

# Towards enhanced urban indicators using Europe-wide geospatial data

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# Overview

- Implementing harmonised concepts
- Geospatial data sources and derived indicators
  - Urban Atlas
  - Global Human Settlement Layer
  - AIRBASE
  - Green urban areas
  - Passenger flights
  - Urban public transport
- Opportunities and challenges

# Harmonised concepts

- Implementation of the EC-OECD harmonised definition of urban areas
  - Eurostat Urban Audit
  - Copernicus Urban Atlas
  - EEA use cases
  - Future changes implemented by Eurostat in co-operation with the national statistical institutes

# Defining urban areas in Europe

Three levels of urban areas based on population distribution and commuting

## Grid level

A classification of raster cells of 1 km<sup>2</sup> using criteria of population density and contiguity. Where available, the population distribution is derived from registers. Elsewhere, it is downloaded from local (LAU2) population figures.



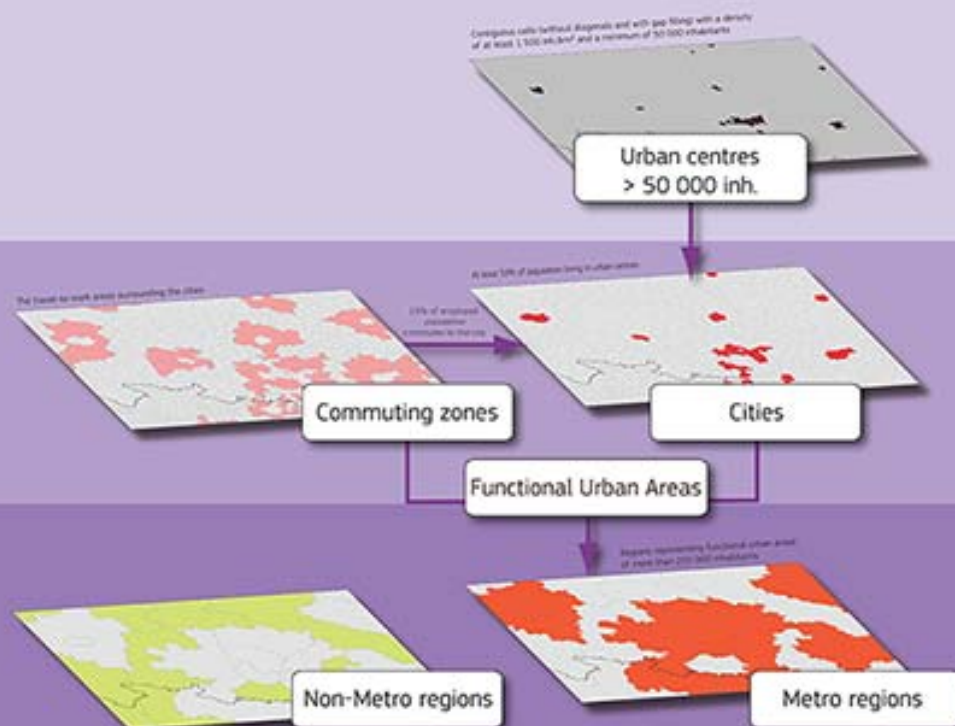
## LAU2 level

A classification of local administrative units (LAU2) based on the share of population living in urban centres and the share of population commuting to a city.



## NUTS 3 level

A typology of NUTS 3 regions based on the share of regional population living in a city and its commuting zone (i.e. Functional Urban Area) of more than 250 000 inhabitants.



These typologies have been developed by DG Regional and Urban Policy in co-operation with DG Agriculture and Rural Development, Eurostat, DG Joint Research Centre and OECD.

Data sources: Eurostat, DG JRC, national statistical institutes, EFGS

Regional  
and Urban  
Policy

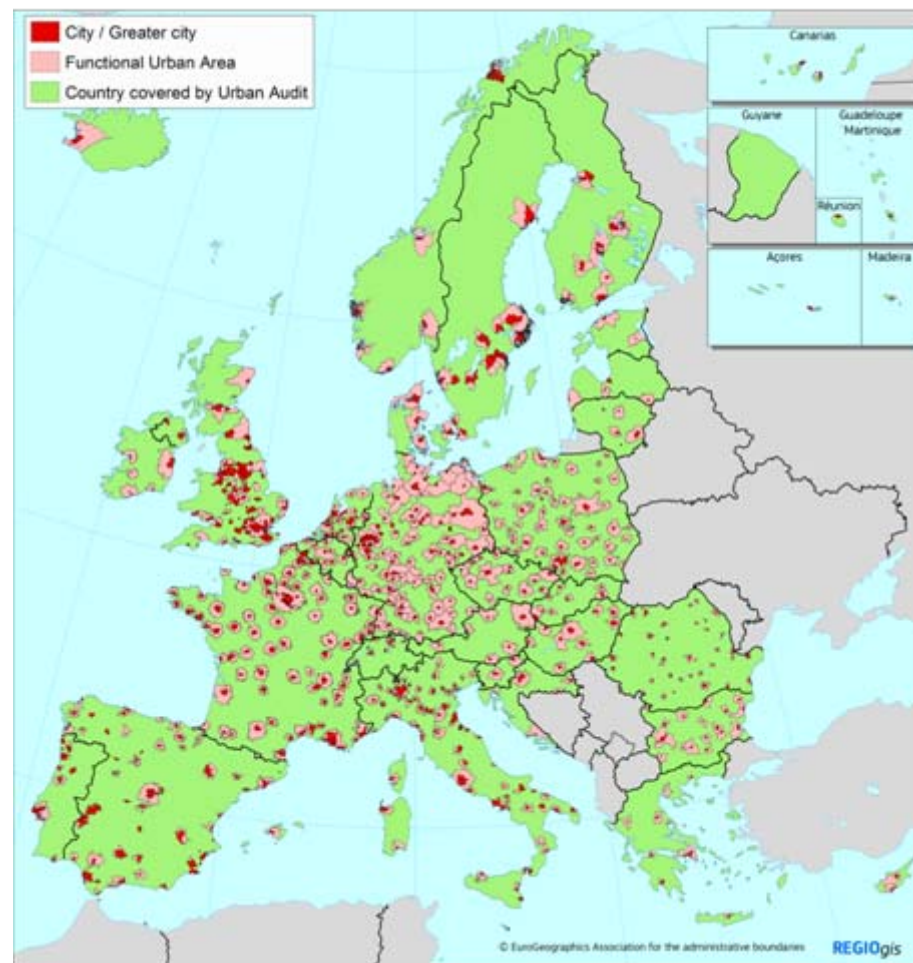
For more information:

• European cities: [http://ec.europa.eu/eurostat/european\\_cities\\_exposed/index.php/european\\_cities\\_-\\_spatial\\_dimension](http://ec.europa.eu/eurostat/european_cities_exposed/index.php/european_cities_-_spatial_dimension)  
• Metro regions: [http://ec.europa.eu/eurostat/european\\_cities\\_exposed/index.php/european\\_cities\\_-\\_metro\\_regions](http://ec.europa.eu/eurostat/european_cities_exposed/index.php/european_cities_-_metro_regions)  
• Cities in Europe: The new OECD-EC definition [http://ec.europa.eu/eurostat/european\\_cities\\_exposed/index.php/european\\_cities\\_-\\_cities\\_in\\_europe](http://ec.europa.eu/eurostat/european_cities_exposed/index.php/european_cities_-_cities_in_europe)

# Urban Audit

- Eurostat regular data collection on all cities with an urban centre of at least 50,000 inh.
- Also greater cities and Functional Urban Areas

## Cities, Greater Cities and Functional Urban Areas

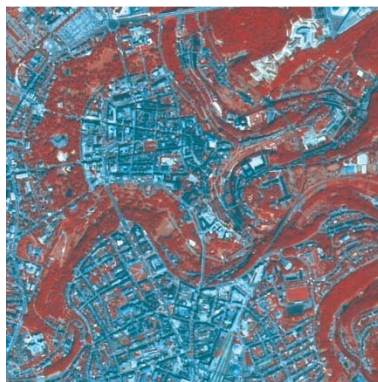




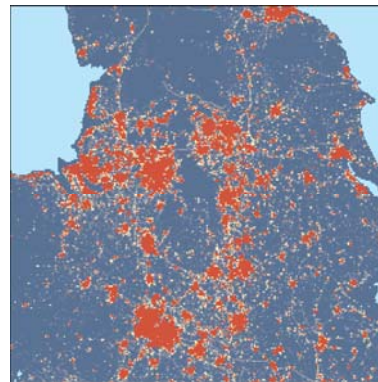
# The Urban Atlas: harmonised and detailed land use data

- A Copernicus land monitoring service
- Comparable, high-resolution land use datasets for European cities and their surroundings, based on:

Satellite  
imagery



Imperviousness  
(soil sealing)



Road  
network



European Environment Agency

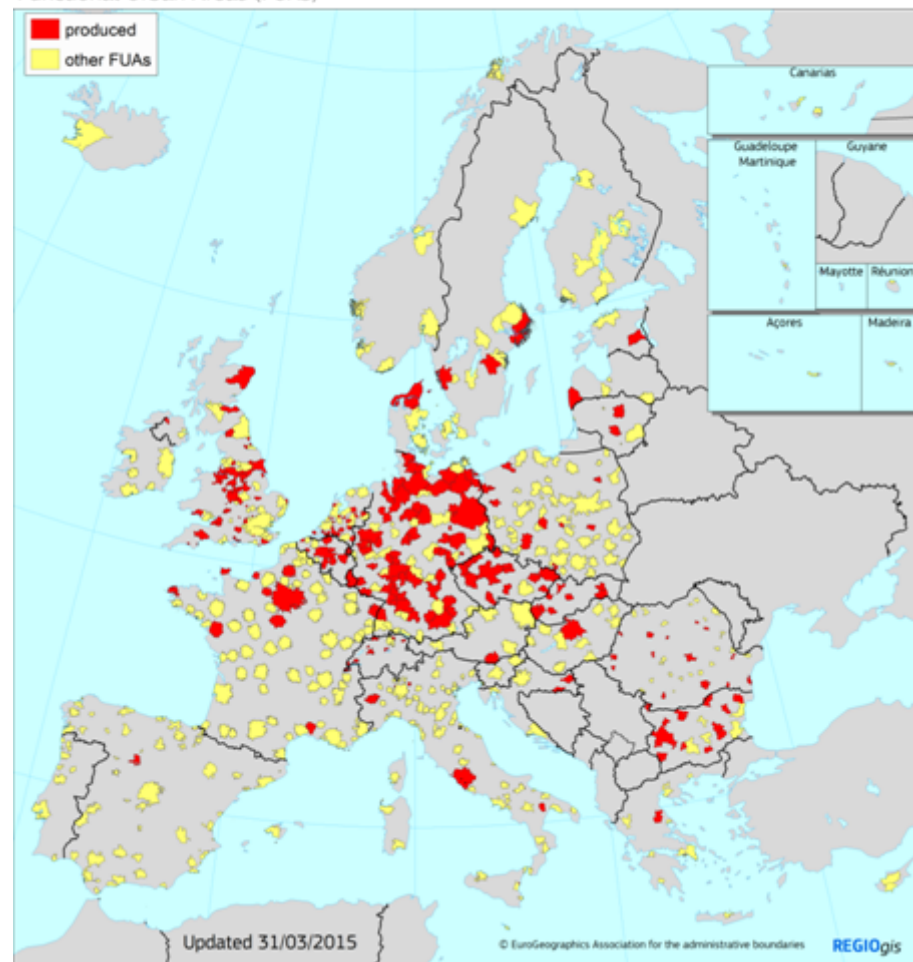


# Urban Atlas 2012

- All cities according to the EC/OECD definition, and their functional urban areas
- EU28 + EFTA countries
- Data dissemination forthcoming via EEA website

