OFFICE OF RAIL REGULATION

Rail infrastructure, assets and environment quality report

Infrastructure on the railway, Average age of rolling stock, Sustainable development

Release date: 23 October 2014

Contents

Introduction

This report is part of a series of thematic quality reports for rail statistics data, introduced by the Office of Rail Regulation (ORR) to help users consider the quality of our statistics and to ensure we are compliant with principle 4 of the Code of Practice for Official Statistics[1].

These quality reports pull together the key qualitative information on relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity and coherence and comparability. They also include information on some additional quality principles on user needs and perceptions, confidentiality, transparency and security of data. Where possible we have also included some quantitative quality performance indicators within each report.

Infrastructure on the railways, average age of rolling stock and sustainable development data are supplied by a number of different sources and are measured using a range of metrics:

- Route open for traffic – the number of kilometres of route open for passenger and freight traffic and the length of route which is electrified sourced from Network Rail;

- Passenger stations – the number of passenger stations on the Great Britain rail network sourced from Network Rail;

- Average age of rolling stock – the average age of rolling stock including all rail vehicles leased to franchised train operating companies by rolling stock leasing companies (ROSCOs) sourced from the Department for Transport (DfT);

- Sustainable development – Carbon dioxide (CO_2) emissions for passenger and freight operators. Passenger data is normalised to show the average CO_2 emission per passenger kilometre. Freight data is normalised to show the average CO_2 emission per net tonne kilometre of freight. Data used in the sustainable development calculations is sourced from passenger operators, Eurostar, freight operating companies, the industry ticketing database (LENNON), Network Rail and the Association of Train Operating Companies (ATOC).

[1] Principle 4: Sound methods and assured quality. Statistical methods should be consistent with scientific principles and internationally recognised best practices, and be fully documented. Quality should be monitored and assured taking account of internationally agreed practices. The Code of Practice can be accessed here http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html

The rail network is divided into three sectors – London and South East, long distance and regional. Passenger rail services can also be divided into franchised and non-franchised operators. Franchised operators are those which operate under the terms of franchises let by Department for Transport and non-franchised operators hold licences to provide supplementary services on chosen routes. There are currently 19 franchised operators and three non-franchised operators[2].

[2] A franchised train operator is the successful winner of a competitive tender process that sets out the train services required to be operated (service level agreement). A franchised operator must operate within the parameters set out in their franchise and they have a fixed life (although this can be extended and a train operator can win successive terms). A non-franchised operator operates because they choose to and the law allows them to have open access to the railway network, subject to the approval of the ORR. These operators are usually given approval by the ORR to operate for a definite period, though it can be renewed. The current non-franchised operators are Grand Central, First Hull Trains and Heathrow Express. Wrexham and Shropshire ceased operation during January 2011. All freight operators are open access operators.

A list of train operating companies is available at ATOC Train Companies

Historical background

Route open for traffic

Great Britain has the 5th longest rail network in Europe, with the total length of railway lines only shorter than Germany, France, Poland and Italy.[3] Since the first locomotive-hauled public railway opened in 1825 the network has been continually developing with the total length of the network reaching a peak of 37,720 km in the 1910s.

Historically one of the most significant impacts on the length of route was the effect of British Railways Board reports *The Reshaping of British Railways* (1963) and *The Development of the Major Railway Trunk Routes* (1965) which were written by Dr Richard Beeching and led to cuts to the network more commonly known as the "Beeching cuts". The first of these reports recommended that 9,700 km, mostly rural and industrial lines, should be closed whilst the second concluded that only 4,800 km of the trunk railway network, now mainline network, (out of a total of 12,100km) should be invested in. Although not all the recommended closures were implemented, the railway network length decreased dramatically. A number of the closed lines have been reopened over the past 20 years, however the length of the network remains much lower than at its peak.

The entire rail network is not open to both passenger and freight traffic as some routes are open to freight traffic only and as such the length of route open for each type of traffic is reported. Some of the network is only open for freight train movements as it is deemed that there is not adequate passenger demand for passenger services to be operated on these routes.

