



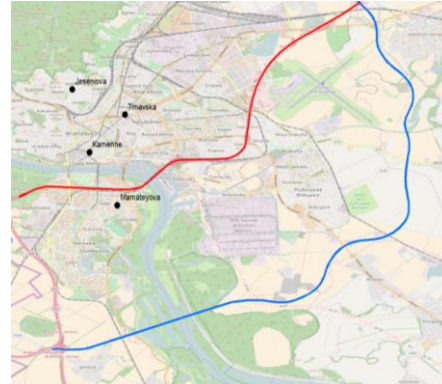
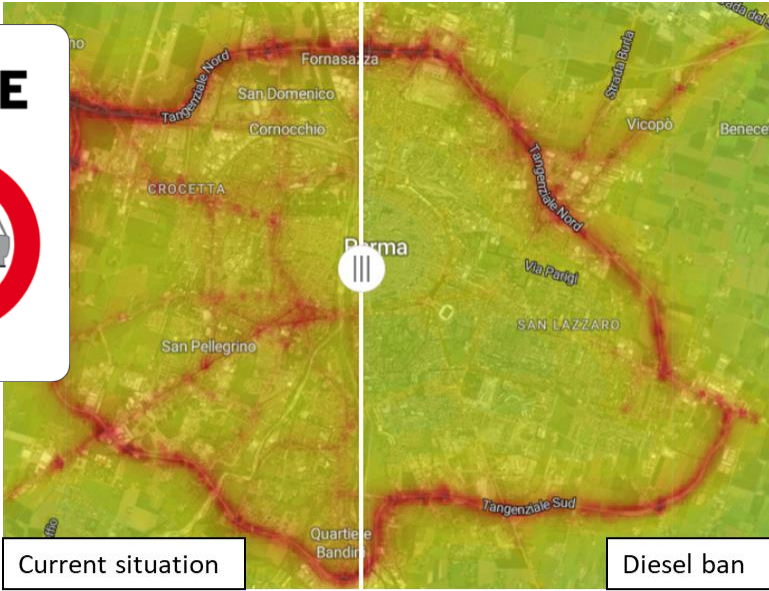
ATMO-PLAN - APPLICATION AND VALIDATION IN KRAKOW, POLAND

Stijn Vranckx, Hans Hooyberghs, Marlies Vanhulsel, Lisa Blyth, Nele Smeets, Nele Veldeman, Bino Maiheu, Wouter Lefebvre, Stijn Janssen (VITO), Ewa Bielas, Włodzimierz Zaleski (City of Krakow)
Email: Stijn.Vranckx@vito.be

Why a web-based decision support tool for air quality?

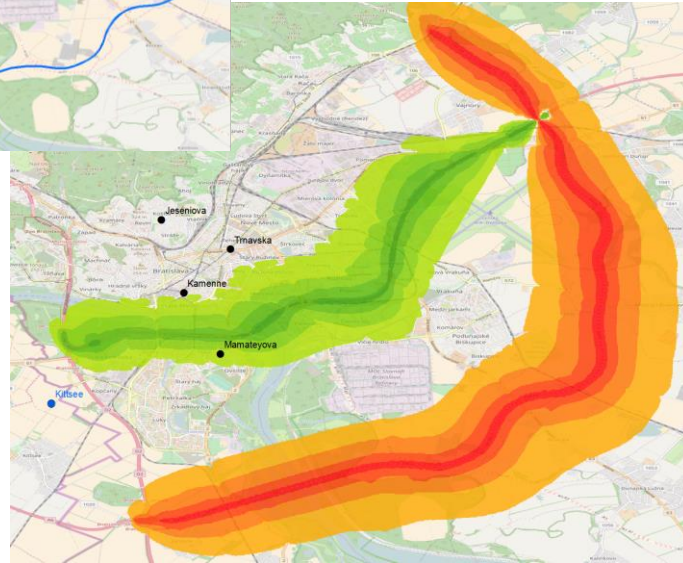
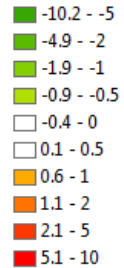
Assessment of emission reduction scenarios on urban scale in high resolution

- Introduction of low emission zones?
- New roads, new traffic plans...



New ring road scenario

Change in NO₂



Krakow_2015_2017 + ↻ 🗑️

Grid

POI

RIO_network2017 + ↻ 🗑️ 📄

Emissions

Background

Meteo

Low emission zones

Concentrations

This case and it's scenarios should not be modified as the result calculation is in progress or finished.

