United Nations ECE/TRANS/WP.6/2022/11

# Economic and Social Council

Distr.: General
25 March 2022

Original: English

## Economic Commission for Europe

Inland Transport Committee

### Working Party on Transport Statistics

**Seventy-third session**
Geneva, 15–17 June 2022
Item 8 (c) of the provisional agenda
**Traffic censuses and geospatial statistics:**
**Other geospatial applications in transport statistics**

# Geospatial transport statistics: examples and future possibilities

### Note by the secretariat

*Summary*

This document describes existing geospatial transport statistical possibilities at the international level, in the context of maximising the value of geospatial transport statistics, notably the UNECE censuses and Eurostat origin-destination data for various modes. An example of the uses of international origin-destination rail data is given in the annex as an input into analysis of which air routes have most potential to be shifted to rail connections.

## I. Background

1. In the context of the E-Road and E-Rail censuses, the secretariat has been exploring additional datasets that allow geospatial projection. The aim of these activities is to increase the use and value of existing transport statistics, by combining different sources and mapping them.

2. The secretariat of the Working Party on Transport Statistics (WP.6) services the statistical needs of other working parties within the Economic Commission for Europe (ECE). Geospatial analysis has been done for this, notably for the Working Party on Rail Transport (SC.2), the Working Party on Inland Water Transport (SC.3), the Working Party on Transport Trends and Economics (WP.5) and the Working Party on Intermodal Transport and Logistics (WP.24). This has typically involved using the census outputs as well as Eurostat origin-destination data to map rail, inland water and road transport volumes (tonnes and tonne-km loaded and unloaded) by NUTS 2[1] region. These additional data sources complement existing work on the E-Road and E-Rail traffic censuses, both as providing an

[1] Nomenclature of territorial units for statistics maintained by Eurostat. Level two refers to “basic regions for the application of regional diagnoses.” https://ec.europa.eu/eurostat/web/nuts/background.

alternative data source when census results for a country are not available, and for comparing different modes against each other.

3. The secretariat plans to continue this work in 2022 in collaboration with the Working Party on Intermodal Transport and Logistics, seeking to improve intermodal and multimodal transport measurement.

4. The remainder of this document is a separate example of working with these kinds of datasets.

# Annex

## Which of the busiest European air routes could be travelled by rail?

An example of using geospatial transport statistics for a real-world application follows. This has been developed by Giorgio Comai at the Osservatorio Balcani e Caucaso Transeuropa, affiliated to the European Data Journalism network. The report used Eurostat origin-destination passenger information to make inferences about how many flights could be shifted to rail journeys of a reasonable duration (defined as less than six hours). The full report is available[2].

The full description of the work undertaken is given on https://edjnet.github.io/european_routes/, and the conclusions are included in a report that was published by the non-governmental organisation Greenpeace. An overview of the process followed is given below, including reference to datasets used, and the challenges encountered in using them.

**Starting Question: What are the main flight routes in Europe that could be shifted to rail?**

In order to answer this question, a dataset with the number of passengers across all main flight routes in Europe was needed. Routes involving different airports associated to the same city were merged. Routes were excluded where no plausible train connection existed, typically involving islands. In addition, very long routes of above 1500km were excluded.

