

Air quality in Europe – challenges for science and management

The Air Quality Directive review

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- Motivations for an AQD review
- Where are we with AQ in Europe?
- A massive harmonization process of policies
- The process in detail: consultation
- The research contribution

Poor implementation

- link to measures and their effectiveness
- Continued wide-spread exceedances: PM, NO_x/2, Ozone,...
- Real world emissions of NO_x much higher than measured at type approval for cars, vans and heavy duty vehicles
- Higher proportion of total NO_x emitted directly in the form of NO₂.
- New pollutants: PM_{2.5}, PM₁, Ultrafines, Black Carbon / Soot

Increasing evidence of impacts

- health effects on children
- biodiversity and ecosystem impacts
- long-recovery periods (eg. acidification)
- Climate & AQ

2005

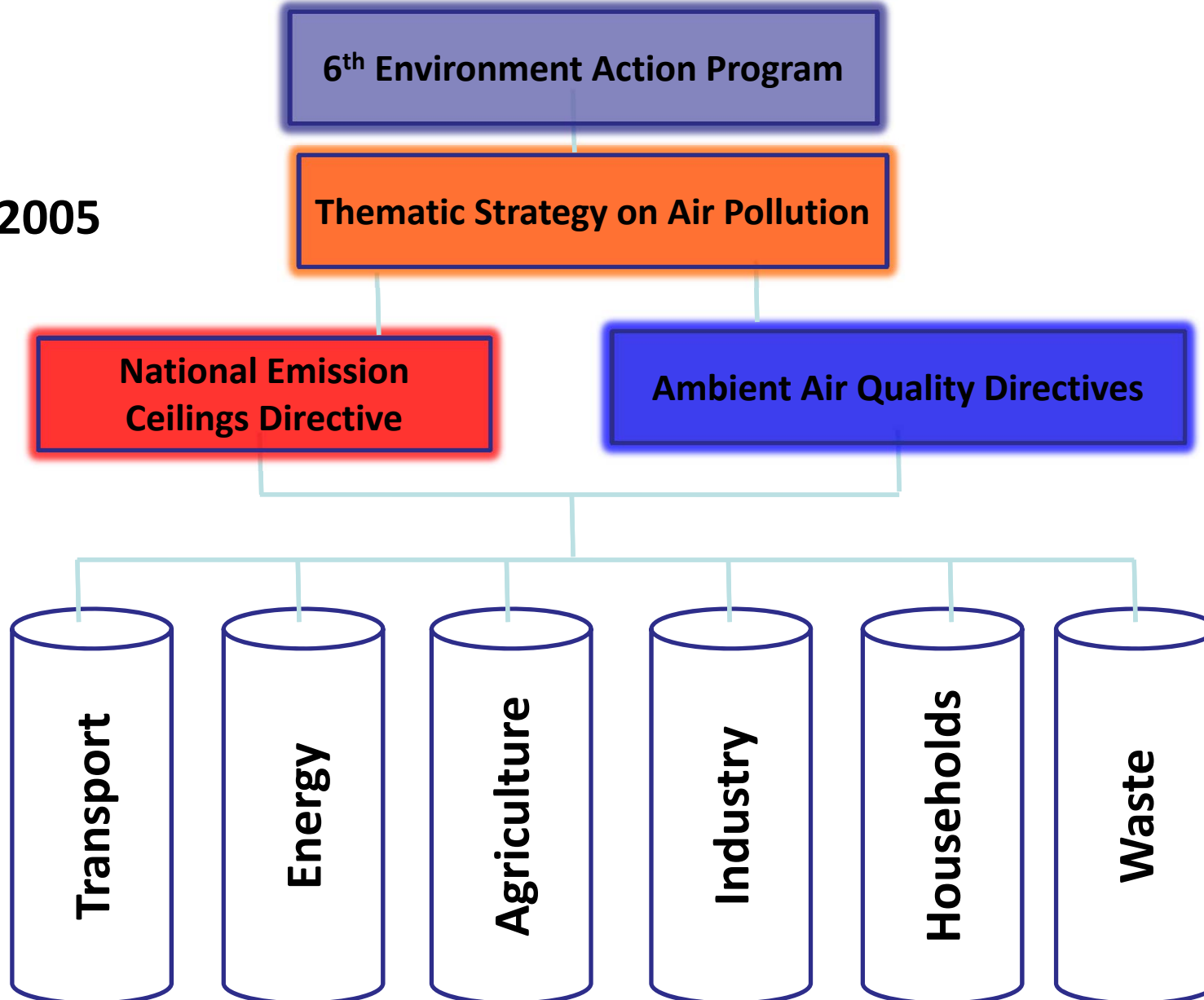
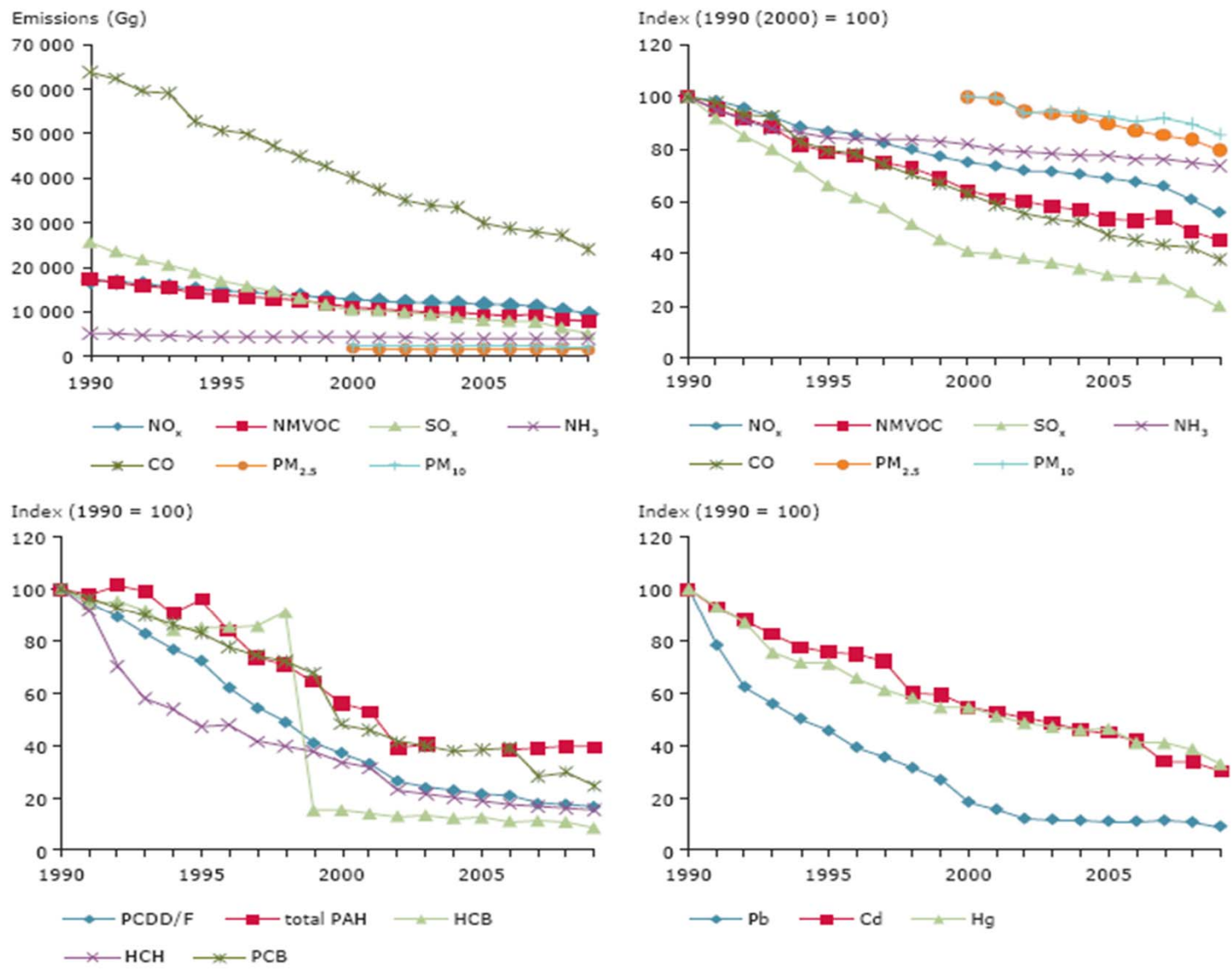
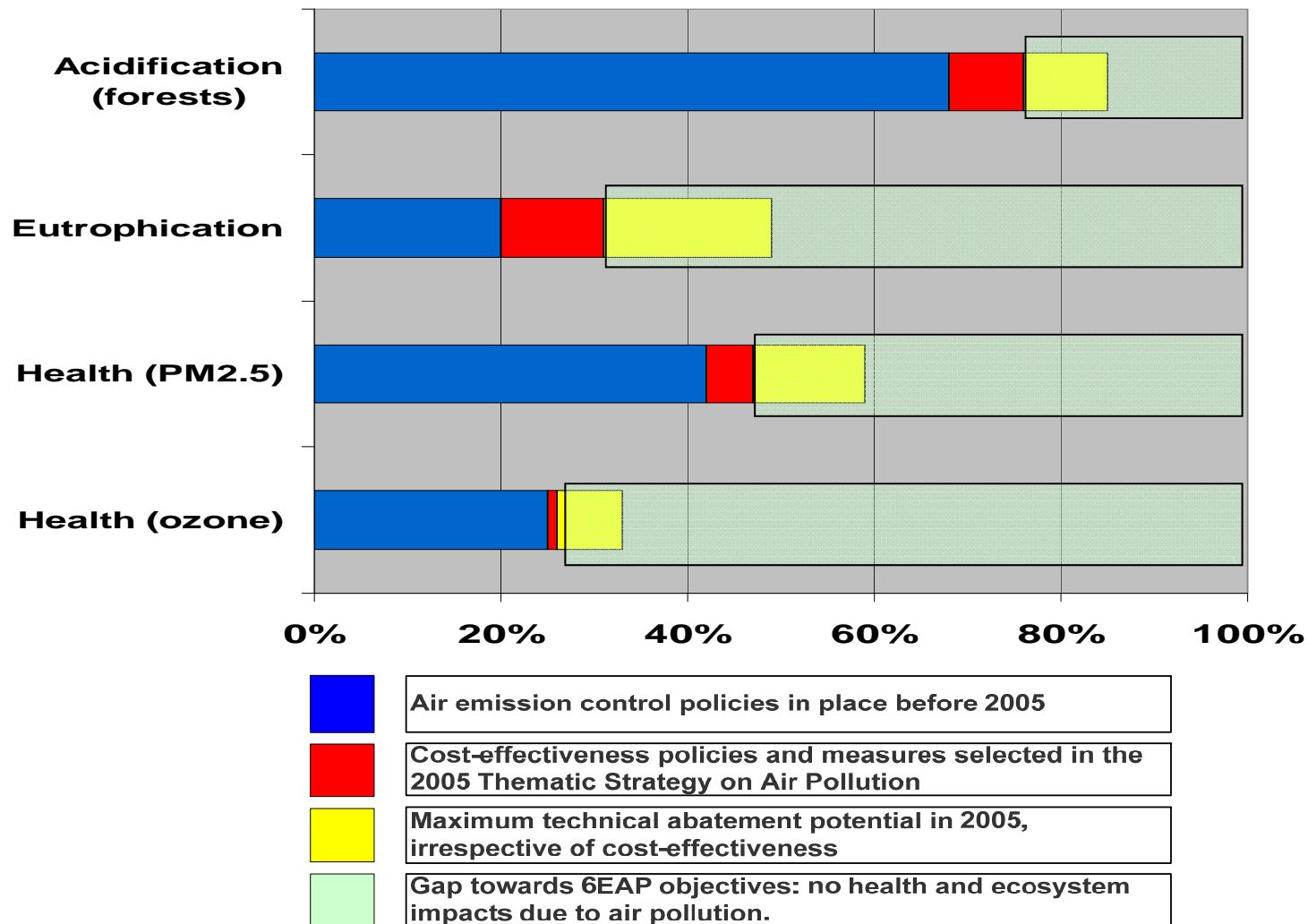


