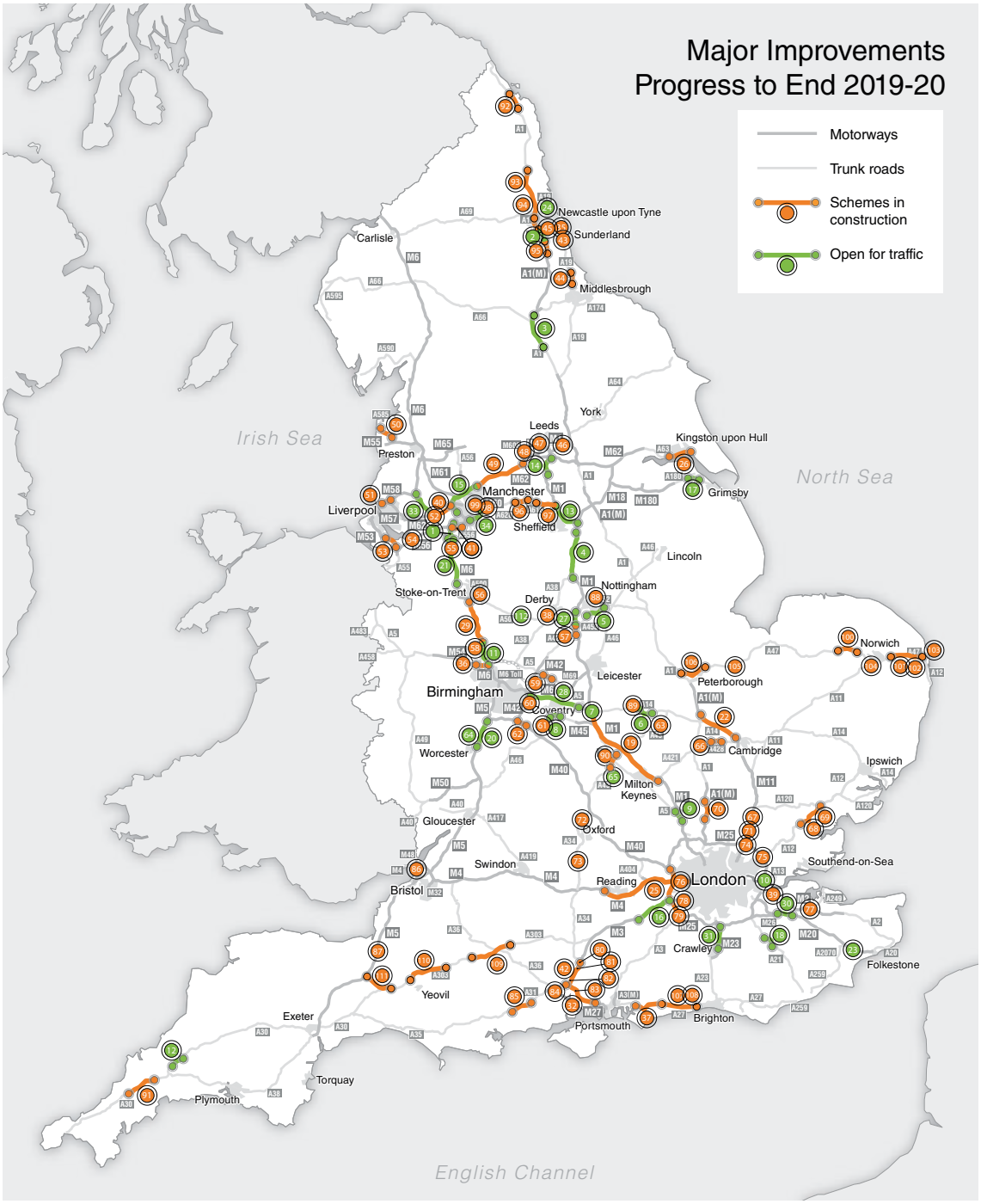
We want to ensure that the portfolio for RP2 works for our customers, our supply chain and provides good value for money for the taxpayer. We believe we can improve outcomes in RP2 by building on the stable 5 year funding settlement and better investment planning to move to a steadier pipeline of work, both overall and within the different types of improvements we deliver.

5.3.1 Schemes in construction

We have made good progress in delivering schemes in the first RIS, with 18 opened on time or early and 15 in construction today.

The projects shown on the map below will still be in construction as we enter the next road period, and we assume funding to complete these will be allocated in the next RIS as a priority on the assumption that they continue to demonstrate good value for money and receive the relevant planning approvals. More detail on each is provided in Annex A.

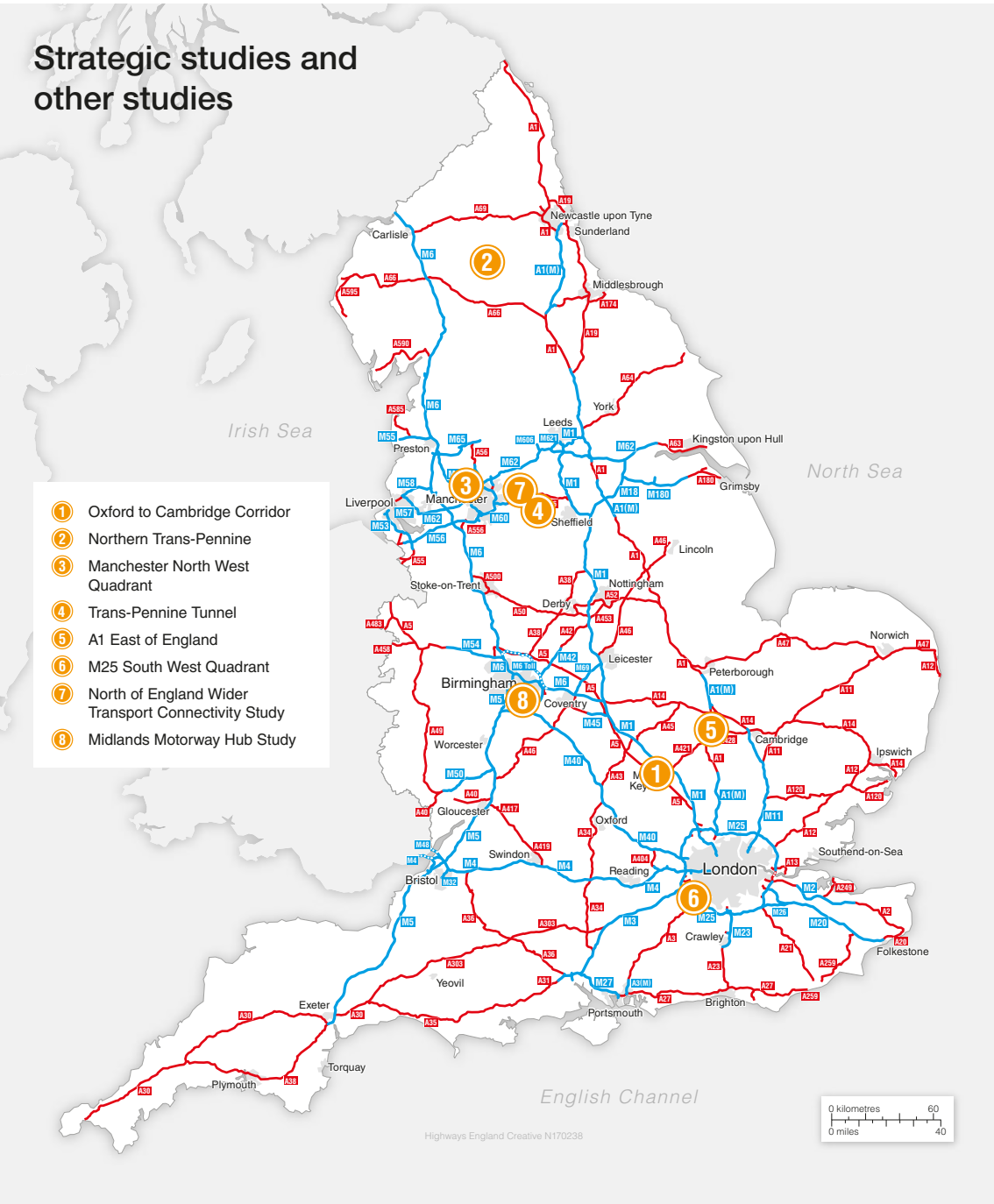
There are many RIS1 announced schemes which will continue into construction into RP2. Based on our forecasts completing these schemes will take up a significant proportion of any funding available in the early years of RP2. The enhancement priorities described in the remainder of this chapter relate to the later part of the RIS and planning ahead for RIS3.



5.3.2 Strategic Studies

In the first RIS, the government announced 6 strategic studies to investigate potential options to solve some of the most significant and complex challenges on the SRN, providing long-term solutions to capacity challenges and improving connectivity. Working with our partners in each region, we have been studying the problems at the 6 strategic study locations and have started to develop options for addressing the problems.

These ambitious studies have the potential to transform how we connect and the economic geography of the country. Given their scale, cost and the complexity of delivery, we advise that these should form a long-term programme of delivery over successive road periods.



1 Oxford to Cambridge Corridor

Construction will begin on key elements of the expressway on the Cambridge – Milton Keynes – Oxford corridor in the next road period. The government will also accelerate work on the 'missing link' elements of the expressway so that it is ready to open by 2030. The government is commissioning England's Economic Heartland to analyse how communities not on the route of the 'missing link' will be able to benefit from it.

2 Northern Trans-Pennine

East-west connectivity in the north of England is currently underutilised and has significant problems with journey time reliability, safety, and a lack of alternative diversion routes. In our development of the Northern Trans-Pennine Strategic Study, we have identified a range of potential options that can help improve Trans-Pennine connectivity and unlock economic growth in the north of England. Further work is being carried out to understand the full benefits and impacts of options and to develop an implementation strategy.

