SPATIAL REPRESENTATIVENESS : RIO METHODOLOGY

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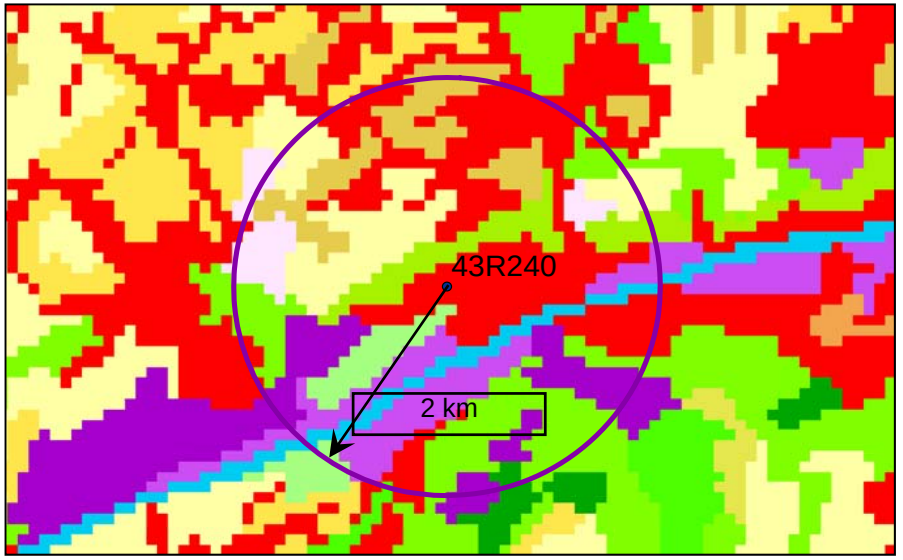
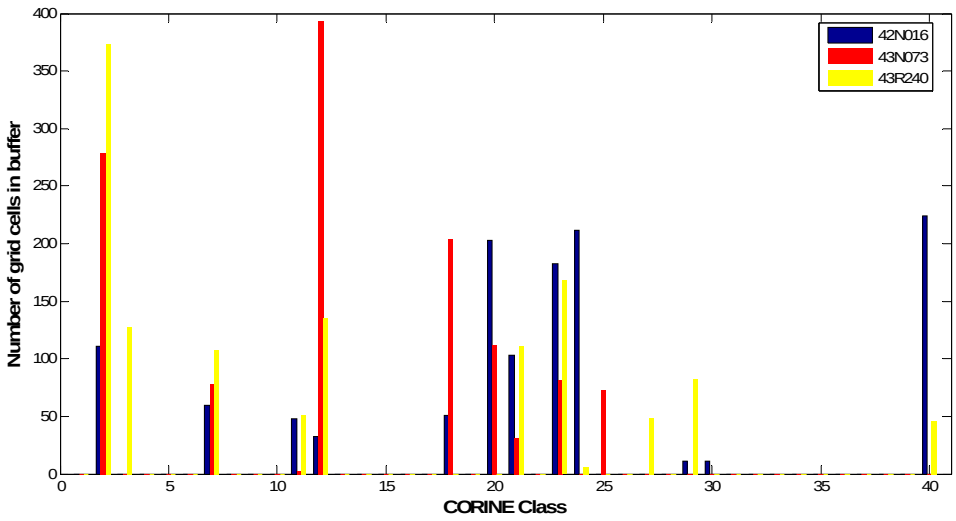
SPATIAL REPRESENTATIVENESS: RIO METHODOLOGY

Land cover distribution as a local fingerprint

- Land use parameter based on CORINE Land Cover data
- Buffer of 2km around monitoring site
- CORINE pixels are classified according to 44 classes
- Class distribution is fingerprint of vicinity of station location



