OFFICE OF RAIL AND ROAD

Benchmarking Highways England's performance

2016 Progress Report

December 2016

Contents

Executive summary

In April 2016 we published our plan for benchmarking Highways England's performance and efficiency. This document reports on progress we have made on that plan. Much of the analysis presented here, particularly of regional differences across Highways England's network, is based on a single year of data. We are publishing this as part of the transparent approach we take to monitoring Highways England and to show the direction our benchmarking work is taking. However, it is too early to draw firm conclusions from this analysis, for example around the linkages between regional variations in performance and spending.

Our work to date has been based around three broad areas:

- **Regional comparisons** of performance in 2015-16 show variation for the six of Highways England's key performance indicators that we have analysed. We have developed a set of regional dashboards that include regional data on performance, network composition, traffic levels and spending. We recognise that it is not possible to draw conclusions on the causes of performance variation from a snapshot using a single year of data. Our initial analysis of linkages between these factors has focused on how they affect **user satisfaction**.
- As a first step towards **international benchmarking**, we have identified a set of countries that will potentially be good comparators for Highways England and the strategic road network. We have also made international **road safety** comparisons, finding that England's motorways currently have one of the lowest fatality rates in the world.
- We have commissioned a **cross-sectoral** study looking at support costs and operational expenditure, which will focus on efficiency improvements achieved in other sectors and we expect to complete this in spring 2017.

The ultimate objective of our benchmarking work is to identify and drive potential performance and efficiency improvements. Our role in developing the second Road Investment Strategy (RIS2) provides an opportunity to do this by using benchmarking to inform our assessment of the level of challenge in Highways England's targets. Therefore our plans for 2017 are largely based around informing the development of RIS2 with a focus on developing our regional analysis, including more analysis of unit costs, and more detailed analysis of road safety on the strategic road network. We will also engage with road authorities in the countries we have identified to complement the regional, internal benchmarking with data for similar networks elsewhere.

Introduction

1. As the operator of the strategic road network in England, Highways England is not subject to the sort of competition that drives performance and efficiency improvements in many other sectors. The aim of our benchmarking work is to help mitigate this lack of competition. By comparing Highways England's regions, and comparing the company against highway authorities in other countries or companies in other sectors, we hope to help identify and drive performance and efficiency improvements that benefit the strategic road network's users and funders.

2. In April 2016 we published our plan for benchmarking Highways England's performance and efficiency[1]. The plan set out the mixture of internal, international and cross-sectoral benchmarking we could undertake, looking at many different areas of performance and the efficiency of different categories of spending. This report focuses on the initial steps we have taken towards developing a wide-ranging benchmarking framework and, in the shorter-term, collecting the benchmarking evidence we require to inform our assessment of the second Road Investment Strategy (RIS2). This is our first annual progress report on our benchmarking work and we would welcome views on our approach, which can be sent to Highways.Monitor@orr.gsi.gov.uk.

3. We expect the value of our benchmarking work to increase over time and consider it will be most successful if pursued as a collaborative effort. Therefore, we have set-up a joint working group with Highways England to discuss how our analysis should develop and to ensure our respective benchmarking activities are well aligned.

4. Highways England is taking forward its own programme of work in a number of areas, including their work to align the Collaborative Performance Framework (which is used to measure suppliers' performance) across the various contracts and regions. The company has also begun to benchmark their corporate functions and organisational structures, to assist internal business planning processes. This is at an early stage and by working with CIPFA (Chartered Institute of Public Finance and Accountancy Body), it hopes to understand how its corporate functions rank against 200-plus government organisations.

5. In addition, Highways England is currently chair of the Infrastructure Benchmarking Group, involving Network Rail, Transport for London and the Environment Agency. This is focusing on exchanging best practice across a wide range of improvement and operational activities. Finally, Highways England is involved with the DfT-led Infrastructure Efficiency Strategy, which is aimed at addressing the current lack of evidence around costs and cost drivers, setting out recommendations that the DfT family can adopt to improve their delivery of efficiencies in the future.

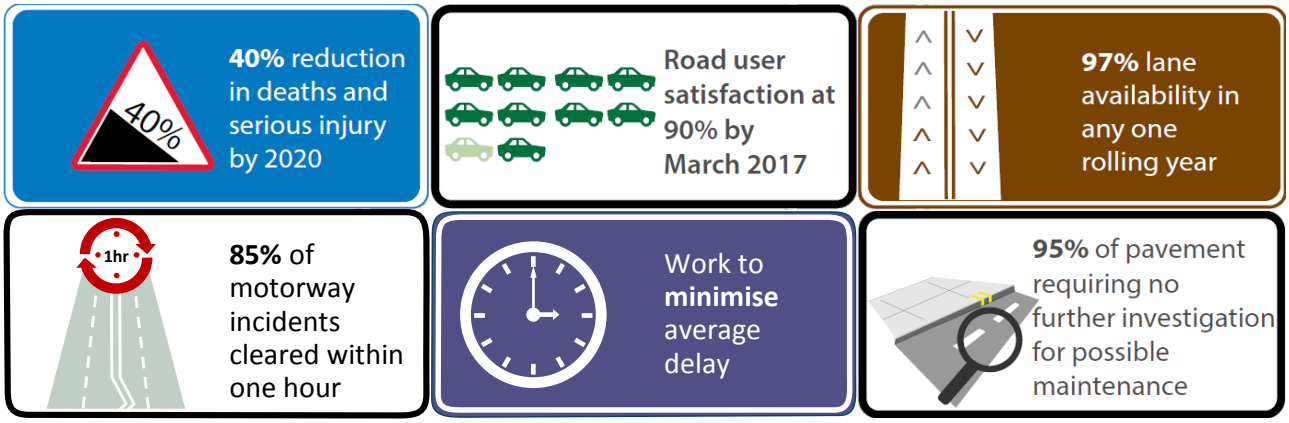
[1] http://orr.gov.uk/__data/assets/pdf_file/0017/21473/benchmarking-highways-england-april-2016.pdf.

1. Regional comparisons

Regional performance against KPIs

1.1 In July 2016 we published our first annual assessment[2], which reported on Highways England's performance in 2015-16. In terms of performance against its performance specification, the overall message was that Highways England had made a good start and was largely meeting the targets for its key performance indicators (KPIs). The majority of the strategic road network is managed by six regions[3] and we have collected regional performance data for 2015-16 for six KPIs, as shown in figure 1.

Figure 1 – KPIs and targets included in the regional performance comparisons



1.2 The next page shows a map of regional performance against these six KPIs for 2015-16.[4] While performance varies regionally, there are not systematic differences; each region performs well on some measures while performing less well on others.

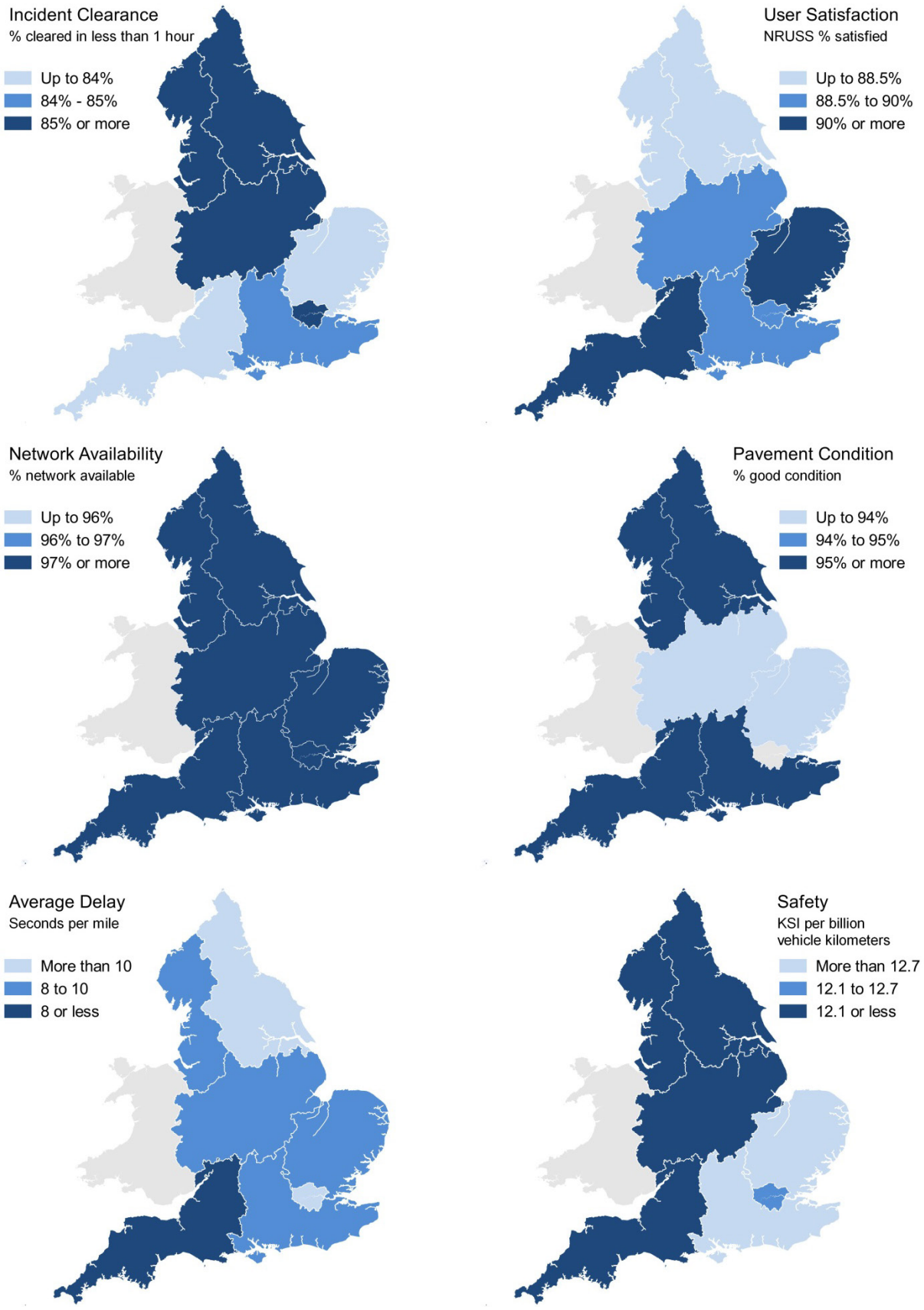
1.3 The reasons for regional performance variation are likely to be complex. The make-up of the network, traffic levels and spending, potentially over many years, are all likely to affect performance and different performance measures will be affected in different ways. For example the "KSI rate" (the number of people killed or seriously injured per billion vehicle kilometres) varies by road type and the mix of motorways, dual and single carriageway 'A' roads varies across the regions. These differences may explain why the KSI rate is higher in the East, which has a smaller proportion of motorways (which have the lowest KSI rate) than the other regions.

[2] http://orr.gov.uk/__data/assets/pdf_file/0015/22434/annual-assessment-of-highways-englands-performance-web.pdf.

[3] Some sections, including the M25, are managed by private providers under Design, Build, Finance, Operate (DBFO) contracts.

[4] The maps show performance for Highways England's regions, excluding DBFO-managed roads. The exception is user satisfaction, where it is not possible to differentiate between DBFO and non-DBFO roads. The M25, which is managed under a DBFO contract, is included as a separate region in the maps. Pavement condition is not shown for the M25 as that KPI excludes DBFO-managed roads.

Figure 2 – Highways England regional KPI performance, 2015-16[5]



[5] Contains Ordnance Survey data © Crown copyright and database right 2016.

1.4 Regional comparisons can help to identify and share best practice across the regions, ultimately leading to improved performance. We understand that Highways England is using regional information in this way and we consider that publishing these regional comparisons in a transparent, accessible manner will help to drive further performance improvements that benefit users. We will work with Highways England to understand how it is using this information and the effect it is having.

1.5 With further development, regional analysis of this sort could help us to understand the efficiency of Highways England's spending and facilitate setting regional performance targets in future road periods, with parallels to the approach being developed for route-level regulation of Network Rail.

Developing regional dashboards

1.6 Many different factors will affect performance against these six KPIs. Fully understanding regional differences in performance will require time-series data (given the complexity of the relationships) on factors such as network composition, traffic and spending. As a starting point, we have collected these data on a regional basis for 2015-16. 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, which is not possible from a single year's data. To be transparent and present this snapshot of information in an accessible manner, we have developed a set of regional dashboards, which are shown on the following pages.[6]

1.7 As with performance, network composition, traffic and spending vary across the regions. However, it is not possible to establish robust links between these variables, and how they affect performance, from a single year of data. For example, investment could be needed to improve performance in one area of the network (such as increasing capacity to reduce delays). The longer-term positive impacts on performance will not materialise until after the investment has completed – so today's performance is likely to be influenced by historical investment, and today's investment will likely affect future performance. Therefore, care should be taken when interpreting the single year of data presented in the dashboards.

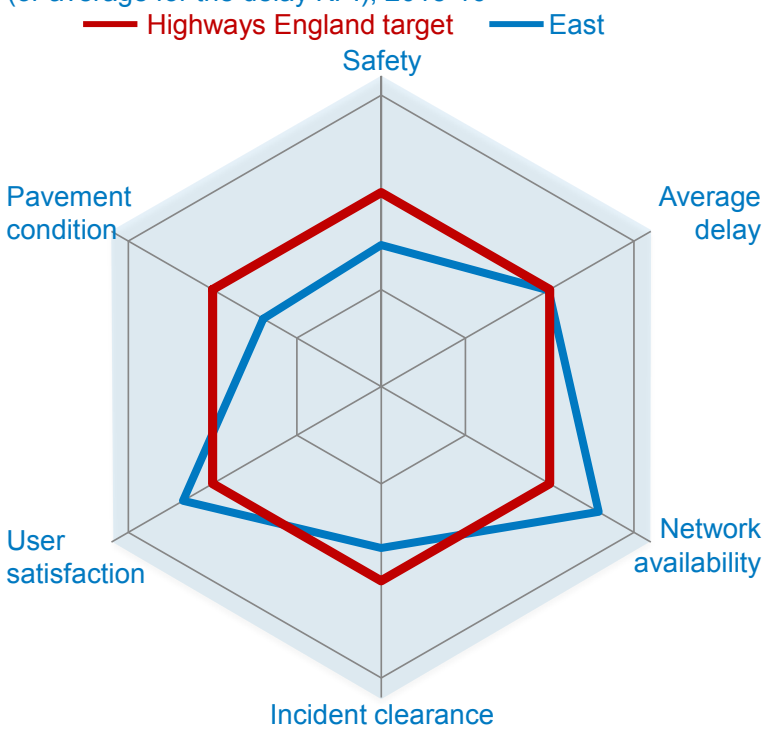
1.8 Annex A provides further detail on the data sources; how we have presented the performance data in "radar charts"; and the treatment of parts of the network managed under DBFO contracts.