3 Manchester North West Quadrant

The M60 plays a vital part in the life of Manchester and is a critical part of the northern transport network. The North-West Quadrant of the M60 between junctions 8 and 18 contains some of the busiest stretches of road outside the M25. The mix of local and strategic traffic, coupled with the design of the road, further exacerbates congestion and has a negative impact on the environment. We have developed a number of potential improvement packages to tackle these issues and enable the area's growth potential. A key element of any package will be public transport improvements, including bus and rail upgrades and park and ride facilities, to enable a fully multimodal approach to solving this key transport problem.

4 Trans-Pennine Tunnel

We are investigating options to complete the 'missing link' in the SRN between Manchester and Sheffield, which could trigger a step change in economic performance for the North. Consideration will need to be given to how such a large-scale and complex project can be delivered over a number of road periods.

5 A1 East of England

The A1/A1(M) in the East of England plays an important role as part of the SRN. It is a strategic inter-regional route for commuting and leisure, both southbound into London and northbound to the rest of the UK. By developing improvement options we hope to provide a solution to the journey time reliability and congestion problems along the route.

6 M25 South West Quadrant

The M25 south-west quadrant strategic study is being undertaken with a focus on how we can reduce congestion and boost economic growth and prosperity; improve transport connections and improve conditions for the surrounding environment. We are considering carefully any proposals to support the planned expansion of Heathrow and are investigating both potential strategic and local road improvements that may be able to improve the performance of the busiest section of the SRN.

5.3.3 Other studies

We have also undertaken two further studies working with Transport for the North and Midlands Connect:

7 *North of England Wider Transport Connectivity Study*

The vision for economic growth in the north of England relies on better transport connectivity to improve journey time reliability, journey quality and deliver shorter journeys. These elements contribute to strengthened labour markets and improved business efficiency therefore increasing productivity in the north of England.
The Trans-Pennine Tunnel Study examined options for the construction of a new high performance road link between Manchester and Sheffield through a purpose-built tunnel.

The Wider Transport Connectivity Assessment (WTCA) has examined a range of interventions on the wider network to enhance a new Trans-Pennine connection. This would improve regional connectivity and create social and economic opportunity not only for Sheffield and Manchester but for the whole region, from Liverpool City Region in the west to Humberside in the east.

8 *Midlands Motorway Hub Study*

The Midlands Motorway Hub, spanning key sections of the M42, M5 and M6, lies at the heart of the regional and national SRN. The Hub has been identified as of critical importance to both the regional and national economy. The long term challenges facing the Hub are complex and whilst considerable investment is planned on individual sections of the Hub, as part of the current Road Investment Strategy, this will not cater for the overall forecast increase in growth in the medium and long term. Highways England and Midlands Connect have undertaken the Midlands Motorway Hub Study to identify a short, medium and long strategy to ensure that the Midlands continue to act as a facilitator of economic growth for the region and the national economy.

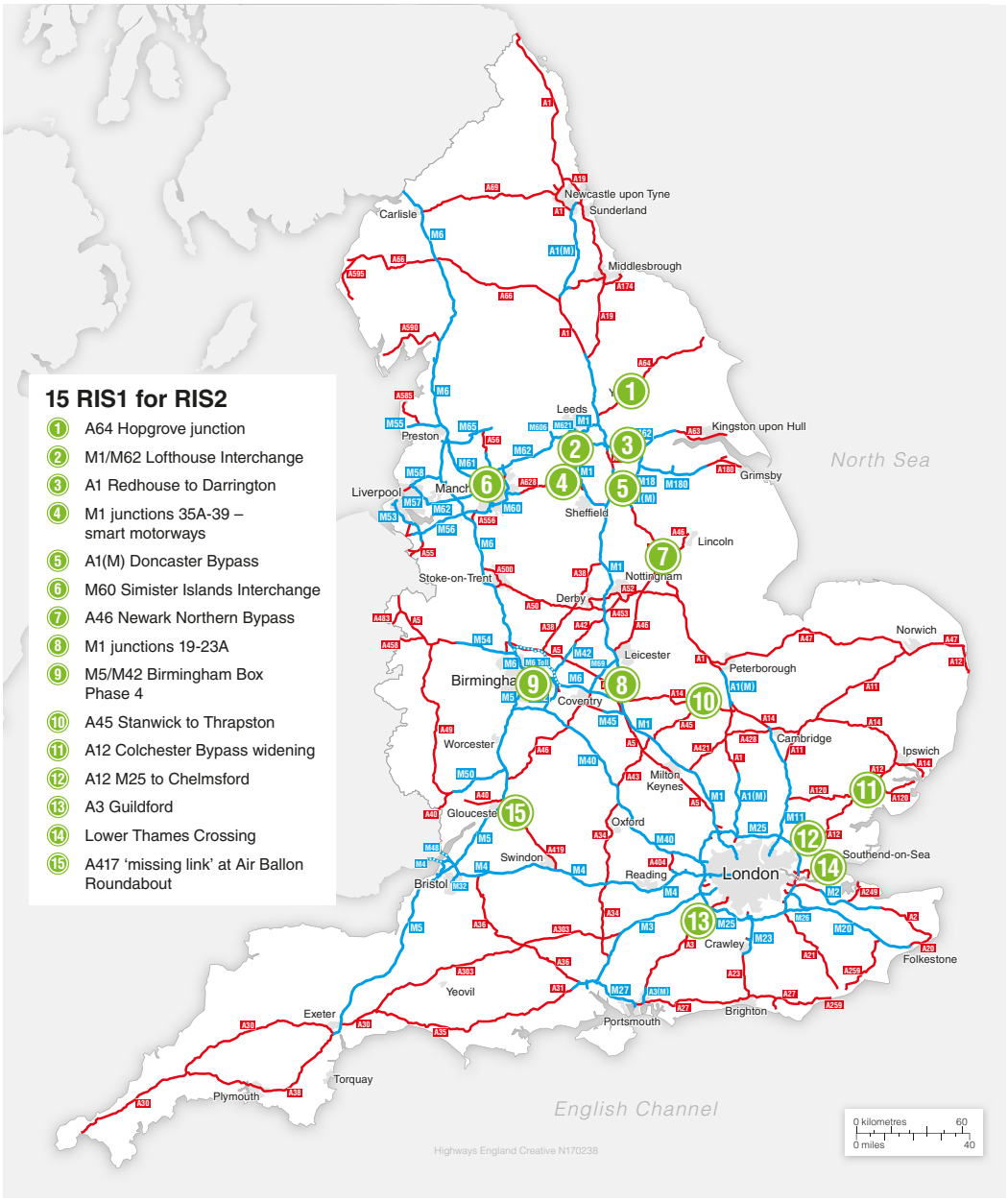
The study has produced a strong strategic case which evidences the need for future infrastructure investment in the Midlands Region and potential options will need to be developed in more detail to enable a better understanding of costs, benefits and deliverability. We are developing a cross-modal approach when considering a range of measures to achieve the objectives of the study.

5.3.4 Schemes to be developed for the next road period

The government have asked us to identify and design solutions for 15 locations announced in the first Road Investment Strategy, with the aim that they could be ready to enter the planning process and construction in the next road period if an appropriate solution could be identified which offers good value for money.

These are:

- A64 Hopgrove junction
- M1/M62 Lofthouse Interchange
- A1 Redhouse to Darrington
- M1 junctions 35A-39 – smart motorways
- A1(M) Doncaster Bypass
- M60 Simister Island Interchange
- A46 Newark Northern Bypass
- M1 junctions 19-23A
- M5/M42 Birmingham Box Phase 4
- A45 Stanwick to Thrapston
- A12 Colchester Bypass widening
- A12 M25 to Chelmsford
- A3 Guildford
- Lower Thames Crossing
- A417 'Missing link' at Air Balloon Roundabout



These studies are all still in a comparatively early stage of development, and the nature of the scheme options presented remains subject to change during detailed design. Work will continue on the design of these schemes during the remainder of this road period, providing they continue to demonstrate value for money, deliverability and affordability. Construction of any scheme option will be subject to its inclusion in the next Road Investment Strategy and obtaining the necessary statutory permissions.

5.3.5 Smart upgrades to our busiest motorways

In RIS1, the government announced an intention to provide a core network of smart motorways which connected our biggest cities – London, Birmingham, Manchester, Leeds and Bristol.

We believe that smart motorways have a role to play in adding capacity and supporting economic connectivity in other locations as well.

Our evidence shows that they are as safe as other motorways, some of the safest roads in the world. We therefore support the continuing roll-out of smart motorways across the core motorway network, and consistent with our vision for the network; we anticipate making further progress with this in RP2.

We recognise motorists need to be confident using smart motorways, and we're going the extra mile to make improvements such as improving signs and installing high visibility orange surfacing in emergency areas. We also have an on-going campaign aimed at improving understanding and making it clearer where drivers can stop in an emergency.

It's a priority for us continue to raise awareness and build confidence among drivers, including informing drivers of the need to observe and follow red X signs when these are displayed on variable message signs to temporarily close lanes.

We remain convinced that smart motorways are the right investment for the core of our network. We continue to work towards the smart motorways network that the government set out in the first RIS. Increasingly, achieving this vision will be done by filling the 'gaps' between two sections of smart motorway. There are also some sections where we want to bring older sections smart motorway up to the latest standard. We think the best way of doing this is to manage a smart motorways programme along the same lines as we manage our maintenance and renewals. Rather than managing smart motorways enhancements as individual schemes we will deliver new sections as one continuous programme. This gives us flexibility to focus on the priority areas, to manage our work on the network to minimise disruption for road users and to drive greater efficiencies in delivery.

