

Current and future air quality in the historic city of Bruges (Belgium)

Luc Int Panis, Martine Van Poppel, Jean Vankerkom
VITO: Flemish institute for technological research

Dirk Michiels, Paul Van Acker, Steve Demulder
City of Bruges



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i-SUP 2008

Innovation for Sustainable

Production 2008



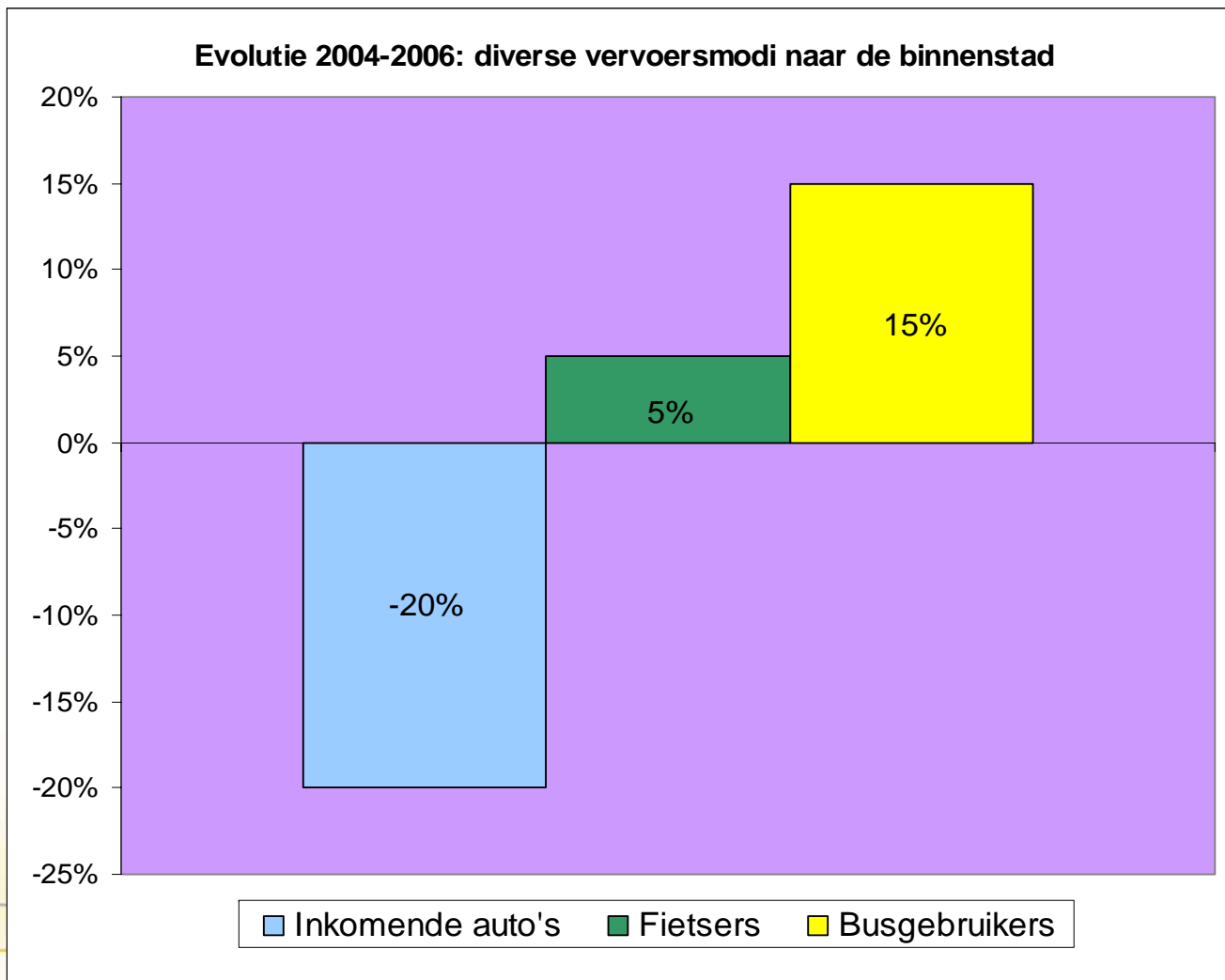
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Mobility policy in Bruges

- Some History
 - Innovation
 - Quality of life in the centre
 - Noise pollution
 - Accessibility
- Measures taken
 - parking
 - speed restrictions
 - alternative modes
 - cycling

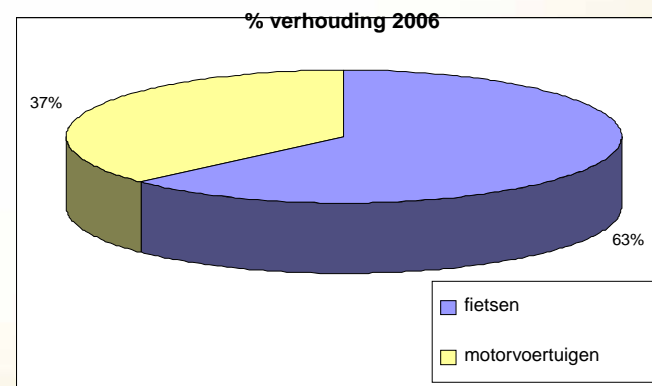
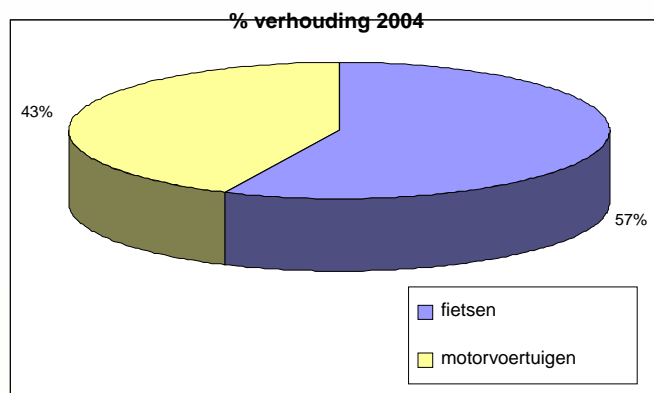


