Rail emissions

2018-19 Annual Statistical Release

Publication date: 7 November 2019 **(Revised 22 November 2019)**

Next publication date: November 2020

Background

This statistical release contains information on environmental statistics for passenger and freight trains in Great Britain for 2018-19.

These are:

- Energy consumption of electricity and diesel.

- Estimates of normalised CO_2e emissions from traction energy .

Passenger data has been normalised to show the average CO_2e emission per passenger kilometre.

Freight data has been normalised to show the average CO_2e emission per net tonne kilometre of freight moved.

Traction energy refers to rolling stock (railway vehicles, including both powered and unpowered vehicles, such as locomotives, carriages and freight wagons) on Great Britain's rail network, and the energy used to power passenger and freight train movements. Non-traction emissions are excluded.

The data is sourced from passenger and freight operators. It is available from 2005-06.

There have been increases in the amount of electricity consumed by passenger and freight trains, however the resulting CO_2e emissions per passenger km and per tonne km have fallen.

This is predominantly due to a transition towards renewable energy sources in the electricity sector in Great Britain.
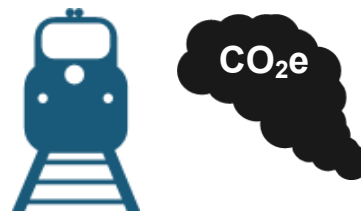
Passenger train emissions
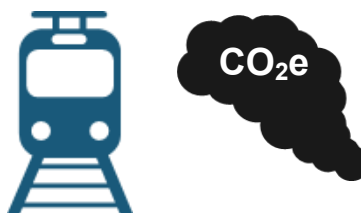
36.6 g CO_2e per passenger km

Decrease of 10.3% compared to 2017-18

Freight train emissions

25.3g CO_2e per tonne km

Decrease of 4.1% compared to 2017-18

Updated 22 November 2019 - freight data for diesel usage has been revised for the years 2011-12 to 2017-18. The percentage comparison to 2017-18 has been updated.

Please note: previous editions of this release were published under the name *Rail infrastructure, assets and environmental*. The release has now been split into two, and Rail Infrastructure and assets data is now published in a separate release: Rail Infrastructure and assets

Passenger train energy consumption and emissions

The level of CO_2e emissions per passenger km in 2018-19 was 10.3% lower than the equivalent figure for 2017-18. This is a continuation of a general trend of falling emissions per passenger km since the start of the time series in 2005-06.

In 2018-19 passenger services consumed:
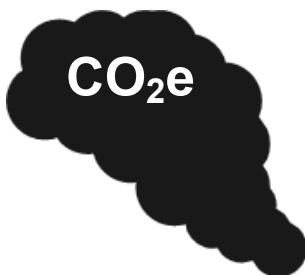
3,976 million kWh of electricity

Increase of 9.1% compared to 2017-18

469 million litres of diesel

Decrease of 5.3% compared to 2017-18

This resulted in:

CO₂e

2,465 KTonnes CO_2e emissions

Decrease of 10.8% compared to 2017-18

36.6 g CO_2e per passenger km

Decrease of 10.3% compared to 2017-18

Despite the increase in amount of electricity consumed for providing traction for passenger rail services, the resulting CO_2e emissions and emissions per passenger km have fallen.

This is predominantly due to a transition towards renewable energy sources in the electricity sector in Great Britain.

Freight train energy consumption and emissions

The level of CO_2e emissions per freight tonne km in 2018-19 was 4.1% lower than the equivalent figure for 2017-18.

Updated 22nd November - freight data for diesel usage has been revised for the years 2011-12 to 2017-18. The percentage comparisons to 2017-18 have been updated.

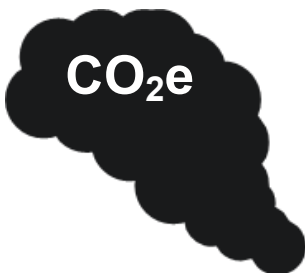**In 2018-19 freight services consumed:**
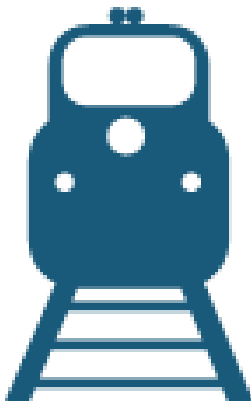
75 million kWh of electricity

Increase of 12.7% compared to 2017-18

153 million litres of diesel

Decrease of 6.7% compared to 2017-18

This resulted in:

CO₂e

476 KTonnes CO_2e emissions

Decrease of 6.3% compared to 2017-18

25.3g CO_2e per tonne km

Decrease of 4.1% compared to 2017-18

The change in electricity and diesel consumption since 2017-18 is due to some freight operating companies running more trains using electric traction.

Similar to passenger rail, the overall CO_2e emissions for freight has decreased despite the increase in electricity consumption. This reflects a transition away from coal to other sources of energy for electricity generation.

