



# Rail infrastructure, assets and environmental

## 2017-18 Annual Statistical Release

**Publication date: 18 October 2018**

Next publication date: October 2019

### Background

This release contains the following rail statistics for Great Britain in 2017-18:

**Rail infrastructure** statistics provide details on track length (including electrified track). Sourced from Network Rail and is available from 1985-86.

**Number of mainline stations** are sourced from Estimates of Station Usage (ORR) and Network Rail and is available from 1985-96

**Average age of rolling stock** is sourced from the Rail Safety & Standards Board and the Department for Transport and is published by train operator from 2007-08 Q4.

**Environmental** statistics are sourced from train operators and provide an estimate of normalised CO<sub>2</sub>e emissions from traction energy since 2005-06.

### Infrastructure:

As a result of various electrification schemes across Great Britain, 5,766km of the mainline railway route is now electrified; 36% of the total (up from 34% in 2016-17).

Three new mainline stations opened in 2017-18, bringing the total to 2,563:

- Ilkeston
- Low Moor
- Cambridge North

### Average age of rolling stock:

The average age of rolling stock is 19.6 years, a 0.6 year decrease over the course of 2017-18. This is a result of the introduction of new rolling stock by many operators.

### Emissions:

Electricity consumed (in kWh) for providing traction to rail services has increased in both the passenger and freight sectors. Conversely, the amount of diesel used has seen a decrease. This is likely a consequence of the introduction of new electric fleets across the country.

Overall CO<sub>2</sub>e emissions from the provision of traction to trains has decreased (6.6% for passenger services, 2.9% for freight), largely due to the use of greener energy sources for electricity generation.

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# 1. Infrastructure on the railways

## Route open for traffic

**Route open for traffic in 2017-18: 15,878km**

**Track km open in 2017-18: 31,046km**

The total length of route open for traffic in 2017-18 was 67km higher than in the previous year.

Between 2016-17 and 2017-18 Network Rail replaced GEOGIS, its master database for track assets, with a new system called INM (Integrated Network Model). As part of this process a number of data improvement and cleansing actions were undertaken. Therefore, some of the changes between 2016-17 and 2017-18 may be due to this system change rather than an actual physical change on the ground.

Infrastructure on the railways shows data on the number of kilometres of route and track open for passenger and freight traffic, the length of route which is electrified and the number of open passenger stations on the Great Britain rail network.

For a detailed history on how route length has changed, including information on the 'Beeching cuts', please see the accompanying [quality report](#).

**Route kilometres** are the total extent of routes available for trains to operate.

**Track kilometres** takes into account multiple track routes (e.g. for each route kilometre where there is double track, there are two track kilometres).

Sidings and depots are excluded from both measures.

## Electrification

At the end of 2017-18 there was a total of 5,766km of electrified route, approximately 36% of the total. This has increased from 5,374km (34%) in the previous year.

Over recent years, the proportion of route electrified has been increasing, mostly as a result of various Network Rail electrification schemes such as those currently underway on the London North Eastern, London North Western, Scotland and Western routes.

More information on these schemes is available online:

- [Midland Main Line upgrade](#)
  - The [Great North Rail Project](#) (GNRP)
  - The [Edinburgh Glasgow Improvement Programme](#) (EGIP)
  - [Great Western Mainline](#) Electrification
- 
- Infrastructure on the railways (route open, electrified, and track km) annual data is available on the data portal in Table 2.52

## Number of mainline stations in Great Britain

**2,563**  
**stations**

3 new stations



### New station

#### Ilkeston

(opened April 2017)

### Served by

Northern services between Nottingham and Leeds; East Midlands Trains services between Liverpool and Norwich

#### Low Moor

(opened April 2017)

Northern services between Huddersfield and Leeds; Grand Central services to London

#### Cambridge North

(opened May 2017)

Greater Anglia, Great Northern and Thameslink services between Cambridge, Norwich, Kings Lynn and London

The ORR's [Estimates of Station Usage](#) dataset is used as the source for the number of mainline stations from 1997-98 onwards. Prior to 1997-98 Network Rail's Operational Property Asset System (OPAS) is used as the source. Therefore there is a series break between 1996-97 and 1997-98. Please view the [quality report](#) for more information.