5.3.6 Developing expressways

Our customers have a broadly consistent experience across our motorways, the same consistency is not always true of our A-roads, where:

- piecemeal upgrades
- single carriageway sections
- roundabouts
- and design to a lower speed of traffic

have resulted in route inconsistency that is often less safe and less resilient.

We therefore want to prioritise fixing these problems to provide better journeys and modernise our busiest A-roads. In the short-term we expect A14 Cambridge to Huntingdon to open as our first operational expressway. We are also working to future proof other capital schemes, being developed in this road period, on routes identified in RIS1 as potential future expressway corridors. The first Road Investment Strategy had an ambition for the roll out of expressways across the length and breadth of the country, some elements of which will be delivered over the RP1. We consider that the development of an expressway network in line with that ambition expressed should continue into RIS2 and beyond.

This would be a significant opportunity to improve journeys nationwide, requiring significant investment. Our initial thinking is that a phased implementation approach for expressways would allow the ambition to be delivered in full over time while still allowing many of the benefits to be delivered sooner:

Phase 1: a 2-3 lane dual carriageway, with no roundabouts, traffic lights or right turns on the main carriageway, some alternative provision for vulnerable road users, such as cyclists, and slow moving vehicles.

Phase 2: replacing central reservation barriers with safer, rigid concrete barriers for these high flow A-road sections.

Phase 3: introduction of technology and operational changes, including Traffic Officer patrol and emergency areas. A scheme may designate as a motorway and prohibit vulnerable road users and slow-moving vehicles if appropriate alternative provision is available, and there are appropriate terminal points.

Phase 4: motorway designation of the complete corridor.

We will continue to work with DfT to develop the concept for expressways and identify where there is a longer term ambition to upgrade certain routes to expressway.

We expect the minimum operational and safety standards to be consistent with smart (and conventional) motorways. To achieve this, the first step is to take forward expressway schemes that were referred to in RIS1, such as the A303 schemes. We then want to lay the foundation of the expressway network with the next phase of schemes.

5.3.7 New schemes

In addition to working to deliver upgrades to smart motorways and expressways over the longer term, we know that we will need to continue investing in other parts of the network. This might include junction improvements to tackle safety, congestion or environmental issues, or improve connections to other roads. Or it might include selected bypasses which benefit communities, motorists and the economy. We believe that in the majority of cases it is about providing better roads rather than new roads.

Opportunities for such improvements should draw on the current and future performance of the road, local growth plans and support the government's wider priorities.

We have invested in a significant enhancement of our analytical tools and capabilities in order to support the development of an investment portfolio for RIS2. Our analytical platform allows us to combine regional traffic models, strategic outcome models and an economic model, alongside a wider suite of data and tools, to take a whole system view of our network and assess the impact of different combinations of potential upgrades, investments and schemes.

Our publication, Analytical Methods to Inform RIS2, published alongside this Initial Report, gives more detail about how this analytical platform operates and is used to identify and assess potential new schemes.

Using these tools, in combination with our understanding of the network and of the delivery challenges presented by individual schemes and programmes, allows us to work closely with the Department for Transport to advise on the choice of enhancements, developing proposals that are balanced between size and type of scheme, region and the transport, safety and economic benefits they deliver.

5.3.8 Tackling local priorities

In autumn 2016, an additional £220 million investment in the SRN was announced to increase capacity, reduce journey times and improve safety. This fund is being spent on smaller schemes at existing roundabouts, junctions and slip roads and is bringing real benefits to communities and supporting economic and housing developments across the country. We want to build on the success of this congestion relief fund, and will aim to work with DfT to develop a fund in the next road period that would be delivered at a regional level and could respond to local priorities and emerging issues through smaller schemes, to address local safety, capacity and journey time priorities. Our experience of delivering similar local network management schemes in the past shows that smaller schemes can offer high value for money and benefit local areas.

> *Sectors heavily dependent on the SRN employ 7.4 million people and contribute £314 billion in Gross Value Added to the economy*

5.3.9 Coordination with HS2 and Heathrow Airport expansion

Heathrow

We are working closely with Heathrow and the Department for Transport to support the government's preferred option of the development of a third runway. As part of this, we want to ensure that the proposals minimise disruption during construction and take into account not only the current demand on the M25 and surrounding roads but also the likely long term future demand on the SRN in their designs for the scheme.

High Speed 2 (HS2)

We are working with the government and HS2 Limited to ensure that that our network supports access to the new HS2 stations, and that during its construction the impacts on the SRN are minimised as far as possible, and the HS2 network fits with our future network development plans.

5.3.10 Building a pipeline

We believe building a stable managed pipeline of improvements to the SRN makes sense for everyone. We can avoid a situation where all the roadworks happen at once – causing road users more stressful journeys. It can help our designers, road building contractors and equipment manufacturers plan their businesses sustainably and encourage more suppliers into the market. It can also help us be more cost efficient and to plan upgrades along entire routes as programmes of work.

In the past, schemes have been announced with very prescriptive scheme descriptions and the earliest possible start date, sometimes before the right information is available. By having a range of schemes at different stages of development – from designing the schemes, to going through planning consent, ready to start construction or already in construction, we can help smooth both the expenditure and the disruption.

5.3.11 Future studies

In addition to schemes which will continue, or aim to start construction, during the next road period, we think there is value in funding the development of a wider range of solutions, both to address areas on the network with poorer performance, and to respond to the future challenges and demands on the network.

The government may wish to progress a range of different studies during Road Period 2, tackling a wide range of connectivity and resilience issues. Our suggestions for studies which merit further investigation include:

Free flow junctions – A strategic network assessment of need for and potential to create free-flow connections at key SRN-to-SRN junctions, where lacking.

Last mile improvements – Assessment of priorities for investment and ownership options to create improved end-to-end journeys to/from key economic destinations especially international gateways.

Integration hubs – Investigation of potential to improve multi-modal integration (for example, strategic park and ride) by creating opportunities for better multi-modal journeys and assessing the potential of better integration to relieve congestion on the SRN.

Key route upgrades – Assessment of key routes which may require long term upgrades. Based on our initial analysis this could, for example, include a study to investigate the potential benefits of upgrading the entire A1 in England to motorway, options for further upgrading the M60 South East quadrant, and building in greater resilience on the M6 corridor between Manchester and Birmingham.

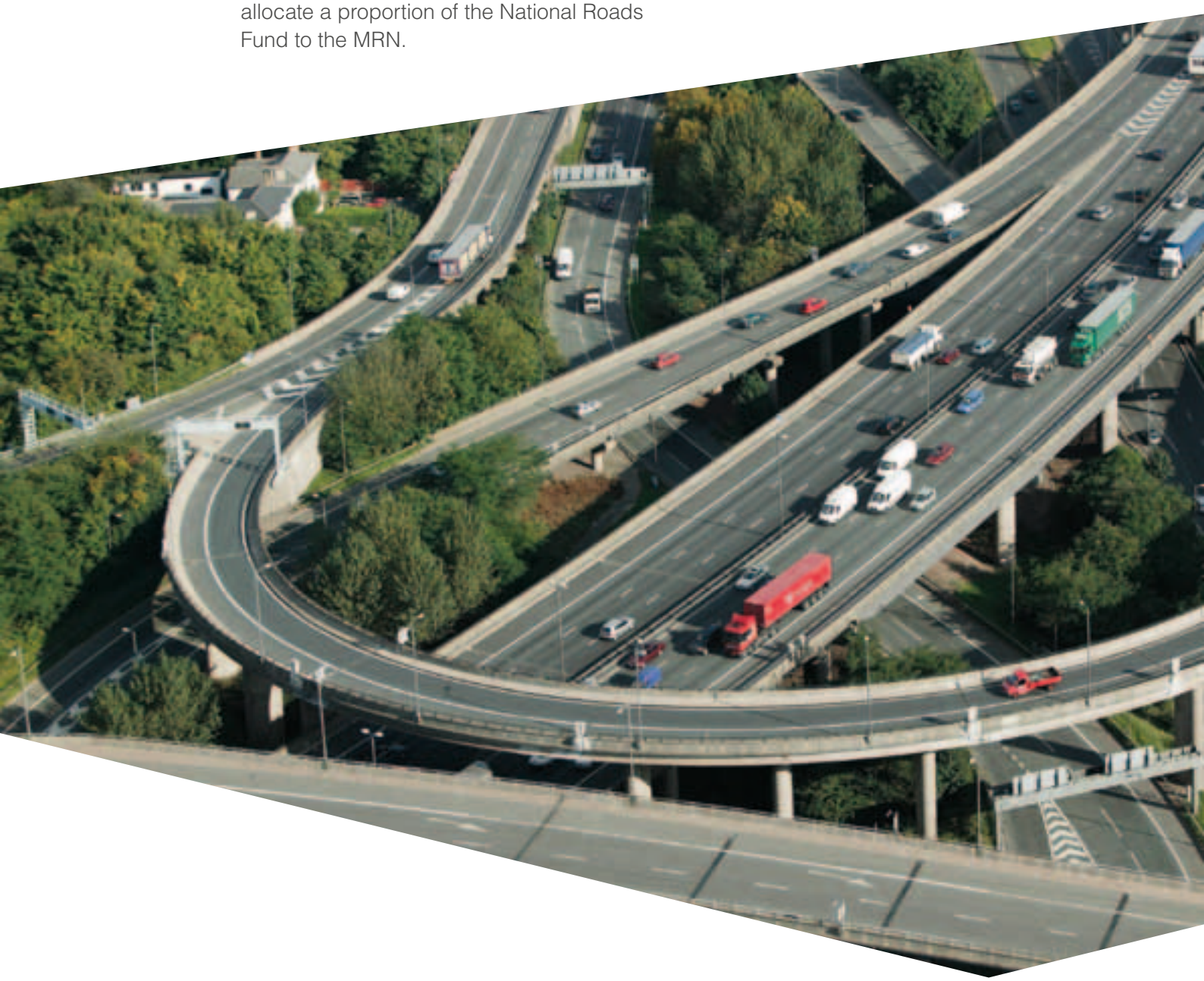
Orbitals – Study to investigate the strategic case for the development of strategic orbital routes to provide better end to end journeys, relieve congestions in cities, to reflect increased urbanisation and to provide improved integration with public transport.

