FAIRMODE
Forum for air quality modelling in Europe

Spatial representativeness method proposed for the Walloon monitoring stations applied to the Antwerp dataset

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Influence/classification of the stations

Urban area:

Distance of their location to the closest major road:
traffic-influenced (distance < 30 m) and non-traffic influenced (distance >= 30 m) sites.

Confirmed by the results of the Joly & Peuch methodology (2012) based on historical time series.

Station code	*Predetermined*	*Index_J&P_NO2*	*Index_J&P_PM10*
40AL01	Urban background	7	7
42R802	Traffic	9	9
42R811	Urban background	7	5

Traffic sites are highly influenced by very local sources => SR areas are restricted and are analysed with a different method than background sites.

We suppose that road emissions are the only one that influence mostly the concentrations at the stations.

1) Traffic station (Borgerhout).

Similarity criteria: road emissions and street configuration.

Local sources: analysis in a restricted area (500m radius buffer).

Emissions: no a priori knowledge of the concentrations. No fine scale model data available in the Walloon Region.

Road emissions (Road_emissions.csv). Segments are divided into three categories based on their emission distribution in the global area.

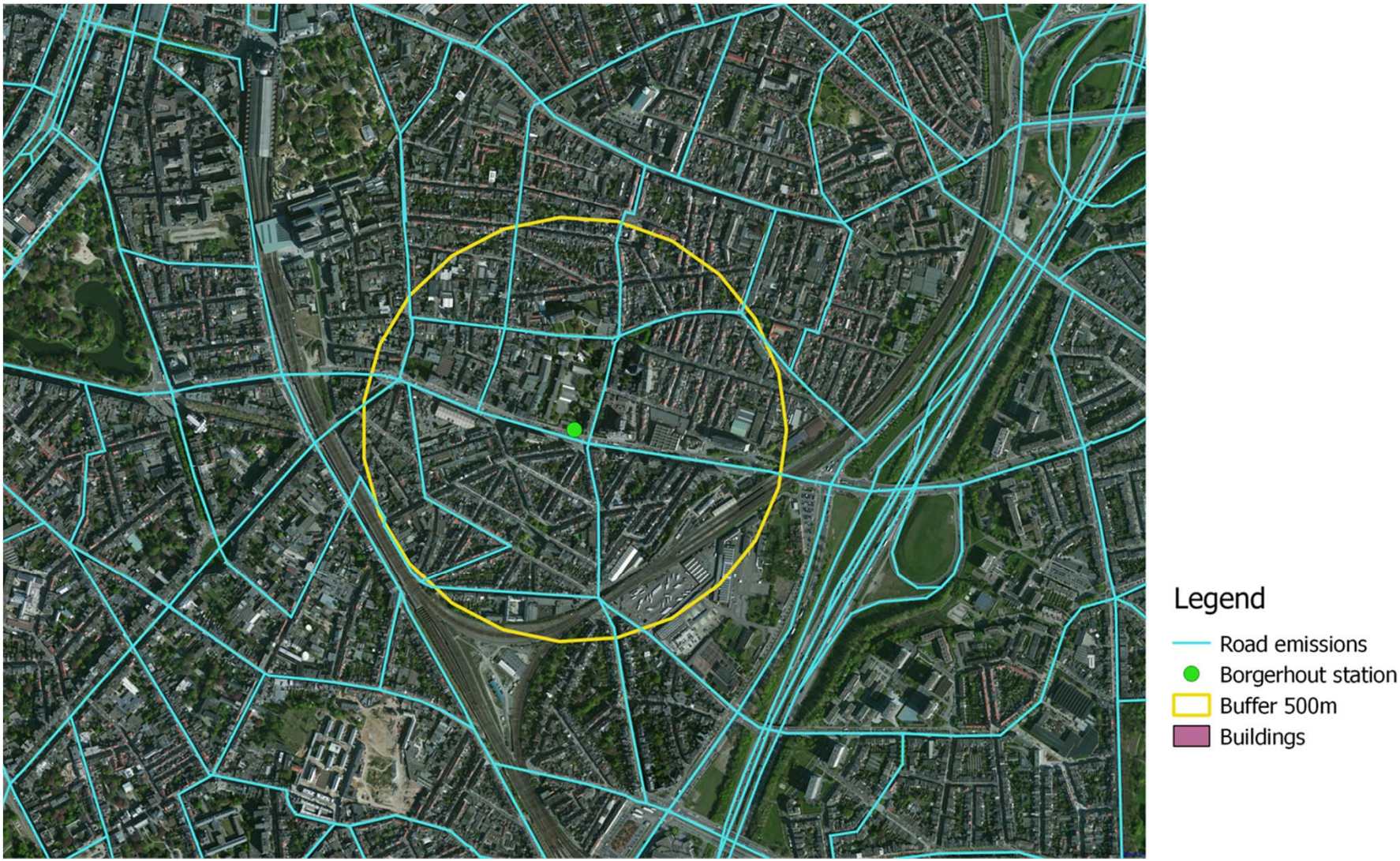
Category	Level	NO2 (kg/km/yr)	PM10 (kg/km/yr)
Low	1	<100	<20
Medium	2	100-500	20-100
High	3	>500	>100

But AQ is influenced by street canyons

⇒ Street canyon index

The pollution level is increased by one when the segment is considered as a street canyon.

1) Traffic station (Borgerhout)



