Green Travel Data (GTD)

Rail Sustainability Methodology

A Rail industry initiative.

25 March 2025

Contents

Version Information

Version	Date	Document Owner
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What is Green Travel Data (GTD)?

Green Travel Data (GTD) – formerly Green Travel Pledge – is the rail industry's commitment to provide detailed, accurate and reliable data on the carbon emissions of rail journeys so that:

- The sustainability benefits of travelling by train become clearer and even more compelling.
- Businesses and their travellers are empowered to make more informed choices.
- The business travel sector can make data on rail journey emissions easier to access and use at the point of sale.
- Businesses can accurately measure the emissions of their rail travel to track their progress against sustainability goals.

The pledge will help encourage businesses to modal shift away from car and plane to stimulate additional business journeys by train.

It is a rail industry initiative being led by the Rail Delivery Group, in partnership with Great British Railways Transition Team, creating a recognised industry benchmark for carbon emissions.

You can find out more about Green Travel Data at: **www.raildeliverygroup.com/gtd**.

Introduction to GTD

GTD

GTD is a decisive step taken by the rail industry in Britain to demonstrate our dedication to sustainability. Through this initiative, we aim to provide transparent and accurate data on the carbon emissions from business rail journeys, enabling travellers and businesses to make more informed choices that support environmental sustainability.

A Unified Approach for Sustainable Rail Travel

GTD is the culmination of a collective endeavour. Spearheaded by the Rail Delivery Group (RDG), the initiative is fortified by the expertise of Fab Digital, Thrust Carbon, and Black Box Partnerships. Together, we are forging a path towards a more sustainable rail network. The data has been developed in close consultation with the business travel community to support their requirement for improved rail carbon data to inform their ESG targets and culture.

The Purpose of This Methodology Guide

This document serves as an authoritative guide on the methodology behind the GTD. It is structured to:

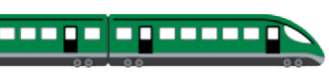
- Outline the meticulous process of calculating the carbon footprint of rail travel.
- Disclose the sources of our data to ensure the integrity and reliability of the information provided.
- Advise on the application of this methodology within different organisational contexts to foster sustainable travel practices.
- Be transparent and share within the public domain for project credibility and to highlight the explicit steps undertaken, which will drive confidence and awareness of GTD.

Our Commitment to Excellence

The methodology is underpinned by a trio of core principles:

1. **Transparency:** We are dedicated to full disclosure, ensuring stakeholders can easily comprehend the project methodologies and the data underpinning them.
2. **Accuracy:** We are committed to precision in data collection and calculations, delivering data that stakeholders can rely on for making decisions.
3. **Adaptation:** We maintain a commitment to continuous enhancement, ensuring that the GTD remains at the forefront of sustainable business travel by integrating the latest findings, market insights and stakeholder feedback.

With these principles, we aim to provide a robust framework that not only measures, but also encourages, the transition to sustainable rail travel, with confidence and consideration, for business travellers.



From MVP to GTD Methodology

Recap of Minimum Viable Product (MVP) and Transition to GTD Methodology

In June 2023, the MVP for GTD, focused on London King's Cross to Edinburgh Waverley Station. B2B travel sector, including businesses, intermediaries, associations dedicated to business travel and rail industry professionals, responded positively. From previous research undertaken, the MVP highlighted a strong demand for precise emissions data, pivotal for making informed travel decisions, supporting corporate sustainability, and aligned to wider ESG goals and culture.

Advancements in GTD:

The ongoing development of GTD follows a defined roadmap. Expanding from the MVP, Green Travel Data extends its coverage in this phase, to nearly all current direct point to point business rail routes across Britain, covering electric, diesel, and bi-modal rail types. This development enhances the accuracy of emissions calculations, providing data on more travel paths, and catering to the varied nature of GB rail travel. Our aim remains to continue to improve the data quality as part of a programme of continuous improvement.

Broader Implications for Sustainability and Business Strategy

Impacts on Corporate Environmental Strategies:

The methodology equips businesses with detailed insights into their travel-related carbon footprint. Providing data for different journeys, it allows companies to adjust their travel policies and guiding principles towards sustainability. This data is crucial for improving sustainability reports and meeting environmental standards, making GTD an essential tool for strategic decision-making and business travellers' awareness and travel considerations.

