Towards indicators of proximity to services in Europe's major cities

Enhancing the analytical use of the GMES Urban Atlas in combination with population distribution data

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Research questions

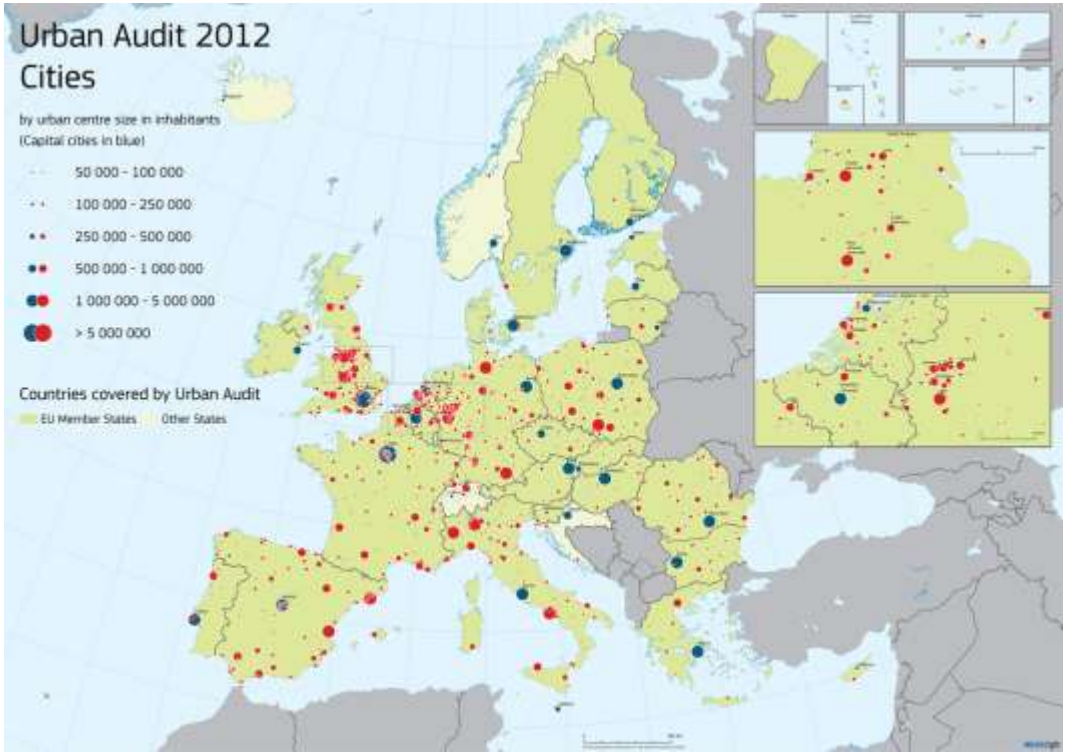
- *How does the population distribution inside cities relate to services of facilities, like green urban areas, or public transport?*
- *Develop harmonised indicators based on centrally available geo-referenced information on urban areas*
- *How to summarise detailed information within cities to produce city-wide indicators?*

Basic data sources

- *Data sources need to inform about:*
  - **Definition and extent of the cities**
  - **Land use categories in cities**
  - **Detailed population distribution**
  - **Urban street network**
  - **Points of interest, e.g. related to public transport**

Definition of cities

- *EC Urban Audit defines Cities, Greater Cities and Larger Urban Zones*
  - **Revised definition (2011), using grid-based population distribution data**

