

European Network on New Sensing Technologies for Air
Pollution Control and Environmental Sustainability –
EuNetAir - COST Action TD1105

INTERNATIONAL WG1-WG4 MEETING on
*New Sensing Technologies and Methods for Air-
Pollution Monitoring*

European Environment Agency - EEA
Copenhagen, Denmark, 3 - 4 October 2013

AIR QUALITY STATUS IN EUROPE



European Topic Centre
on Air Pollution and
Climate Change Mitigation

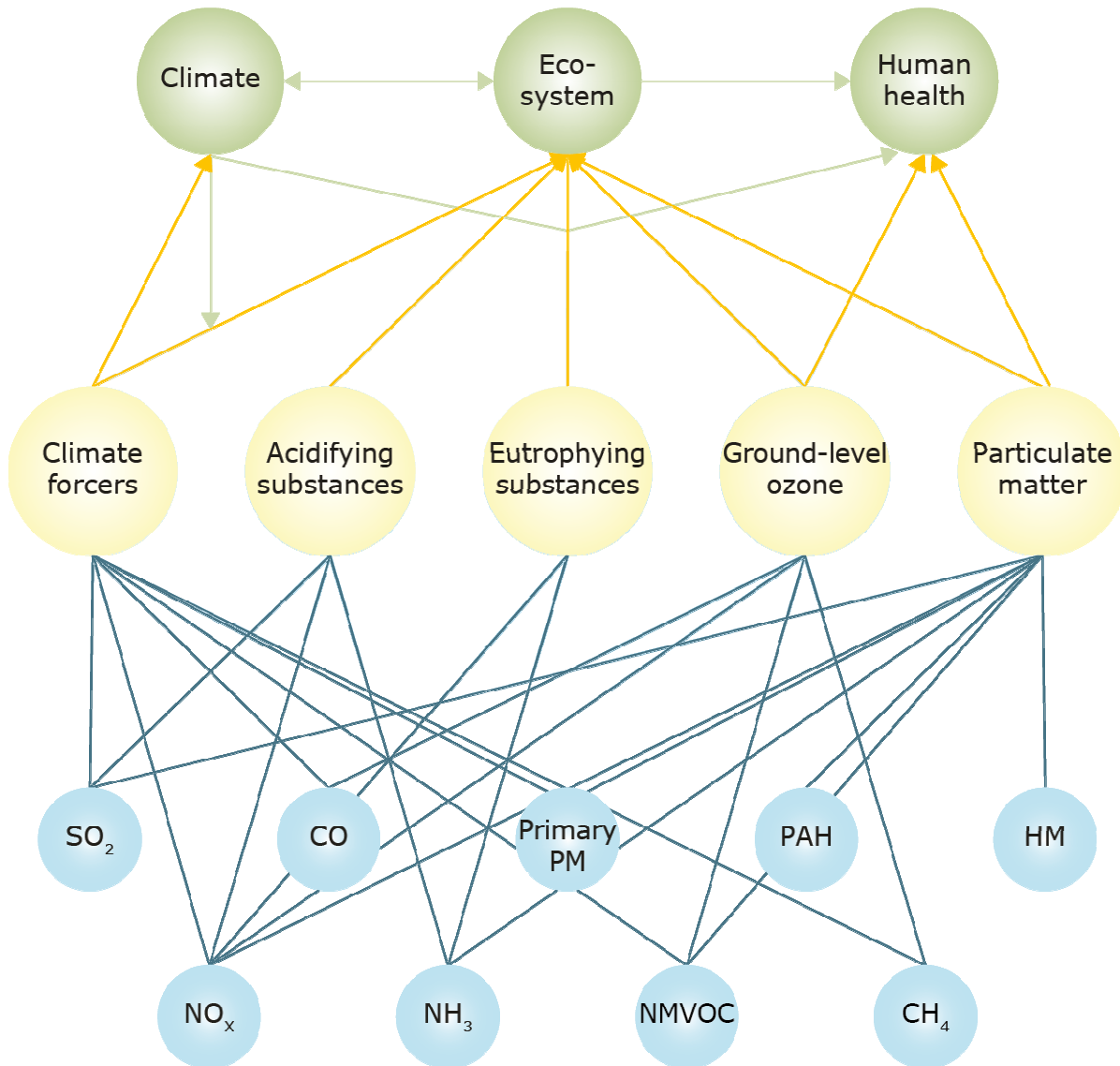
Cristina Guerreiro
Invited Expert
ETC/ACM & NILU / Norway



Impacts

Air quality

Emissions



Percentage of the EU's urban population exposed to air pollutant conc. above the EU and WHO reference levels (2009 to 2011)

Pollutant	EU reference value	Exposure estimate (%)	WHO AQG	Exposure estimate (%)
PM_{2.5}	year (20)	20 – 31	year (10)	91 – 96
PM₁₀	day (50)	22 – 33	year (20)	85 – 88
O₃	8-hour (120)	14 – 18	8-hour (100)	97 – 98
NO₂	year (40)	5 – 13	year (40)	5 – 13
BaP	year (1 ng/m ³)	22 – 31	year (0.12 ng/m ³)	76 – 94
SO₂	day (125)	< 1	day (20)	46 – 54
CO	8-hour (10)	< 2	8-hour (10)	< 2
Pb	year (0.5)	< 1	year (0.5)	< 1
Benzene	year (5)	< 1	year (1.7)	12 – 13

Colour coding:



The reference levels in brackets are in µg/m³ except for BaP in ng/m³ and CO in mg/m³

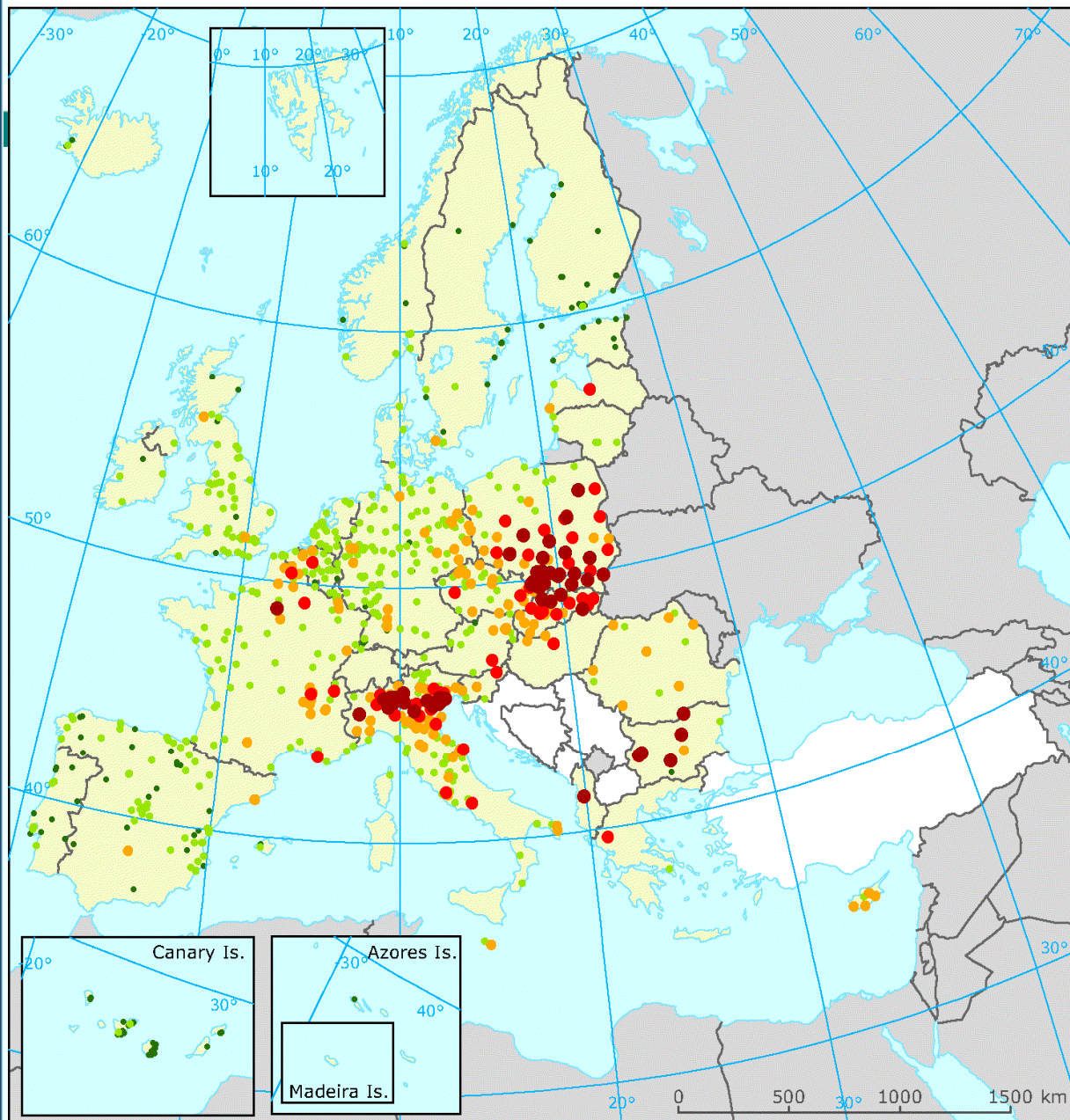


Headline messages

- PM and O₃ are Europe's most problematic pollutants in terms of harm to human health, despite emission reductions in precursors and prim PM.
- Almost one third of Europe's city dwellers are exposed to excessive PM conc.
- Emissions of the main air pollutants in Europe declined in the period 2002–2011, resulting in some improvements in air quality.
- Many European countries still do not comply with one or more emission ceilings set under EU and UN agreements.
- Road transport, households, power plants, agricultural activities and certain industry sectors continue to emit significant amounts of air pollutants.
- Several air pollutants also have a potential impact on the planet's climate and global warming in the short term.



