Department for Transport

Rental E-Scooter Trials Monitoring Data, January 2022 to May 2024

Technical Report

September 2025

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Contents

Coverage

1. Rental e-scooter use across government approved rental e-scooter trials in England, excluding the London trial, from January 2022 to May 2024.

Background

2. This monitoring data has been collected since the opening of the rental e-scooter trials in July 2020 to inform learning from the trials in England. The data covers trips made across the trial areas collected by the operators participating. Data tables covering the period July 2020 to December 2021 were published alongside the first national evaluation of e-scooter trials in December 2022.

3. Due to improvements in the data validation and processing since the previous publication, caution is advised when comparing the two data sets or drawing trend inferences across the time periods. Any conclusions should be treated as indicative.

4. This publication covers rental e-scooter data and is not suitable for calculations which require information on private e-scooter use.

Data Collection

5. The Department collects monitoring data from all operators across all trial areas to examine e-scooter use and to support the learning and development objective of the rental e-scooter trials.

6. The Department has data sharing agreements in place with operators and has commissioned a third-party to manage the technical infrastructure that allows the Department to receive and store operator data. The operators collect data using technology on the e-scooters and transfer this data to a database within the Department's data warehouse hosted on Google Cloud Platform (GCP) via an e-scooter application programming interface (API).

7. The operators are required to provide rental e-scooter trip-level data that includes the following information:

    7.1 trip date

    7.2 vehicle details and status[1]

    7.3 trip start time and end time (in seconds)

    7.4 global positioning system (GPS) waypoints taken at the start, end and during a vehicle trip.

[1] Vehicle details and status refers to whether an e-scooter is marked as available or unavailable by the operator on a given day.

8. Further information on how these variables are collected and measured can be found in the methodology section.

Data Quality: Processing, Verification and Validation

9. Once data enters the Department's GCP, the data goes through several validation and verification processes within the Department's data warehouse to improve data accuracy and minimise the number of potential errors introduced to the dataset.

10. Firstly, a series of automated validation checks are carried out. These include:

    10.1 removing or fixing any invalid, incomplete or duplicate data. For example, removing or fixing incorrect date values, invalid date formats, trip duration outliers or invalid GPS waypoints

    10.2 checking the internal consistency between data provided by the operators. For example, checking that trips are happening on available e-scooters

    10.3 testing if input assumptions and calculations are correct and appropriate. For example, testing that all trips have GPS waypoints and that all valid trips are captured in aggregations of the data

    10.4 sense checking the data to ensure it is feasible. For example, assessing whether available e-scooters are located in the same place as the trips that occur on them

11. At this stage, the input data from operators is aggregated to calculate the published variables. For example, the distance between the individual GPS waypoints for each trip is calculated and then aggregated to determine trip distances. The number of trips, trip durations, e-scooter availability and trips per available e-scooter each day are also calculated.

12. Filters are then applied to these variables to ensure anomalous trip data is removed to improve data quality. The purpose of these filters is to ensure the data reflects real-world activity in terms of what is generally considered a trip and an available e-scooter. These filters are applied consistently across all trial areas and operators. How these filters are applied to e-scooter trip and availability data is outlined below.

Trip data

13. There is no fixed definition across the industry as to what counts as an e-scooter trip. This means operators may apply different filters to e-scooter trip data depending on what they consider a true e-scooter trip. Transport for London (TfL) apply a set of filters to trip data regarding the minimum trip duration and trip distance to ensure any anomalous trips are removed from the data.

14. The Department for Transport have implemented filters used by TfL together with additional filters as explained below:

Table 1: Explanation of filters applied to e-scooter trip level data

Filter name	Exclusion range	Example
Trip duration	Trips that are shown in the data as < 1 second or >240 minutes	When a reservation is made but the e-scooter is not actually used, in the data, the trip lasts less than 1 second
Trip distance	Trips that are shown in the data as < 10 metres or > 65 kilometres	When a user starts a trip inadvertently or the e-scooter is faulty and the user ends it soon after, in the data, the trip lasts less than 10 metres
Trip speed	Trips that are shown in the data as having an average speed > 26 kilometres per hour[2]	When an e-scooter is recording a trip while being transported inside a van for operational purposes, in the data, the trip can have an average speed greater than 26kmh

E-scooter availability data

15. A process also exists to remove e-scooters from the data which may be marked as available but are not actually available to ride. This can occur if e-scooters are in storage but have not had their availability status updated. Therefore, any e-scooter that has been marked as being available for 30 days without recording a trip is then marked as unavailable and removed from the data.

Additional data assurance

16. Additional data assurance processes are then undertaken by the Department for Transport that are focused on improving and ensuring data quality. These include:

    16.1 analysing the trend of data for indications of anomalous data. For example, unexpected spikes in the total number of trips or average number of daily available e-scooters, on a monthly basis for each trial area and operator

[2] The maximum permitted speed of an e-scooter in any trial area is 25km per hour

16.2 comparing the data against available alternative data sources for the total number of trips and average number of daily available e-scooters, on a monthly basis for each trial area

17. Where instances of potentially anomalous data or significant differences between data sources were identified, operators were engaged to understand what was causing these instances. Where possible, solutions were implemented to improve the data at source.

