



Department  
for Transport

# Analysis of travel times on the Strategic Road Network, England: 2014

Published: 30 July 2015

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## Overview

This paper has been produced by the Department for Transport. It brings together introductory analysis of travel times on the [Strategic Road Network](#) (motorways and 'A' roads managed by Highways England\*) in 2014. The analysis focusses on three travel time measures:

1. Average speed
2. Average delay
3. Reliability (or 'predictability')

The measures were developed as part of the '[Road Investment Strategy](#)' (RIS). The RIS sets out a long-term programme for England's motorways and major roads with the stable funding needed to plan ahead effectively.

This analysis is being published now in line with best practice as an introduction to these three new measures. The analysis is intended to be transparent and to inform users. It is our intention to start producing statistics series of a similar nature later in 2015, so any feedback on this analysis via the contact details above is very welcome. The Department for Transport recently stopped publishing statistics based on a different measure of reliability known as the '[On Time](#)' [Reliability Measure](#).

## Average speeds on the Strategic Road Network

### Introduction

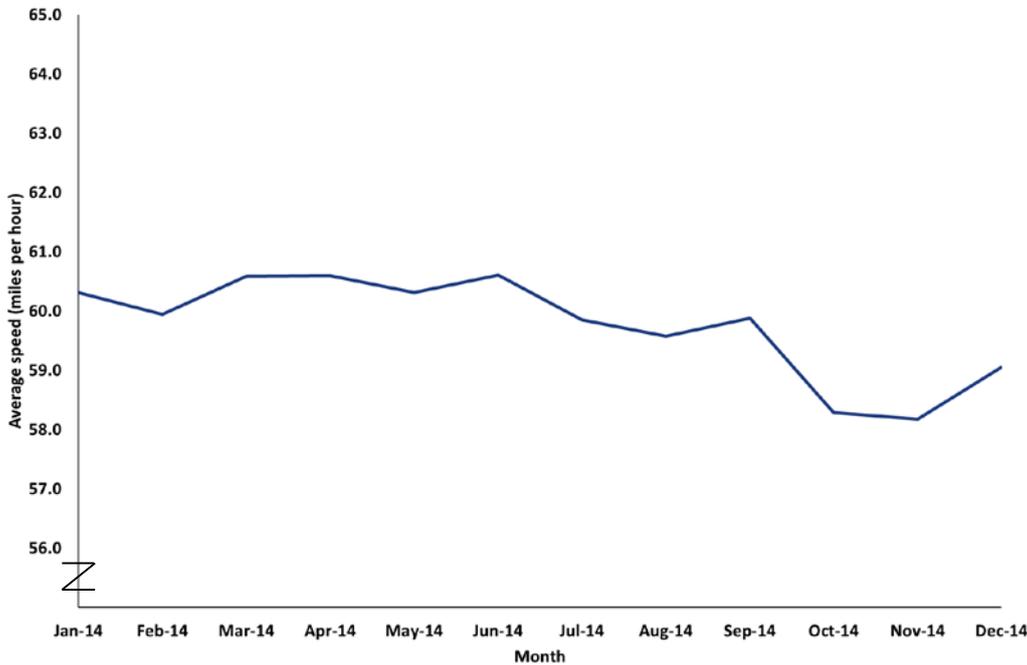
This measure reflects the average speeds of cars on the Strategic Road Network across the whole day (and night). The measure weights speed observations from a sample of vehicles by associated traffic flows so that it is representative of traffic volumes on the roads in different locations and at different times of day.

### National overview of average speeds

The average speeds of cars on the Strategic Road Network in 2014 is estimated to be **59.7mph**. Looking at individual months in 2014, the months with the highest average speed were March, April and June, each with an average speed of 60.6mph. The month with the lowest average speed was November with an average speed of 58.2mph.

\*Highways England, a government owned strategic highway company, came into being on 1 April 2015, following the transformation of the Highways Agency, previously an Executive Agency of the Department for Transport.

**Figure 1: Average car speeds on the Strategic Road Network in 2014**



It should be noted that the average speeds presented above are calculated across all 24 hours of the day and across the entire Strategic Road Network. As such, it would not be appropriate to use these averages to represent 'typical' speeds on any individual section of the network or time of day.