Particulate matter: PM2.5



Annual mean fine particulate matter (PM_{2.5}) 2011, based on annual average with percentage of valid measurements $\geq 75\%$ in $\mu\text{g}/\text{m}^3$

- ≤ 10
- 10-20
- 20-25
- 25-30
- > 30

- No data
- ▒ Countries/regions not included in the data exchange process

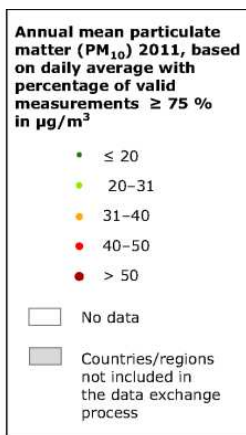
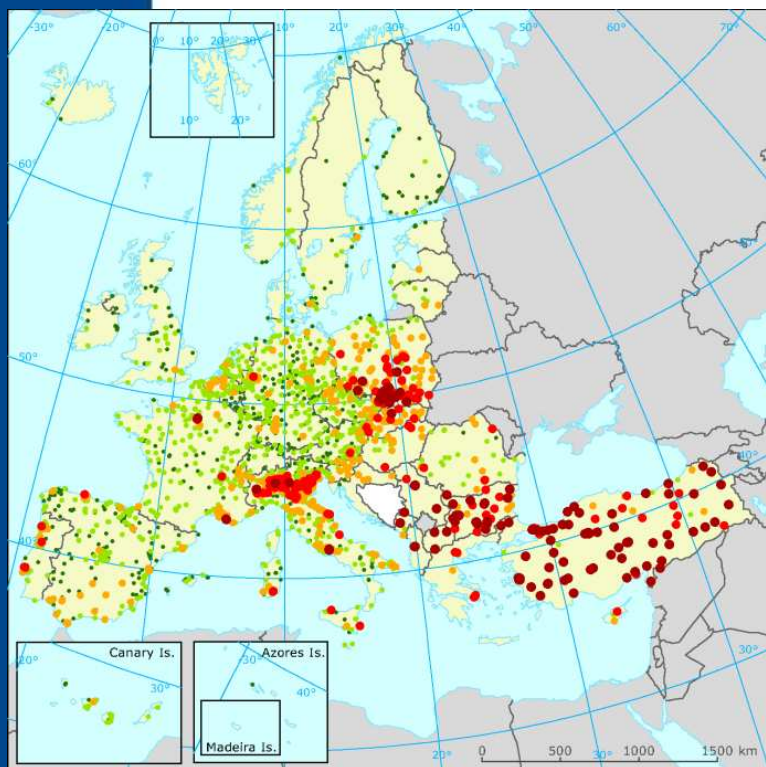
EU target value = $25 \mu\text{g}/\text{m}^3$

WHO AQGL = $10 \mu\text{g}/\text{m}^3$

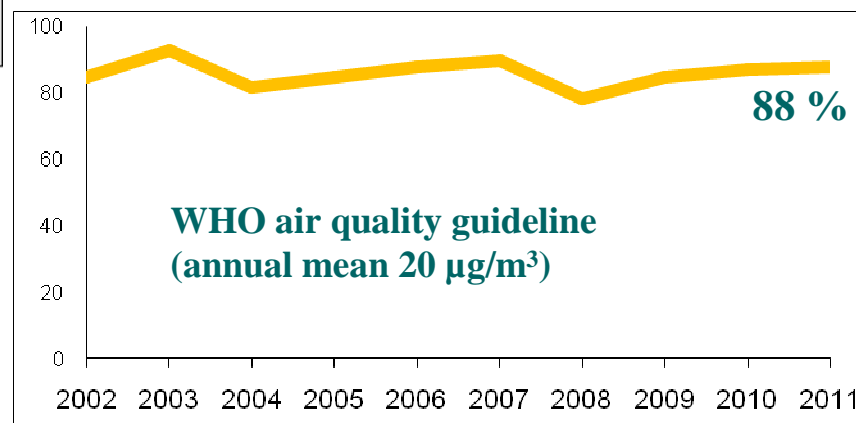
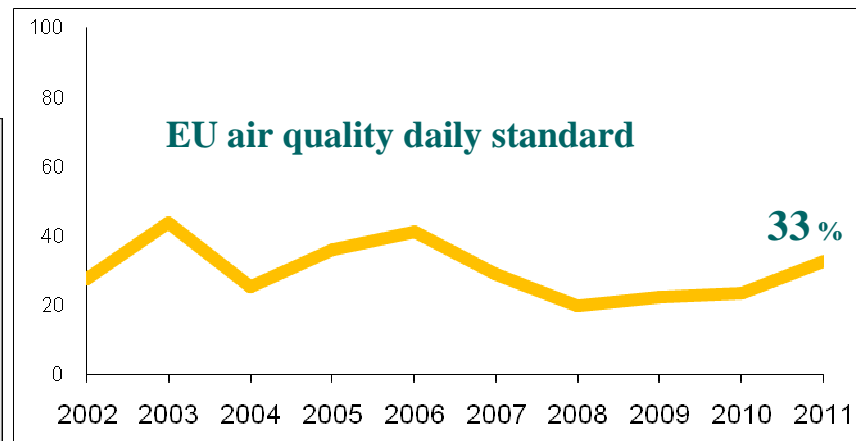
Particulate matter : PM10