The entire network is not electrified, with non-electrified route requiring trains to be powered by diesel or other non-electrical methods. The electrification of routes has the benefit, over diesel routes, of lower fuel and maintenance operating costs, higher performance leading to journey time reductions, higher reliability and availability and lower leasing costs. Electric trains also tend to be quieter and have a significant role in reducing carbon emissions, both of which are beneficial to users, and non-users of the rail network.

[3] Eurostat – *Total length of railway lines*

Electrified route can be either supplied by alternating current (AC) or direct current (DC). Alternating current is supplied from overhead power lines, usually at 25,000 volts. AC electrification through overhead lines can be seen on the East Coast Main Line between London and Edinburgh and West Coast Main Line.

Direct current electricity is supplied from additional rails at track level (often called "3rd rail" though some systems also feature a 4th rail) which are in contact with electricity collection equipment on the train, not its wheels, with current usually supplied at 650 volts. DC electrification can be seen on the routes in Sussex and Wessex. There is also 39 km of electrified route which is supplied through overhead DC at 1,500 volts which powers the Tyne and Wear Metro.

In addition to the measures of route open to passenger and freight traffic and the length of route, electrified network capability is also measured by linespeed capability, gauge capability, route availability and electrified track capability.

- Linespeed capability - a measure of the length of running track based on speed bands;
- Gauge capability – a measurement of the length of route capable of accepting different freight vehicle types and loads by reference to size;
- Route availability – a measurement of the length of track capable of accepting different loaded vehicle types; and
- Electrified track capability – a measure of the length of running track.

These measures of network capability are not presented in the associated statistical release but can be found in the Network Rail Annual Return.

Passenger Stations

The number of passenger stations serving the rail network grew initially as the network grew in the latter half of the 19th Century and early part of the 20th Century, but as was experienced with the reduction in route length the number of stations decreased dramatically following the Beeching cuts. The cuts recommended closing over 2,300 stations on lines which were to close and remain open. As with the recent reopening of some routes, a number of these stations have also been reopened over the past 25 years. The overall number of stations provides an indication of catchment of rail services with an increased number of stations indicating a growth in the catchment area of the rail network and associated opportunity for increased rail usage.

Stations, particularly National Hubs and National Interchanges[4], are playing an increasing important role; not just acting as a point of access to the rail network, but a growing number are also becoming transport hubs integrating with other modes of transport. The growth of retail and eating outlets at stations also indicates the increasing role stations are playing both for passengers, and non-passengers in serving needs other than just travelling, as well as acting as a vital income source for Network Rail.

The rail network has over 2,500 stations which are owned and operated by either Network Rail or a train operating company. Network Rail own and manage 19 stations; eight "National stations" which serve large cities outside of London and 11 "London Stations" which are the main terminus of routes into London.[5] Whilst Network Rail remain the landlord for virtually all other stations they are managed by train operating companies, tending to be those which operate the most services using the station. A list of the station facility owners can be found in the station usage estimates statistics produced by ORR, which also provides estimates of the number of entries, exits and interchanges at each station.

To assess the average condition of stations the station stewardship measure (SSM) is used, which is calculated by assessing the remaining life of key elements of the station by visual inspection and combining into an overall score. The SSM is a regulated output which means the ORR assesses Network Rail's success on whether it has achieved the outputs specified in the final determination.[6] We publically report on Network Rail's progress in the Network Rail Monitor[7].

Average age of rolling stock

Since the privatisation of British Rail in 1994 the rolling stock, which includes all coaches and engine units, that runs on the Great Britain railway is owned by three private rolling stock leasing companies (ROSCOs)[8]. These companies lease the rolling stock to the train operating companies (TOCs) who then deploy it on their services. For the most part, the train companies procure the rolling stock directly from the rolling stock companies. In recent years the Government has also

[4] Network Rail has 6 categories of station – Category A: National Hub, Category B: National Interchange, Category C: Important Feeder, Category D: Medium Staffed, Category E: Small Staffed, and Category F: Small Unstaffed (categories C and F are subdivided into 2 further categorie – C1, C2 and F1, F2) – See *Network Rail Network RUS Stations* for more information.