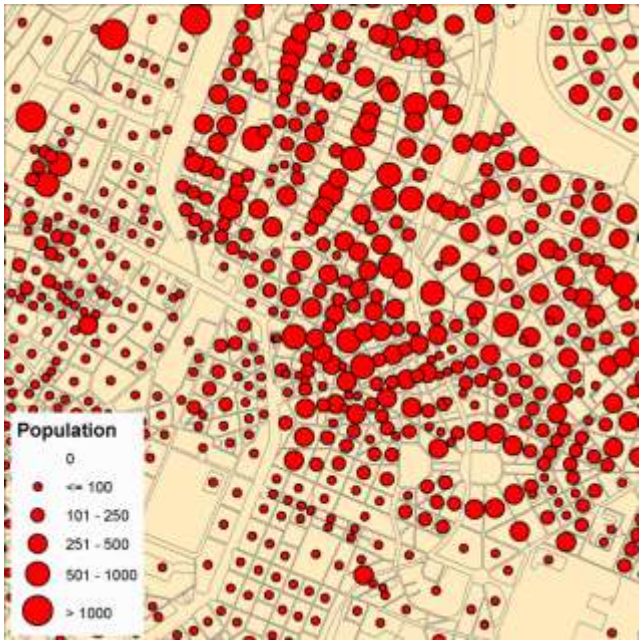


Land use in urban areas

- *GMES Urban Atlas*
  - **Land use/cover data (reference year 2006 +- 1 year) for 305 Larger Urban Zones**
  - **More thematic detail in urban areas and higher resolution than CORINE Land Cover**

Population distribution

- *Detailed population distribution inside the city*
- *Register-based (bottom-up) population grids, at the highest available resolution*
  - **Or: boundaries of census tracts + related population**
  - **Alternatively: LAU2 population figures**
- *Population data are distributed by Urban Atlas polygon*
  - **Estimated population figure per polygon**



Urban street network

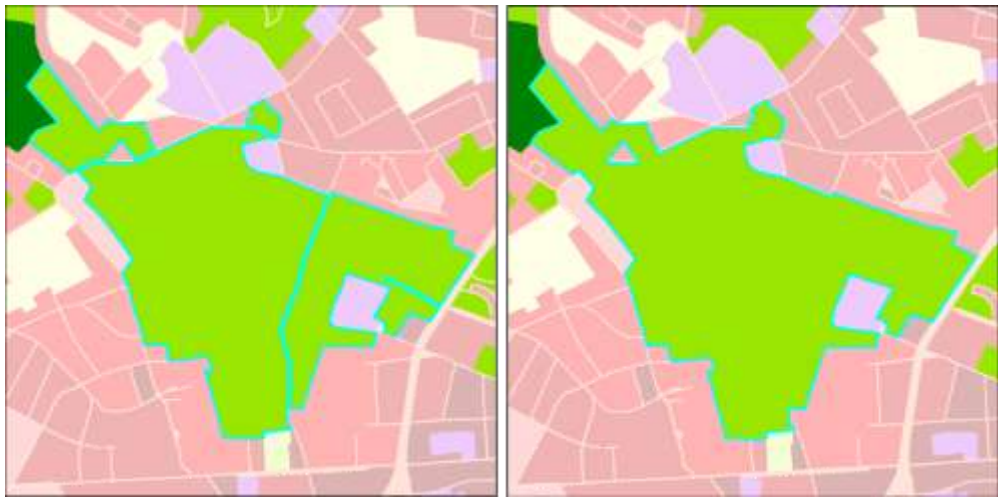
- *Complete road network in urban areas*
- *Compatible with the Urban Atlas polygons*
- *Containing attribute information on the accessibility for pedestrians (i.e. exclusion of urban motorways etc.)*

Proximity of green urban areas: methodology

- *Identify the location and the surface of green urban areas*
- *Determine accessibility zones for pedestrians, starting from inhabited Urban Atlas polygons*
- *Calculate the surface of green areas which can be reached within the accessibility zones*
- *Summarise the proximity indicator at city or neighbourhood level*

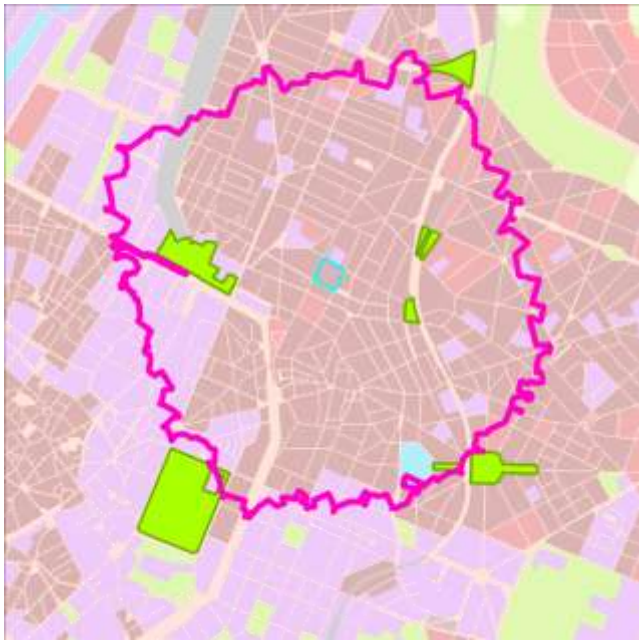
Green urban areas

- *Urban Atlas "green urban atlas" (class 1.4.1) + "forests" (class 3)*
- *Bigger parks are often split by paths, but should be considered as one entity*
- *Assemble the bigger parks by removing the intersecting paths*
- *Calculate the total surface of each green urban area*