Percentage of the EU's urban population exposed to PM10 exceeding

PM10 annual mean concentration 2011

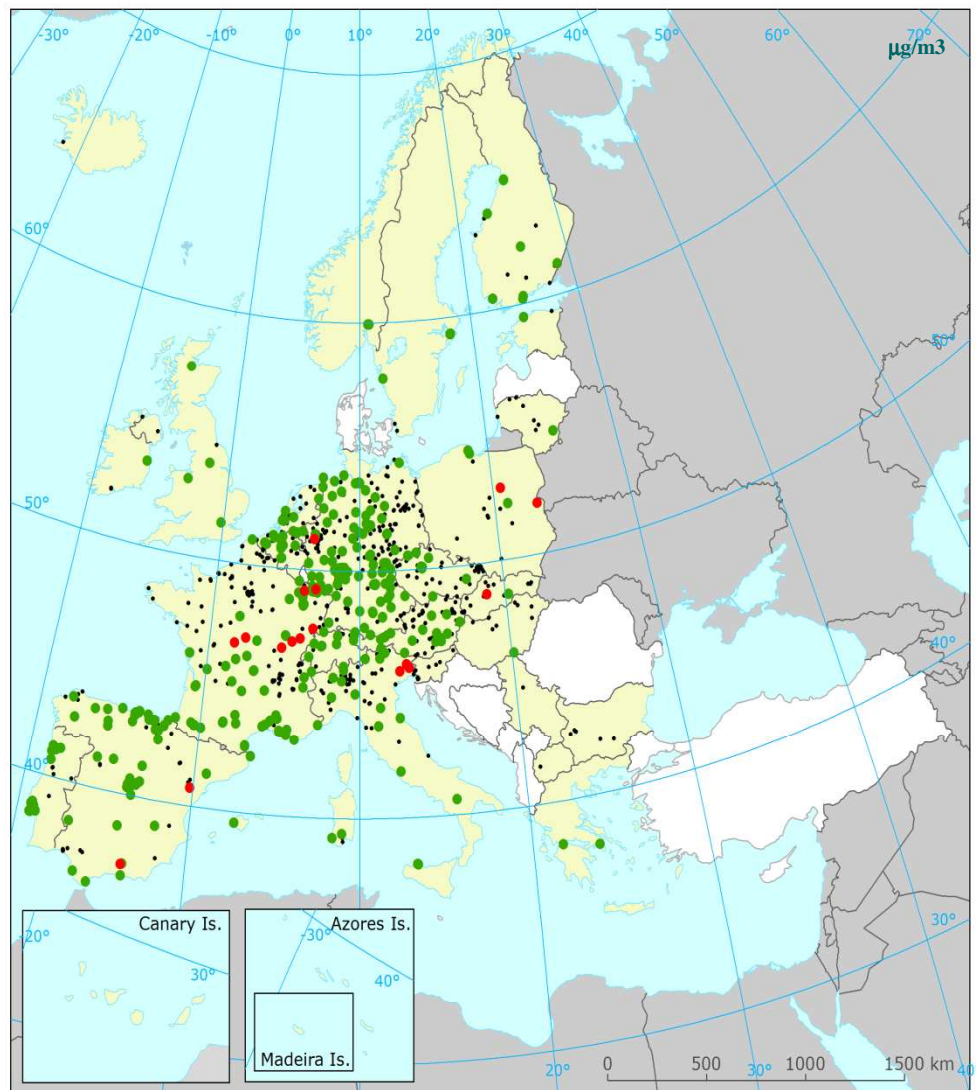


In orange and red: above EU limit values to be met by 2005



Particulate matter

Annual changes in PM10 concentrations 2002-2011



PM10 trend (µg/m³)/year 2002-2011

Trend

• > 0

• ≤ 0

• Stations with non-significant trend

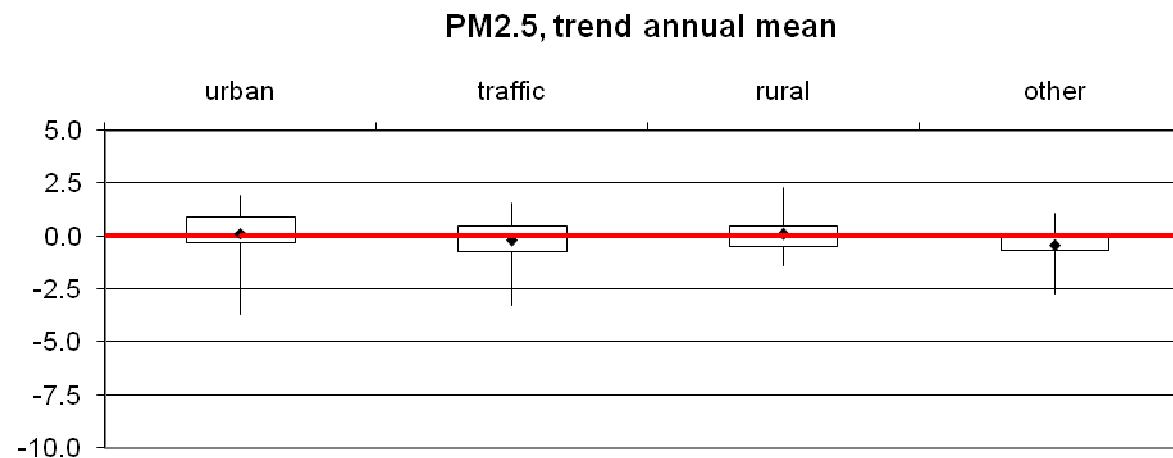
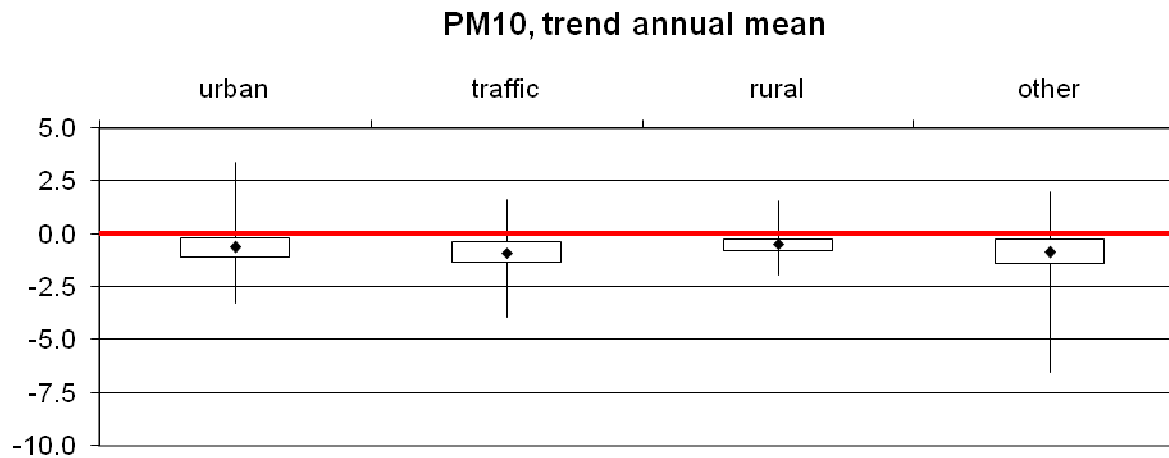
□ Insufficient data or no data

■ Countries/regions not included in the data exchange process

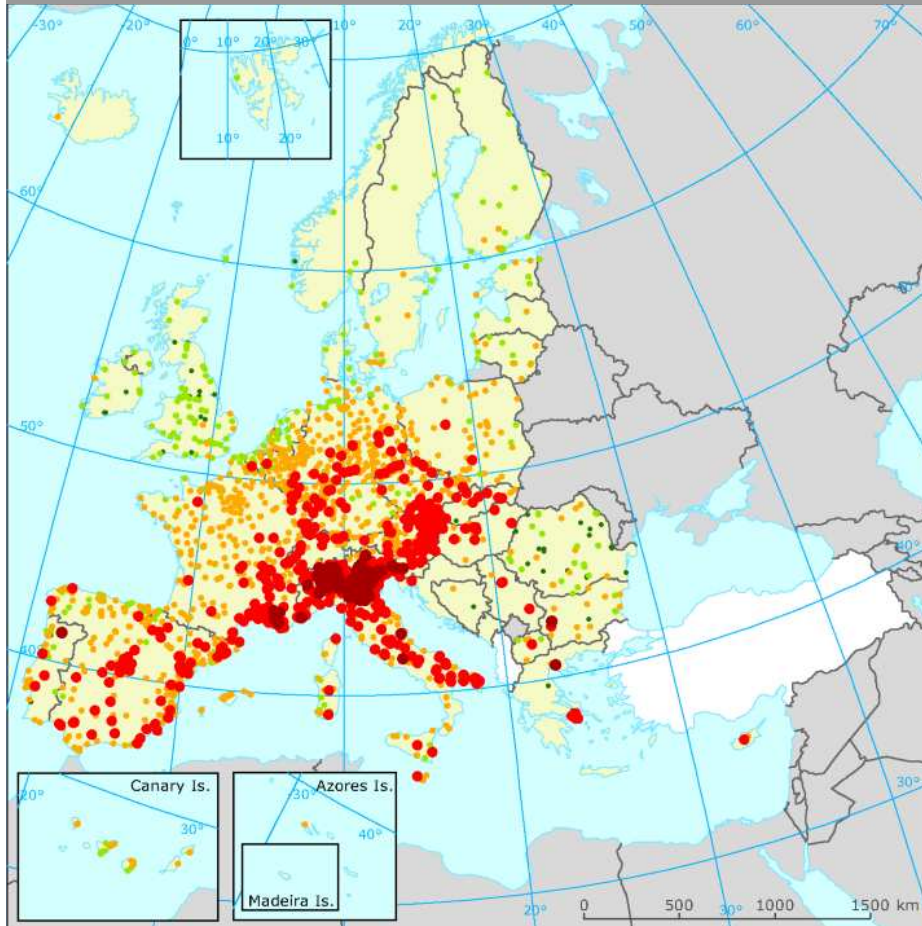


Particulate matter

Average annual changes in PM10 and PM2.5 concentrations 2002-2011



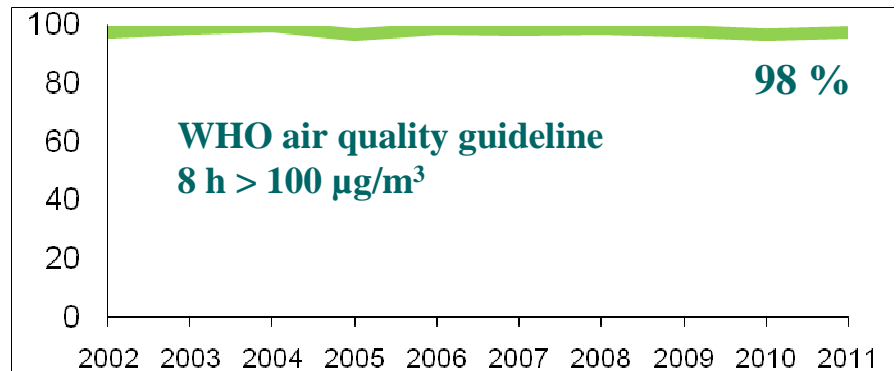
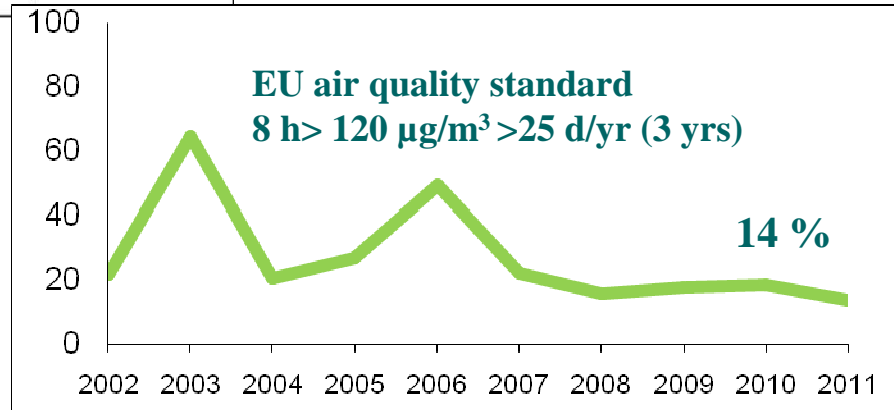
Ground-level ozone



Twenty-sixth highest ozone 2011, based on daily running 8h max with percentage of valid measurements $\geq 75\%$ in $\mu\text{g}/\text{m}^3$

- ≤ 80
 - 80–100
 - 100–120
 - 120–140
 - > 140
- No data
 Countries/regions not included in the data exchange process

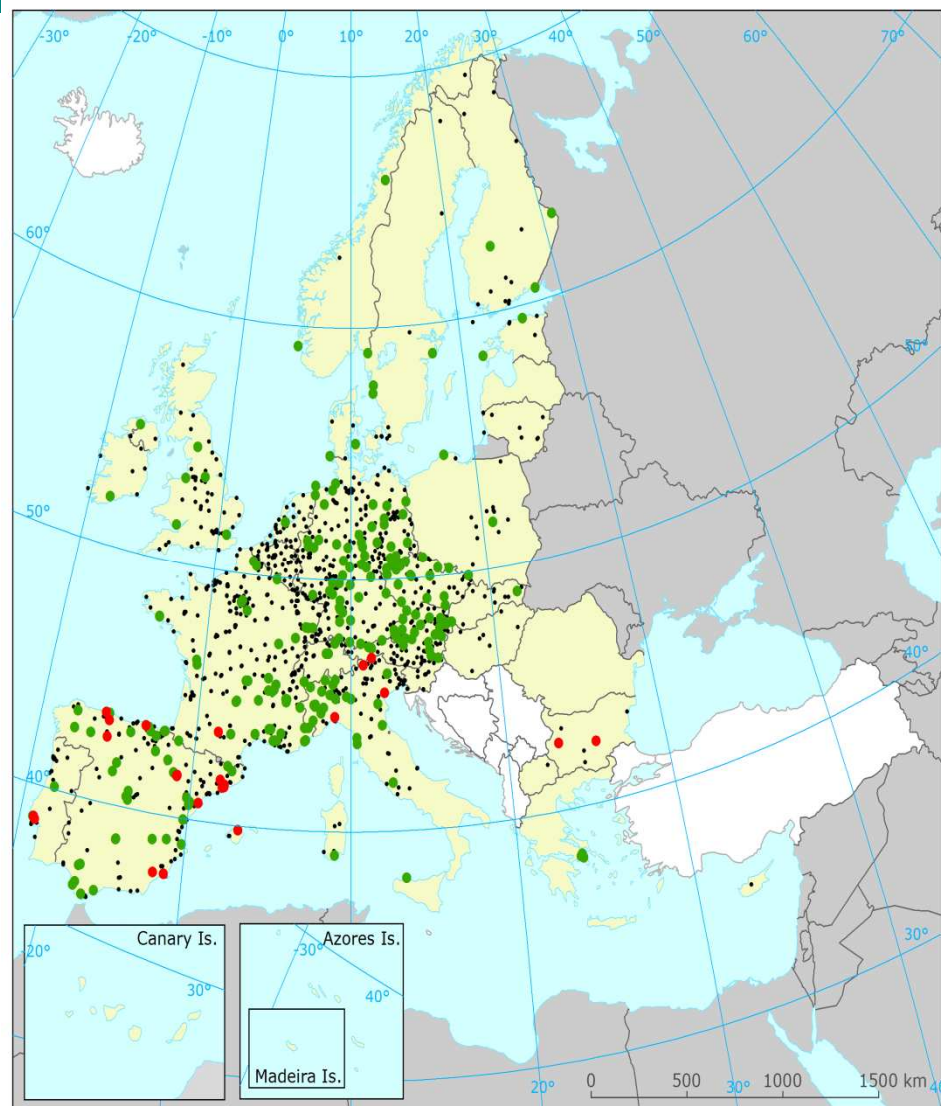
% of the EU's urban population exposed to O_3 exceeding standards