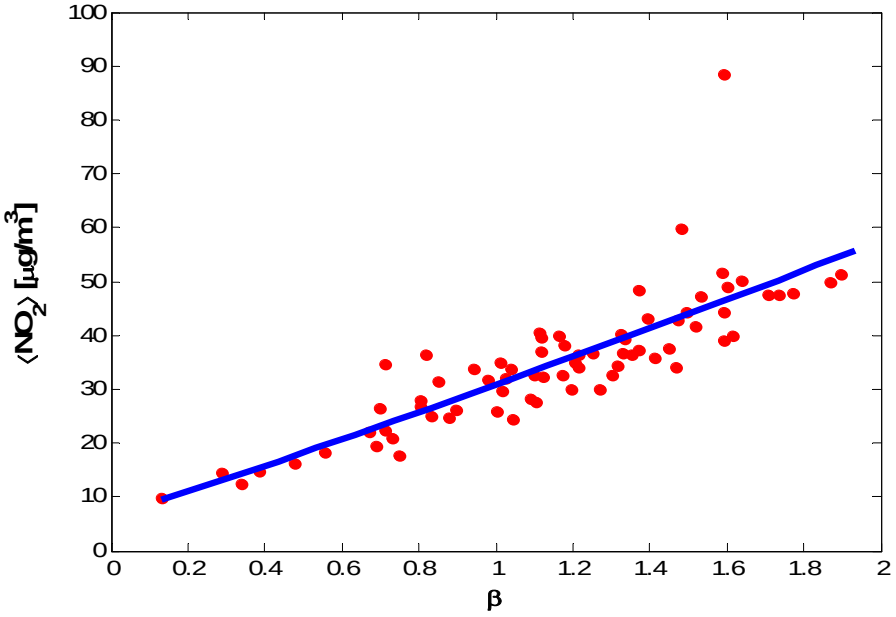


LAND USE INDICATOR

- Land use indicator β is based on CORINE distribution:

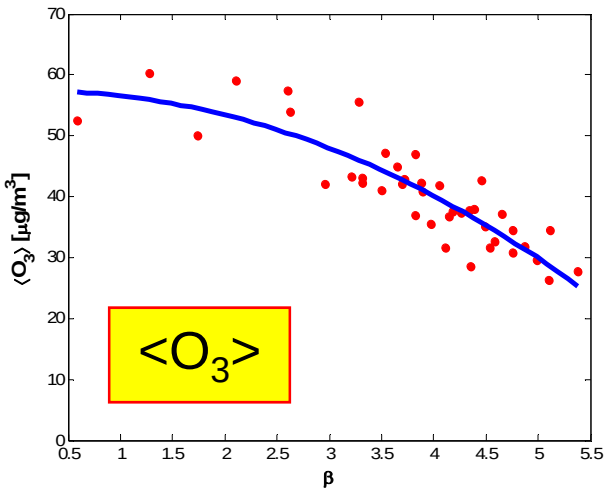
$$\beta = \log\left[1 + \frac{\sum_i a_i \cdot n_{CORINE\ \ Class\ \ i}}{\sum_i n_{CORINE\ \ Class\ \ i}}\right]$$

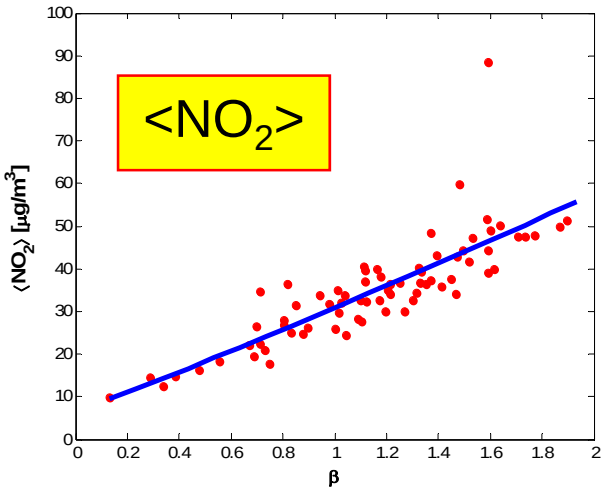
- Calibration of coefficients a_i via a multi-regression to optimize trend for mean and standard dev. of monitoring data

