

PMinter

MARIBOR, 18. - 19. SEPTEMBER 2013

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# Air quality in Maribor

## Why additional measurements?

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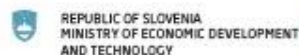


**Naložba v vašo prihodnost**  
Operacijo delno financira Evropska unija  
Evropski sklad za regionalni razvoj



**Investition in Ihre Zukunft**  
Operation teilweise finanziert von der Europäischen Union  
Europäischer Fonds für regionale Entwicklung

PMinter



# Air quality in Maribor

## CONTENT:

- Regular monitoring before PMinter (until 2009)
- Decisions according regular monitoring and project
- Regular monitoring during PMinter (2010-2013)
- Additional monitoring for PMinter (2010-2013)
- Regular monitoring after PMinter (2014)
- Additional information
- Conclusions and further decisions

# Air quality in Maribor

(regular monitoring until 2009)

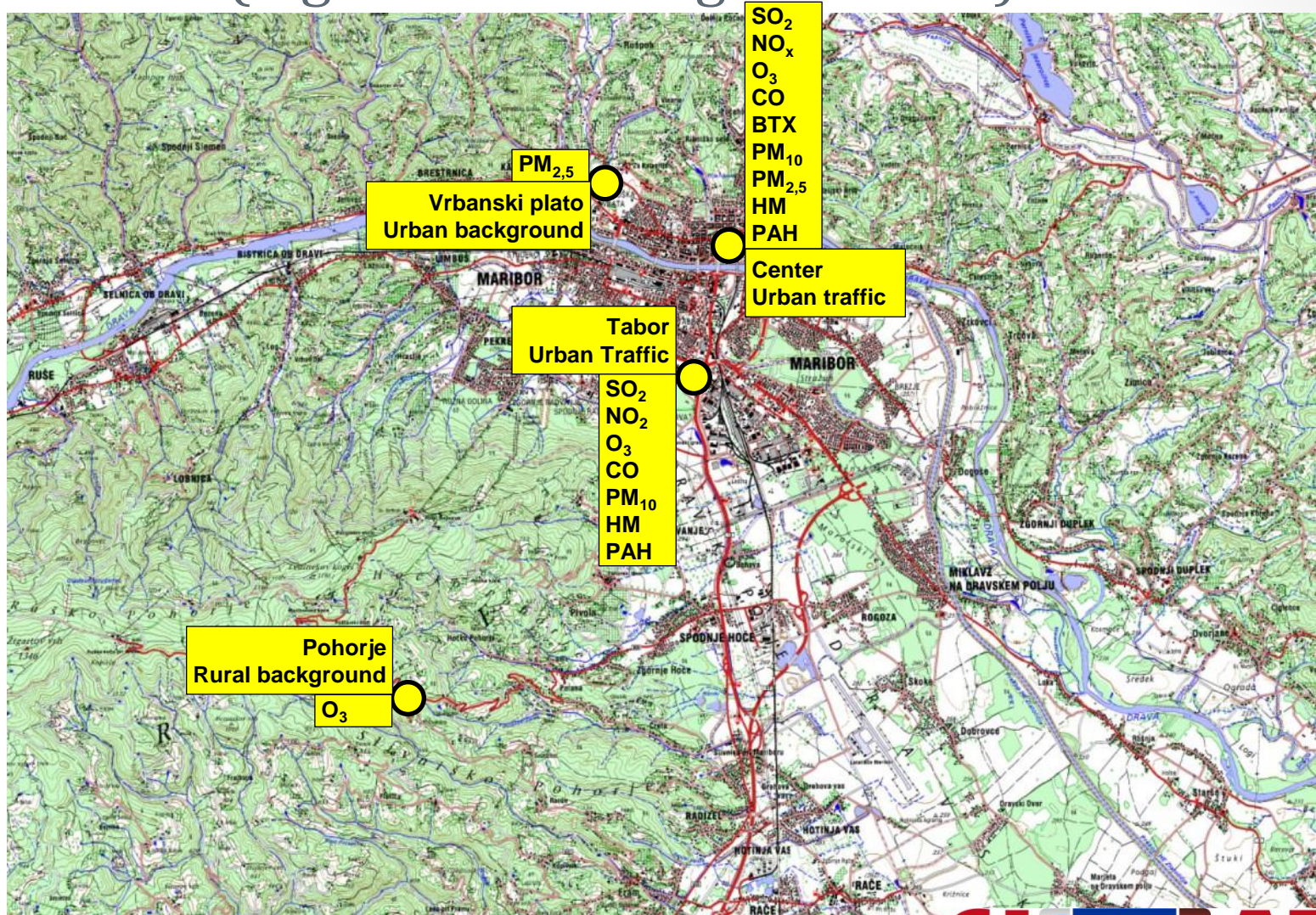
Regular monitoring in two measuring networks (before PMinter, 2010):

- Center, Urbanski plato (Environmental protection agency of Slovenia)
- Tabor, Pohorje (Municipality of Maribor – Public health institute Maribor)



# Air quality in Maribor

(regular monitoring until 2009)

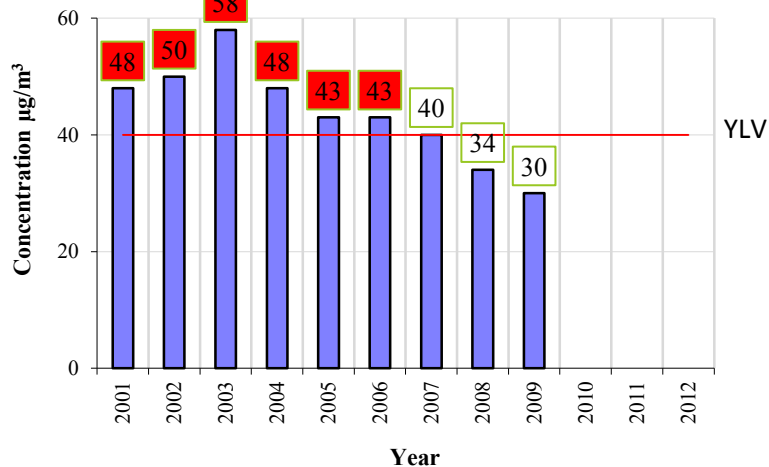


# Air quality in Maribor

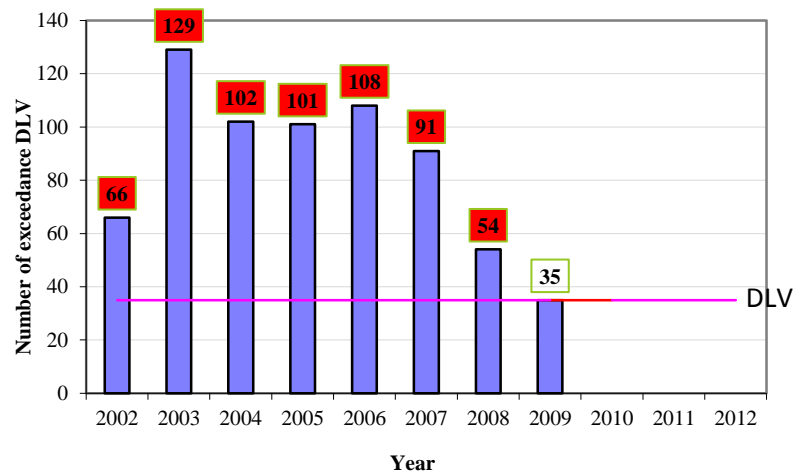
## (regular monitoring in 2009)

Pollutant	SO <sub>2</sub>	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2,5</sub>	CO	C <sub>6</sub> H <sub>6</sub>	Pb in PM <sub>10</sub>	Cd in PM <sub>10</sub>	As in PM <sub>10</sub>	Ni in PM <sub>10</sub>	B(a)P in PM <sub>10</sub>
Center	😊	😐	😐	😐	😐	😊	😊					
Vrbanski plato					😐							
Tabor	😊	😐		😐				😊	😊	😊	😊	😐
Pohorje			😐									

AIR QUALITY IN MARIBOR  
PM<sub>10</sub> (Center)



AIR QUALITY IN MARIBOR  
PM<sub>10</sub> - Center





# Air quality in Maribor

(regular monitoring)

## CONCLUSIONS:

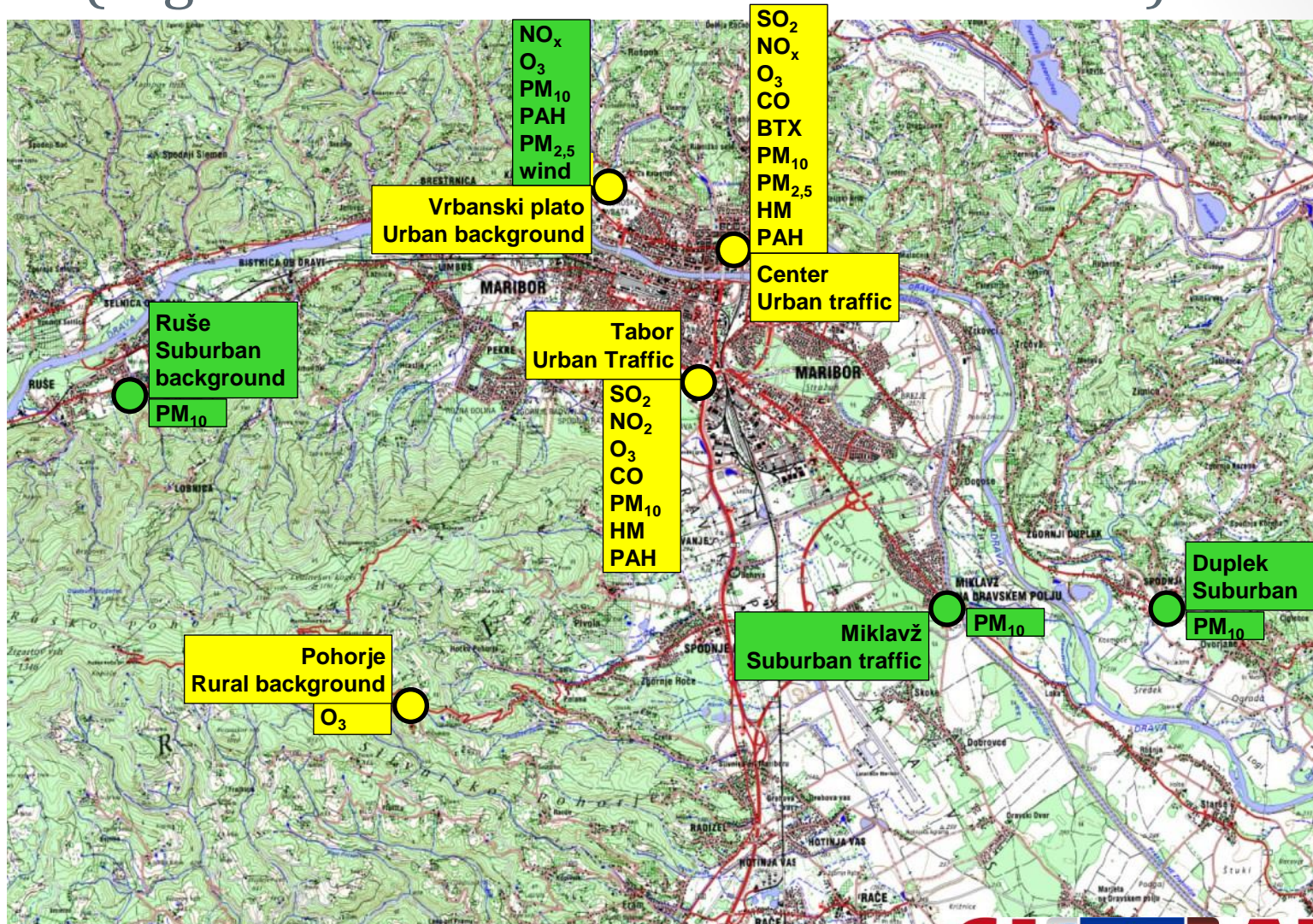
- We don't need two urban traffic stations
- We need urban background station also for other parameters
- We need additional measurements of PM<sub>10</sub>

