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Traffic censuses in the ECE region: 2015 and 2020 E-Rail traffic censuses

Mapping the E-Rail Census Results

Note by the secretariat

I. Background

1. The E-Rail census has been conducted by the Economic Commission for Europe (ECE) secretariat since 2005 and provides data on the number of trains (divided into goods trains, passenger trains and other trains) on specific segments of the E-Rail network, as defined in the European Agreement on Main International Railway Lines (AGC). The secretariat conducts this data collection in cooperation with the Statistical Office of the European Union (Eurostat), which includes this data collection in Annex G of Regulation (EC) 91/2003.

2. The deadline for the 2015 census was 30 June 2017. As of 12 March 2019, nine countries had directly provided the secretariat with census data: Bosnia and Herzegovina, Croatia, Denmark, Hungary, Lithuania, Slovakia, North Macedonia, Turkey and United Kingdom.

3. Data for European Union countries are also collected by Eurostat under the Annex G regulation. Due to technical issues, these data were delayed and provided to the secretariat in September 2018. The data provided covered seventeen countries in total.

II. Challenges of Data Consistency

4. With the receipt of data covering multiple countries, the secretariat tried to map the data as it had done with the 2015 results of E-Road census (see ECE/TRANS/WP.6/2018/3). With the E-Road data, some countries had Shapefiles available, which meant that mapping the results was relatively straightforward (combining the Shapefiles of the available countries, sometimes with some steps of manipulation). Shapefiles are a standard file format for geospatial data.

5. For rail data, no countries provided Shapefiles to the secretariat, and they are not specifically requested under the European Union's Annex G regulation. Therefore, the only way to map the data was to use the start-points and end-points given in the file. In contrast to the road data, the rail segments were typically quite long, and running from one side of a

territory to the other in some cases. This meant that mapping segments from point to point did not fit the true contours of existing rail lines. In some cases, these longer segments still give a good understanding of where trains move to and from, whereas in other cases the straight lines from start to end point misrepresent routes by not traversing the major cities and other important points along segments' true paths. In order to understand how well the data map the actual rail lines, the Shapefile of the European TEN-T core network has been provided on the published map as an additional layer. The TEN-T network identifies the most important lines of the European Union's transport networks and is correlated with the E-Rail network of the AGC.

6. Not all countries provided GPS coordinates of segment start and end-points. Other countries did provide the coordinates, but not always using the same geographic coordinate system. Other countries provided coordinates for their data for 2010, but not for 2015. The secretariat, where possible, tried to use the 2010 coordinates to map the 2015 data. For most countries the segment names and coverage did not change from 2010 to 2015. It did appear, however, that some segment names changed coverage between the two census rounds, based upon differing traffic volumes, but there was no clear way to be sure without coordinates.

7. Segments with coordinates completely missing for 2010 and 2015 were excluded from the map.

8. A further challenge in mapping the data to the E-Rail network is that data coverage varies across countries. The data for some countries seem to cover exclusively the AGC lines as requested in the census, some cover all main lines, and some seem to cover all rail lines. The census asks countries to specify the segments covered by the AGC and those within the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC). However, as countries did not consistently specify which lines were AGC or AGTC, it was decided to map all available segments, even if they were likely out of the scope of the AGC.

9. Some countries reported segments with zero traffic figures. In order to keep the map as simple as possible, these segments were excluded from the published product.

10. Finally, the census asks for traffic data in both directions. For some segments these values differ modestly, whereas for most segments traffic levels were similar or even identical for both directions. Combining these segments into a total traffic figure was considered to simplify the map, however it was decided to keep the directional segments apart in order to maximize available information.

11. In the Table below there is an example of data provided for passenger trains for certain segments (modified from the original census file to fit in one table). In this case the segments all have coordinates GPS in one case, latitude and longitude in the other), and the AGC and AGTC line numbers are available for relevant segment in addition to the European Union's TEN-T flag for one country but not the other.

Table
Example of some data segments for European Union countries

Network segment identifier	*AGC line number*	*AGTC line number*	*Ten Flag*	*Number of Passenger Trains*	*From (Latitude – Longitude)*	*To (Latitude – Longitude)*
FRS23373				0	667678.630 ; 6864127.440	666976.210 ; 6864257.840
FRS23374				26	665559.600 ; 6863857.680	665119.700 ; 6863992.480
FRS23375				8	665559.600 ; 6863857.680	665267.320 ; 6863432.390
FRS23376				0	656960.200 ; 6869996.950	656953.230 ; 6871574.220
HRS11010	E 70	C-E 70	1	2339	45:53:26N ; 15:40:49E	45:52:19N ; 15:44:24E
HRS11020	E 70	C-E 70	1	14510	45:52:19N ; 15:44:24E	45:50:40N ; 15:48:47E
HRS11030	E 70	C-E 70	1	19749	45:50:40N ; 15:48:47E	45:48:33N ; 15:57:15E

III. Results

12. As of March 2019, the map is expected to be published before the 70th session of the Working Party in June 2019.

13. One positive aspect of the rail map compared to the road census map is that passenger and freight trains are clearly distinguished, whereas in the road sector only total Average Annual Daily Traffic (and the number within this of heavy vehicles) is known. This allows more specific analyses of goods and passenger movements.

