OFFICE OF RAIL AND ROAD

Benchmarking Highways England

2017 Progress Report

December 2017

Contents

Executive summary

We monitor Highways England's delivery of the Road Investment Strategy and advise the government on future strategies. Benchmarking contributes to both of these aspects of our role. By comparing across the strategic road network, with other road operators or organisations, we can gain more insight into Highways England's performance and inform our assessment of proposals for the second Road Investment Strategy.

We expect the value of our benchmarking work to increase in value over time as we improve our understanding of the drivers of performance and efficiency. We are moving in the right direction but from two years' of data we cannot yet draw definitive conclusions.

Looking at five of Highways England's key performance indicators, performance varies across the country. To some extent this is expected – meeting national level targets might mean that performance is higher in some regions than others. And there is improvement in 2016-17, particularly for measures of pavement condition and incident clearance. Highways England is also developing its own benchmarking framework, to spread best practice across its regions and deliver improvements for users.

In 2016-17, Highways England reduced its average maintenance spending; improved its pavement condition measure; and reduced the variation in regional maintenance spending. Some regional variation is to be expected as the nature of the network, traffic levels and maintenance need vary across the country. It is important that Highways England demonstrates that it can identify and efficiently carry out maintenance work.

We have also compared performance with other countries, focusing on journey times and delays – a user priority area. We compared delays across strategic road networks, finding that delays in England are comparable with similar networks elsewhere. High traffic levels are the cause of most delays, and addressing these delays is a long-term challenge.

In the shorter-term, it is important for Highways England to do what it can to reduce delays from incidents or roadworks, which was the focus of another study that accompanies this report. Looking across local authorities and other national road authorities, it identified areas of strength, and made recommendations where Highways England could improve its roadworks management. Highways England engaged very positively with this project. It is taking the findings on board in its plans for how it can improve the user experience.

We have also completed several pieces of work looking specifically at the potential for Highways England to make further efficiency improvements. This includes a set of capability reviews, jointly commissioned with Highways England, in areas that we expect to be important for delivering efficiency in the second roads period. They provide a view of the level of efficiency the company could achieve from these activities but need to be considered alongside other evidence. So the capability reviews alone cannot be used to draw conclusions about overall potential efficiency improvements at this point.

Introduction

1. One of the objectives of the roads reform process was to increase the transparency around how the strategic road network in England is managed. Our benchmarking work is part of that – by providing clear, transparent comparisons of how Highways England's performance varies across its regions, and compares against highway authorities in other countries or companies in other sectors. Ultimately, we hope this will help identify and drive performance and efficiency improvements that benefit the strategic road network's users and funders.

2. This document reports on progress with our benchmarking plan in 2017, building on the work we published last year. With planning for the second Road Investment Strategy (RIS2) now ramping up, there is a focus on developing evidence to inform our Efficiency Review of what is proposed for 2020-25.

3. We expect the value of our benchmarking work to increase over time and so are also supporting longer-term initiatives to establish benchmarking in the highways sector. Central to this is a project being led by the International Transport Forum of the Organisation of Economic Cooperation and Development (OECD-ITF) to set up an international road construction cost database. This has the potential to provide very useful benchmarking information. We are actively supporting the project, and are encouraging Highways England to take a leading role in its early stages.

4. It is important for us to work closely with colleagues in Highways England, as they are in the best position to deliver improvements that benefit road users. We have collaborated on much of the work described in this document. For example, section 2 describes how Highways England is incorporating recommendations from our study of roadworks management into its plans.

5. Highways England has also begun to develop its own programme of regional benchmarking to facilitate the sharing of best practice around its regions. And the company is continuing to play an active role in the Transport Infrastructure Efficiency Strategy, with the aim of developing a benchmarking tool that compares infrastructure projects across the Department for Transport (DfT) family.

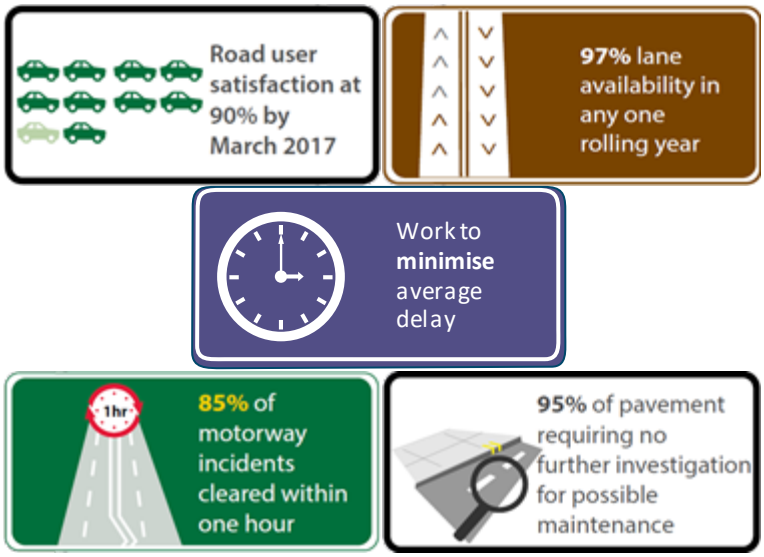
6. We have also worked together on a set of jointly commissioned capability reviews. These reviews looked at Highways England's capability in areas that we expect to be important for delivering efficiency improvements in RIS2. Along with our benchmarking work, they will provide evidence to inform our Efficiency Review. While not strictly benchmarking, we are publishing two capability reviews alongside this report and another shortly. They are discussed in section 3, alongside our cross-sectoral benchmarking work.

1. Regional Comparisons

Regional performance against key performance indicators

1.1 In July 2017, we reported on Highways England's performance in 2016-17 against the key performance indicators (KPIs) in its performance specification. We also collect regional data from Highways England for a subset of the KPIs. This section shows how performance varied across the country in 2016-17 for the five KPIs shown in figure 1.

Figure 1 – Key performance indicators and targets included in the regional comparisons



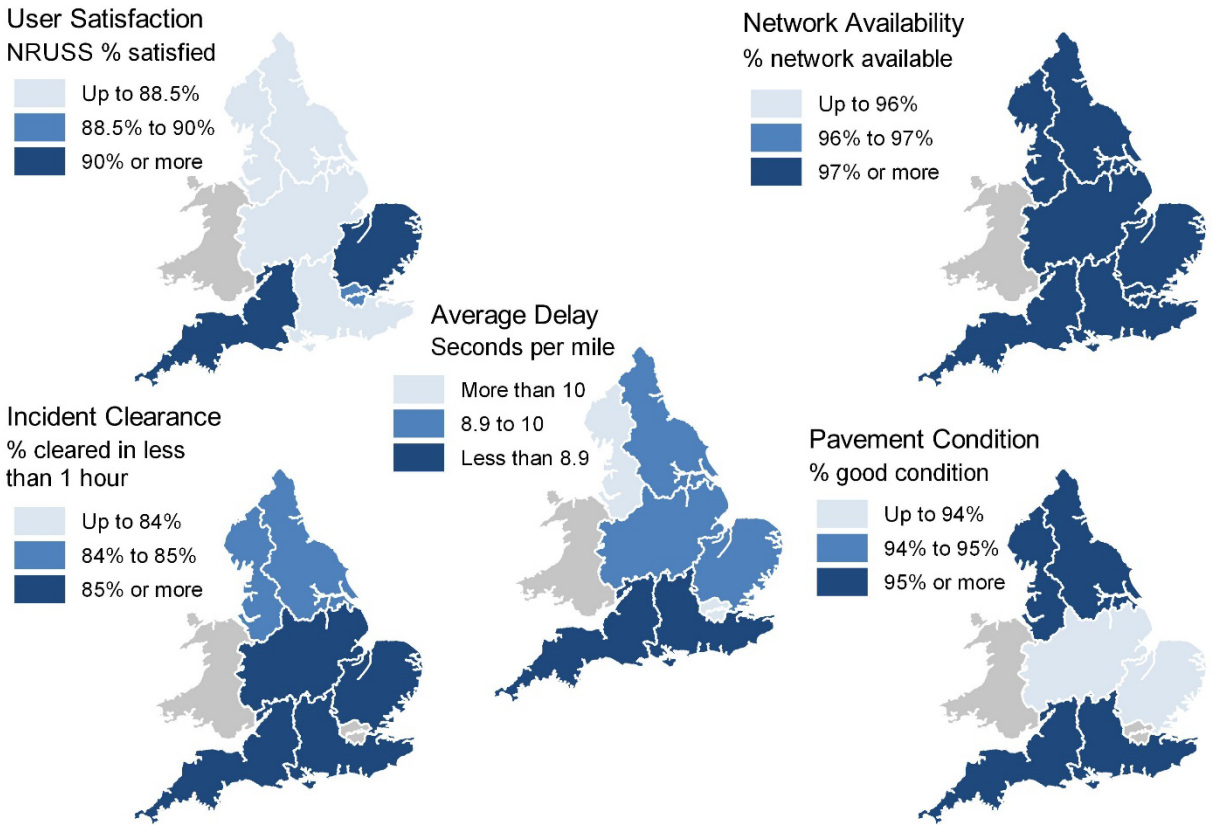
Regional performance maps and dashboards

1.2 Figure 2 shows maps of performance in 2016-17 against the five KPIs across Highways England's regions. The colour coding is based on targets for RIS1, where these exist; uses the same threshold values as our annual assessment; and with darker shades of blue representing stronger performance. Performance is shown relative to Highways England's targets in both the maps and regional dashboards that follow. But these targets are at a national, not regional, level. So it might be expected that in meeting the national target there would be some regional variation, with performance above the national target in some regions and below it in others.