**In red and dark red:
 above EU target value to be met by 2010**

Ground-level ozone

Changes in annual mean of the max. daily 8-hr ozone conc. 2002-2011



O₃ trend ($\mu\text{g}/\text{m}^3$)/year

Trend

● > 0

● ≤ 0

● Stations with non-significant trend

□ Insufficient data or no data

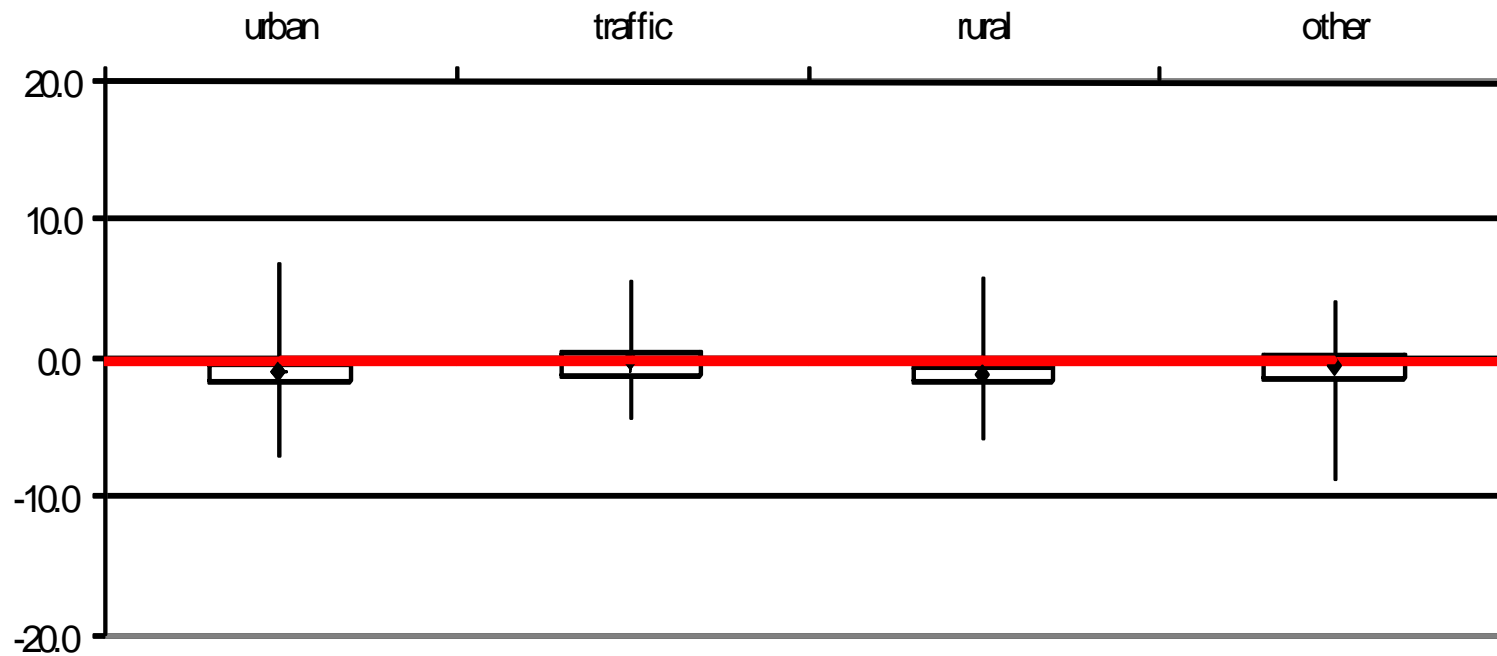
■ Countries/regions not included in the data exchange process



Ground-level ozone

Average annual changes in ozone concentrations 2002-2011

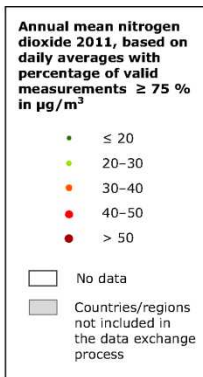
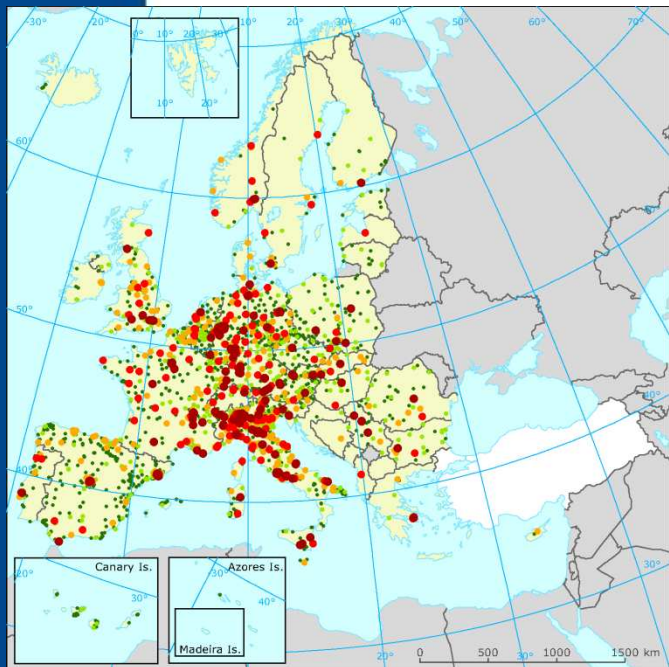
O₃, trend 93.2 percentile maximum daily 8h mean



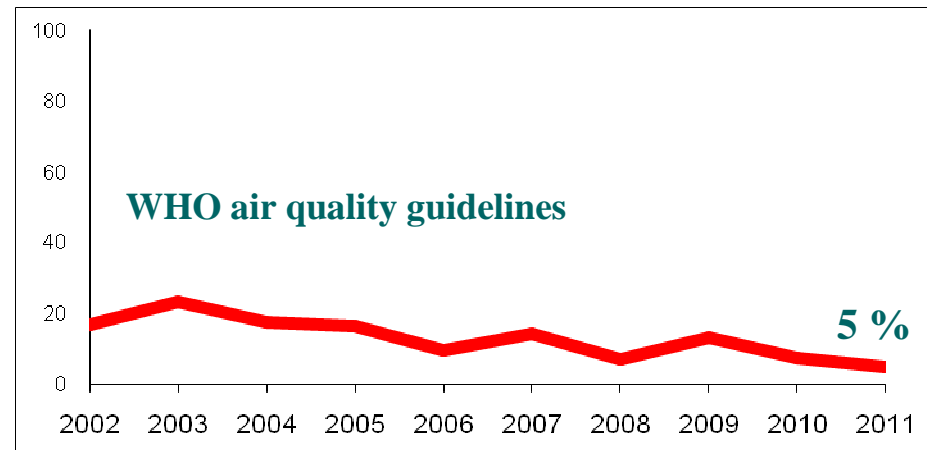
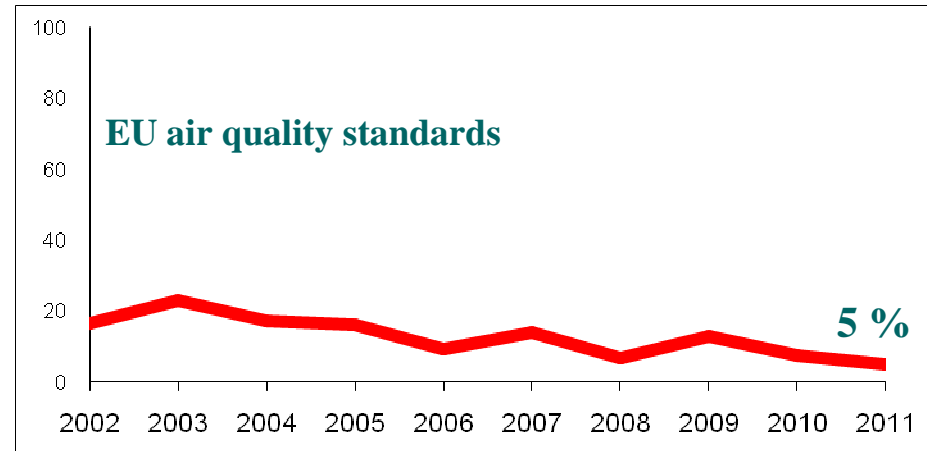
Nitrogen dioxide