14. Figure 1 shows a screenshot of the 2015 passenger train results, while Figure 2 shows the 2015 goods train results. Several things are noteworthy:

(a) As noted above segments for some countries are small and fit the real network quite well, whereas for others the segment lengths are long. In the case of Poland for example, while the segments are quite long, the broad shape of the network, with multiple segments starting and ending in Warsaw and other major cities, can be seen. In contrast, the segments for Spain are so large that traffic between major cities cannot easily be seen on some major East-West lines.

(b) As noted above the data mapped goes into further detail than the E-Rail network. The level of detail seems to vary by country, however. In some cases, all mainlines have been included, whereas for some countries all rail lines, including minor lines, urban commuter lines and possibly even tram or metro lines, have been included. Thus, the data for Germany are very dense in the major urban centres.

Figure 1
Passenger train traffic, 2015

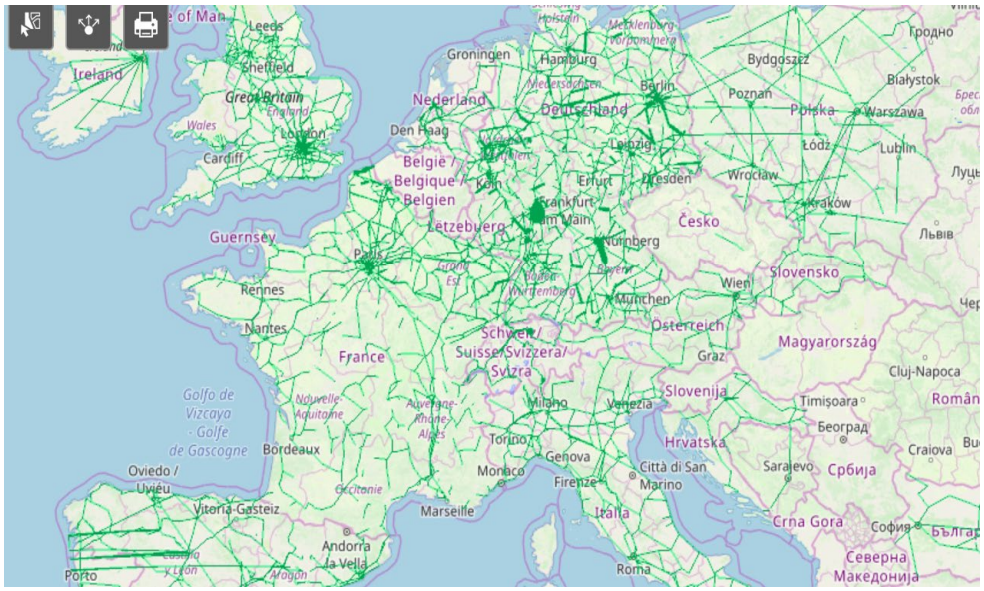
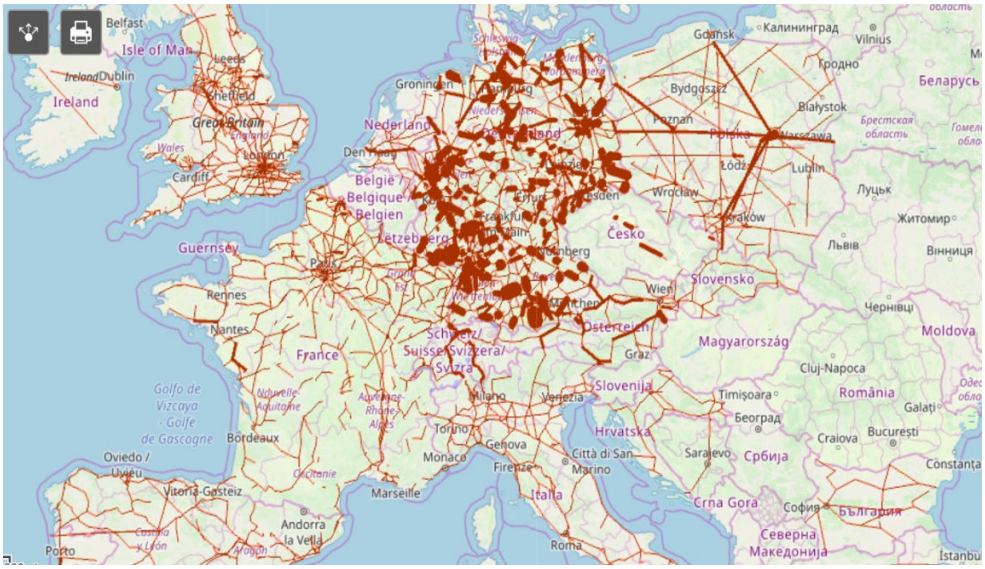