1.3 For some of the KPIs, regional performance strongly reflects Highways England's overall performance. For example, all the regions exceeded the 97% national target for lane availability. In areas where Highways England missed its targets in 2016-17, the maps highlight that worse performance is often concentrated in some regions of the country. For example, pavement condition appears poorer in the Midlands and East. Highways England has a plan in place to achieve the national pavement condition target, which has taken regional differences in performance into account.

1.4 Most of the regions performed strongly against some KPIs in 2016-17 and less well against others. The exception is the South West, where all of the national level KPI targets were met and the level of average delay (which does not have a target in RIS1) was relatively low. The reasons for regional performance variation are likely to be complex. The make-up of the network, traffic levels and spending, potentially over many years, are all likely to affect performance and different performance measures will be affected in different ways.

Figure 2 – Highways England regional KPI performance, 2016-17

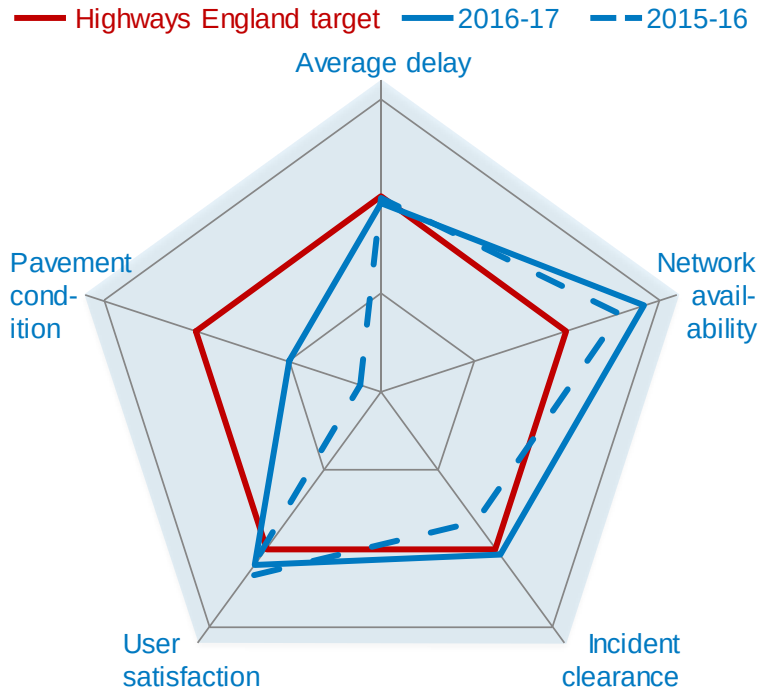


1.5 The following pages present a series of dashboards that combine KPI performance in 2015-16 and 2016-17 with data on the make-up of the network, traffic levels, and Highways England's spending in each region. In general, the dashboards show improved regional performance in 2016-17, particularly in improvements in pavement condition. As we build this dataset over time, we will be able to tell more about the drivers of performance variation and the efficiency of spending.

1.6 The factors affecting performance and efficiency, and the relationships between them are likely to be complex, potentially involving lags between when investments are made and their effects on performance. So care should be taken when interpreting the snapshot of data presented in the dashboards. Annex A provides more detail on the data sources; how we have presented the performance data in 'radar charts'; and how we have treated parts of the network managed under DBFO contracts.

East

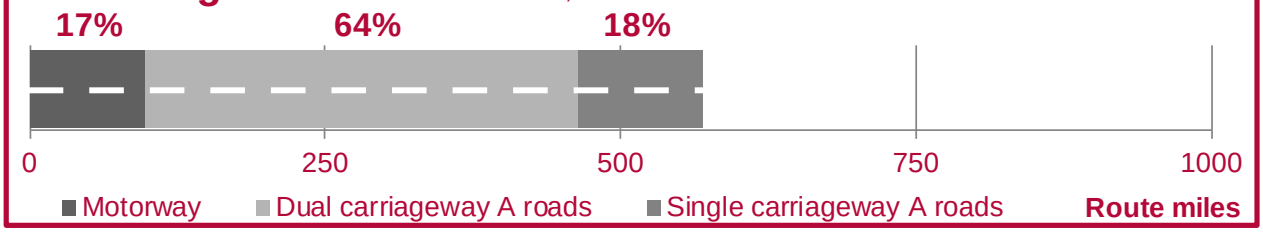
Performance relative to Highways England's target (or average for the delay KPI), 2016-17



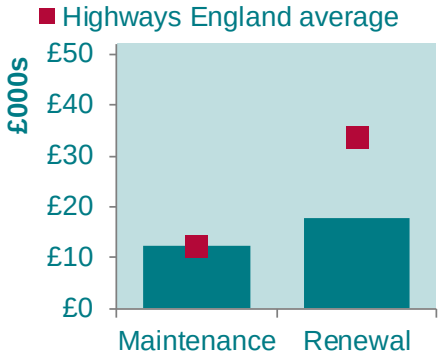
Regional stats

- **6.1m** population
- **£24,000** GVA per head
- **2,034** structures
- **2,561** lane miles

Road length measured in route miles, 2016-17



Expenditure per lane mile, 2016-17



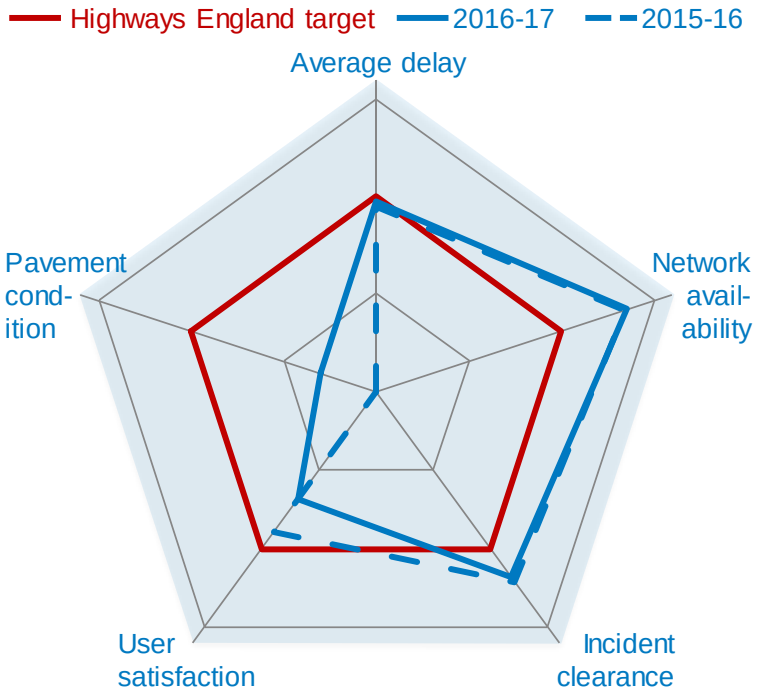
Traffic density

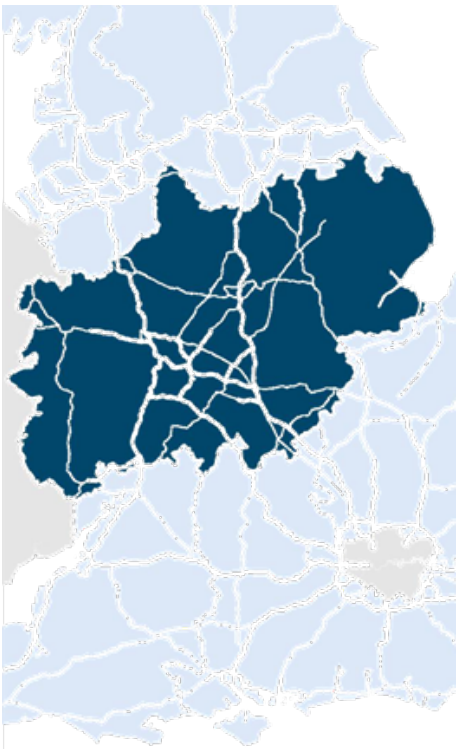
Annual average daily traffic flow, 2016 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

Percentage of HGV traffic

Midlands

Performance relative to Highways England's target (or average for the delay KPI), 2016-17