5.3.12 The SRN and the Major Roads Network

In October 2016, the Rees Jeffreys Road Fund made the case for the establishment of a Major Road Network formed of the busiest and most strategically important A-roads outside the SRN. In the Transport Investment Strategy published in July 2017, the government accepted the case for giving greater attention to these roads and announced that they would be consulting on proposals for creating a 'Major Road Network' ('MRN').

Their view is that the MRN would form a middle tier of roads sitting between the national SRN and the rest of the local road network, and that they would propose to allocate a proportion of the National Roads Fund to the MRN.

There is an important link between the SRN and any MRN. Better integration between these networks will help improve journeys for road users who will travel on both, so we support a network of major roads. We look forward to working with highway authorities with responsibility for the MRN roads to deliver an improved service for complete end-to-end journeys of our customers.



5.4 Designated funds

There are currently five designated funds to support:

- Growth and housing
- Environment
- Cycling, safety and integration
- Innovation
- Air quality

The funds play a critical role in enabling us to focus on and invest in these areas and are already delivering important benefits. We support the continuation of these funds and will work with the Department for Transport to maximise their benefits.

Through close working with our partner organisations, we know that these funds are well supported. We also note the recommendations in Rising to the challenge: a shared green vision for RIS2, a joint report of 17 environmental groups coordinated by Campaign for Better Transport making the case for a greener RIS2, and the Transport Focus report on road users' priorities for the next road period.

Decisions on the future of designated funds will be made by the government as part of planning for the next RIS, but in addition to the fund for tackling local priorities (see 5.3.8) we believe that investment in the following 5 areas could help make roads work for everyone.

Growth and housing:
The current fund helps us engage in progressing schemes required to unlock growth by supplementing developer contributions and other sources of funding. We acknowledge that this may continue to be a priority for the government and that such a fund could continue to support this agenda.

Wellbeing and environment:
We recommend having a more holistic environment fund that covers human wellbeing, and the natural, built and historic environment. This would enable us to continue a green retrofit – tackling some of the worst impacts from noise and air quality on communities and habitats near our roads, and reducing the landscape impacts of traffic, signage and lighting. Diverse plantings can support wildlife and aesthetic design and respond to the places through which they pass. We want to build stronger relationships with our partners to develop alternative means of delivering improvements ranging from habitat connectivity to the roll out of electric charging points. Designated funds could be used to support these objectives.

Connecting communities:
More, safer and better links for pedestrians, cyclists and equestrians. We can connect communities and public transport options and help people make sustainable travel choices, for example by making improvements to bus stops along our A-roads or by improving facilities for coaches.

Innovation:
Supporting finding innovative ways of improving safety; customer service; operating, maintaining and building the SRN. Our innovations are essential to prepare our infrastructure for the huge changes we anticipate in Road Period 2 and beyond. Funding in this area can progress projects to exploit innovative technologies and techniques in road construction and management, revolutionising what it means to both operate and travel on our roads

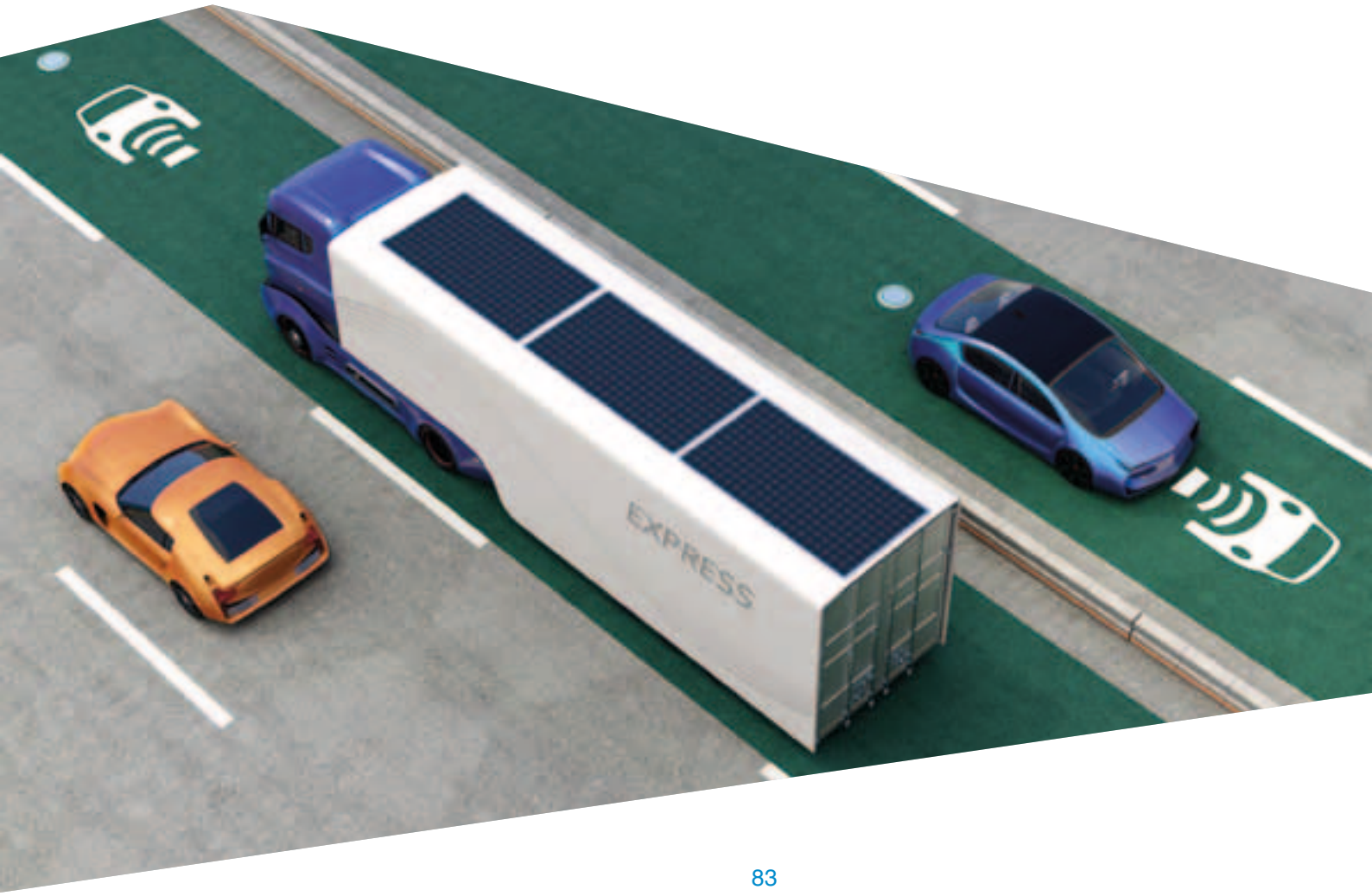
Roadside facilities:
We know that better services at the roadside are important parts of road users' journeys, whether as a comfort break or a necessary rest to help motorists travel safely. This fund could help us deliver better roadside facilities on our motorways and A-roads.

In addition to our suggested changes to the breadth of the focus of designated funding, we believe there is an opportunity to improve how we approach the administration and delivery of any future designated funds.

We are grateful to our partners and the stakeholder groups who advised us during the initiation of these funds, and who continue to do so, and we would like for close working to continue and be strengthened as we move toward Road Period 2. A big part of the success of our growth and housing fund to date is that it has involved joint working. We believe that a similar model, where environmental groups or non-motorised user groups could suggest proposals or bid for funding would benefit everyone and could work toward a better integrated SRN for the future called for in Campaign for Better Transport's shared green vision.

We also strongly believe that these funds may drive better outcomes with:

- opportunities to fund innovative research or exploring better ways of working
- allowing us to deliver through others
- a greater emphasis on specialist stakeholder advice or professional experience in determining the benefits, rather than traditional quantified value for money
- opportunity to commence planning and stakeholder involvement ahead of the start of the road period, reflecting that the mobilisation period for the designated funds announced in RIS1 have been longer than for other programmes.



5.5 Running the company

Our overall programme also includes support costs which are needed to deliver investment in our road network and its operation. These include the business critical areas such as internal staff costs, information technology and estates. We strive to be as efficient as possible and many of these support areas are in themselves designed to make sure the delivery of our commitments via our programmes, projects and management of the day to day network is done in the most efficient way.

During RP2 we are expecting a requirement to deliver more projects and an extensive programme of maintenance. We will also be actively managing a more complex road network than we have previously. To do this, we will need additional skills and resources and these are included in our business support costs. That's why we're investing now, and plan to continue doing so, in acquiring and developing these capabilities. Our Highways England 2020 Organisational Plan describes in detail how we intend to develop the skills and capabilities we will need to deliver RIS2. This includes recruiting and developing the skills of our existing staff in, for example, project management.