Figure ES.1 EU-27 emission trends for the main air pollutants, particulate matter, heavy metals and POPs



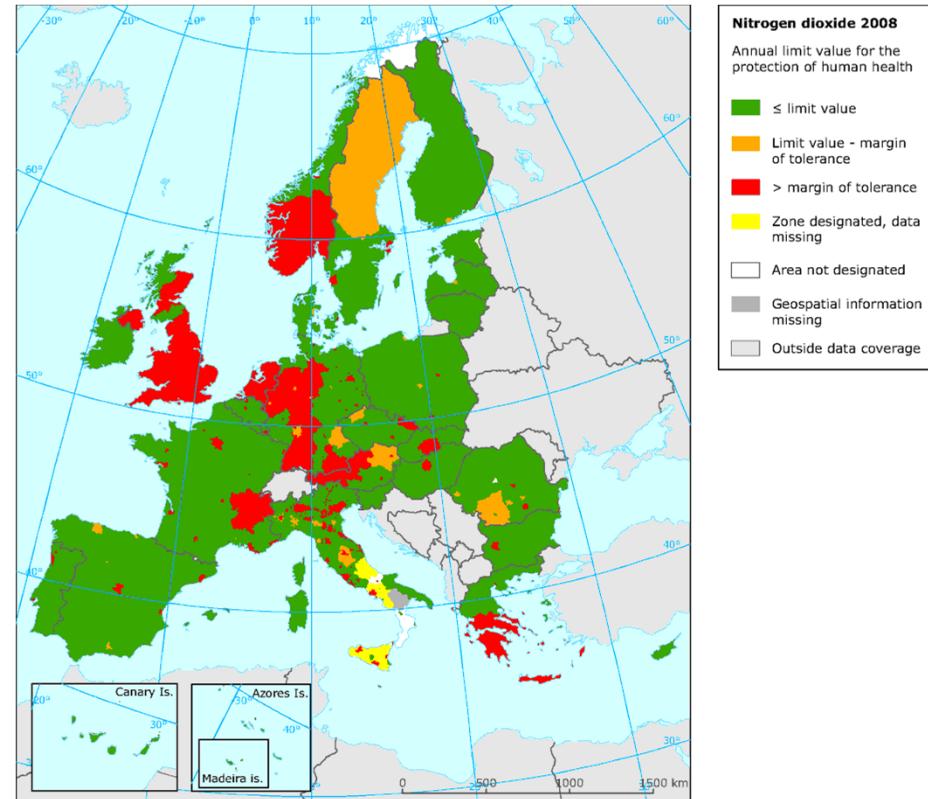
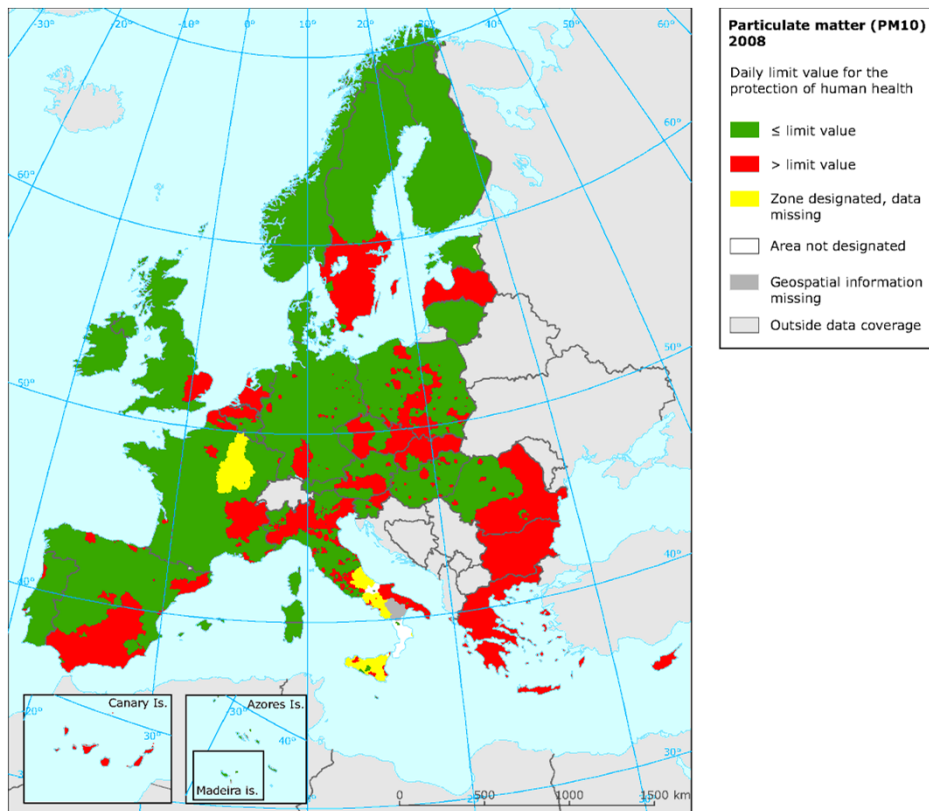
Percent improvement (gap-closure) in 2020 compared to situation in 2000.