## Urban Atlas 2012 production status

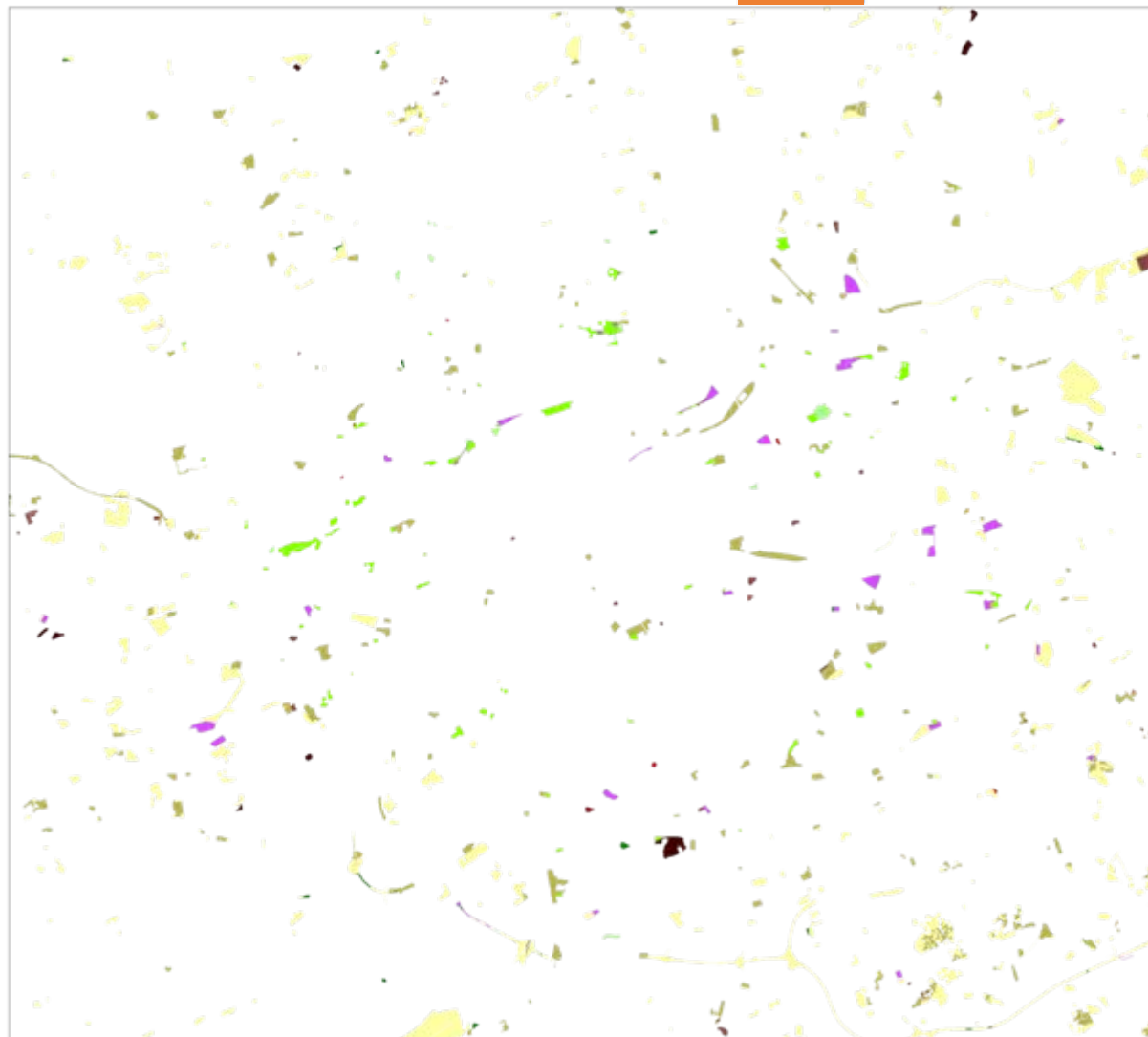
Functional Urban Areas (FUAs)







