

From rail timetables to regional and urban indicators on rail passenger services

Hugo Poelman Linde Ackermans European Commission DG Regional and Urban Policy Analysis Unit - GIS team

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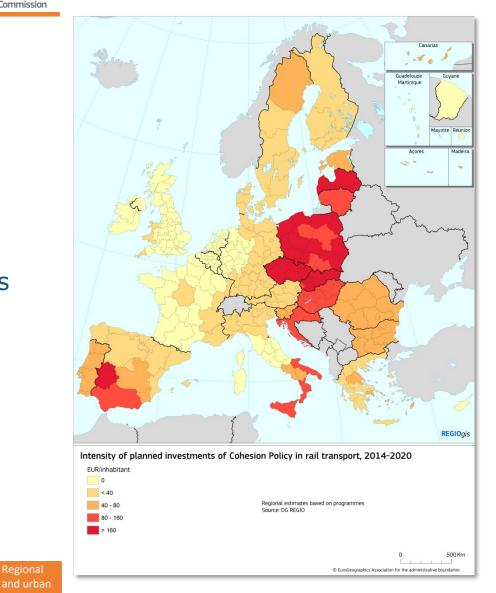
ITF statistical meeting, March 2016



Regional

Policy context

- EU Cohesion Policy
 - Cohesion Policy rail investments 2014-2020: almost 19 bn EUR
 - Mostly programmed in less developed regions
- Enhanced harmonised context indicators on network and its use





Problem statement

- Essential rail infrastructure endowment data available at national and regional level
- But what about the use and performance of this network?
 - Major data challenges to overcome (data availability, openness, harmonisation, transformation)
 - Develop indicators on the actual use of the network: frequency, speed
 - Special focus on regional dimension
 - Assess accessibility of cities and performance of cross-border connections





Scope of the analysis

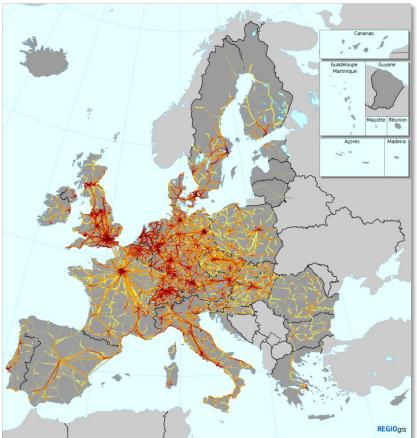
- Regular rail passenger services in 2014
 - Covering the EU plus Switzerland
 - All services leaving between 6:00 and 20:00 on an ordinary weekday from any station in the area (= more than 31000 stations)
 - Timetable data provided by UIC and retrieved from additional individual railway operators





Frequency of services

- Average number of trains per direction and per hour
- Connecting two subsequent stops
- Map shows connections between pairs of stations, not actual railway lines



Frequency of direct rail connections, 2014

train

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ns / direction / hour	
<= 0.25	Average number of trains per direction and per hour, connecting two subsequent stops.
0.26 - 0.50	All direct train trips between geolocated stations, starting between 6:00 and 20:00 on 02/10/2014 (Estonia: 01/02/2013; Ireland: 11/01/2013;
0.51 - 1.00	Greece: 01/09/2015; Corse: 08/09/2015; Northern Ireland: 05/05/2015).
1.01 - 2.00	Sources: UIC, www.peatus.ee, National Transport Authority Ireland, TrainOSE Greece, Chemins de Fer de la Corse, Translink Northern Ireland Railways, EuroGeographics,
2.01 - 4.00	OpenStreetMap, TomTom, RRG, DG REGIO
- > 4.00	
no data / incomplete data	0 500 Km
	© EuroGeographics Association for the administrative boundaries

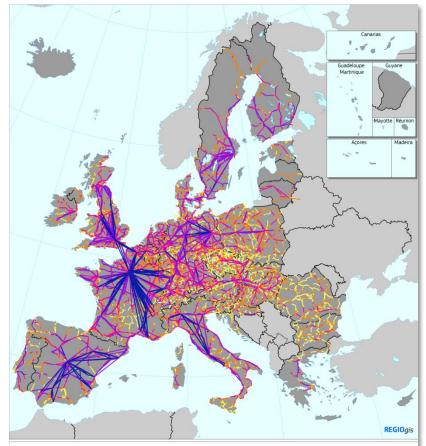


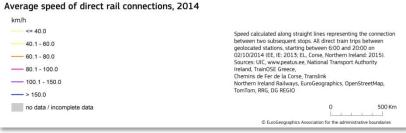
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Average speed of connections

- Average speed of the connections calculated along straight lines linking two subsequent stations
- High-speed infrastructure
- Geographical constraints
- Infrastructure limitations