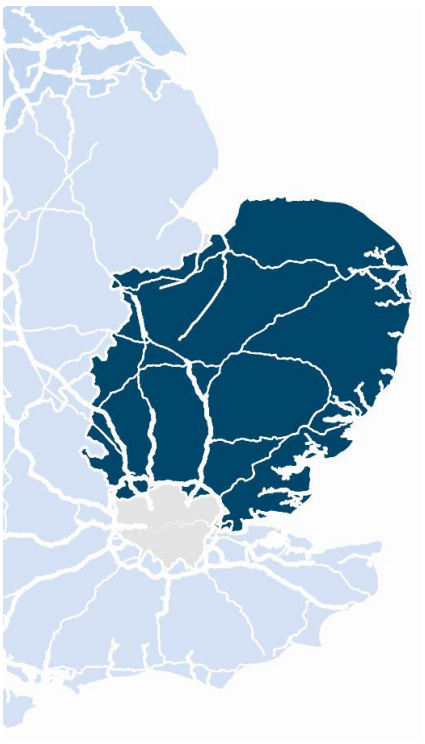
[6] Dashboards are presented for the six Highways England regions only. Most of the data relate only to the parts of the network under their management, excluding parts of the network managed under DBFO contracts. More detail on how the network is managed is available here: https://www.gov.uk/government/publications/roads-managed-by-the-highways-agency.

The "radar" charts show regional performance (the blue line) relative to Highways England's overall targets (the red line), except for average delay (which has no target), which is presented relative to the average delay across the strategic road network. If the blue line is outside the red line, then Highways England's overall target for that KPI was met in that region in 2015-16.

East

Performance relative to Highways England's target (or average for the delay KPI), 2015-16

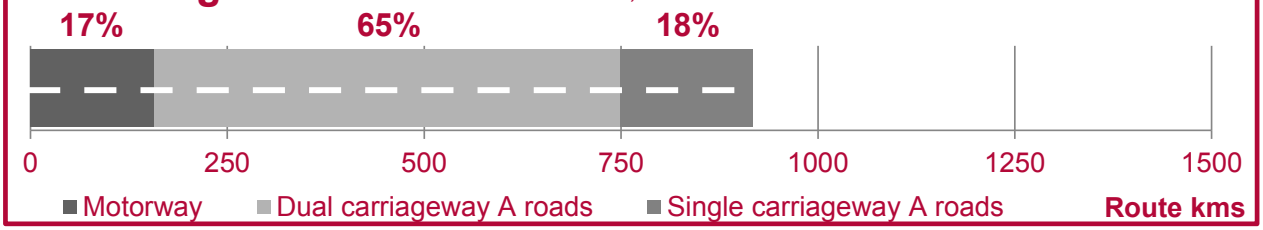




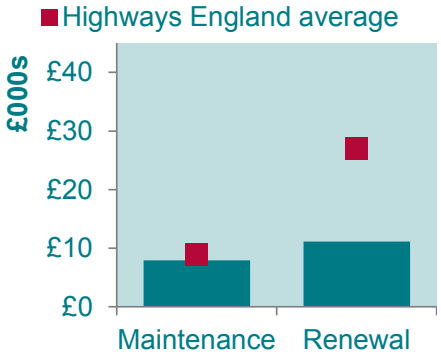
Regional stats

- 6.0m population
- £23,000 GVA per head
- 1,858 structures
- 3,578 lane kms

Road length measured in route kilometres, 2015-16



Expenditure per lane kilometre, 2015-16

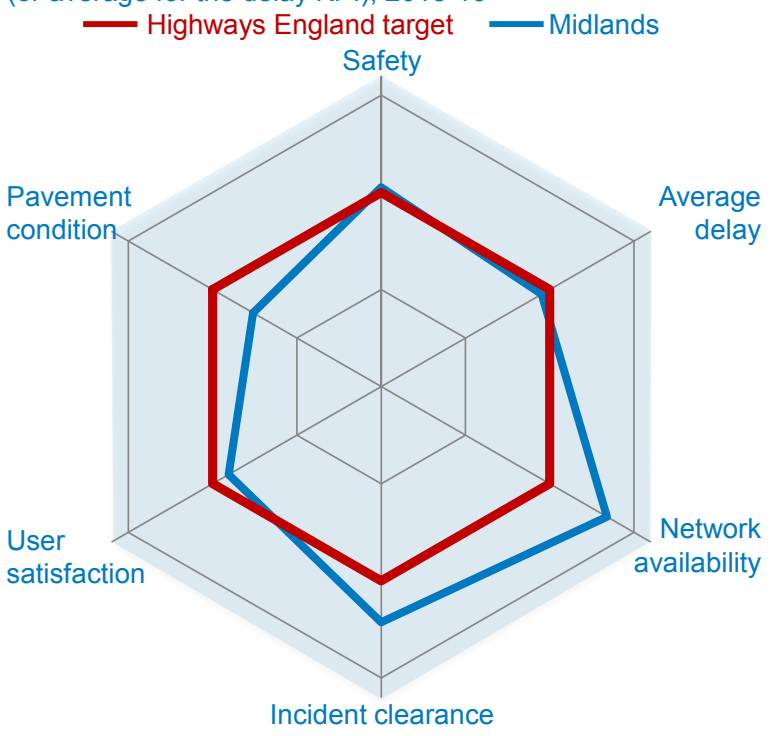


Traffic density

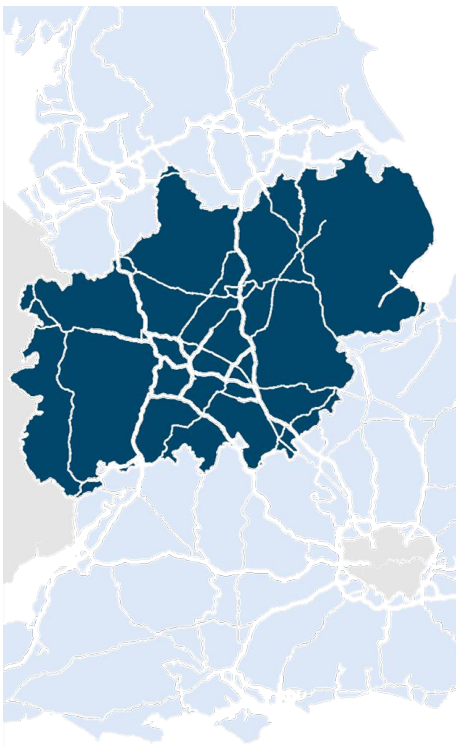
Annual average daily traffic flow, 2015 (vehicles passing a point on a road, in both directions, during an average 24 hour period)

Percentage of HGV traffic

Performance relative to Highways England's target (or average for the delay KPI), 2015-16



Midlands



Regional stats

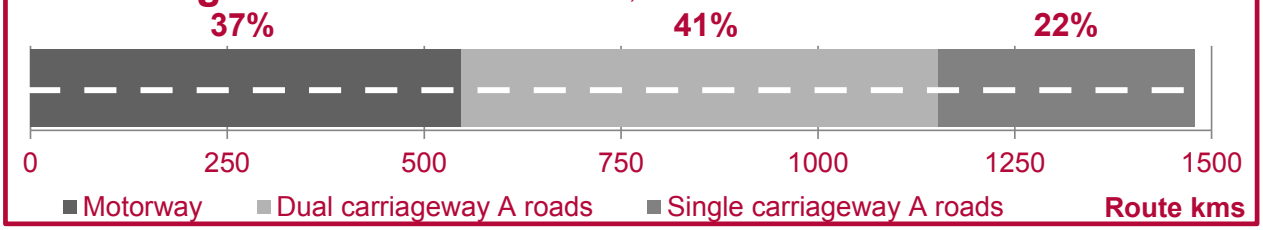
10.4m population

£20,250 GVA per head

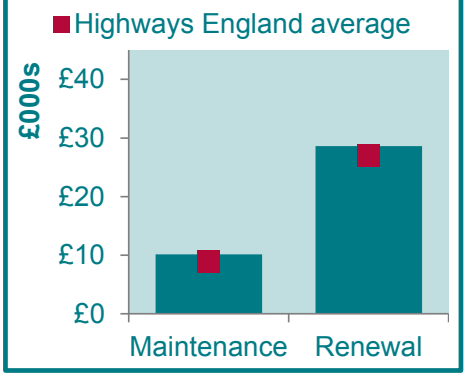
4,394 structures

6,206 lane kms

Road length measured in route kilometres, 2015-16



Expenditure per lane kilometre, 2015-16



Traffic density

Annual average daily traffic flow, 2015

(vehicles passing a point on a road, in both directions, during an average 24 hour period)

Motorways 92,000

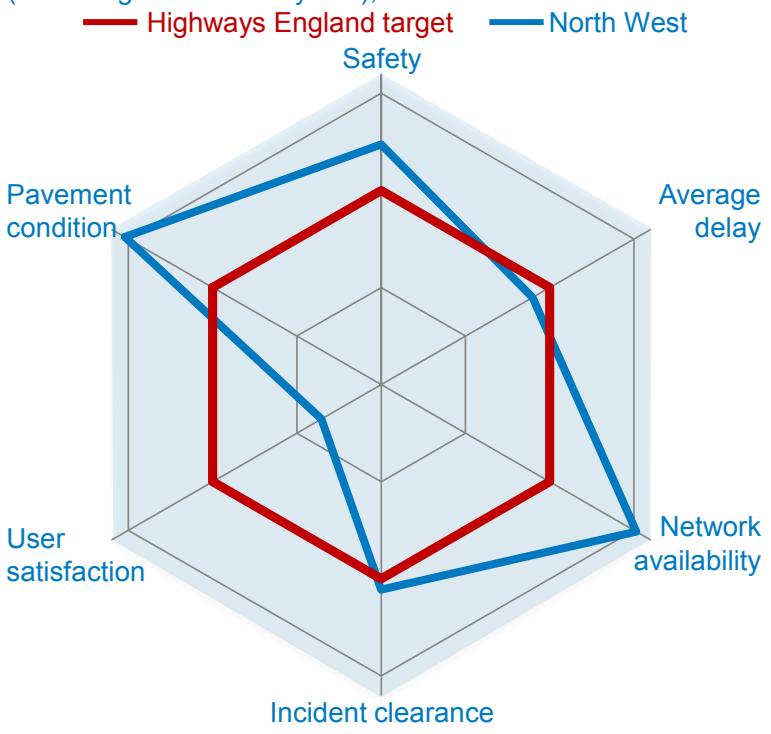
Dual carriageway A roads 37,000

Single carriageway A roads 27,000

Percentage of HGV traffic

13%

Performance relative to Highways England's target (or average for the delay KPI), 2015-16

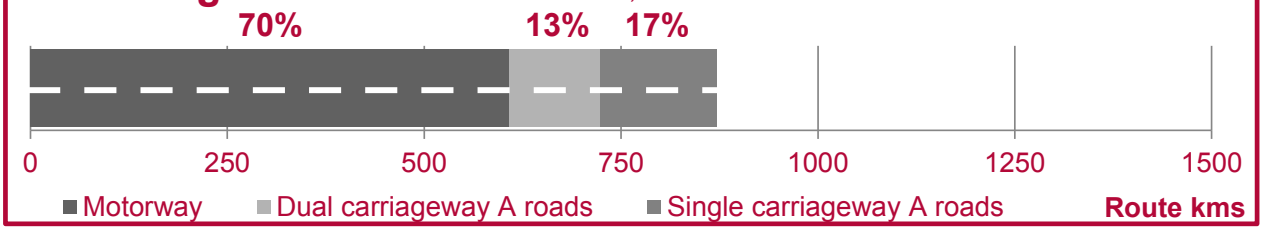


North West

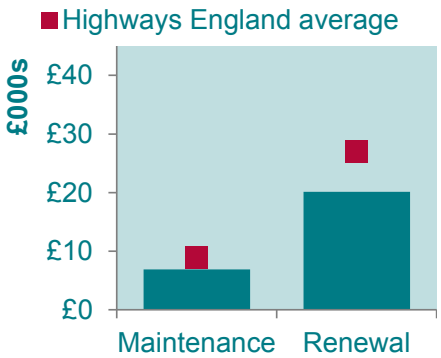
Regional stats

- **7.1m** population
- **£21,000** GVA per head
- **3,046** structures
- **4,337** lane kms

Road length measured in route kilometres, 2015-16



Expenditure per lane kilometre, 2015-16



Traffic density

Annual average daily traffic flow, 2015

(vehicles passing a point on a road, in both directions, during an average 24 hour period)