## Praha: Land use changes 2006 - 2012

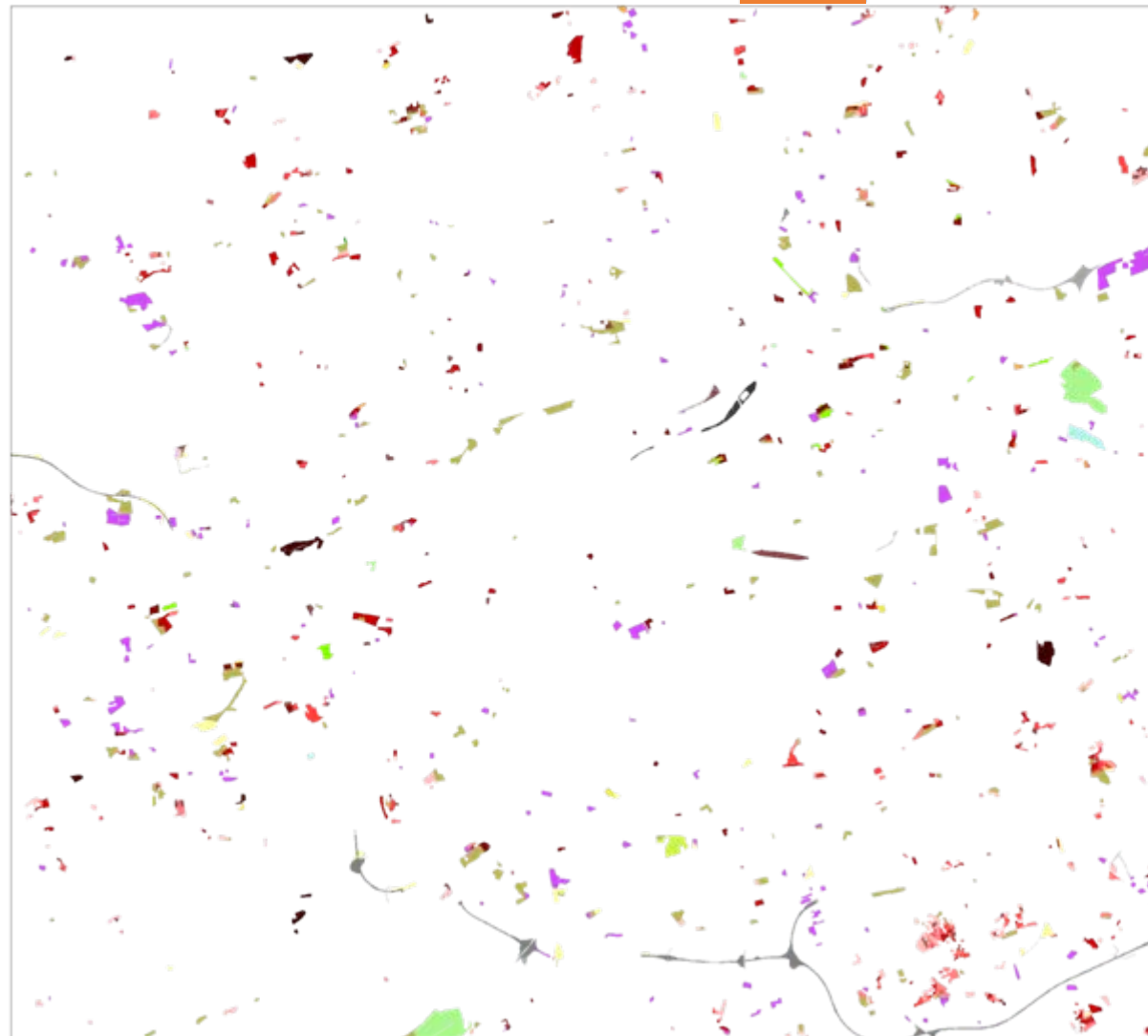


### Changes (land use 2006)

- Continuous urban fabric
- Discontinuous dense urban fabric
- Discontinuous medium density urban fabric
- Discontinuous low density urban fabric
- Discontinuous very low density urban fabric
- Isolated structures
- Industrial, commercial, public, military and private units
- Fast transit roads and associated land
- Other roads and associated land
- Railways and associated land
- Port areas
- Airports
- Mineral extraction and dump sites
- Construction sites
- Land without current use
- Green urban areas
- Sports and leisure facilities
- Agricultural areas
- Forests and semi-natural areas
- Wetlands
- Water bodies

Source: Copernicus Urban Atlas

## Praha: Land use changes 2006 - 2012



### Changes (land use 2012)

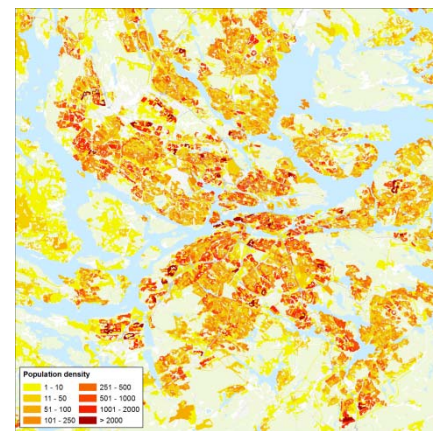
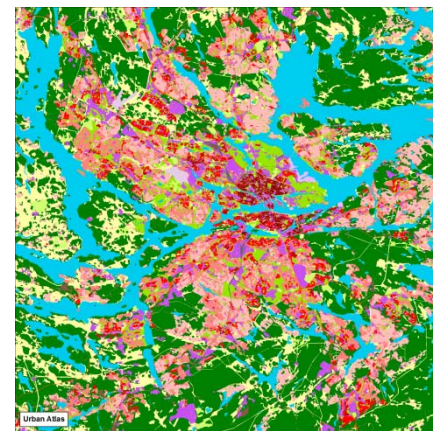
- Continuous urban fabric
- Discontinuous dense urban fabric
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- Isolated structures
- Industrial, commercial, public, military and private units
- Fast transit roads and associated land
- Other roads and associated land
- Railways and associated land
- Port areas
- Airports
- Mineral extraction and dump sites
- Construction sites
- Land without current use
- Green urban areas
- Sports and leisure facilities
- Arable land (annual crops)
- Permanent crops
- Pastures
- Complex and mixed cultivation patterns
- Forests
- Herbaceous vegetation associations
- Open spaces with little or no vegetations
- Wetlands
- Water bodies

Source: Copernicus Urban Atlas



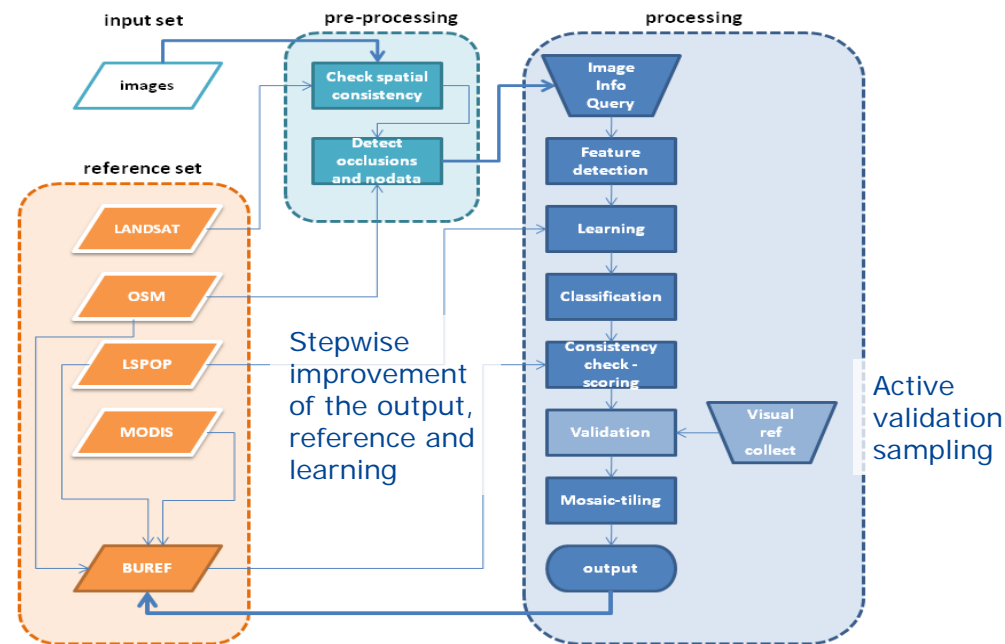
# Urban Atlas derived indicators

- Population estimates per polygon
  - Method applied to Urban Atlas 2006 data
  - Version 2012 forthcoming as Urban Atlas and input population data availability progresses
- Summary indicators on changes in land use
  - For all areas mapped by Urban Atlas 2006
  - Land consumption per capita