- Mainline station annual data is available on the data portal in Table 2.53

## 2. Average age of rolling stock

### National



At the end of 2017-18 the national rolling stock fleet consisted of over 14,000 vehicles. The average age of the rolling stock across this fleet is 19.6 years, a value which has decreased by 0.6 years since the end of 2016-17.

For franchised operators the average age of rolling stock is also 19.6 years, while for non-franchised operators, who are included for the first time in this 2017-18 release, the average age is slightly lower at 17.5 years.

As all existing rolling stock will age by one year between one year and the next, any change in average age of less than 1.0 years is an indication of either the introduction of newer rolling stock or the removal of older stock from the fleet. Further details on the rolling stock changes throughout 2017-18 are presented in Annex 2.

For the 2017-18 statistical release a new data source for the average age of rolling stock has been introduced, backdated to 2016-17 Q4 to allow a valid year-on-year comparison to be made. Therefore this change is not measured against previously published data. Please see the [quality report](#) for further information.

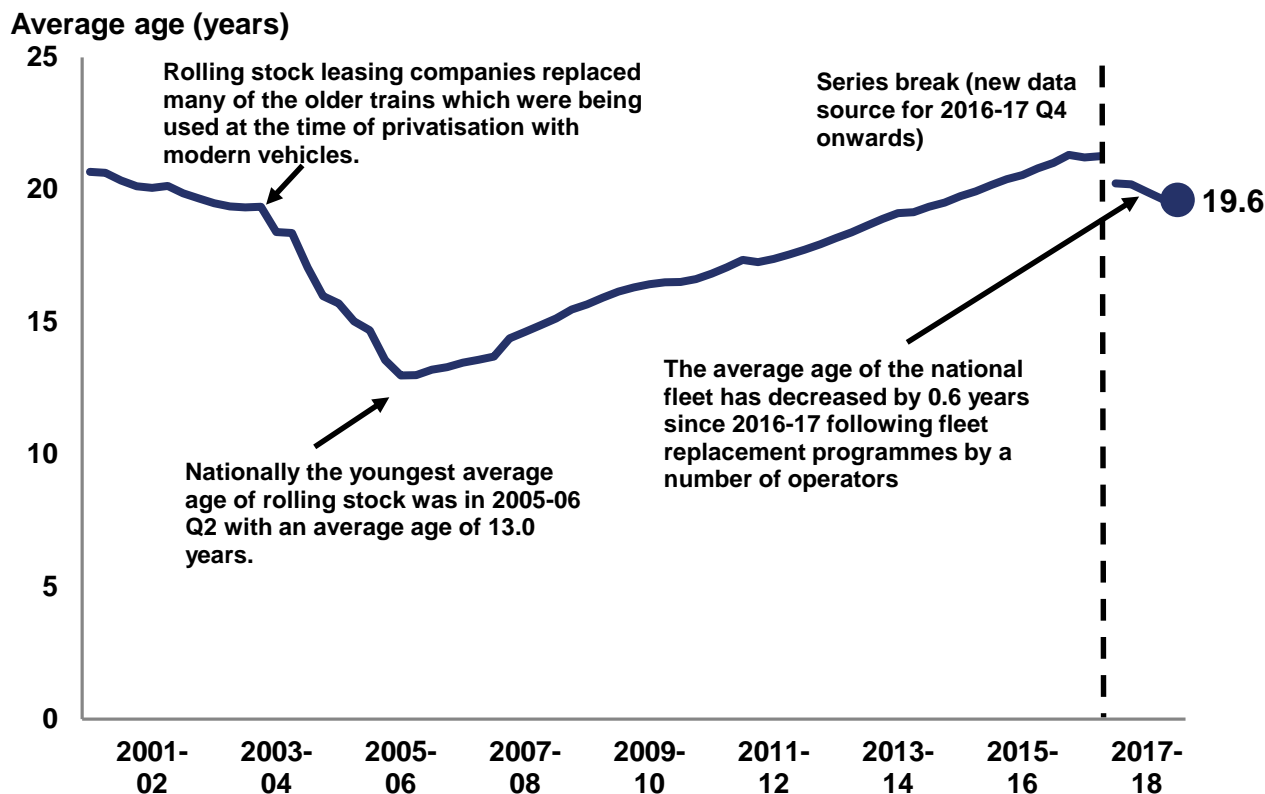
Average age of rolling stock is shown as at the end of 2017-18. These statistics reflect the rate of introduction of new trains to the national fleet.