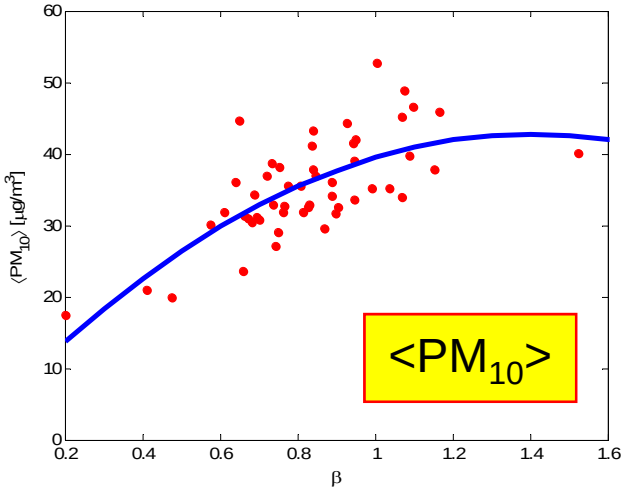


CORRELATION FUNCTIONS

- Correlation functions between land use indicator β and air pollution expectation values:

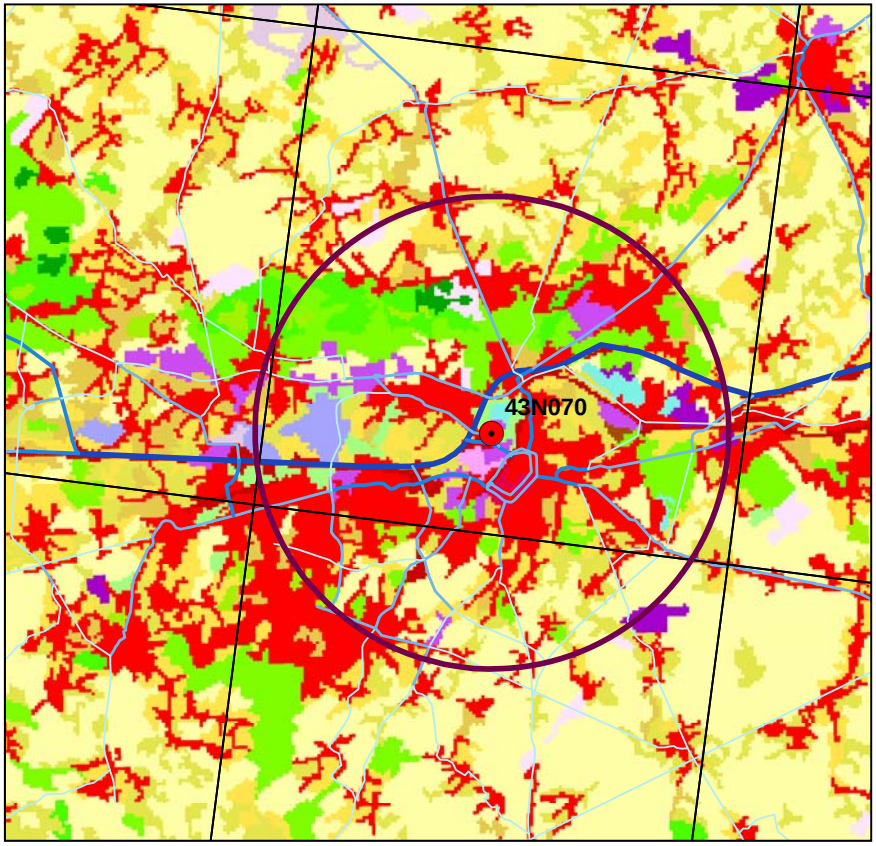