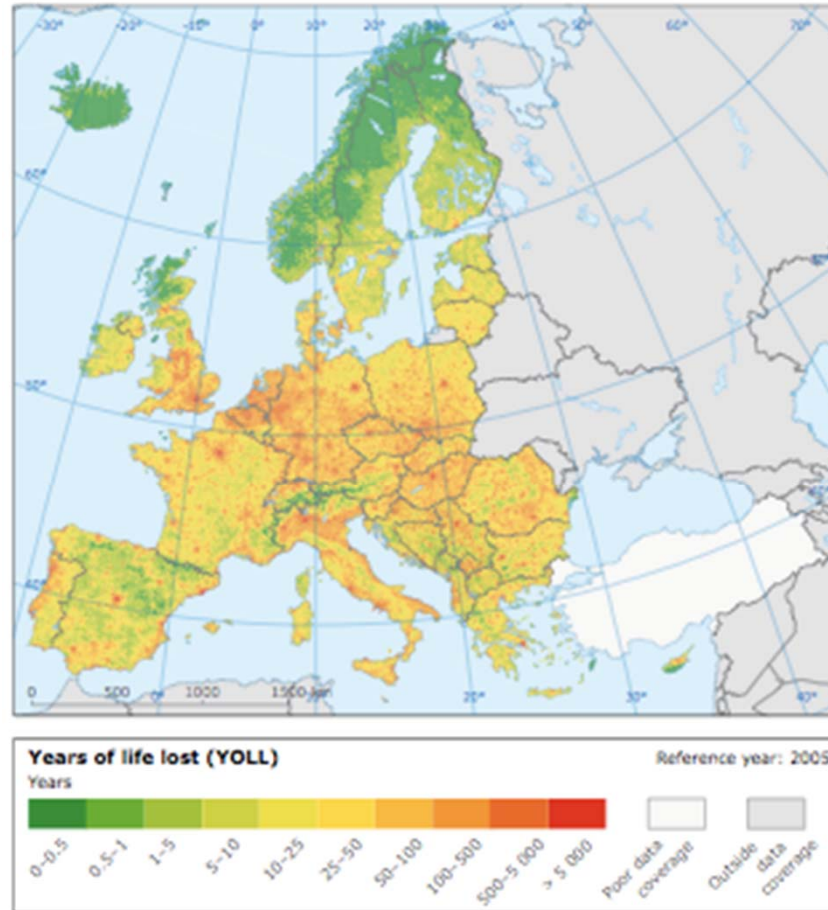


<i>Pollutant</i>	<i>Concentration</i>	<i>Averaging period</i>	<i>Legal nature and deadline</i>	<i>Permitted exceedences each year</i>
Fine particles (PM _{2.5})	25 µg/m ³ ***	1 year	Target value by 01.01.2010 Limit value by 01.01.2015	n/a
Sulphur dioxide	350 µg/m ³	1 hour	Limit value by 01.01.2005	24
	125 µg/m ³	24 hours	Limit value by 01.01.2005	3
Nitrogen dioxide	200 µg/m ³	1 hour	Limit value by 01.01.2010	18
	40 µg/m ³	1 year	Limit value by 01.01.2010	n/a
PM ₁₀	50 µg/m ³	24 hours	Limit value by 01.01.2005	35
	40 µg/m ³	1 year	Limit value by 01.01.2005	n/a
Lead (Pb)	0.5 µg/m ³	1 year	Limit value by 01.01.2005	n/a