Initial analysis suggests that the lower average speeds during months towards the end of the calendar year have been observed in previous years and are likely to be as a result of seasonal effects (e.g. traffic levels or weather).

## Average delay on the Strategic Road Network

### Introduction

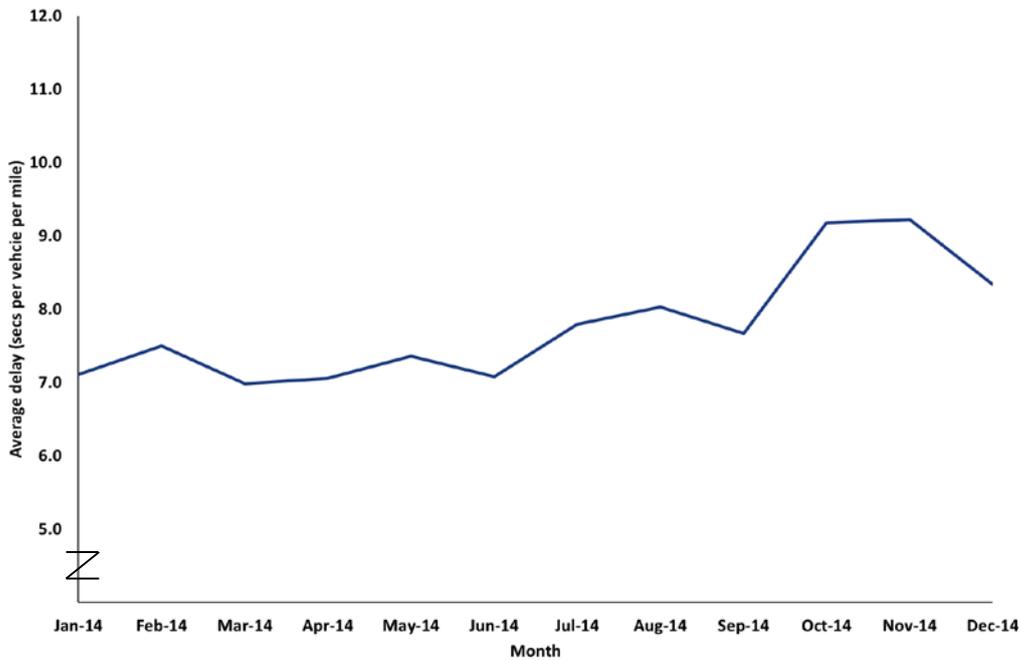
Delay (or 'time lost') is calculated by subtracting derived 'free flow' travel times (see page 7) from observed travel times for individual road sections. Average delay is calculated by aggregating individual delay estimates and weighting observations by associated traffic flows so that it is representative of traffic volumes on the roads (as for average speed). Average delay is presented across all 24 hours of the day and on a per vehicle per mile basis.

Average delay is commonly used as a measure of relative congestion. One advantage it has over the average speed measure is that it takes account of different free flow speeds (often associated with different speed limits) allowing road sections to be compared more easily.

### National overview of average delay

The average delay on the Strategic Road Network in 2014 is estimated to be **7.8 seconds per vehicle per mile**. Looking at individual months in 2014, the month with the lowest average delay was March with an average delay of 7.0 seconds per vehicle per mile. The months with the highest average delay were October and November, each with an average delay of 9.2 seconds per vehicle per mile.

**Figure 2: Average delay on the Strategic Road Network in 2014**



Similar to average speeds, the average delays presented above are calculated across all 24 hours of the day across the entire Strategic Road Network. As such, it would not be appropriate to use these averages to represent 'typical' delays on any individual section of the network or time of day.

Initial analysis suggests the higher average delays during months towards the end of the calendar year have been observed in previous years and are likely to be as a result of seasonal effects (e.g. traffic levels or weather).