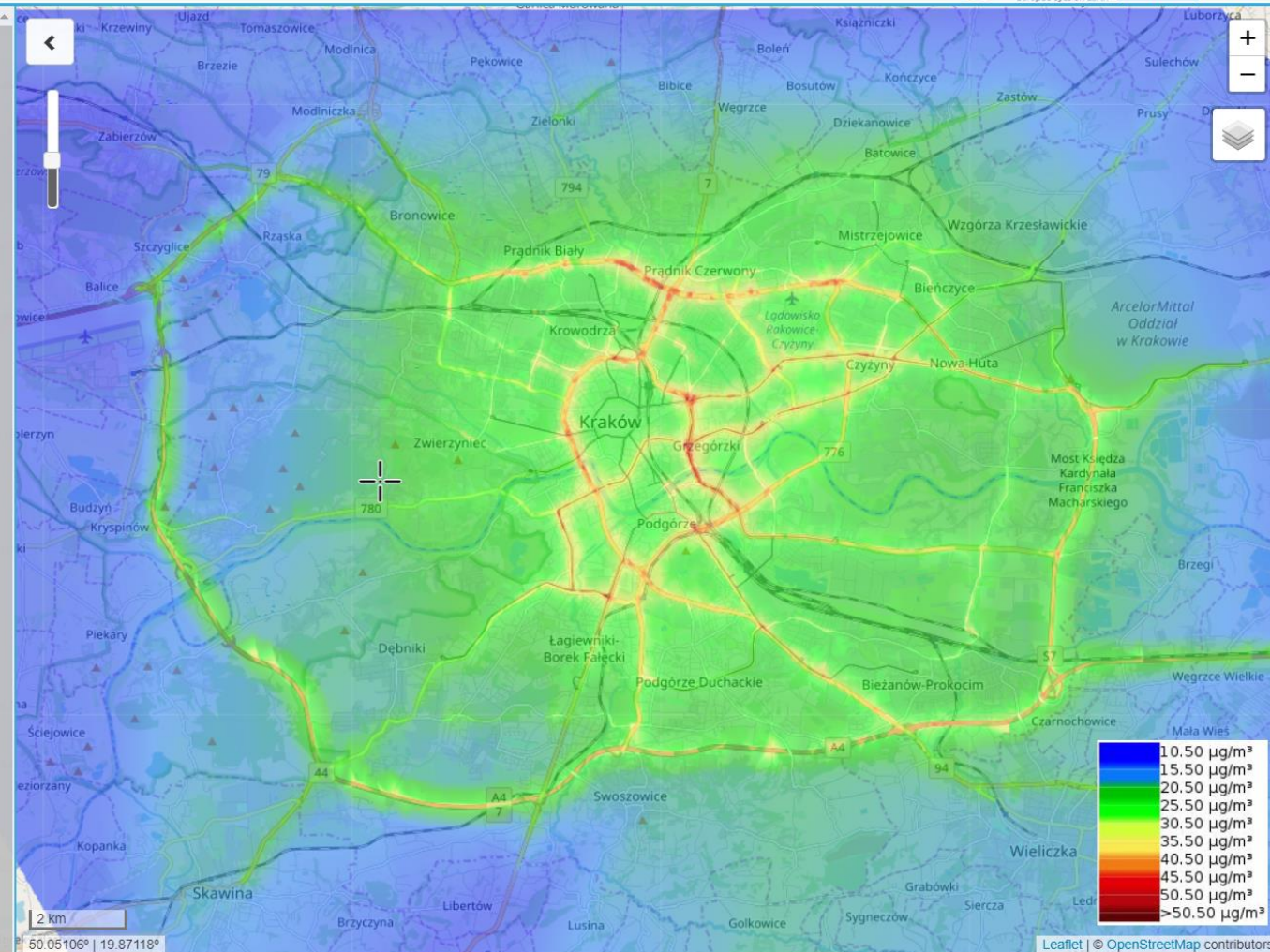
Concentrations

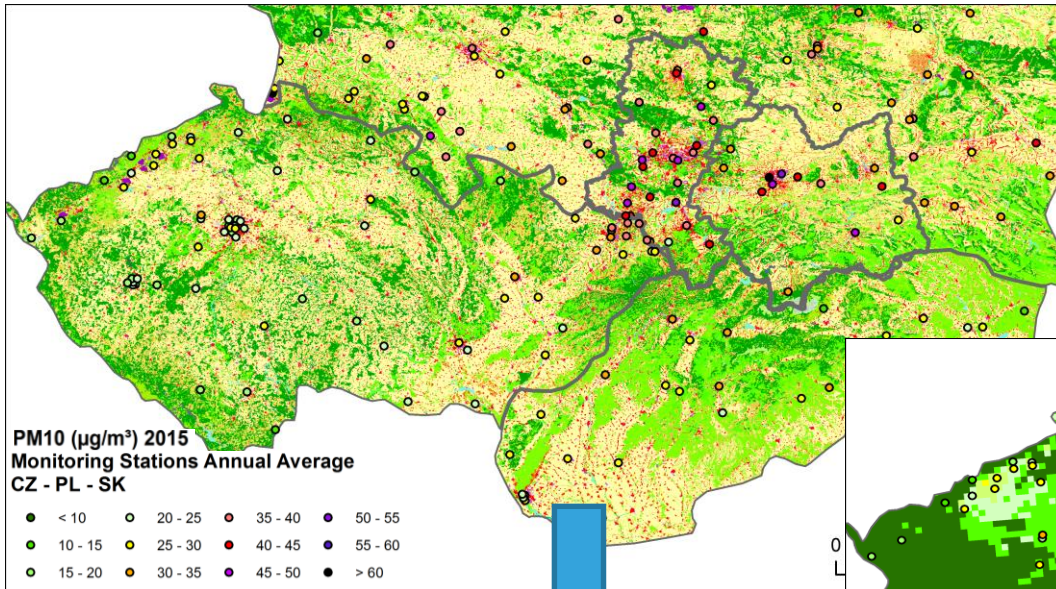
The calculation is finished.