Carbon monoxide	10 mg/m ³	Max daily 8-hr mean	Limit value by 01.01.2005	n/a
Benzene	5 µg/m ³	1 year	Limit value by 01.01.2010	n/a
Ozone	120 µg/m ³	Max daily 8 hour mean	Target value by 01.01.2010	25 days averaged over 3 years
Arsenic (As)	6 ng/m ³	1 year	Target value by 31.12.2012	n/a
Cadmium (Cd)	5 ng/m ³	1 year	Target value by 31.12.2012	n/a
Nickel (Ni)	20 ng/m ³	1 year	Target value by 31.12.2012	n/a
Polycyclic Aromatic Hydrocarbons	1 ng/m ³ (expressed as concentration of Benzo(a)pyrene)	1 year	Target value by 31.12.2012	n/a

PM₁₀ daily limit value exceedances in 2008

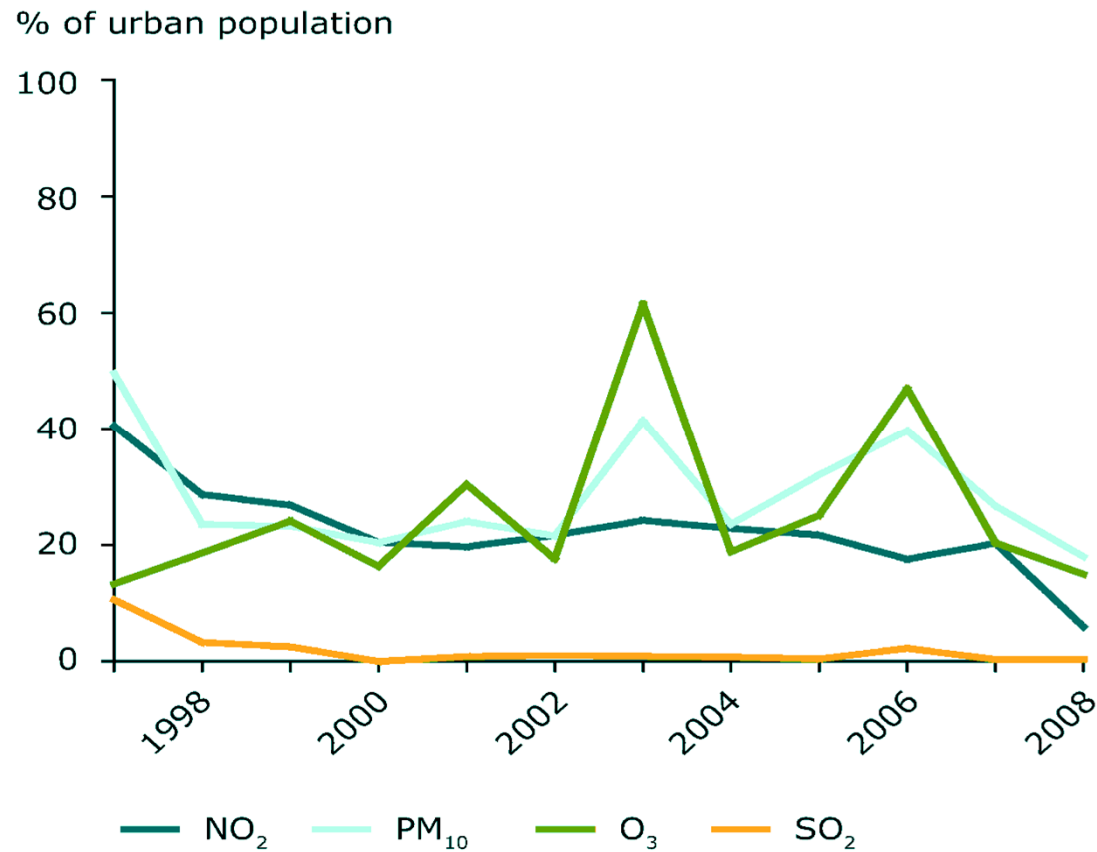
NO₂ annual limit value exceedances in 2008