This includes passenger vehicles leased to franchised train operating companies by rolling stock leasing companies (ROSCOs) and other financiers, but excludes vehicles such as locomotives and Driving Van Trailers.

ROSCOs own most of the coaches, locomotives and freight wagons that run on the rails, which they lease to train operating and freight operating companies.

This data is sourced from the Rail Safety and Standards Board (RSSB) via the Department for Transport. Further information on the calculation of the average age of rolling stock is presented on page 8.

**Average age of rolling stock (franchised operators), Great Britain, 2000-01 Q2 to 2017-18 Q4 (Table 2.31)**



Shortly after privatisation a number of trains from the British Rail era were replaced. Between 2005-06 and 2016-17, after this wave of replacements, the average age of rolling stock for franchised operators rose steadily. The average age has fallen over the last year as a result of a number of rolling stock replacement programmes across the country<sup>1</sup>.

An additional 1,565 vehicles have been ordered by the industry during 2017-18, meaning the total number of new vehicles expected to be delivered between 2014 and 2021 has reached almost 7,200 (over 50% of the current fleet). Consequently, the [average age of rolling stock is forecast](#) to fall to 15 years by March 2021. A selection of future rolling stock orders are explained under each train operating company in Annex 2.

<sup>1</sup> From 2016-17 Q4 onwards the R2 database is being used as the data source for average age, see the quality report for more information

## Average age of rolling stock by train operating company

For ten operators the average age of rolling stock decreased, or increased by less than a year, during 2017-18:

<b>Chiltern Railways</b>	<b>Northern</b>
<b>Govia Thameslink Railway</b>	<b>Southeastern</b>
<b>Grand Central</b>	<b>South Western Railway</b>
<b>Great Western Railway</b>	<b>TfL Rail</b>
<b>London Overground</b>	<b>Virgin Trains East Coast</b>

For these operators the change in average age indicates that either newer rolling stock has been introduced, or older rolling stock phased out.

The rolling stock fleet was unchanged for 10 operators:

<b>Arriva Trains Wales</b>	<b>Heathrow Express</b>
<b>c2c</b>	<b>Merseyrail</b>
<b>Caledonian Sleeper</b>	<b>TransPennine Express</b>
<b>CrossCountry</b>	<b>Virgin Trains West Coast</b>
<b>Hull Trains</b>	<b>West Midlands Trains</b>

For each of these operators the average age of rolling stock increased by exactly 1.0 years. This indicates there has been no, or very little, change to the rolling stock in service over the course of the last year.

The average age of rolling stock increased for three operators:

<b>East Midlands Trains</b>	<b>ScotRail</b>
<b>Greater Anglia</b>	

For each of these operators the average age of rolling stock increased by more than one year. An increase of greater than one year indicates that either some older stock has been put into service, or some younger stock has been removed.

## About rolling stock

While new rolling stock may be more efficient and technologically advanced, existing trains can be refurbished during their lifetime to add better facilities (e.g. WiFi capability). Therefore both newly-built and refurbished rolling stock can offer a more comfortable service for passengers. The age of rolling stock does not necessarily affect passenger satisfaction. The introduction of refurbished rolling stock is not reflected in these statistics.

### How average age of rolling stock is calculated

The average age of rolling stock shown is the age as of quarter 4 (January to March) 2017-18. Changes in rolling stock average age are recorded against the same time period the year before. A vehicle drops out of the dataset if it is no longer leased by a train operator.