## DECISIONS:

- We have stopped measure on second urban traffic station
- We have completed urban background station Urbanski plato: O<sub>3</sub>, NO<sub>x</sub>, PM<sub>10</sub>, B(a)p in PM<sub>10</sub>, wind speed and direction
- We have established new measuring stations for PM<sub>10</sub> around the city

# Air quality in Maribor

(regular measurements in 2010 and on)





# Air quality in Maribor

## (PMinter proposal)

### STARTING POINTS:

- PM<sub>10</sub> over limit values
- Too little information about sources
- Too little information about spatial distribution

### DECISIONS:

- We need Air Quality Management Plan (AQMP)

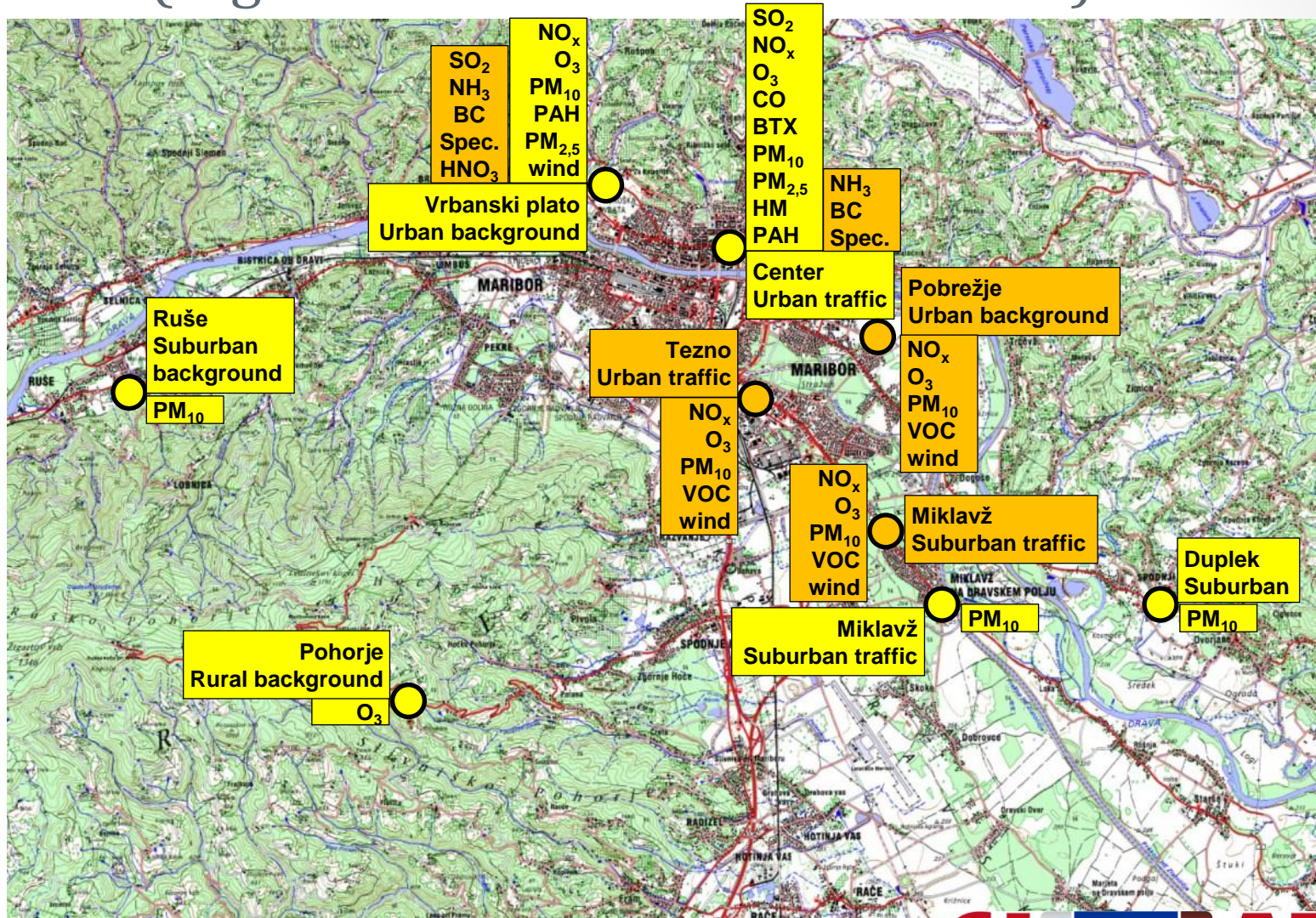
For AQMP:

- We need additional measurements in the city and surroundings: pollutants, meteorology
- We need additional analysis of particles
- We need emission inventory...



# Air quality in Maribor

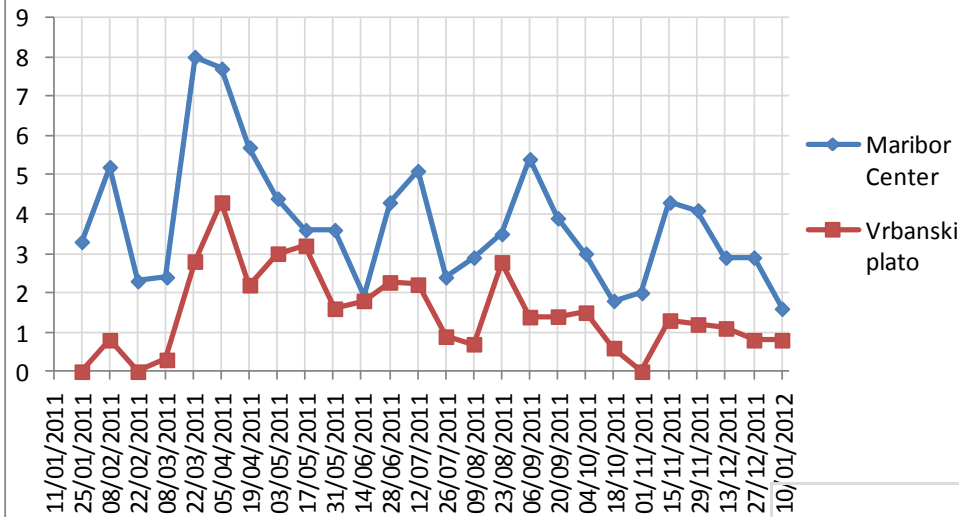
## (regular + PMinter measurements)



# Measurements results

## (PMinter additional monitoring - NH<sub>3</sub>)

Amonijak - NH<sub>3</sub> (µg/m<sup>3</sup>)



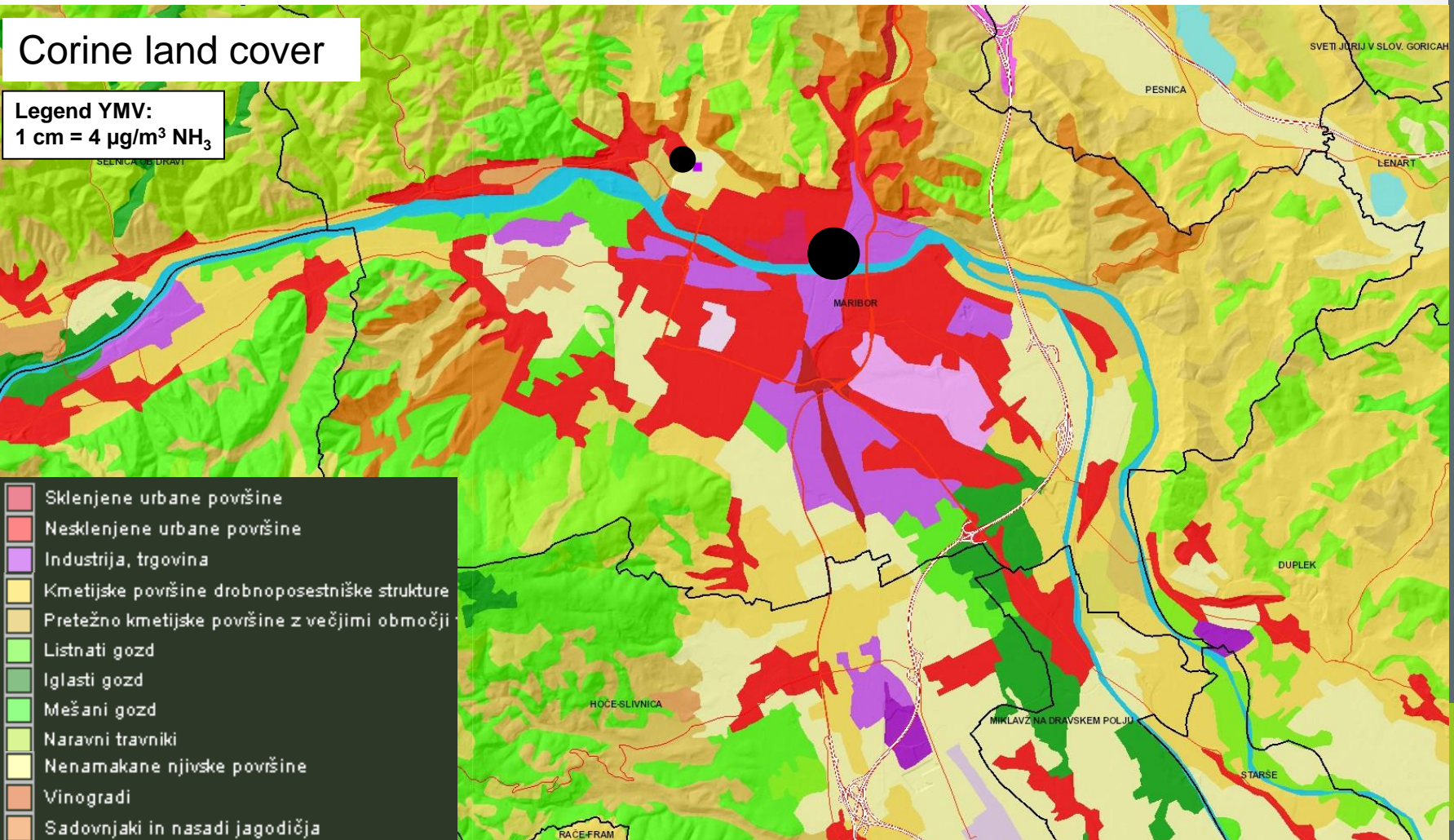
Measuring point	Concentration in µg/m <sup>3</sup>		
	Cyear	Cwinter	Csummer
Vrbanški plato	1,7	1,1	2,1
Center	3,8	3,4	4,2
Leibnitz <sup>1</sup>	3,1	3,5	2,8
Landscha <sup>1</sup>	5,8	5,8	5,8
Arnfels/Remschnigg <sup>1</sup>	1,5	1,4	1,6
WHO 2000,vegetation protection	8,0		