Percentage of the EU's urban population exposed to NO₂ exceeding

NO₂ annual mean 2011

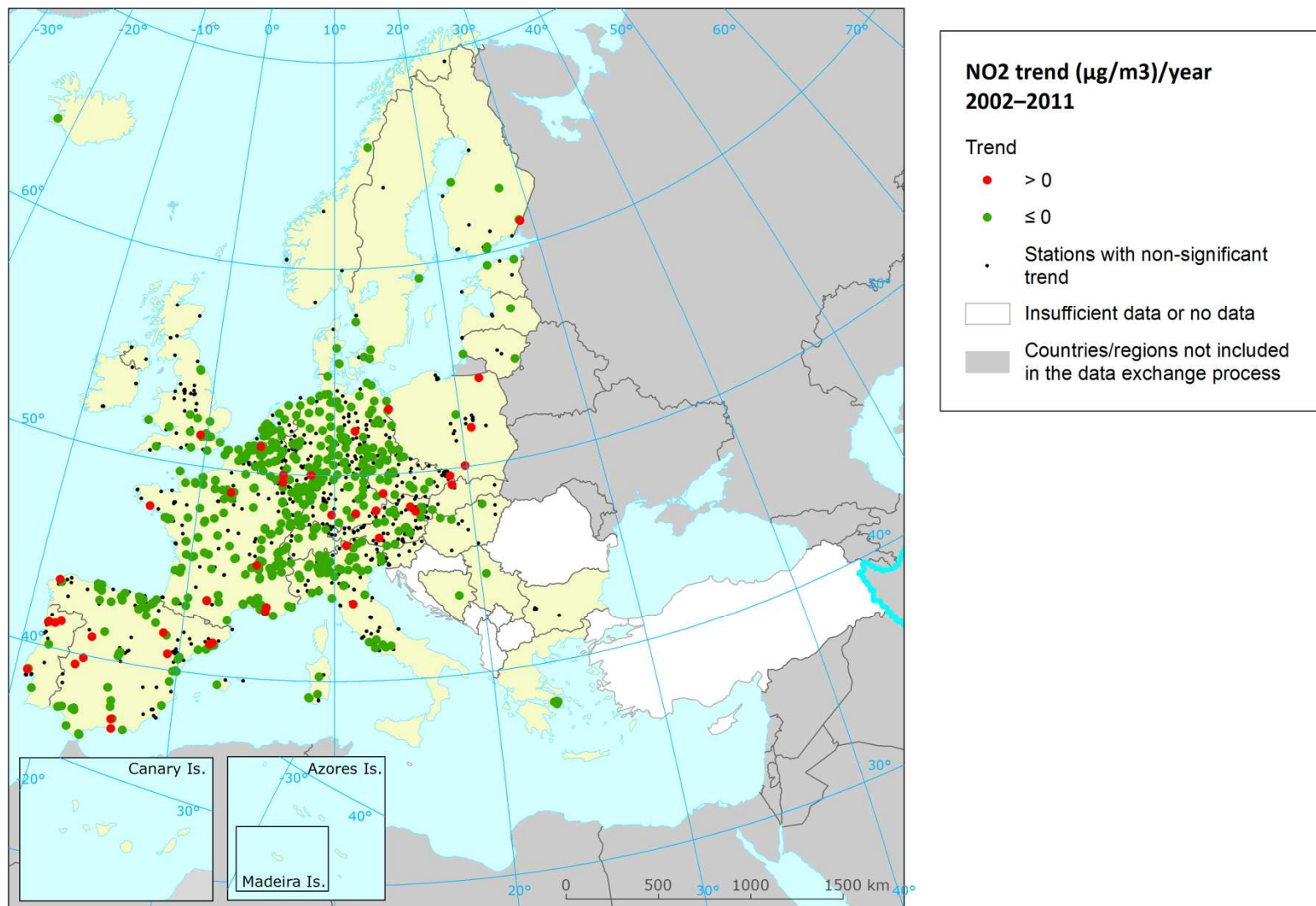


**In red and dark red:
above EU limit value to be met by 2010**



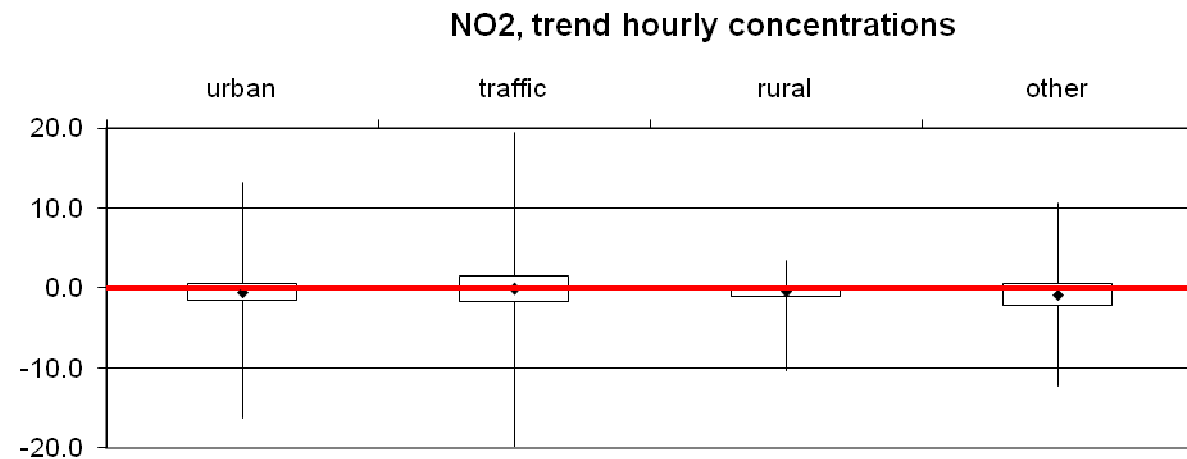
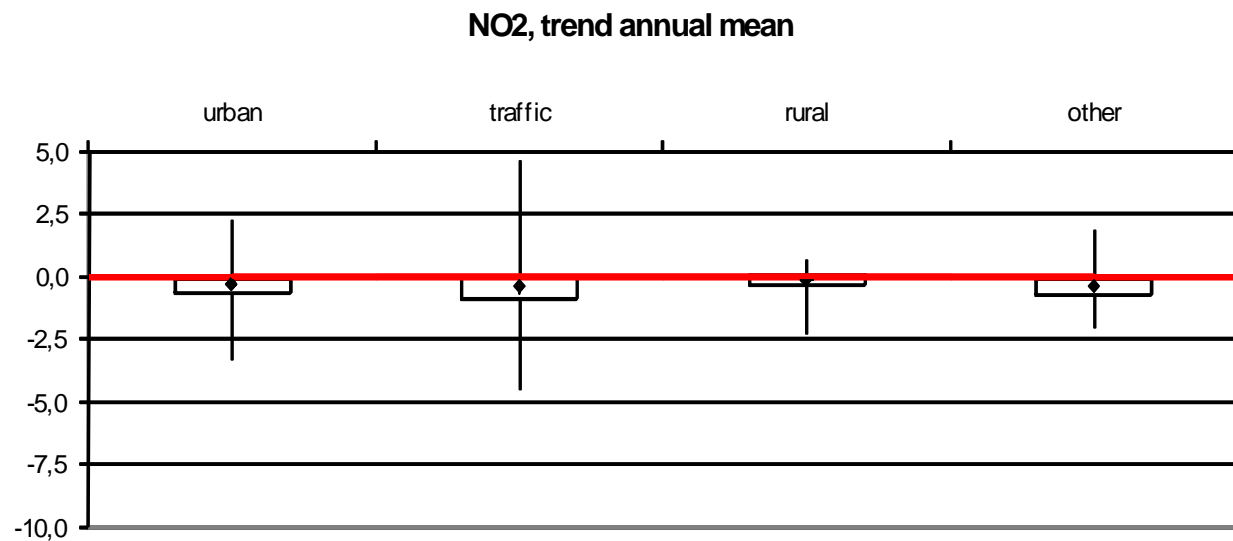
Nitrogen dioxide

