

23/03/2012

EU air quality regulations over time

Wouter Lefebvre, Inge Mayeres (VITO)

Outline

- » Air pollutants and their impacts
- » EU legislation
- » Do we meet the air quality objectives?

Outline

- » **Air pollutants and their impacts**
- » EU legislation
- » Do we meet the air quality objectives?

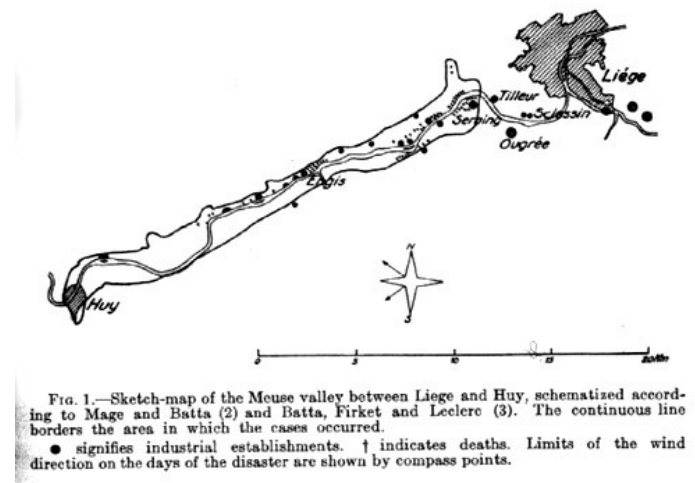
Air pollutants and their impacts



London Great Smog - 1952



Donora Death Fog - 1948



Meuse Valley - 1930



Smog covers the Los Angeles Basin

Air pollutants and their impacts

IMPACT	AIR QUALITY	EMISSIONS							
		Primary PM	SO ₂	NO _x	NH ₃	VOC	PAH	Heavy metals	CO
Human health & Ecosystems	Particulate matter								
	Tropospheric ozone								
Ecosystems	Eutrophying substances								
	Acidifying substances								
Climate & Ecosystems	Climate forcers								

Symbols and abbreviations:

PM:	Particulate matter
SO ₂ :	Sulphur dioxide
NO _x :	Nitrogen oxides
NH ₃ :	Ammonia
VOC:	Volatile organic compounds
PAH:	Polycyclic aromatic hydrocarbons
CO:	Carbon monoxide

External environmental costs of transport emissions in Flanders: euro2009/tonne

Emission	NO _x	NMVOC	SO ₂	PM _{2.5}		PM _{coarse}	CO ₂ eq.
				Urban	Highway & rural		
Road	580	7 540	10 000	475 000	136 000 – 141 000	25 000	20
				Flanders			
Rail, inland navigation	580	7 540	10 000	141 000		25 000	20
High stack	650	7 570	9 600	22 000		5 000	20

Source: MIRA (2010), *Internalisering van externe kosten van transport in Vlaanderen*

Outline

- » Air pollutants and their impacts
- » **EU legislation**
- » Do we meet the air quality objectives?

EU legislation

- » Most of the current legislation in the EU started during the 90s
- » Air pollution on the political agenda already before the 90s
 - » 60s: acidification of Scandinavian lakes and rivers
 - » 80s: air pollution impacts on forests
 - » Since the 90s: health damage caused by air pollution, particularly urban air quality
- » Influence of international negotiations on air pollution:
 - » 1979 Convention of Long-Range Transboundary Air Pollution, and its protocols (particularly 1999 Gothenburg protocol)
- » Important EU policy goals w.r.t. air pollution formulated in
 - » Fifth (1992) and Sixth (2002) Environmental Action Plan
 - » Community Strategy to Combat Acidification (1997)

EU legislation

- » Two approaches for legislation on air pollution:
 - » Technology driven:
 - » Limits on total emissions
 - » regulating emissions from specific sources or sectors either by setting emission standards or by setting requirements on product quality
 - » Issue driven: guaranteeing good air quality
- » Sixth EAP (2002): “Environment 2010: Our future, Our choice”
 - » call for thematic strategy on air pollution aiming to achieve levels of air pollution that do not result in unacceptable impacts on and risks to human health and the environment