Evaluation of the local mobility plan:
Proportion of modal choice has changed

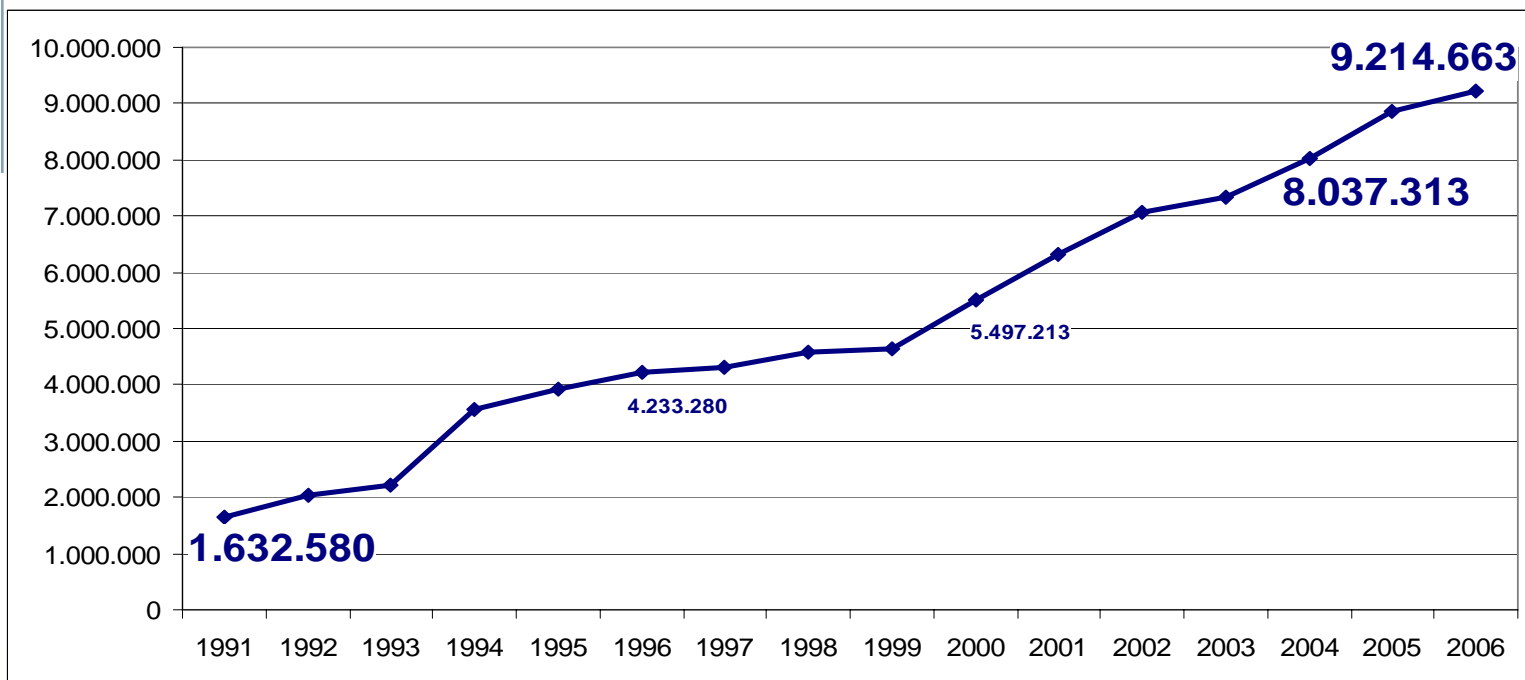


Evaluation of the local mobility plan:
Inbound commuters: cars and cyclists

Vervoersmiddel	2004		2005		2006	
	Totaal	%	Totaal	% verschil t.o.v. 2004	Totaal	% verschil t.o.v. 2004
Auto	3703	100%	3197	-15,80%	3078	-20,30%
Fietsers	4928	100%	5001	+1,5%	5195	+5,2%



Evaluation of the local mobility plan :
Evolution of public transport (diesel buses)



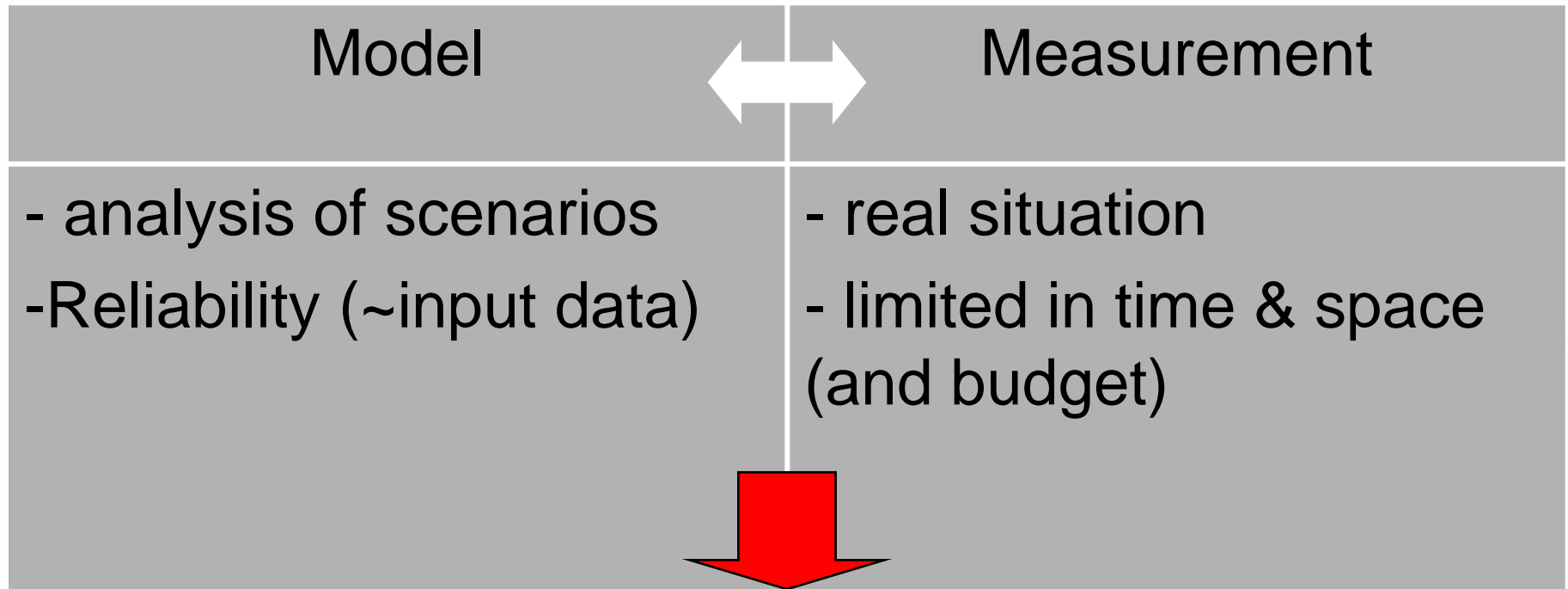
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Context of this study

- Innovation
- Air quality concerns
 - World heritage sites
 - Inhabitants
 - Problems outside of the city centre
- Which measures to take ?
 - Present air quality?
 - Present noise levels?
 - Future EU air quality directives
 - Which vehicles/measures are relevant?
- Measure and model present air quality
 - Predict future air quality
 - Identify specific problems in specific streets

Modelling or measuring AQ?



Combined approach

Measurements



5-6 sites during 4 weeks:

- PM₁₀ Partisol (EU reference methodology)
 - PM₁₀ concentration
 - Black smoke
- Mobile lab (1 week at each site)
 - NO/NO_x
 - PM₁₀ & black smoke (TEOM-FDMS monitor)
- NO₂ with passive samplers