Changes in annual mean NO₂ concentrations 2002-2011



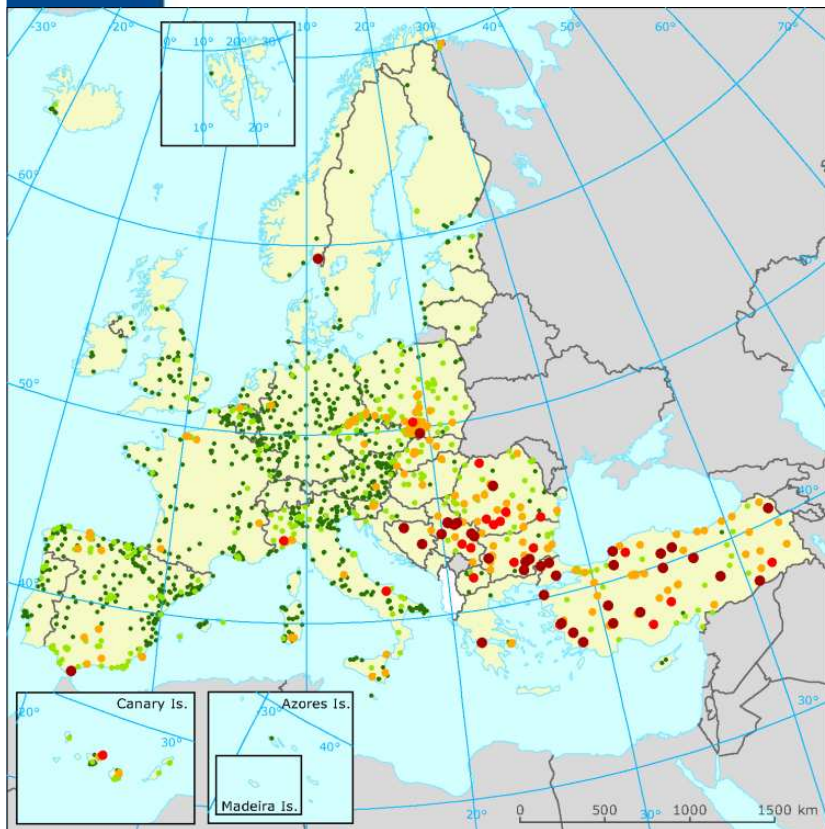
Nitrogen dioxide

Average annual changes in NO₂ concentrations 2002-2011



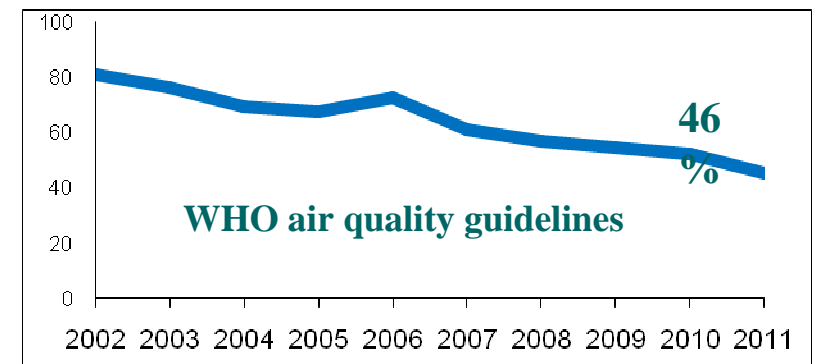
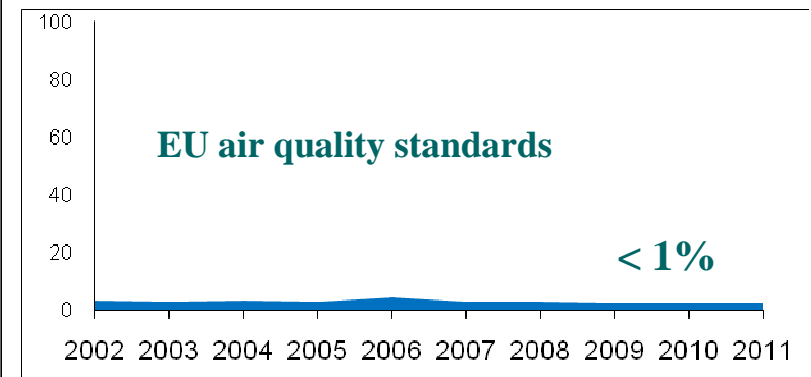
Sulphur dioxide

SO₂ annual mean 2011



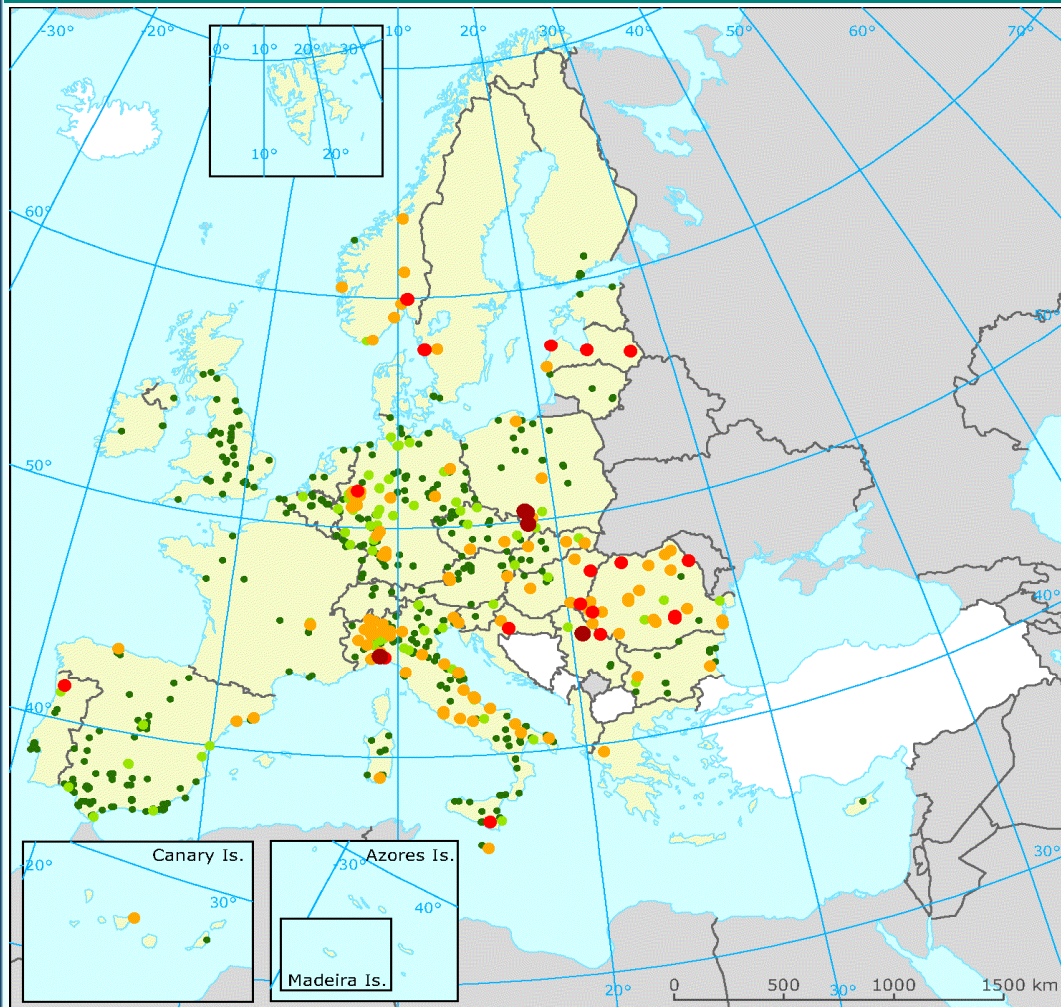
In red and dark red: above EU limit value (vegetation) to be met by 2005

Percentage of EU's urban population exposed to SO₂ exceeding



Benzene

Annual mean of benzene 2011



Annual mean benzene 2011, based on annual averages with percentage of valid measurements $\geq 50\%$ in $\mu\text{g}/\text{m}^3$

- ≤ 1.7
- 1.7–2.0
- 2.0–3.5
- 3.5–5.0
- > 5.0

- No data
- Countries/regions not included in the data exchange process

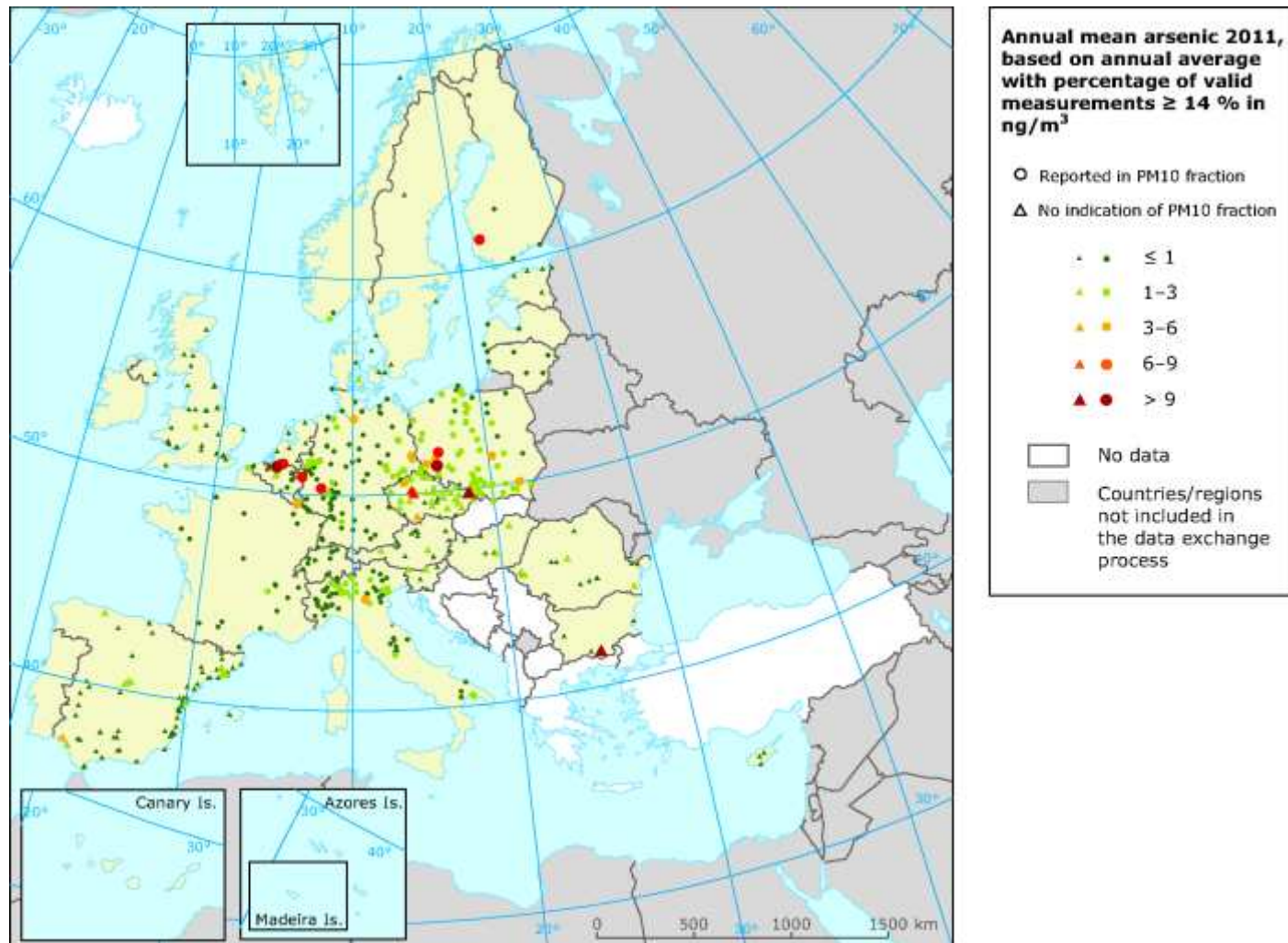
EU target value = 5 $\mu\text{g}/\text{m}^3$