EU legislation

- » Thematic Strategy (2005):
 - » long-term objectives for improvements in 2020 relative to 2000:
 - » 47 % reduction of loss in life expectancy as a result of exposure to PM
 - » 10% reduction in acute mortalities from exposure to ozone
 - » 74% reduction in excess acid deposition in forest areas and 39% reduction on surface freshwater areas
 - » 43% reduction on areas or ecosystems exposed to eutrophication
 - » Implied emission reductions: SO₂ by 82%, NO_x by 60%, VOC by 51%, ammonia by 27% and PM_{2.5} by 59%
- » Roadmap to a Resource Efficient Europe (2011):
 - » 'By 2020, the EU's interim air quality standards will have been met, including in urban hot spots, and those standards will have been updated and additional measures defined to further close the gap to the ultimate goal of achieving levels of air quality that do not cause significant impacts on health and the environment'

Current EU legislation

Type	Pollutants							
	PM	O ₃	NO ₂ , NO _x , NH ₃	SO ₂ , SO _x	CO	Heavy metals	BaP PAH	VOC

Directives ambient air quality

2008/50/EC 2004/107/EC	PM	O ₃	NO ₂	SO ₂	CO	Pb As, Cd, Hg, Ni	BaP	Benzene
---------------------------	----	----------------	-----------------	-----------------	----	----------------------	-----	---------

Directives emissions of air pollutants

2001/81/EC	National emission ceilings	X	X	NO _x , NH ₃	SO ₂			NMVOC
2010/75/EU	Industrial emissions	PM	X	NO _x , NH ₃	SO ₂	CO	various	VOC
Euro standards	Road vehicles	PM	X	NO _x	CO	CO		HC, NMHC
94/63/EC, 2009/126/EC, 1999/13/EC	VOC emissions	X	X					VOC
91/676/EC	Water protection			NH ₃				

Directives fuel quality

1999/32/EC	X			S		Pb	PAH	Benzene,
2003/17/EC	X	X		S				HC, VOC

International conventions

MARPOL 73/78	PM	X	NO _x	SO _x				VOC
LRTAP	PM & X	X	NO ₂ , NH ₃	SO ₂	CO	Cd, Hg, Pb	BaP	NMVOC

Outline

- » Air pollutants and their impacts
- » EU legislation
- » **Do we meet the air quality objectives?**

Air quality in Europe

Table ES.1 Percentage of the urban population in the EU exposed to air pollutant concentrations above the EU and WHO reference levels

Pollutant	EU reference value	Exposure estimate (%)	WHO AQG	Exposure estimate (%)
SO ₂	Day (125)	0.3–2.3	Day (20)	68–85
NO ₂	Year (40)	7–19	Year (40)	7–19
PM ₁₀	Day (50)	18–40	Year (20)	80–90
Pb	Year (0.5)	< 1	Year (0.5)	< 1
CO	8-hour (10)	0–2	8-hour (10)	0–2
O ₃	8-hour (120)	16–50	8-hour (100)	> 95

Colour coding of exposure estimates, fraction of urban population exposed to concentrations above the reference level:

< 10 %	10–50 %	50–90 %	> 90 %
--------	---------	---------	--------

Note: The reference levels included comprise EU limit or target levels and WHO air quality guidelines (AQG). The averaging period is shown and the reference levels in brackets are in µg/m³ except for CO which is in mg/m³.
















For some pollutants EU legislation allows a limited number of exceedances. This aspect is considered in the compilation of exposure in relation to EU air quality limit and target values.

The comparison is made for the most stringent EU limit or target values set for the protection of human health. For PM₁₀ the most stringent standard is for 24-hour mean concentration.

This estimate refers to a recent three-year period (2006–2008) and includes variations due to meteorology, as dispersion and atmospheric conditions differ from year to year.










Source: EEA, Air quality in Europe (2011)

EU limit and target values

Averaging time	1-hour	max 8-hour	24-hour	yearly
<i>2008/50/EG</i>				
SO₂	350 24x/year 		125 3x/year 	
NO₂	200 18x/year 			40  (2010)
PM₁₀			50 35x/year 	40 
PM_{2.5}		target value		25  (2010)
		limit value		25  (2015)
		GBI (urban background)		20  (2015)
		GBI decrease -15 of 20%		20  (2020)
		Indicative target value		20  (2020)
Pb				0,5 
CO		10 000 		
Benzeen				5  (2010)
O₃		120 25x/year 		
		3y_mean (2010)		

(concentrations in $\mu\text{g}/\text{m}^3$)