Accessibility zones for populated areas

- *Selection on the street network: omitting the roads without pedestrian access*
- *An accessibility area is calculated around each populated Urban Atlas polygon, using the street network, and corresponding to 15 minutes of walking time.*



Available green urban areas

- *For each inhabited Urban Atlas polygon, we sum the surface of the green urban areas which can be reached within 15 minutes of walking*
- *Total surface of available green areas becomes an attribute of the inhabited Urban Atlas polygons*
- *City average: population-weighted average available surface within 15 minutes walking time*

$$\frac{\sum (GUA\_surface * population)}{\sum population}$$

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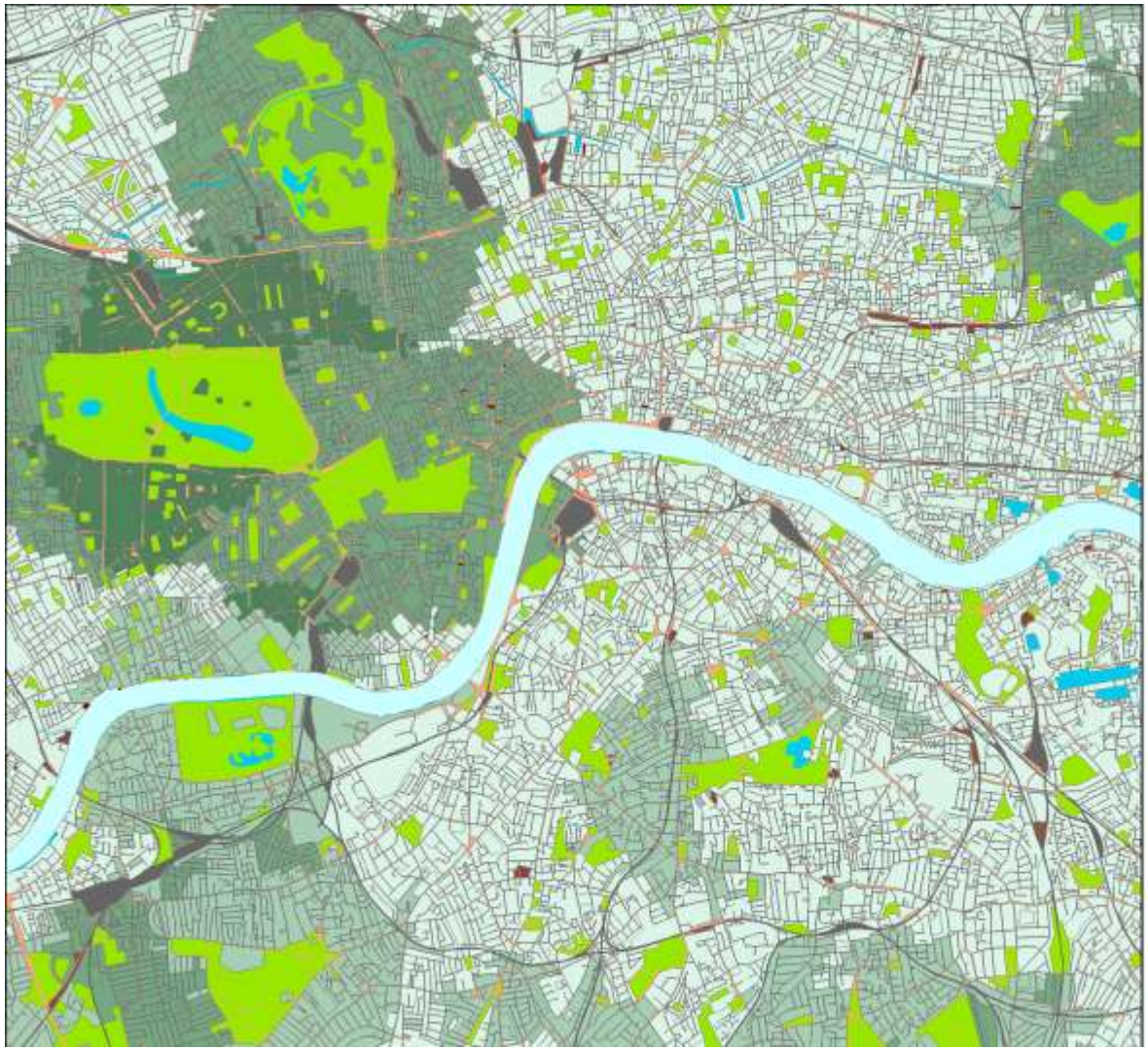