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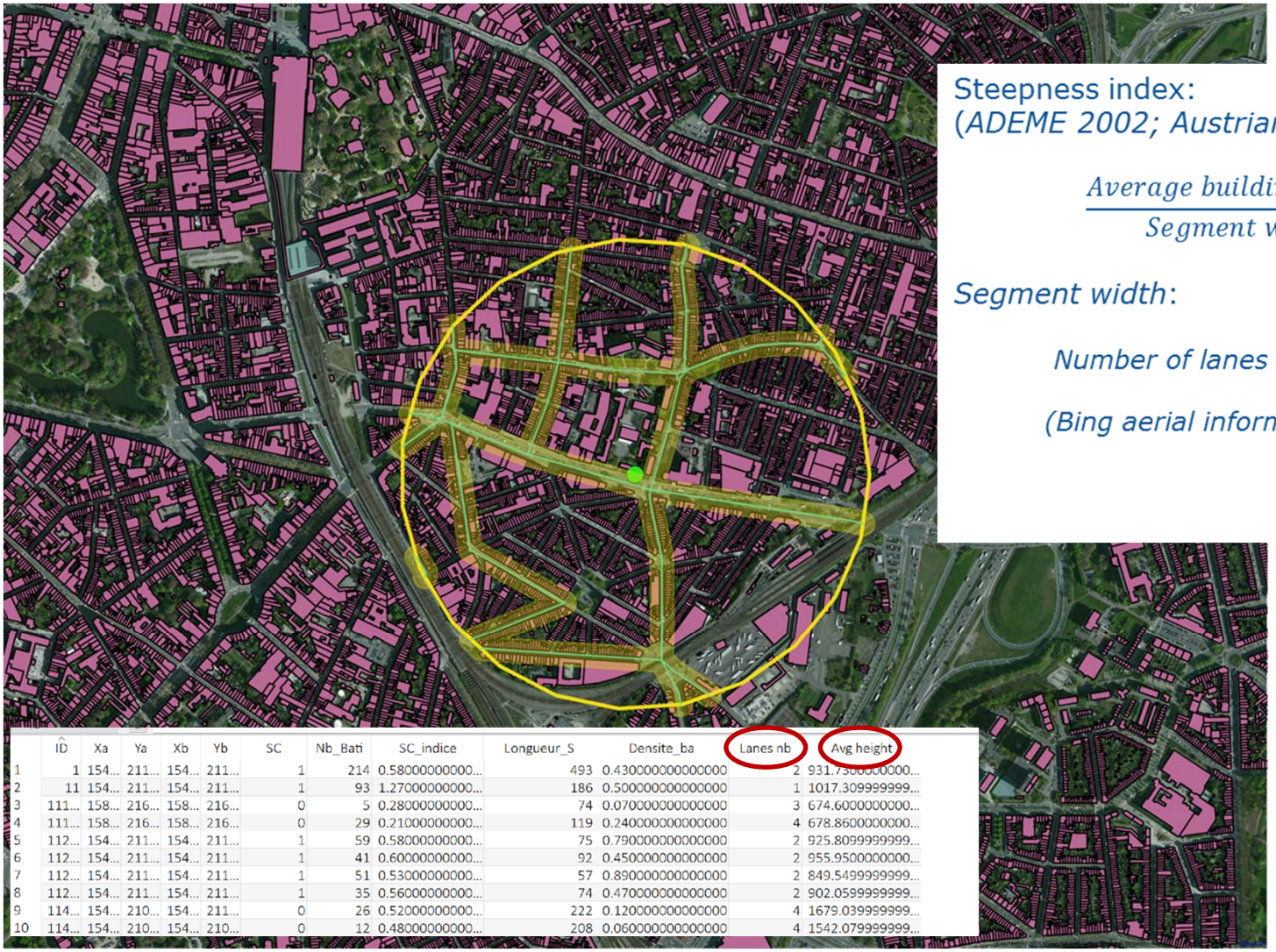

	ID	Xa	Ya	Xb	Yb	SC	Nb_Bati	SC_indice	Longueur_S	Densite_ba	Lanes nb	Avg height
1	1	154...	211...	154...	211...	1	214	0.58000000000...	493	0.430000000000000	2	931.7300000000...
2	11	154...	211...	154...	211...	1	93	1.27000000000...	186	0.500000000000000	1	1017.309999999...
3	111...	158...	216...	158...	216...	0	5	0.28000000000...	74	0.070000000000000	3	674.6000000000...
4	111...	158...	216...	158...	216...	0	29	0.21000000000...	119	0.240000000000000	4	678.8600000000...
5	112...	154...	211...	154...	211...	1	59	0.58000000000...	75	0.790000000000000	2	925.8099999999...
6	112...	154...	211...	154...	211...	1	41	0.60000000000...	92	0.450000000000000	2	955.9500000000...
7	112...	154...	211...	154...	211...	1	51	0.53000000000...	57	0.890000000000000	2	849.5499999999...
8	112...	154...	211...	154...	211...	1	35	0.56000000000...	74	0.470000000000000	2	902.0599999999...
9	114...	154...	210...	154...	211...	0	26	0.52000000000...	222	0.120000000000000	4	1679.039999999...
10	114...	154...	210...	154...	210...	0	12	0.48000000000...	208	0.060000000000000	4	1542.079999999...

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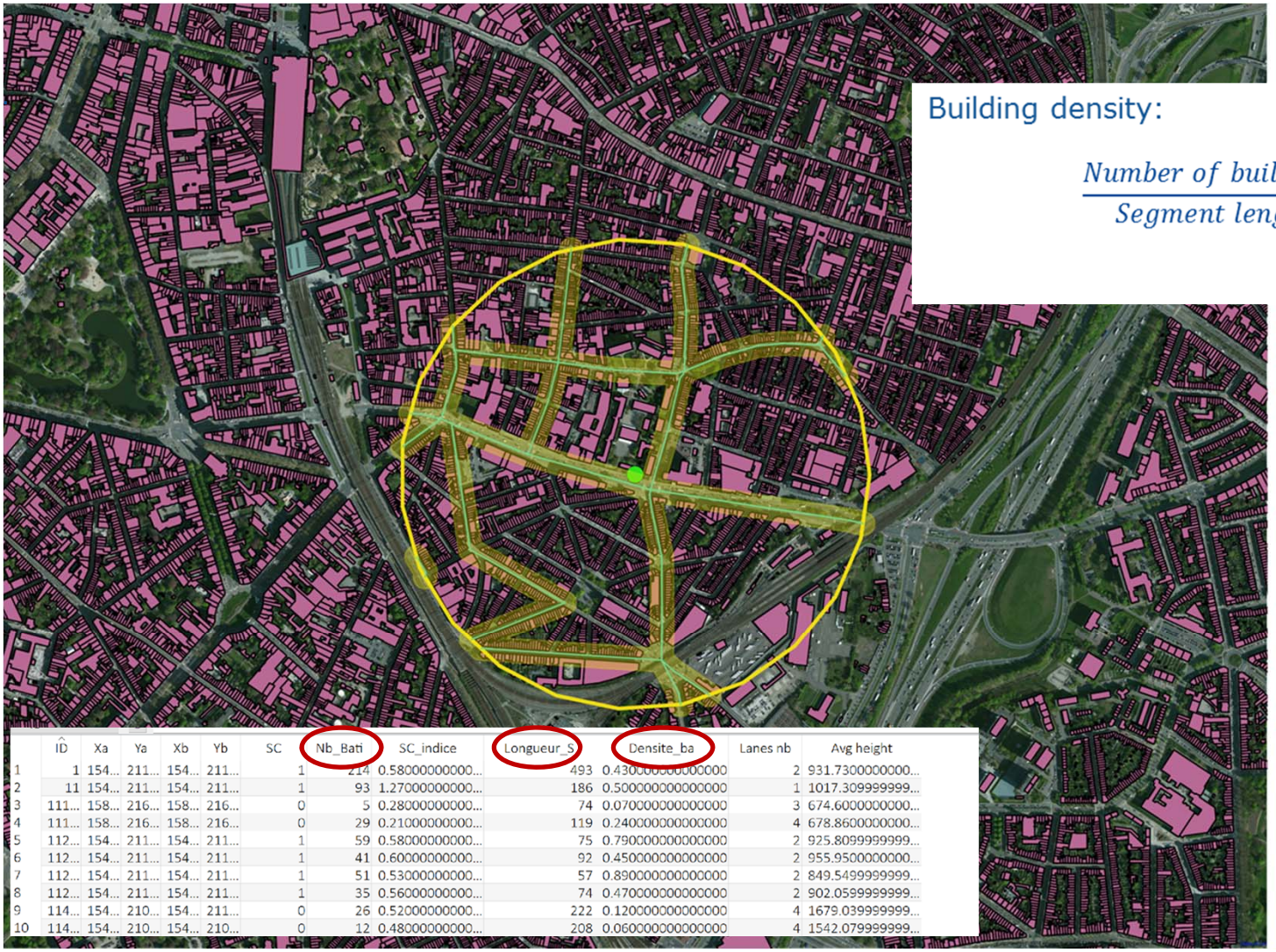