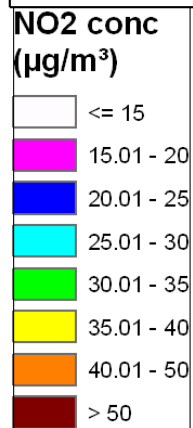
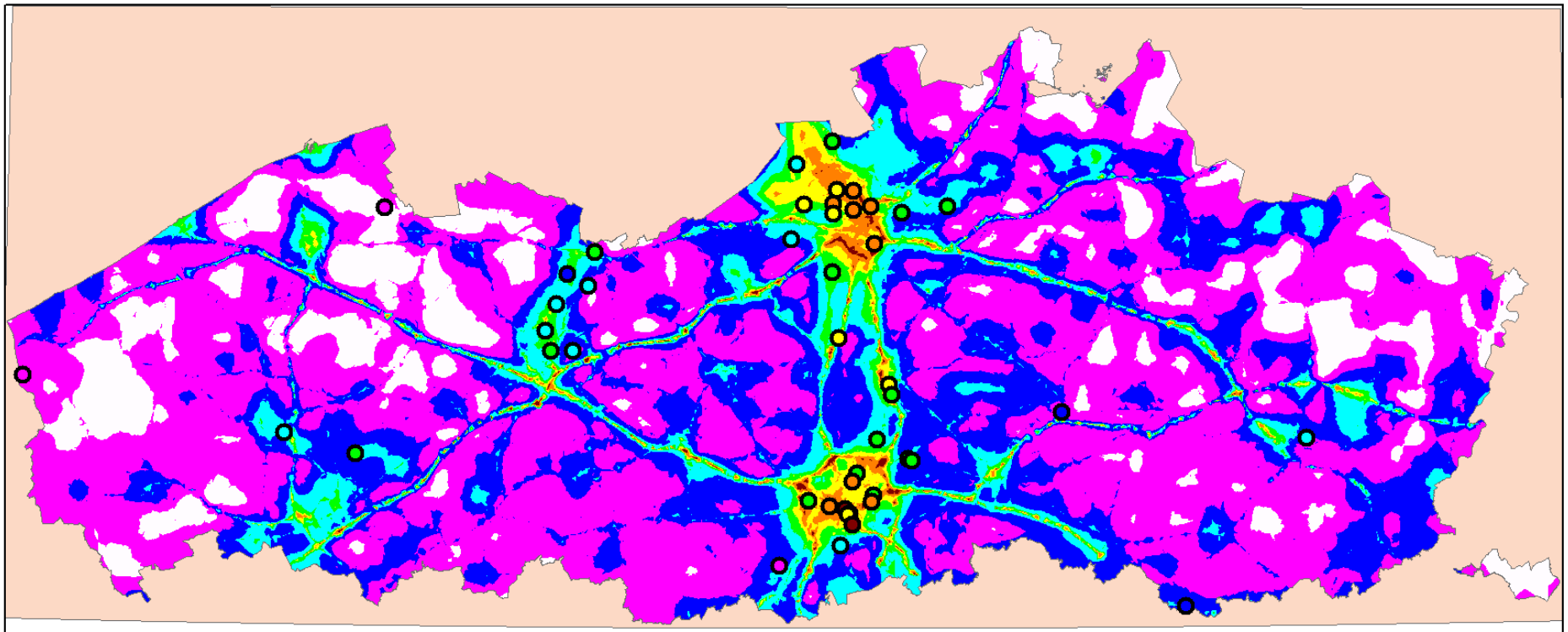
WGO, 2005

	1-hour	max8-hour	24-hour	year
SO₂	500 (10') 		20 	
NO₂	200 			40 
PM₁₀			50 3x/year 	20 
PM_{2.5}			25 3x/year 	10 
O₃		100 		

DE WHO limit values are :