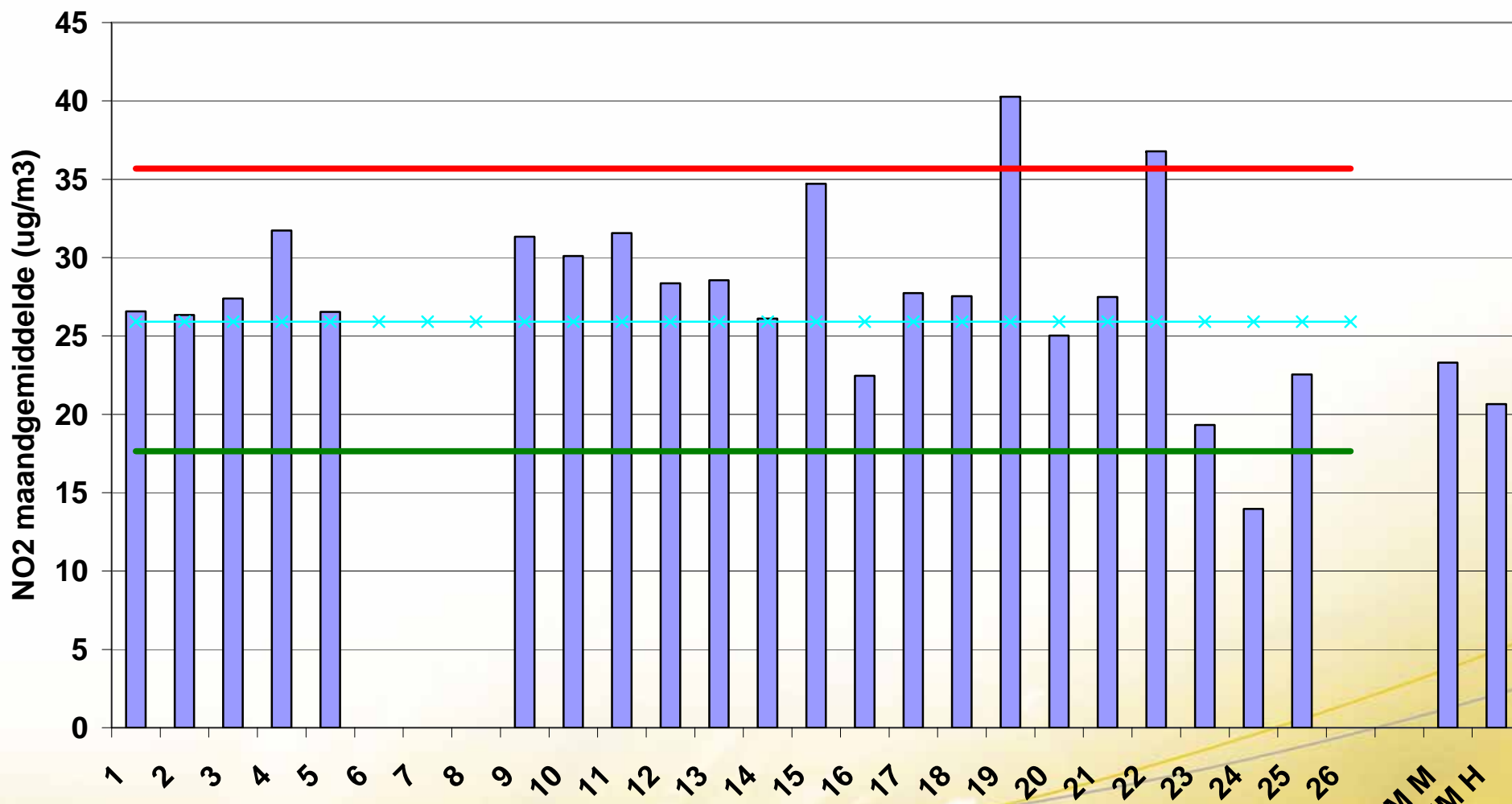


10-20 sites during 1 week (or monthly average)

- NO₂ (passive samplers including some organic pollutants)
- Short PM measurements
- Mobile mapping (bicycle)