We also need to ensure we have the infrastructure that will enable our people to deliver RP2. This includes investing in technology and IT systems, research and our office and operational estates. For example, we've developed a database to record and manage the condition of our assets, unifying the different asset management systems currently used across our regions and allowing more informed decisions across the maintenance and renewals programme. Also, as we expand our Asset Delivery approach to maintenance (bringing key functions in-house), we need to acquire and fit out offices, control rooms and outstations for them to operate from.

Another area of investment that supports the delivery of the capital programme is our on-going programme of research and innovation which enables the operation, maintenance and improvement of the SRN.

Using technology for efficient operations

An example of how we are enhancing our technology assets and investing our business costs in making our operations more efficient is the CHARM project. This will make our traffic control centres operate more efficiently by applying joint learning from other countries. We've set up a joint initiative with the Dutch road authority, Rijkswaterstaat, and together we're developing new information and control systems, and will improve our effectiveness, resilience and ability to deploy our officers more flexibly at particularly busy times or during emergency incidents. These are expected to be in operation in one of our control centres by the end of 2018, and then implemented in others after that.

5.6 Summary of investment priorities for 2020-25

In the previous chapter, we described what we believe to be the key challenges for the SRN in Road Period 2 and beyond. The investment priorities we have identified in this chapter represent our current best view of the schemes, projects and capabilities that would tackle these challenges.

Safety first

To meet our aspiration for a zero-harm network, we need to invest in safety. This requires a two-pronged approach: making our infrastructure safer, and improving the way our users interact with it.

By improving our infrastructure, we can directly reduce the risk of accidents. For example, as we upgrade A-roads to expressways, we can enhance safety by replacing at-grade junctions and right turns with grade-separated junctions. On our smart motorways, we can improve our signs and provide high-visibility orange surfacing in emergency areas, building confidence among drivers. As technology evolves, we can introduce systems for automatically detecting stopped vehicles, and closing lanes in response. The funding we recommend for tackling local priorities will help us to make smaller scale enhancements on a local level that make a big difference to relieving accident black spots.

We also want improve safety by influencing driver behaviour. This has traditionally been achieved through awareness campaigns, but we will develop other initiatives as we enhance our customer understanding through research, data analytics and working with stakeholders such as Transport Focus.

The opportunity for drivers to rest is critical to both safety and customer experience, which is why we support funding for roadside facilities, to improve motorway service areas and provision of rest stops along A-roads and future expressways.

Providing better journeys every day

We want to improve our customers' journeys by creating a safer, better connected and free-flowing network. However, we also want to invest in initiatives which will directly improve our customers' experience on our network in other ways.

We want to give our users stress-free journeys and believe that reducing the number of different road types can help deliver that aim. We continue to invest in new smart motorways, which improve journey times while avoiding the adverse impacts of traditional road widening. Since smart motorways need active management, we will need greater investment to maintain and improve the service as we roll out more. We would like to retrofit our older smart motorways, adding capacity and making them easier to use. Similarly, as we modernise our busiest A-roads to the expressway standard, we aim to provide the benefits of a motorway – enhanced safety, reduced and more reliable journey times and better information – without the conventional costs.

continues overleaf

continued

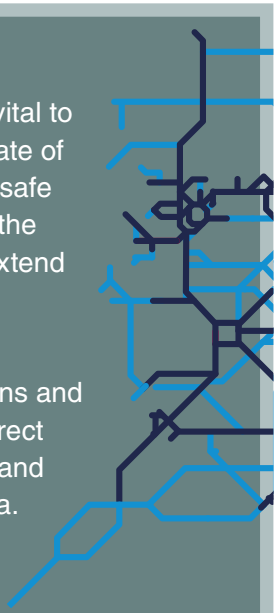
Our first priority will be major schemes which are already in construction and planning. We will also develop new schemes, using our sophisticated analytical capabilities assess them for benefits and value for money. We will develop these into a continuous pipeline of work, ensuring that our supply chain can deliver them and avoiding a spike of roadworks and stressful journeys.

We would like to prioritise improving road users' experience with roadworks; for example by completing roadworks in shorter sections and trialling different working hours. We also need to improve the resilience of the network to reduce disruption by unexpected incidents. This could include improving diversion routes, and will also require investment to replace our fleet of severe weather response vehicles.

We want to provide a better service to our users when they are at their most vulnerable, by expanding the coverage of our Traffic Officer service onto our busiest A-roads. Through faster incident response and clearance, this will enhance safety and improve journey times. We can get better at providing accurate, live information about our network, which will help users plan and change their journeys. This will require investment in our IT infrastructure to help us store, analyse and share data.

Extending the life of the network

The condition of our infrastructure is key to everything we do. It is vital to our users that our roads, bridges, signs and so on are in a good state of repair. This also provides the foundation that enables us to deliver safe and reliable journeys. A number of these assets are now reaching the end of their useful life, so we need to invest significantly to either extend their lifetimes or replace them altogether.



We want to continue to improve our ability to manage our assets, including developing a better understanding of our assets' conditions and how they deteriorate. We would like to do this by taking on more direct responsibility for managing, maintaining and improving our assets and investing in gathering, recording and analysing asset condition data. This will help us to make better decisions, maximising the value of the assets and minimising disruption to our users.

Supporting economic growth

We understand our network's vital role in connecting the country and supporting economic growth. A significant part of our programme for Road Period 2 will be focused on improving existing connections and creating a small number of new connections.

We will continue to roll out smart motorways, increasing capacity on our busiest motorways. Other parts of the network also need priority investment: for example, junction improvements and bypasses to enhance safety and benefit communities, and to improve journey times and connect better to local roads. It is important that these decisions are informed by the current and future performance of the road, local growth plans. We also need to support the government's wider priorities, including continuing our collaboration with Heathrow Airport and High Speed 2 to ensure that we are supporting connectivity with other major transport modes, unlocking growth and prosperity. We recommend that growth and housing designated funding also be used to support the economic growth agenda.

We aim to provide stress-free journeys from door to destination. To achieve this we aim to integrate better with other roads, coordinating traffic management with local highway authorities so that traffic flows better across the whole road network, no matter who manages it.

Making roads work for everyone

We want to provide a network which safely meets the demands of all users including communities close to the network, and vulnerable users such as cyclists, pedestrians and equestrians. We would like to invest in more, safer and better links for these groups. This will require careful thought to ensure that alternative provision is provided as we upgrade them to expressways. We also need to help people make sustainable travel choices. Designated funding that is focused on connecting communities will help us to do this.

Working more harmoniously with our environment

Our aspiration is not just to minimise harm, but to run a network which works harmoniously with its surroundings to deliver an overall positive impact on the environment.

To help move toward a zero emission society, we would like to see greater provision of electric charging facilities on the SRN. We will aim to work with partners and stakeholders to support the continued increase in use of electric vehicles.

Investment in the network can present an environmental challenge, but also provides a huge opportunity to deliver a network that works in greater harmony with the environment than in the past. To help deliver this, we aim to ensure that the strategic design panel's vision and principles are implemented effectively whenever we renew or improve the network and that the 10 principles of good road design become a practical tool underpinning all of our work. We also agree with the panel's recommendation to trial independent design reviews on a selection of proposed new road schemes in sensitive locations through the use of a design review panel to provide timely expert advice to our project design teams.

As well as new schemes, we would like to continue to a green retrofit of our soft estate to restore its condition for the benefit of landscape, heritage and biodiversity and work toward a net gain in biodiversity.

To this end, we recommend designated funding for wellbeing and environment: a continuation of our existing environment fund, but more holistic in scope, covering human health and wellbeing, and the natural, built and historic environment.

Preparing for the roads revolution

We believe that road travel will change dramatically in the coming decades. We must prepare our network for the challenges and opportunities of new technology, such as electrification and connected and autonomous vehicles. By investing now to future-proof the SRN, we can maximise the benefits we gain from these advances.

Our immediate next steps include assessing 5G infrastructure, which would support connected vehicles, and making an investment recommendation for the next road period. We will continue to carry out trials and research on developments such as CAVs and EVs.
We also believe that the way we understand and interact with our customers will be transformed by the big data revolution; we will need to invest in this capability to make the most of it. We would like all of this work will to be supported by designated funding for innovation.

6 How we will deliver

6.1 A high performing organisation

Our activity during RP1 has increased year-on-year and we anticipate this trend to continue in RP2. We are meeting the challenges of delivering RP1 but to continue to become more efficient and deliver at greater scale during RP2 we must continue to enhance our capacity and capability to deliver on our commitments. Highways England needs an appropriate staff complement, with the right skills to manage the challenges coming our way in RP2 and beyond.

We are already building, but as the scale of our delivery increases through this road period, we will do even more. We have developed a corporate plan to 2020, HE2020: Our organisational plan that describes the changes we are making across the company to make sure that we become a high-performing organisation and deliver on the government's first Road Investment Strategy.

Our plan for 2020 is a necessary step toward becoming a high performing organisation in the next road period. A high performing organisation has continuous improvement at its core. Highways England will continue to support our supply chain to manage delivery and performance improvement through the effective use of management information. We will build the lean capability of our company and supply chain to enable the identification of problems and opportunities, maximising customer value and driving improvements through all areas of our business. We will be working with the Department for Transport and ORR to ensure that we are well-prepared for the challenges ahead. In our Strategic Business Plan, we will set out our plans to make sure we are ready.

6.1.1 Our people

We are growing and recruiting a talented workforce. To deliver the road improvements which will make journeys safer, faster and more reliable, we need more of the people and skills who can make that happen. As well as recruiting for key skills, we are providing more development opportunities to our current workforce, and ensuring that we equip and empower them with the tools and processes to help them work well and efficiently.