NO2 - MEAN ↕ Download Toggle POI's

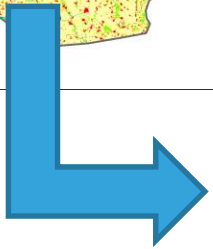
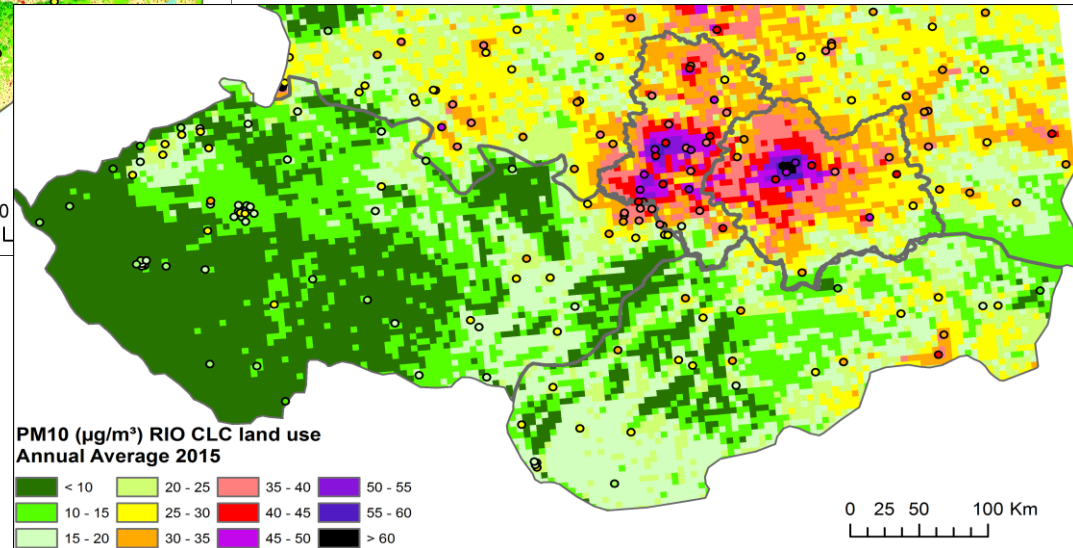
Legend type ↻

- Default legend
- Automatic min and max values.
- Custom minimum and maximum

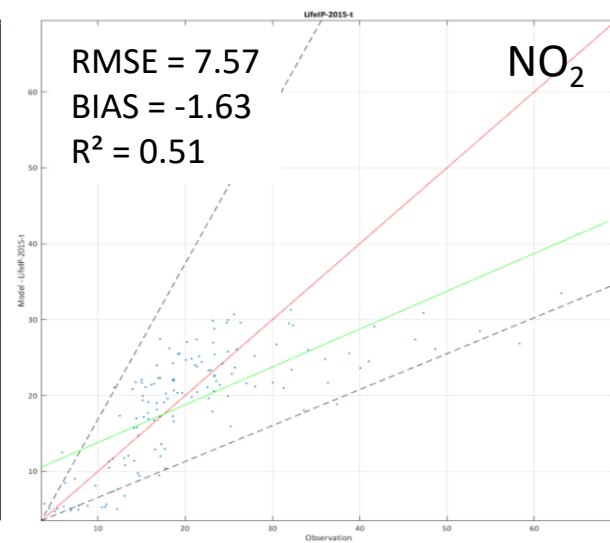
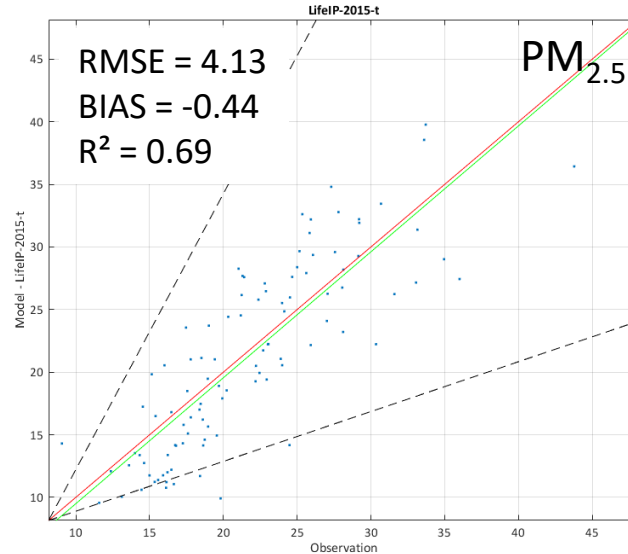
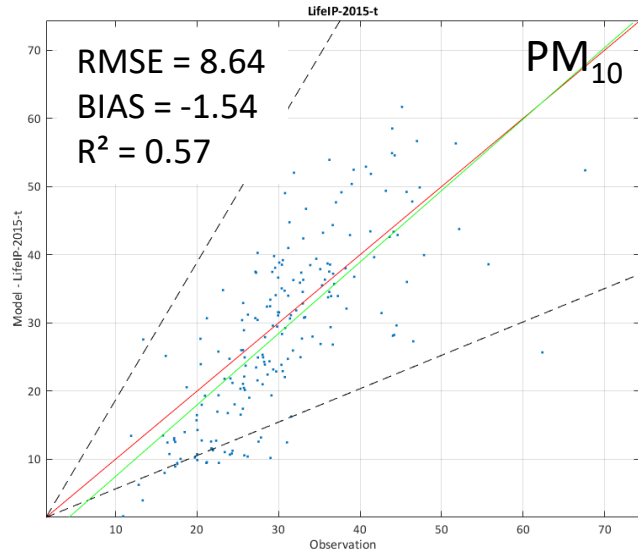