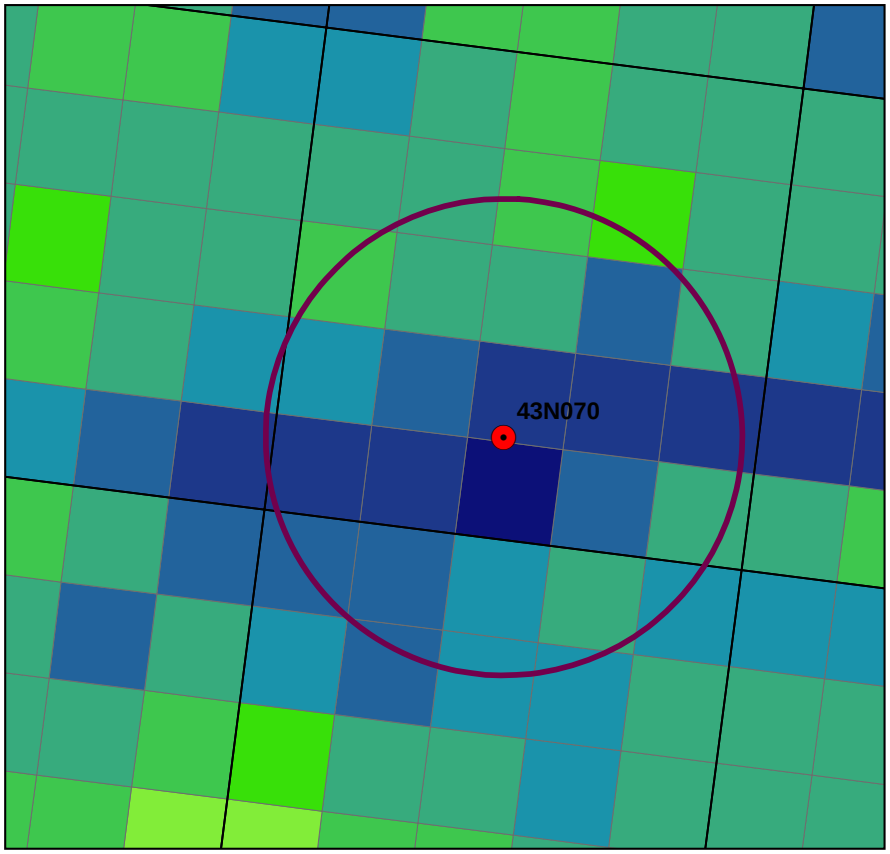




SPATIAL VARIATION

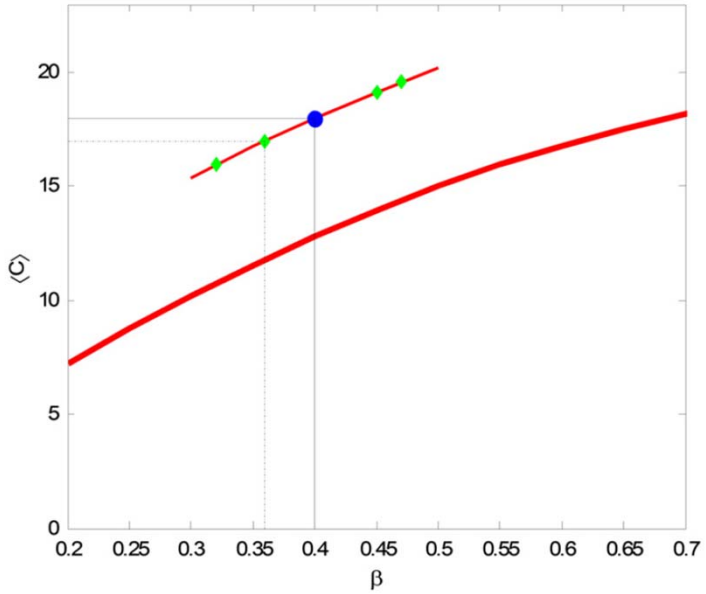
Variation of β in vicinity of the monitoring site: indicator of spatial representativeness of sampling data