[5] Stations owned and run by Network Rail – *Our Stations*

[6] ORR – Periodic Review and final determination

[7] ORR – *Network Rail Monitor*

[8] The three ROSCO's are *Angel Trains Ltd*, *Eversholt Rail Group* and *Porterbrook Leasing Company Ltd*

procured large rolling stock orders directly from manufacturers for schemes such as the InterCity Express Programme, Thameslink and Crossrail. ROSCOs have a responsibility to help develop services by phasing out old and aged rolling stock to make way for modern, more convenient and safer trains.

Sustainable development

First published in the 2007-08 national rail trends yearbook, normalised passenger and freight CO_2 emissions provides 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, with environmental performance having a larger part to play in Government policy through the High Level Output Statement.[9] 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.

In 2010-11, due to a lack of non-traction data and no disaggregation of electricity and diesel consumption, the only tables published were Great Britain level CO_2 emissions per passenger km (gCO_2/km) and CO_2 emissions per freight net tonne km (gCO_2/ntkm).

[9] DfT - *High Level Output Statement*

Relevance

The degree to which the statistical product meets the user in both coverage and content.

Measures of railway infrastructure such as the length of route and length of electrification are key indicators of the size of the overall network in Great Britain.

The average age of rolling stock is a key indicator for assessing rolling stock reliability, safety and passenger comfort. Newer rolling stock will, generally, mean the safer and more reliable operation of services as well as increase passenger comfort. This measure can help TOCs, ROSCOs, and Government in long-term planning for rolling stock renewal and upgrades both at a National level and within individual operators.

Measures of sustainable development provide an indication of average sustainability of passenger and freight services which give an estimate of the industry's success at improving the environmental impact of the services. Sustainable development measures also allow the rail industry to be benchmarked, where comparable statistics are produced, against other modes of transport for both passengers and freight movement in both Great Britain and the rest of the World.

Data published on the ORR data portal are used by a range of individuals including Government organisations, media organisations, ORR, academic institutions and personal users. Analysis of registered users of the ORR data portal identified that uses of data include:

- Government decision making on a wide range of transport/rail policy areas;
- Informing ORR's periodic review of Network Rail and increasing the understanding of market conditions;
- Informing assessment of the environmental impact of the rail industry;
- To inform decision making and the justification for investment in capacity; and
- Independent research;

In September 2011 we also conducted an ORR data portal survey which highlighted similar results. Other results from the portal survey identified:

- 55.8% of respondents felt the statistics available on the ORR data portal met their needs very well or well.

- 80% of respondents felt that the indicators/datasets on the portal were relevant to their requirements in terms of being essential, mostly important or important.

Accuracy

The proximity between an estimate and the unknown true value.

Infrastructure on the railways

Since 2004-05 route open for traffic and the length of electrified route is derived from around a quarter of a million GEOGIS records. GEOGIS is the Network Rail infrastructure asset register database which contains information on the physical location and type of track using four digit track ID's to identify each individual location by track direction, track use, and track number. Whilst the GEOGIS system provides a very accurate measure of the true length of routes there may by small discrepancies from true length due to rounding. There is a drop in the measure from 2004-05 to 2005-06 caused by data cleansing of GEOGIS during 2012-13.

Prior to 2004-05 route length data and electrification data was collected using various systems and collected on a semi-annual basis. These systems, whilst often the most accurate measures available at the time, would not have provided as accurate a measure as the GEOGIS system and there is therefore a break in the time series between 2003-04 and 2004-05.

There is a break in the time series between 2006-07 and 2007-08 due to a new methodology where the route classification reference data was revamped. There is also a break in series between 1993-94 and 1994-95 for passenger stations data only.