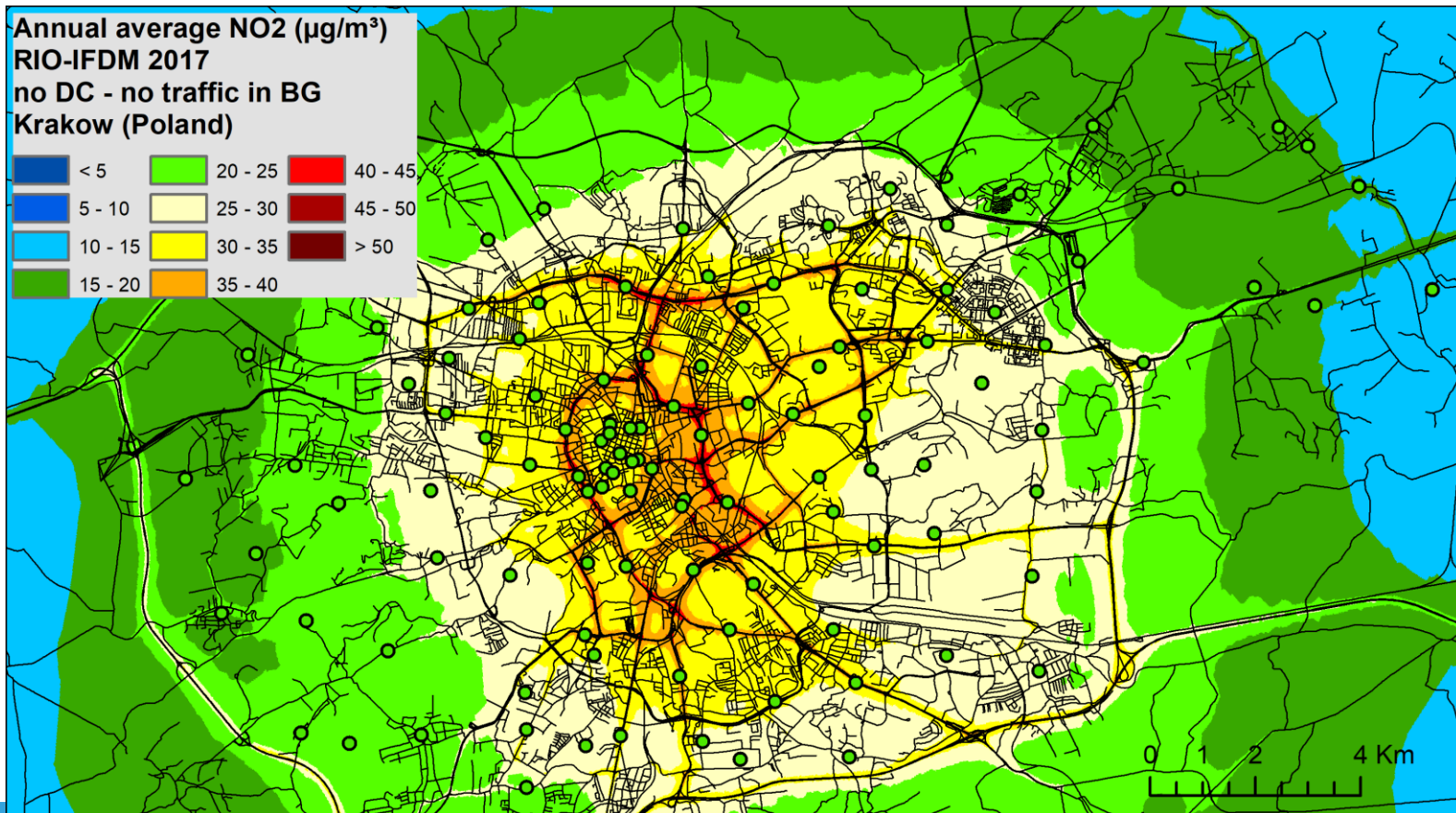
From monitoring data to air quality maps using land cover information and population density