NO₂, model/measured values



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Lokatie

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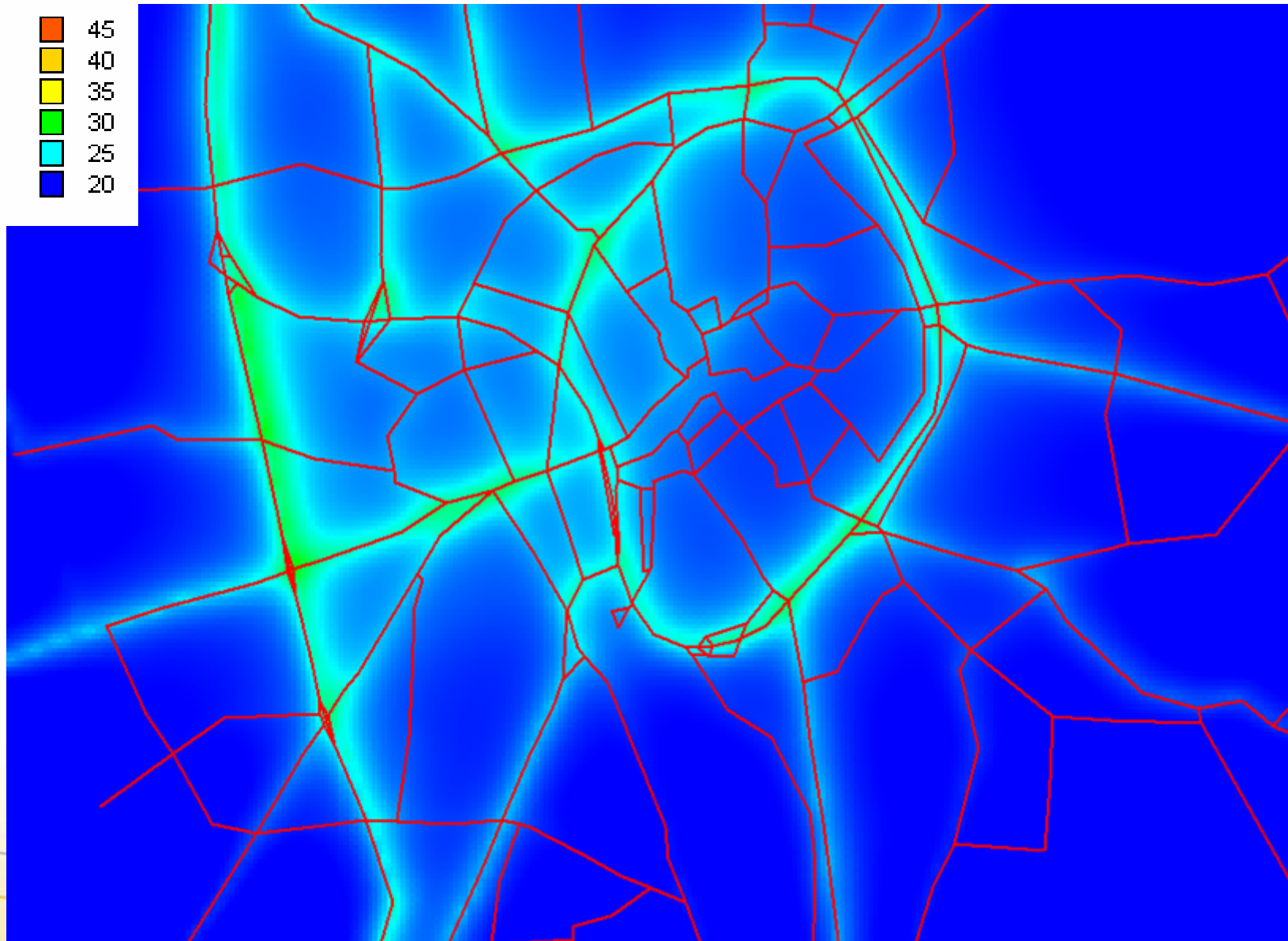
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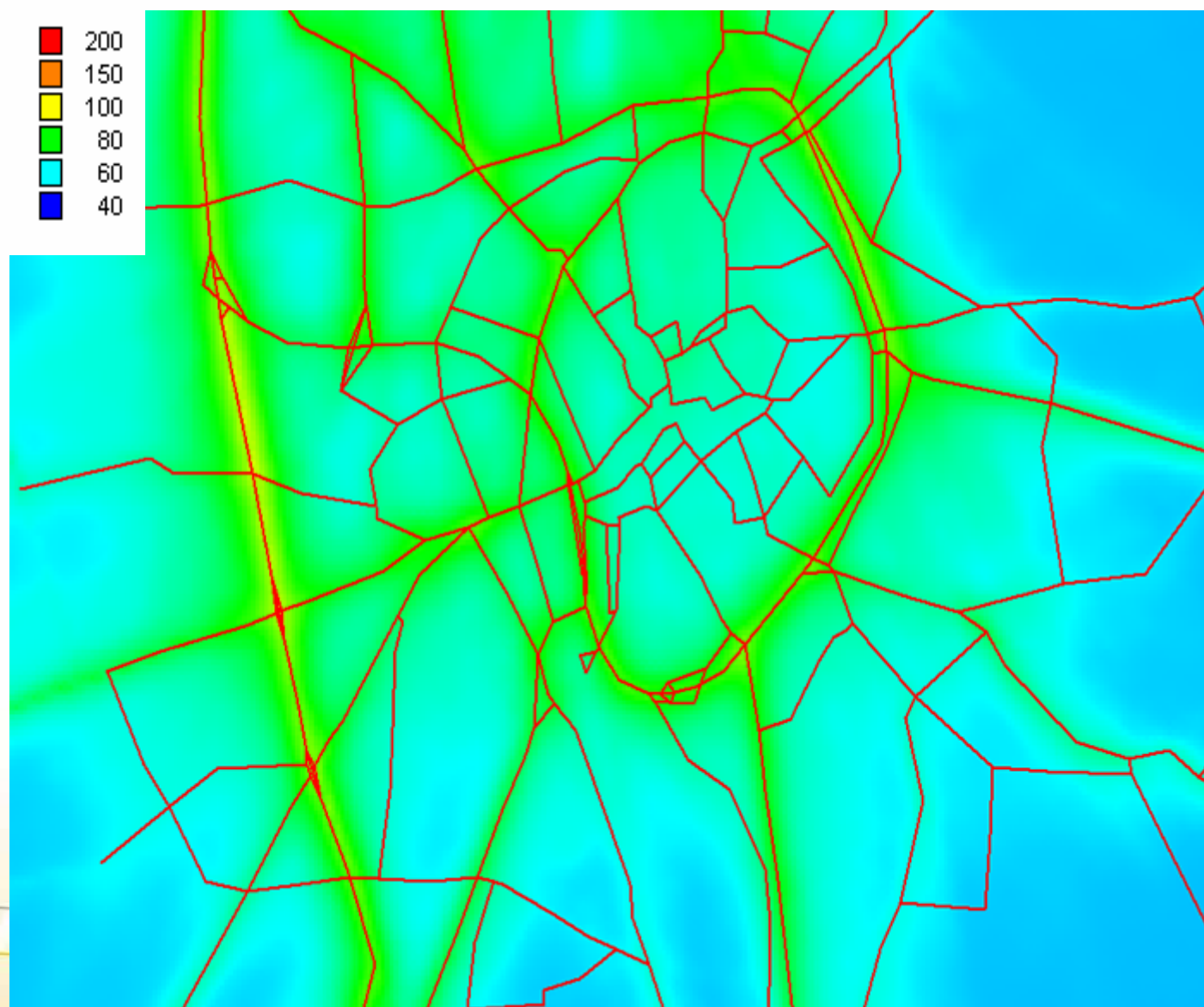
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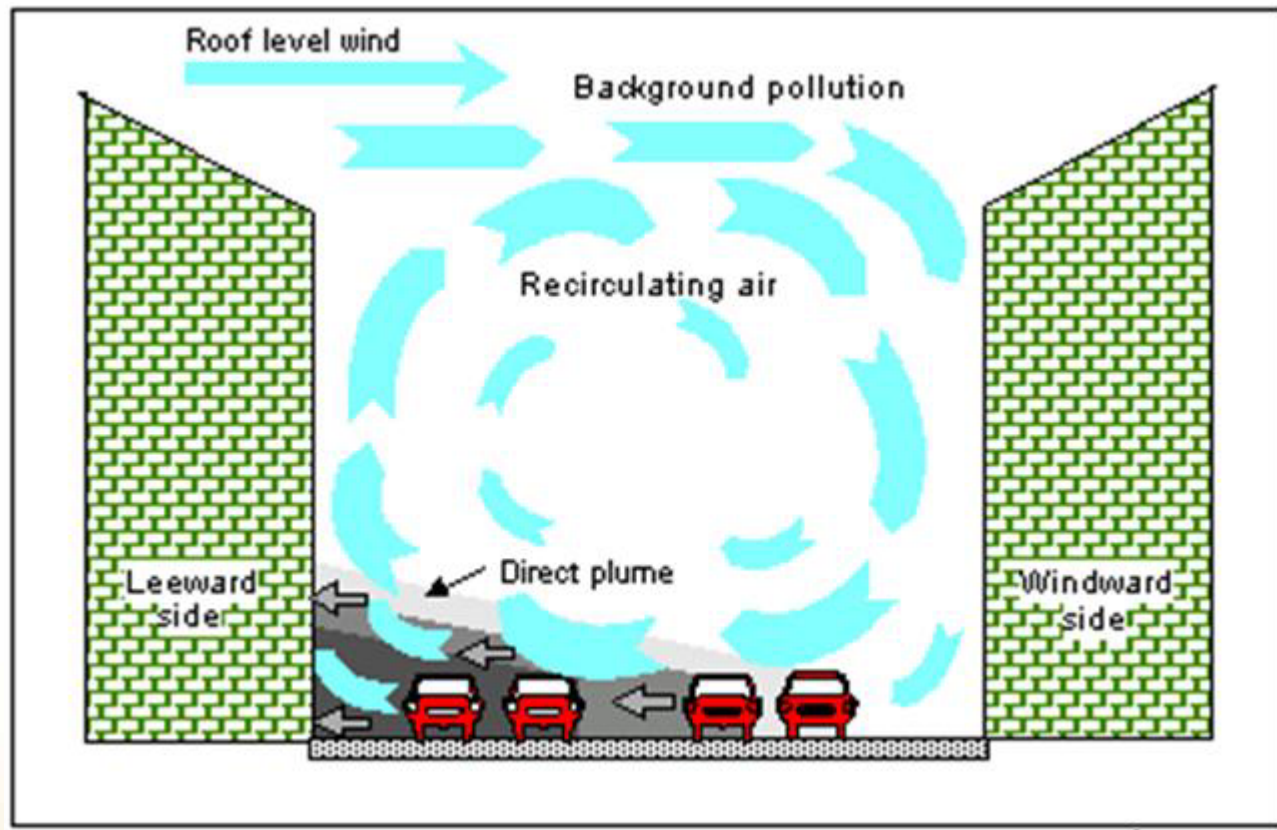
2003, air quality (NO₂)