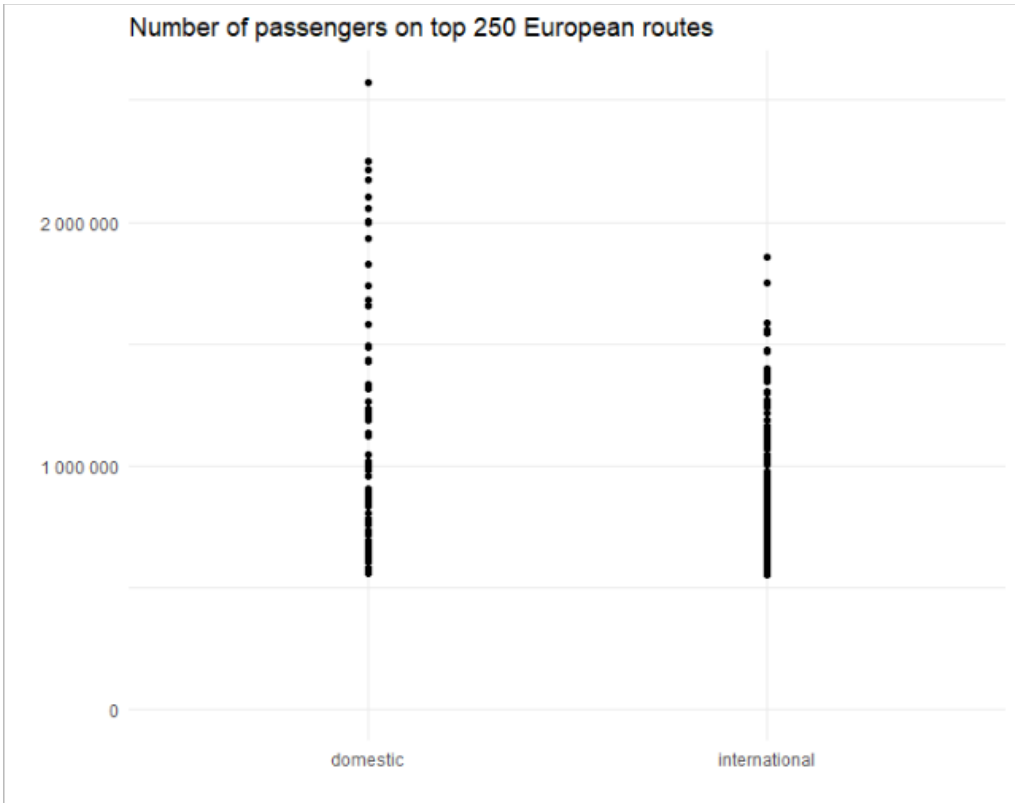
**Working with Eurostat aviation data**

Eurostat has a large array of different datasets for each transport mode. For aviation, there is a series of datasets named avia_par_[country code], each of which gives passenger numbers flying to and from each airport in that country. For the analysis conducted, data only for 2019 were used (excluding other years and quarterly data that were more sporadically available), all routes involving non-European airports were filtered out, the only unit considered was passenger numbers (so seat numbers and flight numbers were excluded), and finally the only indicator considered was "passengers carried (departures)".

The next stage of the data manipulation was to sum up all pairs of origin-destination (as interest lies in e.g. all passengers between London and Paris in both directions, and not each route separately). At this stage of the analysis, the routes can be visualised split between domestic and international routes, as in Figure 1.

[2] https://www.balcanicaucaso.org/eng/Occasional-papers/Train-alternatives-to-short-haul-flights-in-Europe.

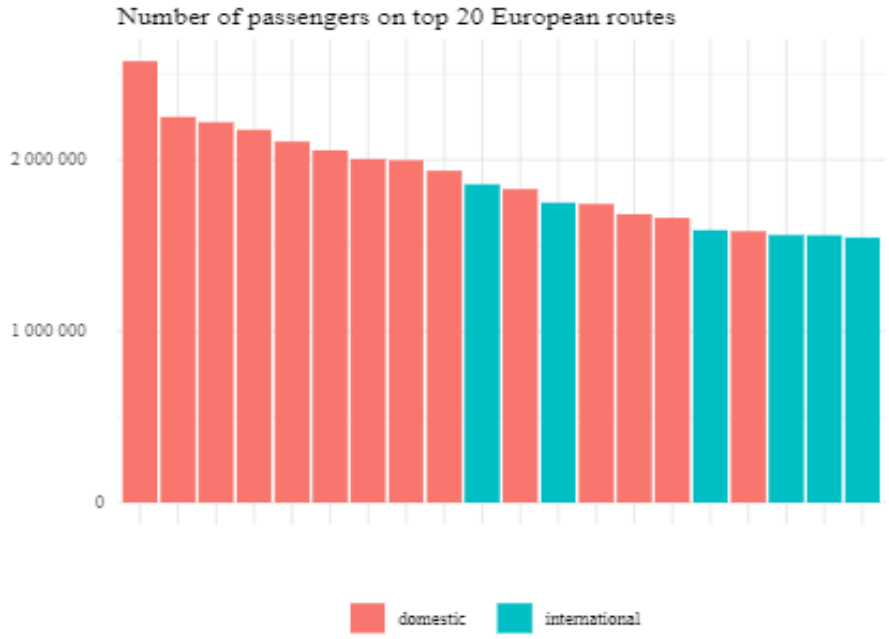
Figure 1
**Passenger numbers on the top 250 European aviation routes 2019, split by domestic and international. © Giorgio Comai/EDjNet**




*Source: Eurostat 'avia_par_' tables*

An alternative visualization shows fourteen of the top twenty routes, and all of the top nine, are domestic (Figure 2).

Figure 2
**Top twenty European air routes 2019, domestic versus international. © Giorgio Comai/EDjNet**




*Source: Eurostat 'avia_par_' tables*

After further data manipulation and cleaning, airport coordinates were found and assigned to the city/cities that they serve. This involved a number of sources, including wikidata.

Figure 3 shows all the airports in this intermediate dataset. After this stage, multiple airports that served the same city (e.g. Orly and Charles-De-Gaulle both serving Paris) were grouped.