Leaving-one-out validation

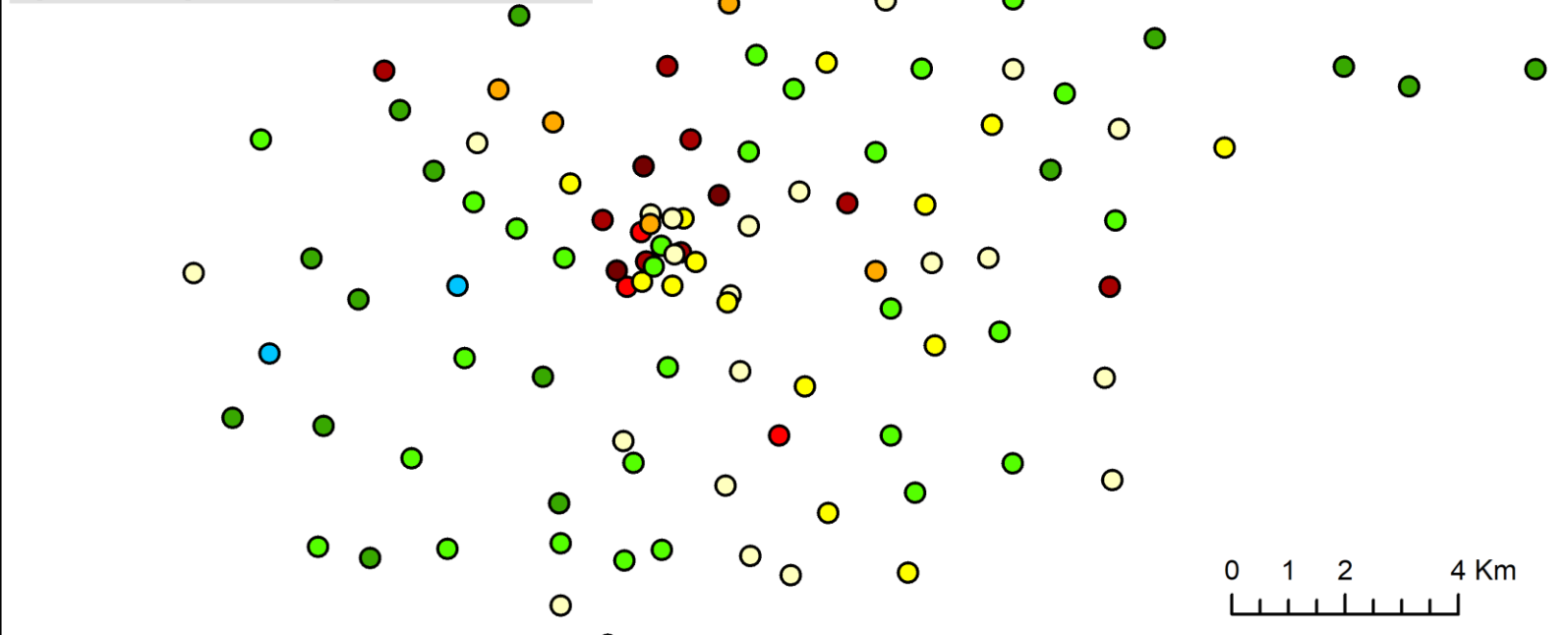


- Spatial resolution: 4.7 x 4.7 km² grid
- Temporal resolution: hourly data



Passive sampler NO₂ ($\mu\text{g}/\text{m}^3$)
 28/5-25/6 2017
 Linear correction

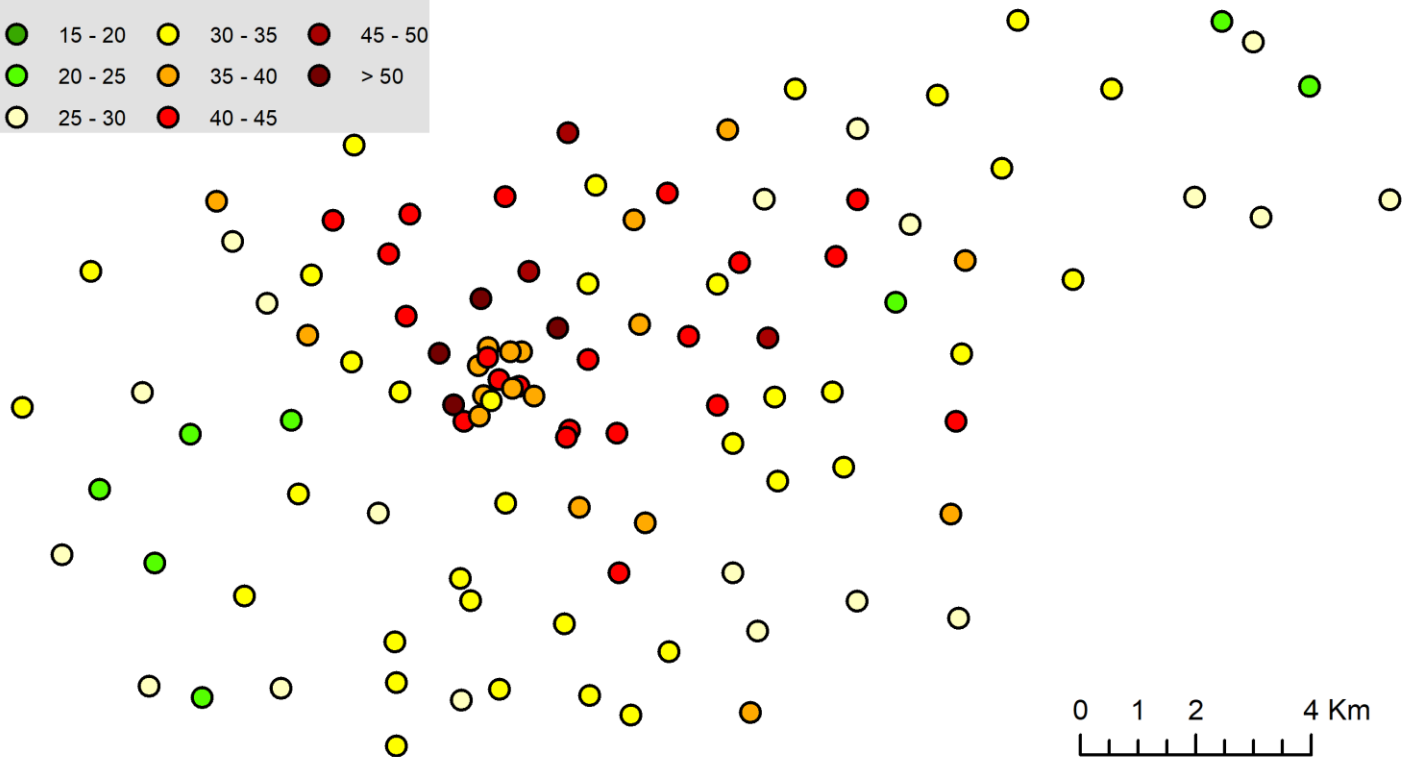
● < 5	● 15 - 20	● 30 - 35	● 45 - 50
● 5 - 10	● 20 - 25	● 35 - 40	● > 50
● 10 - 15	● 25 - 30	● 40 - 45	