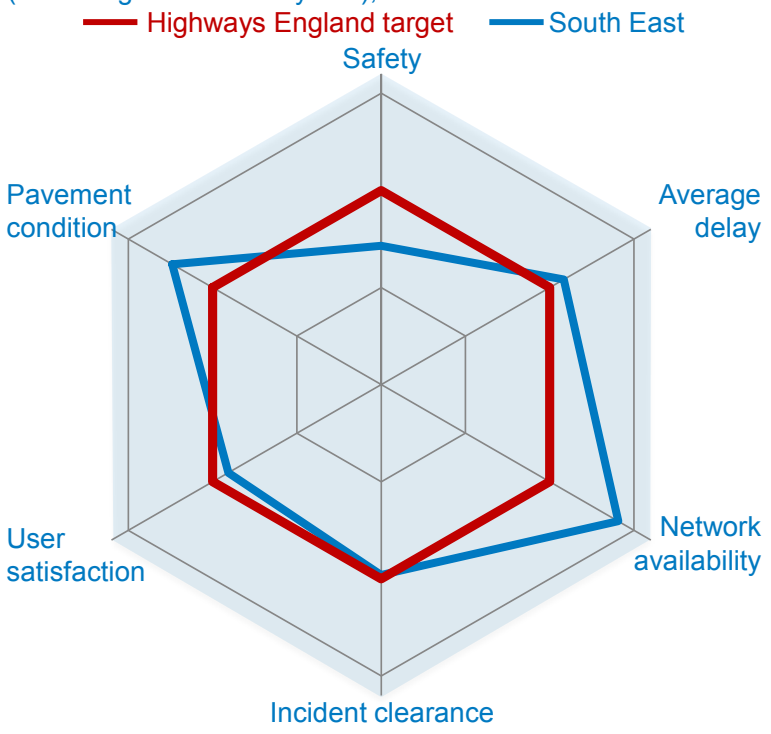
Motorways

Dual carriageway A roads

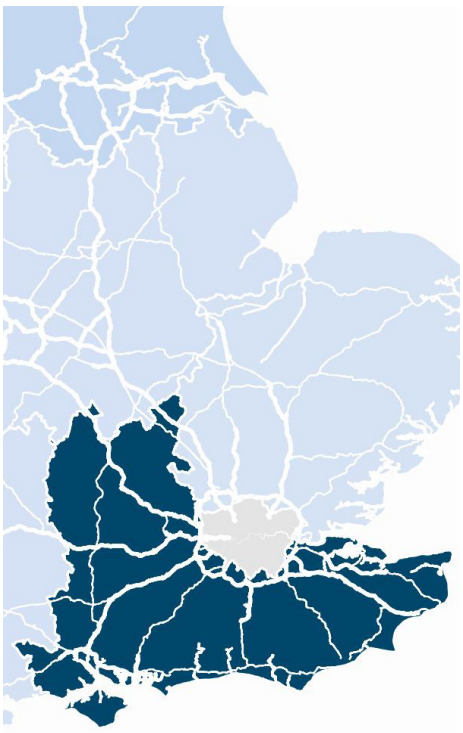
Single carriageway A roads

Percentage of HGV traffic

Performance relative to Highways England's target (or average for the delay KPI), 2015-16



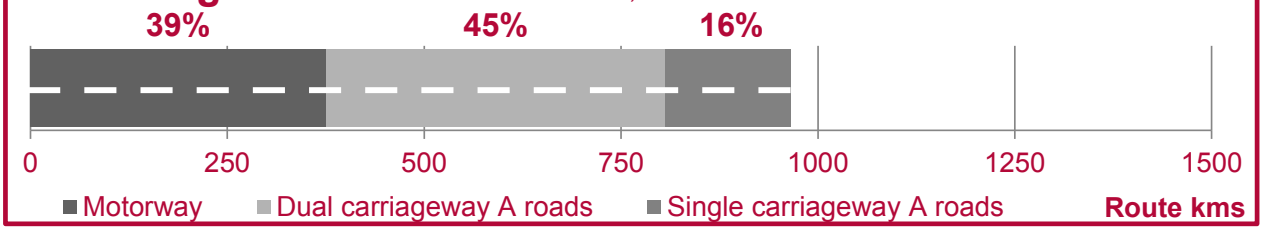
South East



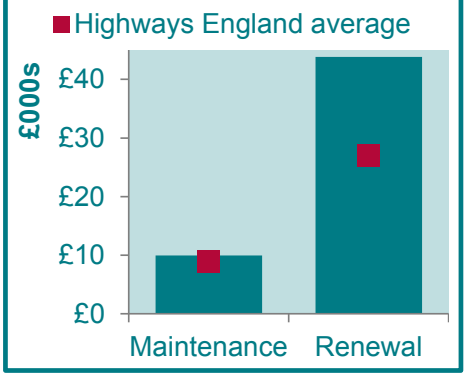
Regional stats

8.9m	£27,000	2,435	4,233
population	GVA per head	structures	lane kms

Road length measured in route kilometres, 2015-16



Expenditure per lane kilometre, 2015-16



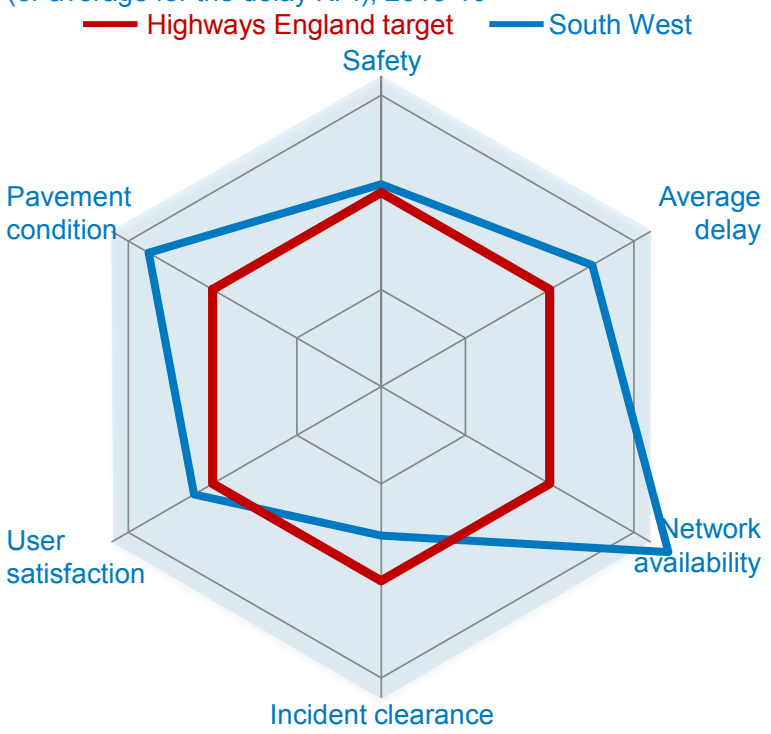
Traffic density

Annual average daily traffic flow, 2015

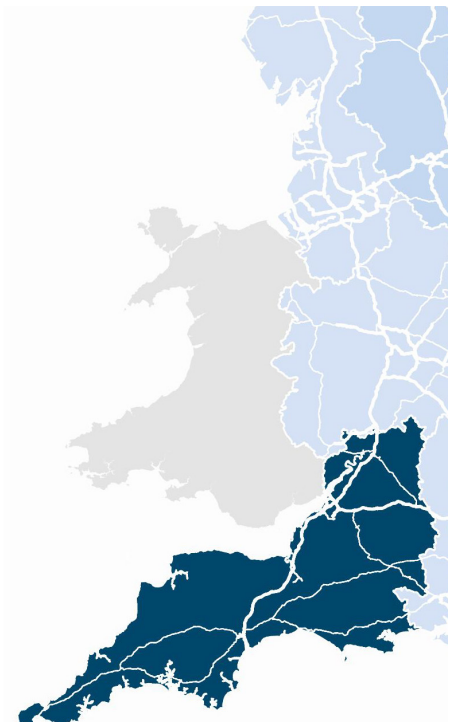
(vehicles passing a point on a road, in both directions, during an average 24 hour period)

Percentage of HGV traffic

Performance relative to Highways England's target (or average for the delay KPI), 2015-16



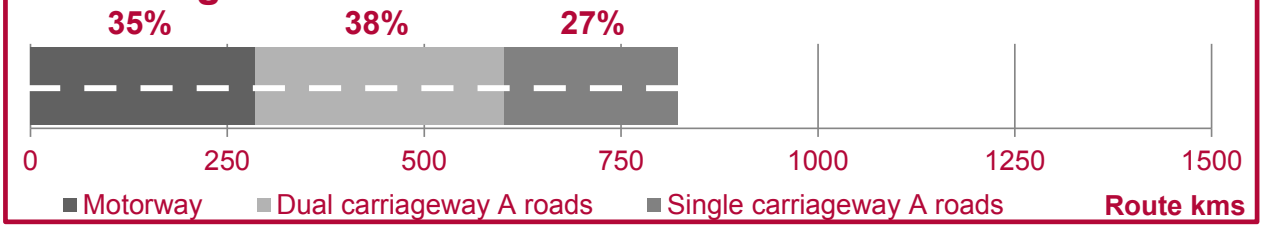
South West



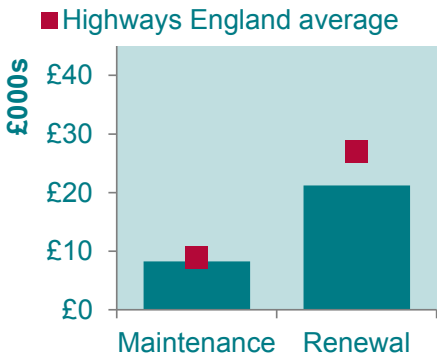
Regional stats

5.4m	£22,250	1,843	3,425
population	GVA per head	structures	lane kms

Road length measured in route kilometres, 2015-16



Expenditure per lane kilometre, 2015-16



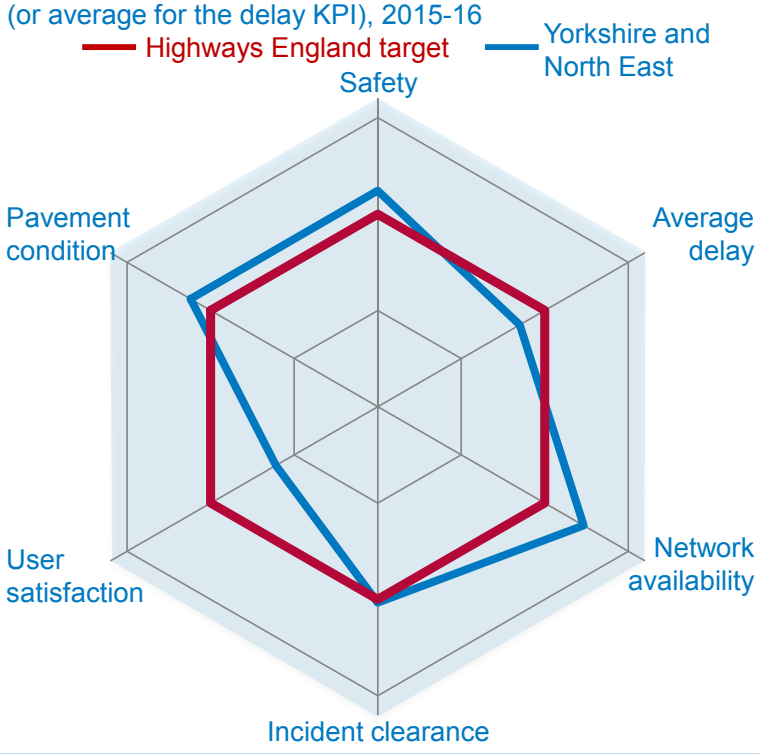
Traffic density

Annual average daily traffic flow, 2015

(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), 2015-16



Yorkshire and North East

Regional stats

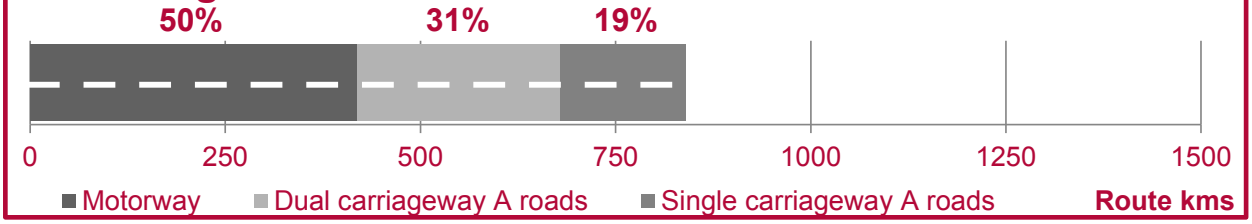
8.0m population

£19,250 GVA per head

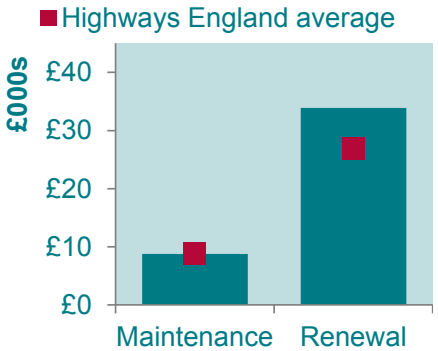
2,044 structures

3,429 lane kms

Road length measured in route kilometres, 2015-16



Expenditure per lane kilometre, 2015-16



Traffic density

Annual average daily traffic flow, 2015

(vehicles passing a point on a road, in both directions, during an average 24 hour period)

Motorways 63,000

Dual carriageway A roads 38,000

Single carriageway A roads 15,000

Percentage of HGV traffic 13%

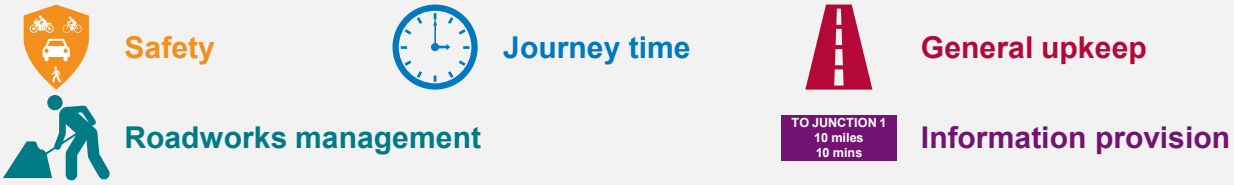
Exploring regional differences in user satisfaction

1.9 Our aim is to move from presenting a single year of data in regional dashboards towards top-down benchmarking. This will allow us to understand better what causes performance variations and to draw firmer conclusions about efficiency across Highways England's regions. But this form of analysis requires time-series data. We will build-up a time-series over time, as new data become available, and we are working with Highways England on the potential to include more historical data.

1.10 When benchmarking efficiency, it is important to consider the output being produced, not just the cost, and the quality of the output should be considered as well as the quantity. For example, user satisfaction is a possible measure of the quality of service that road users receive, which we might include in future analysis alongside possible quantity measures such as network length or traffic volumes. Therefore, we have undertaken initial regional analysis of the potential drivers of user satisfaction, using the single year of data for 2015-16, to help prepare for the more complex analysis that we are planning.

The National Road User Satisfaction Survey (NRUSS)

NRUSS respondents are asked questions about their satisfaction with five key elements of their most recent journey on the strategic road network, with Highways England's user satisfaction KPI based on responses to these five questions:



The survey is undertaken in seven regions across England; six are presented in the dashboards, plus the M25.