Regional stats

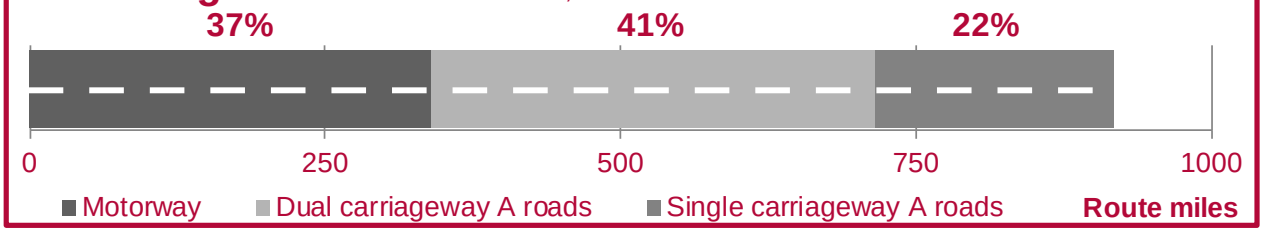
10.5m population

£20,750 GVA per head

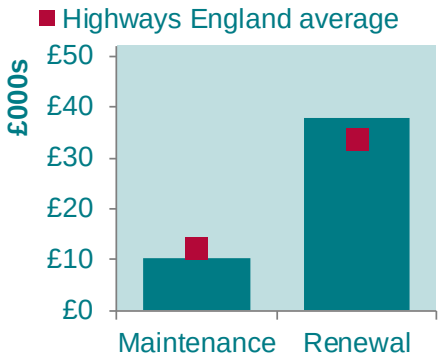
4,390 structures

4,465 lane miles

Road length measured in route miles, 2016-17



Expenditure per lane mile, 2016-17



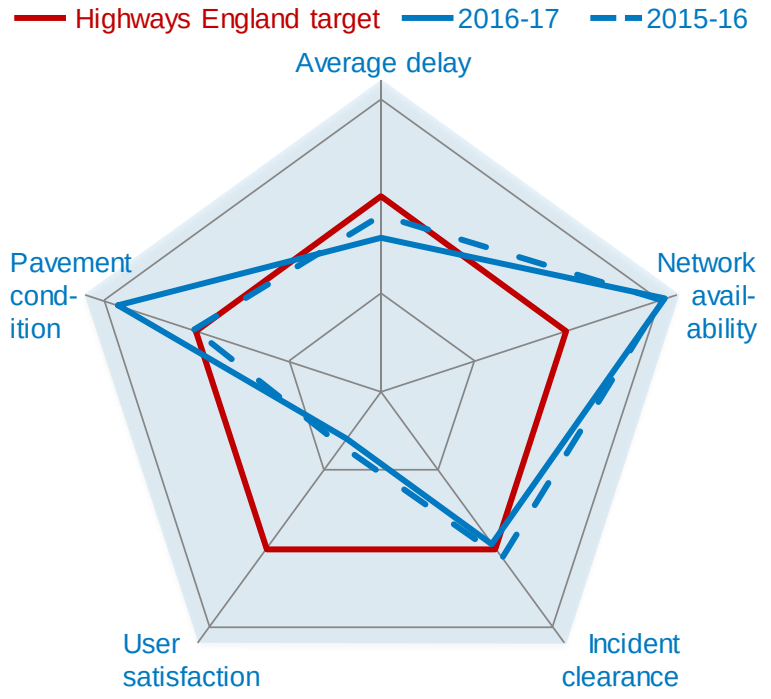
Traffic density

Annual average daily traffic flow, 2016 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

Percentage of HGV traffic

North West

Performance relative to Highways England's target (or average for the delay KPI), 2016-17



Regional stats

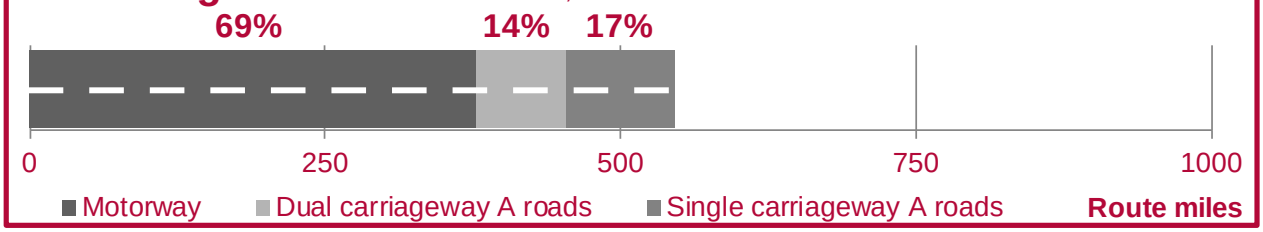
7.2m population

£21,750 GVA per head

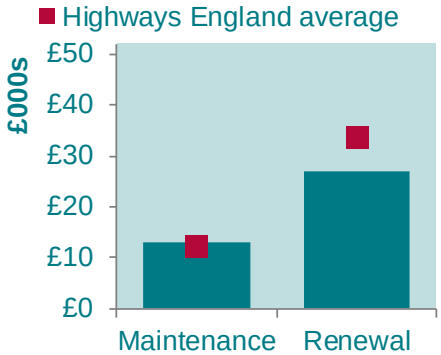
3,063 structures

3,199 lane miles

Road length measured in route miles, 2016-17



Expenditure per lane mile, 2016-17



Traffic density

Annual average daily traffic flow, 2016 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

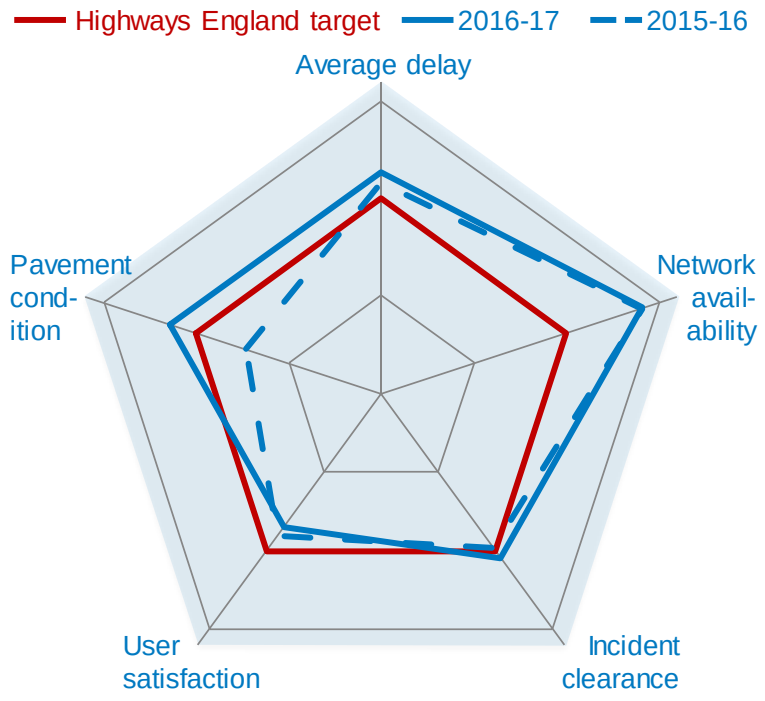
Motorways 85,000

Dual carriageway A roads 27,000

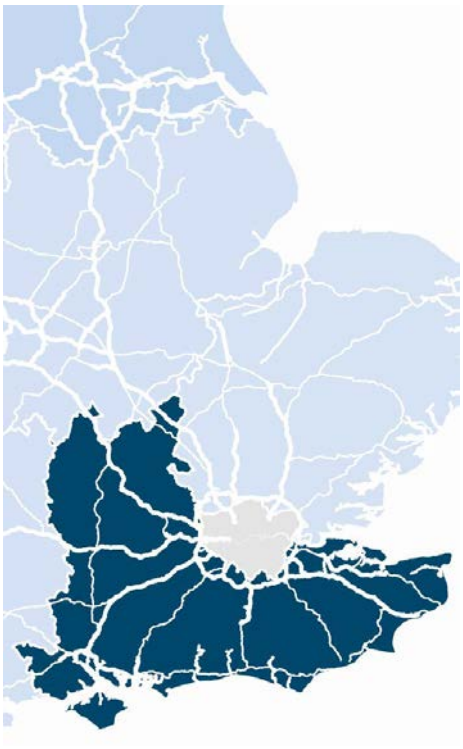
Single carriageway A roads 18,000

Percentage of HGV traffic 11%

Performance relative to Highways England's target (or average for the delay KPI), 2016-17



South East



Regional stats

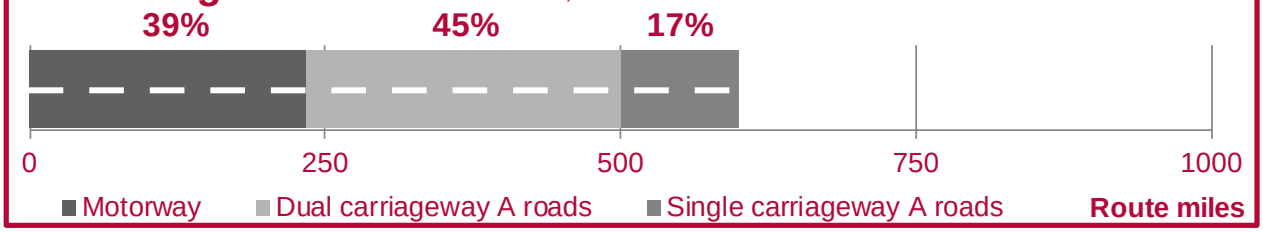
9.0m population

£27,750 GVA per head

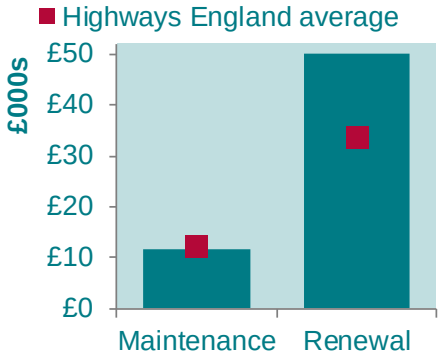
2,448 structures

3,064 lane miles

Road length measured in route miles, 2016-17



Expenditure per lane mile, 2016-17



Traffic density

Annual average daily traffic flow, 2016 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