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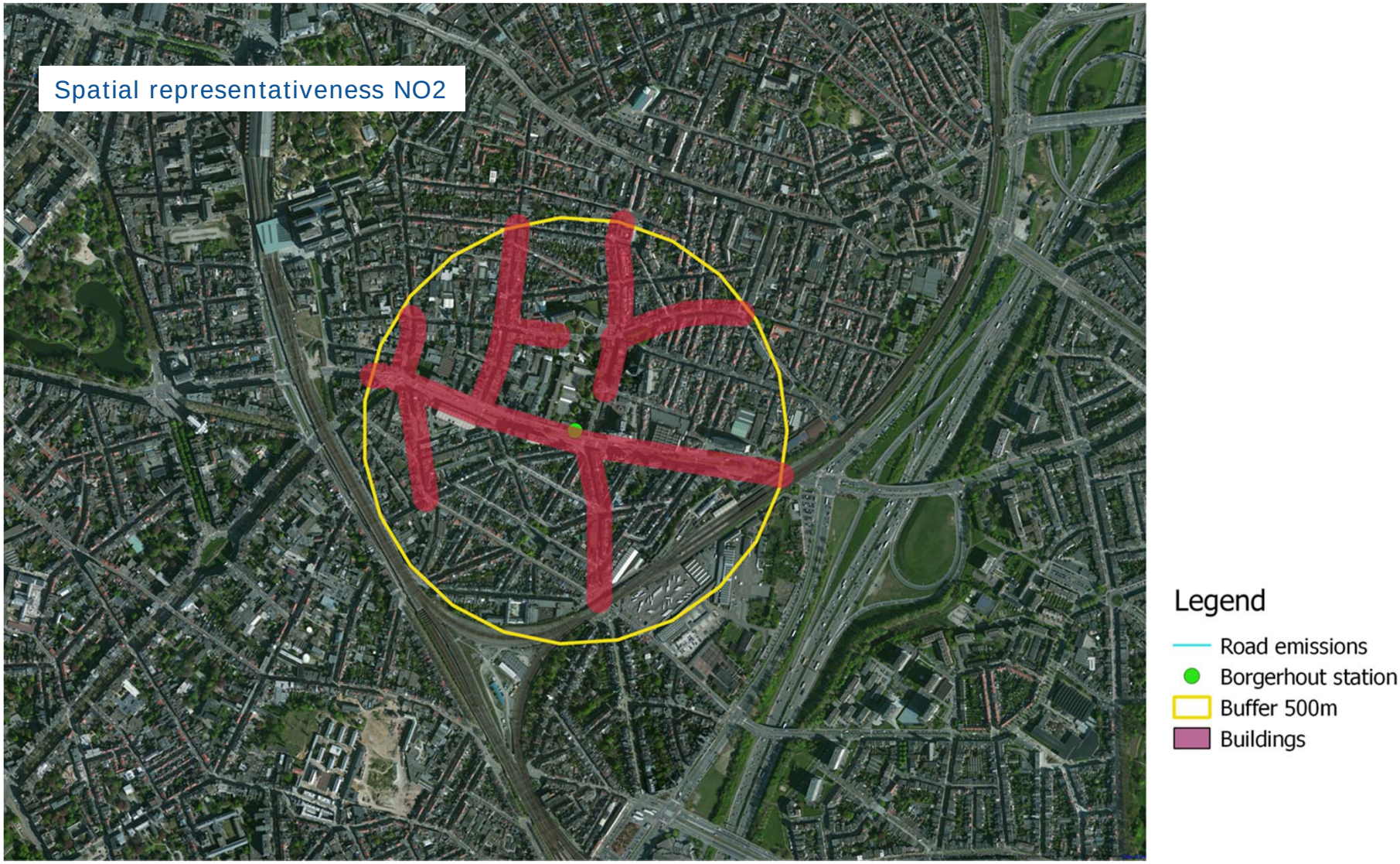