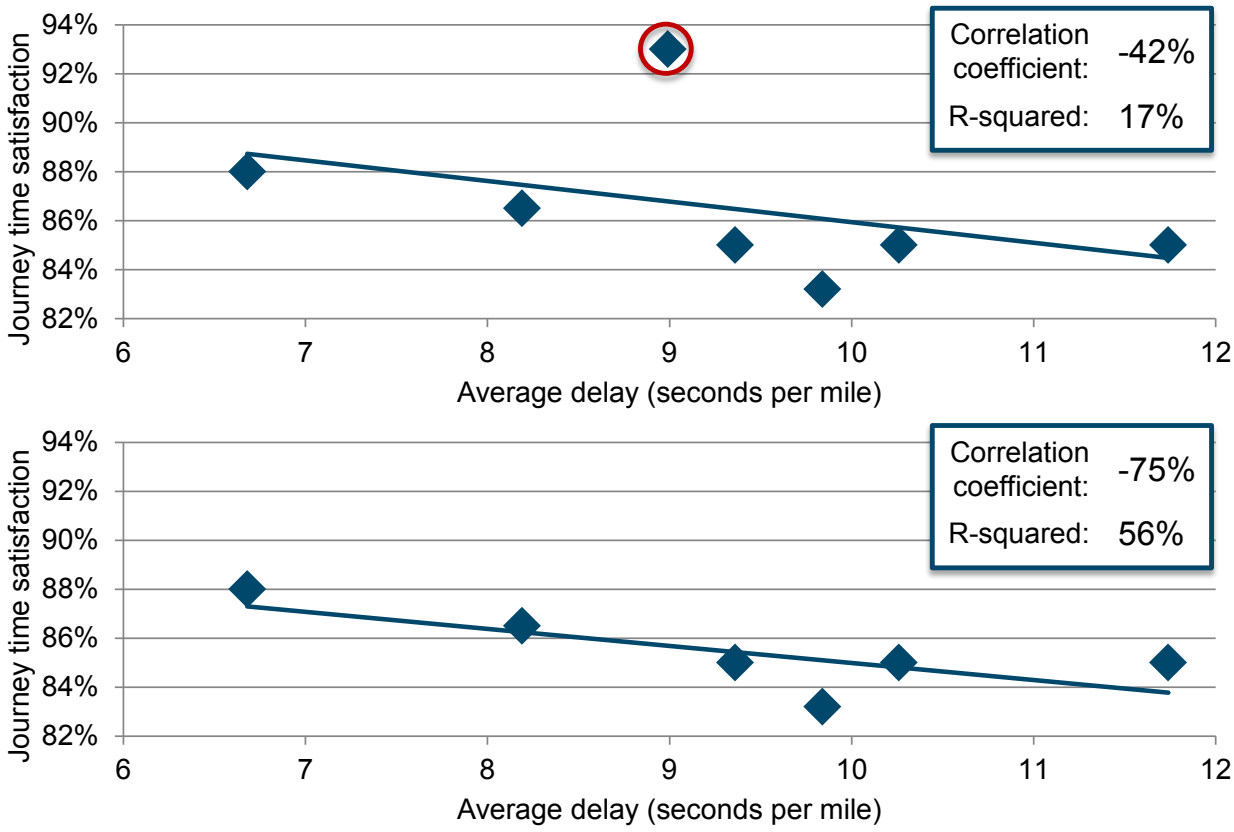
1.11 The rest of this chapter shows emerging results from this analysis, presenting the correlation between the measure of satisfaction and the potential driver / indicator; a scatter chart and trend line between the two variables; and the "R-squared" value for that trend line (which measures how closely the variables are related). Where data are available, we also present trends over time for the whole strategic road network.

1.12 The sample sizes are too small, and this analysis too basic, for it to form the basis of firm conclusions about regional variation of performance or efficiency. However, our initial analysis highlights relationships between variables that we will investigate further when more data are available and could, if the relationships hold over time, inform our assessment of the efficiency, level of challenge and deliverability of RIS2.

Journey time

1.13 Figure 3 shows negative correlation between journey time satisfaction and average delay – satisfaction falls as delays get worse, as you would expect. There is a single region with higher satisfaction than expected from the level of delay, and the relationship between delay and journey time satisfaction is much stronger if this outlier is removed. This demonstrates the limitations of working with such a small dataset and the caution required when interpreting the results. It also highlights the potential benefit of this form of analysis, as there might be something that the other regions can learn from the "outperformance" of the outlier. However, time-series data and more analysis are required before any such conclusions can be reached.

Figure 3 – Regional analysis of journey time satisfaction and average delay, 2015-16



1.14 Given recent trends of traffic growth on the strategic road network, and forecasts for this to continue[7], we have also looked at potential drivers of average delay. The factors we looked at include traffic density (the number of vehicle kilometres per road kilometre in each region), the proportion of HGV traffic and the mix of road types. None of these variables alone is able to explain the variation in average delay. Multivariate analysis, which looks at the impact of multiple variables on delay

[7] for example: https://www.gov.uk/government/publications/road-traffic-forecasts-2015.

simultaneously, appears more promising but a single year's data is insufficient for analysis of this sort.

General upkeep

1.15 Figure 4 shows a relatively strong, positive relationship between regional maintenance spending and satisfaction with the general upkeep of the network and figure 5 shows a similar relationship for the strategic road network as a whole over time. More data and analysis are needed to establish whether this relationship is robust but, if it is, it could help inform how we assess the efficiency of Highways England's maintenance spending.

Figure 4 – Regional analysis of general upkeep satisfaction and maintenance spending, 2015-16

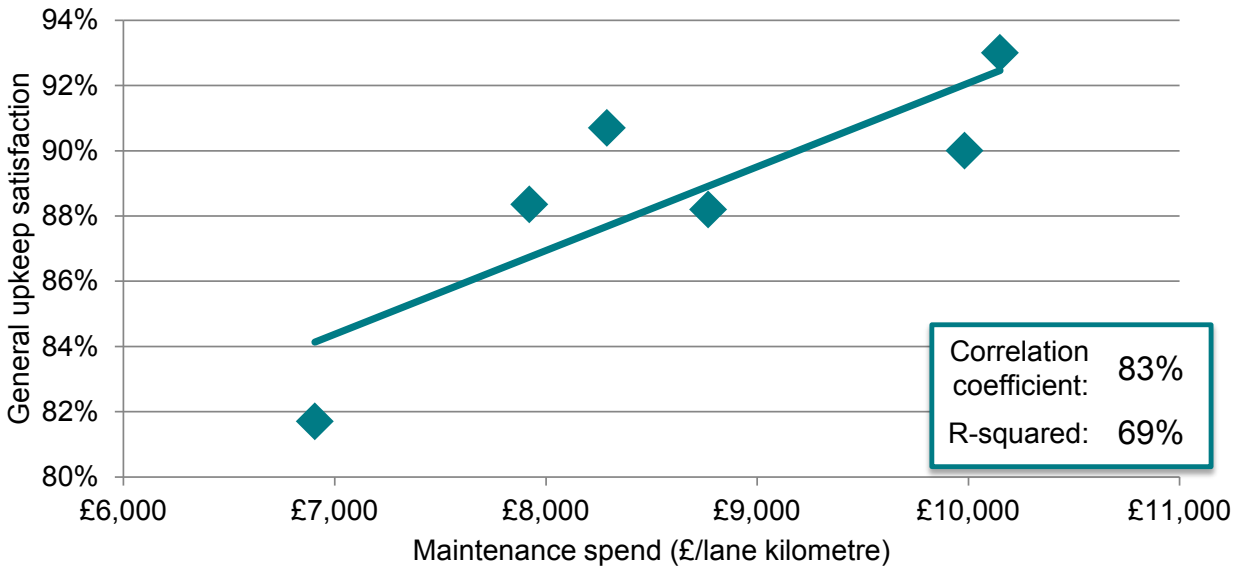
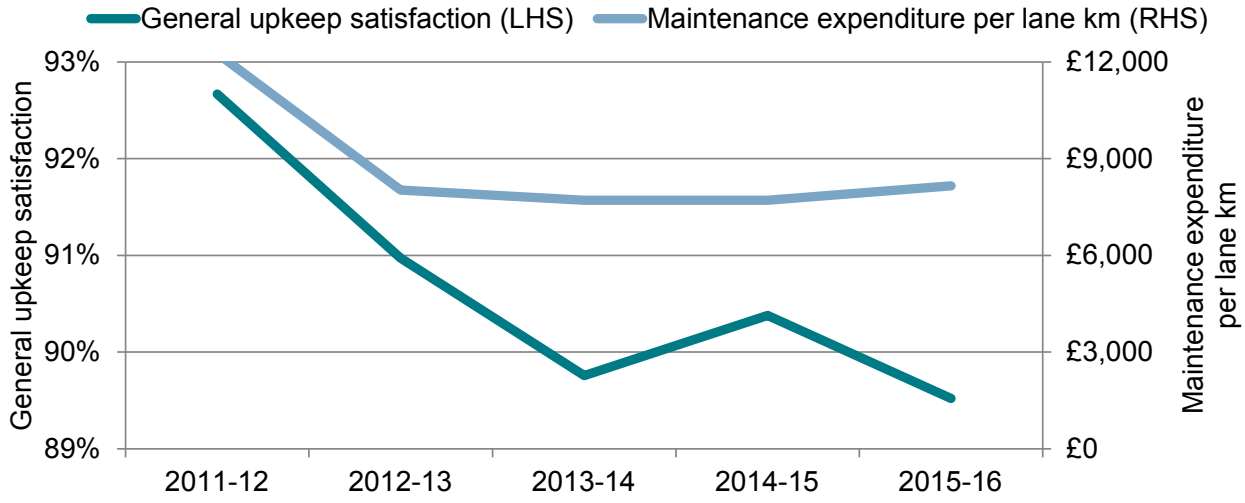


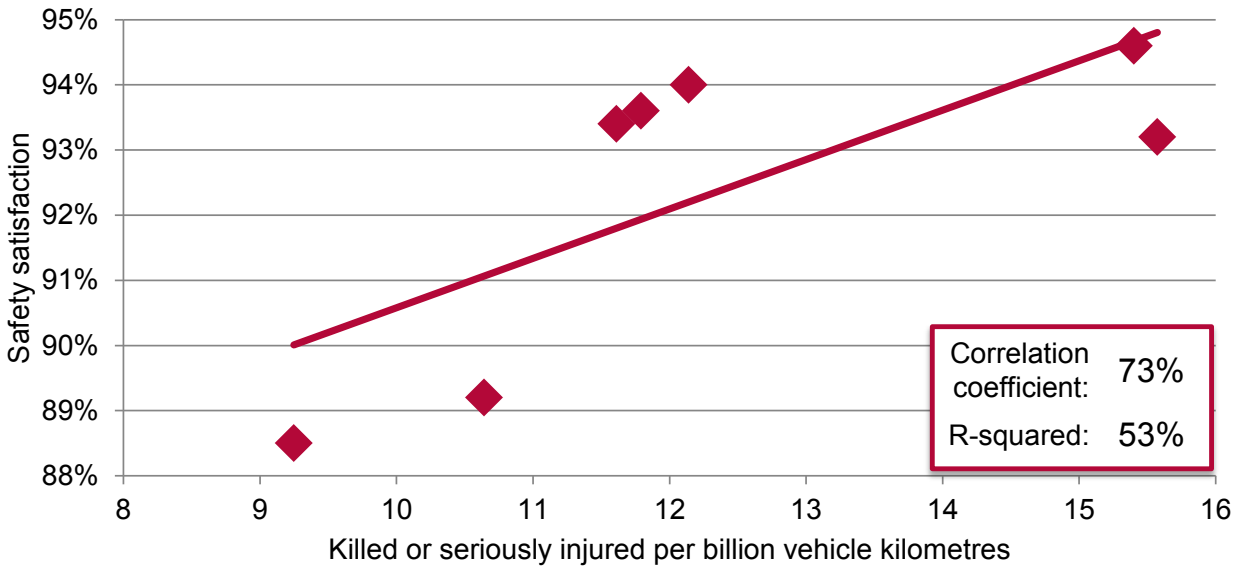
Figure 5 – Highways England general upkeep satisfaction and maintenance spending, 2011-12 to 2015-16



Safety

1.16 Our initial analysis found positive correlation between the KSI rate and satisfaction with safety. This is counterintuitive – it suggests that satisfaction increases with the number of KSIs on the network – and highlights why we are aim to collect time-series data that would support the use of more complex benchmarking techniques. Figure 6 shows the scatter plot for these variables, with a clear split in the data. Satisfaction with safety is lower in two of the regions, despite these regions also having the lowest KSI rates in 2015.

Figure 6 – Regional analysis of safety satisfaction (2015-16) and KSI rates (2015)



1.17 This suggests that, while reducing the number of deaths and serious injuries is a very important objective for Highways England, perceptions of safety are influenced by factors other than the KSI rate. Therefore, it is important for Highways England to understand these factors, so it can improve its users' experience and how safe they feel when using the strategic road network.

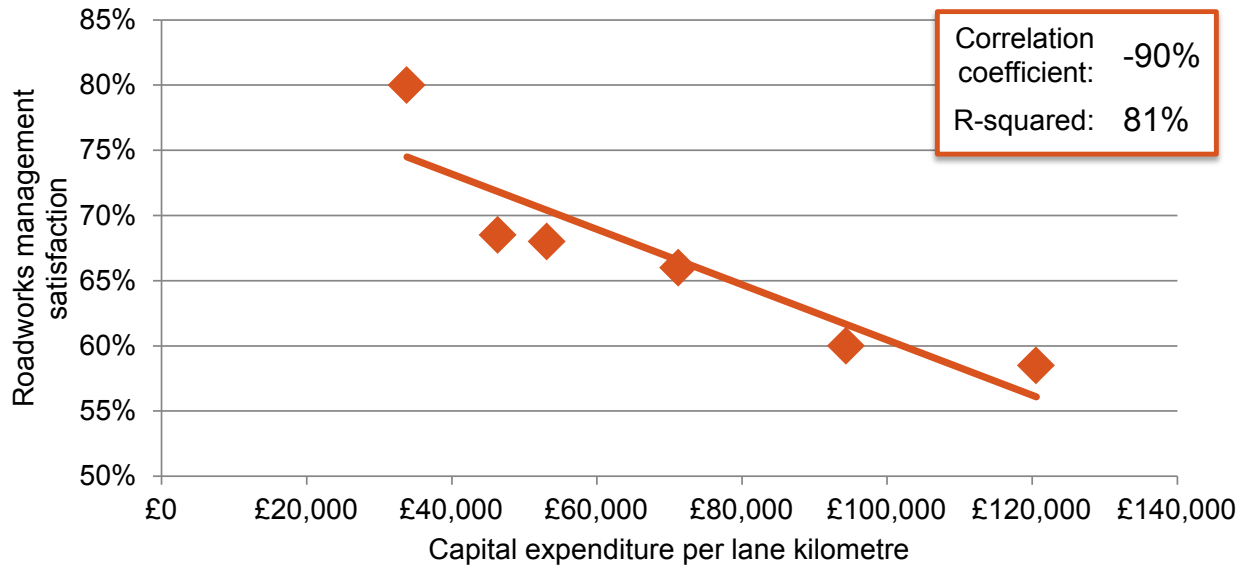
Roadworks management

1.18 Only survey respondents who experienced roadworks on their most recent trip on the strategic road network are asked this question and, historically, this question tends to be the lowest scoring element in NRUSS. Therefore, there are two ways in which roadworks management can affect the overall satisfaction score: changes in the roadworks management satisfaction score; and changes in how many respondents experienced roadworks on their most recent trip.