High Spatial Variation!

Passive sampler NO2 ($\mu\text{g}/\text{m}^3$)
 19/11-17/12 2017
 Linear correction

● < 5	● 15 - 20	● 30 - 35	● 45 - 50
● 5 - 10	● 20 - 25	● 35 - 40	● > 50
● 10 - 15	● 25 - 30	● 40 - 45	



NO₂ passive sampler campaigns:

- Campaign 1 summer 28/05/2017 – 25/06/2017 – 114 locations
- Campaign 2 winter 19/11/2017 – 17/12/2018 – 110 locations

Road locations	53
Urban Green	11
Residential area	26
Industrial area	10
Pedestrian zone	6
Official monitoring station	8

Step 1: comparison of passive sampler data with official monitoring stations Krakow

	Station	Latitude	Longitude	Monitor (µg/m ³) 28/5-25/6	Sensor (µg/m ³) 28/5-25/6	Monitor (µg/m ³) 19/11-17/12	Sensor (µg/m ³) 19/11-17/12
WIOŚ Bulwarowa	PL039A	50.06935	20.05354	24.94	29.81	35.52	51.00
WIOŚ Bujaka	PL501A	50.01028	19.94934	28.08	32.46	35.40	45.00
WIOŚ Dietla	PL641A	50.05761	19.94563	38.48	39.06	39.38	52.00
WIOŚ Krasińskiego	PL012A	50.05797	19.92602	63.61	77.47	59.35	79.00