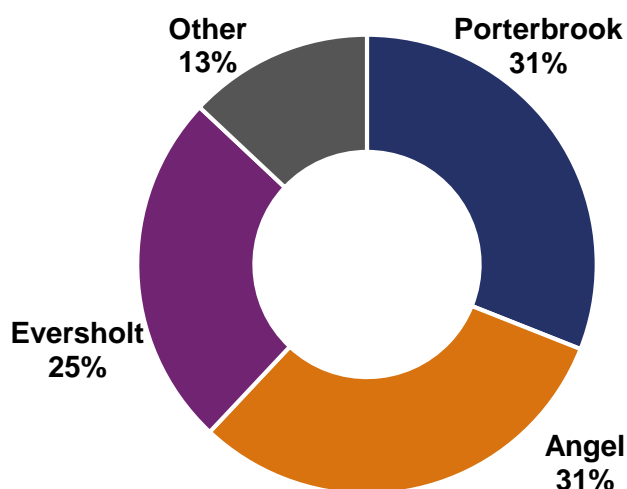
### Rolling stock and accessibility

The Railways (Interoperability) Regulations 2011 and the Rail Vehicle Accessibility (Non-Interoperable Rail Systems) Regulations 2010 require that all passenger rail vehicles meet accessibility standards by 2020. As of July 2018 [the Department for Transport](#) estimates that around 87% of heavy rail rolling stock had been built or refurbished to be accessible to disabled passengers.



## Owners of rolling stock

### Ownership of rolling stock fleet, December 2017



Rolling stock leasing companies (ROSCOs) own the majority of rolling stock in Great Britain, with the three main companies owning 87% of the national fleet. As of December 2017 13% of the fleet was owned by other parties, this is up from 8% in March 2016 and 11% in March 2017. The ROSCOs lease rolling stock to train operating companies.

Source: [Long Term Passenger Rolling Stock Strategy for the rail industry \(sixth edition\), March 2018](#)

### Rolling stock by sector

For this 2017-18 statistical release a new data source, the R2 database, has been used to generate the average age of rolling stock statistics. Sector level information is not present in this database, therefore the data portal table, average age of rolling stock by sector, has been discontinued from 2017-18 onwards. Sector level data by quarter will remain available on the ORR data portal from 2000-01 Q2 to 2016-17 Q4 in Table 2.30.

- Average age of rolling stock by train operating company quarterly data are available on the data portal in Table 2.31

## 3. Environmental

### Passenger train emissions

The level of CO<sub>2</sub>e emissions per passenger km in 2017-18 was 6.9% lower than the equivalent figure for 2016-17. This a continuation of the trend of falling emissions per passenger km that has been ongoing since the start of the time series in 2005-06.

In 2017-18 passenger services consumed:



**3,645 million kWh of electricity**

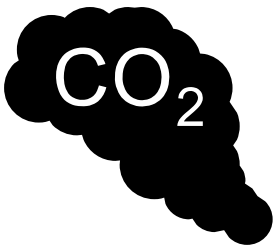
Increase of 3.5% compared to 2016-17



**496 million litres of diesel**

Decrease of 1.1% compared to 2016-17

Which resulted in:



**2,765 KTonnes CO<sub>2</sub>e emissions**

Decrease of 6.6% compared to 2016-17

**40.8 g CO<sub>2</sub>e per passenger km**

Decrease of 6.9% compared to 2016-17

Despite the increase in amount of electricity consumed for providing traction for passenger rail services, the resulting CO<sub>2</sub>e emissions and emissions per passenger km have fallen. This is predominantly due to a [transition towards renewable energy sources](#) in the electricity sector in the UK.

## Freight train emissions

The level of CO<sub>2e</sub> emissions per freight tonne km in 2017-18 remained at a level similar that that seen in recent years.

In 2017-18 freight services consumed:



**66 million kWh of electricity**

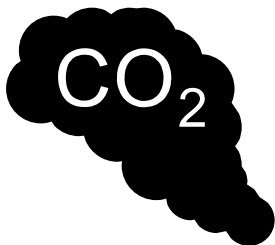
Increase of 13.8% compared to 2016-17



**197 million litres of diesel**

Decrease of 2.5% compared to 2016-17

Which resulted in:



**605 KTonnes CO<sub>2e</sub> emissions**

Decrease of 2.9% compared to 2016-17

**33.0 g CO<sub>2e</sub> per tonne km**

Increase of 0.4% compared to 2016-17

The change in electricity/diesel consumption since 2016-17 is due to some freight operating companies running more trains using electric traction.

As for passenger transport, the overall CO<sub>2e</sub> emissions has decreased despite the increase in fuel consumption due to updated emission factors, reflecting a transition away from coal to greener sources of energy for electricity generation.