1.19 Figure 7 shows a strong, negative relationship between the level of capital expenditure on the network (as a proxy for the amount of work being done) and

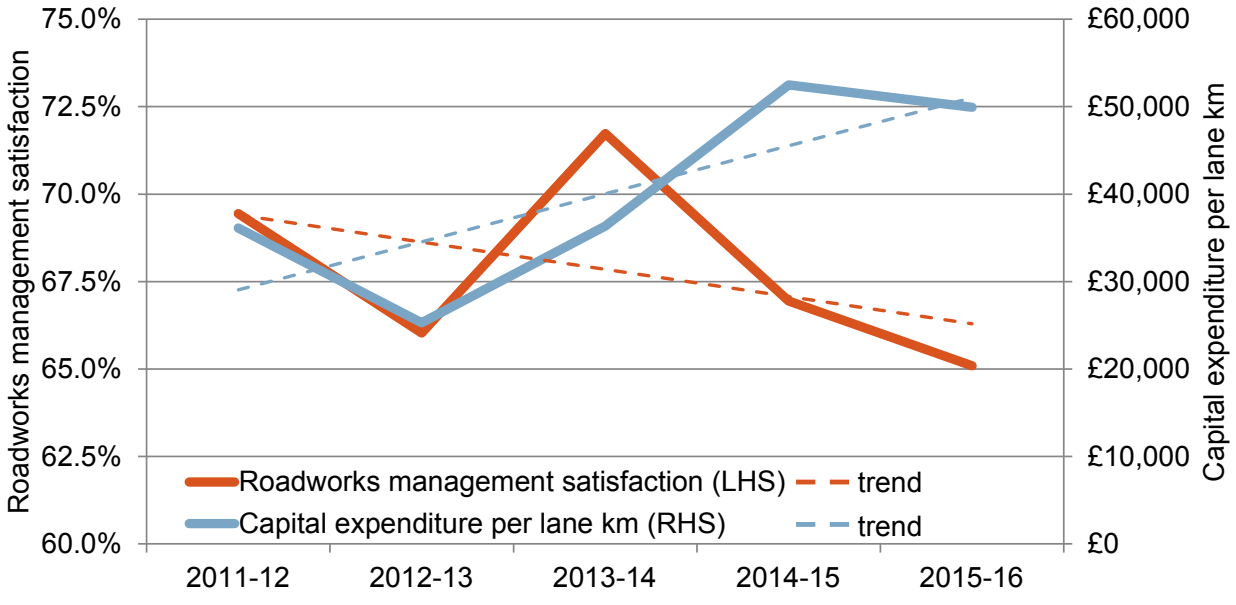
roadworks management satisfaction. This suggests that, as well as being more likely to experience roadworks, road users are less satisfied with how roadworks are managed when there are more roadworks on the network.

Figure 7 – Regional analysis of roadworks management satisfaction and capital spending, 2015-16



1.20 More data are required to test the robustness of this relationship. Figure 8 shows a more mixed picture for the whole strategic road network since 2011-12. While the trend is for increasing expenditure and falling satisfaction, in individual years this breaks down. However, the trends in figure 8 and the cross-sectional pattern in figure 7 highlight the potential challenge that Highways England faces in meeting its user satisfaction target while increasing the amount of investment over the road period.

Figure 8 – Highways England roadworks satisfaction and capital spending, 2011-12 to 2015-16

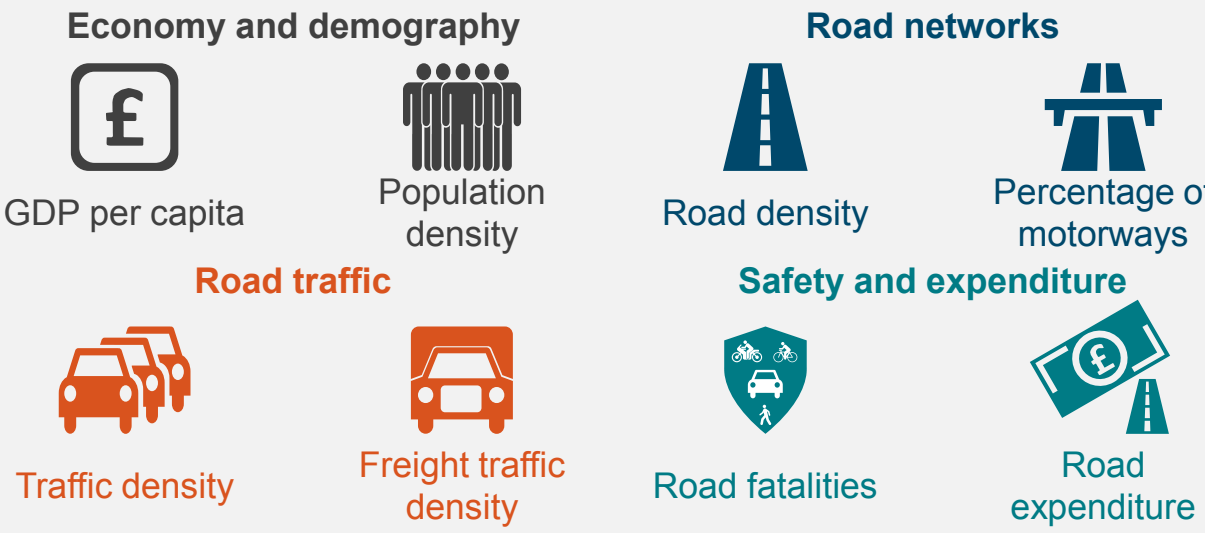


2. International comparisons

Identifying potential international comparators for Highways England

2.1 There are inherent challenges in making comparisons between countries due to differences in road classifications, management, funding structures, exchange rates, labour markets and tax regimes.[8] This section presents results from our initial analysis to identify countries, and ultimately national road authorities (NRAs), that are the best comparators to Highways England. We have compared England with other countries across a range of metrics covering: economy, demography, road networks, traffic levels, safety and road expenditure. This is our first step; the next stage will be to engage with NRAs in the countries we have identified to obtain data for networks similar to the strategic road network for benchmarking Highways England's performance and efficiency.

Metrics used in the international comparison of network characteristics



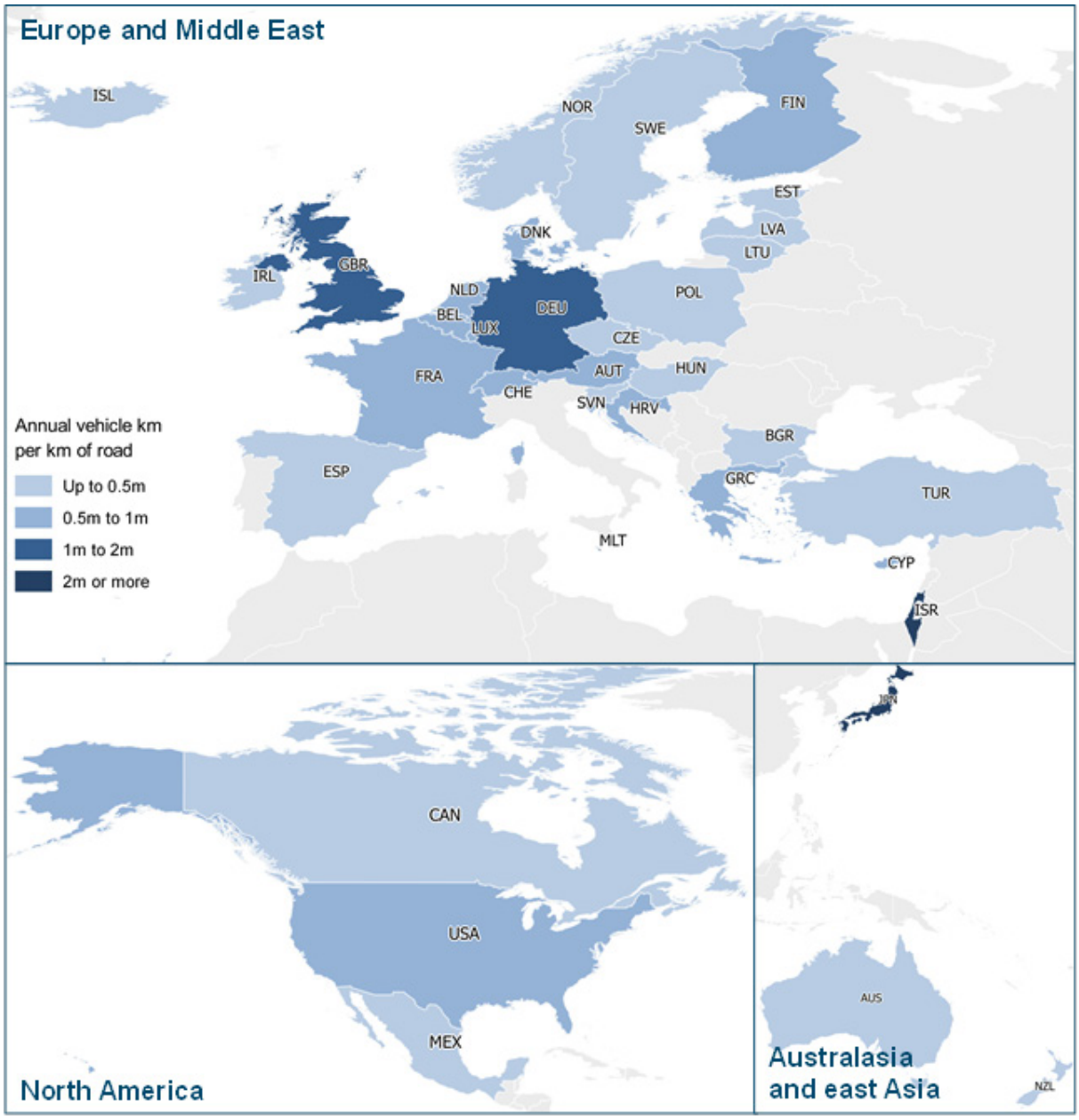
2.2 Our primary source for this analysis was the 2016 World Roads Statistics (WRS) database, which is claimed to be the "only comprehensive, universal source of statistical data on road networks".[9] We took EU and OECD countries as the starting point for our comparisons and more detail on our data sources and the metrics we used is provided in Annex B.

[8] For example see: Report on Bexprac, CEDR, 2010: http://www.cedr.fr/home/fileadmin/user_upload/Publications/2010/e_BEXPRAC.pdf; and Roads funding and regulation in England, France and Italy: An International Comparison, Davis C., Dufour A. and Perna P, 2016: ETC Conference Paper.

[9] IRF World Road Statistics 2016, http://www.irfnet.ch/world_road_statistics.php.

2.3 The map in figure 9 shows how traffic density (measured by annual vehicle kilometres per kilometre of road) varies across this sample. The UK has the third highest traffic density with over 1 million vehicle kilometres per kilometre of road.

Figure 9 – Traffic density in the international comparisons sample, 2014 or latest year available[10]



2.4 We are ultimately interested in benchmarking Highways England, rather than UK roads as a whole, so we used ONS and DfT data for England, Scotland and Wales to supplement the WRS data.[11] Figure 10 shows how we compared and scored each country against England, using freight density as an example.

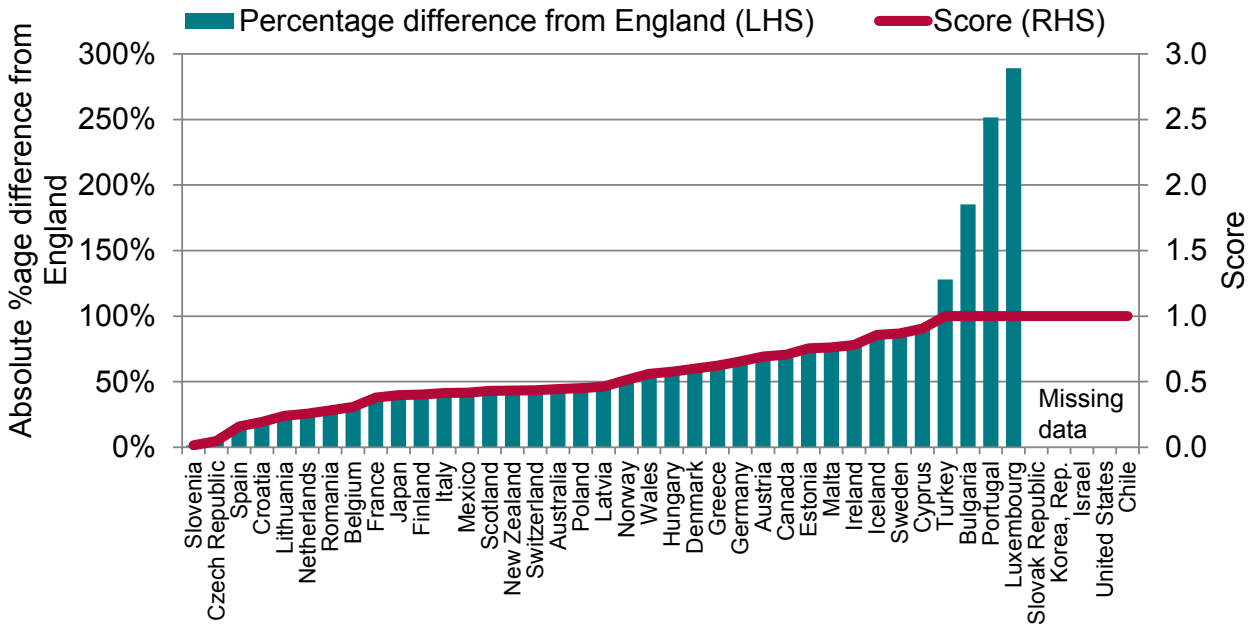
[10] IRF World Road Statistics, 2016. International map boundaries sourced from Eurostat © EuroGeographics for the administrative boundaries.