Average age of rolling stock

The average age of rolling stock is sourced from DfT and is calculated by adding up the individual ages of all rail vehicles in service and dividing by the number of rail vehicles in service. The age of each rail vehicle is the time between the date of entering into service and the end of each quarter, e.g. a vehicle which entered service in January 2000 would be, at the end of 2001-02 Q1 (30 June 2001), 1.5 years old. The date of entry into service is deemed it be the first day of the quarter in which the rail vehicle came into service; e.g. all vehicles which entered service between 1 April 2001 and 30 June 2001 are given a service entry date of 1 April 2001. As a result there will be minor discrepancies between the actual age and recorded age of rail vehicles.

Discrepancies between the estimated average age of rolling stock and unknown true age may also occur where the date of entry into service is not available (essentially for rail vehicles introduced prior to privatisation). The date used in these circumstances is either:

- 1 January in the year of manufacture of the relevant class of rail vehicle; or
- The midpoint of the period over which the relevant class of rail vehicle was manufactured, e.g. if a class of rail vehicle was manufactured over the time frame March 1972 to March 1976 then the midpoint would be March 1974.

A vehicle drops out of the calculation when its lease either expires or is terminated.

Sustainable development

Normalised passenger and freight CO_2 emissions are calculated from actual and estimated data for energy consumption from passenger and freight operators. Where actual energy consumption data has not been provided by a passenger or freight train operating company an estimate has been used based on the actual data received for similar operators and similar rolling stock types. Application of these estimates will result in discrepancies between the actual CO_2 emissions and the published emissions data. For the latest data, 2013-14, estimations were required for two passenger train operating companies and three freight operating companies because actual data was not supplied by these operators.

Passenger operators – Grand Central, Heathrow Express;

Freight operators – Colas Rail, Devon & Cornwall Railways and Europorte Channel.

The calculation of CO_2 emissions uses conversion factors which allow activity data (e.g. litres of fuel used, kWh consumed) to be converted into kilograms of carbon dioxide equivalent (CO_2e). 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 guideline to DEFRA/DECC's GHG Conversion Factors for Company Reporting.[10]

[10] DEFRA – *Greenhouse gas conversion factors for company reporting*

Timeliness and punctuality

Timeliness refers to the time gap between publication and the reference period. Punctuality refers to the gap between planned and actual publication dates.

The data contained within the infrastructure on the railways, average age of rolling stock and sustainable development statistical release are published annually on the ORR data portal approximately six months after the end of the financial year. The publication schedule outlines the publication dates for National and Official Statistics quarterly and annual statistical releases and other statistics up to 12 months in advance.

These publication dates are determined by availability of the data and are the earliest possible dates which we can publish the information. Sufficient time is required to collect, process, quality assure and sign off the data and to prepare the data report itself. In the event of a change to a pre-announced release date, attention would be drawn to this on the data portal together with a full explanation of the reason for the change.

Feedback from the ORR portal survey conducted in September 2011 indicated that 46.3% of individuals were very satisfied or satisfied with the timeliness of the statistics. 55.8% of respondents felt the statistics available on the portal met their needs very well or well.

Accessibility and clarity

Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the metadata, illustrations and accompanying advice.

All infrastructure on the railways, average age of rolling stock and sustainable development data can be accessed free of charge on the ORR Data Portal. The reports provide a table of the data. Charts and commentary on the key results is provided in the thematic statistical releases accompanying the data.

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. The Infrastructure on the railways reports currently published on the ORR Data Portal are:

- Infrastructure on the railways – Table 2.52.

Average age of rolling stock reports currently published on the ORR Data Portal are:

- Average age of rolling stock by sector – Table 2.30.
- Average age of rolling stock by train operating company – Table 2.31.

Sustainable development reports currently published on the ORR Data Portal are:

- Sustainable development: Estimates of normalised passenger and freight CO2 emissions – Table 2.100.
- Sustainable development: Estimates of passenger and freight energy consumption and CO2 emissions – Table 2.101.