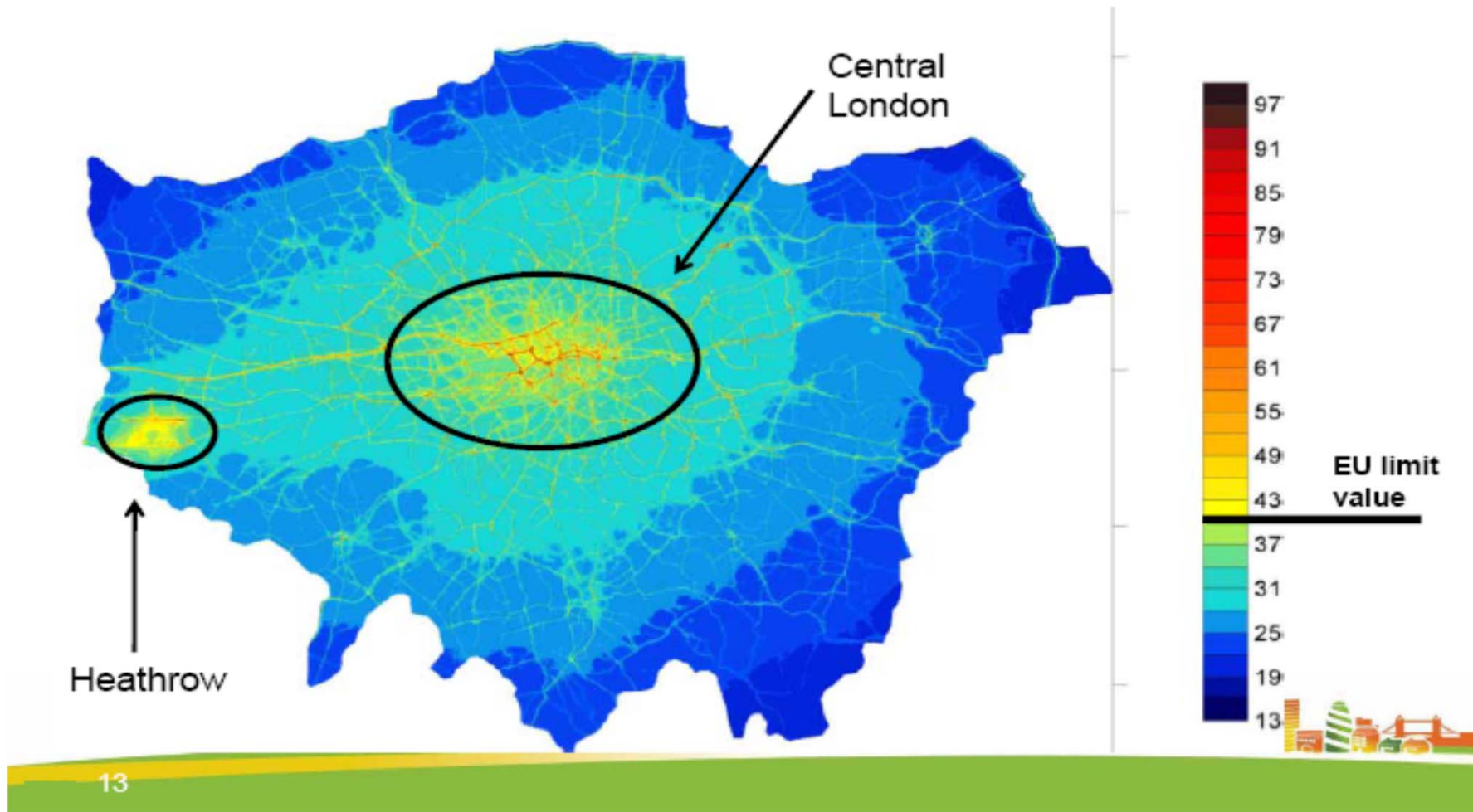
Source: EEA, ETC Air and Climate Change (3).

Percentage of urban population exposed to pollutant concentration levels exceeding selected limit/target values, EEA member countries, 1997-2008



Source: Copyright EEA, Copenhagen, 2009
www.eea.europa.eu

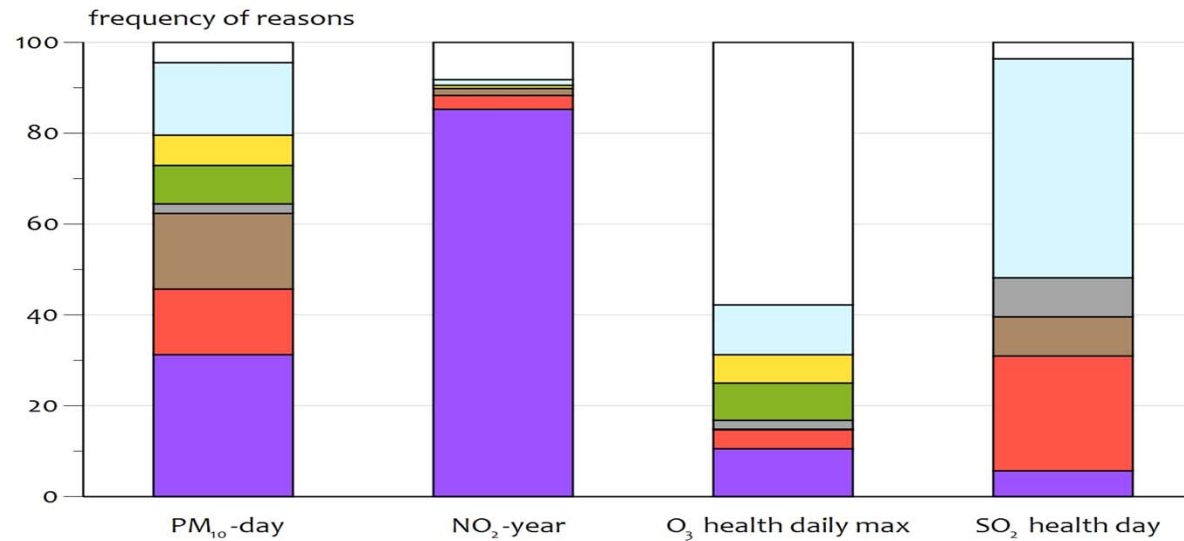
NO₂ exceedences of EU Limit Value in 2015



Why?