Figure 3
**European airports included in the analysis**

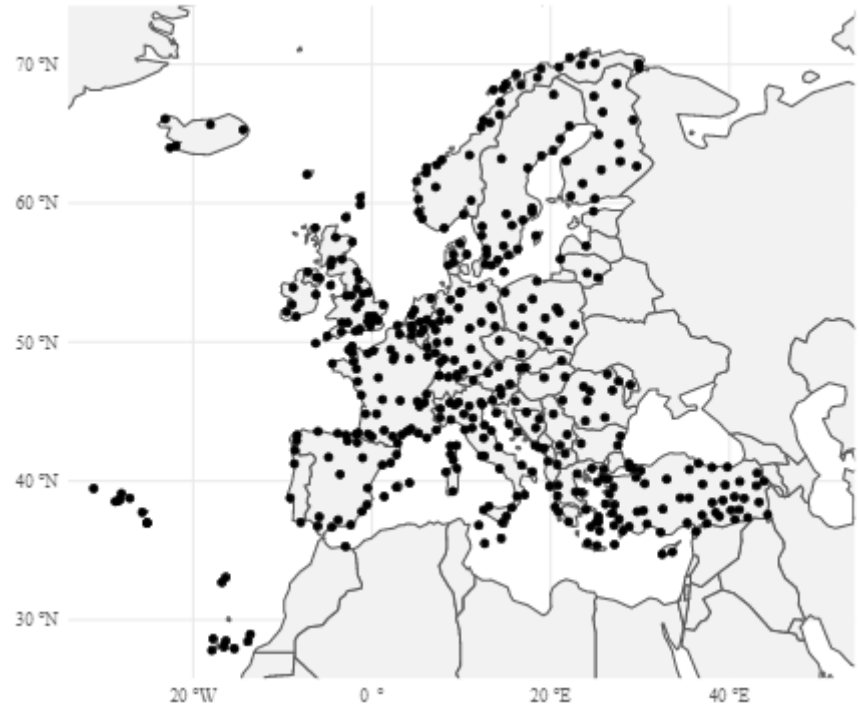



Figure 4 shows the passenger routes included at this stage. The routes to Guadeloupe, Martinique and Réunion stand out. As the focus of the analysis was on what routes could feasibly be switched to rail, a buffer was applied to only include airports that are part of the European mainland, which is shown in Figure 5 This includes Great Britain and Sicily which have rail connections to the mainland but excludes Ireland and other islands where no rail connection exists to the mainland).