For further information about these statistics please contact the rail statistics team at rstats@orr.gsi.gov.uk

Network Rail also publish a range of infrastructure statistics available in the Network Rail Annual Return.

Coherence and comparability

Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain.

Rail infrastructure data is obtained from a single data source, Network Rail GEOGIS database of railway infrastructure assets. The average age of rolling stock is also obtained from a single source, the DfT, for each TOC and by sector.

Sustainable development data is sourced from a numerous data sources. Absolute emissions data is sourced directly, where supplied, from the 19 franchised train operating companies, three open access operators, Eurostar, and operational freight operating companies. Other data sources required in the sustainable development calculation are LENNON, for passenger mileage data, Network Rail, for net tonne kilometre data, and DEFRA for standard rates for converting energy consumption into CO_2.

Comparability to European data

The objective nature of transport infrastructure and assets data means that comparable data can be obtained across the majority of European countries. Eurostat are the statistical office of the European Union and comparable data on railway transport infrastructure and measures of railway transport equipment and available from the Eurostat database.

Trade-offs between output quality components

Trade-offs are the extent to which different aspects of quality are balanced against each other.

We work to publish the infrastructure on the railways, average age of rolling stock and sustainable development data as soon as possible and currently work to a tight timeline based on when the year ends and when the data is received from the appropriate data sources.

The release of data in quarterly and annual statistical releases through the year ensures compliance with the UK Statistics Authority (UKSA) Code of Practice and ensures the ORR statistics are compliant with National Statistics accreditation.

Data is released under themes, such as rail infrastructure, assets and environmental, rail performance or rail usage (passenger) (mirroring the quality report themes), both quarterly and annually depending on the dataset. All data for a given theme is released at one time and these releases provide detailed commentary about the data and trends.

These statistics are National Statistics. For more details please contact the statistics Head of Profession Dr Fazilat Dar at Fazilat.Dar@orr.gsi.gov.uk.

Assessment of user needs and perceptions

The processes for finding out about users and uses, and their views on the statistical products.

Official statistics on the ORR data portal are diverse and there are many different reasons people will use the data we release. From this, we have identified five groups that use our data for various purposes. These are:

1. Policy makers including briefing and local government use the data to inform ministerial briefing, answer ad hoc queries and include in their publications.

2. Funders of the rail industry use these data to make informed decisions about where public money should be targeted in order to improve punctuality on the rail network. They also use these data in briefings and publications.

3. Findings from joint research between ORR and Passenger Focus showed that passengers value more rail data being brought into the public domain. This would help increase the transparency of the rail industry and enable greater scrutiny. This research also showed that some passengers use these data to inform them when making life choices, such as choosing the location of their home.

4. Activists need access to a wide variety of data to provide evidence to challenge the status quo.

5. Rail enthusiasts potentially have no limit to the data they wish to explore.

From May 2012 ORR asked users to complete a survey asking what they used each table for. ORR communicated the survey through the ORR data portal and notes within each report. Whilst the results of the survey provided valuable results and feedback in relation to some of the datasets, there was little outcome in relation to the infrastructure on the railway, average age of rolling stock and sustainable development datasets.

Also, members of the Rail Statistics Management Group (RSMG)[11] have indicated that rail infrastructure and sustainable development data is used for a wide range of decision making processes. This has helped to inform us about what the rail infrastructure and sustainable development data is used for and where possible improvements can be made.

The last ORR portal focus group took place on 5th March 2013 and reviewed the improvements and changes we are planning to make to the data portal. The main objectives of the re-design were to focus on transparency, user experience, increased patronage and gaining UKSA accreditation. The findings from the focus group have been published on the user engagement page of our website at the end of April 2013 Rail Statistics User Engagement.