WHO ref. lev. = 1.7 $\mu\text{g}/\text{m}^3$



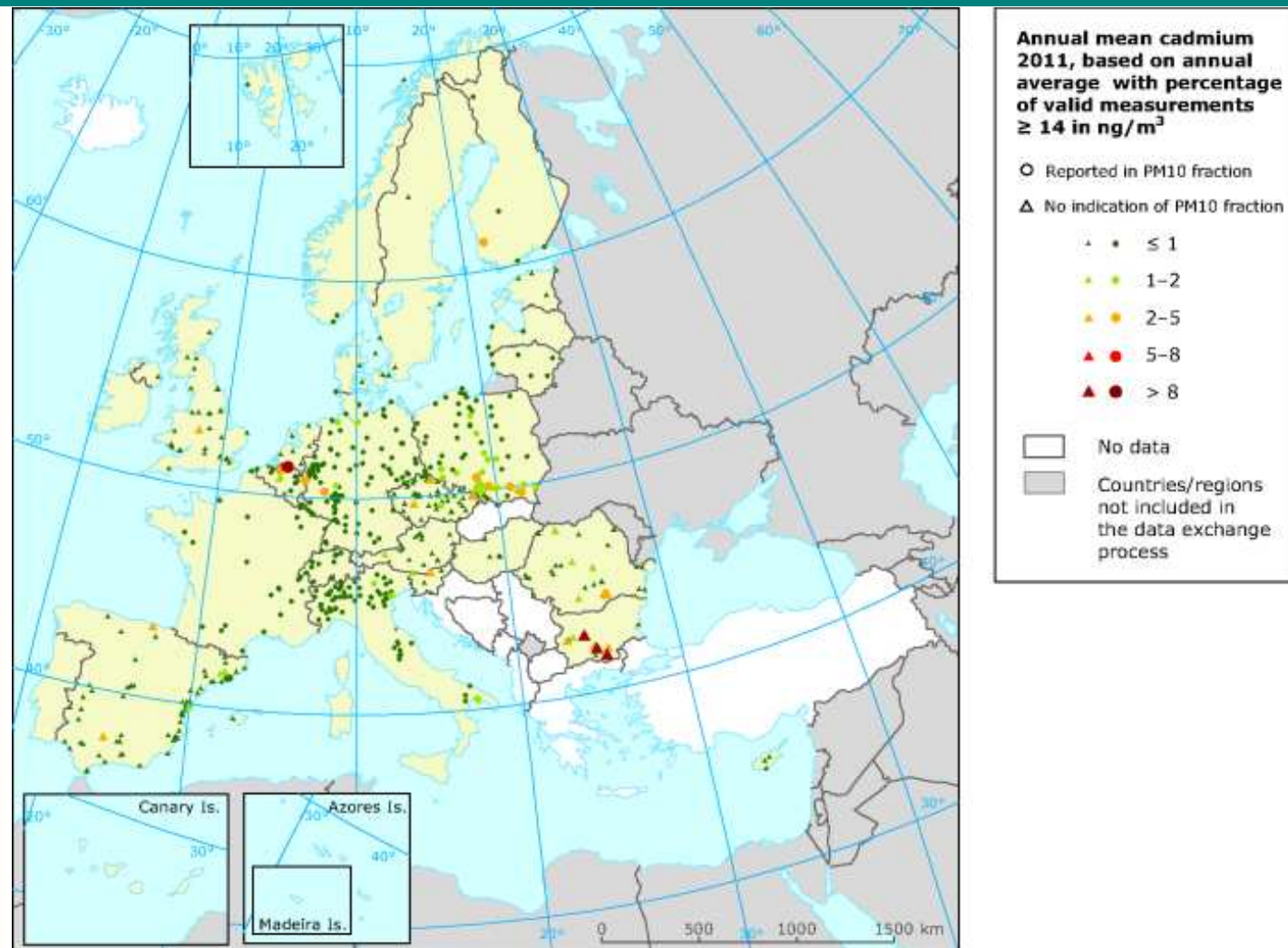
Heavy metals

Arsenic



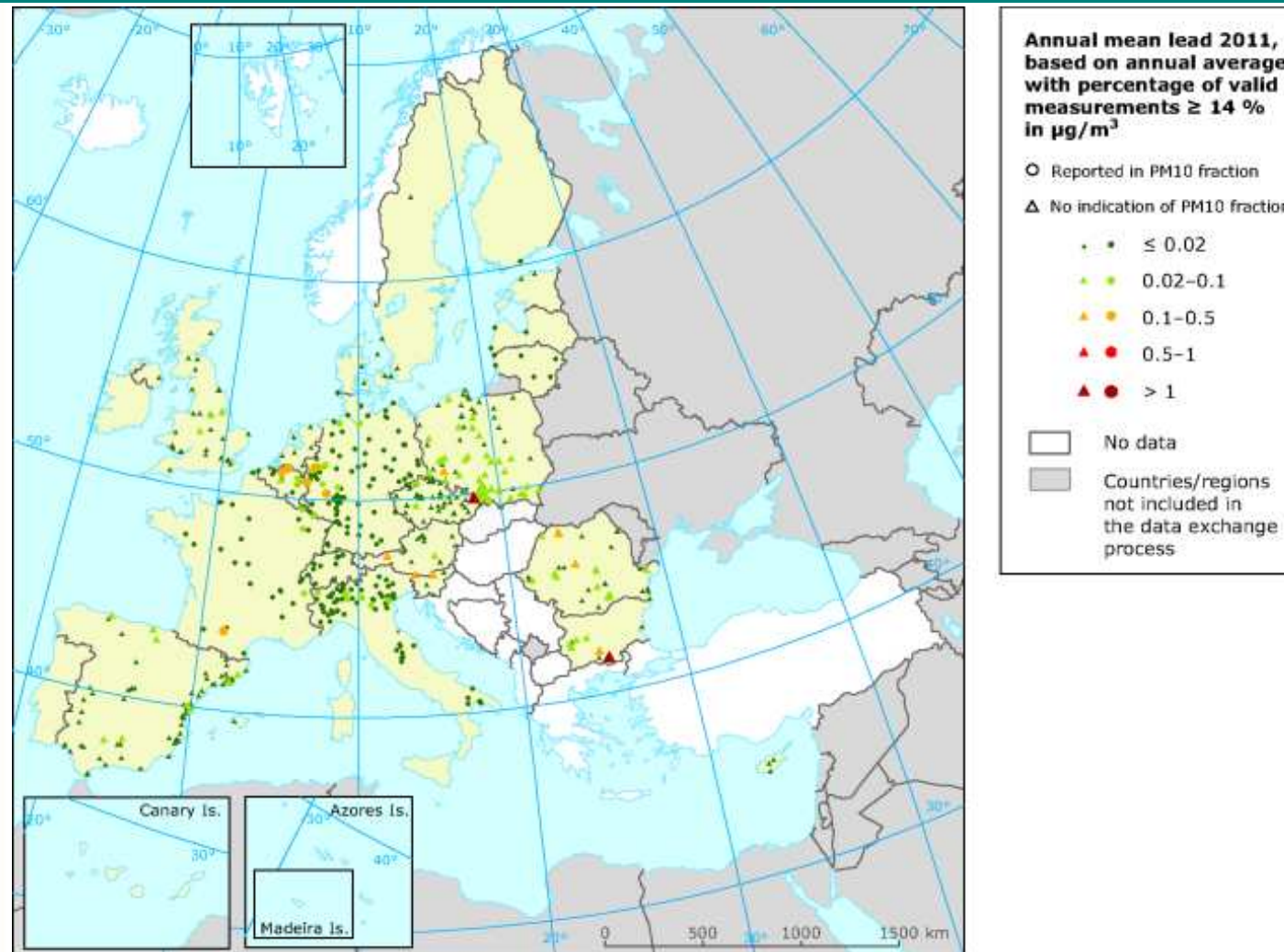
Heavy metals

Cadmium



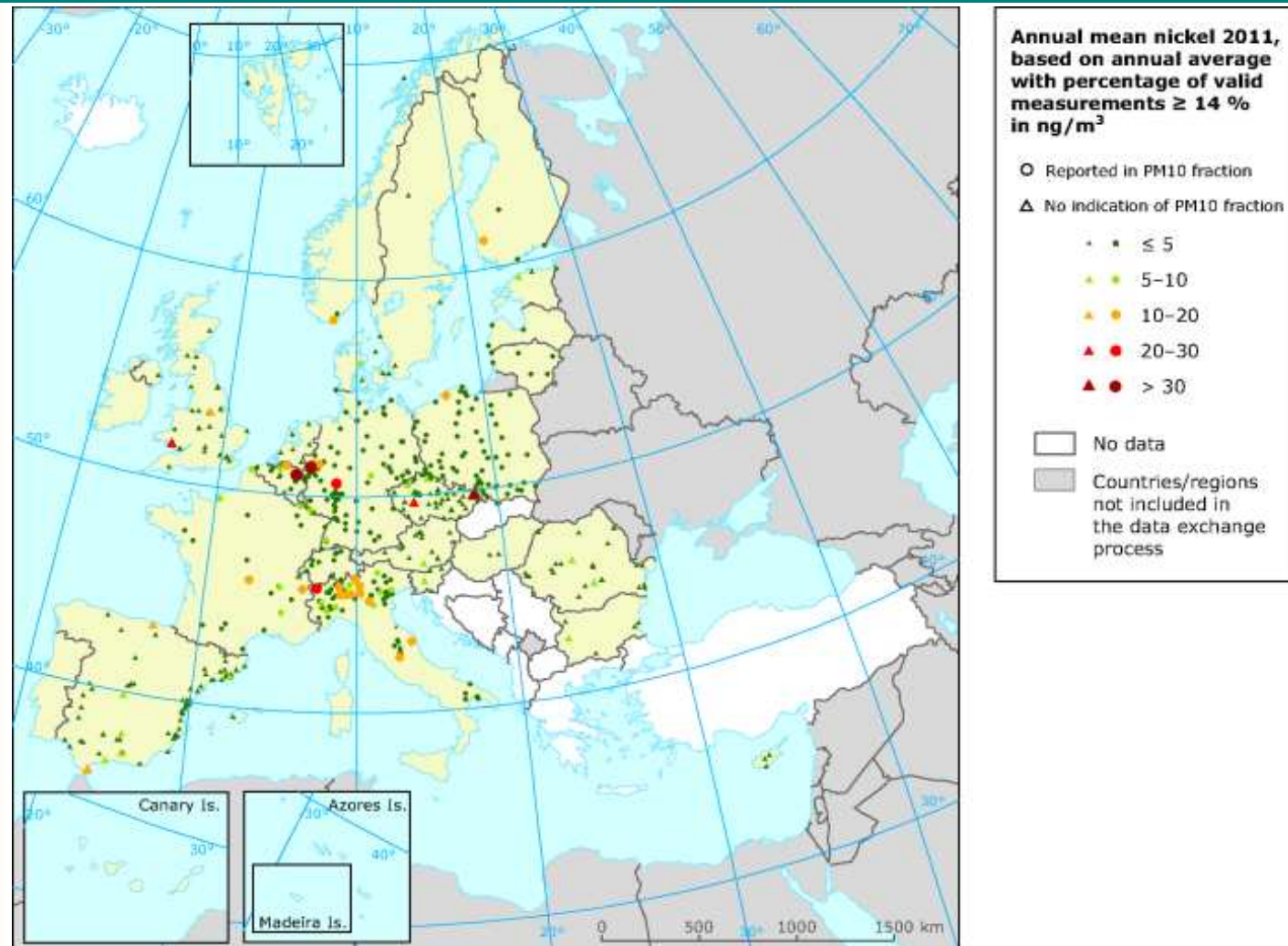
Heavy metals

Lead



Heavy metals

Nickel



Heavy metals: key messages

- Human exposure to Pb, As, Cd and Ni ambient air concentrations above the target values is a local problem
- Atmospheric deposition of heavy metals contributes to the exposure of ecosystems and organisms to HM and their bioaccumulation
- Most countries have exceedance of critical loads for Cd in <1 % of their national ecosystem area
- Atmospheric deposition of Pb exceeds the critical loads in over 12 % of the EU ecosystem area
- More than half of all EEA-32 countries have exceedances of critical loads for Hg across nearly 90 % or more of their ecosystem area
- In total, atmospheric deposition of Hg exceeds the critical loads across 54 % of the EU ecosystem area

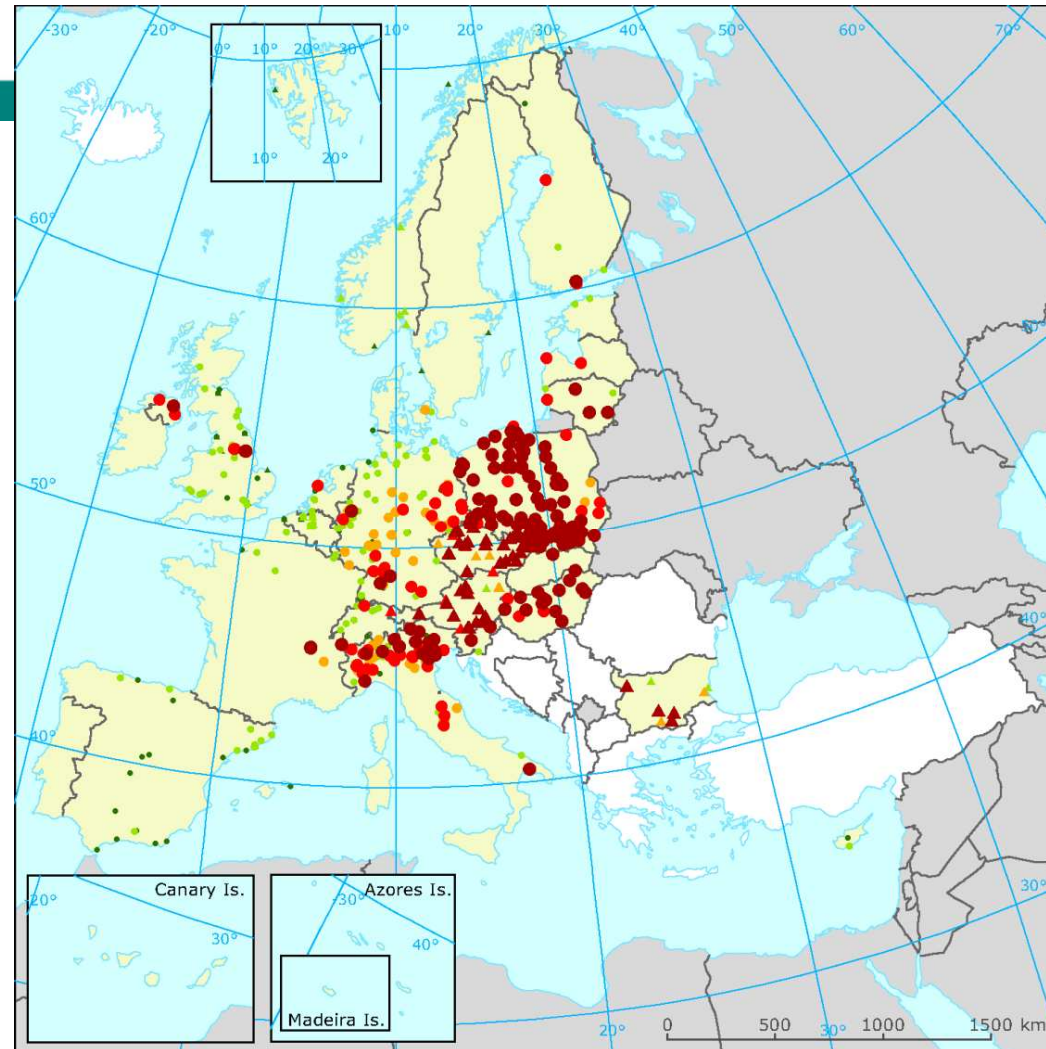


Benzo(a)pyrene

BaP emissions increased by 11% 2002-2011 in EU