Over the course of this road period the funding available for us to maintain and improve the network more than doubles. While we are delivering some of this work through working more efficiently, new skills and additional capacity are needed. During 2016-17, we grew by over 500 staff, and anticipate a further 1,000 this year, significantly enhancing a number of key areas of capability:

- By bringing highly skilled staff from our supply chain into our operational teams, we have built our asset management capability, allowing us to make better and quicker decisions about how we maintain our roads.
- To prepare for the increased number of schemes, we have expanded our capabilities in both programme and project management (so that we can oversee effectively) and legal and contract management (so that we can ensure our suppliers deliver).
- We have reorganised our engineering and technical specialists and are developing capability across these functions and promoting career paths in engineering, for example through supporting 'Year of Engineering 2018'.
- As we expect to be doing more of our work and interactions with our customers digitally in the future, we have significantly enhanced our IT capability.

Operational excellence

We are constantly striving to improve the way we do things. Our current programme of Operational Excellence aims to make our operational capability more streamlined and effective. We are seeking to do this by:

- Putting our customers and their experience at the heart of everything we do
- Streamlining our processes and making sure that they serve our customers effectively
- Integrating our teams so that we can understand our assets and plan work across the country in a joined-up way
- Taking a long-term perspective in planning investment, and empowering people to make the right decisions
- Building collaborative relationships with suppliers and learning together
- Ensuring our data is accurate and using it to make informed decisions and plans
- Giving our staff the ability to update information on the go, using mobiles or tablets

We're also investing to ensure that we can deliver on our three imperatives of safety, customer and delivery by enhancing these strategic capabilities among our people:

- We're developing our safety culture internally and in our supply chain through our safety leadership programme, ensuring all managers put safety at the heart of their decisions
- By creating customer service director roles across key parts of the organisation, and training and developing staff, we're driving this capability forward
- Our leadership development programme provides training to over 1,000 leaders at every level from executives to frontline managers, embedding our values and behaviours so that we can consistently deliver on our ambitions
- We're developing leadership capability in our supply chain too through our sector-wide Roads Academy.

Young people are the future of any organisation, and we're determined to attract and develop young talent to ensure we have the skills to deliver not just the next RIS, but the ones after it too. We expect to recruit at least 100 graduates and apprentices every year to 2021. Our early talent programmes focus on providing a strong talent pipeline for civil engineers, project managers, analysts and IT and commercial specialists.

We have a number of programmes to attract, retain and develop wider talent pools, too. For example, our Women Returners programme aims to attract women back into work after a career break, while a coaching programme is intended to develop and encourage women into leadership roles. We also took part in an inclusive recruitment study, assessing our policies, practices and data, and while the results were largely positive, they also included recommendations which we are taking on board to ensure that we recruit fairly and from the widest possible pool of talent.

Leading women

Our Leading Women network was set up in 2014 by senior women within the company who recognised the benefit of a forum where women can network, share knowledge, and support each other with business challenges. The network has membership of almost 200 women at all levels across the business but welcomes all Highways England employees to attend network meetings.

The objectives of the network are:

- to promote diverse role models for the women in Highways England
- to challenge the organisation to create the right culture and do the right things so that it attracts, retains and promotes a diverse workforce
- to provide a network of support for the women in Highways England

As well as investing directly in recruitment efforts, it's important to get other aspects of our business right to support our recruitment aims. Evidence shows that having a strong employer brand associated with exemplary values and behaviours significantly boosts the ability to attract the best people, and we aspire to develop such a brand. We are also making changes to our pay and grading structure to enable us to be more competitive in the employment market.

Our 2020 organisational plan sets out the changes we are making across the company to make sure that through the remainder of Road Period 1, we will:

- **Work in a more efficient way**, with clear responsibilities and quicker decision making to deliver on our commitments and meet our efficiency target
- **Bring more activity in-house** to have greater control over and better intelligence on the SRN while maintaining knowledge in the company
- **Develop greater customer insights** and be more responsive to our customers' needs
- **Be more proactive** in shaping the future of the company rather than simply reacting to external direction
- **Be more strategic** looking into the future and towards other transport operators and organisations
- **Develop strong collaborative relationships** with our shareholder and building trust with our stakeholders including ORR and Transport Focus.

6.1.2 Working collaboratively with our supply chain

We have been working with our supply chain over a considerable period of time and are constantly seeking ways to improve ways of working. As part of delivering RIS1, we are placing increasing demands on our supply chain in terms of the levels of spend, requiring an uplift in capacity of the market and we expect this to continue into RP2.

Our Supply Chain Strategy includes a range of interventions that continue this on-going assessment of our supply chain and seeks to encourage innovation and collaboration.

The Routes to Market programme has been engaging closely with the supply market as it looks to establish the next generation of Highways England's frameworks and contracts. These frameworks and contracts will begin during RP1 and continue into RP2, providing continuity. The structure and shape of these has taken into account the views of the market and, as the new frameworks and contracts are procured, will involve close working with suppliers.

We are taking a structured view of our supply chain through market segment analysis. This draws particular focus to segments where we have high spend, but our internal analysis suggests there may be supply risks, such as under capacity, or limited competition.

Our market engagement and analysis includes assessment of suppliers directly engaged by Highways England and their subcontractors.

Our Supply Chain Strategy sets the foundation for how we want to work with suppliers. It sets out where Highways England and highways suppliers work together:

- aligning around clear and transparent shared objectives
- engaging on structures to deliver performance and improvement
- committing to develop and delivery capacity and capability

Being delivered within RP1, the changes will put Highways England and its suppliers in a position to deliver the increased demands of RP2.

The strategy focuses on four areas:

- **Deliver business outcomes** – we expect RIS2 to continue the increasing trend in ramping up investment towards a regular stable level of investment that ensures the network remains sustainable in the long term. Our supply chain is a core part of delivering this. We need their support in terms of increasing capacity.
- **Build capability** – seeking to continue to improve effectiveness and efficiency of delivery. We also want to make improvements to customer service, for example by reducing lane closures.
- **Develop relationships** – including sharing outcomes between customer and supplier, endeavouring to spend more time focusing on outcomes than on contracts and compliance. The focus will be on creation of value, irrespective of where in the supply chain it is created.
- **Deliver performance** – using value chain plans across Highways England and suppliers to remove waste and ensure that each part of delivery focuses on the outcome.

Roads Academy: growing leaders of the future

We have been developing our supply chain leadership capability for a number of years through our sector-wide Roads Academy. Since its inception in 2009 over 100 people have graduated from our Roads Academy Senior Leader's programme with new skills in leadership, strategic thinking, collaboration and leading change. The academy has expanded this year with a new Emerging Leaders programme with over 50 people starting on programme from October. In January our degree apprenticeship level programme will start to complete a management and leadership career pathway for the sector. We expect 200 people a year to be starting on academy programmes moving forwards giving the sector a strong management and leadership talent pipeline.

A focus on value remains at the heart of the strategy. We need our suppliers, irrespective of where they sit in the supply chain network, to contribute to that value. This will range from identifying waste and bringing forward innovative ideas that may challenge legacy delivery methods.

We know that our supply chain works more efficiently when it can plan ahead, and we continue to work hard to keep them informed of future workload and skills requirements.

6.1.3 Delivering value for money

We're committed to spending taxpayers' money well. This requires us to review all investment decisions to ensure their benefits to society significantly outweigh their costs.

We continue to monitor all our major projects to ensure they will deliver value for money. To help embed this culture in the organisation we have set up a series of sponsorship teams with embedded analysts, challenging our delivery teams to ensure benefits are maximised, costs and disbenefits are minimised throughout the delivery process.

We are committed to improving our understanding of how road investments impacts on society. This includes developing a suite of tools that will help us to analyse the impacts of our investments faster and more effectively than ever before.

We will continue to pursue opportunities to generate private investment in our network. We are working towards using Private Finance (PF2) to finance schemes where this is value for money, such as Lower Thames Crossing and the A303. We will also be thinking more creatively about how to involve private finance, working with government to investigate land value capture where our investments make this possible, developing commercial income streams (for example new motorway service areas) and seeking developer and beneficiary contributions. As an example of what this we are working with major local businesses to secure a contribution to the construction of the Lower Thames Crossing which benefits their businesses, and the wider country, by opening up access to the port.

6.1.4 Driving further efficiencies

We also strive to deliver value for money by pushing down on our costs. In RP1 we committed to deliver £1.2 billion of efficiency savings over a five-year period. We are well on our way to achieve this, having exceeded our annual efficiency target for 2016-17.

Efficiencies are being piloted through increased supply chain collaboration and these will be deployed going forward across geographical regions and programmes as part of 'business as usual' by the start of the next road period. This will continue to drive delivery of efficiency.

Our focus on carrying out capital renewals programmes more efficiently is continuing through adjusting the timing of work to take advantage of more daylight and better weather. We are securing efficiencies by packaging major schemes together, combining renewals and routine maintenance, better design and improved reliability, as well as finding new and innovative ways of working.

As we develop our Strategic Business Plan for RP2 we will be looking to build on our early successes in RP1 to continue to drive efficiency. We will be building on our existing approaches, introducing new procurement methods to drive better value, learning from international best practice and driving innovation in the UK to deliver projects more quickly and realise real savings for the tax payer. Our efficiency plans will be developed in conjunction with our supply chain and others and subject to rigorous independent checking by the Office for Road and Rail to ensure they are realistic and stretching

6.2 An enabling framework

When Parliament passed the Infrastructure Act in 2015, it created Highways England as a new government-owned company. We were set up to drive greater efficiencies – £2.6 billion over 10 years – while also delivering better outcomes for customers. The five-year funding settlement and greater delegations we have is enabling us to do this.