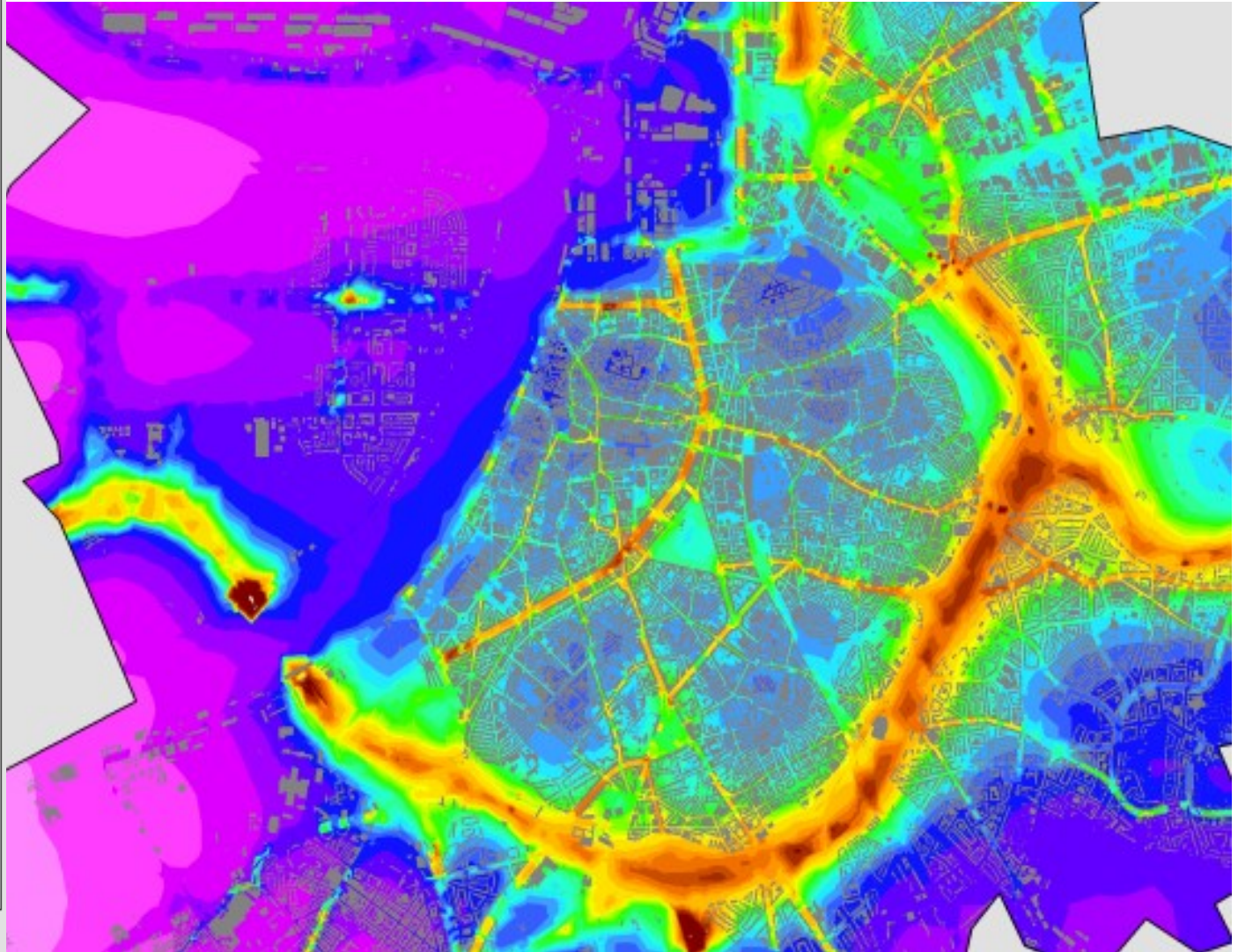
- the lowest values for which we still find in epidemiological research statistical significant health effects
- values at which the human health is sufficiently protected, despite the existence of some effects

NO₂: yearly mean concentration (2007)