# Reliability of travel times on the Strategic Road Network

## Introduction

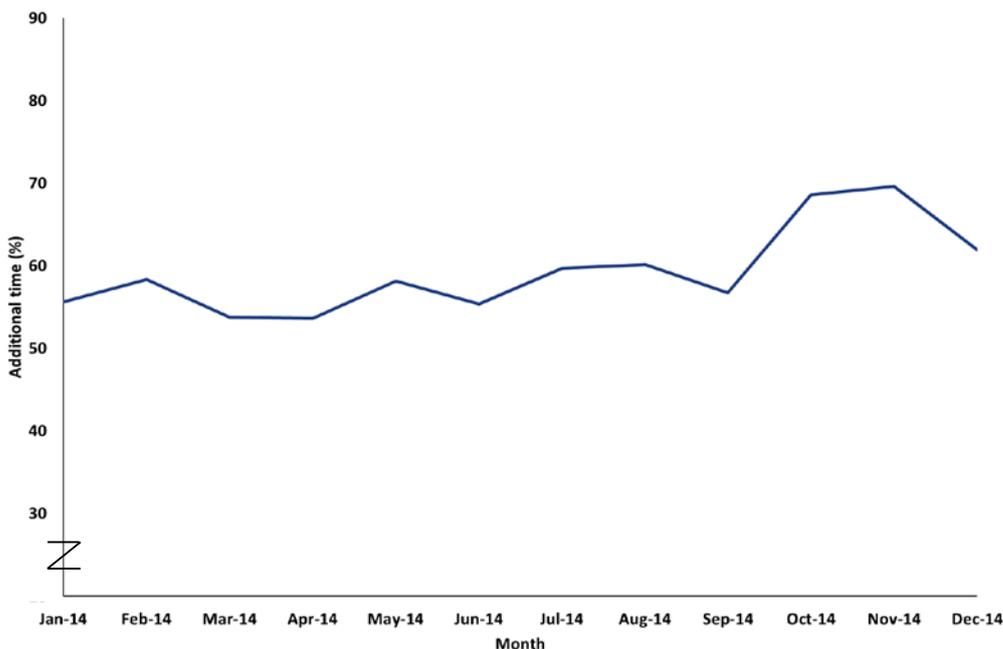
The measure of reliability presented in this paper is the **Planning Time Index (PTI)**. The PTI tells us about the predictability of travel times and aims to measure the additional time (compared to free flow conditions) that drivers need to leave between junctions to ensure that they arrive on time. This measure is the ratio of the 95<sup>th</sup> percentile travel time to the free flow travel time. The PTI can also be presented as a percentage, as in the analysis below.

## National overview of reliability

On average in 2014, users of the Strategic Road Network needed to leave **59%** additional time between junctions to ensure they arrived on time.

This means that for an 'average' journey between junctions on the Strategic Road Network in 2014 that took 10 minutes in free flow conditions, 95% of users leaving 16 minutes to make this journey would have arrived on time. Alternatively, someone leaving 16 minutes to make the same journey 20 times a month would have been on time on 19 out of 20 of those journeys.

**Figure 3: Average additional time needed between junctions to achieve on time arrival on the Strategic Road Network in 2014**



Looking at individual months in 2014, the months where the least amount of additional time needed were March and April where 54% additional time needed to be added on average to ensure on time arrival. The month where the largest amount of additional time needed was November where 70% additional time needed to be added on average to achieve on time arrival.

The average additional times needed presented above are calculated for day time only (6.00am-8.00pm) across the entire Strategic Road Network. As such, it would not be appropriate to use these averages to represent 'typical' additional times needed on any individual section of the network or time of day.

Similar to average speeds and delays, initial analysis suggests that the higher levels of additional time needed during months towards the end of the calendar year have been observed in previous years and are likely to be as a result of seasonal effects (e.g. traffic levels or weather).