## About emissions

**Environmental** statistics are an environmental indicator showing normalised CO<sub>2</sub>e (carbon dioxide equivalent) emissions from traction energy for passenger and freight trains.

Passenger data has been normalised to show the average CO<sub>2</sub>e emission per passenger kilometre. Freight data has been normalised to show the average CO<sub>2</sub>e emission per net tonne kilometre of freight moved.

Traction energy refers to rolling stock on the Great Britain rail network and the energy used to power passenger and freight train movements. Non-traction emissions are excluded.

### How emissions are calculated:

CO<sub>2</sub>e emissions are calculated from actual and estimated data for energy consumption. Train operators provide ORR with their total traction electricity (kWh) and diesel usage (litres) consumption.

Actual energy consumption data is converted into CO<sub>2</sub>e using standard conversion factors from the Department for Business, Energy and Industrial Strategy (BEIS). The [conversion factors](#) allow activity data (e.g. litres of fuel used, kWh consumed) to be converted into kilograms of carbon dioxide equivalent (CO<sub>2</sub>e) which is a universal unit of measurement that allows the global warming potential of different greenhouse gases (GHGs) to be compared. For more technical information see the [quality report](#).

### Estimated emissions:

For 2017-18 the following were estimated due to passenger train or freight operators not providing data:

- Emissions from two passenger train operators; more than 99% of passenger kilometres are covered by actual emissions data.
- Emissions from six freight operators; more than 99% of freight tonne kilometres are covered by the five freight companies who provided emissions data.

## Fifth Carbon Budget

The government has a legally binding Fifth Carbon Budget which aims to reduce emissions by 57% in 2032 compared to 1990 levels, and an 80% reduction by 2050. Moving freight from road to rail is part of the solution and has the potential to help [reduce emissions](#), as part of this [a study](#) showed that shifting from HGV road freight to rail could reduce greenhouse gas emissions by nearly a fifth (19%).

- Estimates of normalised passenger and freight CO<sub>2</sub>e emissions annual data is available on the data portal in Table 2.100
- Estimates of passenger and freight energy consumption and CO<sub>2</sub>e emissions annual data is available on the data portal in Table 2.101

# Annex 1 – List of pre-created reports available on the ORR Data Portal

All data tables can be accessed on the data portal free of charge. The ORR data portal provides on screen data reports, as well as the facility to download data in Excel format and print the report. We can provide data in csv format on request.

## Infrastructure on the railways

- Infrastructure on the railways (1985-86 to 2016-17) – Table 2.52
- Mainline station in Great Britain (1985-86 to 2016-17) – Table 2.53

## Average age of rolling stock data

- Average age of rolling stock by train operating company (2007-08 Q4 to 2016-17 Q4) – Table 2.31

## Environmental data

- Estimates of normalised passenger and freight CO<sub>2e</sub> emissions (2005-06 to 2016-17) – Table 2.100
- Estimates of passenger and freight energy consumption and CO<sub>2e</sub> emissions (2005-06 to 2016-17) – Table 2.101

**Revisions:** There have been revisions to the previously published time series. Further details on revisions to the data can be found in the [revisions log](#)

## Annex 2 – Average age of rolling stock: further detail by train operator

This annex supplements the rolling stock chapter, and provides some further detail about key rolling stock changes and future rolling stock orders. Further information on rolling stock changes and future developments can be found in the Department for Transport's [Rolling Stock Perspective](#) and the Rail Delivery Group's [Long Term Passenger Rolling Stock Strategy](#).

<b>Train Operating Company</b>	<b>Average age of rolling stock</b>	<b>Compared to 2016-17</b>	
<b>Arriva Trains Wales</b>	<b>27.5 years</b>	<b>↑ 1.0</b>	KeolisAmey, who will take over the Wales and Border franchise from October 2018, have committed to ensuring <a href="#">95% of journeys on their franchise will be on new trains</a> by 2023
<b>c2c</b>	<b>16.1 years</b>	<b>↑ 1.0</b>	c2c have ordered six <a href="#">ten-car Bombardier Aventura trains</a> to be delivered by September 2021
<b>Caledonian Sleeper</b>	<b>38.5 years</b>	<b>↑ 1.0</b>	Caledonian Sleeper will be introduce a <a href="#">fleet of 75 new carriages</a> by May 2019
<b>Chiltern Railways</b>	<b>25.1 years</b>	<b>↑ 0.7</b>	Chiltern retired its Class 121 units in May 2017
<b>CrossCountry</b>	<b>19.4 years</b>	<b>↑ 1.0</b>	
<b>East Midlands Trains</b>	<b>25.1 years</b>	<b>↑ 1.9</b>	East Midlands Trains acquired an additional three six-car Intercity 125 sets from Grand Central in early 2018
<b>Govia Thameslink Railway</b>	<b>11.3 years</b>	<b>↓ 2.9</b>	GTR has continued the rollout of its Class 700 trains across 2017-18
<b>Grand Central</b>	<b>17.6 years</b>	<b>↓ 9.2</b>	Grand Central has <a href="#">increased the size of its Class 180 fleet</a> following the retirement of the HST fleet