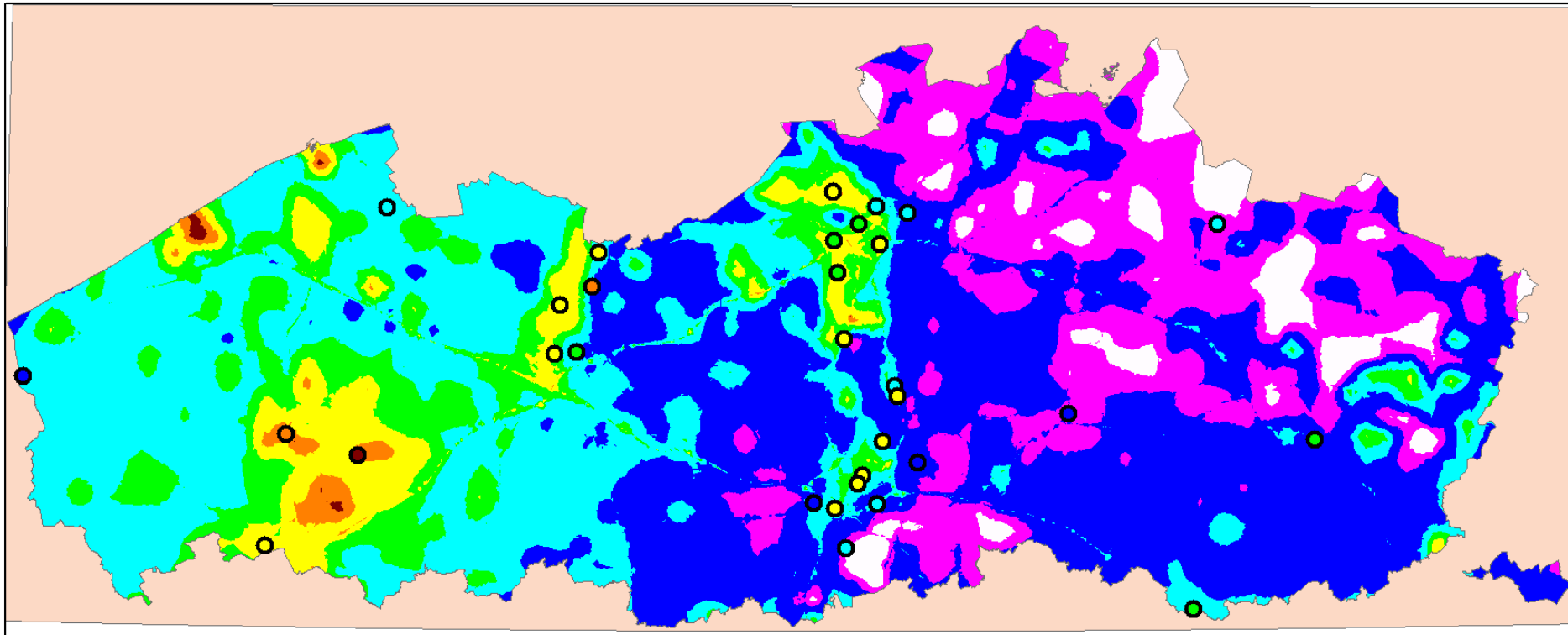


Also in street canyons

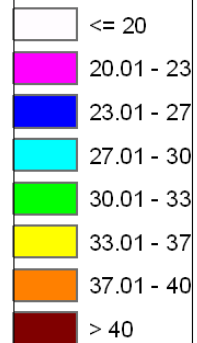
NO2 basis ($\mu\text{g}/\text{m}^3$)