Accessibility to green urban areas

London

m²

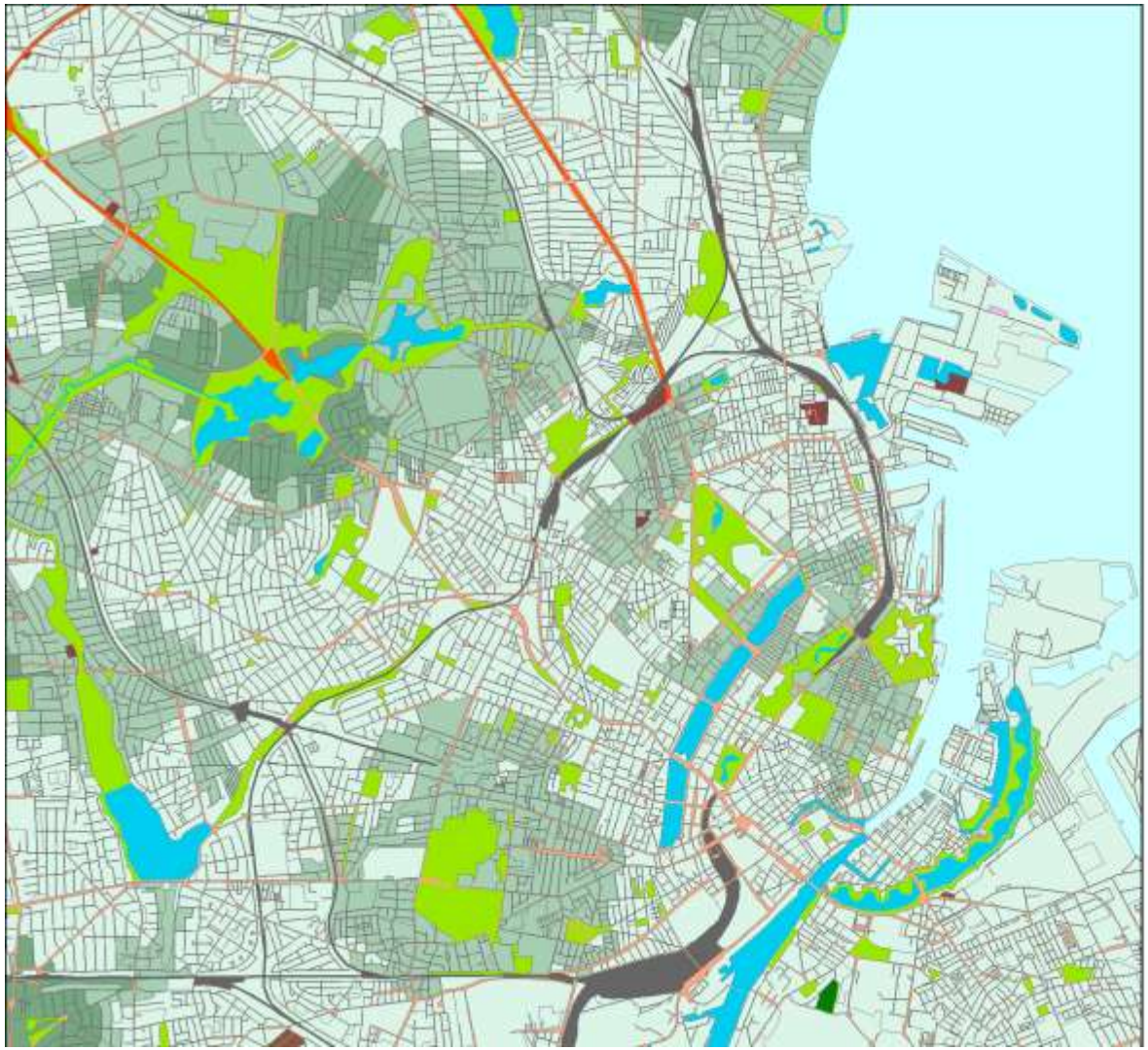
- 0 - 500000
- 500001 - 1000000
- 1000001 - 2500000
- 2500001 - 5000000
- > 5000000