# Detecting settlements and buildings

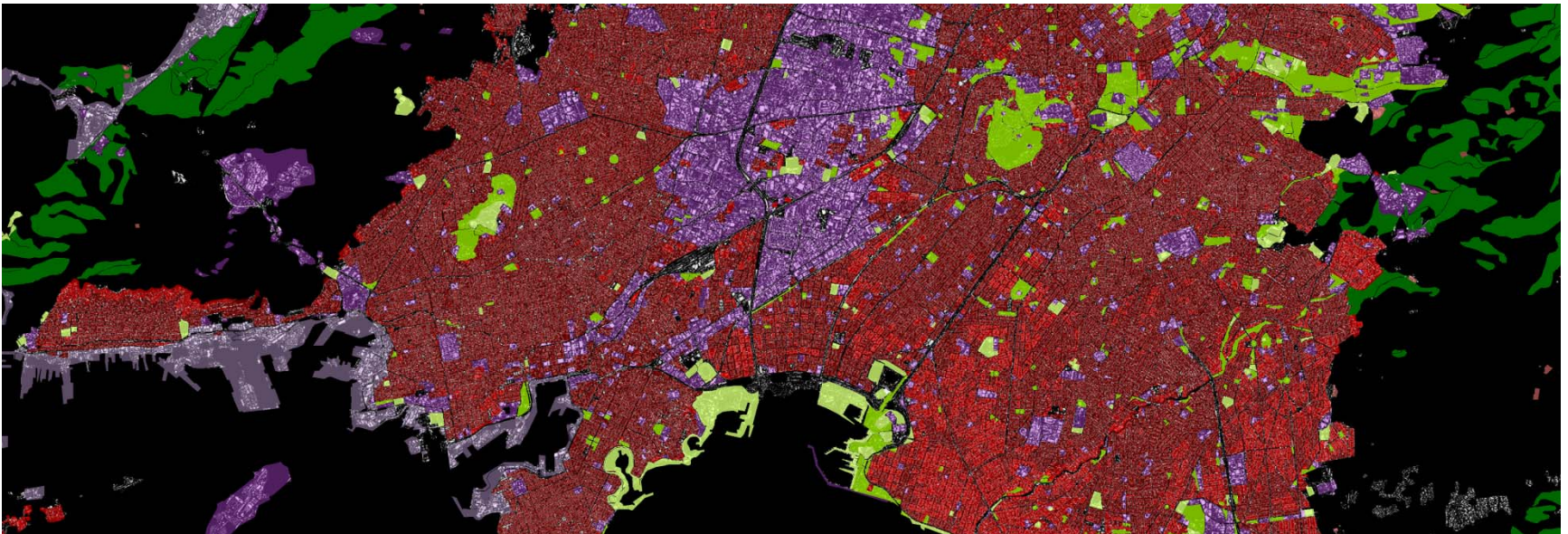
- JRC GHSL (Global Human Settlements Layer)
  - Settlement and building patterns derived from satellite imagery by means of automatic image information retrieval
  - <http://ghslsys.jrc.ec.europa.eu/>





# GHSL in Europe

- building probabilities at 10 m raster resolution
- 100 m version disseminated by Copernicus Land Monitoring Services



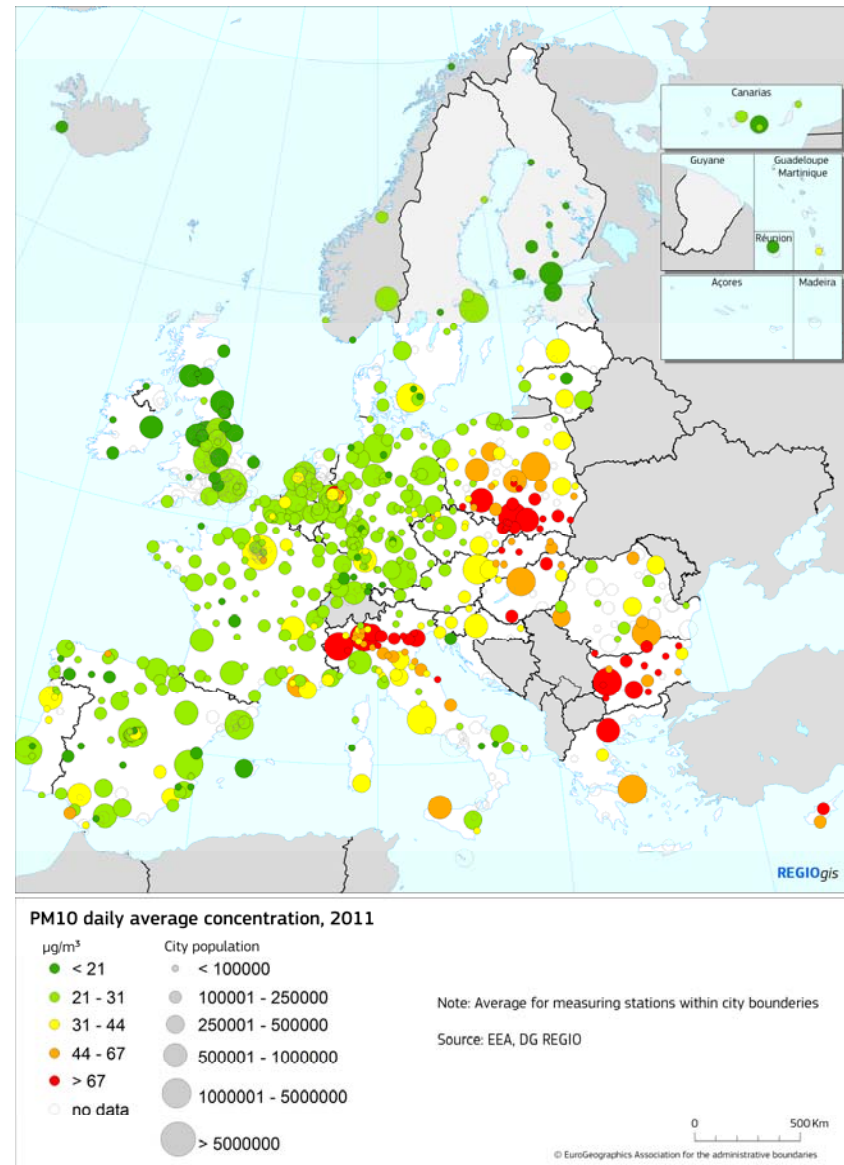


# GHSL based analysis

- Improved methods for population downscaling to 100 m grid and to Urban Atlas polygons
- Settlement typology, focusing on small towns, suburban areas and villages (complementing the EU/OECD city definition)
- Change in settlement types; change in urban morphology (pending validation of time series GHSL)