[11] We were unable to source the required data for Northern Ireland.

2.5 Across England as a whole in 2014 there were approximately 430,000 tonne kilometres of freight carried per road kilometre and the green bars in figure 10 show the absolute percentage difference from this value for each country. For example, the equivalent figure in Belgium was approximately 300,000 tonne kilometres per road kilometre, an absolute difference of around 30%.

2.6 The absolute percentage difference forms the basis of the "score" for freight density for each country (approximately 0.3 for Belgium). The red line in figure 10 shows how the score was capped at 1.0 if the absolute percentage difference was greater than 100%, or where there was missing data.

Figure 10 – Ranking and scoring of absolute differences from freight density in England[12]



2.7 We repeated this process for each of the eight metrics. Adding together the scores for each metric gave a total score for each country, ranging from 0 (very similar to England) to 8 (very different to England).

2.8 Table 1 on the next page shows the scores for the twelve lowest-scoring countries (those most comparable to England). Pages 23 to 25 show how these twelve countries compare to England against each metric in a series of radar charts.[13] The radar charts have been normalised to the English value for each metric. The red line in each chart shows the normalised value of "1" for England, and the blue line shows how that country compares to England for each metric. As we are using this analysis to identify the likely best comparators for more detailed benchmarking in the future, the data have not been adjusted to show whether performance is "better" or "worse"

[12] IRF World Road Statistics 2016.

[13] IRF World Road Statistics 2016; World Bank; DfT and ONS statistics.

than England. So, for example, if the blue line is inside the red for traffic density, it means that there is less traffic per kilometre of road, on average, in that country than England. Similarly for road safety, if the blue line is outside the red, there are more fatalities per vehicle kilometre, on average, in that country than England. The distance between the red and blue lines represents the size of the difference between that country and England for that metric.

Table 1 "Top 12" potential comparators for Highways England from our initial international comparisons

Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
1	Netherlands	2.6	**5**	Belgium	3.6	**9**	Italy	3.9
2	Germany	2.9	**6**	Scotland	3.7	**10**	Denmark	4.0
3	Finland	3.2	**7**	Wales	3.7	**11**	Spain	4.3
4	Ireland	3.4	**8**	France	3.8	**12**	Austria	4.4

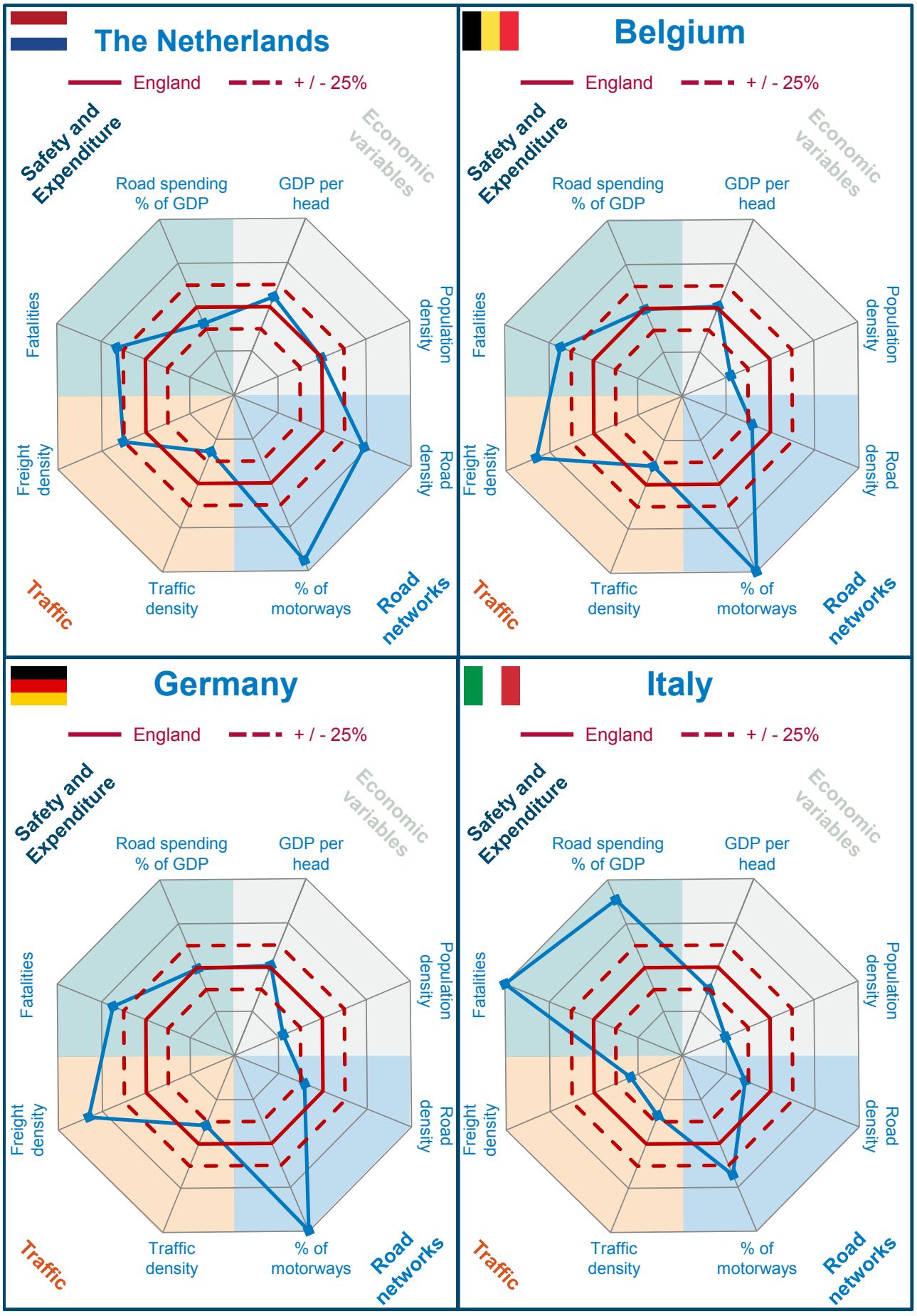
2.9 We will use the findings from this first stage of our work to engage with NRAs in the identified countries. We plan to obtain data for nationally managed networks similar to the English strategic road network to explore more detailed performance and cost efficiency benchmarking. We will also explore whether NRAs in these countries would be interested in collaborating on benchmarking approaches. This initial analysis has also highlighted differences that it will be important to be aware of, and take account of, in our future benchmarking.

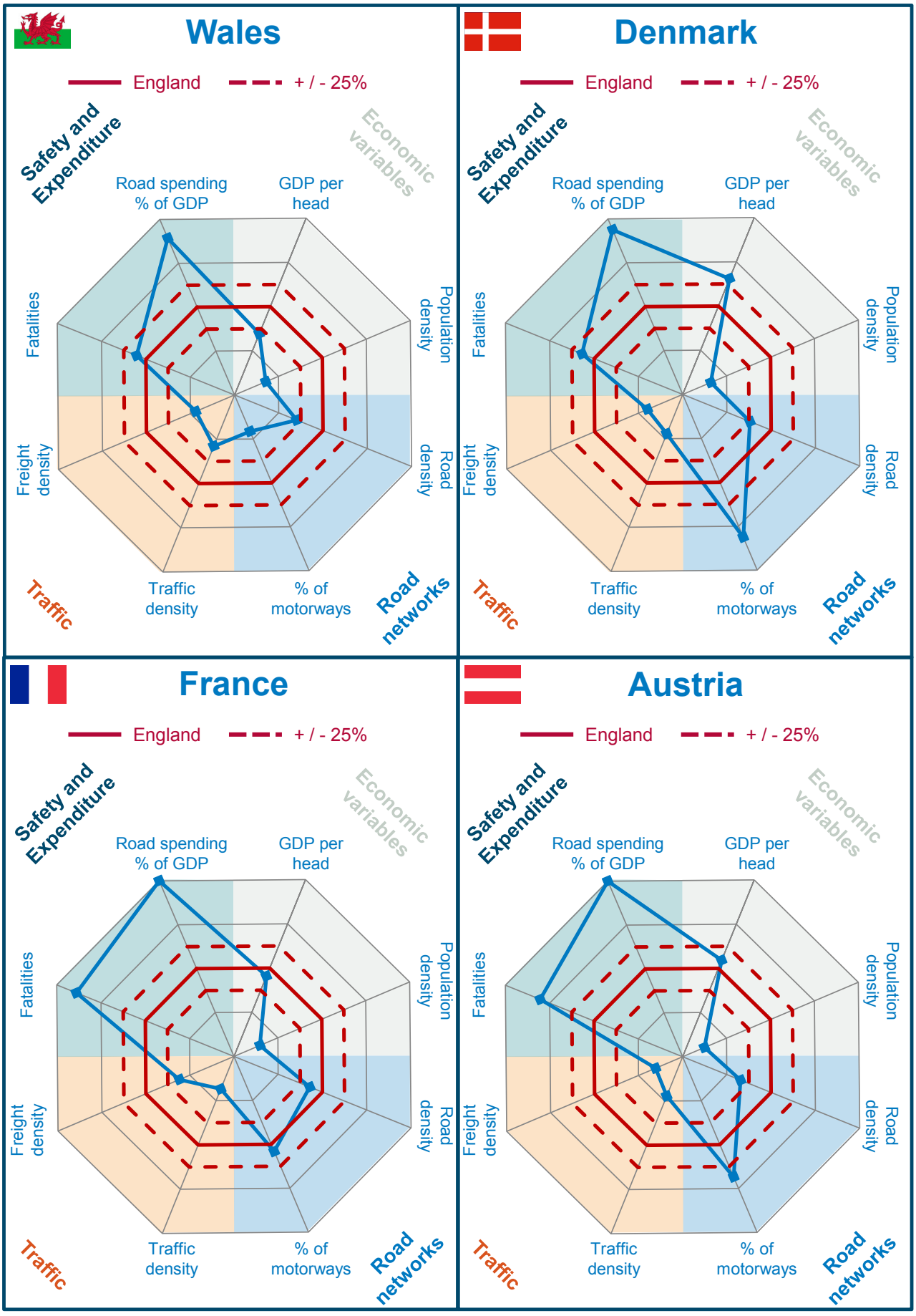
The potential importance of population density for benchmarking

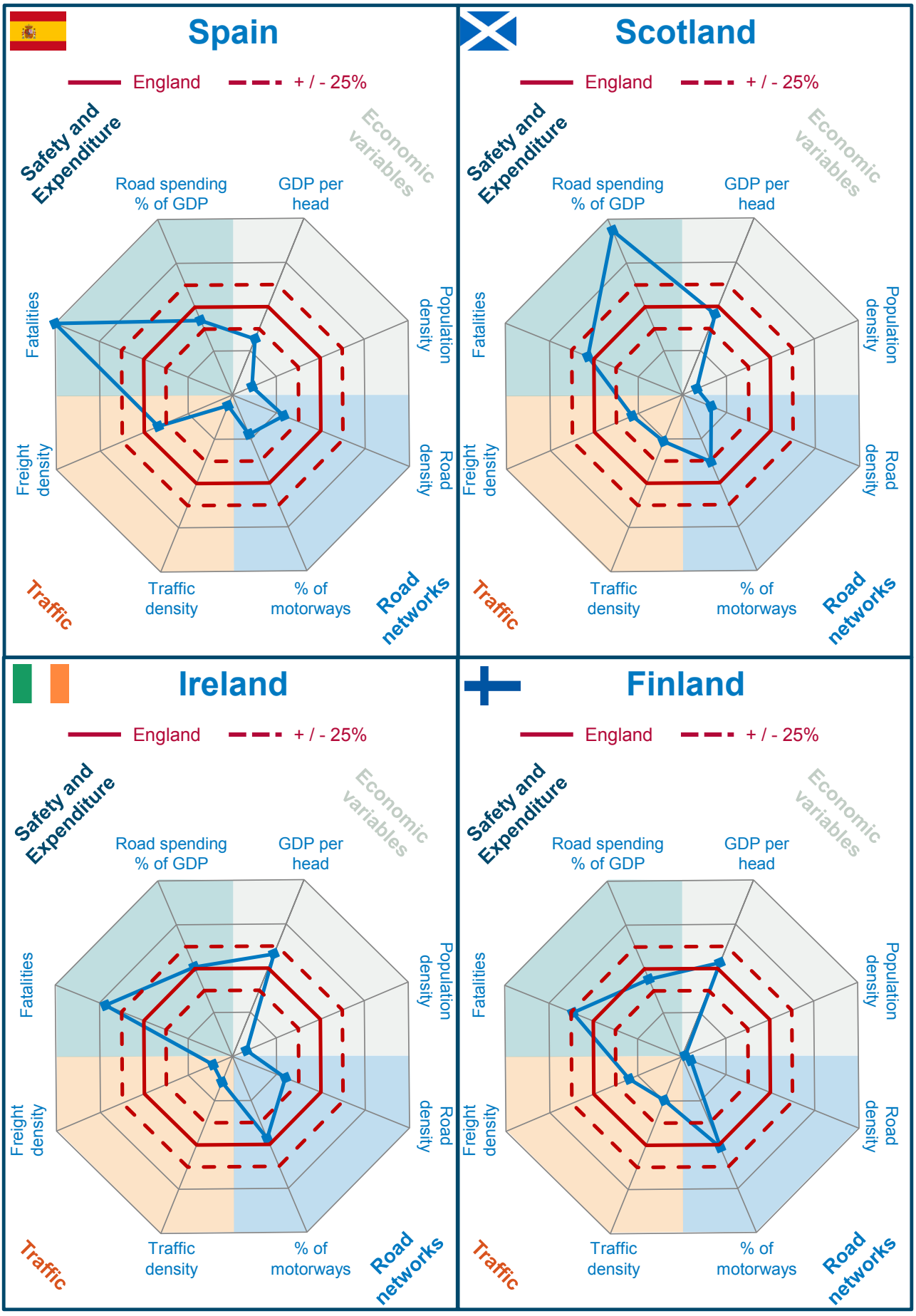
Population density could affect the performance and efficiency of national road networks in a number of ways, both through how it affects travel demand and more direct impacts on costs. For example:

- higher population density tends to be related with denser road networks and more traffic;
- in less densely populated countries there might be more long-distance travel but, particularly over longer distances, rail and air travel tend to take a larger share; and
- land is more scarce in densely populated countries, putting pressure on land prices which could increase costs, particularly of adding capacity to the network.