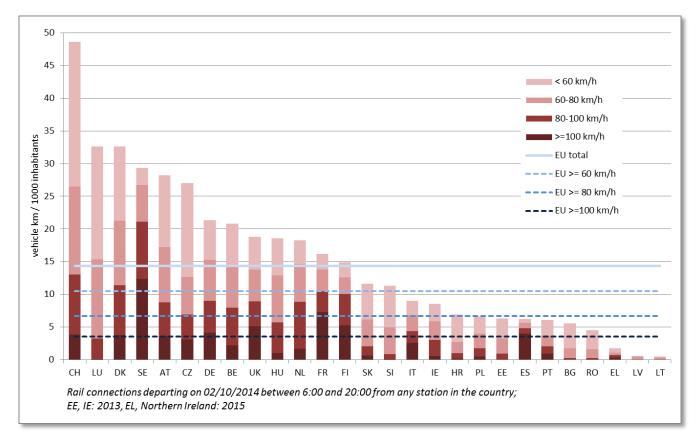
Frequency and speed by country or region

- Location of all stops, relative to their country or region
- All departing services are aggregated by country or by region
 - Total straight-line length of all direct trips starting in any station of the region (vehicle km)
 - Total travel time of these trips
 - Average speed
 - Services intensity, dividing sum of vehicle kilometers by regional population





Aggregated length of all connections departing in the country, by speed category



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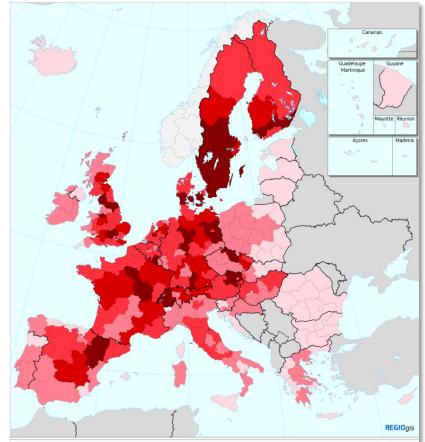


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Fast connections by region

- Vehicle km per inhabitant of connections with a speed of more than 80 km/h
- All connections departing in the region
- Some of the high values relate to relatively low population density
- Performance issues in eastern and southern regions



Length by inhabitant of fast rail connections with departure in the region, 2014





From timetable data to accessibility

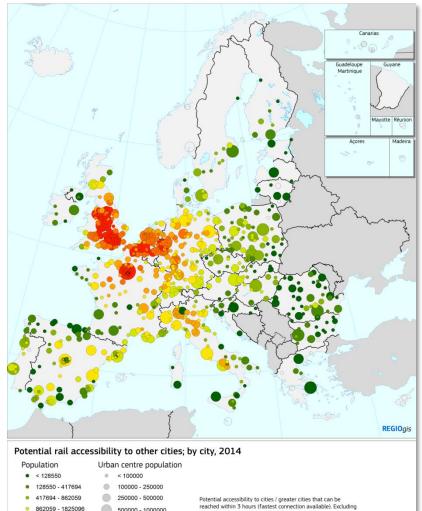
- Assess the accessibility between all cities in Europe (EC/OECD city definition)
- Taking into account trips relevant for day-time travel: maximum travel time of 3 hours
- For each pair of cities: total travel time (including waiting times and transfer times) for travels starting between 7:00 and 9:00
- Calculation repeated every 15 minutes to take into account frequency of services





Accessibility of cities

- Total population of other cities that can be reached within a reasonable travel time
 - Taking into account total travel time
 - Inverse-(time)distance weighted
 - Only destinations relevant for a day-time trip



the population of the city / greater city of origin.

Ireland TrainOSE Greece

TomTom RRG DG REGIO

Chemins de Fer de la Corse Translink

Sources: UIC, www.peatus.ee, National Transport Authority

Northern Ireland Railways, EuroGeographics, OpenStreetMap

500 Km

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500000 - 1000000

= 5000000

1000000 - 5000000

1825096 - 2937945

2937945 - 5419350

5419350 - 8157566

>= 8157566

No data

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Short-distance connections

- Connections between cities < 100 km away
- Variety of average speed <u>inside</u> countries
 - Geographical obstacles
 - Infrastructure challenges
 - Differences in performance of network use
 - In countries with more than 100 domestic city connections: speed varies between 47.3 km/h in Poland and 63.3 km/h in the Netherlands
- <u>Cross-border</u> connections mostly slower than domestic connections (45.8 km/h versus 59.4 km/h)
 - Waiting times?
 - Lack of coordination of schedules?





Conclusion

- Timetable analysis allows for harmonised metrics on network use
- Highlights extreme diversity in terms of services performance
- **Simplifications** were needed due to limited data integration
- Method can be applied to **other territories** if adequate timetable information is available
- Enhanced interoperability of data models, including actual network layout, will create new opportunities for a more in-depth analysis of network use