Motorways 97,000

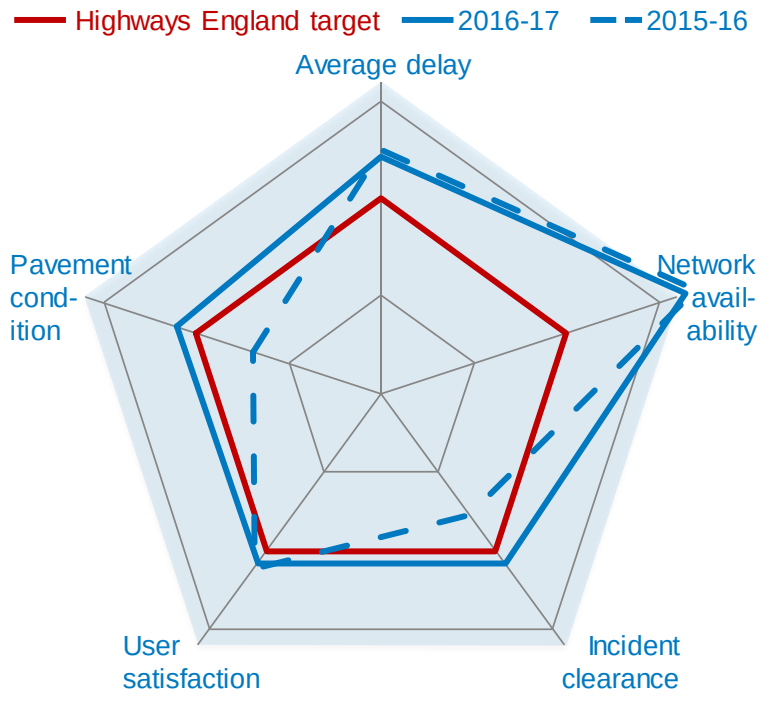
Dual carriageway A roads 57,000

Single carriageway A roads 19,000

Percentage of HGV traffic 8%

South West

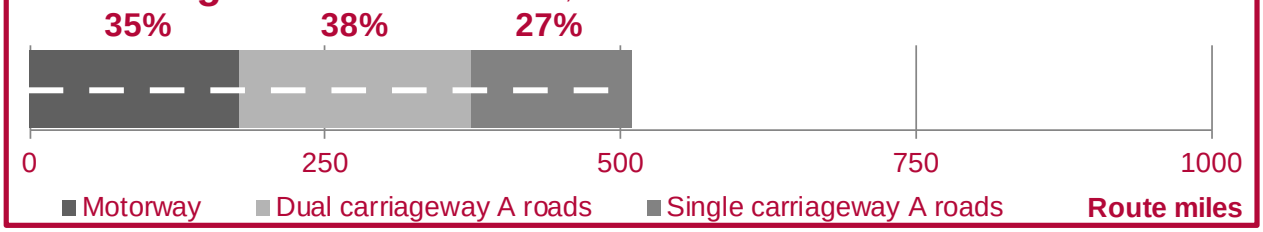
Performance relative to Highways England's target (or average for the delay KPI), 2016-17



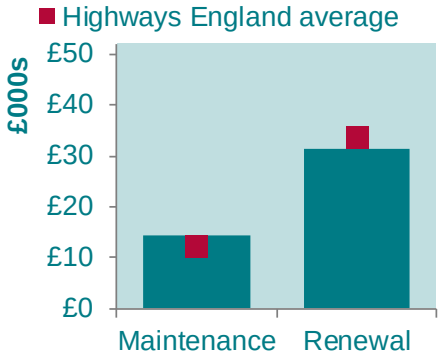
Regional stats

- 5.5m population
- £23,000 GVA per head
- 1,878 structures
- 2,356 lane miles

Road length measured in route miles, 2016-17



Expenditure per lane mile, 2016-17

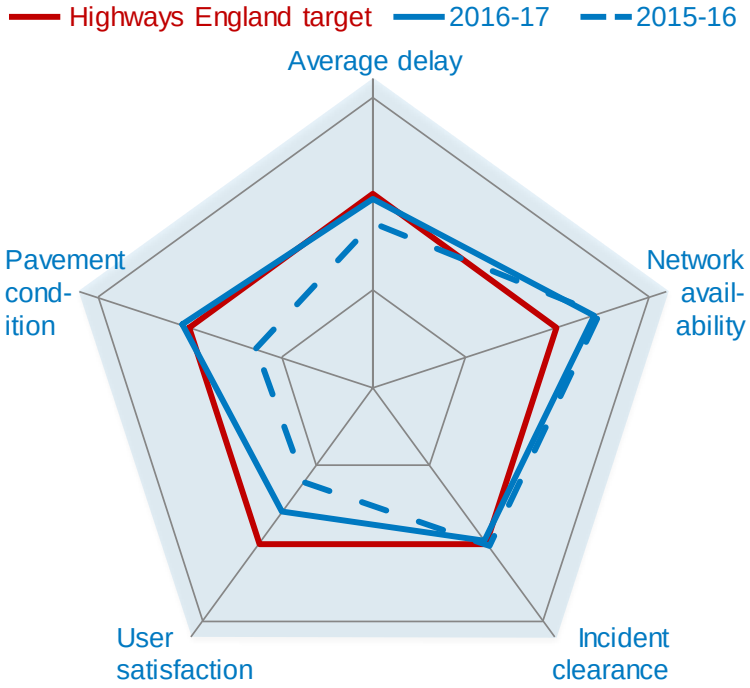


Traffic density

Annual average daily traffic flow, 2016 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

Percentage of HGV traffic

Performance relative to Highways England's target (or average for the delay KPI), 2016-17

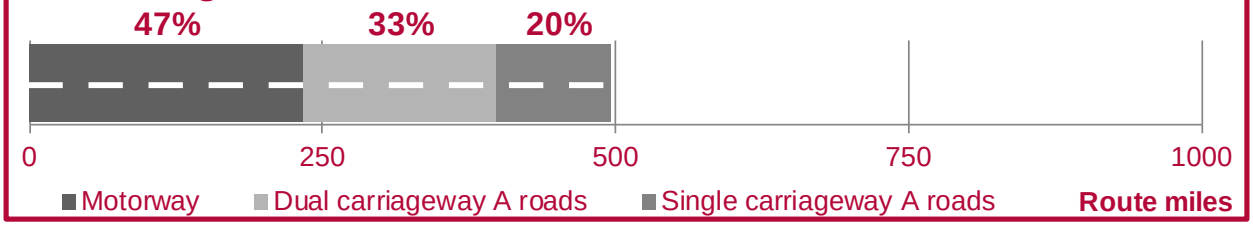


Yorkshire and North East

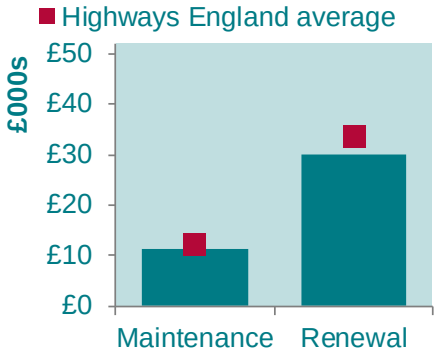
Regional stats

8.1m	£20,000	2,282	2,476
population	GVA per head	structures	lane miles

Road length measured in route miles, 2016-17



Expenditure per lane mile, 2016-17



Traffic density

Annual average daily traffic flow, 2016 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

Motorways	71,000
Dual carriageway A roads	39,000
Single carriageway A roads	16,000

Percentage of HGV traffic

13%

1.7 Our 2016 benchmarking progress report included analysis of possible links between user satisfaction and other elements of Highways England's performance specification. Highways England built on that analysis with a longer time-series (from 2011-12 onwards). It found some statistically significant relationships. But, partly because of the relatively small sample size in the National Road User Satisfaction Survey, these had very low explanatory power. Therefore, Highways England has pursued a qualitative, logic map-based approach to assessing the links between user satisfaction and its drivers.

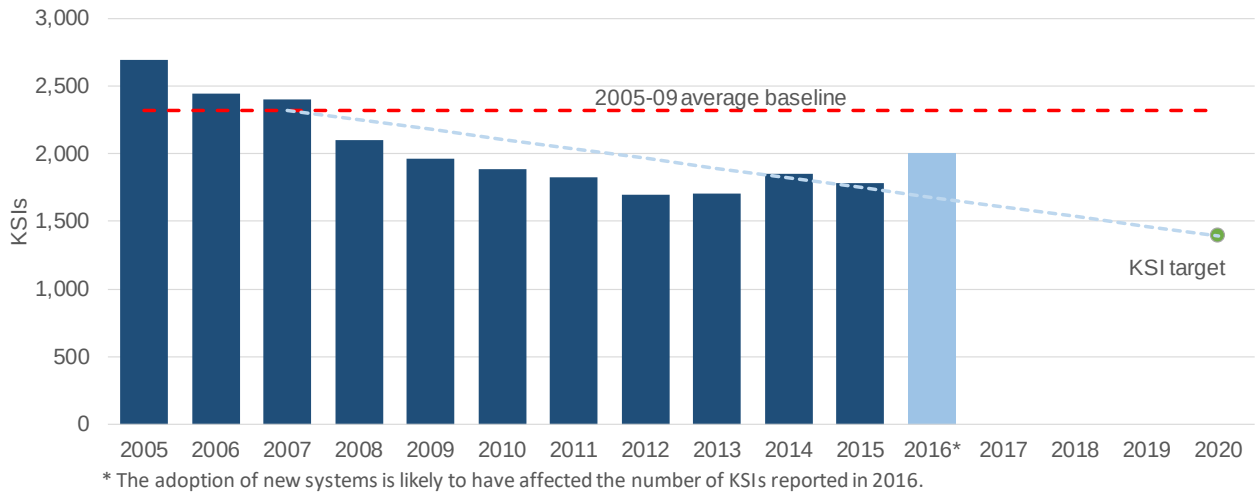
Road safety

1.8 Highways England also has a target to reduce the number of people killed and seriously injured (KSIs) on its network. In last year's benchmarking progress report we showed how the KSI rate varied by region. But we have not included safety in this year's regional comparisons, because of changes to how the police record road accidents and casualties.

1.9 Figure 3 shows that the number of KSIs increased in 2016 according to the DfT's published statistics. During 2016, around half the police forces in England began using a new system to record road accidents and casualties, CRASH, and the Metropolitan Police Service introduced its own new system, COPA. In its initial analysis, DfT reports that these new systems might have improved the accuracy of severity recording, but also might have contributed to the increase in KSIs.[1] DfT has commissioned the Methodology Advisory Service at the Office for National Statistics to research the impact of the new reporting systems; provide guidance to users on how to understand the effect; and produce consistent time series that are independent of the system being used.