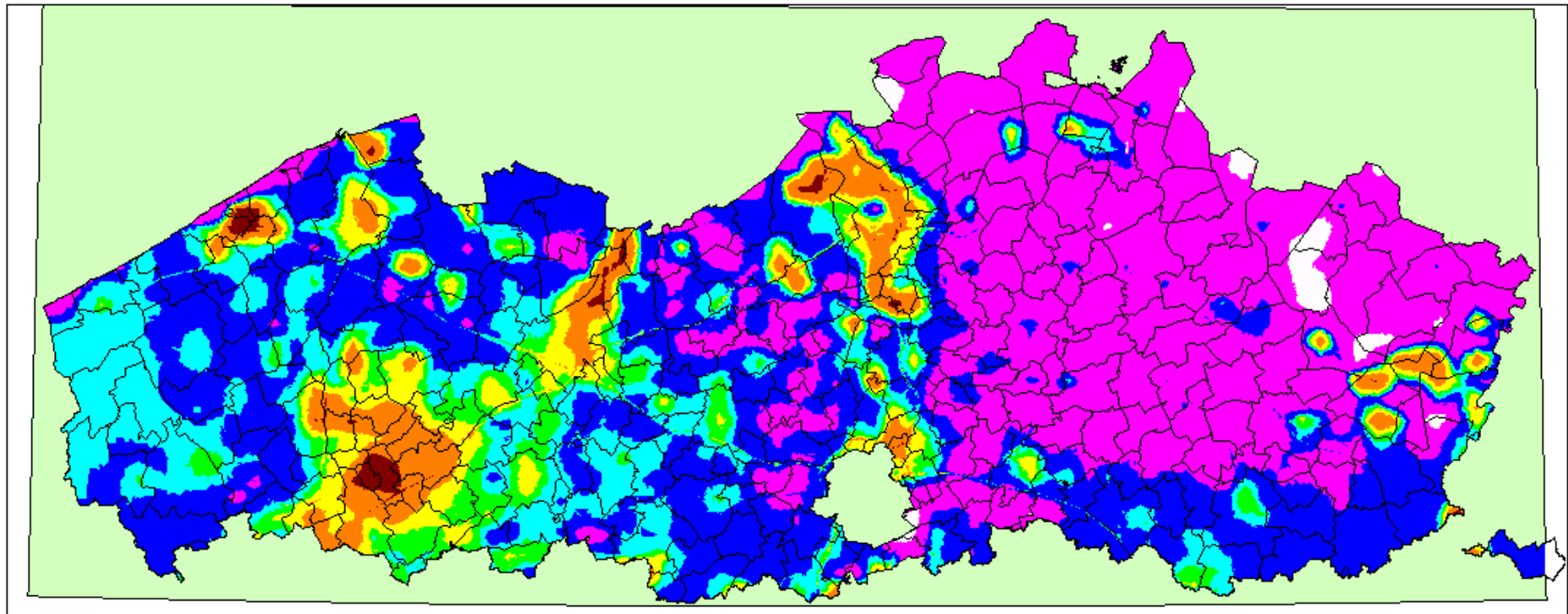
PM₁₀: yearly mean concentration (2007)



PM10 conc
($\mu\text{g}/\text{m}^3$)



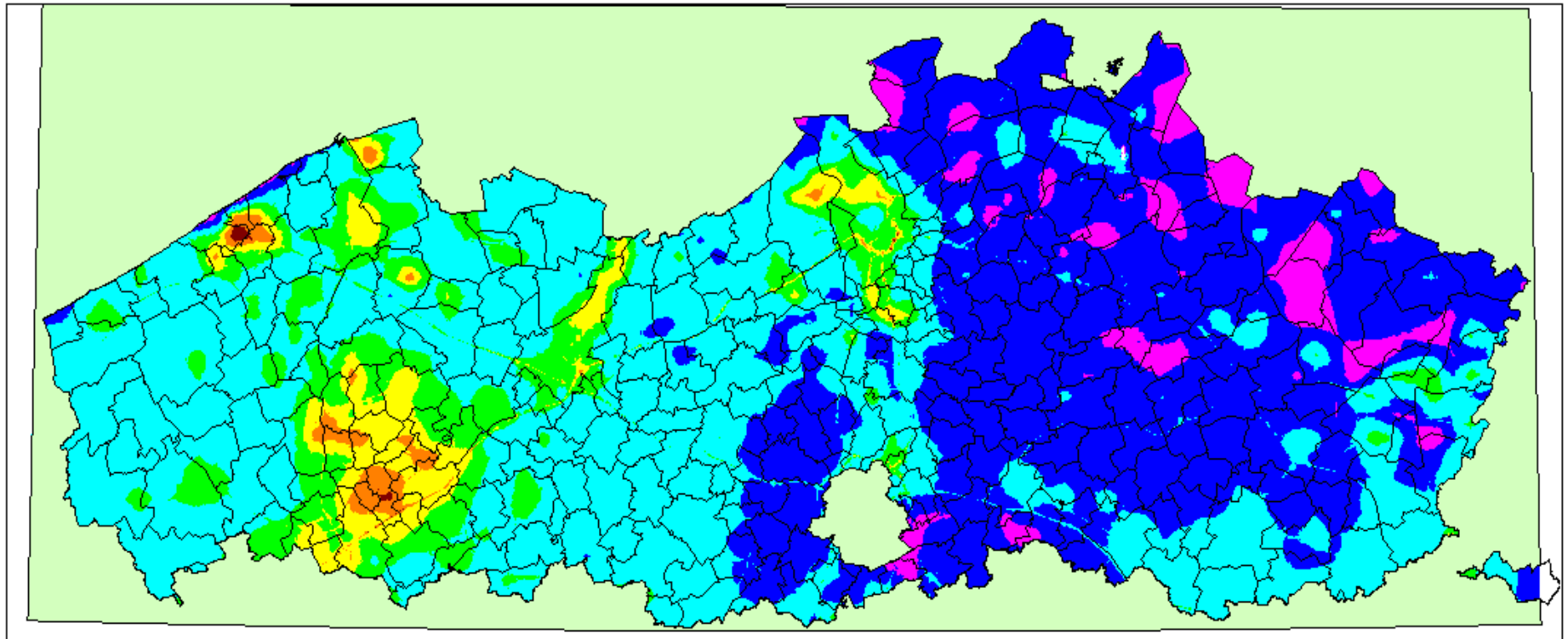
PM₁₀: # days, conc > 50 µg/m³ (2007)