The metrics we included in this analysis were chosen because of their relevance to the more detailed international benchmarking that we hope to undertake in the future. However, few countries are as densely populated as England, and countries with similar population density have similar "shapes" overall. Therefore the charts on the next few pages are ordered by decreasing population density.


The Netherlands
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks
Belgium
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks
Germany
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks
Italy
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks


Wales
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks
Denmark
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks
France
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks
Austria
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
% of motorways
Traffic density
Freight density
Fatalities
Traffic
Road networks


Spain
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
Road networks
% of motorways
Traffic density
Traffic
Freight density
Fatalities
Scotland
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
Road networks
% of motorways
Traffic density
Traffic
Freight density
Fatalities
Ireland
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
Road networks
% of motorways
Traffic density
Traffic
Freight density
Fatalities
Finland
England
+ / - 25%
Safety and Expenditure
Economic variables
Road spending % of GDP
GDP per head
Population density
Road density
Road networks
% of motorways
Traffic density
Traffic
Freight density
Fatalities

International comparison of motorway fatalities

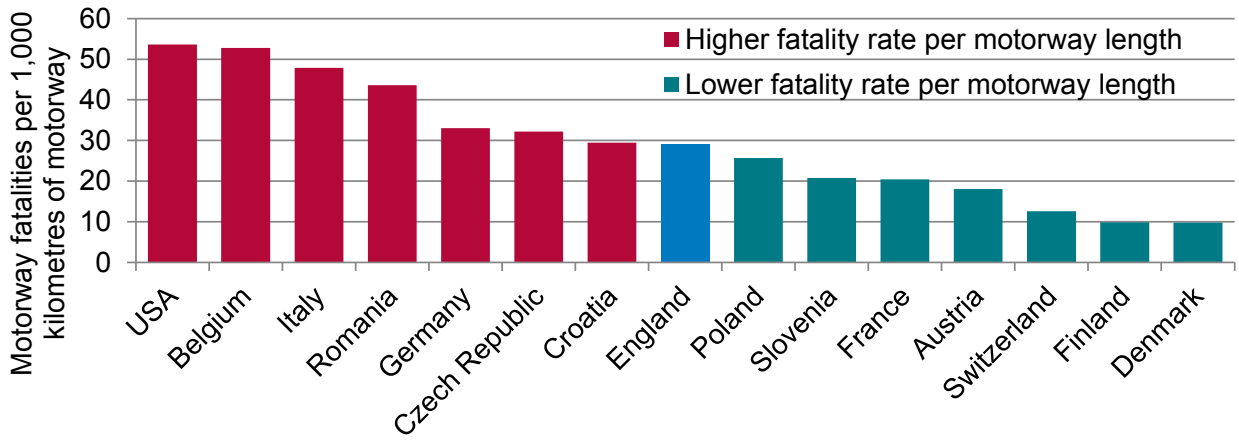
2.10 International comparisons of road safety have consistently found that the UK has a leading road safety record. In September 2016, the Parliamentary Advisory Council on Transport Safety (PACTS) published research undertaken by TRL to better understand the strengths and weaknesses of Britain's road safety record.[14]

2.11 Amongst other factors, the study looked at safety on different road types, split by motorways, urban and rural roads. TRL found that, per kilometre of motorway, fatality rates on UK motorways are around the average for EU countries. They noted that this "average" performance might be caused by motorways in the UK carrying more traffic than elsewhere, but also suggested that higher speed limits might be part of the cause.

2.12 We have built on TRL's analysis, collecting motorway traffic data to calculate fatality rates per kilometre travelled, as well as per kilometre of motorway. However, data are not as widely available for motorway traffic as they are for motorway length, meaning our sample is smaller than TRL's.[15]

2.13 Despite differences in the sample, figure 11 shows England in a similar position to TRL's findings. England is in the middle of the range when considering fatalities per kilometre of motorway, and the ordering of the other countries is similar to that found by TRL.

Figure 11 – Motorway fatalities per kilometre of motorway, 2013 or latest year available[16]



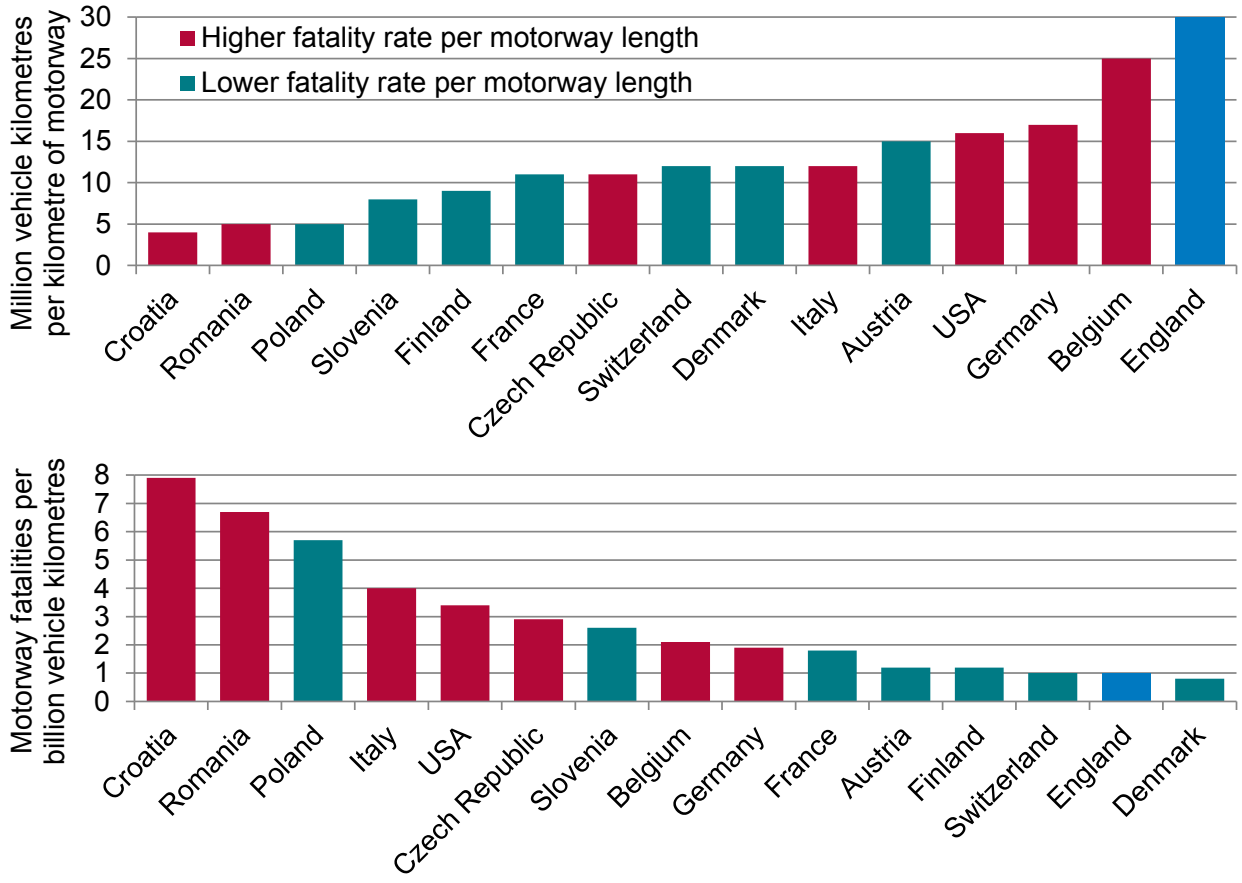
[14] http://www.pacts.org.uk/wp-content/uploads/sites/2/PPR796-Understanding-the-Strengths-and-Weaknesses-of-Britains-Road-Safety-Performance-1.pdf.

[15] Both motorway length and motorway traffic fatality rates could be affected by differences in how 'motorways' are defined in different countries. Traffic-based rates could also be affected by differences in how motorway traffic data are collected / estimated in different countries.

[16] Source: Eurostat and German Federal Highway Research Institute (BASt): http://www.bast.de/EN/Publications/Media/Unfallkarten-international-englisch.pdf?__blob=publicationFile&v=5.

2.14 However, figure 12 shows that England's motorways carry more traffic than the other countries in the sample and have the second lowest motorway fatality rate (per vehicle kilometre), behind only Denmark.

Figure 12 – Motorway traffic volumes and fatalities per vehicle kilometre, 2013 or latest year available[17]



2.15 We performed similar analysis with data from the Conference of European Road Directors' (CEDR's) trans-European transport network (TEN-T) 2013 performance report.[18] Not every country in the TEN-T network participated in the study, and the network does not cover all motorways in those countries, but, based on the included sample of motorways, we found the same result – that English motorways have one of the lowest fatality rates (per vehicle kilometre).

2.16 Around 40% of deaths and serious injuries on the strategic road network happen on motorways. This analysis does not mean that it is impossible to reduce them, or that it would not be cost-effective to do so. However, it highlights the challenge in further improving safety on roads that are already amongst the safest in the world.

[17] Source: Eurostat and German Federal Highway Research Institute (BASt): http://www.bast.de/EN/Publications/Media/Unfallkarten-international-englisch.pdf?__blob=publicationFile&v=5.

[18] http://www.cedr.fr/home/fileadmin/user_upload/Publications/2014/TENT_Performance_Report_2013.pdf.

Comparing international road safety targets

Casualty reduction targets

2.17 Given the low fatality rates (when compared internationally, and with other road types) on Highways England's network, comparing casualty reduction targets will be useful in assessing the level of challenge and deliverability of future road safety targets or outcome measures. We have analysed the casualty reduction targets for countries with leading road safety records, and summarised them in the box below.[19]

2.18 The format of the targets varies: some countries set targets for different severities of injury, some just for KSIs, and the timescales vary. However, one thing that stands out is that, while the UK is not the only country without a quantitative casualty reduction target, Highways England appears to be in a unique position of having a target for its strategic road network, without there being an over-arching national target.

Casualty reduction targets

Denmark: 50% reduction in KSIs from 2010-2020 – fewer than 120 deaths and 1,000 serious injuries

Norway: Fewer than 500 KSIs by 2024

Iceland: 46% reduction in KSIs from 2011-2022 – average 5% per year reduction

Sweden: 50% reduction in fatalities from 2007-2020 and reduce serious injuries by 25%

Netherlands: Fewer than 500 fatalities by 2020 and fewer than 10,600 MAIS2+ injuries

Switzerland: No quantitative target

United Kingdom: No quantitative target – Highways England has a target to reduce KSIs on the SRN by 40% by 2020 from a 2005-2009 average baseline

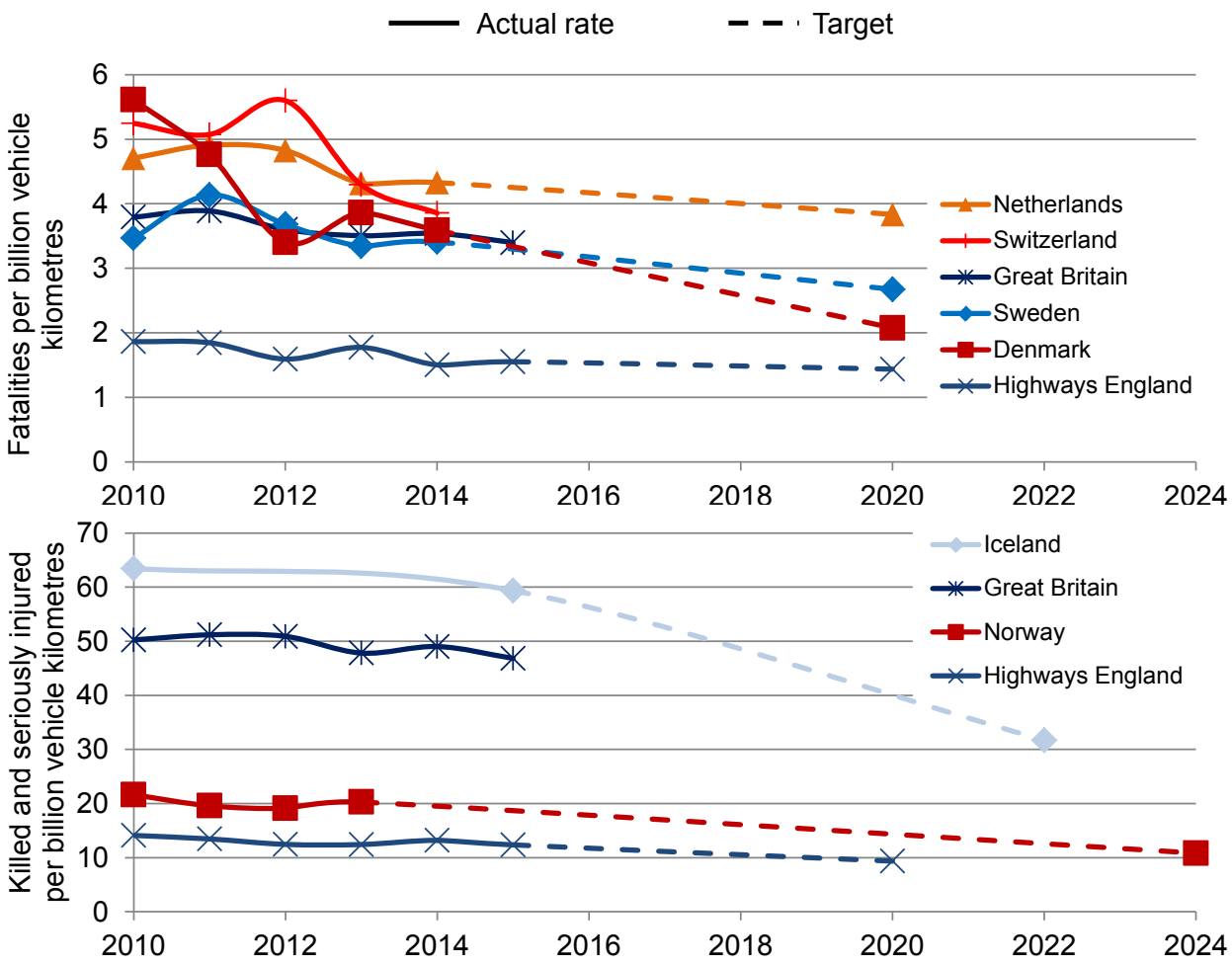
2.19 To make better comparisons with safety on the strategic road network, we converted the targets into rates per billion vehicle kilometres.[20] Figure 13 shows actual safety performance and the "target rates", including for Highways England.[21] For better comparability between countries and consistency with the most readily available data, we present fatalities for Denmark, the Netherlands and Sweden, but we use KSIs for Norway and Iceland, as their targets do not distinguish between severities.