[1] For more detail, see Reported Road Casualties Great Britain, annual report: 2016, DfT, 2017: https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-annual-report-2016

Figure 3 – Killed or seriously injured on the strategic road network, 2005-2016

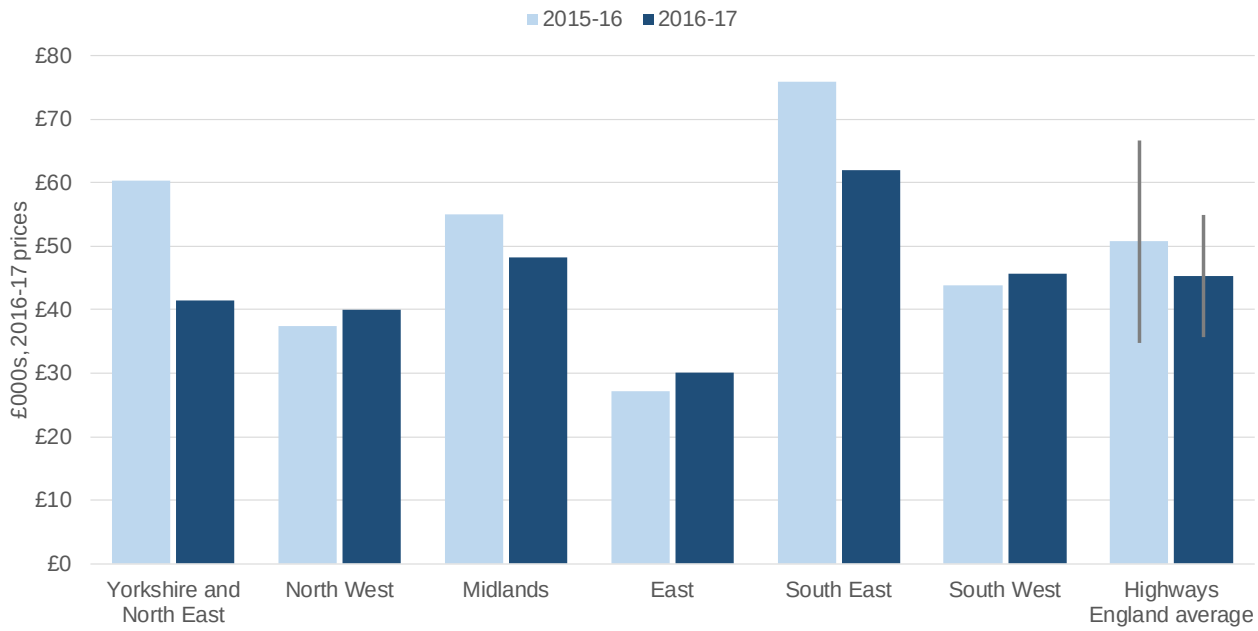


Highways England's regional maintenance efficiency

1.10 We now have two years of the data shown in the dashboards. This is not enough to fully understand all the drivers of performance and efficiency but it does allow us to begin to look at trends over time. The dashboards show how performance changed from 2015-16 to 2016-17 and figure 4 summarises the changes in regional maintenance (and renewal) spend.

1.11 Among other factors, maintenance spending would be expected to vary with the length of the strategic road network (SRN) in each region. So the data are normalised to a per lane mile basis. Figure 4 shows that Highways England increased its 2016-17 maintenance spending in the three regions with below average 2015-16 spend, and reduced spending in the other three regions. The overall effect, shown in the 'Highways England average' columns in the chart, was a reduction in both the average maintenance cost per lane mile, and the variation in regional spend (shown by the grey bars around the final two columns). Figure 4 does not include spending on major projects, which increased in five regions in 2016-17.

Figure 4 – Maintenance and renewal spend per lane mile, 2015-16 and 2016-17



1.12 There are many reasons why spending might vary between regions and over time. So from simple, top-down unit cost analysis like this, with only two years of data, we cannot draw definitive conclusions about Highways England's efficiency over time, or regional differences in efficiency. We will continue to collect this regional data so that we can build a longer time-series and gain more insight in future analysis.

1.13 In the meantime, we have begun to develop models of Highways England's regional maintenance spend and efficiency. While they still take a top-down approach, the key advantage of these models over unit cost analysis is that they can take multiple factors, or 'cost drivers', into account. For example, our initial analysis, looks at the effect of both network length and traffic levels on maintenance spending.[2]

1.14 We plan to develop this analysis further to inform our Efficiency Review of proposals for RIS2. Our focus is on trying to include a more complete set of cost drivers in the models and ensuring the data are robust enough to draw conclusions about efficiency.

[2] Our initial analysis uses a measure of regional maintenance spending, which used to form a KPI for the Highways Agency. This differs from Highways England's current regional reporting of maintenance spending in three key ways: it combines maintenance and renewal together; it includes an estimate of costs on sections of the network managed under Design, Build, Finance, Operate (DBFO) contracts; and it is does not separately categorise 'centrally managed' spending. A description of the spending metric is available here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/8239/measurement-template.pdf

Highways England's internal regional benchmarking

1.15 Highways England has developed an internal benchmarking framework for regional operational performance. Defining this framework allows Highways England to focus on a core set of measures, and provides a skeleton to build on as further business intelligence data become available.

1.16 The framework includes a balanced scorecard to promote the sharing of best practice and comparison between regions, with the aim of driving improvements in safety, customer service and delivery of the road investment strategy through performance management. It is built on a set of consistent measures that are transparent and largely controllable by business operations.

1.17 We and Highways England both recognise that initially the data series will be immature. However, use of a consistent view of relative performance is intended to inspire conversations and collaboration between regions, improving both performance and knowledge as time progresses.

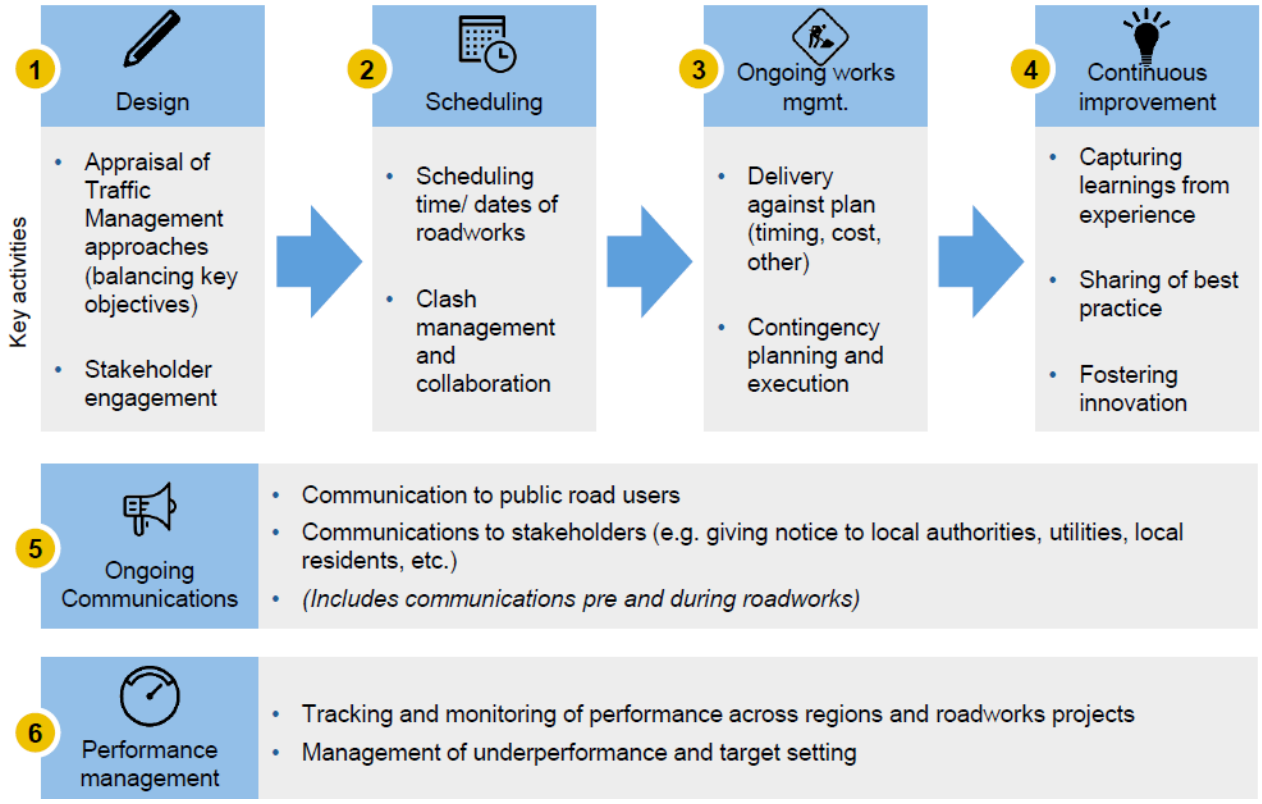
2. International comparisons

2.1 Our 2016 progress report included work we had done to establish a set of the most likely good international comparators for Highways England or the SRN. In 2017, we have built on that analysis in two projects comparing roadworks management and the level of delays on similar networks in other countries. In this section, we provide a brief overview of the two projects and their key findings. The full reports are available on our website.[3]

Roadworks management

2.2 We commissioned Credo to review how Highways England manages its roadworks and to identify opportunities to implement best practice from elsewhere. The project considered roadworks delivery as an end-to-end process. As shown in figure 5, this goes from design through to continuous improvement, with communications and performance management treated as ongoing activities.

Figure 5 – End-to-end process of roadworks delivery



2.3 Credo undertook a wide range of interviews to understand Highways England's current practices and performance, and to identify examples of best practice from

[3] All the reports are available here: http://orr.gov.uk/highways-monitor/publications/benchmarking-highways-englands-performance-and-efficiency

other infrastructure owners or operators. This included national road authorities in other countries, local authorities and other UK-based infrastructure operators.

2.4 Highways England engaged very positively with the project and has used the recommendations to inform how it plans to improve its management of roadworks further. The box below sets out some of the steps that Highways England has already taken, and how they fit with recommendations from the report.