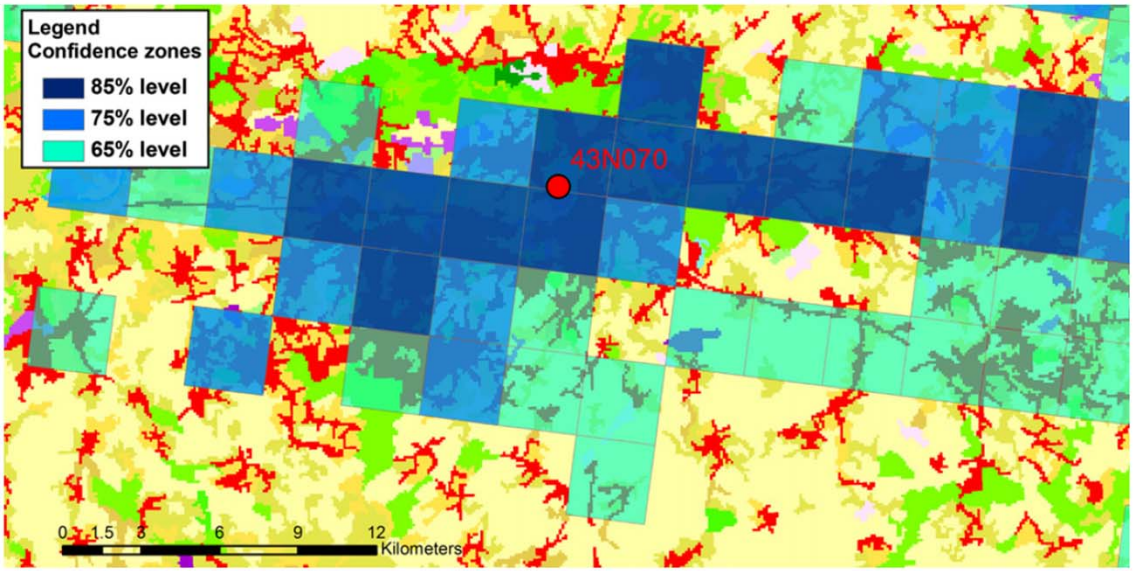




CONFIDENCE ZONES OR REPRESENTATIVENESS AREAS

A Δ C is translated into a Δ β





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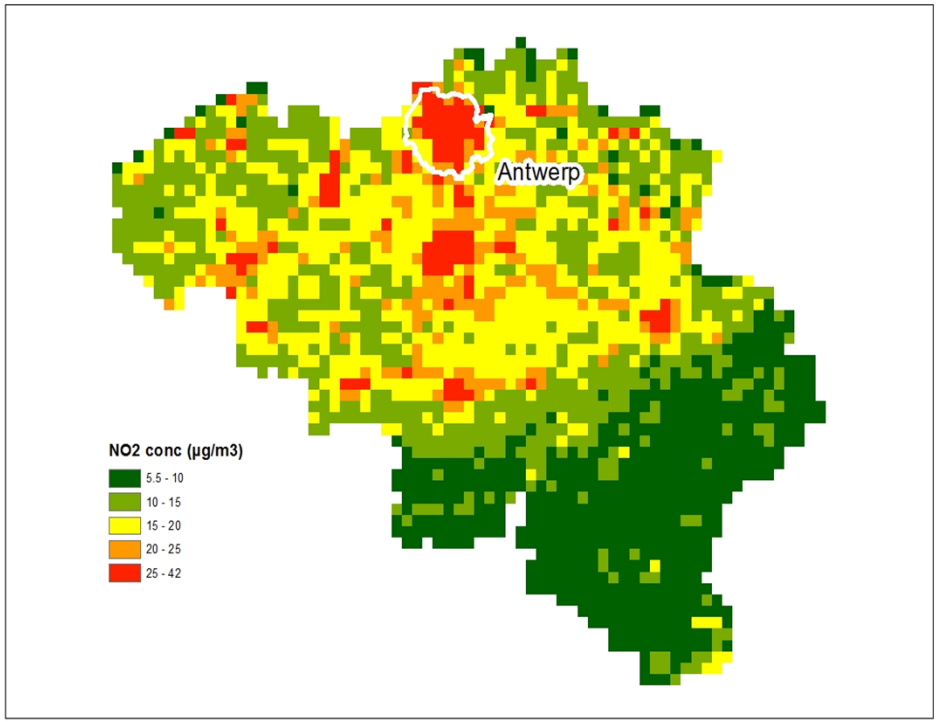
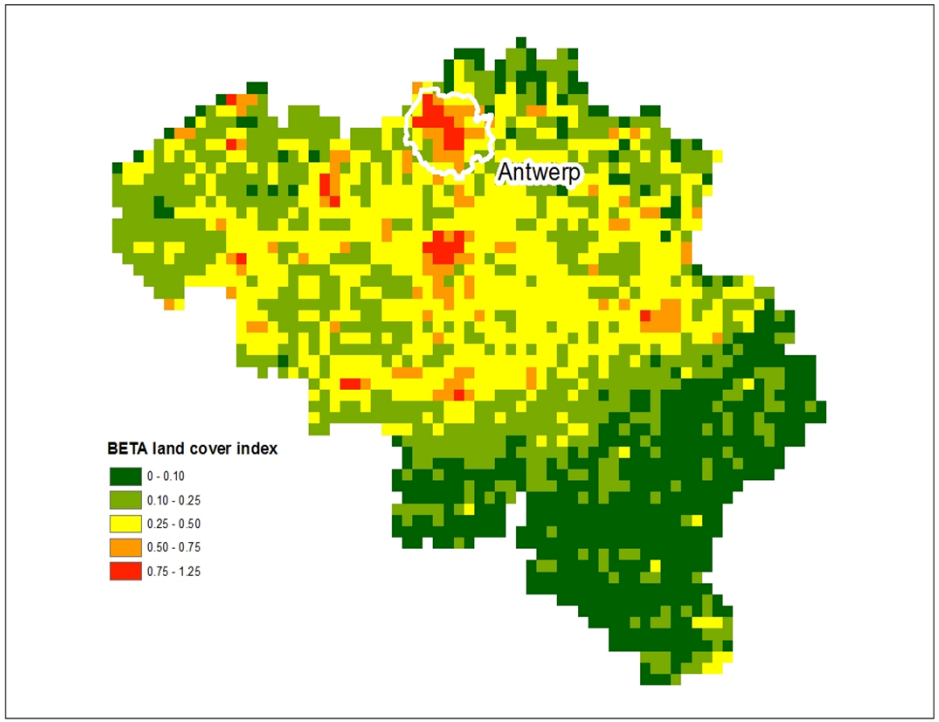
NO_2 CONCENTRATION