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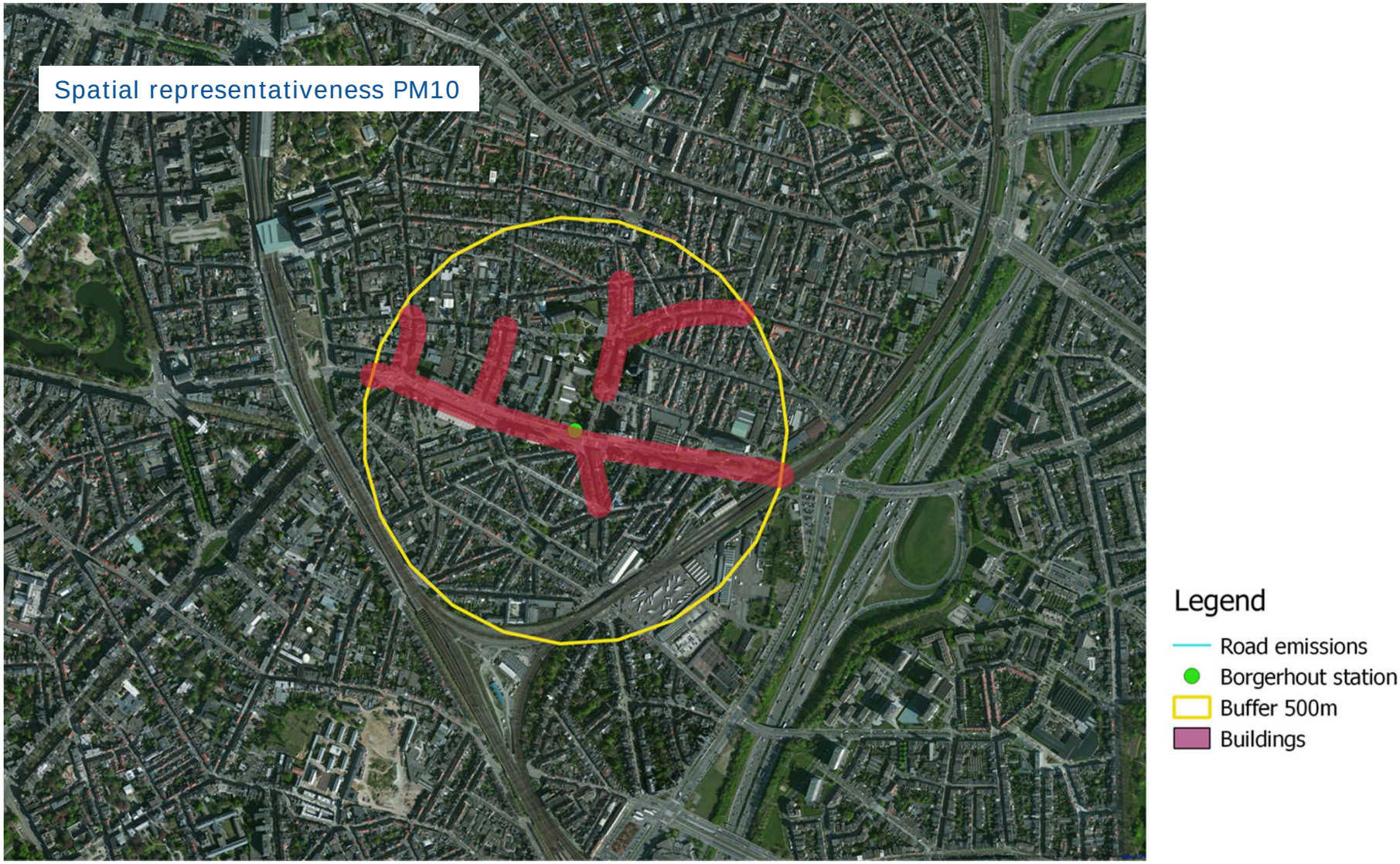
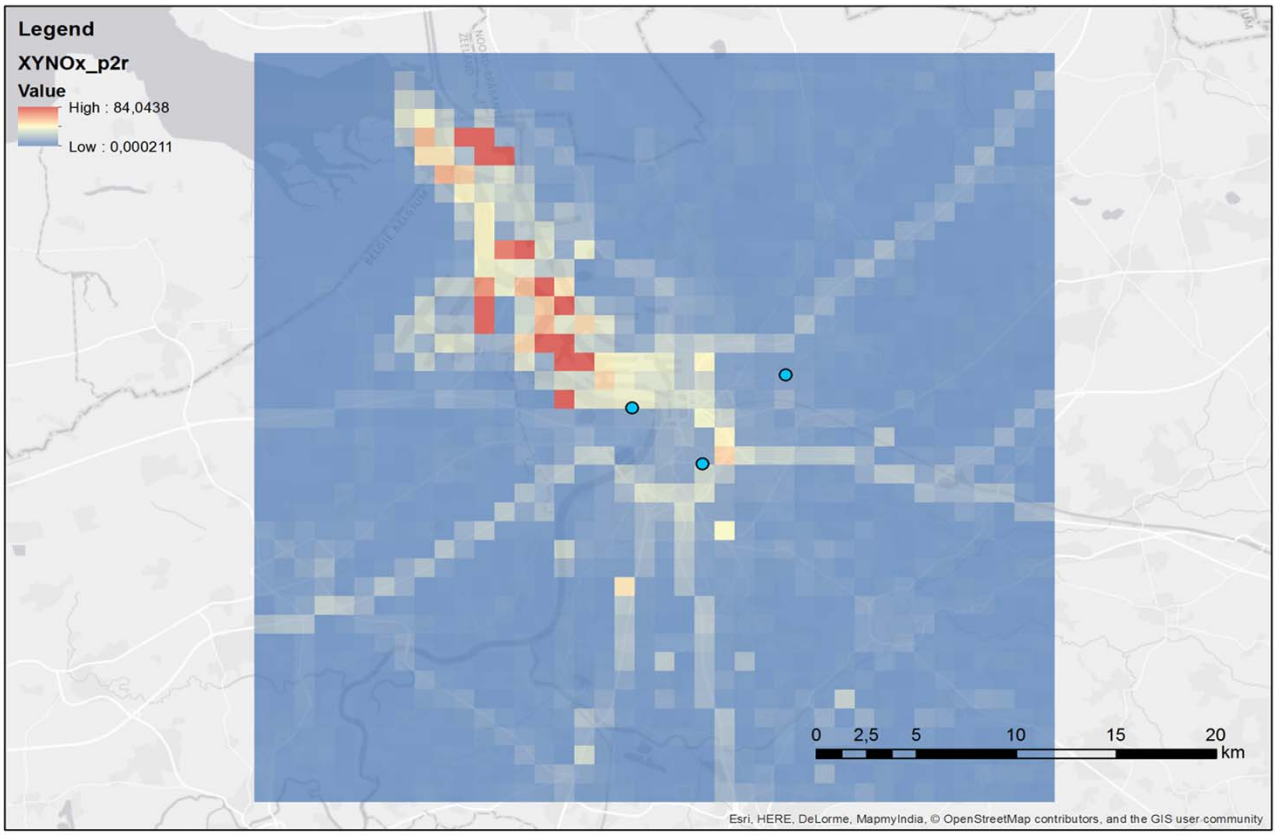


2) Background stations (42R802 and 42R811)