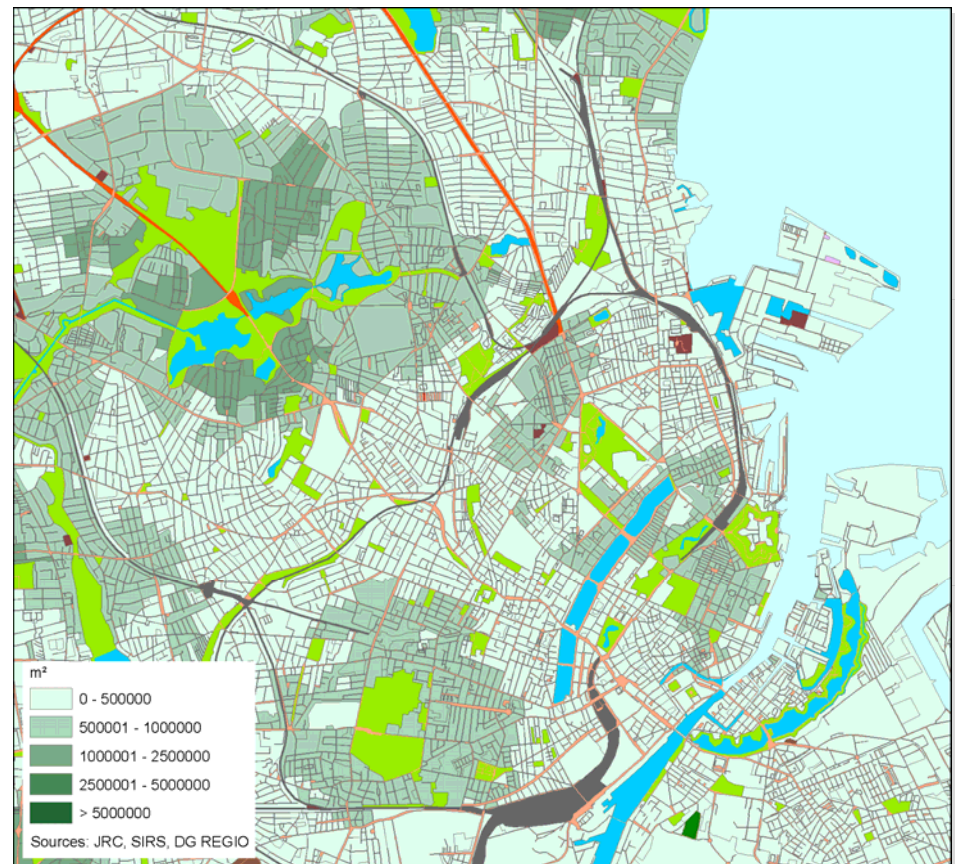
# Environmental indicators

- City aggregates of air quality data
- AIRBASE measurement data aggregated by urban centre / city / greater city



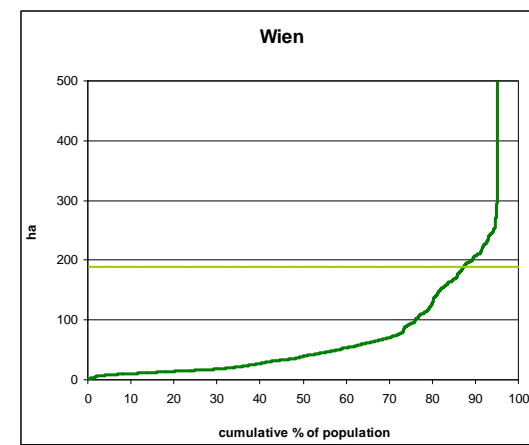
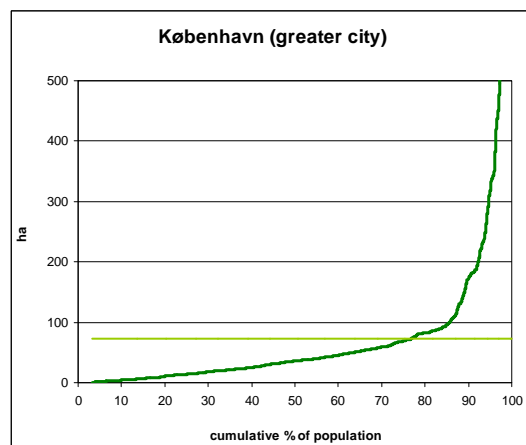
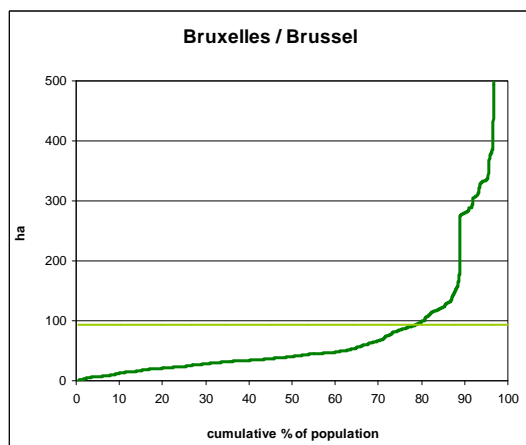
# Access to green urban areas

- Assessing the amount of green urban areas (m<sup>2</sup>) within walking distance
- Evaluated at the level of Urban Atlas polygons