<b>Great Western Railway</b>	<b>22.6 years</b>	<b>↓ 7.4</b>	Over the year, Great Western Railway has introduced additional class 387 Electrostar units as well as Class 800 trains as part of the <a href="#">Intercity Express Programme (IEP)</a>
<b>Greater Anglia</b>	<b>27.2 years</b>	<b>↑ 1.2</b>	Over the course of the new East Anglia franchise Greater Anglia is planning to replace its entire fleet of trains with <a href="#">new units built by Bombardier and Stadler</a>
<b>Heathrow Express</b>	<b>17.7 years</b>	<b>↑ 1.0</b>	
<b>Hull Trains</b>	<b>16.0 years</b>	<b>↑ 1.0</b>	
<b>London Overground</b>	<b>15.5 years</b>	<b>↑ 0.8</b>	London Overground will be introducing Bombardier Class 710 trains from late 2018
<b>Merseyrail</b>	<b>38.3 years</b>	<b>↑ 1.0</b>	The current fleet of trains are due to be replaced by <a href="#">new units built by Stadler</a> from 2020
<b>Northern</b>	<b>28.5 years</b>	<b>↑ 0.9</b>	Northern has received Class 150 and Class 170 units, cascaded from Great Western Railway and ScotRail respectively
<b>ScotRail</b>	<b>23.4 years</b>	<b>↑ 2.7</b>	ScotRail has taken delivery of some High Speed Trains for use on InterCity routes.  <a href="#">Class 385 units will enter service across 2018</a> , carrying passengers between Edinburgh-Glasgow, and other routes
<b>South Western Railway</b>	<b>19.1 years</b>	<b>↓ 0.7</b>	The delivery of <a href="#">Class 707 trains</a> to South Western Railway completed in January 2018  In addition, the operator has ordered from Bombardier a fleet of 750 <a href="#">new Class 701 Aventra vehicles</a> due to enter service by mid-2019
<b>Southeastern</b>	<b>17.8 years</b>	<b>↑ 0.6</b>	Class 377 trains have cascaded to Southeastern from the Govia Thameslink Railway franchise



<b>TfL Rail</b>	<b>23.3 years</b>	<b>↓ 12.4</b>	TfL Rail has introduced <a href="#">Class 345 trains</a> into service between London Liverpool Street and Shenfield, ahead of the full launch of Crossrail in 2019
<b>TransPennine Express</b>	<b>11.8 years</b>	<b>↑ 1.0</b>	TPE have ordered 19 <a href="#">bi-mode units from Hitachi Rail</a> , which are to be introduced from December 2019, and also a fleet of <a href="#">Nova trains</a> that will be introduced from late 2018
<b>Virgin Trains East Coast</b>	<b>31.1 years</b>	<b>↑ 0.4</b>	A new fleet of <a href="#">Class 800 Azuma trains</a> will be introduced on the East Coast franchise in 2018
<b>Virgin Trains West Coast</b>	<b>13.5 years</b>	<b>↑ 1.0</b>	
<b>West Midlands Trains</b>	<b>13.8 years</b>	<b>↑ 1.0</b>	As part of its franchise agreement, West Midlands Trains has ordered a total of 413 vehicles from Bombardier and CAF, to be delivered by 2021

## Annex 3 – Effect of change in data source for average age statistics

For the 2017-18 release, a new data source (the R2 database) has been used for the generation of the average age of rolling stock statistics. The table below compares the data for 2016-17 Q4 from the previous release using the original data source, with the equivalent data from the new source.