2007
dag > 50 µg/m³ PM10



PM_{2.5}: yearly mean concentration (2007)

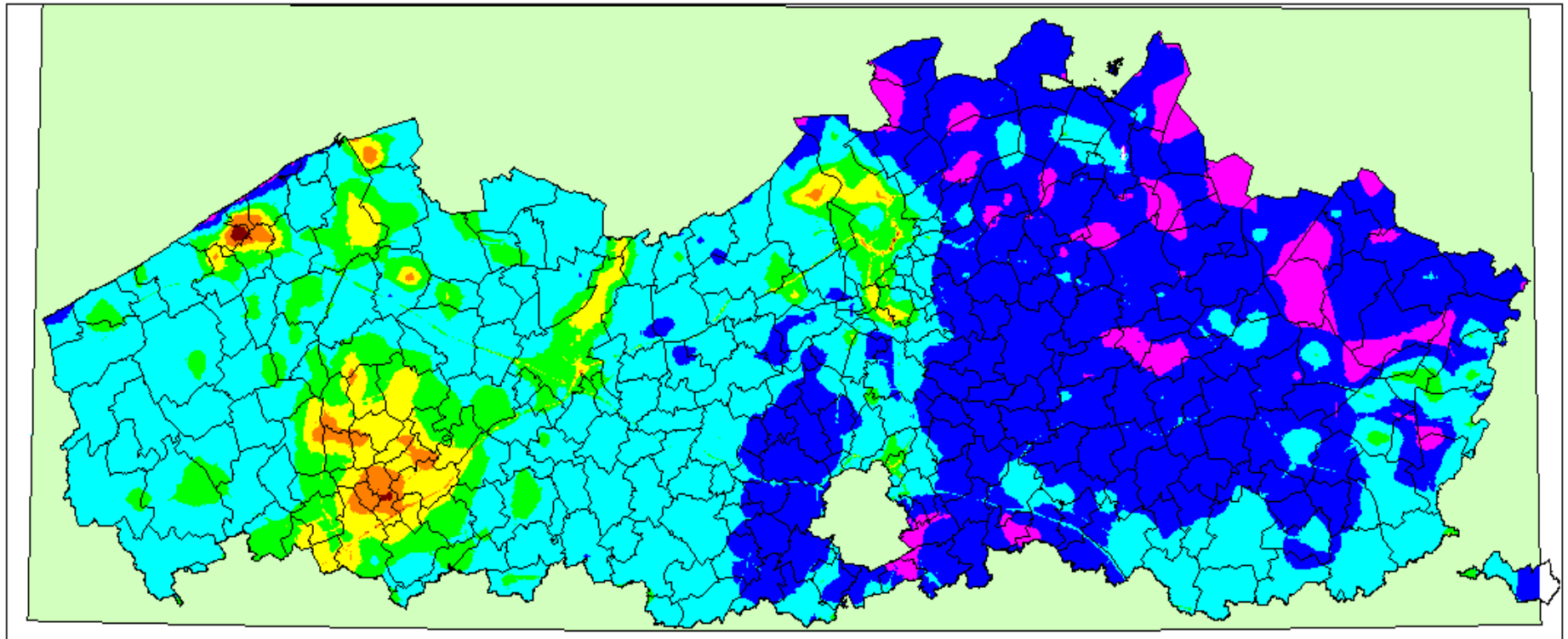


2007

Jaargem PM2.5 (µg/m³)

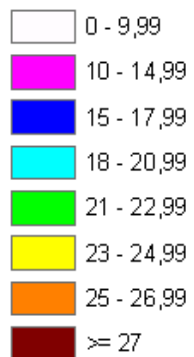


PM_{2.5}: yearly mean concentration (2007)



