



Enhancing indicators on urban public transport in combination with geostatistics

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# Harmonised indicators on European cities?

- EU-OECD definition of cities
- Eurostat city statistics (Urban Audit)
- Copernicus Urban Atlas land use data
- EFGS GEOSTAT population grid (1 km<sup>2</sup>)
- But: comparable indicators on public transport in urban areas remain problematic...



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## Aim of the analysis

- 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
  - City definitions
  - Spatial distribution of population





#### Measuring access to public transport: input data

- Location of all public transport stops
- Timetables of services: 2 groups:
  - bus and tram
  - train and metro
- Population per building block based on:
  - detailed population grids
  - census tracts
  - neighbourhood statistics
  - plus disaggregation using land use data and/or imperviousness if needed







#### Timetables: General Transit Feed Specification model





## **Location of stops**





#### Stockholm



## Average stops an hour from 6:00 to 20:00 on a normal week day







### Service areas around stops

- Stops near to each other are clustered
  - stops at both sides of a street; bus stations
  - sum of available departures per cluster
- Service areas
  - 5 minutes walking distance for bus and tram
  - 10 minutes for train and metro
  - created using comprehensive street network, accessible to pedestrians







#### **Frequency classes**

- Number of departures per service area
  - In overlapping areas: maximum value of the overlapping service areas
- Frequency classes of departures
  - High: > 10 departures an hour
  - Medium: more than 4 but less than 10 an hour
  - Low: less than 4 an hour
  - Null: no public transport stops within walking distance





## **Typology of frequency classes**

Very high	Access to more than ten departures an hour for both medium- and high-speed modes
High	Access to more than ten departures an hour for one mode, but not both
Medium	Access to between four and ten departures an hour on one or both modes, but no access to more than ten departures and hour
Low	less than four departures an hour for one or both modes, but no access to more than four departures an hour
Null	No access within walking distance





### **Population distribution**

#### Urban Atlas: land use



#### Population by block





### **Urban centre versus administrative city**







## **Stockholm: areas and population by access to public transport and its frequency**





and urban











#### Population density, job density and typology of frequencies

Population density (250x250 m cell size)





Dublin

Job density (workplace-based employment) (250x250 m cell size)









#### Population distribution and number of departures in large cities\*



Y% of population has access to more than X departures an hour and urban

\* cities: defined as urban centres



#### Population distribution and number of departures in mid-size cities\*



Y% of population has access to more than X departures an hour and urban

\* cities: defined as urban centres



Regional and urban

#### Median number of departures an hour

- Number of departures to which 50% of the urban population has easy access
  - Varies between 7.4 and 28.3 departures in bigger cities
  - Between 3.5 and 20.2 in medium-sized cities





#### Conclusion

- A harmonised way of assessing access to public transport and services' performance
- Gives an internationally comparable method of assessment
- Could also be used to develop regional indicators
- Uses quite big data: millions of departures, thousands of bus, tram, train and metro stops





### Challenges

- Timeliness and spatial resolution of population distribution data
- Spatial distribution of employment data
- A more harmonised implementation of public transport data standards
- Documentation and conversion of data according to national standards
- Availability of open data (timetables), data licensing policy
- (Performance of) origin/destination modelling





## **Forthcoming analysis**

- Measuring frequency and speed of the services (by mode) inside the cities
- Origin/destination modelling
- Assess connectivity between cities by rail





#### Sources

- Delineation of cities: EC-OECD city definition
- Population distribution: national statistical institutes, GEOSTAT 2006 grid
- Copernicus Urban Atlas 2006 land use data
- Road network: TomTom MultiNet
- Public transport data:
  - BE: VVM De Lijn, STIB-MIVB, SRWT-TEC, NMBS-Infrabel;
  - CZ (Praha): urban transport: <u>www.infoprovsechny.cz</u>; DK: Rejseplanen.dk;
  - EE: <a>www.peatus.ee</a>; IE: dublinked.ie;
  - FR: open data portals of cities/départements and of SNCF;
  - IT (Torino): open data Torino; NL: OV-9292; PL (Szczecin): ZDITM;
  - FI: <u>www.matka.fi</u>, HSL; SE: <u>www.trafiklab.se</u>;
  - UK: Data.gov.uk (NapTAN and NPTDR);
  - various cities: <u>http://www.gtfs-data-exchange.com/agencies</u>; Die Bahn; station locations from EuroRegionalMap (EuroGeographics)





#### References

- Eurostat city statistics (Urban Audit): <u>http://ec.europa.eu/eurostat/web/cities/overview</u>
- Copernicus Urban Atlas: <u>http://land.copernicus.eu/local/urban-atlas</u>
- European Forum for Geography and Statistics: <u>http://www.efgs.info/</u>
- Eurostat GEOSTAT project: <u>http://ec.europa.eu/eurostat/web/gisco/geostat-project</u>
- Population estimates for the Urban Atlas polygons: <u>http://publications.jrc.ec.europa.eu/repository/bitstream/11111111111/30408/1/</u> <u>qms h08 intesa deliverable 2 2 eur 26437.pdf</u>
- Cities in Europe: the new OECD-EU definition: <u>http://ec.europa.eu/regional\_policy/sources/docgener/focus/2012\_01\_city.pdf</u>
- General Transit Feed Specification: <u>https://developers.google.com/transit/gtfs/</u>



## **Questions**?

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