Main sector: Commercial, institutional and household fuel combustion- 84%

Increased by 24% in 2002-2011



Annual mean benzo(a)pyrene 2011, based on annual average with percentage of valid measurements $\geq 14\%$ in ng/m^3

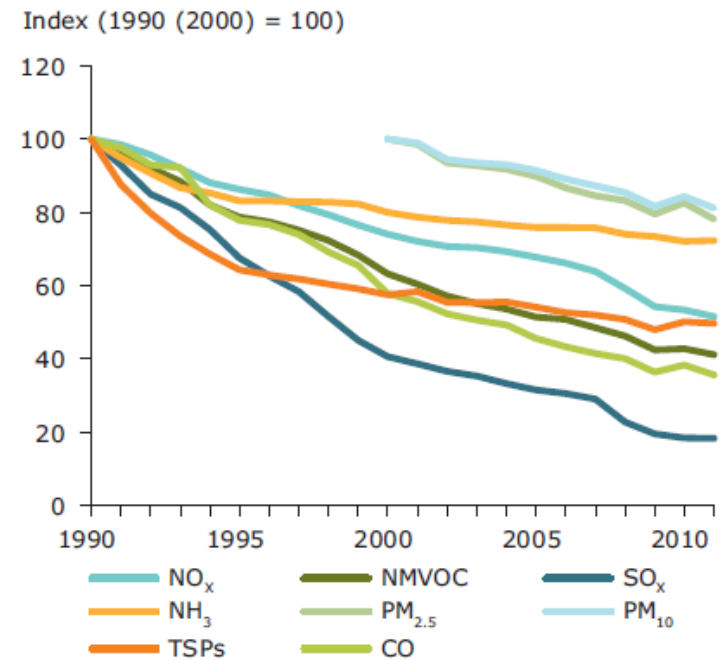
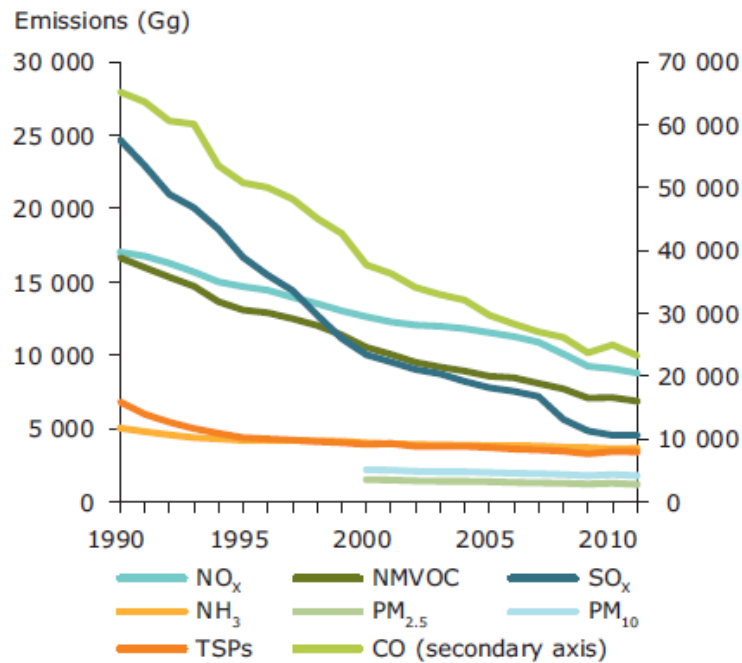
- Reported in PM10 fraction
- △ No indication of PM10 fraction
- ▲ ≤ 0.12
- ▲ $0.12-0.4$
- ▲ $0.4-0.6$
- ▲ $0.6-1.0$
- ▲ > 1.0
- No data
- Countries/regions not included in the data exchange process

In red: above EU target value to be met by 2013 ($1 \text{ ng}/\text{m}^3$)

WHO : $0.12 \text{ ng}/\text{m}^3$



EU-27 emission trends for the main pollutants



Source: European Union emission inventory report 1990–2011 to UNECE LRTAP Convention (EEA 2013, *in print*)



The final results will be presented in EEA report:

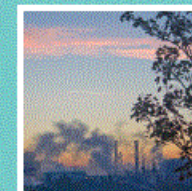
AQ in Europe 2013

To be launched later this month

EEA Report | No 9/2013

Air quality in Europe — 2013 report

ISSN 1725-9177



Thank you!

Cristina Guerreiro, ETC/ACM