Figure 4
**All European air routes included in the analysis**

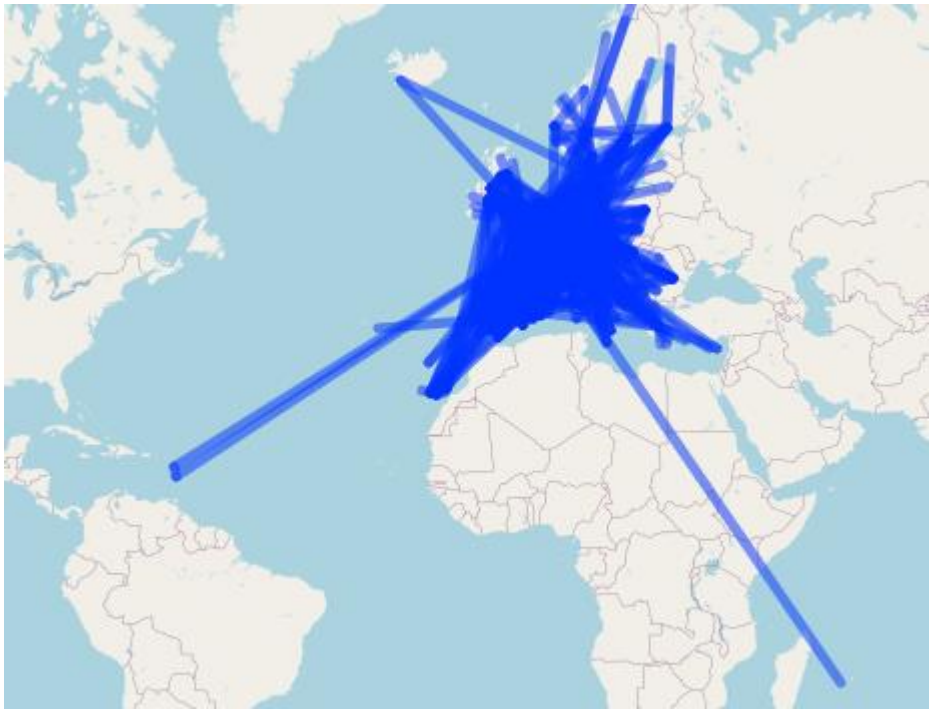
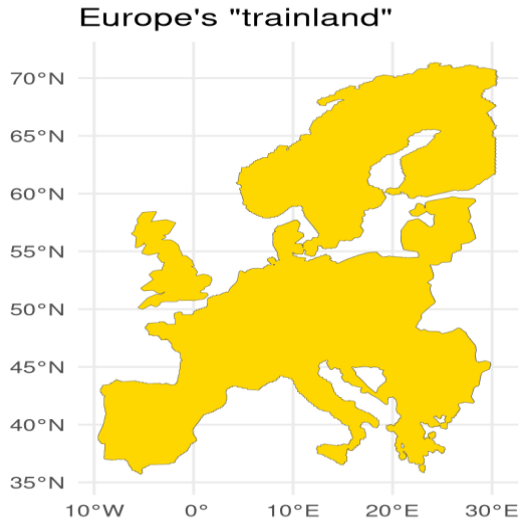
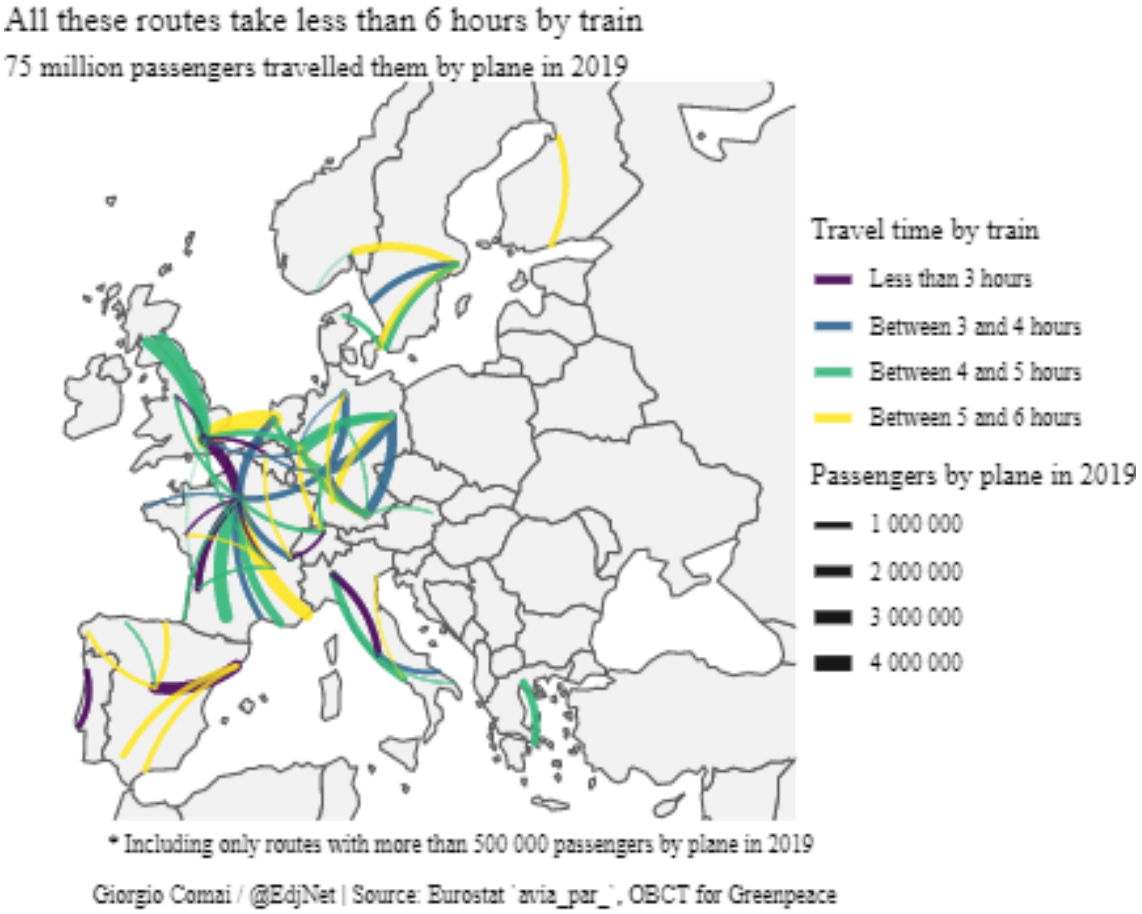


Figure 5
**The European mainland, for the purposes of comparison between rail and air journeys**




Finally, with more data manipulation and data on train routes[3] a map of flight routes that take six hours or less by train is made, shown in Figure 6.

Figure 6
**Final map of aviation journeys with a viable rail connection. © Giorgio Comai/EDjNet. Source: Eurostat 'avia_par_' tables**




[3] https://www.balcanicaucaso.org/eng/Occasional-papers/Train-alternatives-to-short-haul-flights-in-Europe.