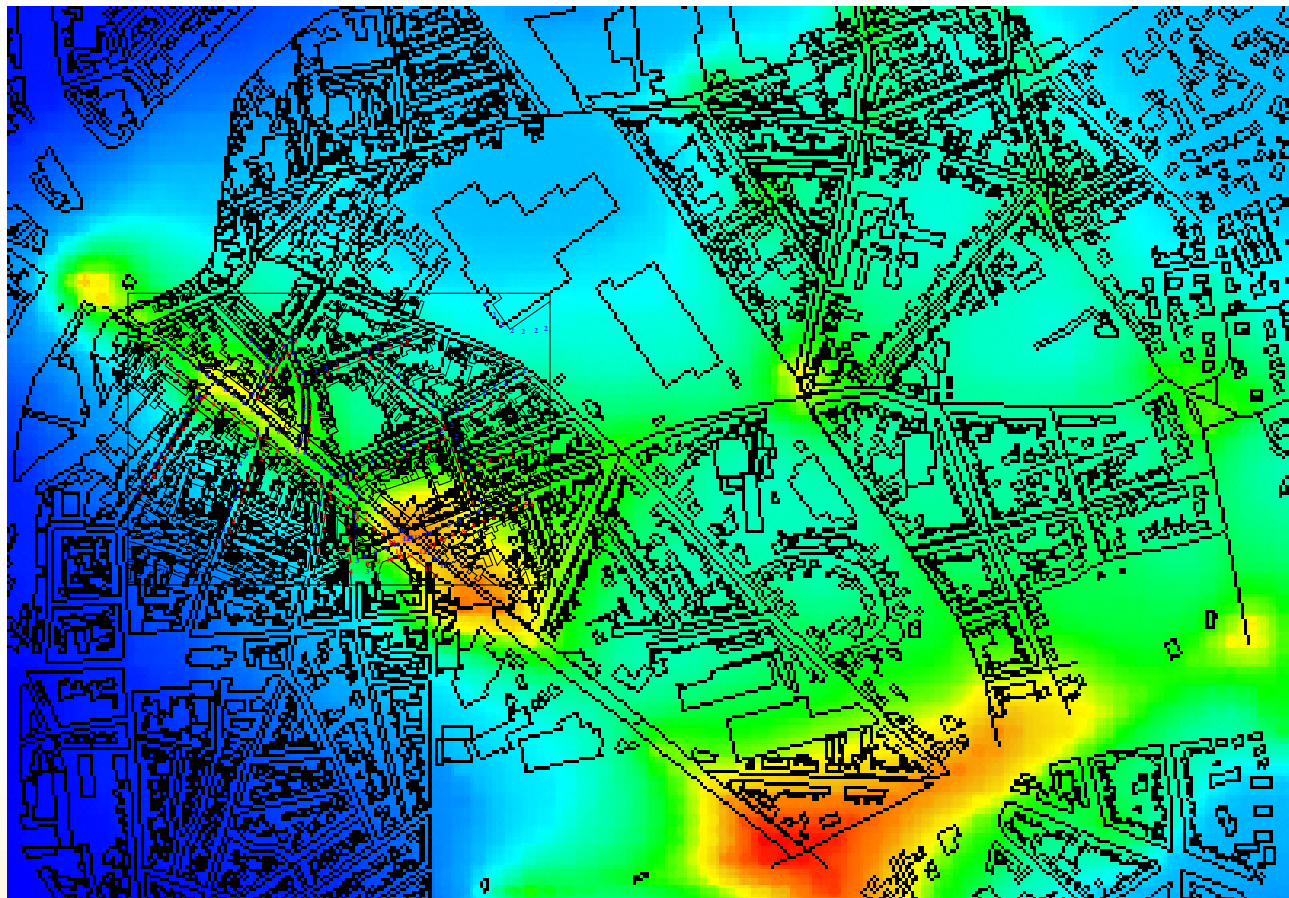
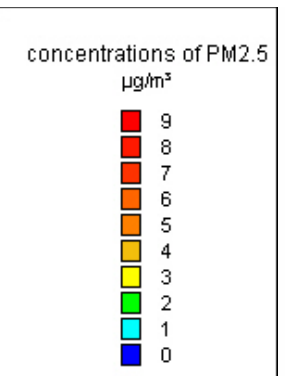
2003, NO₂ P99.79



Dispersion of pollutants in a street canyon



Gentbrugge PM_{2.5} (2003)



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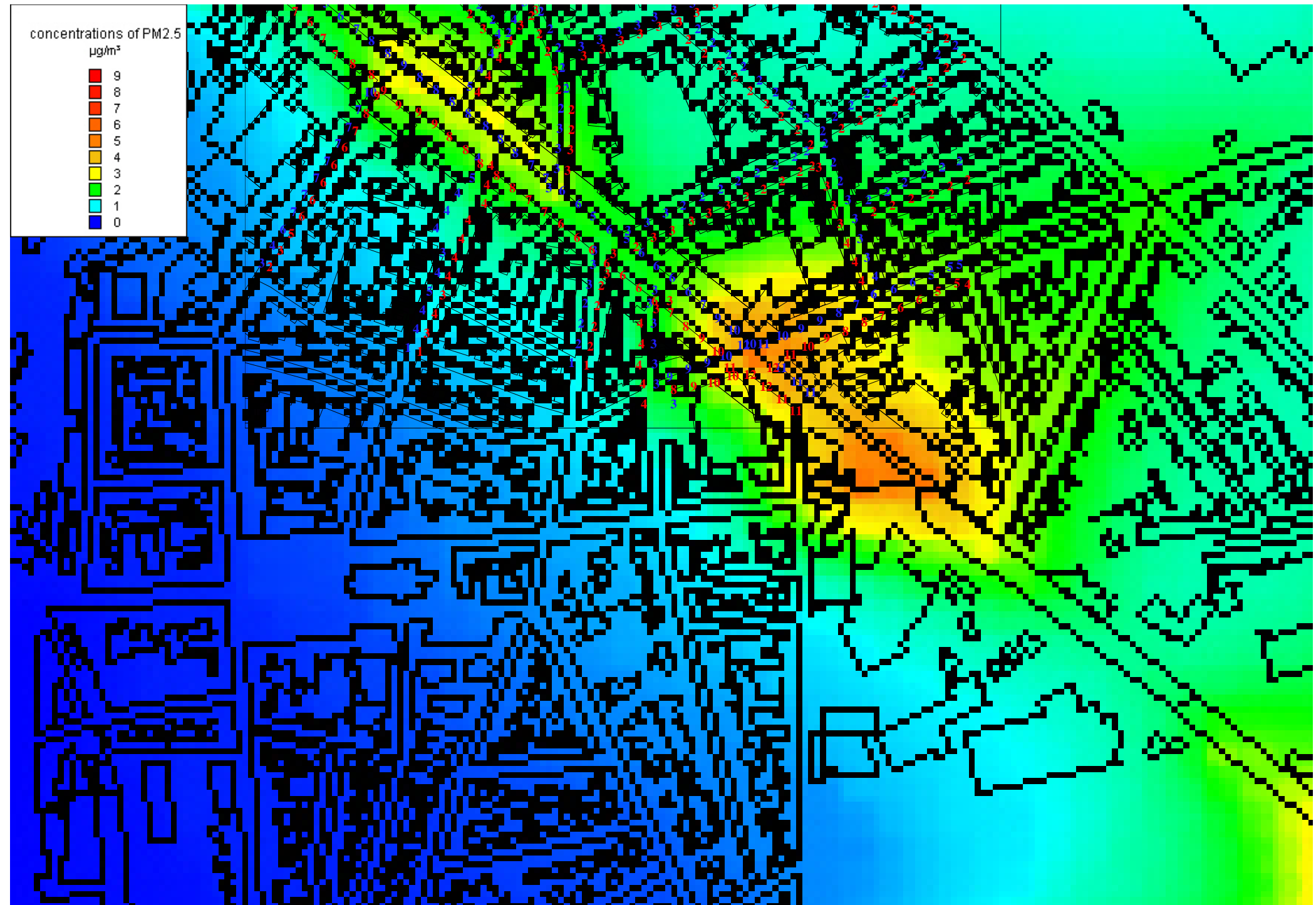
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concentrations of PM2.5

$\mu\text{g}/\text{m}^3$



2003, NO₂, in canyons in Bruges

Ezelstraat/Guldenvlieslaan



2003, NO₂

- Sint Jorisstraat
- Kalkovenstraat

- Clear Canyon-effects
- Important?

