Towards harmonised indicators on access to urban public transport in Europe

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

• EU Cohesion Policy
  • European Regional Development Fund (ERDF) support
    Sustainable urban development
    Promotion of sustainable multimodal urban mobility
    Environmentally-friendly and low-carbon transport systems
  • Allocations for clean urban transport
    2007-2013: about 6 bn EUR
    2014-2020: about 11.7 bn EUR
  • Output indicators explicitly refer to public transport
    Length of new or improved tram and metro lines
Problem statement

- Many attempts to collect data on supply and access to public transport

Obstacles:
- Non-comparable geographies
- Absence of spatial distribution of population
- Scarcity of data on scheduled frequency of public transport

Need for harmonised and comparable indicators allowing benchmarking of cities
Aim of the analysis

- To develop comparable indicators on
  - **Access** to public transport in urban areas
  - **Frequency** and **speed** of urban public transport
- Using standardised data sources
- Referring to **harmonised** concepts
  - Definitions of urban areas
  - Spatial distribution of population
A harmonised definition of cities

- European system of city concepts
  - Essentially grid-based
  - "Urban Centres" (high density clusters): the preferred concept for inter-city comparisons
Distribution of population in a city

- High level of spatial detail needed when mapping the population distribution
- Copernicus Urban Atlas land use data used as a framework

Urban Atlas land use

Population by block
Frequency of departures

- Location of all public transport stops
- Timetables in 2 groups:
  - bus and tram
  - train and metro
- For each stop: average number of departures an hour between 6:00 and 20:00 on a normal weekday
Measuring access to public transport

- Who has easy walking access to a public transport stop?
  - Maximum 5 minutes walk to bus or tram stop
  - Maximum 10 minutes walk to train or metro
- Walking distance calculated using a street network
  - Density of the street network matters
  - Obstacles for pedestrians are taken into account
- Creation of a surface of service areas, representing the number of departures available within walking distance
- Intersected with population distribution layer
## Frequency classes

- 5 groups based on access and departure frequency

<table>
<thead>
<tr>
<th>Bus and tram</th>
<th>Metro and train</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High frequency (&gt; 10 departures/hour)</td>
</tr>
<tr>
<td>High frequency (&gt; 10)</td>
<td>VERY HIGH</td>
</tr>
<tr>
<td>Medium frequency (4 to 10)</td>
<td>HIGH</td>
</tr>
<tr>
<td>Low frequency (&lt; 4)</td>
<td>HIGH</td>
</tr>
<tr>
<td>No services</td>
<td>HIGH</td>
</tr>
</tbody>
</table>
Access to public transport in capital cities and large cities, 2014

Source: DG REGIO calculations
Median number of departures an hour

- Number of departures to which 50% of the urban population has easy access
  - Varies between 7.4 and 33.1 departures in bigger cities
  - Between 4.0 and 34.8 in medium-sized cities
Population density, job density and typology of frequencies

Population density (250x250 m cell size)

Job density (workplace-based employment) (250x250 m cell size)
Quantifying trip length and speed

- Timetable data combined with stop locations
- Connections between two stops represented by straight lines
- Average speed and frequency for each connection

Brussels (city): average Euclidian speed by segment of the tram and the metro network
# Summary indicators by urban centre

<table>
<thead>
<tr>
<th></th>
<th>large urban centres (&gt;= 500,000 inh.)</th>
<th>medium-sized urban centres (200,000 - 500,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>population without access to services (%)</td>
<td>1.4</td>
<td>23.8</td>
</tr>
<tr>
<td>median number of departures</td>
<td>7.4</td>
<td>33.1</td>
</tr>
<tr>
<td>modal split of length of all vehicle trips (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tram</td>
<td>-</td>
<td>45.5</td>
</tr>
<tr>
<td>metro</td>
<td>-</td>
<td>30.2</td>
</tr>
<tr>
<td>train</td>
<td>-</td>
<td>23.5</td>
</tr>
<tr>
<td>bus</td>
<td>45.8</td>
<td>97.3</td>
</tr>
<tr>
<td>length of all vehicle trips, by inhabitant (m/inh.)</td>
<td>42.8</td>
<td>349.1</td>
</tr>
<tr>
<td>average vehicle trip speed (km/h)</td>
<td>10.5</td>
<td>23.0</td>
</tr>
<tr>
<td>tram</td>
<td>10.1</td>
<td>25.0</td>
</tr>
<tr>
<td>metro</td>
<td>23.7</td>
<td>42.4</td>
</tr>
<tr>
<td>train</td>
<td>12.2</td>
<td>51.3</td>
</tr>
<tr>
<td>bus</td>
<td>10.5</td>
<td>23.1</td>
</tr>
</tbody>
</table>
Conclusion

- A harmonised way of assessing access to public transport and services' performance
- Gives an internationally comparable method of assessment
- Shows substantial differences in accessibility and network performance between cities
- Can be used to benchmark cities, to simulate the effect of planned investments or network performance enhancements
Challenges

- Timeliness and spatial resolution of population and employment distribution data
- A more harmonised implementation of public transport data standards
- Availability of open data (timetables), data licensing policy
- Need for better links between public transport data, INSPIRE data models and EU-wide rail data models (Eurostat, ERA: RINF)
References

- General Transit Feed Specification: [https://developers.google.com/transit/gtfs/](https://developers.google.com/transit/gtfs/)
- Eurostat GEOSTAT project: [http://ec.europa.eu/eurostat/web/gisco/geostat-project](http://ec.europa.eu/eurostat/web/gisco/geostat-project)