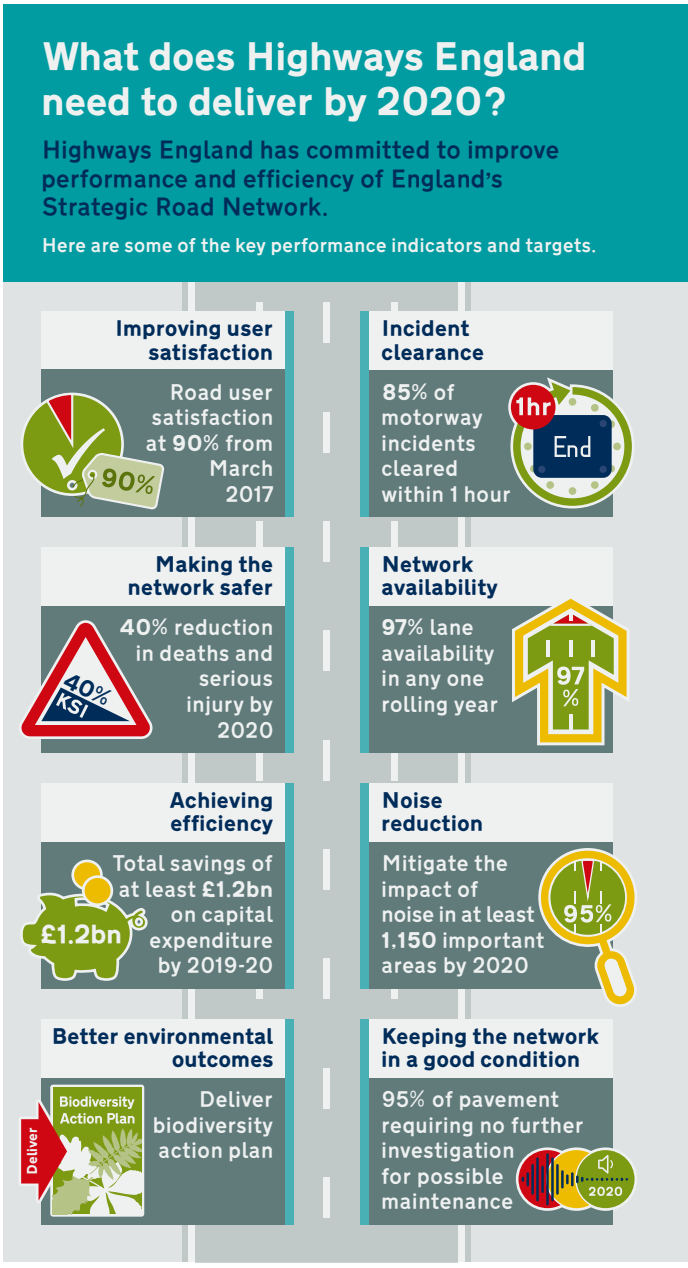
Whilst the additional flexibilities that roads reform has provided within the overall framework of managing public money have already made a difference, we believe there are other areas worth exploring.

At the moment, maintenance tasks are funded from two separate budgets – for example replacing a worn out section of road would be funded from a 'capital' budget whereas cutting the grass or clearing litter would be funded from a 'resource' budget. This means it is more difficult to manage according to whole life cost principles, for example it may incentivise us to accept a larger capital cost in the future rather than pay a smaller resource cost now. We have also experienced cases where we would like to invest in research and innovation style projects but the wrong 'type' of funding has been allocated - which means we have not been able to be as inventive as we would like in identifying new technology solutions or projects that reduce our impact on the environment.

We think now is the time to discuss whether there are benefits in greater flexibility around our budgets in the interests of our road users. We think that our asset managers can achieve better operating efficiency and lower costs – so delivering better value for road users – by managing a single budget. This will support their plans to deliver better maintenance of our assets – the roads, bridges and other structures that make up our network – by being able to make the right interventions at the right time.

6.3 Measuring our performance

During this 5-year road period, our performance is measured on 8 key areas outlined in our Performance Specification:



Although the current performance measures and targets cover a lot of what we do and we are performing well against many of the measures, we think there is an opportunity to revise and improve the framework.

We would welcome a performance framework that measures the things that are important to customers and our shareholders, and in ways that are easily understood by our users.

We also think there is opportunity to learn from the best practice of how the performance of other infrastructure owners and operators is measured and reported. A cross-sector review of outcomes frameworks carried out on behalf of ORR recognises the variation on how detailed different frameworks are, and, in line with the ORR's report, we would advocate fewer outcome areas with associated performance indicators that are a greater priority to our customers, which are measurable and largely within our control.

In light of this, one change principle we would like to explore is making sure there is a more direct relationship between the targets we have and our ability to take decisions that help us meet them.

We think therefore that our next performance framework should be in two parts. One part would include information and performance data that we report and that will be of interest to road users and our wider stakeholders. This will help our customers understand how the network performs and some longer term trends. Alongside that, ORR should monitor our company performance through a range of performance measures and targets. These would be measures that we can more clearly influence and so will incentivise performance and the right behaviours within the company. We believe we should be penalised for missing targets when we didn't deliver our planned activities rather than because of one or a number of factors we can't control.

There are also potential opportunities to have a more consistent way that targets are set and a clearer understanding of what happens if targets are not met, met or exceeded.

This is not about making targets easier to achieve. It's measuring what we do, and having real measures of our performance.

We are committed to working with the Department for Transport, ORR and other stakeholders in developing the framework.

The SRN moves more freight than all other roads and transport modes combined.

Our asset managers can achieve better operating efficiency and lower costs

We want to hear the views of our customers

7 Have your say…

We want to hear the views of our customers, as well as those of the wider public, local government, and any other groups with an interest in the RIS2 programme. There is a big debate to be had on the future of roads investment, and we welcome your participation in that debate.

The publication of this Initial Report will initiate a public consultation led by the Department for Transport as outlined in:

"Shaping the Future of England's Strategic Roads: Public consultation on Highways England's Initial Report"

We encourage anybody with an interest in the improvement and operation of the strategic road network to respond to this consultation, so that your voice can be heard. To find out how you can participate in the consultation, please visit GOV.UK

Annex A – Major improvement projects continuing beyond 2020

Map Ref	Scheme	Region	Scheme web link	Programme			
				Start of works		Open to traffic	
				Commit	Status	Commit	Status
22	A14 Cambridge to Huntingdon	East	http://roads.highways.gov.uk/projects/a14-cambridge-to-huntingdon/	2016-17 Q3	Started	2020-21	
23	M20 junction 10a	South East and London	http://roads.highways.gov.uk/projects/m20-junction-10a/	2017-18 Q4		2020	
25	M4 junctions 3-12 : smart motorway	South East and London	http://roads.highways.gov.uk/projects/m4-junctions-3-12-smart-motorway/	2016-17 Q4	Started	2021-22	
26	A63 Castle Street	North East and Yorkshire	http://roads.highways.gov.uk/projects/a63-castle-street-improvement/	2018-19		2021-22	
28	M6 junctions 2-4 : smart motorway	Midlands	http://roads.highways.gov.uk/projects/m6-junction-2-to-junction-4-smart-motorway/	2017-18 Q4		2019-20	
29	M6 junctions 13-15 : smart motorway	Midlands	http://roads.highways.gov.uk/projects/m6-junction-13-to-junction-15-smart-motorway/	2017-18 Q4		2021-22	
30	M20 junctions 3-5 : smart motorway	South East and London	http://roads.highways.gov.uk/projects/m20-junctions-3-to-5-smart-motorway/	2017-18 Q4		2019-20	
31	M23 junctions 8-10 : smart motorway	South East and London	http://roads.highways.gov.uk/projects/m23-junctions-8-to-10-smart-motorway/	2017-18 Q4		2019-20	
32	M27 junctions 4-11 : smart motorway	South East and London	http://roads.highways.gov.uk/projects/m27-junctions-4-to-11-smart-motorway/	2018-19		2020-21	
33	M6 junctions 21a-26 : smart motorway	North West		2018-19		2021-2022	
34	M60 junctions 24-27 and junctions 1-4 : smart motorway	North West		2020-21		2022-23	
35	A19 Testos junction improvement	North East and Yorkshire	http://roads.highways.gov.uk/projects/a19-testos-and-downhill-lane-junction-improvements/	2018-19		2020-21	
36	M54 to M6/M6 toll[1]	Midlands	http://roads.highways.gov.uk/projects/m54-to-m6m6-toll-link-road/	2018-19		2021-22	
38	A38 Derby junctions	Midlands	http://roads.highways.gov.uk/projects/a38-derby-junctions/	2019-20		2022-23	
39	A2 Bean and Ebbsfleet	South East and London	http://roads.highways.gov.uk/projects/a2-bean-and-ebbsfleet-junction-improvements/	2019-20		2022-23	
40	M62 junctions 10-12: smart motorway	North West		2017-18 Q4		2019-20	
41	M56 junctions 6-8 : smart motorway	North West		2018-19		2020-21	
42	M3 junctions 9-14 : smart motorway	South East and London	http://roads.highways.gov.uk/projects/m3-junctions-2-4a-smart-motorway/	2019-20		2021-22	
43	A19 Down Hill Lane junction improvement	North East and Yorkshire	http://roads.highways.gov.uk/projects/a19-testos-and-downhill-lane-junction-improvements/	2019-20			
44	A19 Norton to Wynyard	North East and Yorkshire	http://roads.highways.gov.uk/projects/a19-norton-to-wynyard/	2019-20			
45	A1 and A19 Technology Enhancement	North East and Yorkshire		2019-20			
47	M621 junction 1-7 improvements	North East and Yorkshire	http://roads.highways.gov.uk/projects/m621-junctions-1-to-7/	2019-20			
48	M62/M606 Chain Bar	North East and Yorkshire	http://roads.highways.gov.uk/projects/m62m606-chain-bar-interchange/	2019-20			
49	M62 junctions 20-25 : smart motorway	North East and Yorkshire	http://roads.highways.gov.uk/projects/m62-junction-20-to-junction-25-smart-motorway/	2019-20			
50	A585 Windy Harbour – Skippool	North West	http://roads.highways.gov.uk/projects/a585-windy-harbour-to-skippool/	2019-20			
51	A5036 Princess Way – access to Port of Liverpool	North West	http://roads.highways.gov.uk/projects/a5036-port-of-liverpool-access/	2019-20			
52	M6 junction 22 upgrade	North West		2019-20			
53	M53 junctions 5-11	North West		Note 1			

Note 1: Some schemes will not be taken forward at this time and will be reviewed as part of route strategies to identify future needs across the SRN, these will be reconsidered as part of this future planning.