<sup>1</sup>Source: NH<sub>3</sub>-Passivsämmlermessungen im Leibnitzer Feld, LU-02-2012, Amt der Steiermärkischen Landesregierung, Fachabteilung 17C – Technische Umweltkontrolle, Referat Luftgüteüberwachung,



# Measurements results

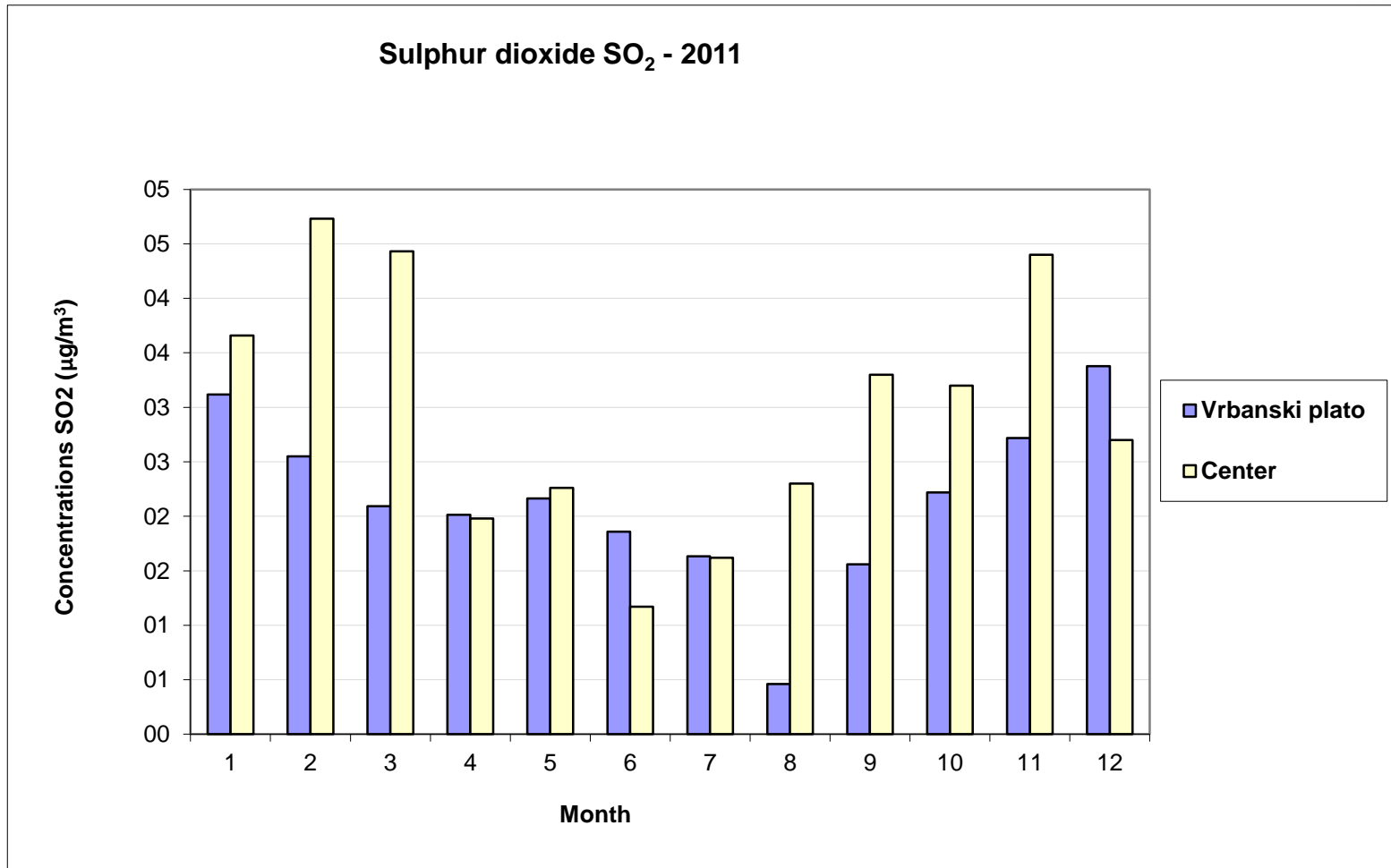
## (PMinter additional monitoring – NH<sub>3</sub>)





# Measurements results

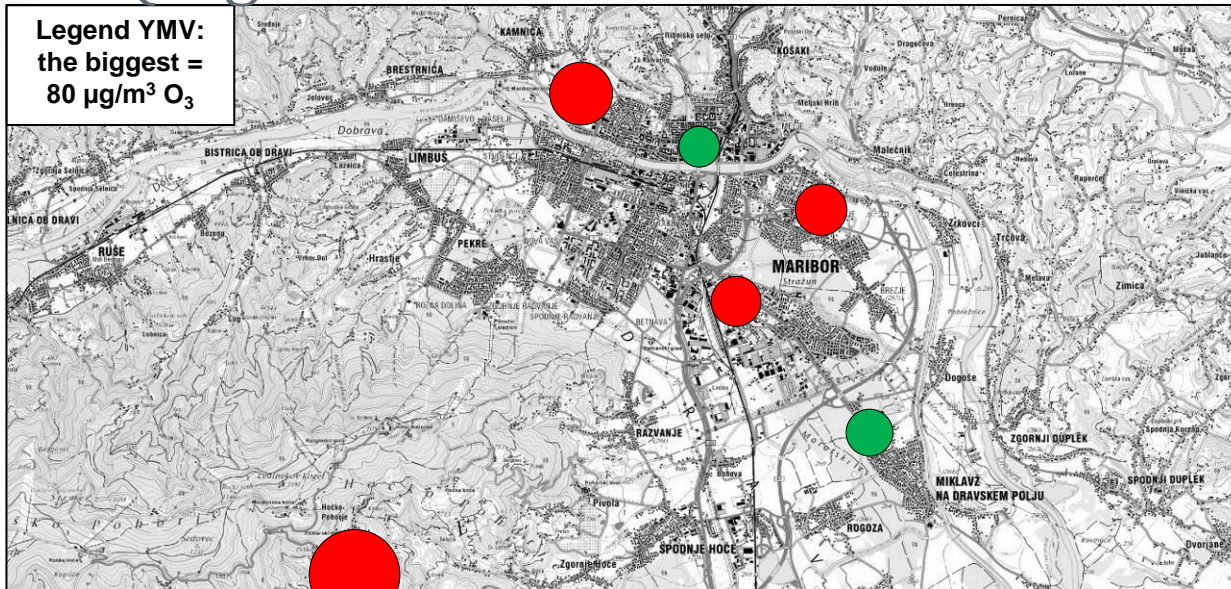
(PMinter additional monitoring- SO<sub>2</sub>)



# Measurements results

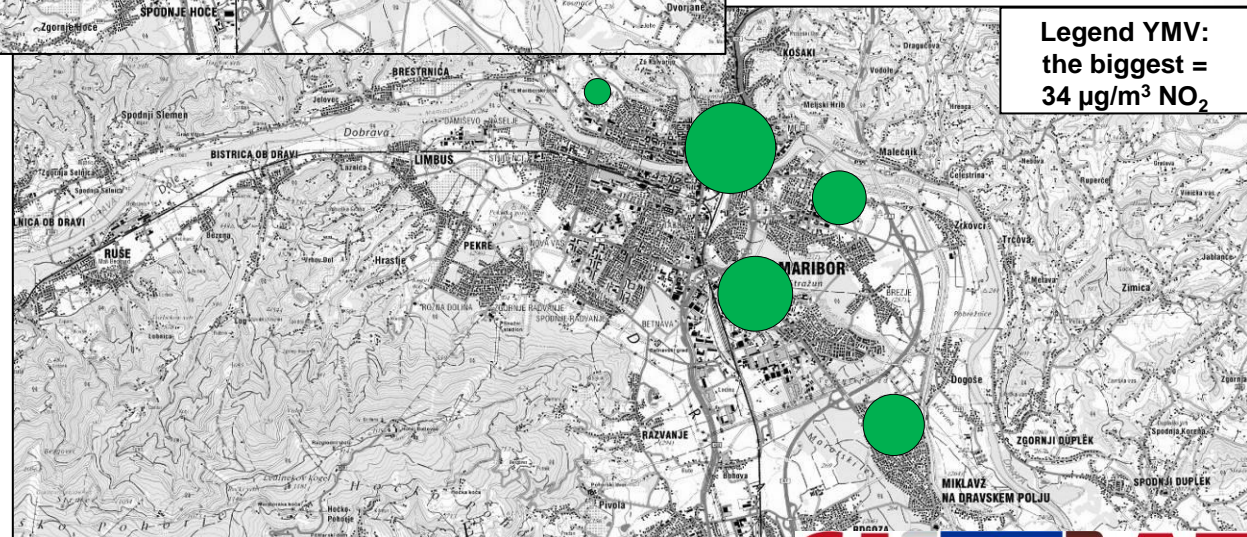
(regular + PMinter additional monitoring NO<sub>2</sub>+O<sub>3</sub>)