2007

Jaargem PM2.5 (µg/m³)

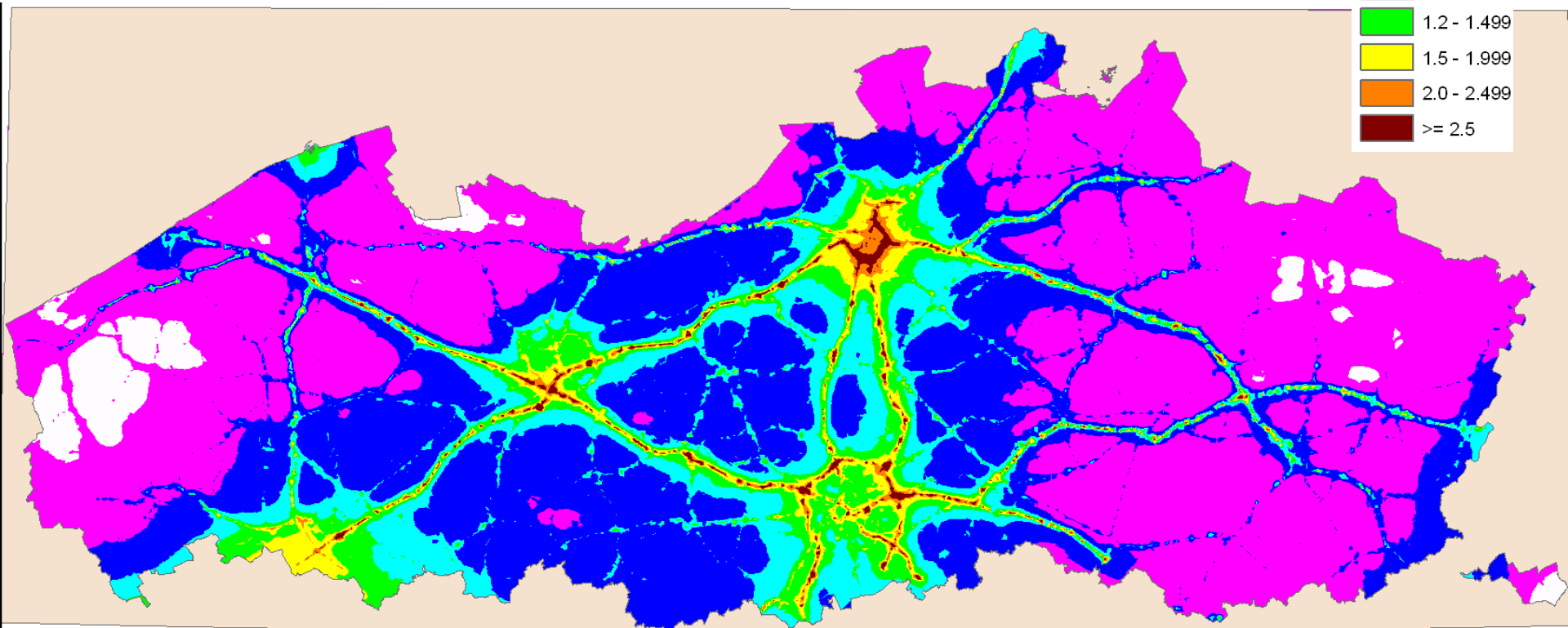
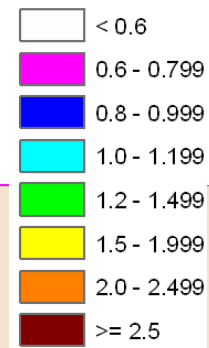


EC: yearly mean concentration ($\mu\text{g}/\text{m}^3$)

Not regulated (yet?)

Probably one of the most harmful components of PM_{10}

Jaargem EC
($\mu\text{g}/\text{m}^3$)



Review of EU legislation

- » Current policy efforts have fully not realised the objectives
- » Comprehensive review ongoing to arrive at new clean air strategy package,
 - » Combined with short term actions, amongst which
 - » Prioritising actions related to urban hot spots in exceedance of air quality limits
 - » Real world emissions
 - » Promotion of clean and energy-efficient road transport vehicles
 - » Sustainable Urban Mobility Plans incl. fostering roll-out of clean and low (or close to zero) carbon vehicles
 - »
- » Review to be realised by 2013