In June and July we held 8 public focus groups, including a number specifically for the visually impaired, covering London and South East, the Midlands and North West. These focus groups, run by a specialist research consultancy, focused on the usability of the data portal with the aim of identifying areas of improvement to further help meet user's needs with changes made to the Data Portal to made to reflect the outcomes of these focus groups.

If you would like to provide feedback about the data portal or attend future focus groups, please email dataportal@orr.gsi.gov.uk

[11] The Rail Statistics Management Group (RSMG), chaired by the ORR, consists of lead statisticians and data specialists that have the responsibility for the production and use of rail data and improvement of rail statistics. The group meets quarterly. Further information on RSMG and its members can be found here Rail Statistics User Engagement

Performance, cost and respondent burden

The effectiveness, efficiency and economy of the statistical output.

Following a project in 2008 to establish the best way to store rail data and improve the efficiency and effectiveness of ORR outputs, a number of changes were made to the data publication process. As a result of these changes, amendments have been made to the processes for the publication of official statistics. The introduction of a data warehouse has allowed ORR to automate a number of processes used to check the quality and accuracy of the data we receive, reducing the staff resource required to produce these publications.

We have automated various processes involved in the production of these statistics, reducing the overall time and burden involved in publishing these statistics.

Furthermore, we have memorandums of understanding (MoUs) with data suppliers detailing the scope and timeliness of each dataset supplied. This ensures consistent and timely data is received each period. The MoUs are reviewed on an annual basis.

Approximately five days are required each quarter to load and quality assure the data and prepare and publish the reports on the data portal. A maximum of 7 staff are involved in this process. These estimates exclude the time taken to undertake changes to the underlying data, structured query language (SQL) used to create the reports or the re-design of the reports. Such changes are relatively infrequent but can occur.

Confidentiality, transparency and security

The procedures and policy used to ensure sound confidentiality, security and transparent practices.

ORR is fully compliant with the Statistics and Registration Service Act 2008 and principle 4 of the Code of Practice for Official Statistics.

The data are supplied electronically and stored in a data warehouse (ORRbit). Only selected members of staff in ORR have access to the data warehouse and access is password protected. The data provision and storage processes have been independently assessed by external consultants Amour Group to ensure they are secure. Internal and external IT vendors also conduct periodic assessments of our systems.

ORR has systems and processes in place to safeguard personal identities/details and commercially restricted data. Data is internally validated by two teams before it is granted a 'publication' status and viewable on the data portal. Connections to remotely hosted databases are within a secure network and penetration testing has confirmed that the data portal is secure against external attacks.

ORR wants the rail industry to be more open and transparent. We have established a transparency programme to drive our ambitious vision for the industry, and govern a number of projects to support our aims and objectives.

More information on the ORR transparency programme can be found at ORR's transparency programme.

Summary of methods used to compile the output

Infrastructure on the railways

Since 2004-05 the route open for traffic and the length of electrified route is derived from GEOGIS the Network Rail infrastructure asset register database. Prior to 2004-05 route length data and electrification data was collected using various systems and collected on a semi-annual basis. These systems, whilst often the most accurate measures available at the time, would not have provided as accurate a measure as the GEOGIS system and there is therefore a break in the time series between 2003-04 and 2004-05.

Average age of rolling stock

The average age of rolling stock is sourced from DfT and is calculated by adding up the individual ages of all rail vehicles in service and dividing by the number of rail vehicles in service. The age of each rail vehicle is the time between the date of entering into service and the end of each quarter, e.g. a vehicle which entered service in January 2000 would be, at the end of 2001-02 Q1 (30 June 2001), 1.5 years old. The date of entry into service is deemed it be the first day of the quarter in which the rail vehicle came into service; e.g. all vehicles which entered service between 1 April 2001 and 30 June 2001 are given a service entry date of 1 April 2001.

For rolling stock for which the date of entry into service is not available (essentially for rail vehicles introduced prior to privatisation) the date used is either:

- 1 January in the year a of manufacture of the relevant class of rail vehicle; or
- The midpoint of the period over which the relevant class of rail vehicle was manufactured, e.g. if a class of rail vehicle was manufactured over the time frame March 1972 to March 1976 then the midpoint would be March 1974.