Legend YMV:  
the biggest =  
80 µg/m<sup>3</sup> O<sub>3</sub>



O<sub>3</sub> yearly mean  
values 2011

Legend YMV:  
the biggest =  
34 µg/m<sup>3</sup> NO<sub>2</sub>



NO<sub>2</sub> yearly mean  
values 2011

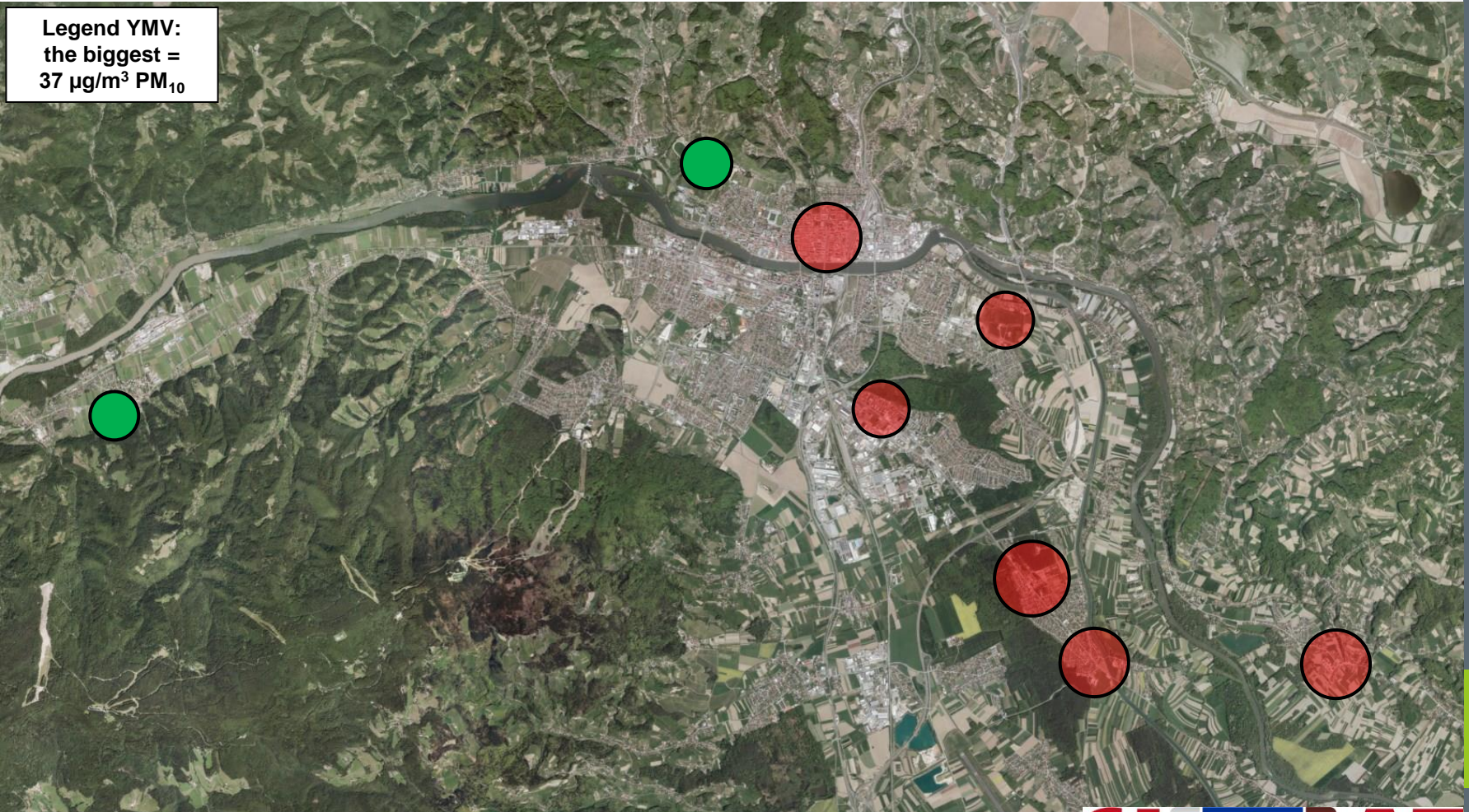


# Measurements results

(regular + PMinter additional monitoring)

PM10 yearly mean values 2011

Legend YMV:  
the biggest =  
37  $\mu\text{g}/\text{m}^3$  PM<sub>10</sub>

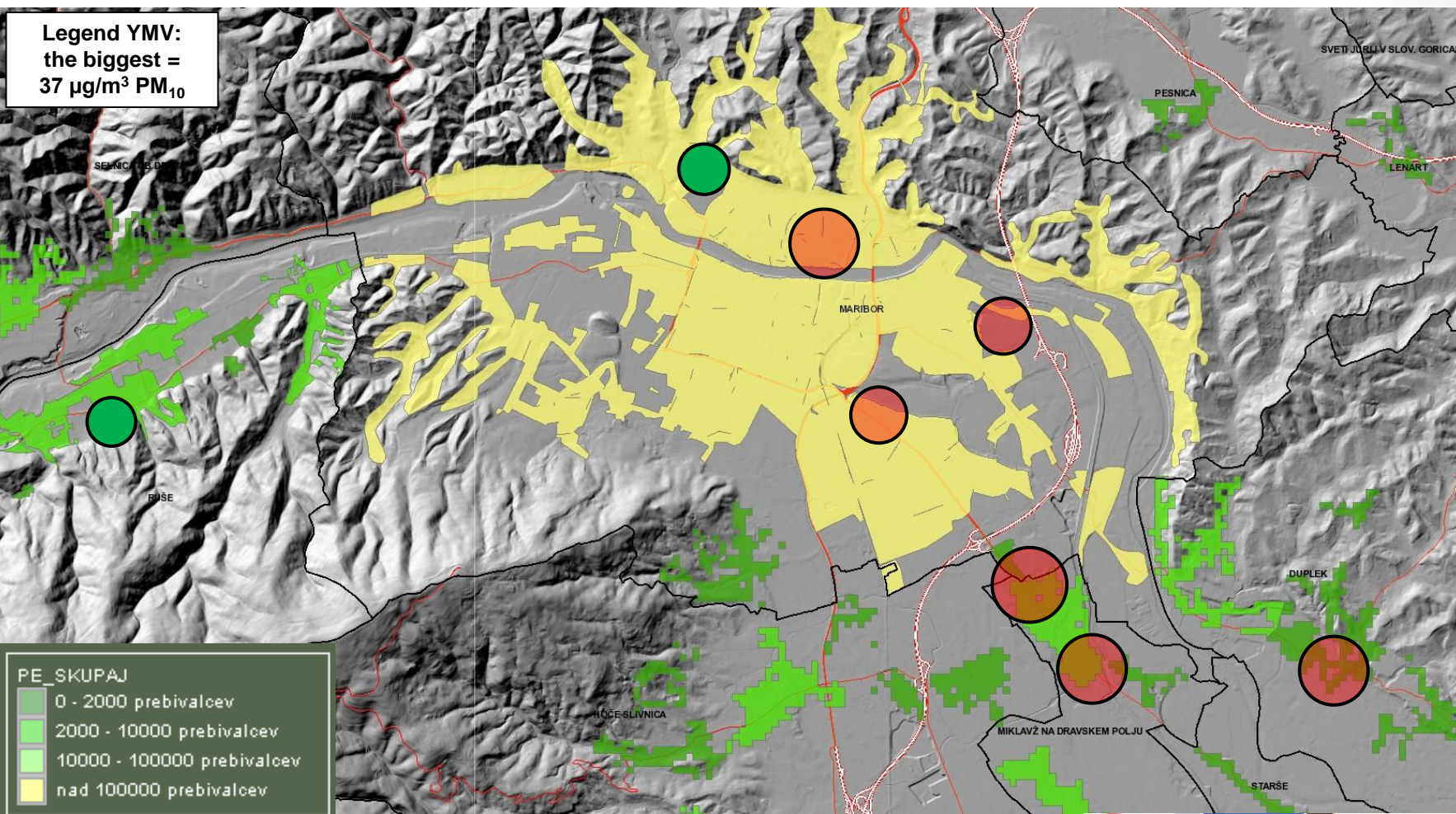




# Measurements results

(regular + PMinter additional monitoring)

PM10 yearly mean values 2011 + density of population + relief + other communes

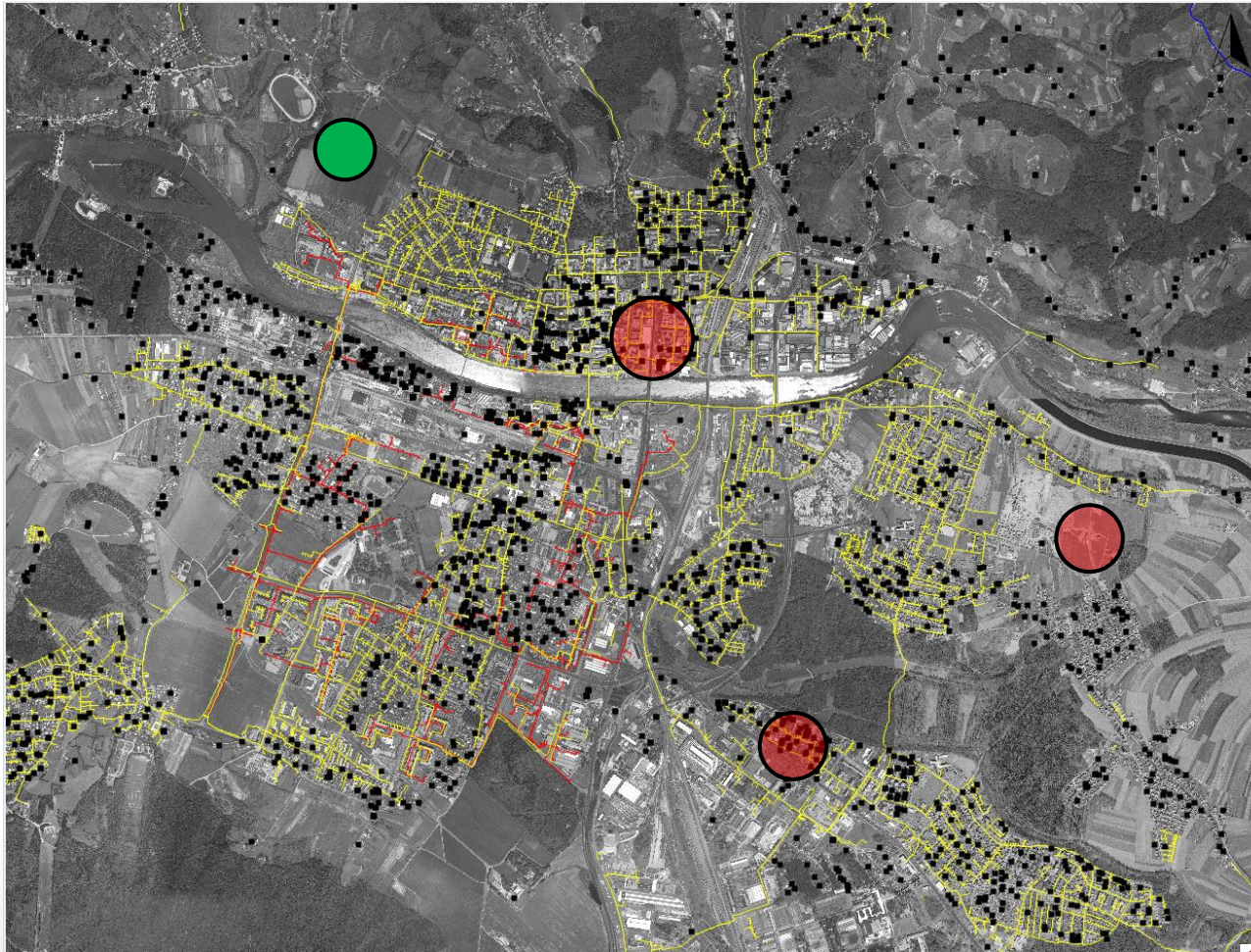




# Measurements results

(regular + PMinter additional monitoring)