Main reasons for exceedances of LV's in 2008

Main reasons for exceedances of LVs (& MOT) in 2008



- ⇒ **Commission Work Programme 2011 (COM(2010) 623 final) foresees review for 2013**
- ⇒ **College Debate 18/01/2011 (SEC(2011) 342 final)**

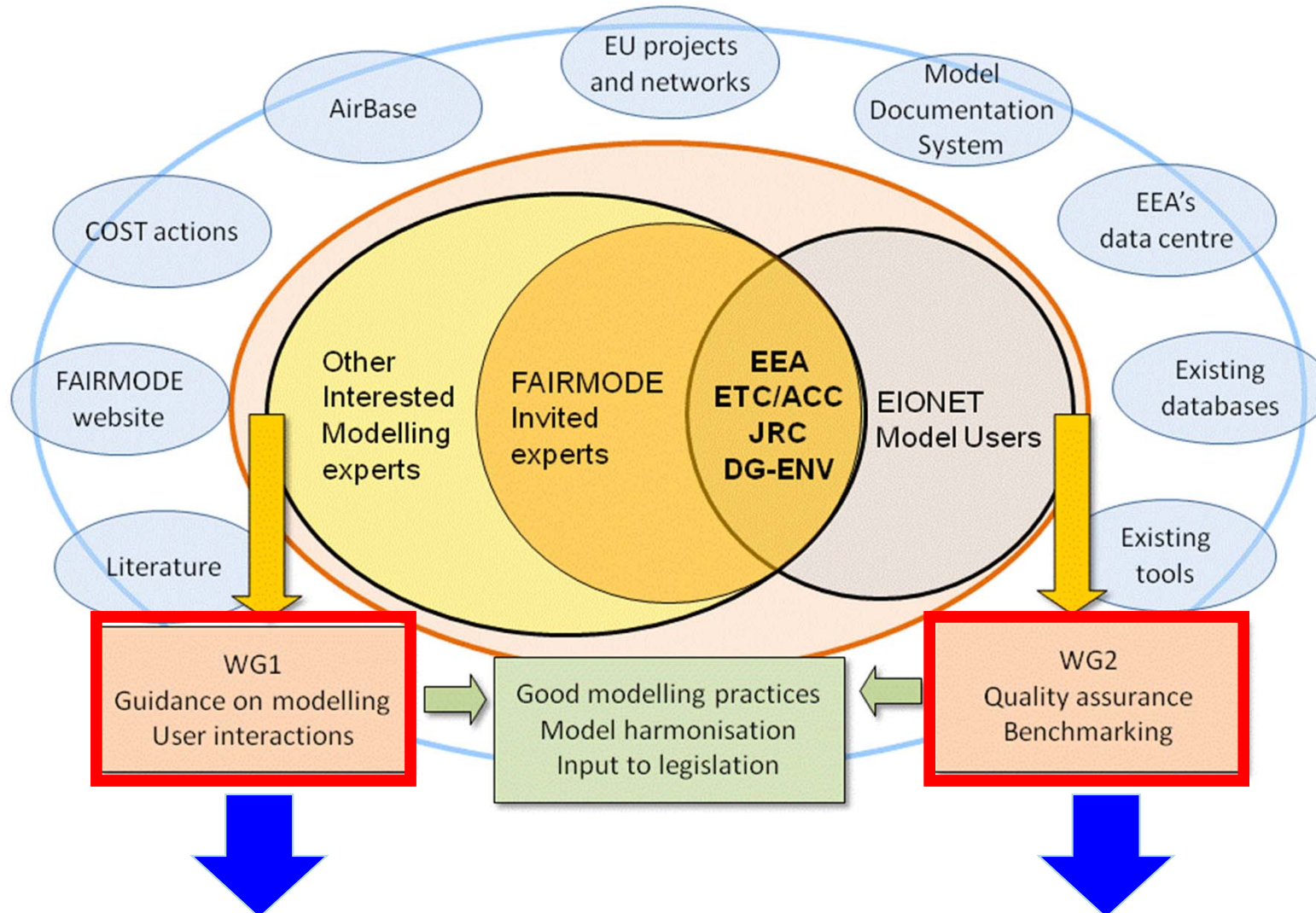
Positive response and outspoken support by the President and the whole College on:

- **Comprehensive review of EU Air Quality Policy in 2012/2013**
- **Revised NEC directive latest as part of the review**
- **Immediate action in specific policy areas (sulfur in shipping fuels, vehicles and non-road emissions, international negotiations, energy, agriculture, research)**
- **Co-operation with Member States, assisting in achieving compliance (not stopping infringements)**
- **Link to Europe 2020 objectives, e.g. Innovation**
- **Co-benefits with climate change agenda**

Various inputs and consultation processes envisaged:

- Stakeholder group(s)
- Online consultations
- EC inter-service group and ENV contact group
- Ambient Air Quality Committee
- Dedicated networks (FAIRMODE, AQUILA)
- International organizations (eg. WHO, CLRTAP, etc.)