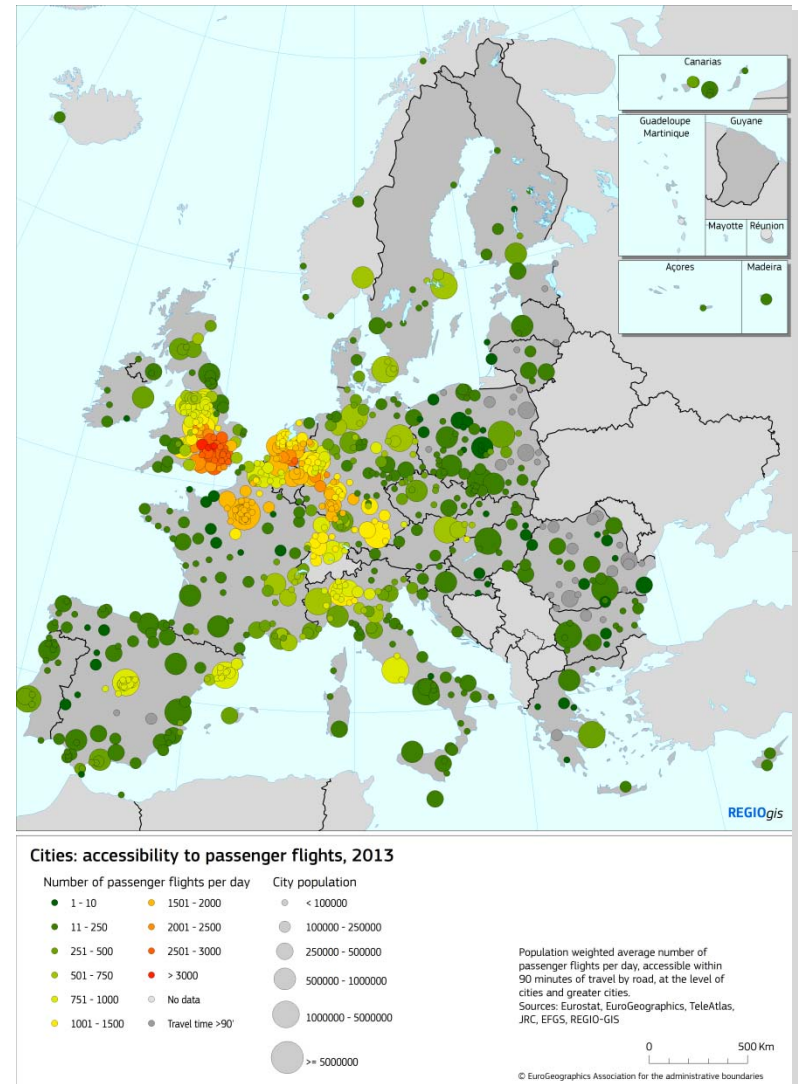
# Green urban areas

- Aggregated indicators at city level, taking into account the spatial population distribution
- Will be implemented on all cities using Urban Atlas 2012 data



# Accessibility to passenger flights

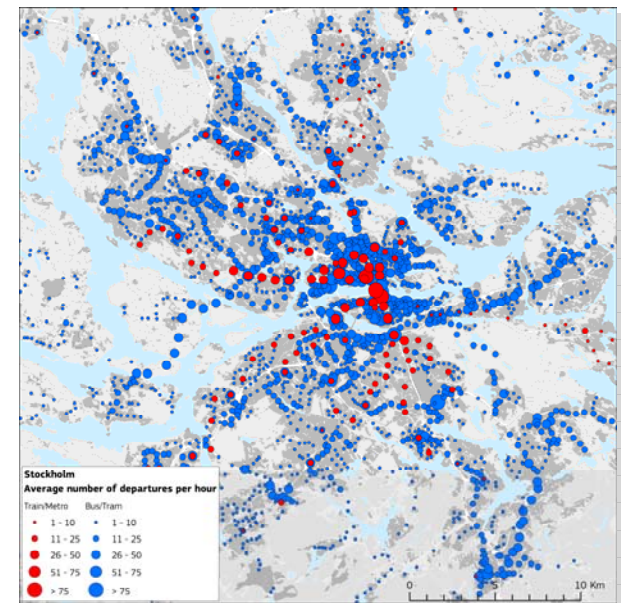
- Population-weighted indicator of number of passenger flights available within 90 minutes by car
- Aggregated by city / FUA / region
- Based on Eurostat yearly data by airport





# Public transport in urban areas

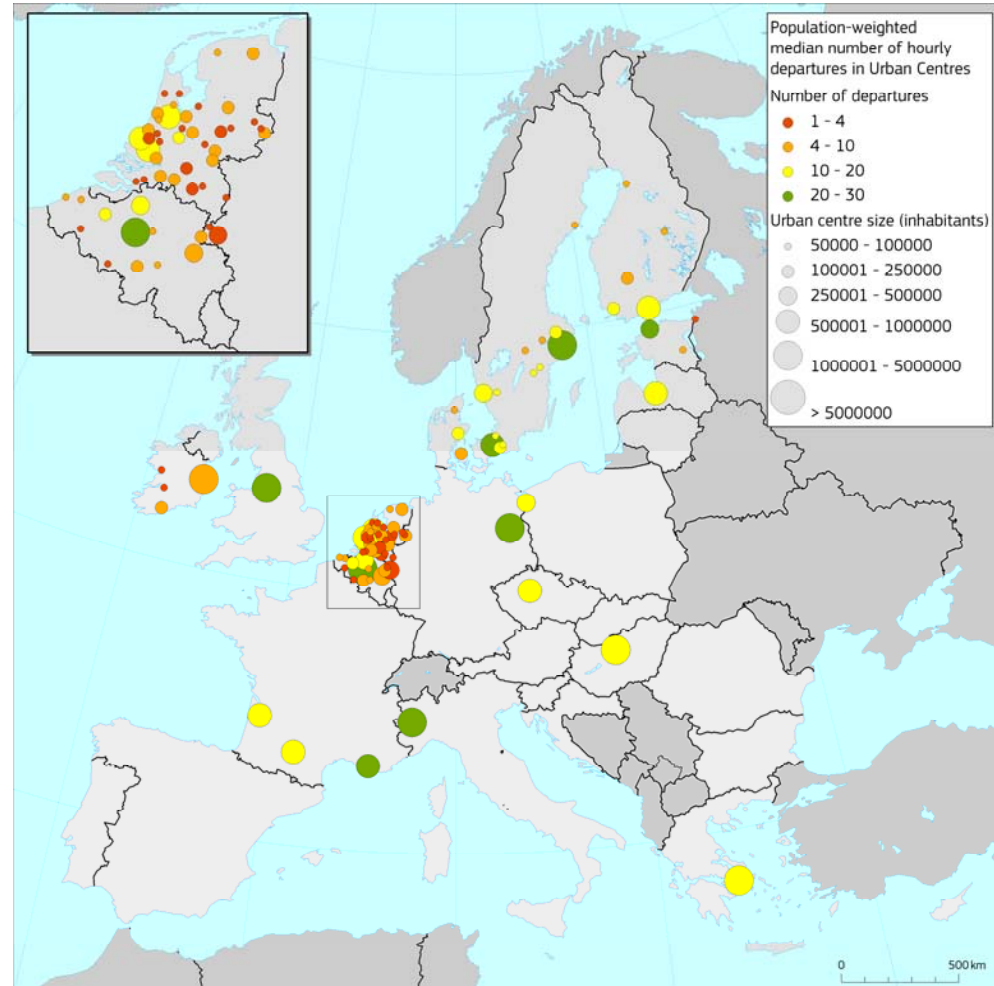
- Developing comparable indicators based on harmonised data and concepts
  - Timetable data bus / tram / metro / rail
  - Urban delineations
  - Comprehensive street network
  - Very detailed population distribution
  - Optionally: detailed employment distribution





# Accessibility to public transport

- Median number of departures an hour
  - Number of departures to which 50% of the urban population has access within walking distance