PM10 yearly mean values 2011 + heating



MARIBOR

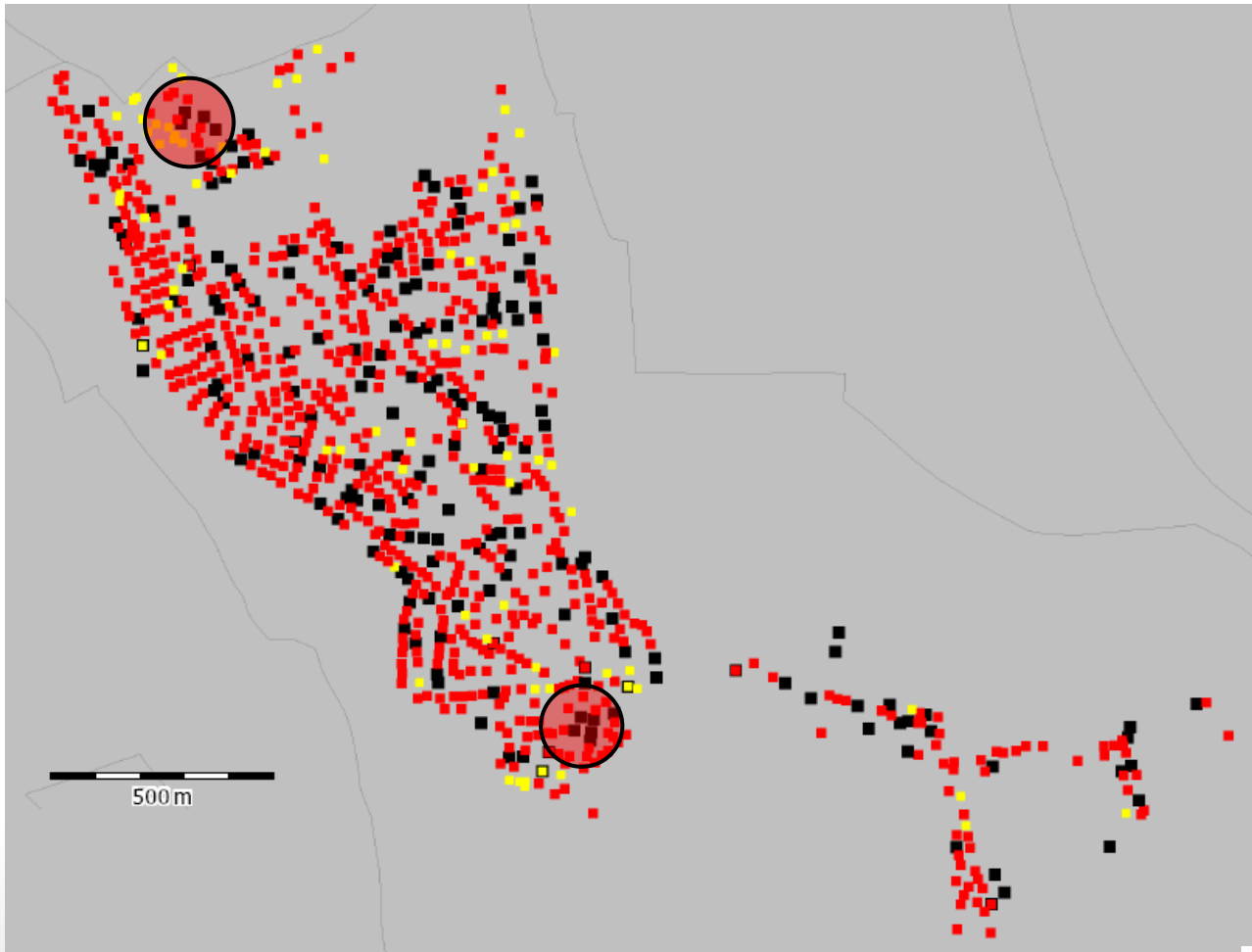
Heating:

- Wood (11 %)
- District (12 %)
- Natural gas (34 %-power)

# Measurements results

(regular + PMinter additional monitoring)

PM10 yearly mean values 2011 + heating



MIKLAVŽ

Heating:

- Wood (17 %)
- Liquid (60 %)
- Natural gas (15 %-number)