β land use indicator



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SPATIAL REPRESENTATIVENESS: RIO METHODOLOGY

The RIO RS methodology in a nutshell:

1. Derive a relation between the land use indicator β and long term averaged pollutant concentrations

2. Create a map of β for at 4km x 4km grid

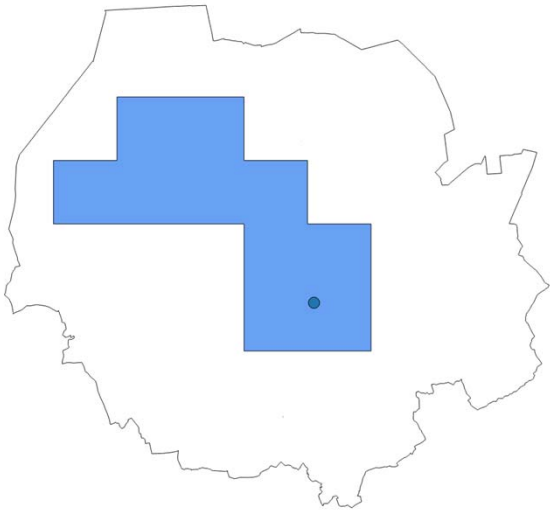
3. Determine the β value for each station

4. Derive the β value interval corresponding to a variation of 15% in concentration at measurement stations

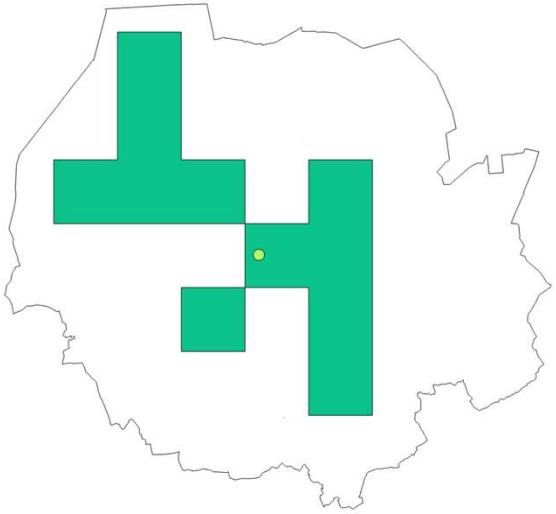
5. Select the grid cells that have a β within this β interval AND that form a contiguous area neighboring the measurement station