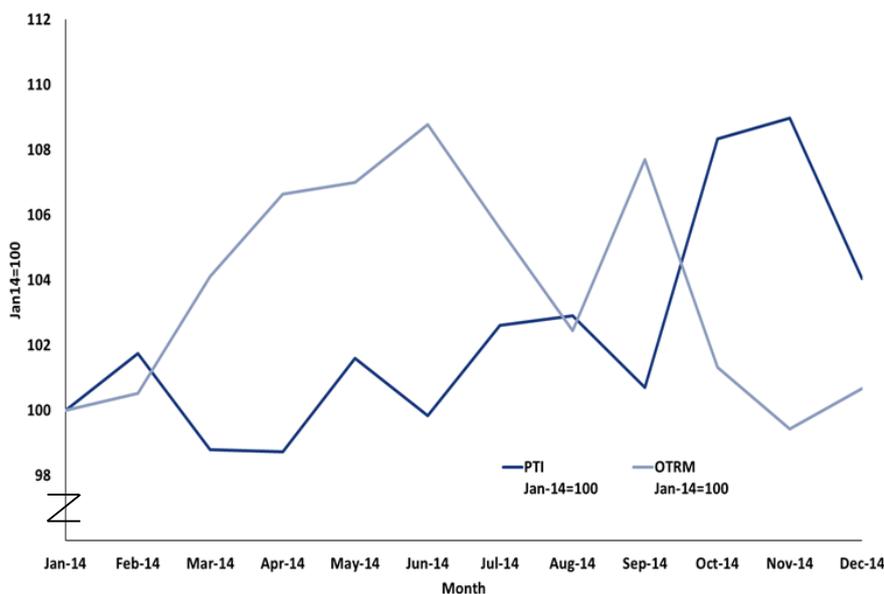
**Comparison of Planning Time Index analysis with On Time Reliability Measure statistics**

The Department recently stopped publishing statistics based on a different measure of reliability known as the '[On Time Reliability Measure](#)' (OTRM).

To understand how the new PTI reliability measure compares with the old 'On Time' measure, monthly changes in each measure have been indexed (January 2014 = 100) in the chart below.

There is some evidence of an inverse (mirroring) relationship in the chart. This is not particularly surprising because a decrease in the PTI (less additional time needed to ensure on time arrival) and an increase in the OTRM (greater percentage of journeys on time) are both generally regarded as positive.

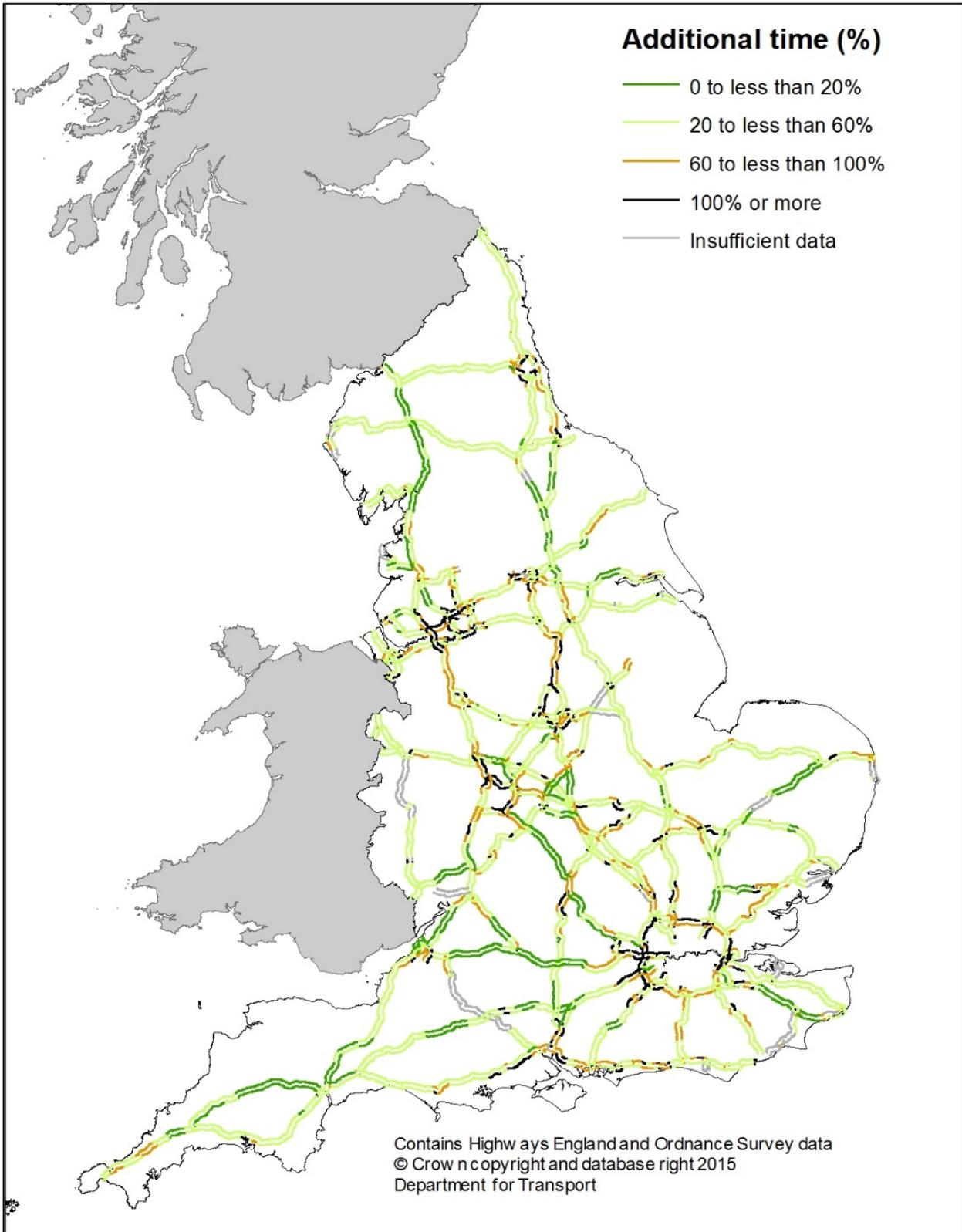
**Figure 4: Comparison of Planning Time Index and the On Time Reliability Measure in 2014**