Alignment with Environmental Goals:

GTD supports the UK's 2050 net zero carbon emissions goal. It provides a quantifiable impact of choosing rail over other transport modes, aiding strategic sustainable choices. As an integral tool for sustainable travel, it plays a crucial role in national and global environmental efforts.

Upcoming sections will detail the technical aspects of GTD Methodology, covering the data, calculations, and underlying assumptions. They will also explore how this initiative fits into the wider sustainable rail travel narrative, highlighting its importance in achieving environmental goals and steps that need to be undertaken across business travel.

Understanding Data Utilisation in GTD Methodology

Before we break down the calculation steps, let's understand how each data point contributes to GTD Methodology:

1. **Engine Type: (also known as 'model of train):** helps define the energy consumption of each specific train service.
2. **Fuel Emissions:** Essential for calculating emissions based on energy use.
3. **Origin & Destination (also known as 'Journey Distance'):** Crucial for determining journey length and route characteristics.
4. **Number of Carriages:** Along with "engine type", Helps define the energy consumption of each specific train service, which is also dependent on the number of carriages (which defines the weight of the train).
5. **Configuration:** Provides details about train layout, aiding in accurate emission allocation.
6. **Load Factor (also known as 'Occupancy'):** Number of forecasted passengers (based on ticket sales and modelled passenger behaviour), vital for per-passenger emission calculations.
7. **Scheduled Timetable:** Influences load factor and journey specifics through train frequency.

Data Sources:

Data Points:	Source:
Engine Type:	MOIRA
Fuel Emissions:	Network Rail EC4T data (electric), owner and operator emissions data (diesel). This will be a continual process of data gathering and refinement
O&D Distance:	Network Rail distance database
Number of Carriages:	MOIRA
Configuration:	Publicly available train specific information
Load Factor:	MOIRA
Schedule Timetable:	Network Rail long-term timetable database (CIF)

Data Normalisation and Preparation in GTD Methodology

GTD methodology is underpinned by comprehensive data normalisation and preparation processes. These processes, outlined here, ensure that the GTD's carbon footprint assessments for rail travel are both accurate and reflective of the current state of industry data as of March 2025. It's important to note that these processes are iterative and will evolve as richer data becomes available.

Station Naming Protocols:

In our methodology, station names are aligned with official references from the Network Rail (NR) database.

Selecting Qualifying Schedules and Services:

For each station pair, all direct service links from the Network Rail long-term timetable database (CIF) are identified, covering services on all seven days of the week. We exclude journeys requiring a change of train.

Services in both directions are considered, and each train is segmented into non-stop station-to-station pairs. As a note, we have considered journeys in both directions to operate in an identical setup.

Deriving Journey Distances:

Distances for each segment are sourced from the Network Rail long distance database, based on actual distances travelled. The average distance between origin and destination is calculated by dividing the sum of all segments' distances by the total number of train services.

Passenger Loadings:

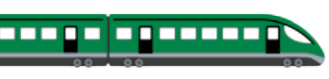
Loadings are derived from the RDG'S MOIRA model forecast data. This process matches stopping patterns and times within a 30-minute tolerance, passenger numbers are split into those travelling with standard tickets and those travelling with first class tickets. A combined overall passenger count is also calculated by consolidating passenger numbers for both classes.

In this approach, a loading value for either class is therefore available if the class of travel is known. If not, a unified loading measure for all classes is also available. Where passengers are travelling with first class tickets on services that do not convey first class accommodation, they are added to the standard class passenger numbers.

Emission Values for each type (model) of train:

As part of this project, we have developed a database of train formations (known as the 'traction table') which includes all types of train operated by each company (at the time of publishing and subject to periodical update), including train length and fuel type variations. This has been created using the Network Rail EC4T chart for electric trains, as well as information from train operators and owners for diesel fleets.

Emission values per kilometre are derived for electric and diesel trains, using sources like the Network Rail EC4T chart for electric trains and operator data for diesel trains. Where assumptions have been made these are under continual review and will be updated as new data is made available.