Figure 2
Goods train traffic, 2015



IV. Potential Uses

15. The map is a useful visualization of passenger and freight trains on specific network segments and allows understanding of where the network is particularly busy. But there are two potential future uses that are focused on here.

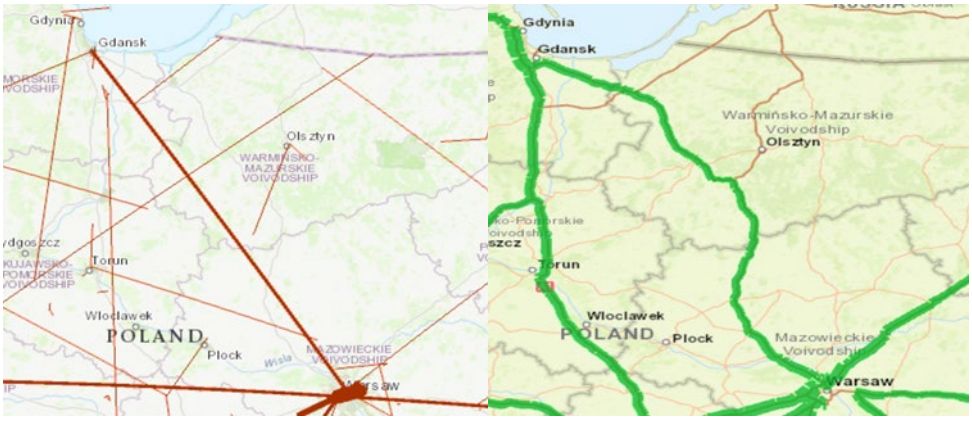
A. Monitoring Euro-Asian Transport Links

16. Goods transport by road and rail between Europe and Asia is expected to increase significantly in coming years, as the benefits in timeliness and avoiding the busy European and Asian maritime ports make the higher cost of using road and rail links more worthwhile. To make any analysis of future trade patterns, knowing existing traffic volumes along different routes is necessary. However, this will only be possible if data are provided by the key transit countries along the route, which is currently not the case.

B. Specific Corridor Modal Split Calculations (and Identification of Modal Switching Opportunities)

17. Figure 3 shows side-by-side the rail traffic and road volumes between Warsaw and Gdansk in Poland, a major maritime port. From the road census the average number of heavy vehicles per day is known for the road segment (taking a segment somewhere in the middle as being likely to represent traffic travelling the entire distance). On the rail side the number of goods trains is known. This information on its own does not allow a modal split calculation, but with assumptions about the number of freight containers per goods train and the number of heavy vehicles which are carrying goods the entire way, a simplified analysis would enable an approximation of the impact on road freight traffic of one extra goods train per day, and the corresponding benefits with regards to road safety, local pollution, greenhouse-gas emissions, noise and congestion.

Figure 3
Road and goods train traffic on the Warsaw-Gdansk corridor, 2015



V. Considerations for the 2020 Census

18. The secretariat has already published recommendations for the 2020 census (ECE/TRANS/WP.6/2018/8), which the Working Party endorsed at its sixty-ninth session. Further to these recommendations, the Working Party may wish to consider encouraging countries to consistently provide coordinates in a standardized way, and to accurately label which rail lines are AGC, AGTC or TEN-T lines. Delegates may also wish to check the data for their own countries to see if they are accurate, in particular the coordinates of start and end points. Any further guidance for European Union countries on how to submit data for annex G of the regulation may lead to more consistent data in the future.

19. If the map is to meaningfully provide insights into Euro-Asian transport links, more data for transit countries will be necessary. Data are only currently available for nineteen countries, most of which are European Union member States.

20. Finally, if there is interest in using the census to track modal share data in specific corridors, then the Working Party should consider the feasibility of container tracking in addition to counting number of trains.