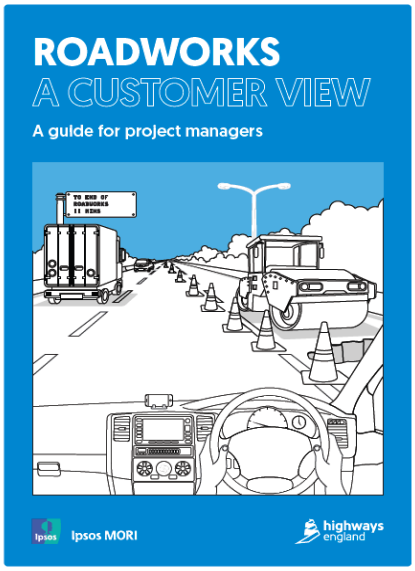
How Highways England is acting on the report's recommendations

"We at Highways England very much welcomed the Credo review which has given us a real opportunity to better understand the effectiveness and perception of how we currently plan and manage our roadworks. Whilst recognising that there are areas for improvement, we were pleased to see that the report highlights some areas of good practice by Highways England, for example, in our major projects roadworks planning and design. We have used the findings and external best practice learning identified in the review to help inform our current and future thinking and where appropriate built these into our existing plans.

Case Study Initiatives

One of the key findings identified in the report is the importance of ensuring that the customer experience is prioritised appropriately and we are taking forward a number of initiatives in this area. For example we have undertaken a trial on looking at increasing the speed limits through our roadworks to 60mph where it is safe to do so for both road users and workers. During the trial there were reduced journey times for customers through the roadworks sites involved. Customers also perceived the 60mph speed limit positively, both in terms of journey time and overall satisfaction.

This year we have also developed a guide for our project managers which provides a customer view of how to improve our roadworks. The guide is based on customer insight from 900 customer audits, 6 engagement forums and a range of other sources. Alongside this we are taking forward monthly customer audits of our biggest projects on the network. Through these audits customers give us feedback on their journey experience through our roadworks with a focus on safety, the customer perception of the works and the information provided. The output from these audits is provided to our project teams to help inform and improve their decision-making as the works are delivered.



Another example initiative is our Roadworks Mapping Tool which has been developed to display, in map based format, where planned works are due to be delivered on the network over the next 3 years. The aim of the tool, using a built in functionality, is to make the lives easier of those who either develop the regional forward programme of works or project manage schemes to help them optimise, with a longer term focus, the use of roadspace. The tool is currently in place in all regions and is being actively used by teams to plan and coordinate works.

The tool principally links with the recommendation to "develop a more agile and holistic approach to traffic management based on users end to end journeys", with plans afoot to consider how it can be evolved and improved further to provide an end-to-end view."

Journey time and delays

2.5 In March 2017, we published research we carried out jointly with Transport Focus looking at user priorities for RIS2.[4] This found that journey times are central to how users view the performance of the SRN. Highways England's current KPI in this area measures average delay. So, we commissioned Transport Futures to compare levels of average delay on similar networks across Europe. There were four key stages to the project:

- consistently defining strategic road networks in each of the comparator countries;
- collecting travel time/speed data from Google Maps for each section of the identified networks;
- defining the 'free-flow' speeds/times against which delay can be measured; and
- calculating the level of delay.

2.6 Throughout, the aim was to produce as similar a measure of delay as possible to Highways England's KPI, which measures the average number of seconds of delay per vehicle mile. But, because of data availability and time and resource constraints for the project, there were some differences in the method used in this project:

- Highways England's KPI uses the speed limit as the 'free-flow' speed but robust speed limit data were not available across all of the comparator networks. So

[4] Measuring performance of England's strategic roads: what users want, ORR and Transport Focus, 2017: http://orr.gov.uk/highways-monitor/publications/measuring-performance-of-englands-strategic-roads-what-users-want

the study used overnight speeds as the 'free-flow' and measured delays when speeds were below 85% of the 'free-flow'.

- Highways England's KPI uses detailed traffic data to estimate the number of vehicles affected by a delay. Again, these detailed data were not available for the comparator countries. So the number of vehicles affected by delays was based on the historic relationship between traffic flows and delays.

- The lack of traffic data also meant it was not possible to estimate delay per vehicle mile in the comparator countries. So two alternative metrics were developed: vehicle delay per day per mile of strategic road network; and the proportion of time that there was delay on the network.

- We would have needed to extract around 770,000,000 observations to cover every link of every network for every 15 minute time slice over a year. So a sample-based approach was used.

2.7 Despite these differences, the study found an average level of delay of 9.15 seconds per vehicle mile on the English SRN, very similar to that reported in Highways England's KPI. As noted above, alternative measures of delay were used to compare across countries and some of the main results are presented in figure 6. When looking by road type (splitting between single carriageways and dual carriageways/motorways), delays on the English SRN are relatively high but are below those in Denmark, Germany and the Netherlands, and similar to Belgium. This is similar to the results from research by the European Commission in 2012.[5]

2.8 Figure 6 also shows that the make-up of the networks matters – delays tend to be higher on single carriageway strategic roads, than on dual carriageways or motorways. The English network has more of these single carriageway roads than most of the other countries. Only Finland, Ireland, Scotland and Wales, all of which are less densely populated than England, have a higher proportion of single carriageway roads. This means that overall, when the single and dual carriageway delays are combined, only Germany had a higher level of delay than England.

2.9 There are likely many reasons for the higher delays seen in England, like relatively high population density; the possible greater use of the English SRN for shorter trips; or the more common use of tolling on major European roads. The ultimate effect of these factors is that the English SRN carries more traffic than strategic networks in other countries. In separate analysis, Highways England found that around 70% of SRN delays are caused by congestion from traffic levels. The remaining 30% comes from roadworks, incidents and other causes, like the weather.

[5] Measuring road congestion, European Commission, 2012: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/measuring-road-congestion

Figure 6 – Vehicle delay per day per road mile on strategic road networks, by road type

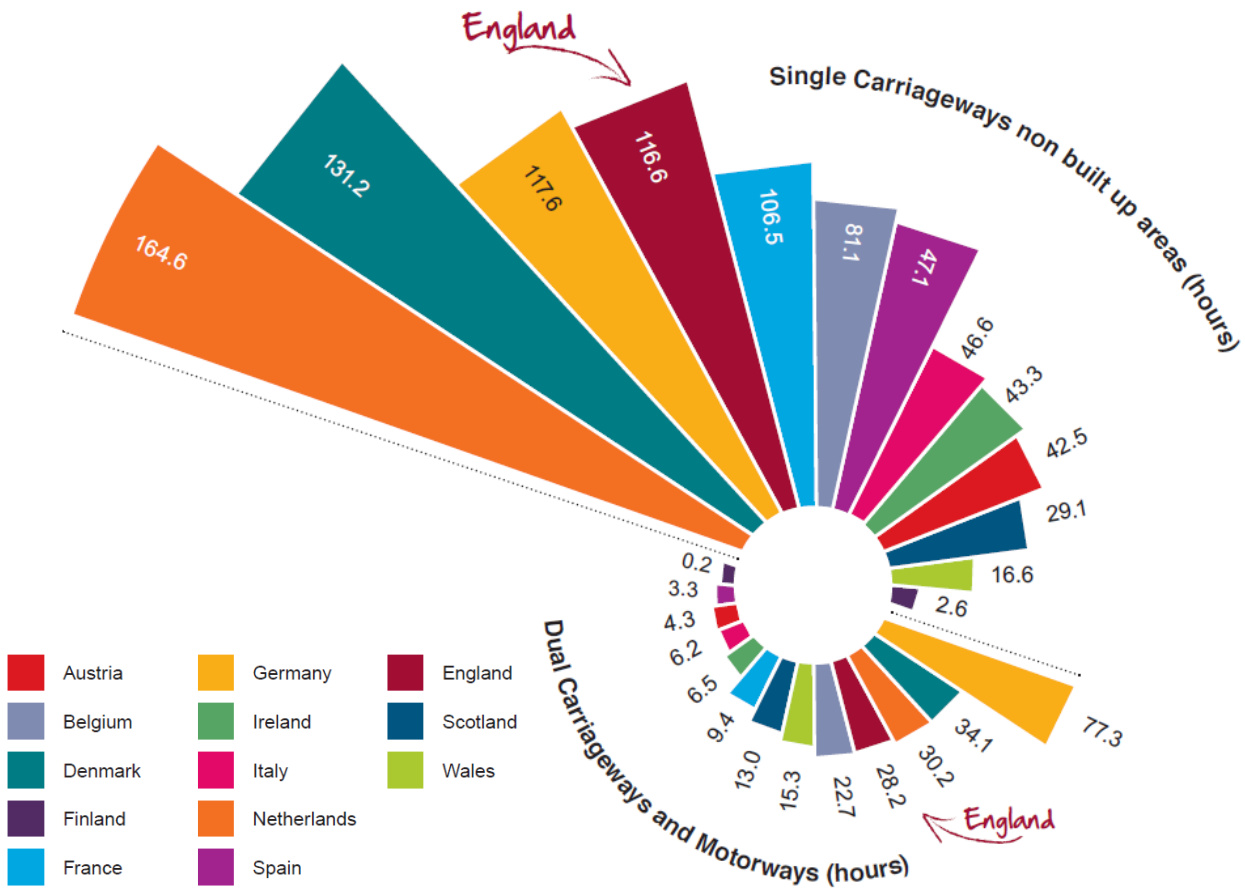
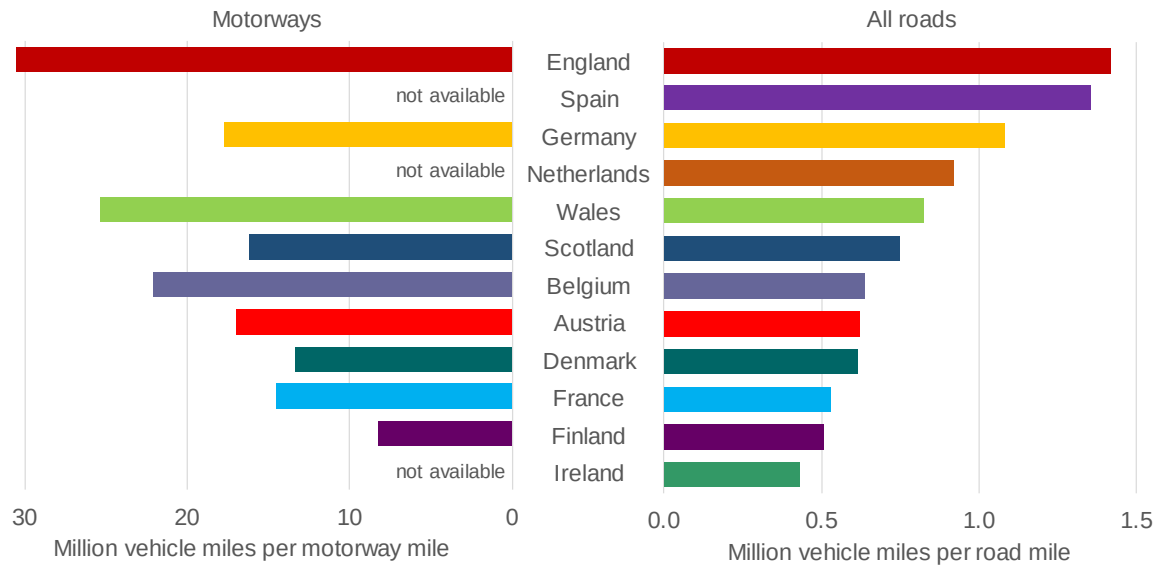