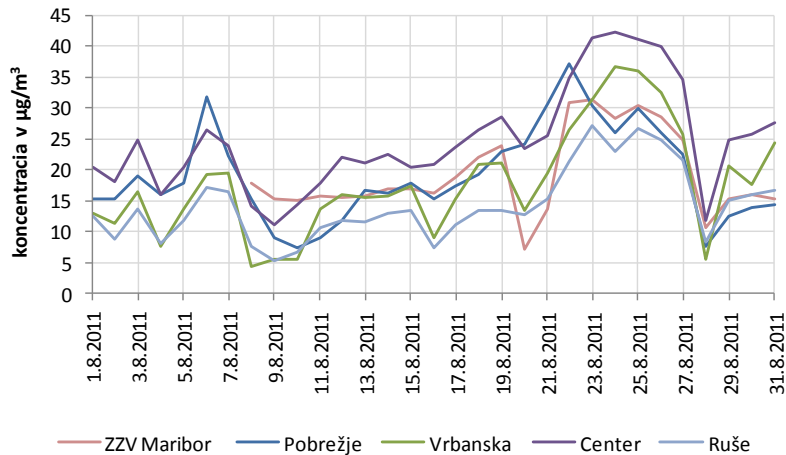


# Measurements results

## (regular + PMinter additional monitoring)

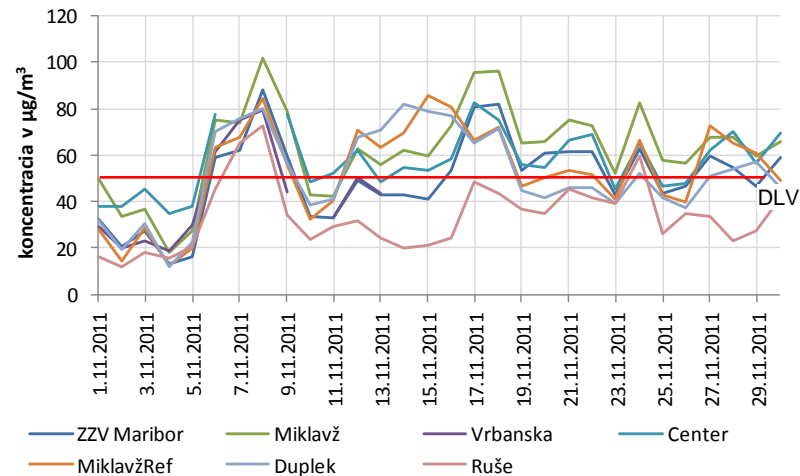
KAKOVOST ZRAKA V MARIBORU - 2011

primerjava povprečnih dnevni vrednosti PM<sub>10</sub> - avgust 2011



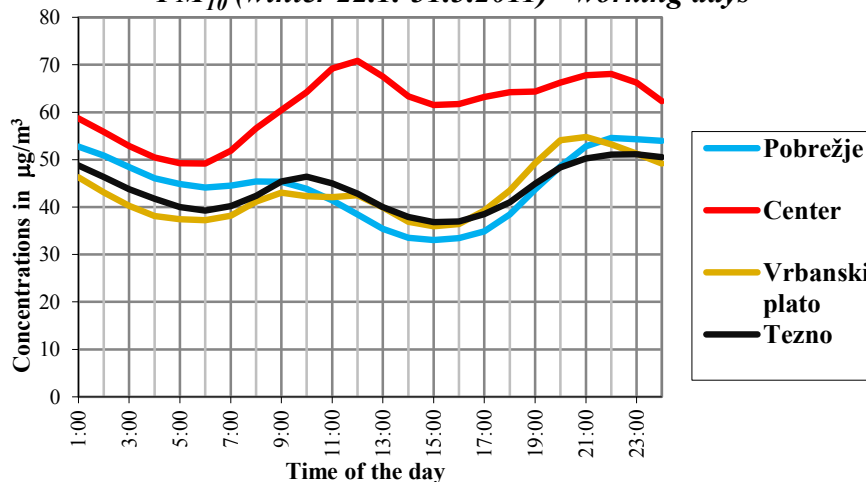
KAKOVOST ZRAKA V MARIBORU - 2011

primerjava povprečnih dnevni vrednosti PM<sub>10</sub> - november 2011



PM<sub>10</sub> –  
August 2011

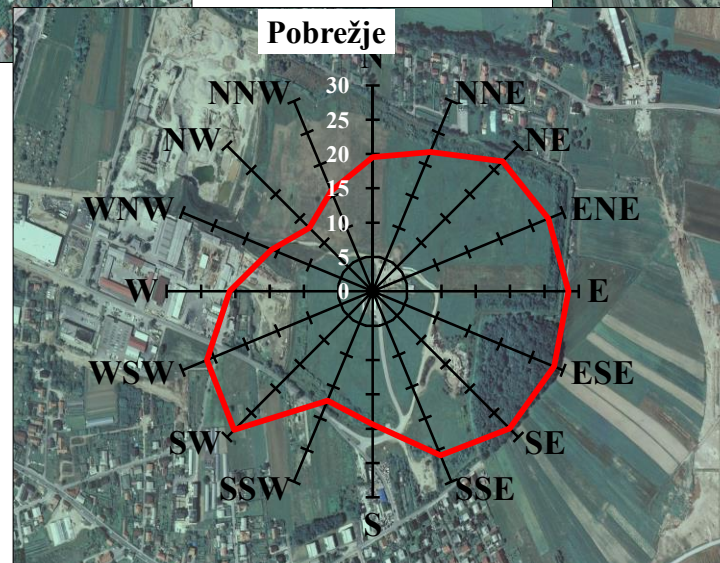
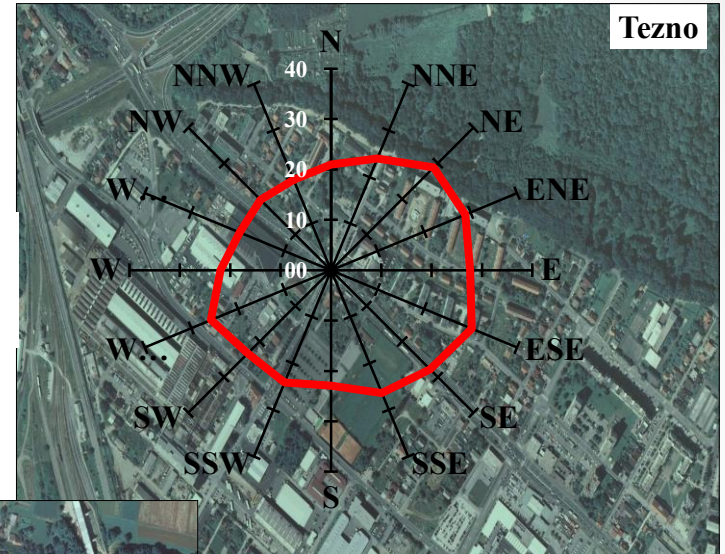
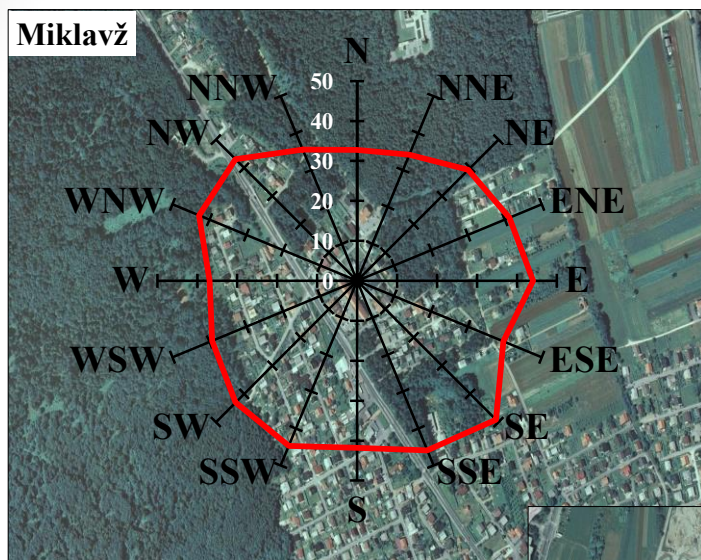
Daily average concentrations  
PM<sub>10</sub> (winter 22.1.-31.3.2011) - working days



PM<sub>10</sub> –  
November 2011

# Measurements results

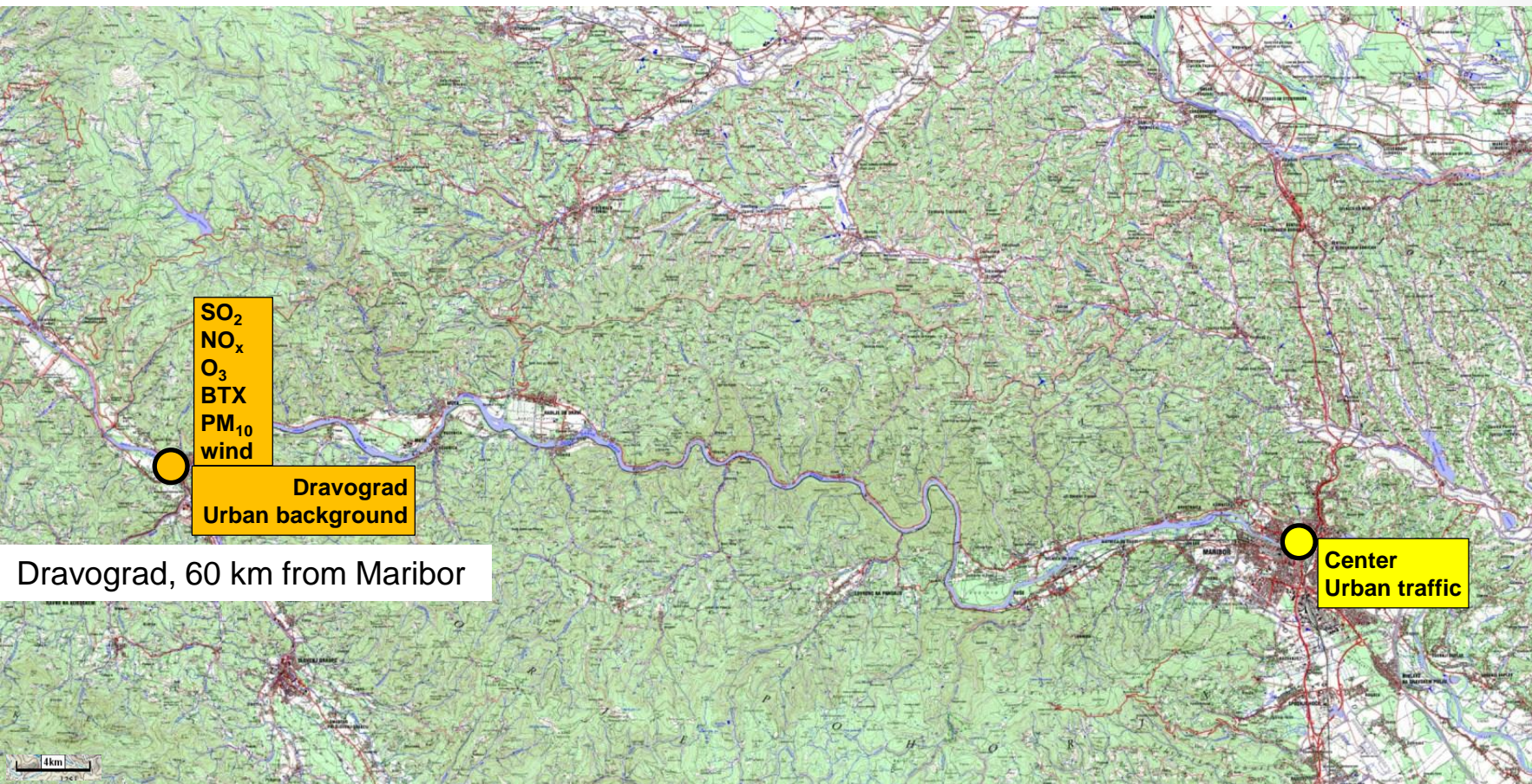
(PMinter additional monitoring)





# Air quality in Maribor

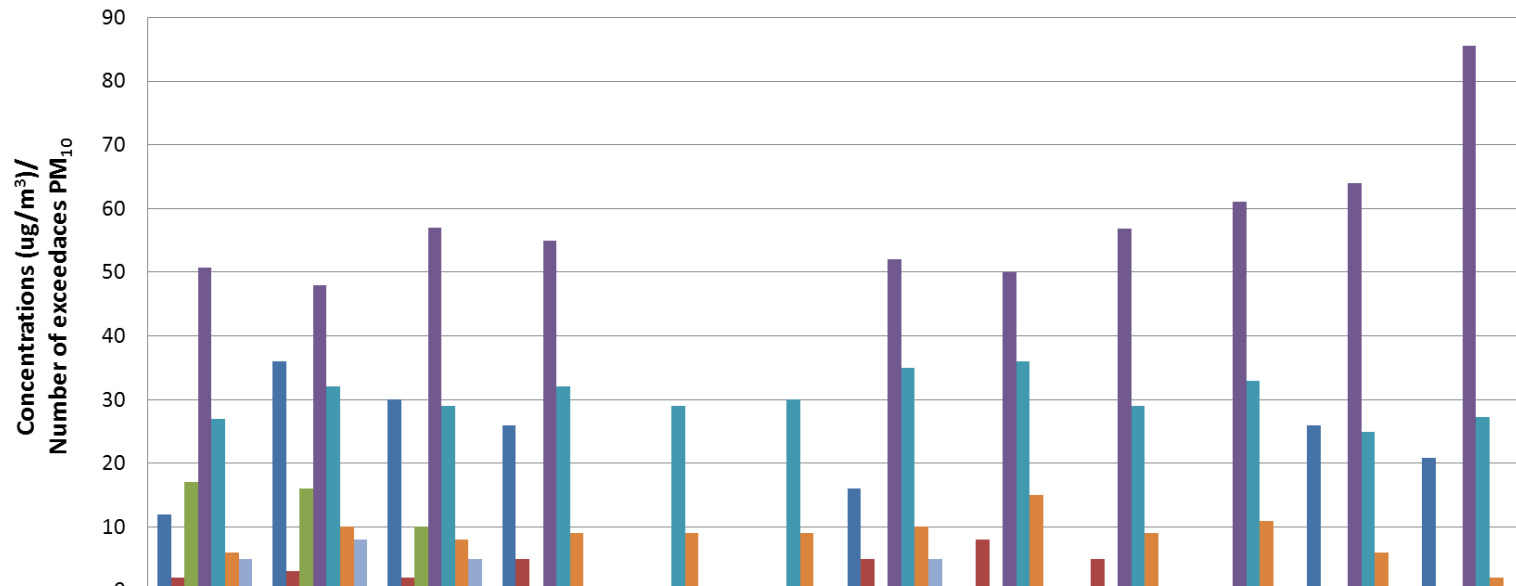
(PMinter additional monitoring)



# Measurements results

(PMinter additional monitoring– EPA Dravograd)