NO2

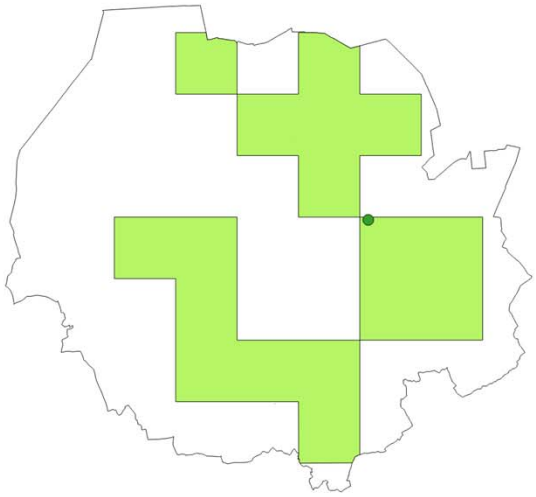
Borgerhout (v216)



Linkeroever (v7)

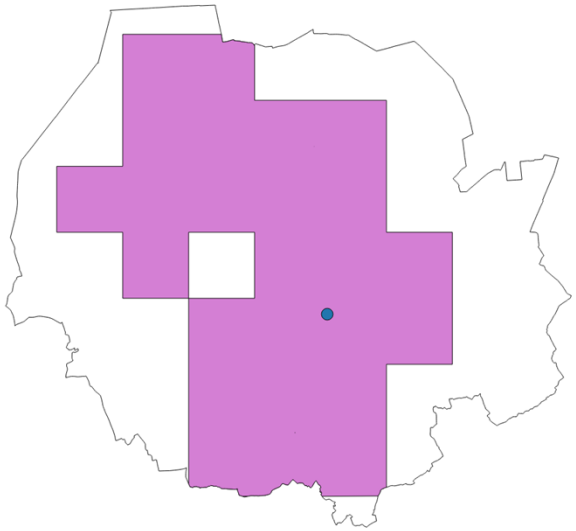


Schoten (v17)

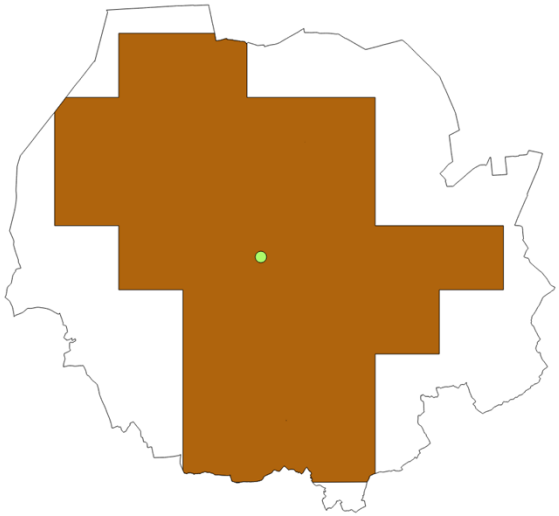


PM10

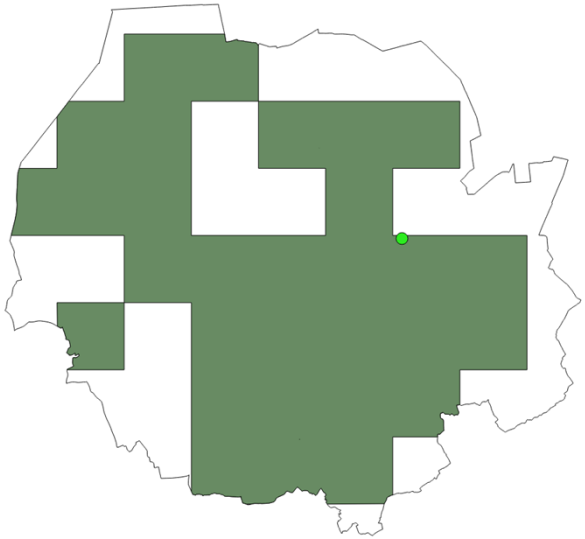
Borgerhout (v216)



Linkeroever (v7)



Schoten (v17)



Scope, objectives and typical use of the selected spatial representativeness (SR) method