Sources: JRC, SIRS, DG REGIO

0 2 Km

REGIOgis

European Commission



Accessibility to green urban areas

Copenhagen

m²

- 0 - 500000
- 500001 - 1000000
- 1000001 - 2500000
- 2500001 - 5000000
- > 5000000

Sources: JRC, SIRS, DG REGIO

0 2 Km

REGIOgis

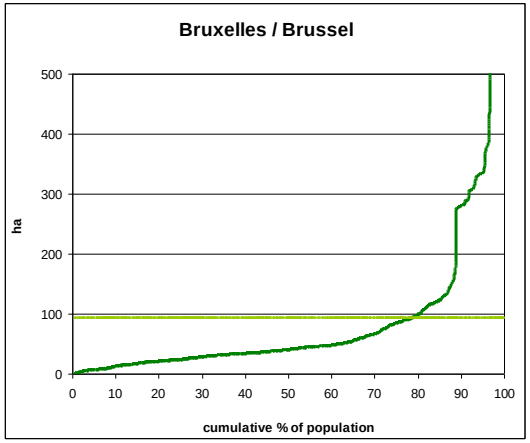
Results for selected Urban Audit cities/ greater cities

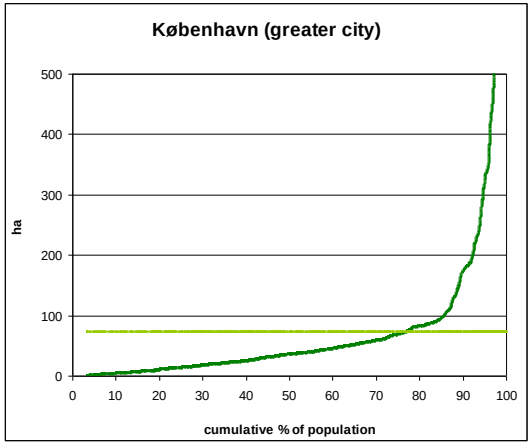
- *Surface of green urban areas, close to population*

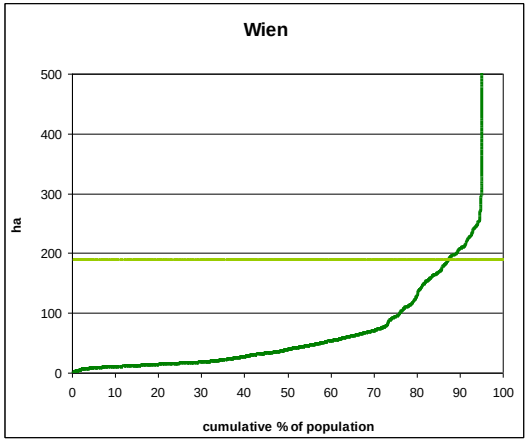
	Average	Median	% of pop. close to less than 2 ha
Brussels	92.9 ha	40.3 ha	1.3 %
Copenhagen (greater city)	72.6 ha	36.1 ha	5.8 %
Vienna	189.5 ha	39.0 ha	0.4 %
Ljubljana	2391.8 ha	212.0 ha	12.2 %
Stockholm (greater city)	79.4 ha	51.2 ha	0.2 %
London (greater city)	61.3 ha	31.0 ha	4.2 %