Map Ref	Scheme	Region	Scheme web link	Programme			
				Start of works		Open to traffic	
				Commit	Status	Commit	Status
54	M56 new junction 11a	North West	http://roads.highways.gov.uk/projects/m56-new-junction-11a/	2019-20			
55	M6 junction 19 improvements	North West	http://roads.highways.gov.uk/projects/m6-junction-19/	2019-20			
56	A500 Etruria widening	North East and Yorkshire	http://roads.highways.gov.uk/projects/a500-etruria-widening/	2018-19			
58	M6 junction 10 improvement	Midlands	http://roads.highways.gov.uk/projects/m6-junction-10-improvement/	2019-20			
59	A5 Dodwells to Longshoot widening	Midlands	http://roads.highways.gov.uk/projects/a5-dodwells-to-longshoot-widening/	2020-21			
60	M42 junction 6	Midlands	http://roads.highways.gov.uk/projects/m42-junction-6-improvement/	2019-20			
61	A46 Coventry junction upgrades	Midlands	http://roads.highways.gov.uk/projects/a46-coventry-junctions-upgrade/	2019-20			
62	M40/M42 interchange : smart motorways	Midlands	http://roads.highways.gov.uk/projects/m40m42-interchange-smart-motorway/	2019-20			
63	A45/A6 Chowns Mill junction improvement	Midlands	http://roads.highways.gov.uk/projects/a45a6-chowns-mill-roundabout-improvement/	2019-20			
65	A43 Abthorpe junction	Midlands	http://roads.highways.gov.uk/projects/a43-abthorpe-roundabout-improvement/	2019-20	Started	2017-18 Q1	
66	A428 Black Cat to Caxton Gibbet	East	http://roads.highways.gov.uk/projects/a428-black-cat-to-caxton-gibbet/	2019-20			
67	M11 junctions 8-14 – technology upgrade	East		Note 1			
68	A12 Chelmsford to A120 widening	East	http://roads.highways.gov.uk/projects/a12-chelmsford-to-a120-widening-scheme/	2020-21			
69	A12 whole-route technology upgrade	East		Note 1			
70	A1(M) junctions 6-8 : smart motorway	East	http://roads.highways.gov.uk/projects/a1m-junction-6-to-junction-8-smart-motorway/	2019-20			
71	M11 junction 7a – junction upgrade[3]	East	http://www.essexhighways.org/Highway-Schemes-and-Developments/major-schemes/m11-junction-7a.aspx	2019-20			
72	A34 Oxford junctions	South East and London		2019-20			
73	A34 technology enhancements	South East and London	http://roads.highways.gov.uk/projects/a34-technology-enhancements/	2019-20			
74	M25 junction 25 improvement	South East and London	http://roads.highways.gov.uk/projects/m25-junction-25-improvements/	2020-21			
75	M25 junction 28 improvement	South East and London	http://roads.highways.gov.uk/projects/m25-junction-28-improvements/	2021-22			
76	M4 Heathrow slip road	South East and London		2017-18 Q2			
77	M2 junction 5 improvements	South East and London	http://roads.highways.gov.uk/projects/m2-junction-5-improvements/	2019-20			
78	M25 junctions 10-16	South East and London	http://roads.highways.gov.uk/projects/m25-junction-10-to-junction-16-smart-motorway/	2020-21			
79	M25 junction 10/A3 Wisley interchange	South East and London	http://roads.highways.gov.uk/projects/m25-junction-10-to-a3-wisley-interchange/	2019-20			
80	M3 junction 9 improvement	South East and London	http://roads.highways.gov.uk/projects/m3-junction-9-improvements/	2021-22			
81	M3 junction 10-11 improved sliproads	South East and London		2019-20			
82	M3 junctions 12-14 improved sliproads	South East and London		2019-20			
83	M27 Southampton junctions	South East and London	http://roads.highways.gov.uk/projects/m27-southampton-junctions/	2019-20			
84	M271/A35 Redbridge roundabout upgrade	South East and London	http://roads.highways.gov.uk/projects/m271-and-a35-redbridge-roundabout-upgrade/	2019-20			
85	A31 Ringwood	South East and London	http://roads.highways.gov.uk/projects/a31-ringwood-road-widening/	2020-21			
86	M49 Avonmouth junction	South West	http://roads.highways.gov.uk/projects/m49-avonmouth-junction/	2019-20			
87	M5 Bridgwater junctions	South West	http://roads.highways.gov.uk/projects/m5-bridgewater-junction/	2019-20			

[3] M11 junction 7a – DfT have requested that funding previously allocated for improvements to M11 junction 7 be transferred to Essex County Council for the delivery of an alternative junction - M11 junction 7a. It is envisaged that this new scheme will start works within this roads period and a more detailed delivery programme is under development with the local authority.

Map Ref	Scheme	Region	Scheme web link	Programme			
				Start of works		Open to traffic	
				Commit	Status	Commit	Status
88	A52 Nottingham junctions[4]	Midlands	http://roads.highways.gov.uk/projects/a52-nottingham-junctions/	2019-20	Started		
89	A14 junction 10a	Midlands		2019-20			
90	A5 Towcester relief road	Midlands		2019-20			
91	A30 Chiverton to Carland Cross	South West	http://roads.highways.gov.uk/projects/a30-carland-cross-to-chiverton/	2019-20			
92	A1 North of Ellingham	North East and Yorkshire	http://roads.highways.gov.uk/projects/a1-north-of-ellingham/	2019-20			
93	A1 Morpeth to Ellingham dualling	North East and Yorkshire	http://roads.highways.gov.uk/projects/morpeth-to-ellingham-dualling/	2019-20			
94	A1 Scotswood to North Brunton	North East and Yorkshire	http://roads.highways.gov.uk/projects/a1-scotswood-to-north-brunton/	2019-20			
95	A1 Birtley to Coal House widening	North East and Yorkshire	http://roads.highways.gov.uk/projects/a1-birtley-to-coal-house/	2020-21			
96	A628 climbing lanes	North East and Yorkshire	http://roads.highways.gov.uk/projects/a57a628-trans-pennine-programme/	2019-20			
97	A61 dualling	North East and Yorkshire	http://roads.highways.gov.uk/projects/a57a628-trans-pennine-programme/	2019-20			
98	Mottram Moor link road	North West	http://roads.highways.gov.uk/projects/a57a628-trans-pennine-programme/	2019-20			
99	A57(T) to A57 link road	North West	http://roads.highways.gov.uk/projects/a57a628-trans-pennine-programme/	2019-20			
100	A47 North Tuddenham to Easton	East	http://roads.highways.gov.uk/projects/a47-corridor-improvement-programme/	2021-22			
101	A47 Blofield to North Burlingham dualling			2021-22			
102	A47 Acle Straight			2019-20	Started	2017-18 Q4	
103	A47 and A12 junction enhancements			2018-19			
104	A47/A11 Thickthorn junction			2020-21			
105	A47 Guyhirn junction			2020-21			
106	A47 Wansford to Sutton			2020-21			
107	A27 Arundel bypass	South East and London	http://roads.highways.gov.uk/projects/a27-arundel-improvement/	2019-20			
108	A27 Worthing and Lancing improvements	South East and London	http://roads.highways.gov.uk/projects/a27-worthing-and-lancing-improvement/	2019-20			
109	A303 Amesbury to Berwick Down	South West	http://roads.highways.gov.uk/projects/a303-stonehenge-amesbury-and-berwick-down/	2019-20			
110	A303 Sparkford – Ilchester dualling	South West	http://roads.highways.gov.uk/projects/a303-sparkford-to-ilchester/	2019-20			
111	A358 Taunton to Southfields	South West	http://roads.highways.gov.uk/projects/a358-taunton-to-southfields/	2019-20			
112	A50 Uttoxeter	Midlands		2015-16 Q3	Started	2018-19	

[4] A52 Nottingham junctions – In order to deliver benefits ahead of schedule we taken the opportunity to deliver this programme of junction improvements in a phased approach. The first 2 junctions started in 2016-17. Completion of 2 of the remaining 9 junctions will be subject to achieving an appropriate value for money case.

If you need help accessing this or any other Highways England information, please call **0300 123 5000** and we will help you.

This document is also available on our website at **www.gov.uk/highways**

If you have any enquiries about this publication email **info@highwaysengland.co.uk** or call **0300 123 5000***. Please quote the Highways England publications code **PR128/17**.

Highways England creative job number N170233

*Calls to 03 numbers cost no more than a national rate call to an 01 or 02 number and must count towards any inclusive minutes in the same way as 01 and 02 calls. These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone. Calls may be recorded or monitored.

Printed on paper from well-managed forests and other controlled sources.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363