Data quality

18. The data has undergone rigorous quality assurance. Alternative data sources may use different approaches to data processing, cleaning and filtering that will likely result in different estimates of the variables presented in this publication. A known source of uncertainty is due to trips and available e-scooters being mapped to unknown trial areas. Trips mapped to unknown trial areas account for less than 1% of total trips.

19. The source data is received directly from the rental e-scooter trial operators and is the most appropriate source to demonstrate rental e-scooter activity. The filters applied as described above ensures the data accurately reflects what it intends to measure and is coherent and consistent across trial areas and operators.

20. As a new transport mode, data collection methods and validation processes are continuously improving. The extent that this impacts the accuracy or quality of the data is significantly mitigated by the nature of the data not being complex. There is a small amount of uncertainty within the data that accounts for less than 1% of total trips and availability which has not been fully resolved through the validation process.

21. Where possible, harmonisation with similar data sources has occurred. For example, as outlined above, the validation processes for TfL's rental e-scooter trial data were reviewed and similar trip-level filters have been applied to the data. This ensures a consistent definition of an e-scooter trip across the sources.

22. Some of the data assurance processes outlined above were undertaken after the data was collected (after May 2024). In some trial areas, the Department was unable to work with operators who were no longer operating in the UK to improve the data quality. For the London trial, some operators were unable to retrospectively improve data. This is discussed below in greater detail.

Exclusion of London trial area data

23. Data provided by operators to the Department for the London trial area has not been included in this publication because it failed key validation checks. Validation processes revealed data for the London trial area included e-bikes, significantly impacting the reported number of trips undertaken on e-scooters and the average number of daily available e-scooters. The operators could not resolve this due to the historic nature of the data.

24. TfL collect and publish data on the number of e-scooter trips and available e-scooters specifically for the London trial area using their own data feed and processes. For this data please refer to TfL's rental e-scooter trial metrics: Electric scooter rental trial - Transport for London.

Methodology

Waypoints

25. The operators provide trip-level data to the Department which is made up of a collection of waypoints. Waypoints are collected and provided approximately every 30 seconds although the specific amount of time between waypoints will vary with e-scooter capability and operator pipeline functionality.

26. These waypoints are used to calculate the total trip distance by calculating the distance between adjacent waypoints and aggregating these.

27. The trip distance is calculated through the following steps:

    27.1 **sort waypoints by timestamps:** The waypoints are first ordered chronologically based on their timestamps to ensure the sequence of travel is accurate

    27.2 **filter invalid GPS co-ordinates:** Any waypoints with invalid GPS coordinates are removed to ensure only valid data is used in the calculation

    27.3 **validate latitude and longitude:** Since some operators may provide latitude and longitude values in reverse order, the system checks for this mistake and swaps the values if necessary

    27.4 **compute pairwise distances:** The distance is calculated between each consecutive pair of valid waypoints

    27.5 **sum the distances:** Finally, all the pairwise distances are summed to derive the total trip distance

28. The calculations for the published variables included in this data publication are described below. These variables are visualised in a PowerBI dashboard where they are exported and manipulated into the published data tables using R code.

Variables

Total number of trips

29. This variable shows the total number of trips taken on rental trial e-scooters across a given time period, trial area and operator.

Vehicle days

30. This variable is calculated by summing the number of available e-scooters each day across a given time period, trial area and operator.

Average number of daily available e-scooters

31. This variable shows the average number of rental trial e-scooters which are available to hire each day for a given time period, trial area and operator.

32. This is calculated by dividing the total number of vehicle days by the total number of days for a given time period, trial area and operator.

Average number of daily trips per e-scooter (utilisation rate)

33. This variable shows the average number of daily trips per available rental e-scooter for a given time period, trial area and operator. This is also referred to as the utilisation rate.

34. This is calculated by dividing the total number of trips by the total number of vehicle days for a given time period, trial area and operator.

Average trip distance

35. This variable shows the average trip distance on a rental trial e-scooter measured in kilometres for a given time period and trial area.

36. This is calculated in two steps. Firstly, the total calculated distance travelled across all rental e-scooter trips in metres is divided by 1000 to convert the value into kilometres. Secondly, total calculated distance is divided by the total number of trips for a given time period and trial area.

37. The total calculated trip distance refers to the aggregation of calculated distances between adjacent trip waypoints as outlined above (see 'waypoints' section).

Average trip duration

38. This variable shows the average trip duration on a rental trial e-scooter measured in minutes (and seconds) for the given time period and trial area. The duration is calculated as the difference between the trip start and end times.

39. This is calculated by dividing the total duration across all trips by the total number of trips for a given time period and trial area.