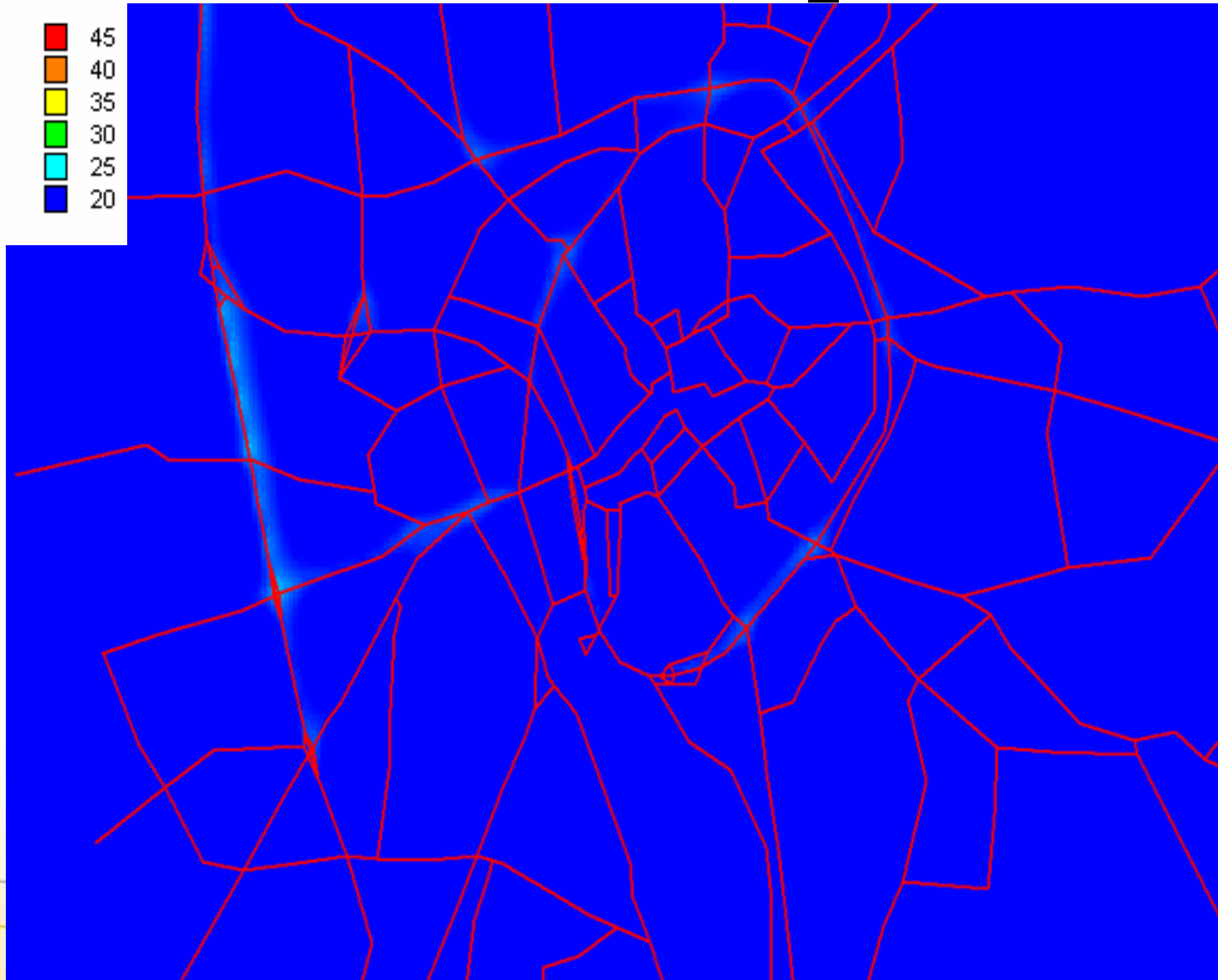


2003, historical centre NO₂

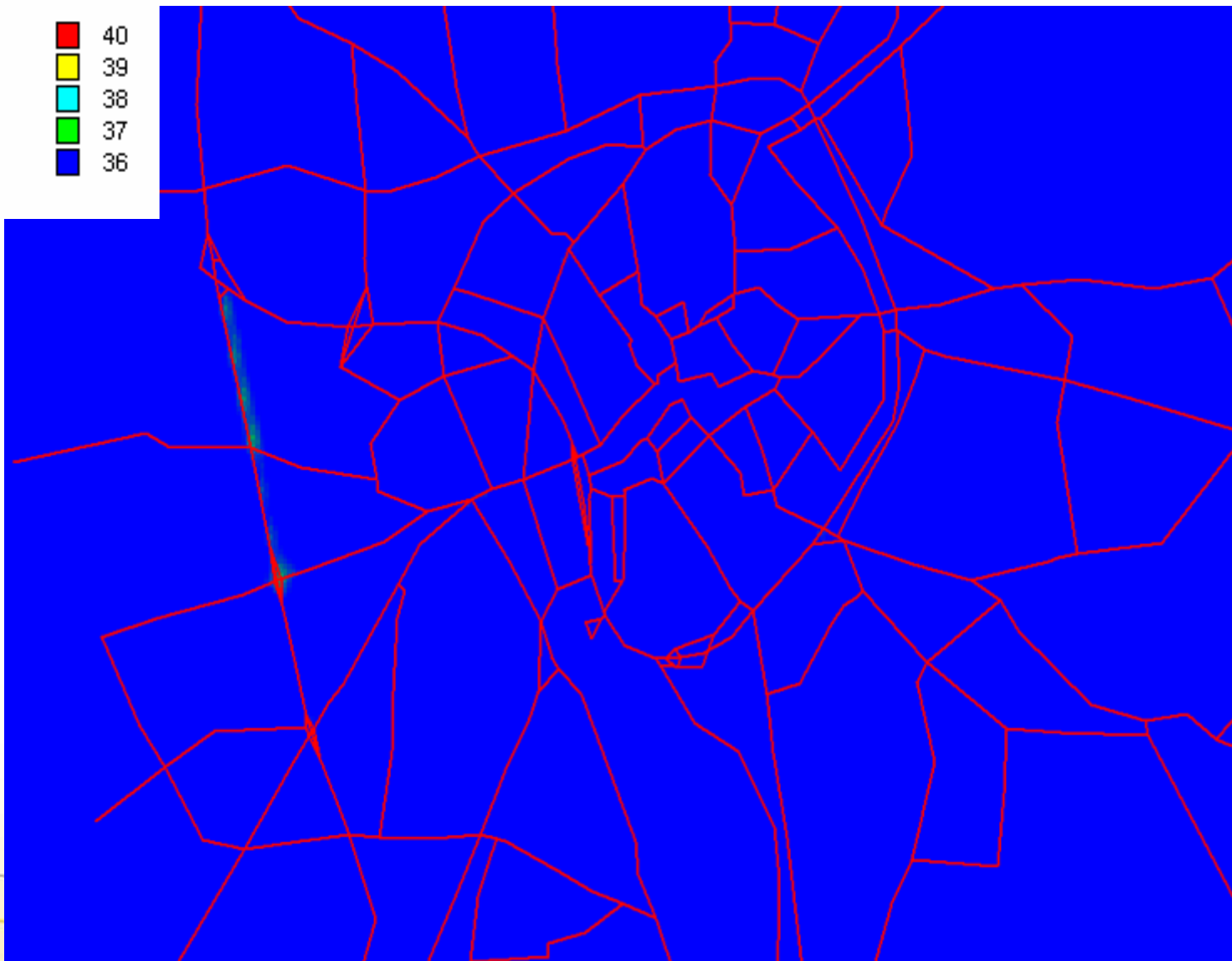
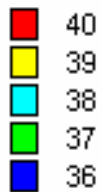