[19] Countries with fewer than four fatalities per billion vehicle kilometres in the OECD's Road Safety Annual Report, 2016: http://www.oecd-ilibrary.org/transport/road-safety-annual-report-2016_irtad-2016-en.

[20] Assuming recent traffic growth trends continue until the end of the target period.

[21] Assuming Highways England's 40% target is applied equally to both fatalities and serious injuries.

Figure 13 Casualty reduction targets in selected countries[22]



2.20 Figure 13 shows that Highways England's network has the lowest fatality and KSI rates, which is largely because it is comparing the strategic network in England with whole road networks in other countries. However, it also shows that the casualty rates associated with the targets in other countries appear to be converging towards, or "catching-up" with, Highways England's.

2.21 It might be that the significant improvements targeted, particularly in the Scandinavian countries, are expected to occur on urban and smaller rural roads, rather than motorways or other national roads. Therefore it is difficult to assess the comparability of these national targets with Highways England's strategic road network-specific target. This is something we plan to investigate further through the engagement with other NRAs discussed in the previous section.

[22] Source: OECD Road Safety Annual Report 2016: http://www.oecd-ilibrary.org/transport/road-safety-annual-report-2016_irtad-2016-en.

Road "star rating" targets

2.22 As well as its KSI reduction target, Highways England has committed to "star rate" the safety of the strategic road network using the EuroRAP model (or equivalent).[23] Highways England has two additional targets or commitments relating to this star rating exercise, to ensure that:

- by the end of 2020 more than 90% of travel on the strategic road network is on roads with a safety rating of EuroRAP 3* (or equivalent); and
- the majority of those roads with a 1* and 2* safety rating have improved to 3*.[24]

2.23 The EuroRAP (and outside Europe, iRAP) safety rating model has been applied in many countries worldwide, some of which have set similar targets. While there is some difference in the terminology, there is a large degree of consistency in the star rating-based targets being applied to strategic / national / high volume networks. The main exception is Sweden, where the target is for travel on all roads.

Star rating-based targets


(Highways England) 90% of SRN travel on 3* roads or better by 2020


(Sweden) 75% of travel on 3* roads or better by 2020 and approaching 100% by 2025


(Netherlands) All national roads 3* or better by 2020


(New Zealand) All Roads of National Significance to be 4*


(Australia) All new roads 4* rated, with no user group <3*. Separate targets for some states for their national roads to be 3* or better


(Malaysia) 75% of travel on high volume networks on 3* or better roads by 2020

2.24 However, some of the targets appear to be more stretching, for example the Netherlands is targeting all national roads to be 3* or better by 2020 (rather than 90% of travel), and New Zealand is targeting 4* or better for all Roads of National Significance. Therefore, there is clearly potential for further use of star rating-based targets in future road periods. We are planning to use the data from Highways England's star rating exercise to analyse the links between star ratings and casualty rates to help understand the potential casualty reductions from improved star ratings.

[23] More detail on road star ratings can be found at: http://www.eurorap.org/.

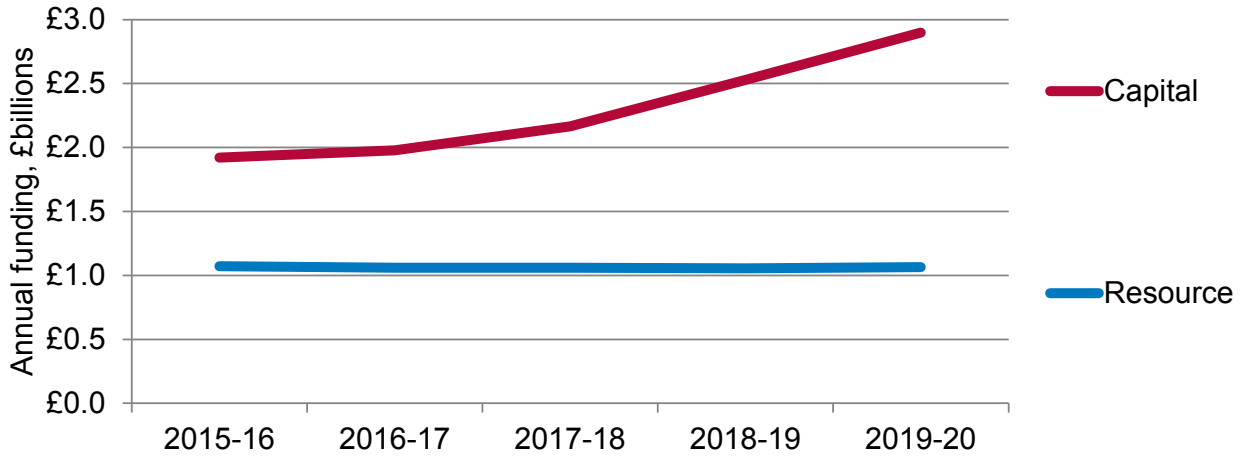
[24] Highways England Delivery Plan 2015-2020: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/424467/DSP2036-184_Highways_England_Delivery_Plan_FINAL_low_res_280415.pdf.

3. Cross-sectoral comparisons

Support costs and operational expenditure

3.1 Highways England has a KPI target to deliver at least £1.2 billion of efficiency savings on capital expenditure by 2020. Figure 14 shows that capital expenditure makes up the majority of Highways England's funding, but it also has around £1 billion of resource funding (also referred to as operational expenditure) per year, mainly for operating the network, performing maintenance activities and funding DBFO contracts. Given the size of this funding, we feel it is important to consider the efficiency of resource, as well as capital, spending, when preparing for RIS2.

Figure 14 – Highways England funding for road period 1 [25]



Operational expenditure efficiency in other sectors

3.2 We have commissioned a research study to look at how operating expenditure efficiency has evolved in other network industries, both in recent years and in the periods following privatisation or sectoral re-structuring. The study will consider a number of measures of efficiency and we are expecting it to complete in spring 2017.

Corporate function and organisational structure

3.3 Highways England has begun to benchmark its corporate functions and organisational structures, to assist internal business planning process for 2017-18. This is at an early stage and, working with CIPFA (Chartered Institute of Public Finance and Accountancy Body), it hopes to understand how its corporate functions rank against 200-plus government organisations.

[25] Source: Highways England Delivery Plan 2016-17: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/538130/S160049_Highways_England_Delivery_Plan_2016_Final_-_Digital_version.pdf.

4. Our plans for 2017 and beyond

4.1 Much of our benchmarking work is focused on the RIS2 development process as we require a strong evidence base to assess whether proposals are challenging and deliverable, including when assessing proposed levels of efficiency in our Efficiency Review.[26] This section highlights some of our key planned work areas for the next year.

Developing our regional benchmarking

4.2 There are significant data availability and comparability challenges associated with international benchmarking. Therefore, a major element of our benchmarking will focus on regional comparisons, consistent with the route-level approach we are developing for Network Rail. We are planning to build on the initial regional analysis presented in chapter 1 by collecting a time-series of regional network, traffic, performance and expenditure data. This will provide greater insight on the drivers of performance variation and, with enough data, would facilitate top-down efficiency benchmarking.

More detailed unit costs

4.3 We are also working with Highways England to develop more disaggregated data on the unit costs for enhancement projects, renewals and maintenance activities.[27]

Benchmarking safety – links between star rating and casualty rates

4.4 As discussed in chapter 2, we are planning to use the data from Highways England's baselining exercise to analyse the links between casualty rates and roads' star ratings. This will help inform the potential scale of casualty reduction that could come from improving the star rating of the strategic road network.

International benchmarking

4.5 We will use the analysis presented in chapter 2 as the basis for engaging with NRAs in other countries to collect data for performance and efficiency benchmarking. The form this takes will largely depend on data availability but could, for example, include regional data for national networks in other countries that would help with top-down efficiency analysis. This is the direction we would like to take in the longer-term, with Highways England at the heart of a network of NRAs that share the data and information needed for benchmarking across a range of activities.

[26] http://orr.gov.uk/highways-monitor/publications/orrs-approach-to-the-second-road-investment-strategy

[27] For maintenance, this will focus on areas of the network managed under Highways England's new "Asset-Led Delivery Model", where more detailed maintenance cost data will be available.

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 2015-16. The exception is average delay, which has no target. For this KPI the red line represents average delay across the strategic road network as a whole, with regional performance presented relative to the national average. The table below sets out the outcome areas, metrics and targets for each of the six KPIs:

Outcome area	KPI metric	Target
Making the network safer	Number of killed and seriously injured (KSI) casualties	RIS1: 40% reduction in KSIs by 2020 from a 2005-09 average baseline 2015 monitoring point: <1,750 KSIs
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
	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

Safety

Highways England's safety KPI target is to reduce the number of people killed and seriously injured (KSI) in road accidents on the strategic road network by 40% by the end of 2020 from a baseline of the 2005-2009 average. This equates to a target of fewer than 1,393 KSIs on the strategic road network in 2020.

Highways England has a series of monitoring points to monitor progress towards the 2020 target, based on a straight line reduction. The monitoring point for 2015 is 1,750 KSIs. We converted this to a KSI rate (KSIs per billion vehicle kilometres) and compared the KSI rate in each region against this monitoring point rate. While all the other performance data are for the 2015-16 financial year, the number of KSIs and the traffic volumes used to calculate the KSI rates are for calendar year 2015. A lower KSI rate represents better performance, but better performance is best represented by a bigger "shape" on the radar charts. Therefore we transformed the data so a lower KSI rate produces a bigger shape:

$$Safety = 1 + \left(1 - \frac{KSI\ rate_{region}}{KSI\ rate_{target}}\right)$$

Average delay

As discussed above, performance against this KPI is represented against the average for the strategic road network, as there is no target. As with safety, lower delay represents better performance so the transformation applied for safety was also applied for delay:

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

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 in the manner shown below:

	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 safety and average delay is then applied for presentation in the radar charts.[28]

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

Treatment of DBFO-managed sections of the network

Management of the strategic road network 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 strategic road network but do not differentiate between sections that are directly managed by Highways England's regions.[29] More detail on which parts of the network fall into each region, and which are managed by DBFO operators, can be found 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 2015 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 2014 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

[29] 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.

Structures

The number of structures on each region of the strategic road network is sourced from Highways England's Structures Management Information System (SMIS)). The data represent a snapshot from SMIS on 1 April 2016. The main categories of structures included are:

- Bridges and large culverts – e.g. bridges, buried structures, subway underpasses, culverts and similar structures with a span of more than 3 metres. Structures supporting the highway as it crosses an obstacle or a service or a structure supporting the passage of a service over the highway.
- Masts – structures providing various functions, including, cantilever masts for traffic signals, high masts for lighting, masts for camera, radio, speed cameras and telecommunication transmission equipment; catenary lighting support systems and highway signs on posts.
- Retaining walls – earth retaining structures.
- Road tunnels – enclosed lengths of road of 150m or more.
- Signs and / or signal gantries – portal and cantilever gantries that support signs and / or signals.

Road length

Two measures of the length of the strategic road network 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 kilometres – 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 1 April 2016.

Spending

Maintenance and renewal spending data were sourced from statements F2.1 and F3.1 of Highways England's 2015-16 performance monitoring statements. The spending figures are divided by the lane kilometre data described above to give a figure per lane kilometre, and are compared with the average across the six regions:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/537621/S160230_Highways_England_201516_Year-end__Performance_Monitoring_Stateme....pdf

Traffic

Traffic data are for 2015 and were sourced from DfT. 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 kilometres (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 2015.

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

Annex B – International data sources

The eight metrics used to identify the likely best comparators for Highways England were calculated in the following manner:

- GDP per capita – 2014 GDP (in US dollars) divided by 2014 population
- Population density – 2014 population divided by land area (km^2)
- Road density – total network road kilometres divided by land area (km^2)
- Motorway percentage – motorway kilometres divided by total network kilometres
- Traffic density – total annual vehicle kilometres divided by total network kilometres
- Freight density – road freight tonne kilometres divided by total network kilometres
- Road fatalities – road accident fatalities divided by total annual vehicle kilometres
- Road expenditure – total annual road expenditure divided by GDP

The table below details the data sources used. 2014 data were used where possible, with the latest available year used otherwise.

Metric	EU and OECD source links	England, Wales and Scotland source links
GDP per capita	http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2014&locations=GB&start=1960	http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/administrative/the-countries-of-the-uk/index.html
Population density	http://www.irfnet.ch/world_road_statistics.php	http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/2015-06-25
Road density		https://www.gov.uk/government/statistical-data-sets/rdl02-road-lengths-kms
Motorway percentage		https://www.gov.uk/government/statistical-data-sets/rdl02-road-lengths-kms
Traffic density		https://www.gov.uk/government/statistical-data-sets/tra02-traffic-by-road-class-and-region-kms
Freight density		https://www.gov.uk/government/statistical-data-sets/tra02-traffic-by-road-class-and-region-kms
Road fatalities		https://www.gov.uk/government/statistical-data-sets/ras30-reported-casualties-in-road-accidents (RAS30008)
Road expenditure		https://www.gov.uk/government/statistical-data-sets/transport-expenditure-tsgb13 (TSGB1302)

In addition, there were some gaps in the World Road Statistics database. Where these were likely to affect the scoring and ranking, we used alternative data sources:

- Vehicle kilometres; Italy – 10th Annual Road Safety Performance Index (PIN) Report, http://etsc.eu/10th-annual-road-safety-performance-index-pin-report/
- Motorway length; Netherlands – Eurostat, http://ec.europa.eu/eurostat/web/transport/data/database
- Road expenditure; Belgium, Germany, Italy, Israel and Japan - International Transport Forum road infrastructure investment and maintenance spending, http://stats.oecd.org/Index.aspx?DataSetCode=ITF_INV-MTN_DATA

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