Bi-mode Trains:

In our methodology, we address the unique characteristics of bi-mode trains. These trains can operate on both electric and diesel power. Understanding and accurately calculating the emissions for these trains is crucial due to their ability to switch between modes depending on the route.

To effectively capture the emissions of bi-mode trains, we derive separate emission values for both their electric and diesel modes. We utilize geographical databases to identify which parts of the routes are electrified. This information allows us to determine the operating mode of the train for different segments of its journey.

By doing so, we ensure that our emission calculations for bi-mode trains are as accurate as possible, reflecting the energy usage based on the specific route conditions. This level of detail is vital for a comprehensive understanding of the carbon footprint of these versatile trains within our methodology.

Assigning Train Types and Deriving Emission Values for Journeys:

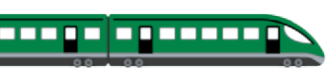
MOIRA's details on traction types are matched with the 'traction table'. Discrepancies are flagged for correction, ensuring real-world accuracy. For electric trains, service group information from Network Rail distance database (CIF) is used to match the correct emission values. In bi-mode trains, sections of electrified lines dictate the operating mode for emission calculations.

Direct Journeys and Service Counts:

Currently, our focus is on direct journeys, with a view to expanding to indirect routes in future phases. We indicate the nature of each journey and tally the total number of services considered in our analysis.

Summary of Data Normalisation:

By meticulously preparing and normalizing data according to these parameters, GTD ensures that its methodology for calculating rail travel emissions is both robust and reflective of the latest industry standards (such as the GHG Protocol). This process is fundamental to achieving the GTD's goal of providing accurate and meaningful insights into the carbon footprint of rail travel.



Calculation Process

The GTD Methodology's calculation process ensures precise and accurate emission figures:

1) Data Input:

Inputs include journey specifics like origin, destination, and energy consumption per kilometre for different train types.

1A) Data Validation Assumptions:

- Carriage Adjustment for Recorded Loads:
  - Rule: Align carriage counts with non-zero passenger loads.
  - Condition: If passenger load exceeds zero but carriage count is zero, adjust the count to one.

2) Emission Factor Identification:

Uses CO2e conversion factors for electricity and diesel from government sources.

3) Emissions Calculation for Each Kilometre:

Electric Train Emissions: Electric Energy per km * CO2e_Electricity

Diesel Train Emissions: Diesel Energy per km * CO2e_Diesel

4) Total Journey Emissions:

Combines the CO2e per kilometre for electric and diesel.

Formulas:

- Electric Journey Emissions: CO2e per km Electric * Total km Travelled
- Diesel Journey Emissions: CO2e per km Diesel * Total km Travelled
- Total Journey Emissions: Diesel Journey Emissions + Electric Journey Emissions
- Average Emissions per km: Total Journey Emissions ÷ Total Distance Travelled

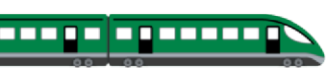
5) Allocation of Emissions to Forecasted Passengers:

Emissions for rail travel are calculated for all passengers. A proportion of the overall emission value of the train is allocated equally for each passenger irrespective of class.

Emissions are also calculated for passengers in each class of accommodation. Where first class seats take up a larger amount of space in the carriage than standard class seats, the proportion of the train's emissions for each first-class passenger is given an increased weighting to allow for the additional emissions of a passenger travelling in first class.

Formulas:

- Average Passenger Emissions per km = Total Train Emissions per km ÷ Total Passengers.
- Standard Class Passengers = The count of standard class passengers on the train.
- First Class Passengers (true) = The count of first-class passengers on the train
- First Class Passengers (weighted) = The count of first-class passengers on the train * space taken by first class seat compared to standard class seat (e.g. a 50% larger first-class footprint will have a factor of 1.5).



- **First Class Passenger Emissions per km**

  The total count of standard class passengers on the train + total count of first-class passengers (weighted) = Total passengers (weighted).

  Total Train emissions per km ÷ Total Passengers (weighted) * First class passengers (weighted) = First class emissions per km (weighted).