A vehicle drops out of the calculation when its lease either expires or is terminated.

Sustainable development

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;
- Open access passenger operations;
- Freight operations; and
- Eurostar services (UK side).

These operators provide us with their total traction and non-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. Non-traction energy consumption covers consumption for maintenance activities, lighting of infrastructure, commercial activities etc.

We convert the actual energy consumption data into CO_2 using standard conversion factors from the Department for Environment, Food and Rural Affairs (DEFRA) Greenhouse gas conversion factors for company report policy paper.[12] The conversion factors allow activity data (e.g. litres of fuel used, kWh consumed) to be converted into kilograms of carbon dioxide equivalent (CO_2e) which is a universal unit of measurement that allows the global warming potential of different greenhouse gases (GHGs) to be compared.

In some instances actual consumption data is not provided by passenger or freight operators. In these cases an estimate of CO_2 is made based on the number of train miles each operator runs. The estimate of CO_2 which is applied to the number of train miles is calculated using a conversion factor derived by taking the aggregate sum of CO_2 emissions calculated from operators' actual consumption data and dividing by the aggregate sum of their actual train miles.

[12] DEFRA – *Greenhouse gas conversion factors for company reporting*

To calculate the final normalised output, the total CO_2 emissions for passenger and freight operators were normalised by passenger kilometres and net tonne kilometres respectively. Passenger kilometre data has been calculated from passenger kilometre statistics published in the Passenger rail usage statistical release,[13] and Eurostar and Heathrow Express data submissions. Net tonne kilometres data for the normalisation of freight emissions is source from the dataset published in the Freight rail usage statistical release.[14]

For the purposes of the calculation of normalised CO_2 emissions the following definitions are employed.

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

In 2010-11, due to a lack of non-traction data and no disaggregation of electricity and diesel consumption, the only tables published were Great Britain level CO_2 emissions per passenger km (gCO_2/km) and CO_2 emissions per freight net tonne km (gCO_2.ntkm)

[13] ORR – *Passenger rail usage statistical release*

[14] ORR – *Freight rail usage statistical release*

Quality performance indicators table

Quality measure	Indicator	Description	Value
Accuracy	Number of mistakes made, by type	The number of serious mistakes in calculation or presentation of aggregates that are not found until after publication.	Railway infrastructure: 0 Average age or rolling stock: 0 Sustainable development: 0 TOC assets: 0
Accuracy	Average size of revisions	The average of the difference between a later and an earlier estimate expressed as the average revision, the average absolute revision, and/or the corresponding relative quantity(ies).	Railway infrastructure: 0 Average age or rolling stock: 0 Sustainable development: 0 TOC assets: 0
Timeliness and punctuality	Time lag between the end of the reference period and date of final results	Average number of days from the last day of the reference period to the day of publication of final results	Annually: Approximately 6 months
Timeliness and punctuality	Punctuality of publication	The number of days separating a previously announced date of publication and the actual date.	0 days
Accessibility and clarity	Number of subscriptions/purchases of each of the key paper reports	Average number of users who access the data portal on publication day. Please note other reports are also published on each date.	2013-14: TBC

Coherence and comparability	Lengths of comparable time series	Number of reference periods in time series from last break.	Railway infrastructure: Annually from 1985-86 Average age of rolling stock: Quarterly from 2007-08 Sustainable development: Annually from 2011-12
Assessment of user needs and perceptions	Length of time since most recent user satisfaction survey	Length of time since most recent user satisfaction survey	Use of data portal survey: ongoing (since May 2012) Data portal survey: September 2011
Performance cost and respondent burden	Number of days a month taken to produce the reports and number of staff required for this	Average number of days and maximum number of staff involved in loading and quality assuring the data, preparing the reports and publishing them on the data portal.	5 days with a maximum of 7 staff