Train operating company	2016-17 Quarter 4		Difference
	DfT dataset (2016-17 data source)	R2 (2017-18 data source)	
Arriva Trains Wales	26.99	26.52	-0.47 years (-1.8%)
c2c	14.85	15.05	0.20 years (1.4%)
Caledonian Sleeper	42.38	37.48	-4.90 years (-11.6%)
Chiltern Railways	23.15	24.35	1.20 years (5.2%)
CrossCountry	18.60	18.38	-0.22 years (-1.2%)
East Midlands Trains	25.30	23.20	-2.10 years (-8.3%)
Govia Thameslink Railway	15.70	14.18	-1.52 years (-9.7%)
Great Western Railway	31.98	30.06	-1.92 years (-6.0%)
Greater Anglia	27.59	26.02	-1.57 years (-5.7%)
London Overground	14.70	14.71	0.01 years (0.0%)
Merseyrail	38.25	37.34	-0.91 years (-2.4%)
Northern	28.21	27.58	-0.63 years (-2.2%)
ScotRail	20.81	20.71	-0.10 years (-0.5%)
South Western Railway	20.93	19.82	-1.11 years (-5.3%)
Southeastern	17.44	17.17	-0.27 years (-1.6%)
TfL Rail	37.25	35.75	-1.50 years (-4.0%)
TransPennine Express	9.18	10.78	1.60 years (17.4%)
Virgin Trains East Coast	31.28	30.71	-0.57 years (-1.8%)
Virgin Trains West Coast	12.39	12.53	0.14 years (1.1%)
West Midlands Trains	13.08	12.75	-0.33 years (-2.5%)
<b>National (franchised)</b>	<b>21.08</b>	<b>20.24</b>	<b>-0.84 years (-4.0%)</b>
Heathrow Express	n/a	16.72	n/a
Hull Trains	n/a	14.95	n/a
Grand Central	n/a	26.73	n/a
<b>National (non-franchised)</b>	<b>n/a</b>	<b>19.52</b>	<b>n/a</b>
<b>National (all)</b>	<b>n/a</b>	<b>20.23</b>	<b>n/a</b>

The majority of operators show a slightly lower average age when using the R2 data source. This is primarily a result of the entry into service dates for individual vehicles in particular fleets in this dataset ranging over a number of years (reflecting the time a large fleet introduction takes). In the previous methodology the assumed date of entry into service was typically the same for an entire fleet, usually the start of the year in which the fleet introduction commenced, or the year of manufacture. For further information please see the [quality report](#).

## Annex 4 – Statistical Releases

This publication is part of the statistical releases which cover the majority of reports that were previously released through the [Data Portal](#). The statistical releases consist of four annual and four quarterly themed releases:

### Annual:

- Rail Finance & Rail Fares Index;
- Key Safety Statistics;
- Rail Infrastructure, Assets and Environmental;
- Regional Rail Usage.

### Quarterly:

- Passenger and Freight Rail Performance;
- Freight Rail Usage;
- Passenger Rail Usage;
- Passenger Rail Service Complaints.

A full list of publication dates for the next twelve months can be found in the [release schedule](#) on the ORR website.

# National Statistics

The United Kingdom Statistics Authority designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the Code of Practice for Official Statistics.

National Statistics status means that official statistics meet the highest standards of trustworthiness, quality and public value.

All official statistics should comply with all aspects of the Code of Practice for Official Statistics. They are awarded National Statistics status following an assessment by the Authority's regulatory arm. The Authority considers whether the statistics meet the highest standards of Code compliance, including the value they add to public decisions and debate.

It is ORR's responsibility to maintain compliance with the standards expected of National Statistics. If we become concerned about whether these statistics are still meeting the appropriate standards, we will discuss any concerns with the Authority promptly. National Statistics status can be removed at any point when the highest standards are not maintained, and reinstated when standards are restored.

For more details please contact the Statistics Head of Profession Lyndsey Melbourne on 020 7282 3978 or contact [rail.stats@orr.gov.uk](mailto:rail.stats@orr.gov.uk).

The Department for Transport (DfT) also publishes a range of rail statistics which can be found at [DfT Rail Statistics](#).



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