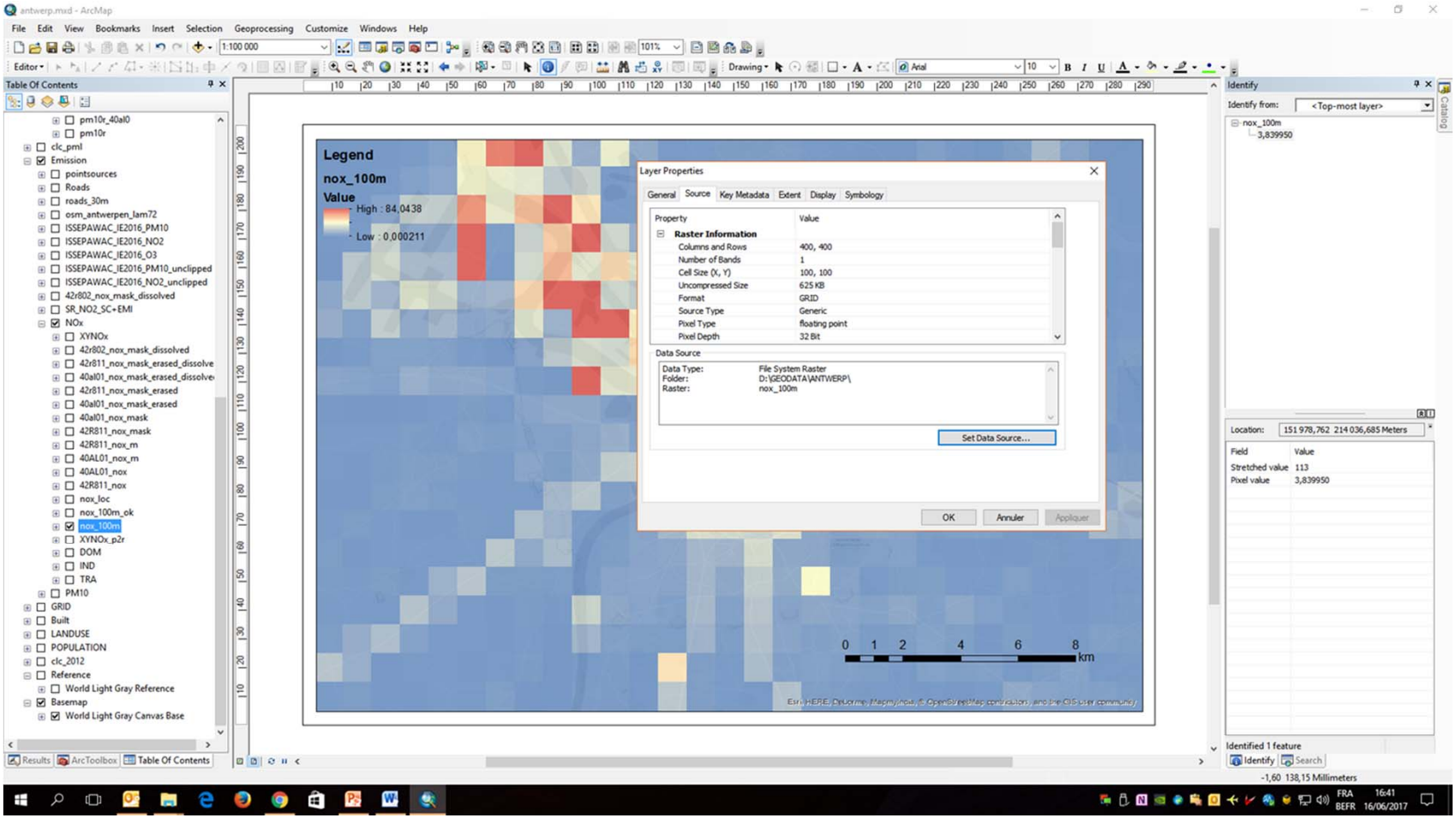
Similarity criteria based on the total emissions of all sectors.

NOx total emissions 1 km * 1km



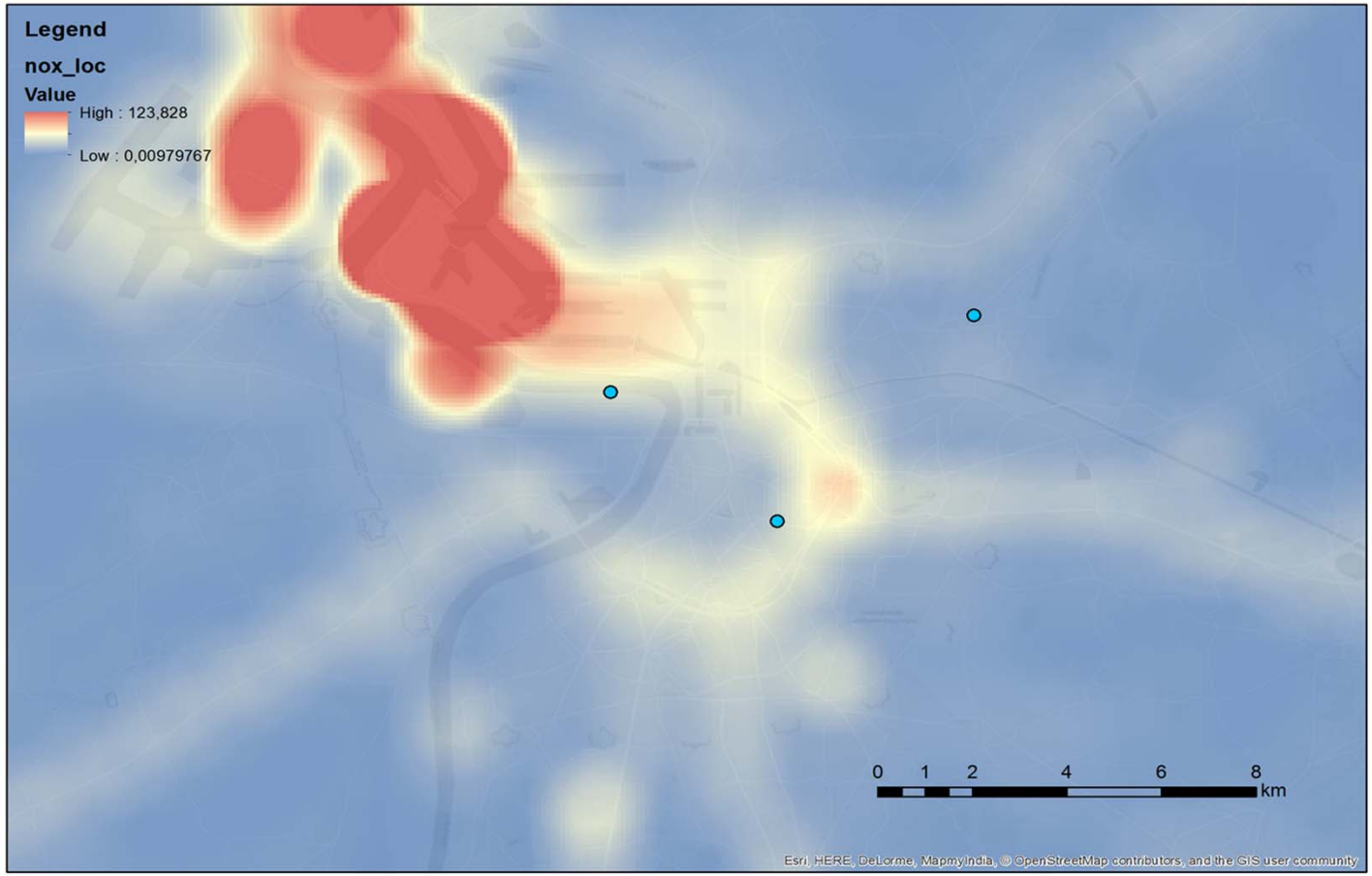
2) Background stations (42R802 and 42R811)