June 6, 2003

2012, NO₂

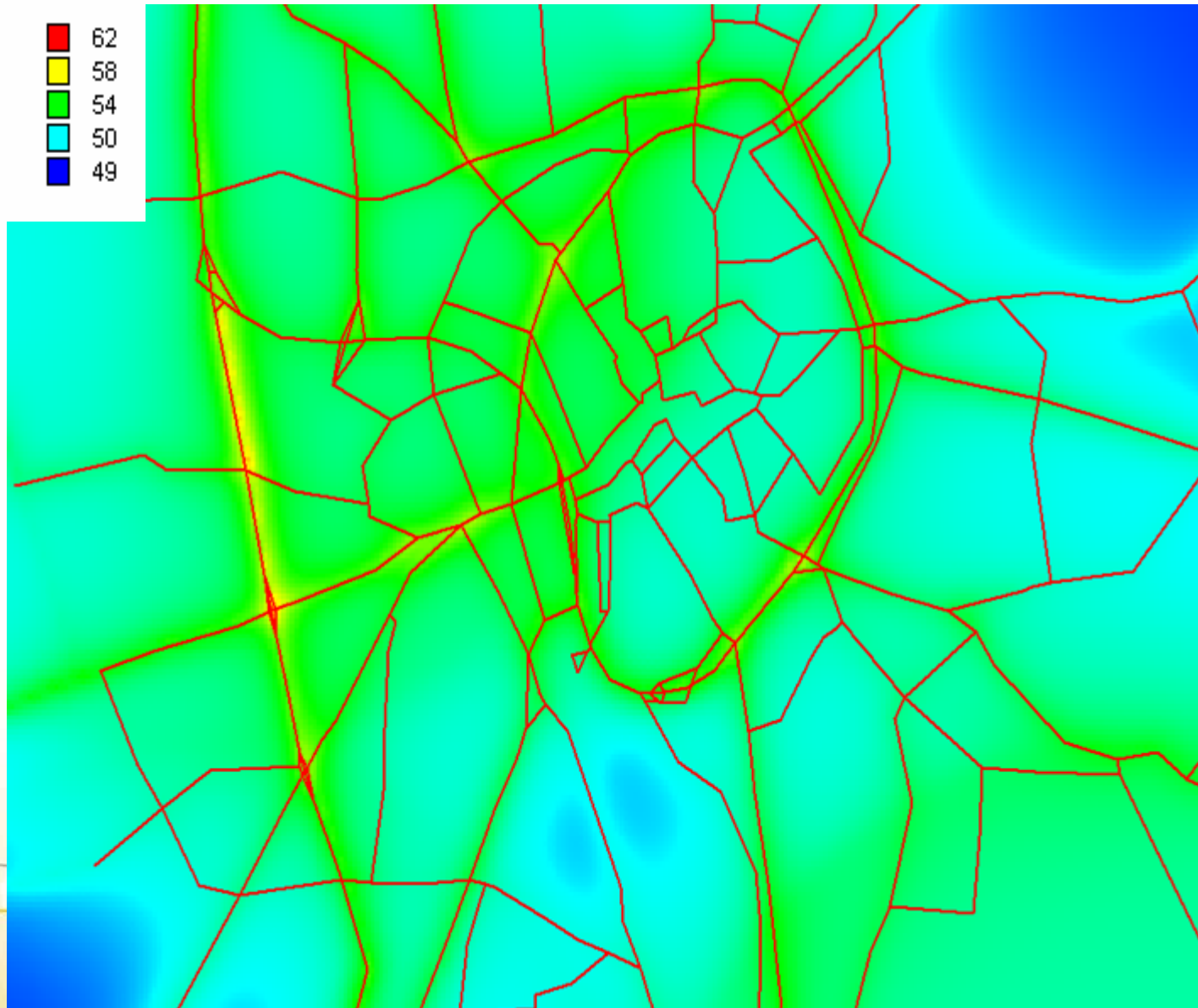


2003, PM₁₀



2003, PM₁₀

daily limits are frequently exceeded (>>35x 50µg/m³)



2003, PM₁₀

exceedences in the canyons

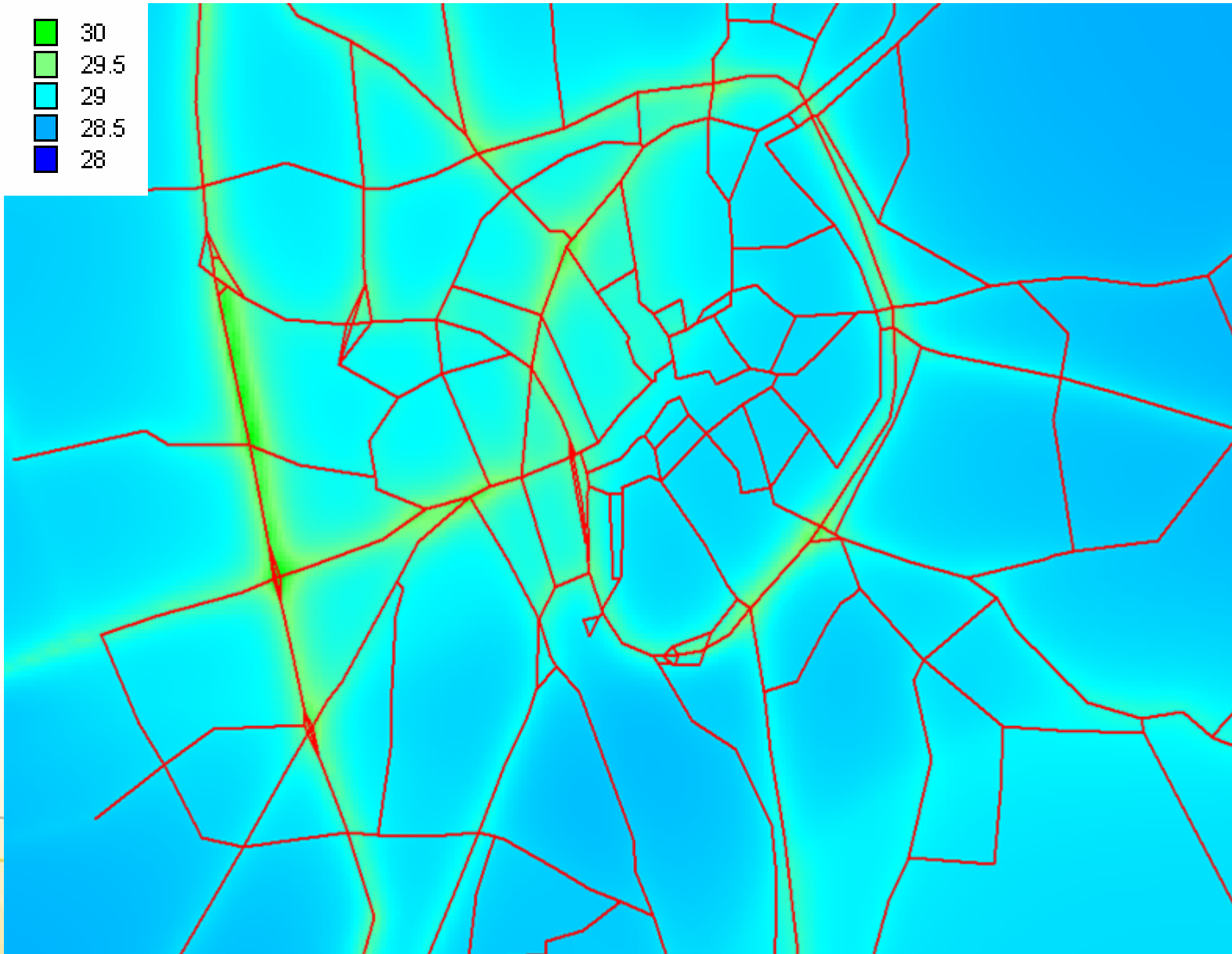
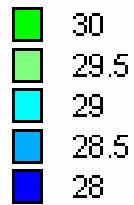