1) What is the **scope** and the detailed **objectives** of your SR method used in the exercise?
   *The method has been proposed in a scientific publication[1]. The underlying methodology is closely related to the **RIO interpolation method** that relies on land cover.*
2) In which **context** do you typically use this method?
   *The method has only been used for **research** (e.g. in the context of FAIRMODE). It is intrinsically designed for the **regional scale** (based on 4km grid), not for the local scale!*
3) Are there **other SR methods** that you would typically use in your work on SR assessments? *Spatial representativeness is typically based on **expert opinion** in combination with the current existing station classification in AIRBASE or available from the environmental agency that is conducting the measurements.*
4) How does the use of your method(s) relate to local / regional / national / EU-wide **regulatory and /or legal obligations**?
   *The proposed methodology is related to the land cover based interpolation method **RIO model** that is used for producing air pollutant concentration maps by the Flemish and national administration in Belgium*

1* Janssen,S., Dumont, G., Fierens, F., Deutsch, F., Maiheu, B., Celis,D., Trimpeneers, E., Mensink, C. ,2012, Land use to characterize spatial representativeness of air quality monitoring stations and its relevance for model validation Atmospheric Environment 59 492-500.

Maturity and fitness to purpose of the SR method used in the exercise

1) How many **years of experience** do you have with the specific SR method used in the exercise? *The RIO interpolation method is well established and has been operationally applied for more than 10 years. The SR method is described in a scientific application and has been tested for Belgium.*
2) How many **years of experience** do you have with evaluating SR in general (including experience with other methods)? *VITO has been involved in air quality modelling for several decades. The evaluation of **SR is as such not the main focus** of our work but we are involved in this from time to time due to the implications the SR has for the use of station observation data with AQ models.*
3) How would you rate the **maturity of the SR method** you have used in the exercise?

   (This may reach from "rather experimental" to "well established" – please also comment on the fitness to purpose of you method.)

   *The method is **rather experimental** and only applicable at the **regional scale***
4) Is it possible to **apply your method by other institutes** using the tools you have developed?

   (e.g.: Are your tools available to others? Is there a copyright concern? What is the level of difficulty and necessary skills for their implementation?)

   *The method relies on the CORINE **land cover data**. The land cover index that relates the land cover to the concentrations will need to be determined. The method is detailed in a number of articles and is as such available for use by other institutes. There are tools available to help users determine an appropriate land cover index/ concentration relation.*

Similarity criteria & definition of Spatial Representativenes (1)

1) Please summarize the **underlying definition** of SR you have used in the exercise.
   *The SR of the station is determined by the prevalence of a similar **land cover index** value in the area surrounding a station.*
2) Please summarize the **underlying similarity criteria & threshold parameters** you have used.
   *Similarity is based on the value of the land cover index on a 4 km resolution grid. A **15% variation in concentrations** is transformed in a corresponding **variation in land use indicator**. All grid cell within this range belong to the SR area of the station*
3) Are there **other SR definitions** and / or **similarity criteria** you would typically use in your work on SR?
   No

Similarity criteria & definition of Spatial Representativenes (2 – some details)

1) Are the boundaries of your spatial SR areas constrained **exactly**, or did you add some additional **buffers or safety factors**?

   The area with a similar land use index is further constrained by requiring that it is contiguous and the station is located within the area.

2) Can SR areas of different stations **overlap** or are they considered to be **exclusive** by principal?

   The SR areas of different stations can overlap

3) Are your similarity criteria applied **one sided** or **two sided**?

   Two sided

   Within your estimated SR areas: is spatial representativeness guaranteed for locations of **all station types**, or only for locations of **station types identical** to the type of the central station?

   To all station types: we only account for similarity in land cover.

Input data

1) Please summarize which part of the **input dataset** you have used in the exercise.
   Only the land cover data and population data were used.
2) Did you use **additional data**, not contained in our dataset?
   Previously derived relation to derive the land cover index from the land cover data.
3) How suitable did you find the **Antwerp dataset** for your method? / How suitable would you rate your method to be for this type of dataset?
   - All required data was there. To derive a novel land cover index relation for the area of interest could require information for more station / land cover combinations than those made available by the data set.
   - The low resolution of the method makes it less suitable for urban or traffic stations
4) Did you **miss** any type of data / information in this dataset?
   No
5) How does the dataset of the exercise compare to the **data you would more typically use** for you work on SR?
   The data are for a restricted area, previous tests were done on a larger area.