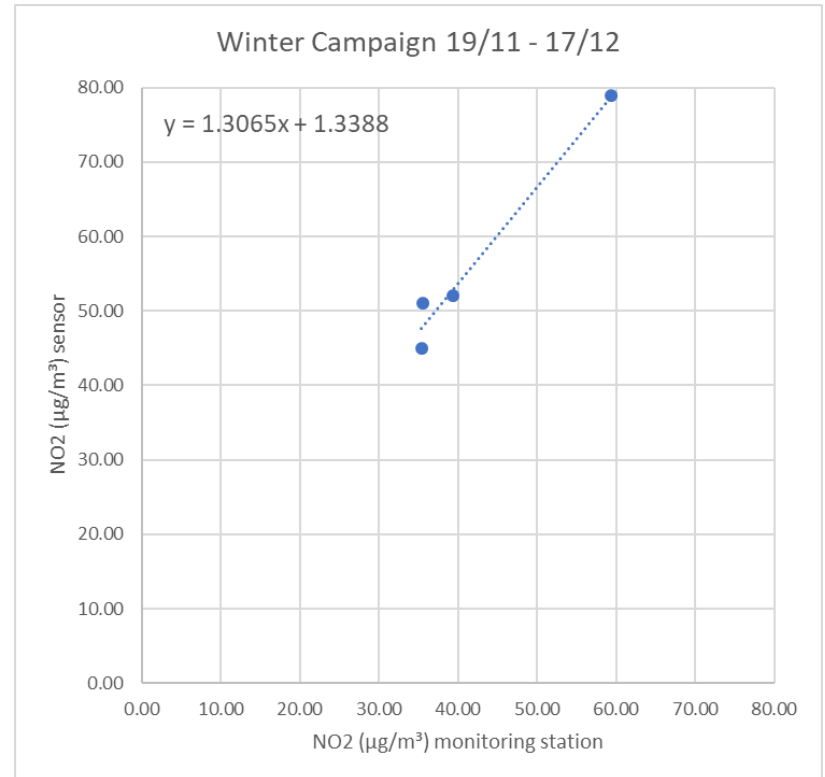
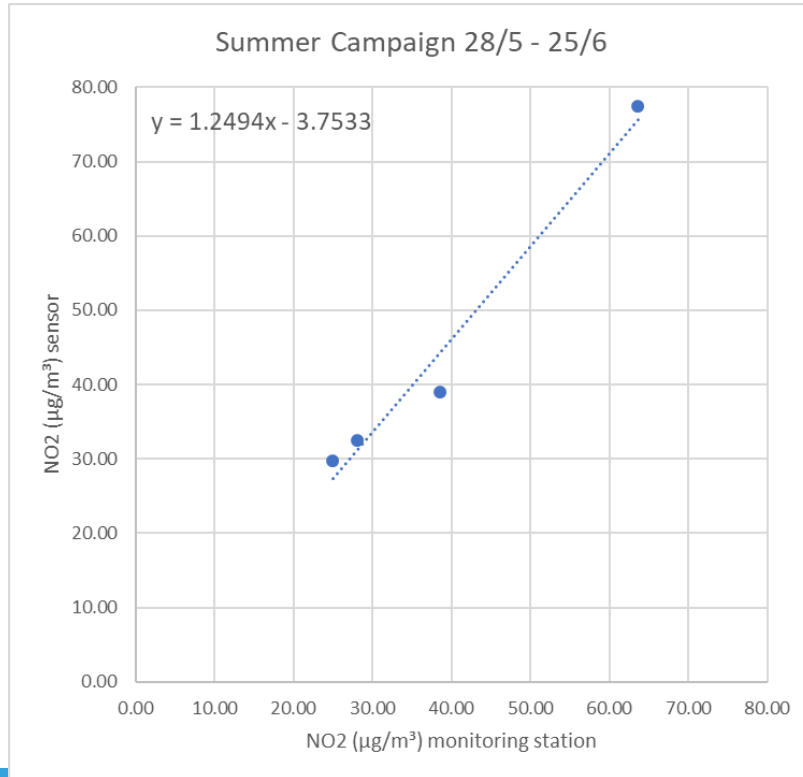
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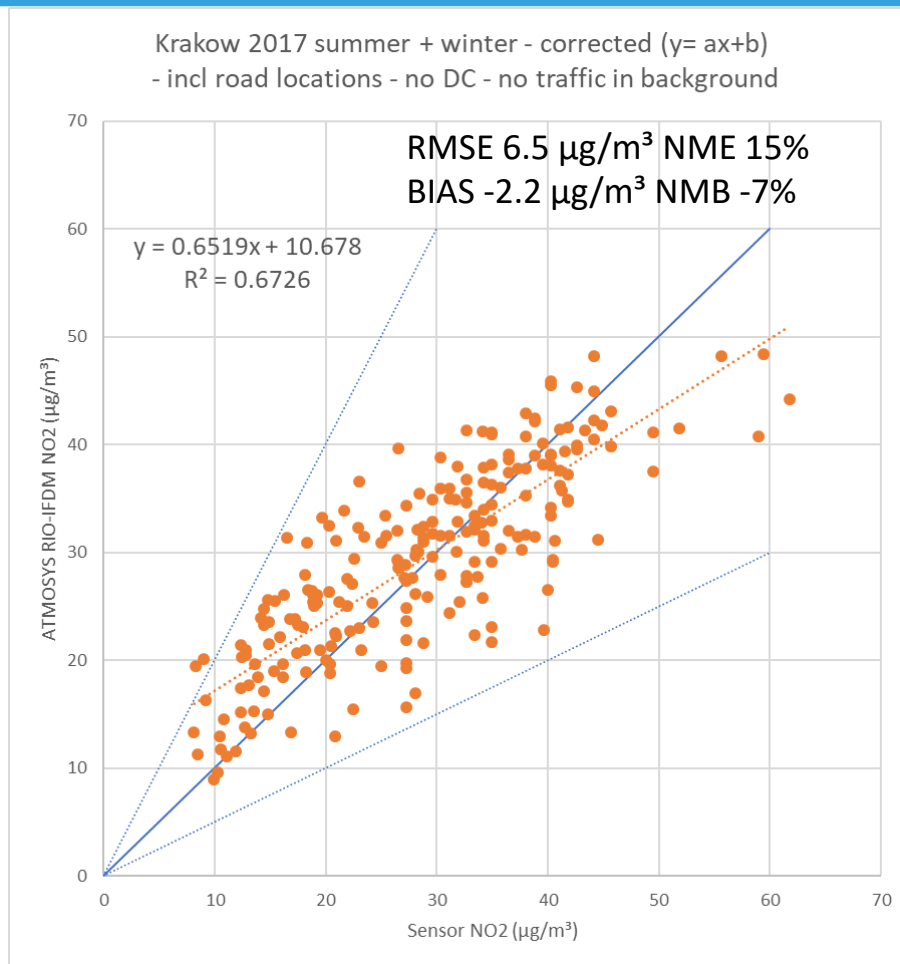
Step 1: comparison of passive sampler data with official monitoring stations Krakow

	Station	Latitude	Longitude	Rel. Diff. 28/5-25/6	Rel. Diff. 19/11-17/12	Abs. Diff. (µg/m ³) 28/5-25/6	Abs. Diff. (µg/m ³) 19/11-17/12
WiOŚ Bulwarowa	PL039A	50.06935	20.05354	19%	44%	4.86	15.48
WIOŚ BUJAKA	PL501A	50.01028	19.94934	16%	27%	4.37	9.60
WIOŚ Dietla	PL641A	50.05761	19.94563	1%	32%	0.57	12.62
WIOŚ Krasińskiego	PL012A	50.05797	19.92602	22%	33%	13.86	19.65
					AVERAGE	5.92	14.34