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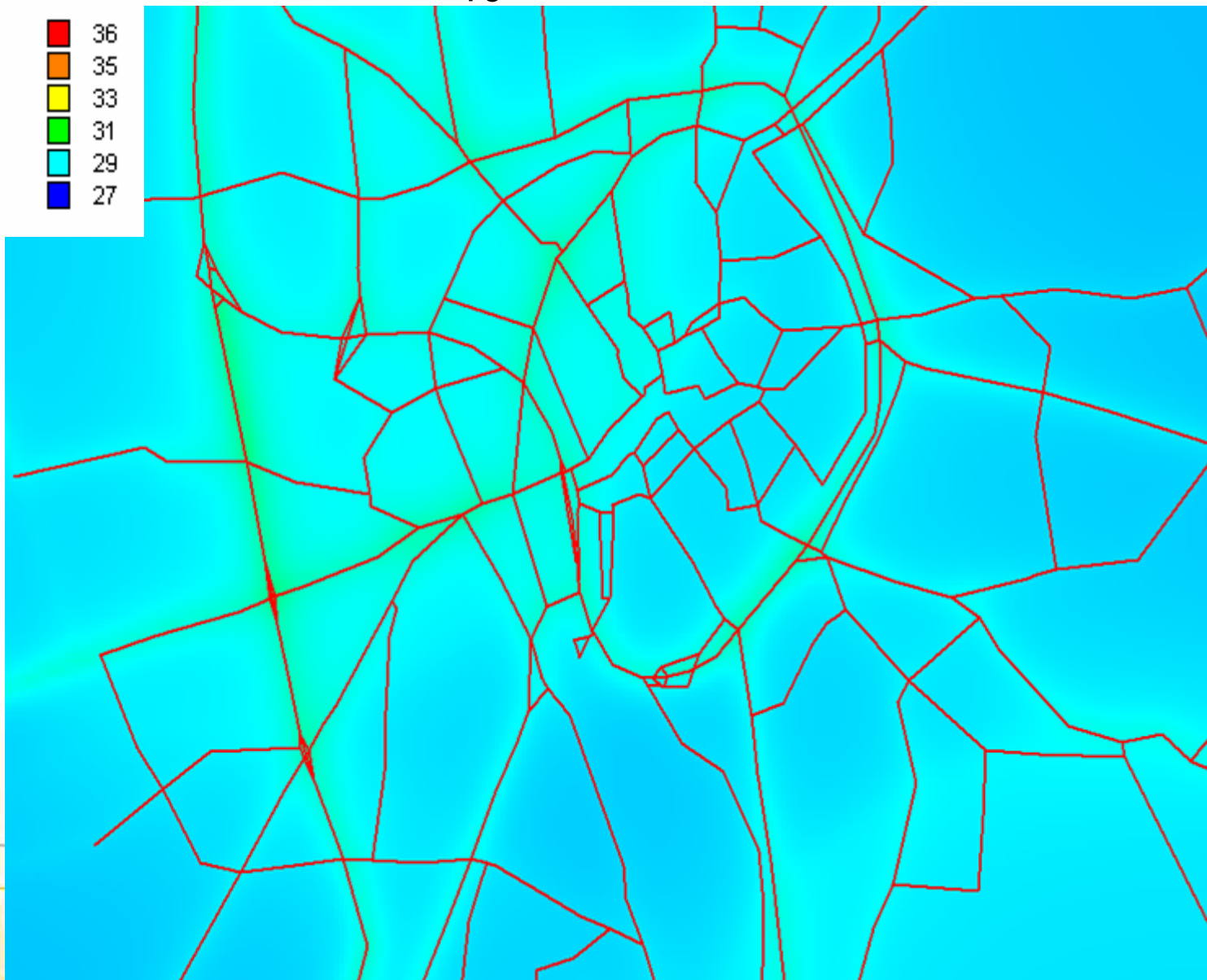
Model predictions

2012, PM₁₀ annual average



Model predictions

2012, PM₁₀, exceedences



Policy measures

- NO₂: no major problems expected
- N31: major problems
 - ~ noise
 - ~ Heavy vehicles
 - ~ speed / congestion
 - ~ new stadion
- PM “*problems*” with daily limit value
- 2012: good air quality/noise possible but:
 - Ring/N31
 - Canyons centre
 - Heavy vehicles
 - Buses
 - Coaches
 - Trucks

Measures discussed

Voorbeeld functie

- Automatische meting luchtkwaliteit
- Informatiebord
- Vergroening stedelijke vloot
- Geavanceerde voertuigen
 - Elektrisch (fiets, Segway)

Snelheid/congestie

- ISA
- Doorstroming bruggen

Technisch

- Geavanceerde bussen
- % hybride voertuigen
 - Parkeerbeleid

Volumes

- Fiets
- Promotie OV (1-dag)-toeristen
- Carpool/Telewerk
- Bedrijfsvervoerplannen
- Uitbreiden Cambio (andere centra)

Canyons

- LEZ (low emission zone)
 - Lengte/tonnage beperking
 - Verplichte roetfilter (HDV)
 - Politiecontrole (heavy smokers)
- Voetgangerszone
- Fietstrajecten

Evaluatie mobiliteitsplan: voorstellen

Luchtkwaliteit



- ↪ Aanbevelingen VITO zullen de leidraad zijn van het beleid voor de komende jaren in de relatie mobiliteit – verkeer – luchtkwaliteit.
- ↪ Realisatie concrete maatregelen voorgesteld door VITO:
 - invoering van milieuvriendelijke hybride bussen
 - gebruik van propere brandstoffen en motoren
 - vergroening van het stedelijk wagenpark
 - concrete opvolging van de luchtkwaliteit door het stadslabo

Is this the Way forward to Sustainable Development and Market Opening?

- Who did we convince?
 - Bruges city council
- How were they convinced?
 - Continuation of succesful mobility policy
 - Simultaneous concerns on noise/air quality
 - The desire to be first/best

Conclusions (AQ)

- Combination of measurements & models yields reliable results
- Present AQ in the city centre is good (and better than most other Flemish cities)
 - No problems with NO₂ (concentration below annual average and hourly limits)
 - Daily limit for PM10 is frequently exceeded in most places in and around Bruges (up to 60x each year)
- Important improvements are possible by 2012
 - Cleaner cars introduced under European legislation
 - Local policies
 - Daily limit value for PM10 *may* be met in Bruges
- Additional local policies and measures are necessary to avoid exceedences in 2012
 - In street canyons (with increasing bus traffic)
 - On regional roads (road transport of sea containers)

Conclusions (mobility)

- First hybrid bus will be operational in 2008
- 4 more buses operational early 2009 at the latest
- Ensure
 - Continued growth of urban bus transport
- Avoid
 - complaints on odour & noise