Comparison between Slovenian measuring locations  
1.3.-6.4. and 2.8.-31.8.2011

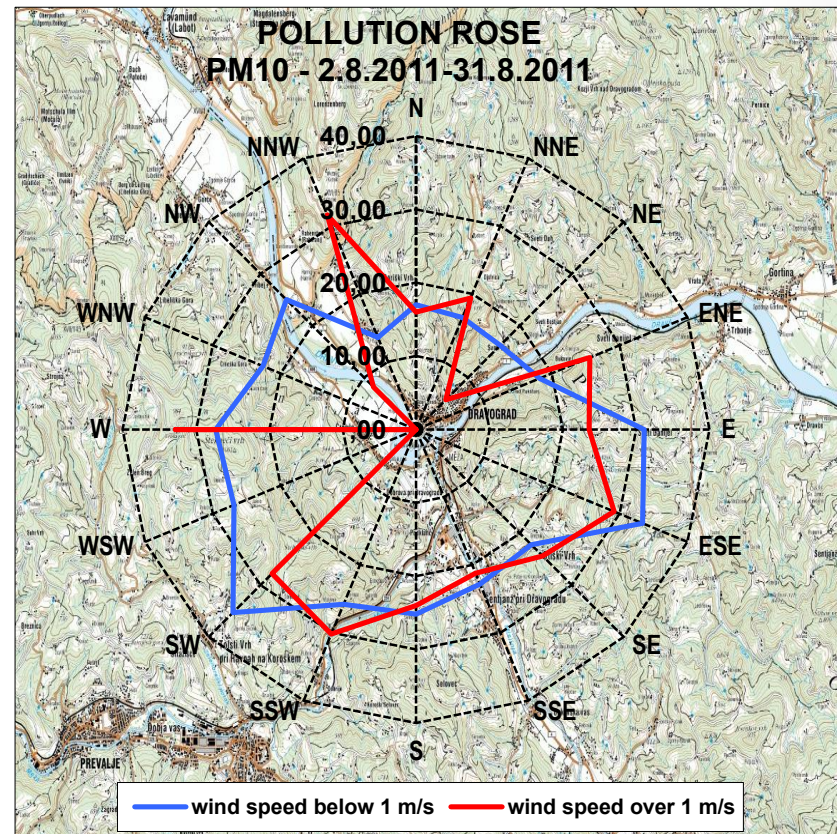
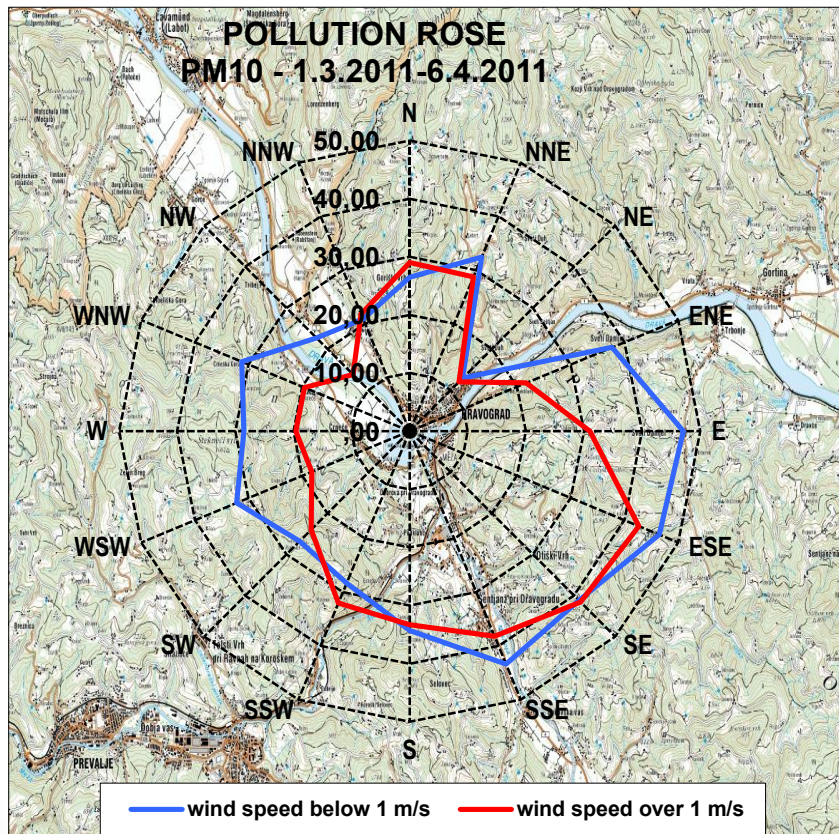


	Dravograd	Maribor Center	Ljubljana	Celje	Kranj	Novo mesto	Trbovlje	Zagorje	Hrastnik	Murska Sobota	Nova Gorica	Koper
■ NO2	12	36	30	26			16				26	21
■ SO2	2	3	2	5			5	8	5			
■ BENZEN*10	17	16	10									
■ O3	51	48	57	55			52	50	57	61	64	86
■ PM10	27	32	29	32	29	30	35	36	29	33	25	27
■ PM10over	6	10	8	9	9	9	10	15	9	11	6	2
■ CO	5	8	5				5					



# Measurements results

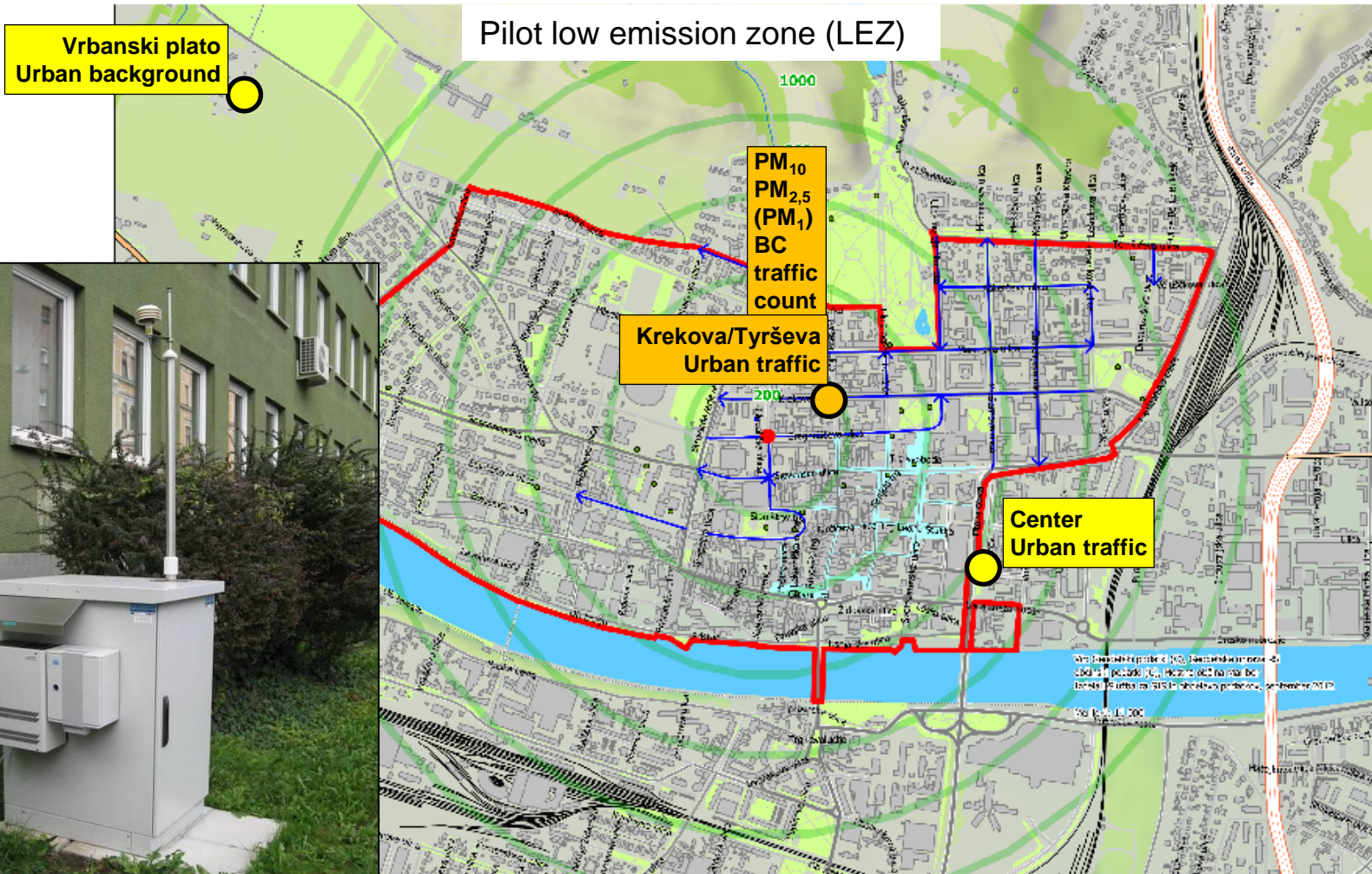
(PMinter additional monitoring- EPA Dravograd)





# Air quality in Maribor

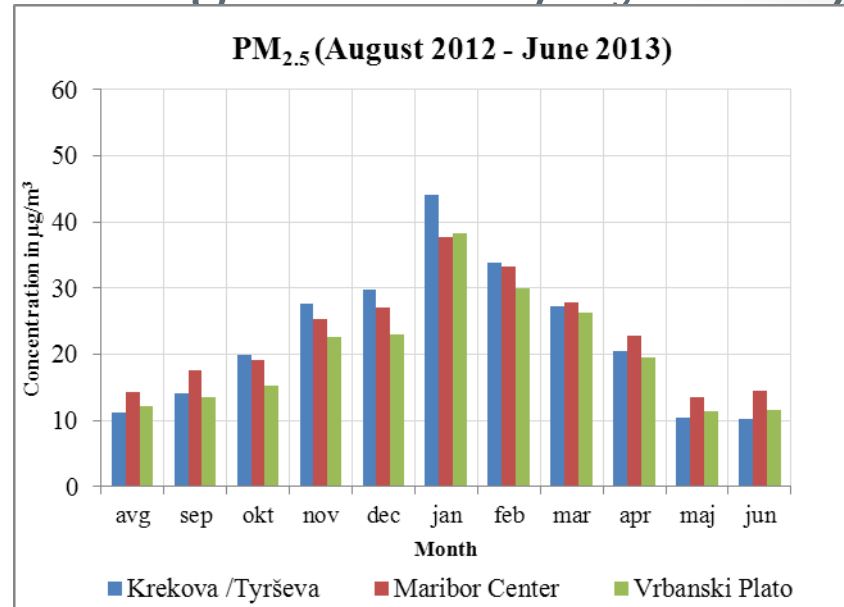
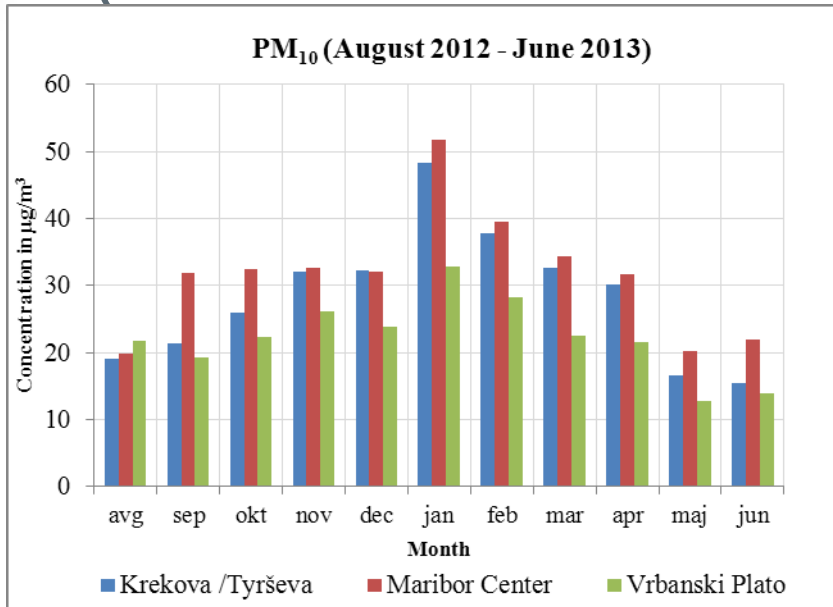
## (PMinter additional monitoring)