Figure 7 – Traffic density on motorways and all roads across the comparator countries, 2014 or earlier[6]



[6] Sources: All roads – OECD, Environment at a Glance 2015; and DfT statistics. Motorways – Eurostat; German Federal Highway Research Institute (BASt); and DfT statistics.

2.10 As already noted, it was not possible to source traffic data specifically for the networks included in the study. Figure 7 draws together data from a range of sources to compare traffic density – the amount of traffic per mile of road – across the countries. Given the range of sources used, there is some uncertainty around these figures, but they show that, both for all roads and particularly motorways, English roads tend to carry more traffic than in the comparator countries. This provides important context to the relatively high levels of delay found in this study.

2.11 In the short-term Highways England has relatively little control over the amount of traffic using its network, or the delay that it causes. So, especially in the shorter-term, it is important for Highways England to focus on areas where it has more control, like in how it manages roadworks and clears incidents on the network.

International road construction cost database

2.12 The OECD-ITF is developing a project to establish an international database of road construction costs. This is likely to be a long-term project but has the potential to yield highly useful information on how and why road construction costs vary between countries.

2.13 For the initiative to succeed, it is vital that road authorities are involved in defining the data requirements and the forms of analysis that would be of most use to them. In the long-term we want to see Highways England at the heart of a network of national road authorities that share benchmarking data and information. This project is a potentially important step in that direction. So we are encouraging Highways England to take a leading role.

3. Cross-sectoral comparisons

Operational expenditure efficiency in other sectors

3.1 Highways England's current efficiency target is for the company to make £1.2 billion of capital efficiency savings over the first road period. Most of Highways England's funding is for capital spending, but it also has around £1 billion of resource (or operating) spending each year. So it is important for us to consider Highways England's resource spending efficiency, as well as capital.

3.2 We commissioned a study from CEPA to develop efficiency benchmarks for Highways England's resource spending. The study looked at evidence from other sectors, producing a range of benchmarks based on 'real unit operating expenditure' (RUOE) efficiency savings made in comparable sectors (other regulated network industries), and productivity trends in relevant sectors of the economy.

3.3 Highways England's resource spending includes payments made to DBFO contractors[7], which are set by long-term contracts; and spending on 'protocols', additional services that Highways England performs on behalf of the government. We excluded these spending categories from the analysis to focus on controllable cost elements relating to Highways England's core activities.

Real unit operating expenditure

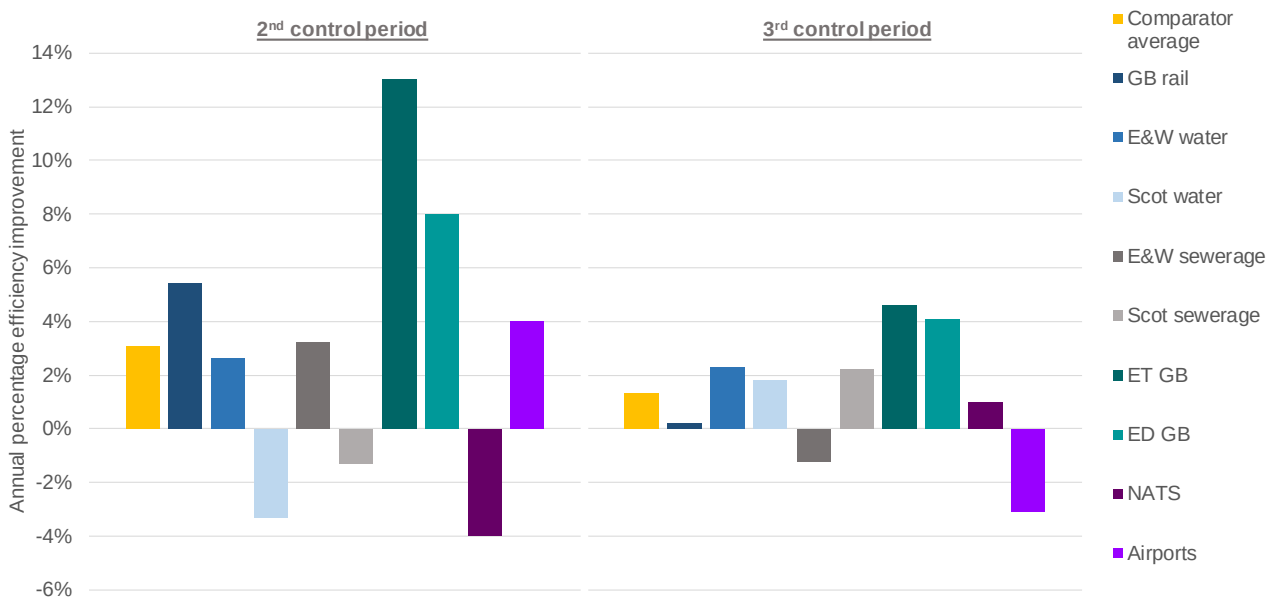
3.4 The analysis followed this process:

- identify a set of comparator industries or companies;
- collect data on comparable categories of resource spending;
- adjust for inflation to convert the spending data from nominal to real;
- divide the real spending by a relevant output metric for each industry to produce a series of real unit costs; and
- measure the average change in the real unit cost over time.

3.5 The analysis focused on other regulated sectors and figure 8 shows the average annual efficiency savings made in the 2nd and 3rd control periods in the included sectors. There is a large range of efficiency savings, particularly in the 2nd control period. But the average efficiency savings across the comparators were 3.1% and 1.8% per year in the 2nd and 3rd control periods, respectively.

[7] Design, Build, Finance, Operate – see Annex A for more details.

Figure 8 – Average annual operating efficiency improvements in comparator sectors



Productivity-based measures

3.6 The project also looked at a range of productivity measures that use data from sectors across the whole economy. This involved matching categories of Highways England's spending to sectors of the economy to build a 'composite index'. Changes in productivity for this index are then tracked over complete business cycles.

3.7 When considering efficiency improvements it is common to distinguish between:

- 'catch up' – the potential to implement best practice improvements from organisations at the 'efficient frontier'; and
- 'frontier shift' – improvements in efficiency for organisations already at the 'frontier' from, for example, adopting new or better technologies.

3.8 Efficiencies measured by the RUOE method are likely a combination of the two, but with a large element of catch up. As they are based on improvements across the wider economy, the results from these productivity-based methods are often interpreted as representing frontier shift.

3.9 The study looked at a range of different productivity measures that treat the factors of production differently. This included:

- TFP – total factor productivity, covering all factors of production;
- LEMSP – labour and intermediate input productivity; and
- LP – labour productivity.

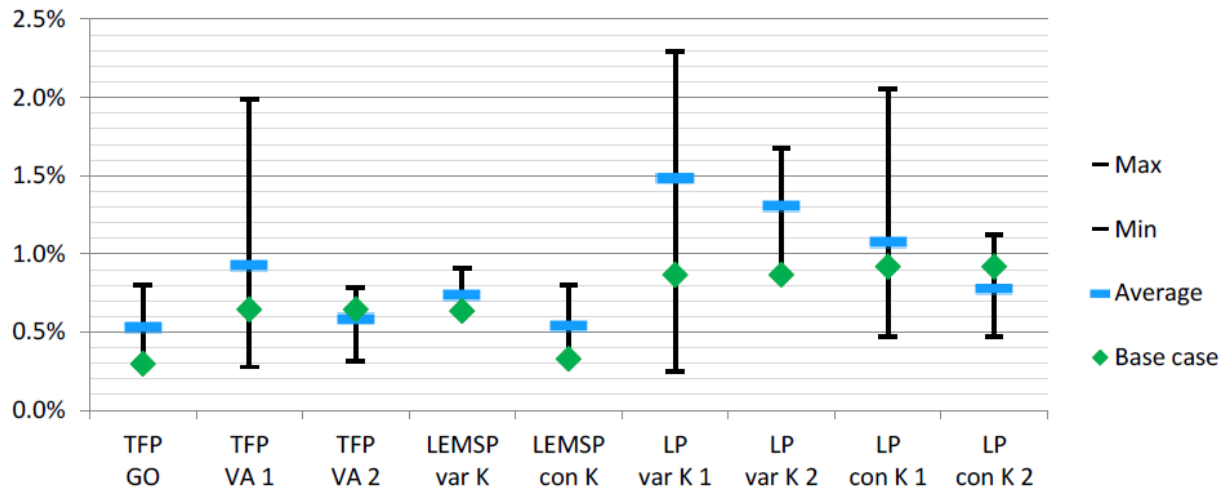
3.10 Productivity improvements were estimated under variants of these measures.