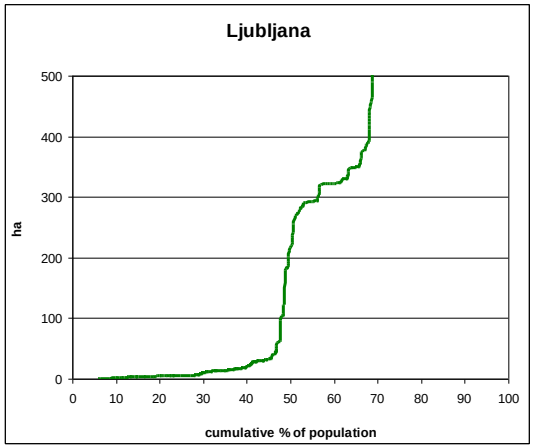
- *Averages hide considerable differences in distribution throughout the cities*

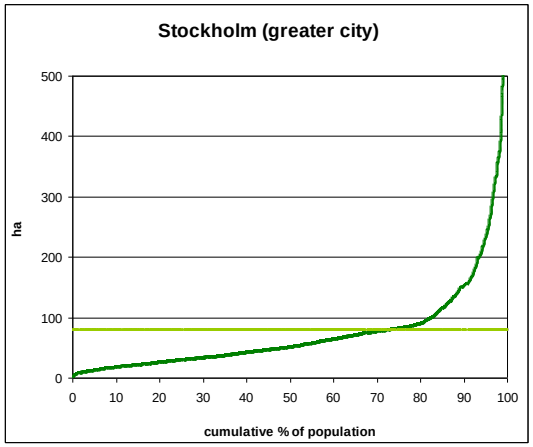
Green urban areas and population distribution

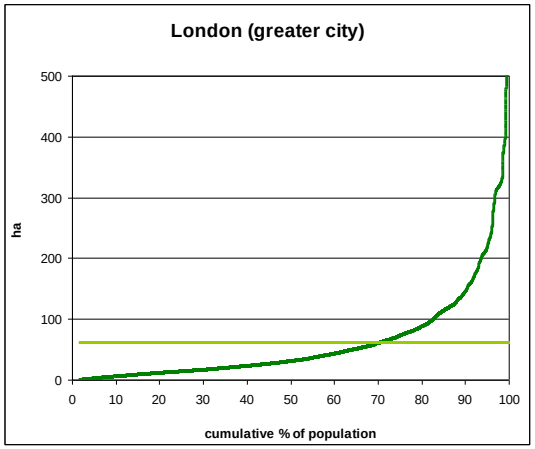












Proximity to public transport

How many people live at walking distance of public transport access points?

- **Railway stations, metro and suburban rail: 10 minutes walking time**
- **Tram stops: 5 minutes walking time**
- **Bus stops: no complete nor reliable information available in a systematic way = not taken into account in this analysis**

Basic public transport data

Data availability has been checked for capital cities and additional major cities:

Railway stations, suburban rail and metro stations: TeleAtlas MultiNet

But: classification issues distinguishing between rail/suburban rail and between suburban rail/metro: definitions can vary from one city to another

Tram stops: OpenStreetMap

Possible issues of completeness, timeliness, comparability?

Methodology (1)

Define accessibility areas around public transport access points, using walking time via the street network

Areas of different categories considered separately or combined

All categories

Methodology (2)

Overlay these areas with the populated Urban Atlas polygons, and calculate the population living close to the access points

Express the proximity as % of total population (at city level, at the level of neighbourhoods, or in relationship to distance from city centre)