# Measurements results












(PMinter additional monitoring–Krekova/Tyrševa)

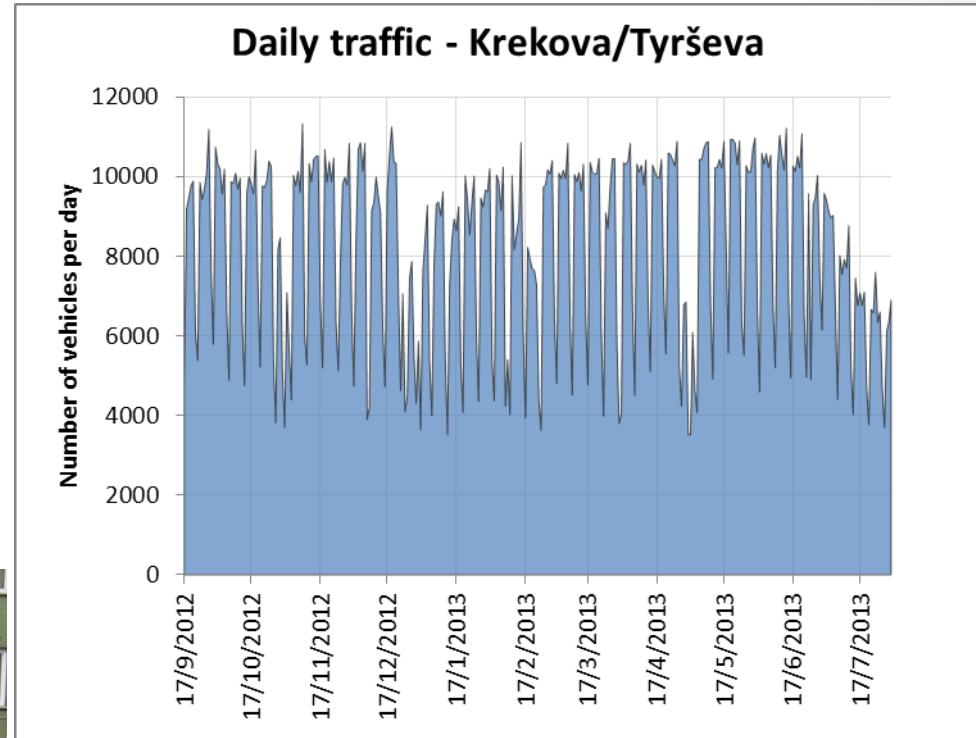


Average conc. (µg/m <sup>3</sup> )	Krekova /Tyrševa	Maribor Center	Vrbanski Plato
<b>PM10</b>	28	32	22
<b>PM2,5</b>	23	23	20
<b>PM2,5/PM10</b>	0,77	0,72	0,89
Number of exceedances DLV	Krekova /Tyrševa	Maribor Center	Vrbanski Plato
<b>PM10</b>	22	39	8

# Measurements results

(PMinter additional monitoring–Krekova/Tyrševa)

	Class	Subclass	Description
	A		<b>Personal Cars</b>
		A0	Motor bikes
		A1	Passenger cars, Passenger cars with a trailer
		A2	Vans with or without a trailer
	B		<b>Cargo vehicles</b>
		B1	Lorries
		B2	Mid-sized trucks
		B3	Trucks
		B4	Trucks with trailers
		B5	Tows
	C	C1	Buses
		C2	City buses
	D	XX	Unrecognized vehicles

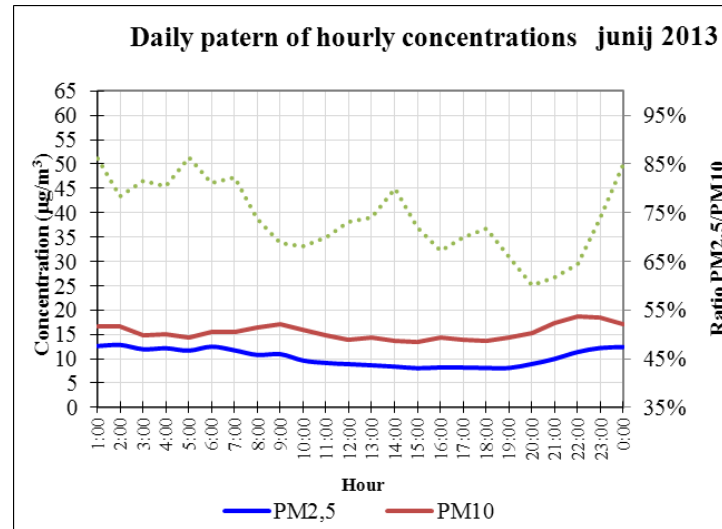
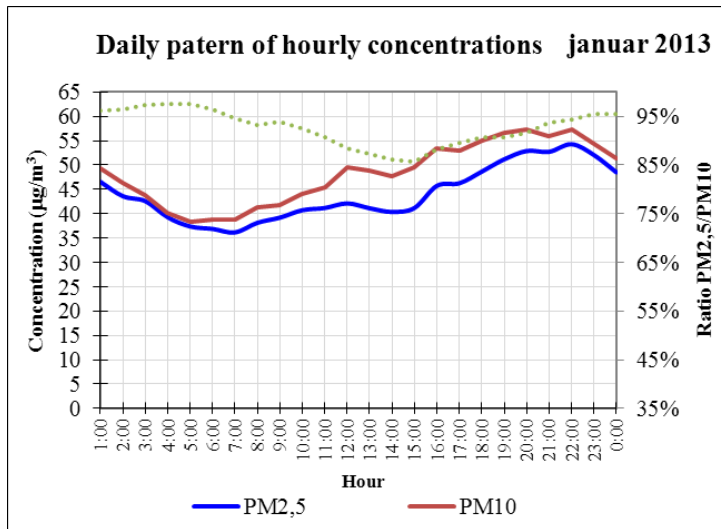
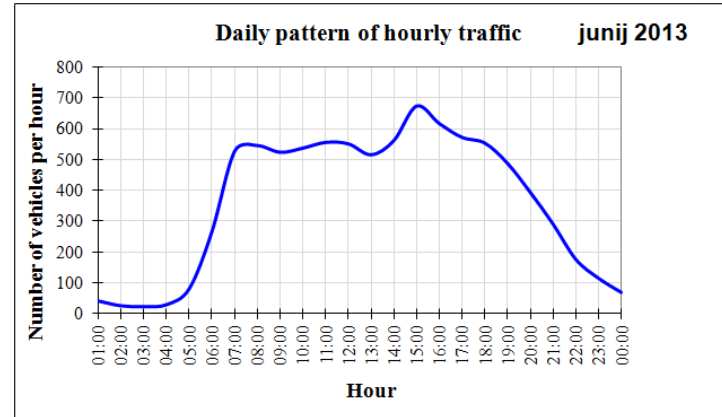
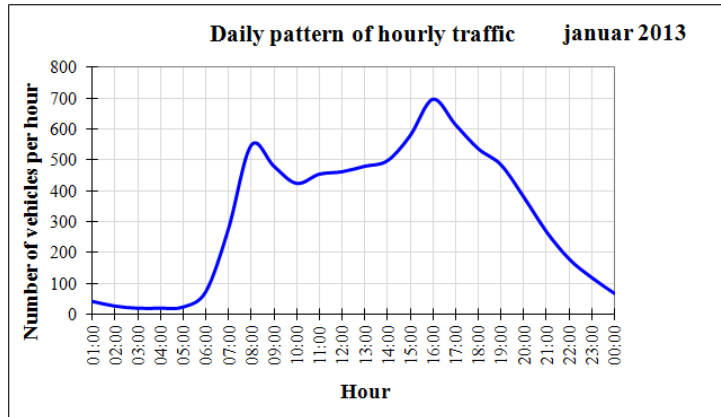


Traffic counting



# Measurements results

(PMinter additional monitoring–Krekova/Tyrševa)



# Air quality in Maribor

## (conclusions)

### We have needed AQMP

- We have adapted regular monitoring and established additional monitoring
- We have collected additional information (public data, emissions...)

### Why we made measurements?

- We have recognized *spatial distribution* of air pollution: higher near dense traffic routes and in more dense urban districts. In urban and suburban background stations concentrations are lower. For O<sub>3</sub> the opposite is true. Dravograd (60 km W) wasn't influenced by Maribor.
- *No limits* for pollution: AQMP should be prepared also for neighbouring communes!
- *Emissions*: no big point pollution sources, main sources are heating and traffic
- It is not important just to compare results with *limit values*.
- Low contribution from *natural sources* and *winter-sanding* or *-salting of roads*.
- Measurements are used also for validation of modeling results.



# Air quality in Maribor

## (decisions)

We had enough data to prepare AQMP which is now waiting for public opinion.

We will continue to measure on new location (also after the project!):  $PM_{10}$ ,  $PM_{2,5}$ ,  $PM_1$ , BC ( $BC_{ff}$  and  $BC_{wb}$ ) and count traffic.

New measuring location and also all collected data (emissions, air pollution) will be used for detailed tracking of the implementation of Air quality management Plan (AQMP) after the project's end.

# Air quality in Maribor

Thank you for your attention!

*Detailed results and reports on [www.pminter.eu](http://www.pminter.eu) and [www.maribor.si](http://www.maribor.si)*