- The measure of output – either 'gross output' (GO), where intermediate inputs are assumed to contribute to productivity growth; or 'value added' (VA), where their impact is removed.[8]
- Capital variability – LEMSP and LP exclude the productivity of capital, and can be calculated with either constant (con K) or variable (var K) capital.
- The period of data coverage – the annual efficiency improvements are calculated over complete business cycles using either the longest available series (variant 1) or a subset of the most recent business cycles (variant 2).
- Sensitivities – testing changing the weights of the different sectors making up the composite index, and varying the time period for the variant 2 measures.

3.11 Figure 9 shows annual efficiency improvements under base case assumptions, and the maximum, minimum and average, for each variant. All of the base case results are in the range of 0.3%-0.9%. As the work focused on resource spending, CEPA's preferred range uses LEMSP and LP results, which exclude capital productivity, but with variable capital, as capital and resource budgets are likely to be set together. This gives a central range of 0.6%-0.9% and can be interpreted as meaning that a reasonably competitive company with similar activities to Highways England would make annual operating productivity gains of around 0.6%-0.9%.

[8] TFP can be measured in either gross output or value added. LEMSP is measured in gross output, as it includes intermediate inputs. LP is measured in value added, as it only includes labour productivity.

Figure 9 – Annual efficiency improvements from productivity-based measures



Source: EU KLEMS dataset, CEPA analysis
Abbreviations: GO = Gross Output, VA = Value-added; TFP = Total Factor Productivity; LEMSP = LEMS Productivity, LP = Labour Productivity; var K = variable capital, con K = constant capital. "1" and "2" refer to coverage period variants.

How we plan to use the results

3.12 These approaches are top-down and based on efficiencies achieved in other sectors, not a detailed bottom-up assessment of where Highways England could improve efficiency. And there are significant differences between institutional changes that happened in the other sectors and the roads reform process that created Highways England. But the purpose of this analysis is not to set a specific efficiency target based on one, or a set of, comparators.

3.13 We expect Highways England's proposals for RIS2 to include a detailed, bottom-up assessment of where further efficiency improvements can be made. From those proposals, we will calculate the implied real unit operating efficiency improvements and can compare them against the range of benchmarks from this study. Along with evidence in Highways England's proposals, and from the capability reviews that are discussed in the next section, this will help us to assess whether the proposals are challenging and deliverable.

Transport Infrastructure Efficiency Strategy

3.14 Highways England is actively involved at all levels of the Transport Infrastructure Efficiency Strategy (TIES) initiative to assist with the development of a benchmarking tool that compares infrastructure projects across the Department for Transport family. The company has provided data in relation to the Hindhead Tunnel as part of the proof of concept, and will continue to engage with TIES during the delivery phase to help realise the benefits.

Capability reviews

3.15 This report has provided an update on progress with benchmarking work which in part will be used as evidence for our RIS2 efficiency review. We also intend to use three recent reviews of Highways England's capability in areas which are expected to be important for delivering efficiency in RIS2. The reviews which are published[9] alongside this document were jointly commissioned with Highways England and report on the company's capability in:

- portfolio and programme management;
- asset management; and
- procurement and contract management.

3.16 The reports provide an assessment of Highways England's current capability, expected future capability at the end of Roads Period 1 and a view of the level of efficiency the company could achieve in RIS2, under a given set of assumptions.

3.17 The capability reviews may overlap in some of the areas of expenditure they cover. We will also need to consider benchmarking data; the specific outputs RIS2 will require Highways England to deliver; and Highways England's own evidence supporting the level of efficiency it is proposing. The capability reviews alone cannot be used to draw conclusions about overall potential efficiency in RIS2 at this point.

[9] Two accompany this report, a third will be published shortly afterwards.

Annex A – Regional dashboards

Calculating the performance radar charts

The 'radar charts' on each dashboard show regional performance relative to Highways England's overall target. Performance has been normalised to the target level and is shown with the red line. If the blue line is outside the red target, then performance exceeded the target for that KPI in that region in that year. The exception is average delay, which has no target. For this KPI the red line represents average delay across the SRN as a whole in 2015-16, with regional performance presented relative to the national average. The table below sets out the outcome areas, metrics and targets for each of the five KPIs:

Outcome area	KPI metric	Target
Improving user satisfaction	Percentage of NRUSS respondents fairly or very satisfied	>90% NRUSS score by 31 March 2017
Supporting the smooth flow of traffic	Percentage of the network (measured in lane kilometres) open to traffic	>97% of the network available to traffic
Supporting the smooth flow of traffic	Percentage of incidents on motorways cleared within 1 hour	>85% of motorway incidents cleared within 1 hour
Encouraging economic growth	Average delay – the difference (in seconds per mile) between actual and free-flow speeds	No target
Keeping the network in good condition	Percentage of the pavement not requiring further investigation for maintenance	>95% of pavement not requiring further investigation

Average delay

As discussed above, performance against this KPI is represented against the average for the SRN, as there is no target. Lower delay represents better performance so the data are transformed in the following way:

$$Average\ delay = 1 + \left(1 - \frac{average\ delay_{region}}{average\ delay_{SRN}}\right)$$

Network availability, incident clearance, user satisfaction and pavement condition

These four KPIs are all measured in percentage terms, with a higher number representing better performance. However, the targets for all four KPIs are relatively close to 100%, making it difficult to demonstrate variation between the regions. Therefore each metric, and its respective target was transformed as shown in the table on the next page:

	KPI	Target	Transformed KPI	Transformed target
Network availability	% lane availability	>97%	% lane **un**availability	<3%
Incident clearance	% of incidents cleared within 1 hour	>85%	% of incidents **not** cleared within 1 hour	<15%
User satisfaction	% fairly or very satisfied	>90%	% **not** fairly or very satisfied	<10%
Pavement condition	% of pavement not requiring further investigation	>95%	% of pavement requiring further investigation	<5%

These transformations produce metrics where a lower score is better. The transformation used for average delay is then applied for presentation in the radar charts.[10] The 2015-16 regional pavement condition data are based on a pro-rata adjustment to the performance reported last year, to reflect the revised figure for the network as a whole in that year.

Treatment of DBFO-managed sections of the network

Management of the SRN is split into a series of areas and regions. There are thirteen areas, one of which (the M25) is managed by a private contractor under a Design, Build, Finance, Operate (DBFO) contract. The other twelve areas are combined together into six regions, with two areas in each region.

Including the M25, there are eleven sections of the network managed under DBFO contracts. Private operators are appointed to design, build and finance major improvements to the network, and to operate (maintain and renew) it over a 30-year period. The regional dashboards, including the network and traffic data, relate only to those parts of the network managed by Highways England's regions – DBFO-managed roads are excluded. The user satisfaction KPI in the radar charts is the exception, as it is not possible to differentiate between DBFO and non-DBFO sections of the network.

The maps on the dashboards show the SRN but do not differentiate between sections that are directly managed by Highways England's regions.[11] More detail on which parts of the network fall into each region, and which are managed by DBFO operators, can be found

[10] The 2015-16 pavement condition data are under further investigation.

[11] Use of the data included in the maps is subject to terms and conditions. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which Office of Rail and Road makes it available; You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form; and Third party rights to enforce the terms of this licence shall be reserved to Ordnance Survey.

here: https://www.gov.uk/government/publications/roads-managed-by-the-highways-agency

Regional stats, road length, spending and traffic

Population

Regional population estimates for mid-2016 were sourced from the ONS and are rounded to nearest 100,000 in the dashboards:

http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland

GVA per head

Gross value added (GVA) data for 2015 were sourced from ONS; divided by regional population to give GVA per head; and are rounded to the nearest £250 in the dashboards:

https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgrossvalueaddedincomeapproach

Structures

The number of structures on each region of the SRN is sourced from Highways England's Structures Management Information System (SMIS)). The main categories of structures included are:

- bridges and large culverts,
- masts,
- retaining walls,
- road tunnels, and
- signs and / or signal gantries.

Road length

Two measures of the length of the SRN are presented in the dashboards:

- route length, split by road type – the sum of the main carriageway lengths only (e.g. excluding slip roads) with a factor of 0.5 applied to dual carriageways; and
- lane length – the sum of the carriageway sections multiplied by the number of permanent running lanes (i.e. hard shoulders are excluded).

Data were sourced from Highways England's pavement management information system (HAPMS) and represent a snapshot for 31 March 2017.

Spending

Maintenance and renewal spending data were sourced from statements F2.1 and F3.1 of Highways England's 2016-17 performance monitoring statements. The spending figures are divided by the lane length data described above to give a figure per lane mile, and are compared with the average across the six regions:

https://www.gov.uk/government/publications/highways-englands-2016-to-2017-performance-monitoring-statements

Traffic

Traffic data are for 2016 and were sourced from DfT Road Traffic Statistics. Traffic on DBFO-managed roads was separately identified but the regional boundaries do not exactly match the boundaries of Highways England's regions. The source data gives vehicle kilometres in 2015 by road and vehicle type. We have converted this to annual average daily traffic flow by dividing annual vehicle miles (for all vehicle types) by route length (as defined above) and then by 365 days to give the daily average.

Flow refers to the number of vehicles passing a point on a road over a given period of the time. The annual average daily traffic flow represents the number of vehicles (travelling in both directions) that would pass a point on the network during an average 24 hour period in 2016.

The percentage of HGV traffic is the proportion of HGV miles in total vehicle miles.