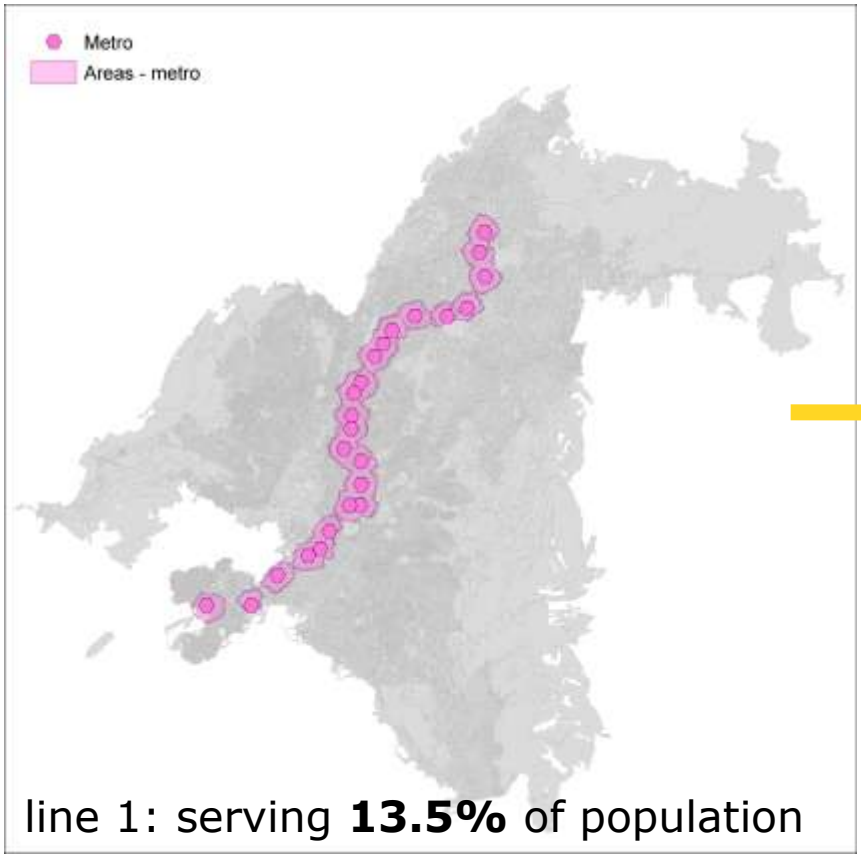
Results for selected Urban Audit cities / greater cities

% of population within walking distance from stations and stops

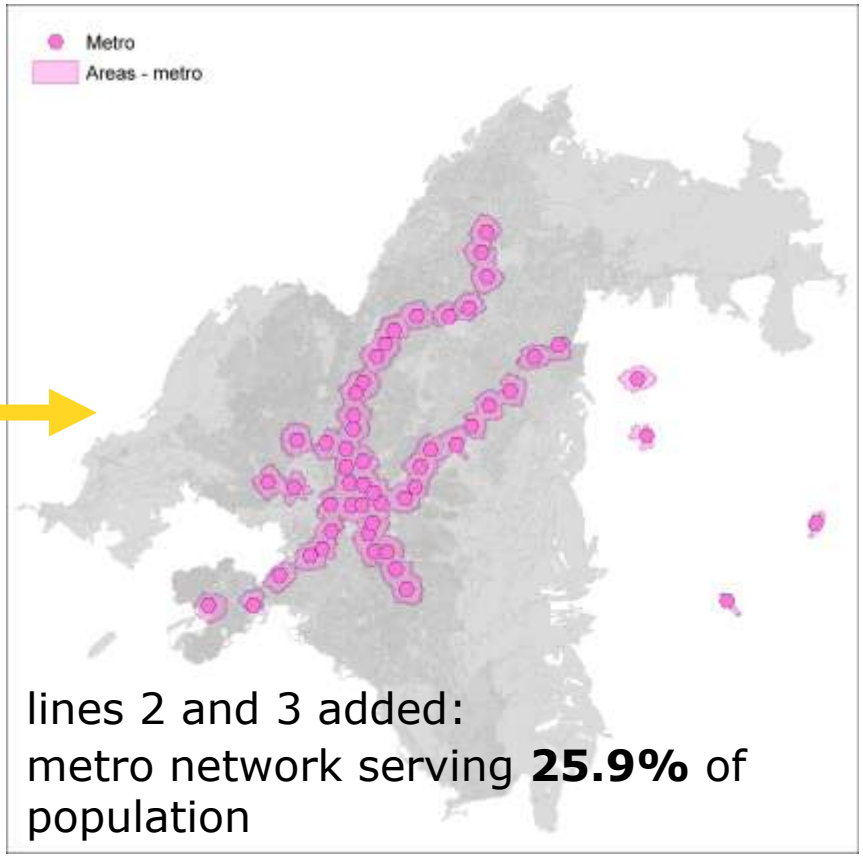
	Rail, suburban rail and metro	Incl. tram
Brussels	52.6	74.9
Berlin	41.1	48.9
Prague	25.7	36.1
Athens	28.0	28.0
Madrid	81.6	81.6
Lisbon*	23.5	23.9
London*	47.2	47.5