Annex 1- Quality and Methodology

Definitions:

- Diesel – gas, oil, diesel or biofuel volume (litres) consumed in train movements (separate volumes for each fuel type used).

- Electricity – electricity consumed (kWh) in train movements.

- Passenger kilometre – moving one passenger, one kilometre.

- Net tonne kilometre – moving one tonne of freight, one kilometre.

How rail emissions are calculated

CO_2e 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_2e using standard conversion factors from the Department for Business, Energy and Industry Strategy (BEIS). The conversion factors allow activity data (for example, litres of fuel used, kWh consumed) to be converted into kilograms of carbon dioxide equivalent (CO_2e). This is a universal unit of measurement that allows the global warming of different greenhouse gases (GHGs) to be compared. These conversion factors are averages for activity type which will vary from the actual emissions of the rail industry, which will be dependent on the consumption efficiency of each reporting element. For more detail on the conversion factors please see the methodology paper for emissions factors produced by BEIS.

Prior to conversion into CO_2e, electricity consumption is uprated to assume 1.5% of electricity generated is lost during transmission. In some instances actual consumption data is not provided by operators. In these cases an estimate of CO_2e is made based on the number of train kilometres each operator runs (see below). This is done by working out an average level of CO_2e emissions per train kilometre for the operators who have provided data and applying this factor to the train kilometres for operators that require estimation. From these an estimate of actual emissions can be calculated.

To calculate the final normalised output, the total CO2e emissions for passenger and freight operators were normalised by passenger kilometres and net tonne kilometres respectively. Passenger kilometre data is taken from LENNON ticketing database and TOC data submissions (including Eurostar and Heathrow Express). Net tonne kilometres data for the normalisation of freight emissions are sourced from Network Rail.

Estimates for missing data

For 2018-19 the following were estimated due to passenger train or freight operators not providing data:

- Emissions from one passenger train operator. More than 99.8% of passenger kilometres are covered by actual data.

- Emissions from three freight operators. More than 99.9% of freight tonne kilometres are covered by the five freight companies who provided data.

Data sources

For the time period between 2005-06 and 2009-10, energy consumption data was provided for passenger and freight operators by the Association of Train Operating Companies (ATOC) and Network Rail respectively. Since 2011-12, energy consumption data have been collected directly from the operators themselves:

- Franchised passenger operators

- Non-franchised (open access) passenger operations;

- Freight operations; and

- Eurostar services (UK side).

Franchised operators are train operators who operate under the terms of franchises let by the Government. Non-franchised operators (open access) hold licences to provide supplementary services on chosen routes. These operators provide us with their total traction electricity (kWh) and diesel usage (litres) consumption. Traction energy refers to rolling stock on the Great Britain rail network and the energy used to power passenger and freight train movements.

Historic background

First published in the 2007-08 National Rail Trends yearbook, normalised passenger and freight carbon dioxide equivalent (CO2e) emissions provide a measure of energy consumption. As with all industries, there is continued and growing interest and emphasis on the environmental sustainability of the rail industry. Normalised emissions data provides a measure of the success of policy on reducing the environmental impact of the rail industry, as well as providing a measure against which other modes of transport can be compared.

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%).

Annex 2 - List of tables available on the ORR data portal

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

- Estimates of normalised passenger and freight CO_2e emissions annual data is available on the data portal in: Table 2.100

- Estimates of passenger and freight energy consumption and CO_2e emissions annual data is available on the data portal in: Table 2.101

Revisions

The statistical release and data tables for 2018-19 was revised on 22 November 2019. Freight data for diesel usage has been revised for the years 2011-12 to 2017-18. The percentage comparisons to 2017-18 have been updated for diesel usage and emissions.

For the 2016-17 release a consistency review was undertaken to ensure that methodologies have been applied consistently across the time series. As a result of this minor revisions were incorporated into the data for 2011-12 onwards. For further information please see the revisions log.

There was no data for 2010-11 due to a change in the data collection process, consequently comparisons to emissions in earlier years should be made with caution.

Note: there is no methodology and quality report for this release. All the content in previous reports has now been incorporated into this release.

Annex 3 - National Statistics

This publication is part of ORR's National Statistics accredited statistical releases which consist of annual and quarterly themed releases.

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.

Our statistical releases hold National Statistics status since being assessed in 2012. Since our assessment we have improved the content, presentation and quality of our statistical releases. Also, in July 2019 we launched our new data portal. We are currently working with the Office for Statistics Regulation (the regulatory arm of the UK Statistics Authority) to conduct a compliance check to ensure we are still meeting the standards of the Code and to therefore reconfirm our National Statistics status.

For more information on how we adhere to the Code please see our compliance statements at: dataportal.orr.gov.uk/code-of-practice/

For more details please contact the Statistics Head of Profession Lyndsey Melbourne at 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.

Transport Focus publish the National Rail Passenger Survey (NRPS).