**Reliability for individual road sections**

The map below presents the average additional time needed between junctions to achieve on time arrival by (junction to junction) road section in 2014. The green coloured road sections are the more reliable sections of the network in terms of additional time needed. The brown and black links are less reliable sections of the network.

**Figure 5: Average additional time needed between junctions to achieve on time arrival on the Strategic Road Network in 2014**



## Further information

### Road Investment Strategy

The '[Road Investment Strategy](#)' (RIS) sets out a long-term programme for England's motorways and major roads with the stable funding needed to plan ahead effectively. As part of the RIS, the Performance Specification sets out what Government wants from Highways England over the course of the first Road Period 2015/16 to 2019/20.

The Performance Specification includes a number of performance measures, supported by performance indicators. The three travel time measures presented in this report are all performance indicators identified in the Performance Specification, or in the case of *Average speed*, identified and developed by Highways England. Each measure is defined in the [Operational Metrics Manual](#).

### Methodology and technical detail

1. Users should exercise some caution when interpreting the analysis in this paper, particularly when looking over short periods of time. Travel times (and the measures in this report) are likely to be affected by a range of factors such as traffic levels, weather, roadworks, or changes to speed limits.
2. The underlying datasets used to produce the analysis in this paper are similar to those used for the old '[On Time](#)' [Reliability Measure](#) (OTRM) statistics. The data are based on travel times estimated using Global Positioning Systems (GPS) and traffic flows using estimated using Highways England automatic traffic counters.
3. All measures in this paper use travel times from car observations only. This greatly reduces the risk that observed changes in any of the travel time measures being a result of changes in the vehicle mix of the sample. Close to 50,000 cars each month are used to calculate the measures. This is less than the number used for the old OTRM statistics (where cars, vans and HGVs were used). All measures are weighted by associated expected traffic flows to ensure that they represent traffic volumes on the roads in different locations and at different times of day.
4. All measures use real, observed travel time data with a good temporal match where available. For the *Average speed* and *Average delay* measures, where no data of this quality are available for a particular section of road and time period, journey times are imputed using corresponding monthly day-time and night-time averages for individual road sections. For all measures, where there is insufficient data for individual road sections, national day-time and night-time averages are used.
5. The *Reliability* measure is based on travel taking place between 6.00am and 8.00pm. This is the period where traffic is highest (and sample sizes) and delays and journey unreliability are more likely.
6. For the *Average delay* and *Reliability* measures, free flow travel times are derived by taking the 85<sup>th</sup> percentile speed across all car observations over the last 6 years, 'capped' to current speed limits. For the majority of road sections, the resulting free flow speed is, or is very close to, the current speed limit.
7. The Department for Transport publishes a separate statistics series on [free flow vehicle speeds on British roads](#). The series focusses more on the speeds at which drivers choose to travel and their compliance with speed limits. Free flow speeds presented in the series are calculated in a different way and using a different data source to the free flow speeds used for the analysis presented in this paper.