** greater city*

Athens: effect of additional metro lines



line 1: serving **13.5%** of population

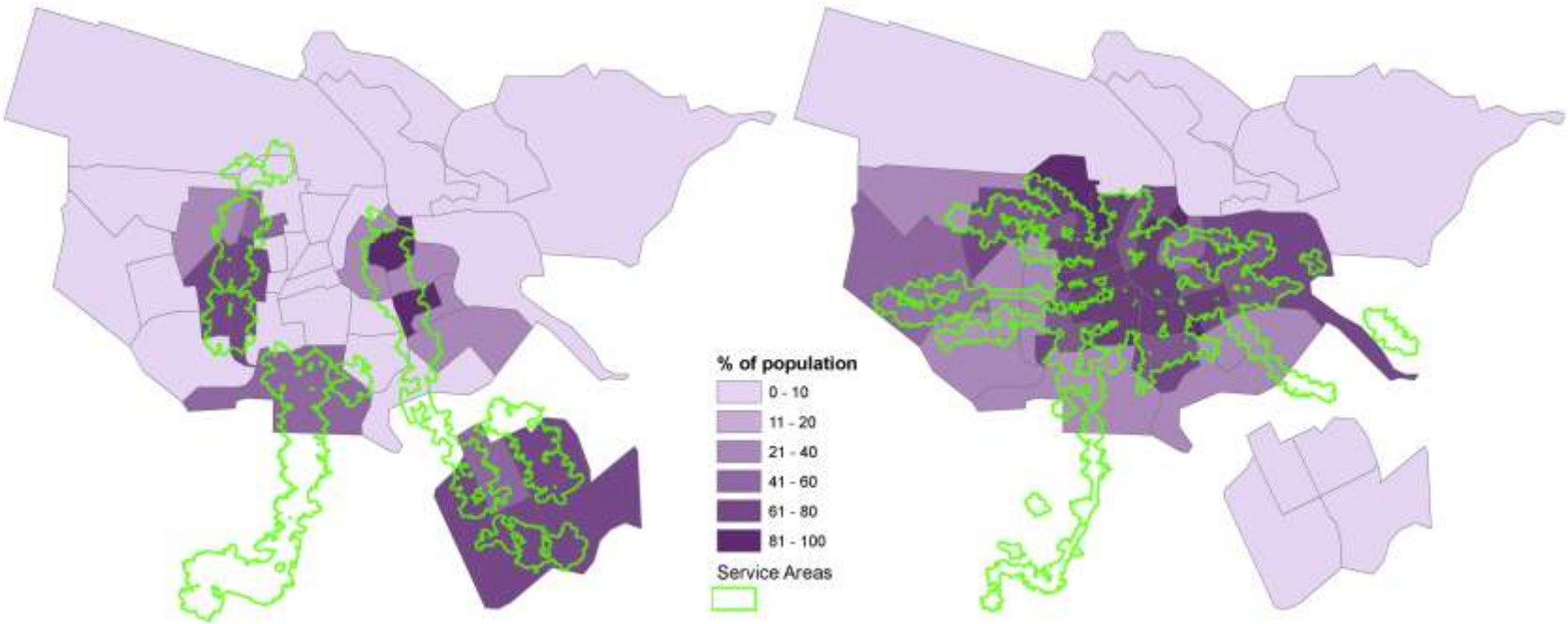


lines 2 and 3 added:
metro network serving **25.9%** of population

Amsterdam: results per neighbourhood

Metro

Tram



Some conclusions (1)

- *Quality of population estimates matters*
  - **Depending on the resolution of the input data**
  - **Strong case for the use of bottom-up population counts**
- *City averages depend on administrative boundaries: alternative, more neutral aggregates, like "urban centres" (= grid-based clusters of high population density) can also be used*

Some conclusions (2)

- *Green urban areas: some other Urban Atlas classes, like sports and leisure facilities may also be relevant*
  - **Refinement of the Urban Atlas typology foreseen for the next production round (2012-2013)**
- *Information on public transport access points still to be improved to enable meaningful analysis on an extended number of cities*

Thanks to…

- *Filipe Batista (JRC) and Veerle Martens (SIGGIS) for the development of the population distribution algorithm*
- *Veerle Martens and Jenny Segers (SIGGIS) for the development of the proximity algorithms*
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