  First class emissions per km (weighted) ÷ Total first-class passengers (true) = First Class Passenger Emissions per km

- **Standard Class Passenger Emissions per km**

  The total count of standard class passengers on the train + total count of first-class passengers (weighted) = Total passengers (weighted)

  Total Train emissions per km ÷ Total Passengers (weighted) * standard class passengers = standard class emissions per km (weighted)

  Standard class emissions per km ÷ Total standard class passengers = Standard Class Passenger Emissions per km

- Average Standard Class Passenger Emissions per KM = Total Emissions per km of train ÷ overall weighted passenger count, Standard Class Passengers.
- Average First Class Passenger Emissions per KM = First Class Carraige Emissions per KM ÷ Standard Class Passengers.

Note: This streamlined calculation method emphasizes transparency and simplicity, offering a clear view of the environmental impact per passenger. It allows for a direct comparison of emissions across different rail journeys, simplifying the assessment for stakeholders.

6) Output #1 Emissions per passenger KM:

GTD Methodology progresses to generating key outputs that reflect average CO2e emissions per kilometre per passenger. These figures are intended to offer organisations an alternative to the standard Government Greenhouse Gas Conversion Factors (also known as DEFRA emission factors, now owned by the Department for Energy Security and Net Zero) emission averages, especially when comprehensive station-to-station reporting is not feasible.

Overall Average Emissions per Kilometre:

This calculation provides emissions data for First Class, Standard Class and a combined value for all passengers. The sum product of emissions per average passenger and total passengers is divided by the sum of emissions for all passengers. This is repeated for only standard class journeys and again for first class journeys.

Formula: Sum Product (Total Passengers × Emissions per Average Passenger) / Sum of Emissions for All Passengers

Note: This output generation is a key element of GTD's commitment to delivering precise and practical emissions data. By presenting a refined overall average, this output becomes a critical tool for organisations. This methodology offers a new and more accurate average emissions per kilometre metric. It is especially beneficial for organisations not yet utilising station to station journey

calculations. Utilising GTD data, businesses can calculate their emissions more accurately, aiding in a shift towards sustainable travel practices. This approach enhances the relevance and specificity of emissions information within the travel sector, providing a finely tuned alternative to existing methodologies.

7) Output #2 Calculating Emissions for Station-to-Station Journeys:

GTD Methodology's final step involves calculating the emissions for specific station-to-station journeys. This crucial phase provides stakeholders with detailed and actionable data for specific rail journeys, enhancing the utility of the methodology for precise sustainability assessments and decision-making.

Journey Emissions:

For all rail journeys, emissions are calculated by multiplying the average emissions per forecasted passenger per kilometre by the total journey distance. This method provides a precise metric for the emission output of each journey, applicable to all passengers, or to a Standard/First Class passenger as required.

Formula: Emissions per Passenger per KM × Distance Travelled (KM) = Total Emissions Journey

Conclusion:

GTD marks a significant stride in understanding the environmental impact of business rail travel. This innovative methodology, equipped to accurately calculate carbon emissions, incorporates various factors including train type, fuel emissions, carriage configuration, and load factor. Currently, Green Travel Data extends its coverage in this phase, to nearly all current direct point to point business rail routes across Britain, offering a more precise depiction of the carbon footprint for these journeys.

This approach not only allows organisations and individuals to gain a clearer understanding of their environmental impact when travelling by rail, but it also facilitates a more equitable comparison with other modes of transportation. By providing a transparent and easily interpretable metric for carbon emissions, GTD bolsters efforts towards sustainable travel choices.

GTD is in alignment with the broader objective of reducing the UK's carbon emissions to net zero by 2050. It signifies the rail industry's proactive role in this environmental endeavour, contributing significantly to the nation's sustainable future.

Through GTD, we are not just quantifying emissions; we are enabling a shift in travel behaviour, underpinning the move towards a more sustainable, environmentally conscious approach to rail travel across Britain.

Appendix:

FAQs:

For the latest frequently asked questions and their answers, please visit the FAQs section on the Green Travel Data website. This ensures that you have access to the most current information, maintained in a single, centralised location for your convenience.

Please find the link here: Green Travel Data website.