Resampled 100*100m (division of the total by 100)



2) Background stations (42R802 and 42R811)

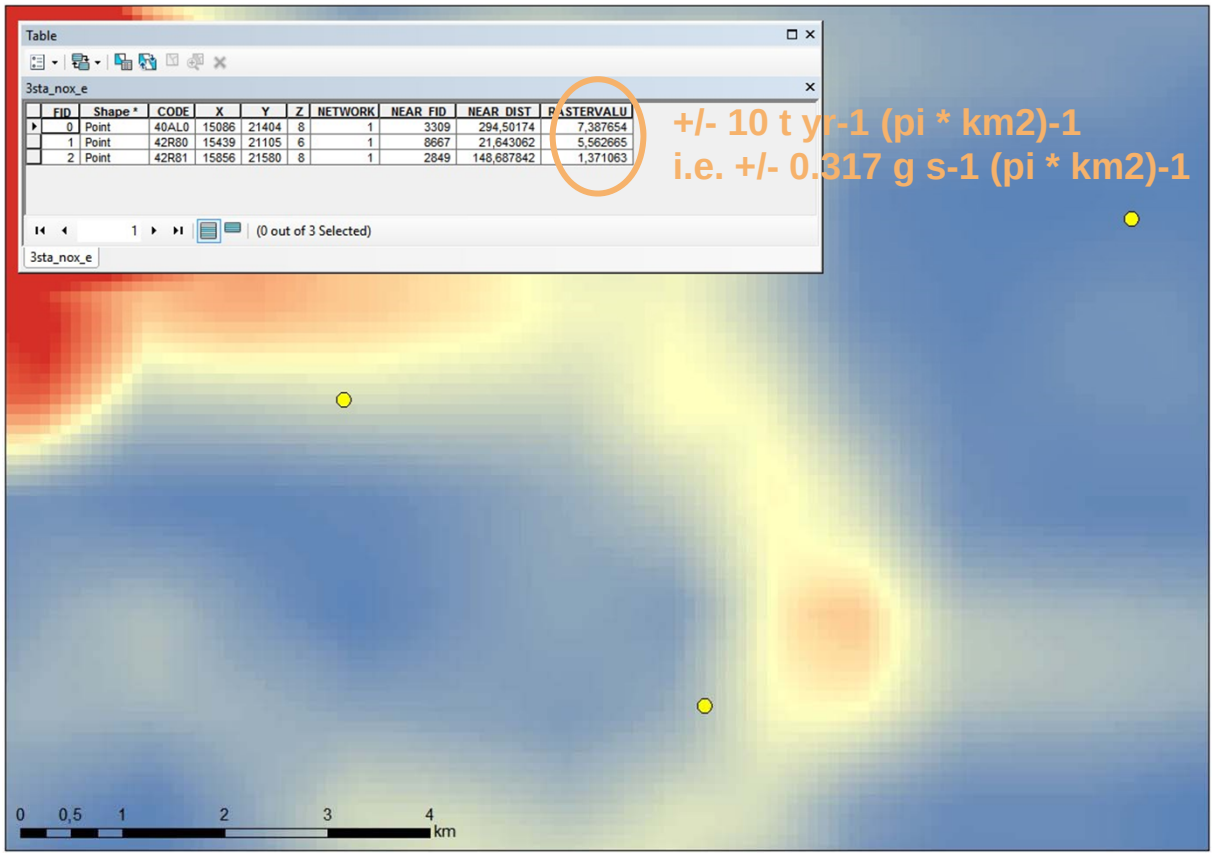
Resample 1km radius buffer = running sum of 1 km radius buffer for each 100*100m cell



NO_2:

Extraction with all grid cells : emission values +- emission tolerance

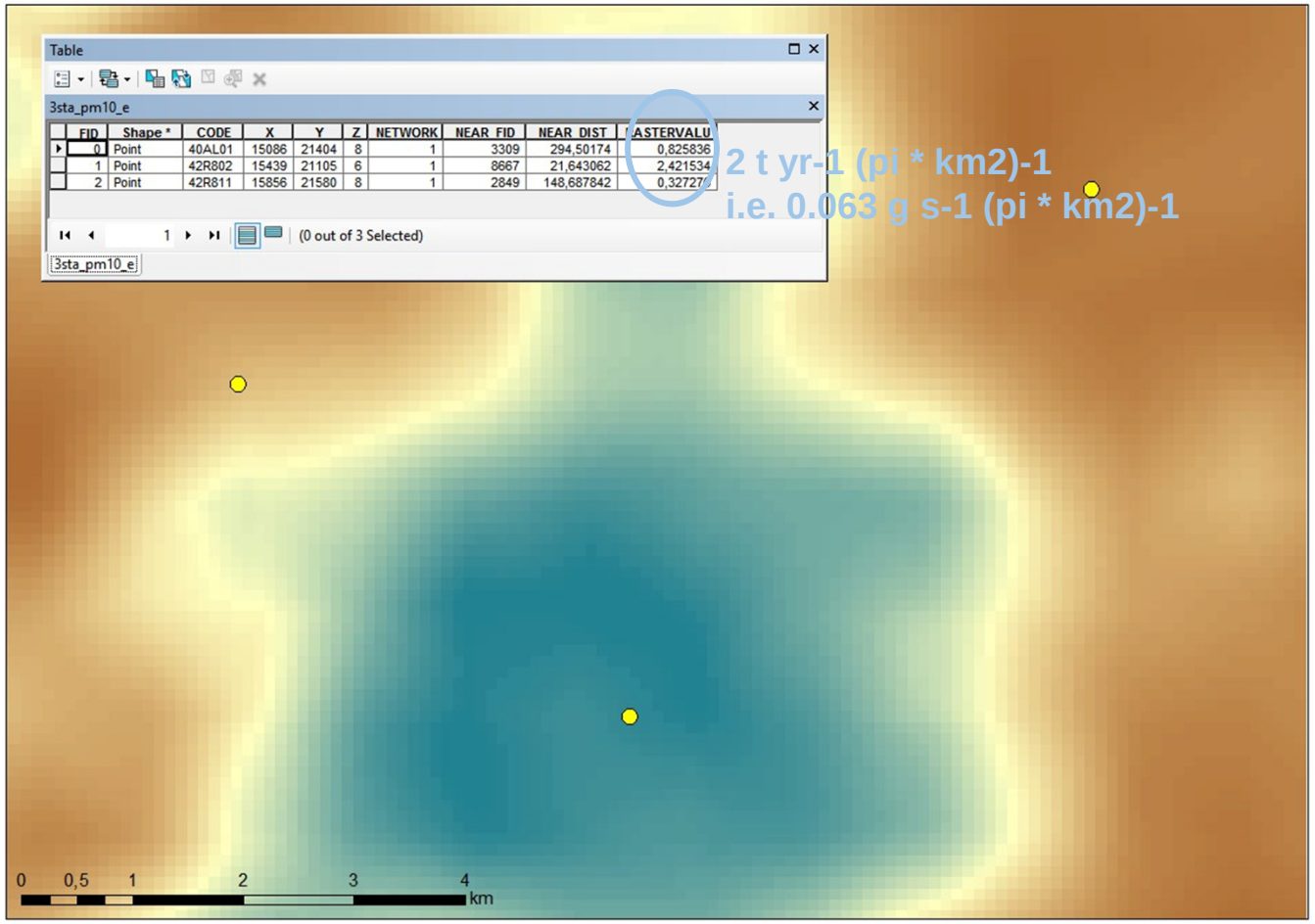
Emission tolerance : 10 t yr-1 (pi * km^2)-1 (spread of the intermediate class from the document “Representativeness and classification of air quality monitoring stations”).



PM10:

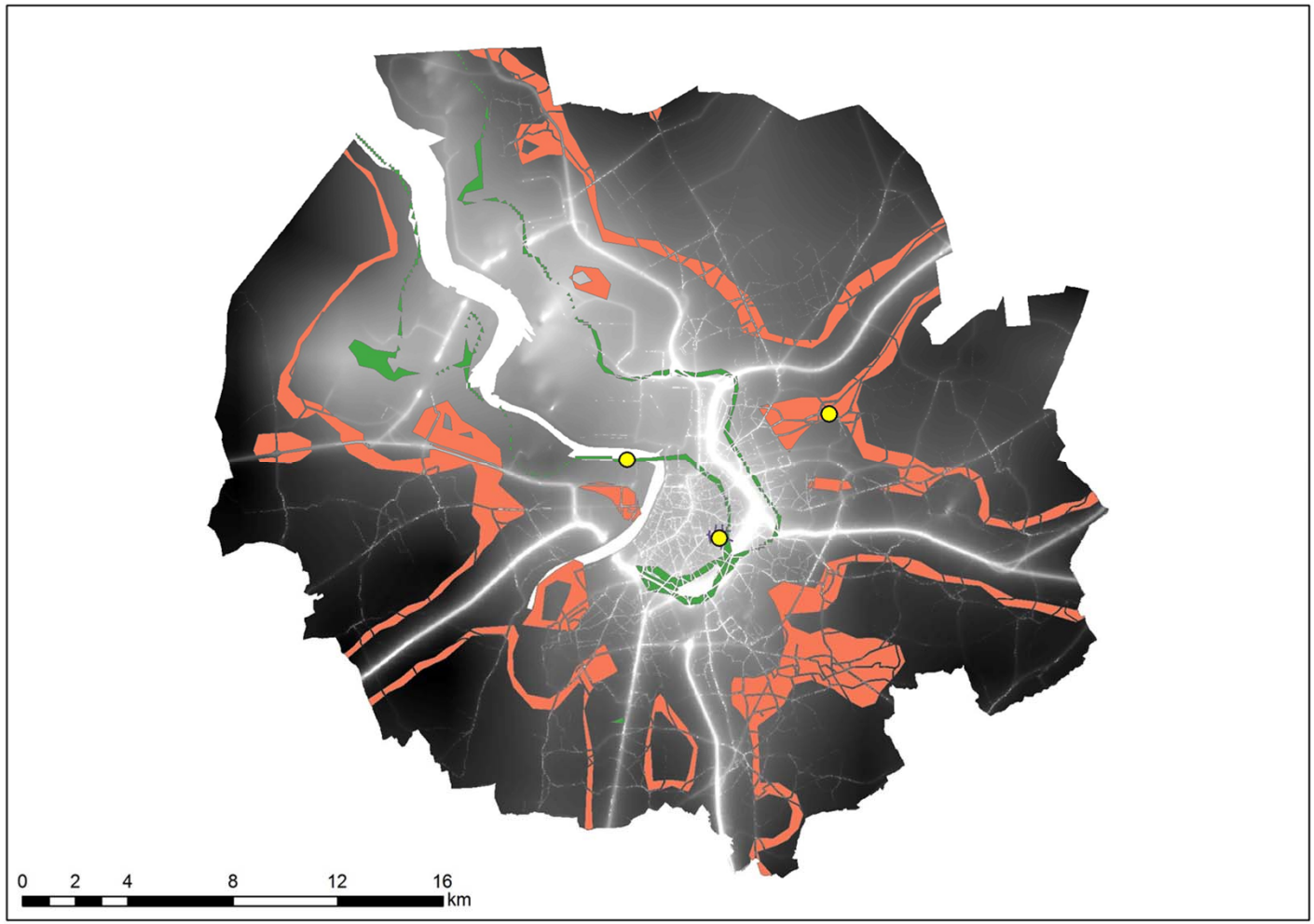
Extraction with all grid cells : emission values +- emission tolerance

Emission tolerance: 2 t yr-1 (pi * km2)-1) (spread of the intermediate class from the document “Representativeness and classification of air quality monitoring stations”).