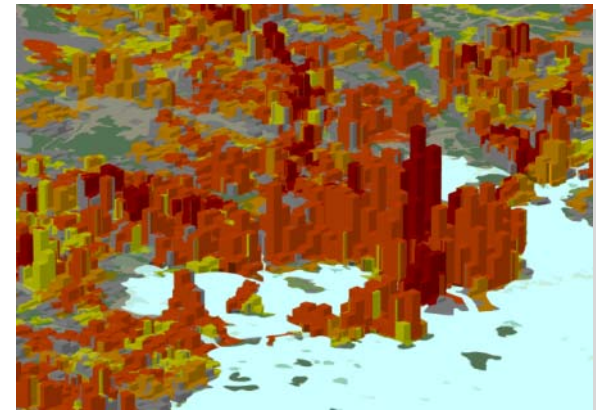


# Population density, job density and typology of frequencies

Population density  
(250x250 m cell size)

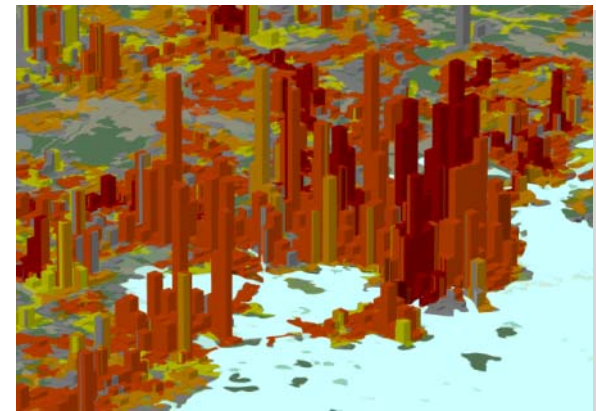
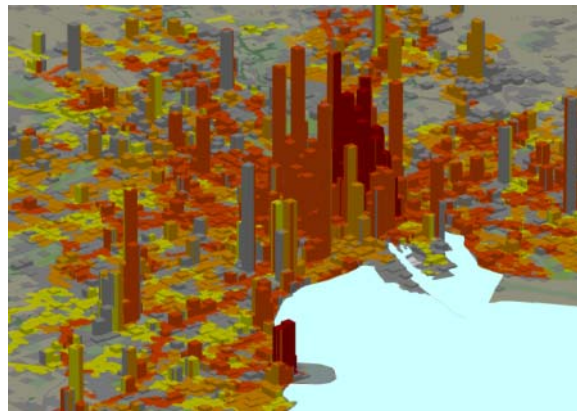


Dublin



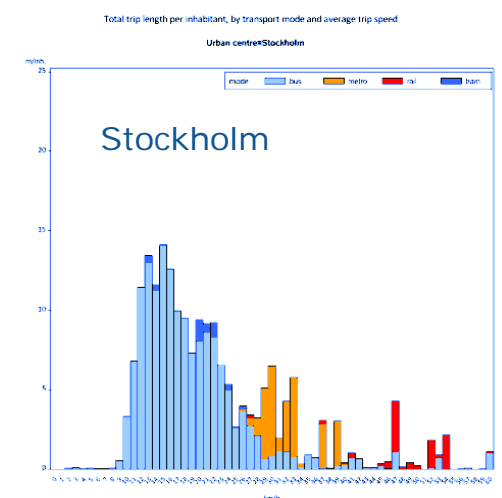
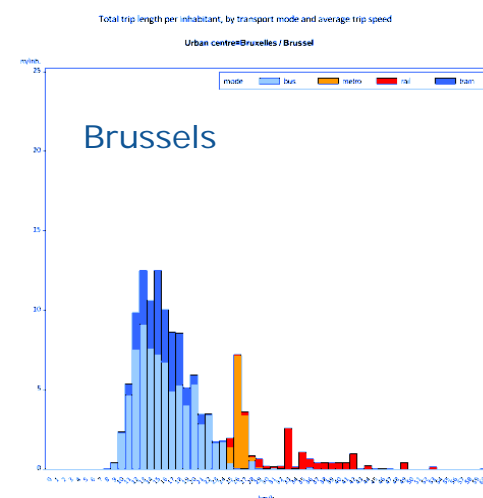
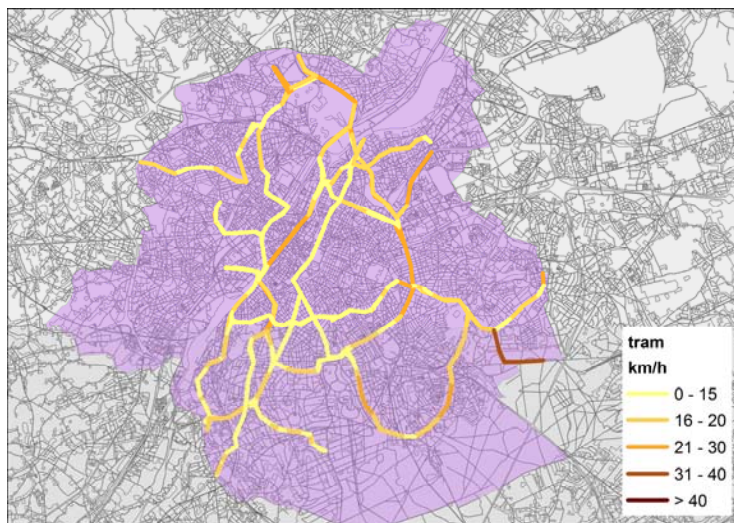
Helsinki

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



# Frequency and speed of public transport

- Total length of all trips, by inhabitant and by transport mode
- Average speed of all trips, by transport mode



# Opportunities and challenges

- Combination of various (new) datasets enriches indicator collection
- Harmonisation of concepts and data sources progresses
- Timeliness of spatially detailed data remains a challenge
- Lack of availability of open data; restrictive licensing policy

# References

- Cities in Europe - The new OECD-EC definition: Regional Focus 01/2012  
[http://ec.europa.eu/regional\\_policy/sources/docgener/focus/2012\\_01\\_city.pdf](http://ec.europa.eu/regional_policy/sources/docgener/focus/2012_01_city.pdf)
- Eurostat city statistics: <http://ec.europa.eu/eurostat/web/cities/overview>
- Copernicus Urban Atlas: <http://land.copernicus.eu/local/urban-atlas>
- Eurostat GEOSTAT project: <http://ec.europa.eu/eurostat/web/gisco/geostat-project>
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- General Transit Feed Specification: <https://developers.google.com/transit/gtfs/>
- European Forum for Geography and Statistics: <http://www.efgs.info/>