Step 1: comparison of passive sampler data with official monitoring stations Krakow



- Passive sampler data
 - Option 1: model output versus raw sensor data
 - Option 2: model output versus corrected sensor data – absolute correction
 - Option 3: model output versus corrected sensor data – correction linear fit**
- **Monthly average values!** based on RIO-IFDM hourly resolution
- Traffic emissions: **network 2017 (VISUM) – Fleet 2014**
- Meteo data 2017 (ERA-interim ECMWF)
- Background RIO 2017 - Option 1 **No double counting – no traffic in background**
 - Option 2 Double counting – traffic stations in background



- Application ATMO-PLAN
 - **Operational web-based decision support tool for air quality**
- Validation ATMO-PLAN
 - Good validation given:
 - Limitations in passive sampler data
 - Need to correct passive sampler data based on monitor data
 - Limitations in model input data
 - Possible improvements:
 - Currently fleet data 2014 used
 - No street canyon modelling
- Outlook: Offline ATMO-Street map including street canyons

Krakow_2015_2017

Grid

POI

RIO_network2017

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Concentrations

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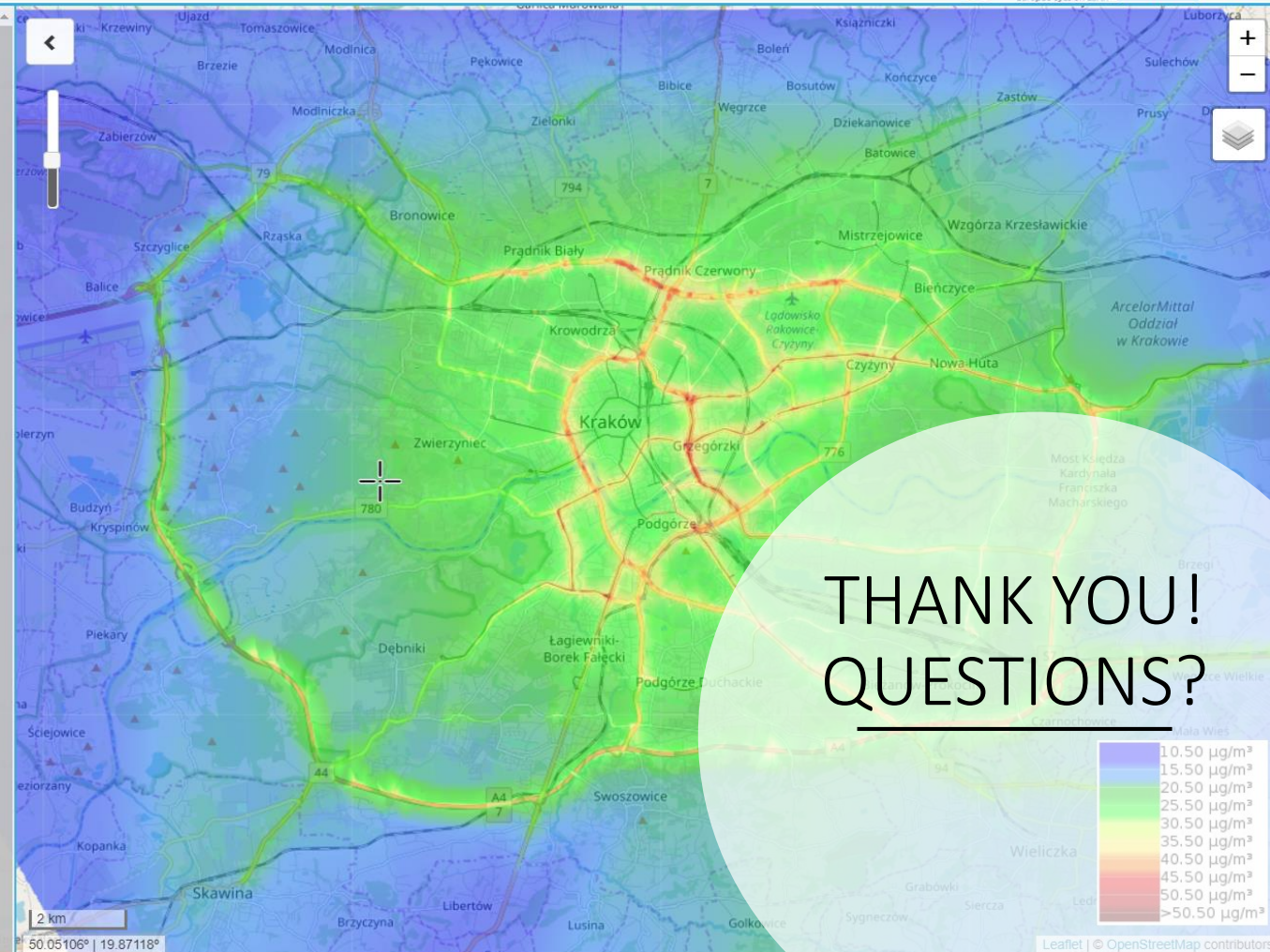
NO2 - MEAN

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THANK YOU!
QUESTIONS?