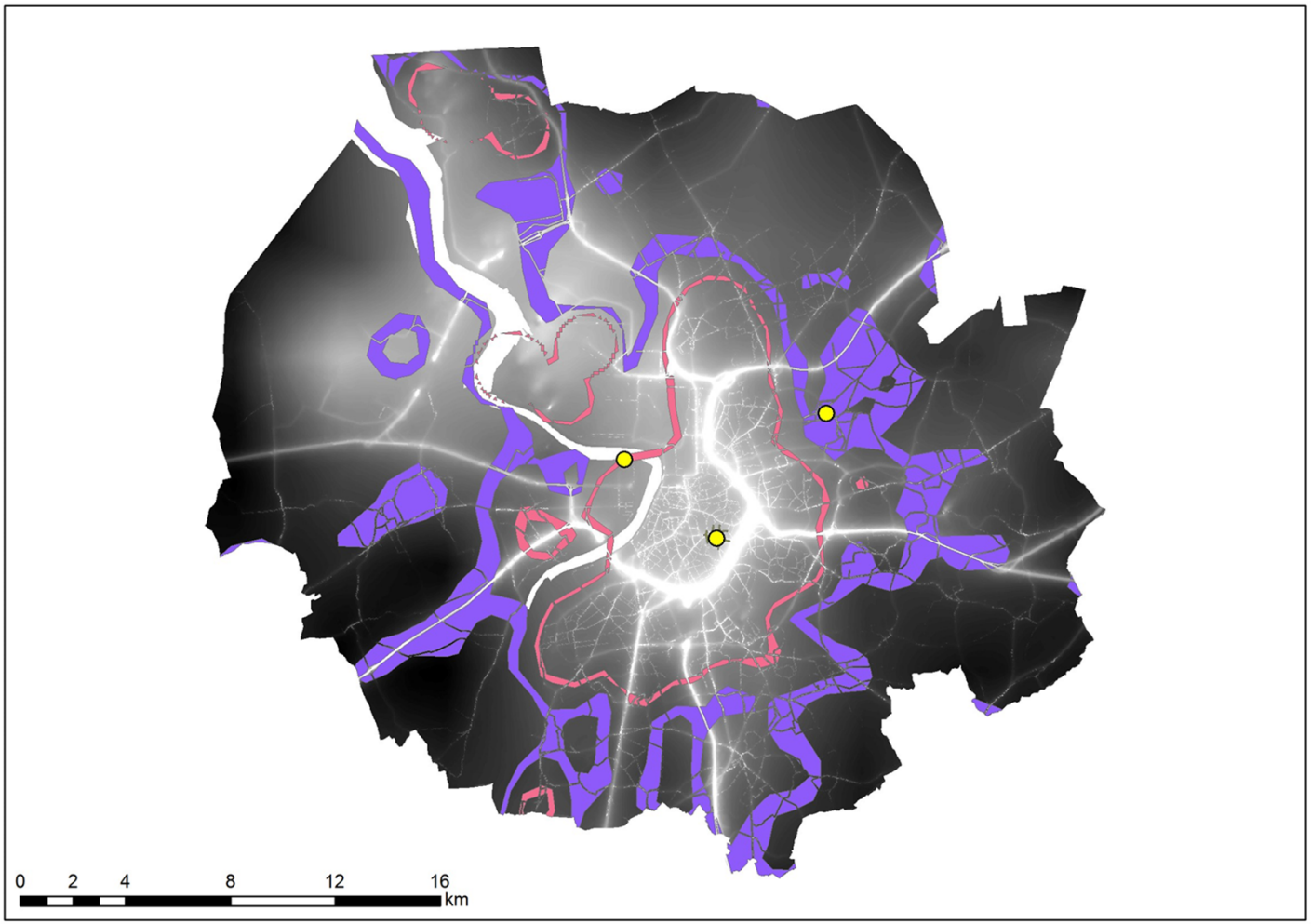


SR results for NO2 (whole domain)

Road segments with 30m buffer were removed from the SR area.



SR results for PM10 (whole domain)



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?

Define an area in the surroundings of the station where the concentrations of the pollutant should be similar to that at the measuring point – without an a priori knowledge about the concentrations.

On an annual basis, the main influences are assumed to be:

- influence of local sources (local character)

- Pollutant emissions

- Steepness (for traffic station): building height, street width

2) In which **context** do you typically use this method?

We want to describe the environment and representativeness area of the walloon monitoring stations/ implementation of new stations

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

3) Are there **other SR methods** that you would typically use in your work on SR assessments?

No method of spatial representativeness has been used in the Walloon Region before.

4) How does the use of your method(s) relate to local / regional / national / EU-wide **regulatory and /or legal obligations**?

AQ assessment under the directives 2008/50 and 2004

***"fully document the site-selection procedures and record information to support the network design and choice of location for all monitoring sites**. (…)"*

If some changes need to be done in the stations network, this methodology also aims at selecting the stations with redundant SR areas.

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?

➢ *This is a new method, but inspired by other well established methods (Spangl et al, Joly and Peuch, LCSQA method).*

2) How many **years of experience** do you have with evaluating SR in general (including experience with other methods?

➢ *In the Walloon Region, no method has been used to assess the environment of a station so far.*

3) How would you rate the **maturity of the SR method** you have used in the exercise?

➢ *It is a new proposal, rather experimental. Some improvements would need to be done. Disaggregation of Nox emissions according to CLC, definition of the emissions classes and tolerance, building density.*

4) Is it possible to **apply your method by other institutes** using the tools you have developed?

➢ *Yes provided that fine scale emission inventories are available.*

Similarity criteria & definition of Spatial Representativenes (1)

1) Please summarize the underlying **definition of SR** you have used in the exercise.

If traffic station: road emission level, upgraded if street canyon

If background station: emission values +- emission tolerance

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**?

> Background stations: exactly but tolerance factor. Traffic station: buffer of 30 m for road segments (to reach the first buildings)

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

> They can overlap (according to the tolerance)

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

> Two sided (tolerance)

4) 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?

> Guaranteed only for background stations on one hand and traffic stations on the other hand (two methodologies).

Input data

Please summarize which part of the **input dataset** you have used in the exercise.

- *Total pollutant emissions 1km*1km: Nox_OPS_2012_0.csv;*
- *Road_emissions.csv;*
- *Building information.*

Did you use **additional data**, not contained in our dataset?

- *Street View pictures*
- *Info from Joly and Peuch classification method*

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? Did you **miss** any type of data / information in this dataset?

The Antwerp dataset was very complete

How does the dataset of the exercise compare to the **data you would more typically use** for you wark on SR?

We could have a more detailed dataset for road emissions in Wallonia.