FAIRMODE





WG1 EEA Coordination
(A. Lukewille, EEA)

Guidance on the use
of models for the
European Air Quality
Directive

Modelling of Nitrogen
Dioxide (NO₂) for air
quality assessment
and planning

Modelling of
Particulate Matter
(PM) for air quality
assessment and
planning

<http://fairmode.ew.eea.europa.eu/>

- Technical interpretation of the current directive
- Identification of weakness
- Proposal of alternative methods or approaches
- Identification of areas where research still needed

(B. Demby, NILU)

<http://fairmode.ew.eea.europa.eu/>

To develop and apply quality assurance practices **when combining models and monitoring** (B. Demby, NILU)

Source apportionment and the contribution of natural sources on pollutant concentrations. (J. Douros, Thessaloniki Un.; C. Belis, JRC)

Devoted to emission needs to support AQ modelling applications, and it is focused on urban **emissions and projections**. (L. Tarrason NILU; R. Borges, J. Lumberras, UPM; H. Deneir van der Gonne, TNO)

Developing a **common procedure** for the benchmarking of air quality model **performance** and indicate a way for improvements (P. Thunis, S. Galmarini, JRC)



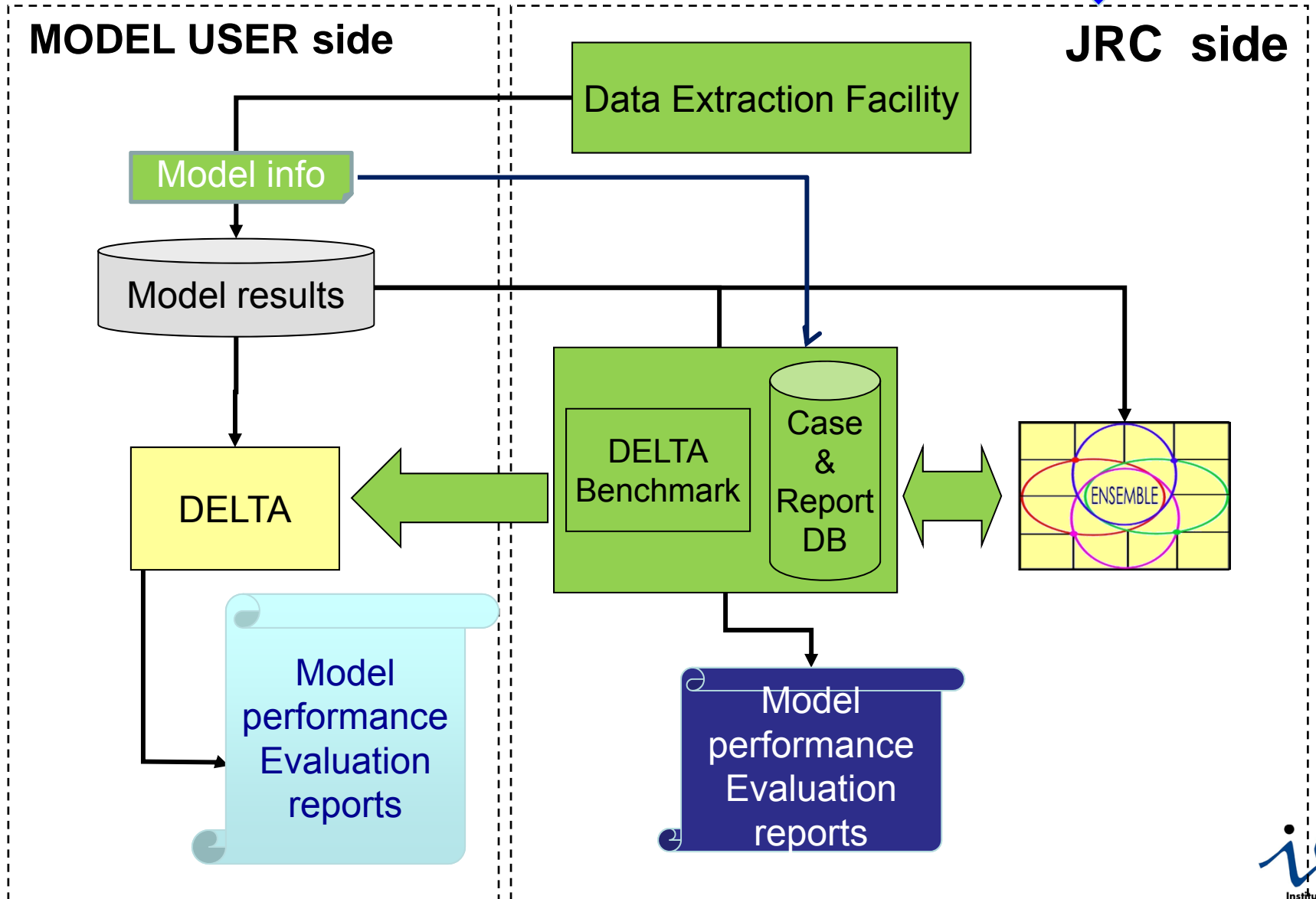
WG2 JRC Coordination
(S. Galmarini, JRC)

SG1
Models and
Measurements

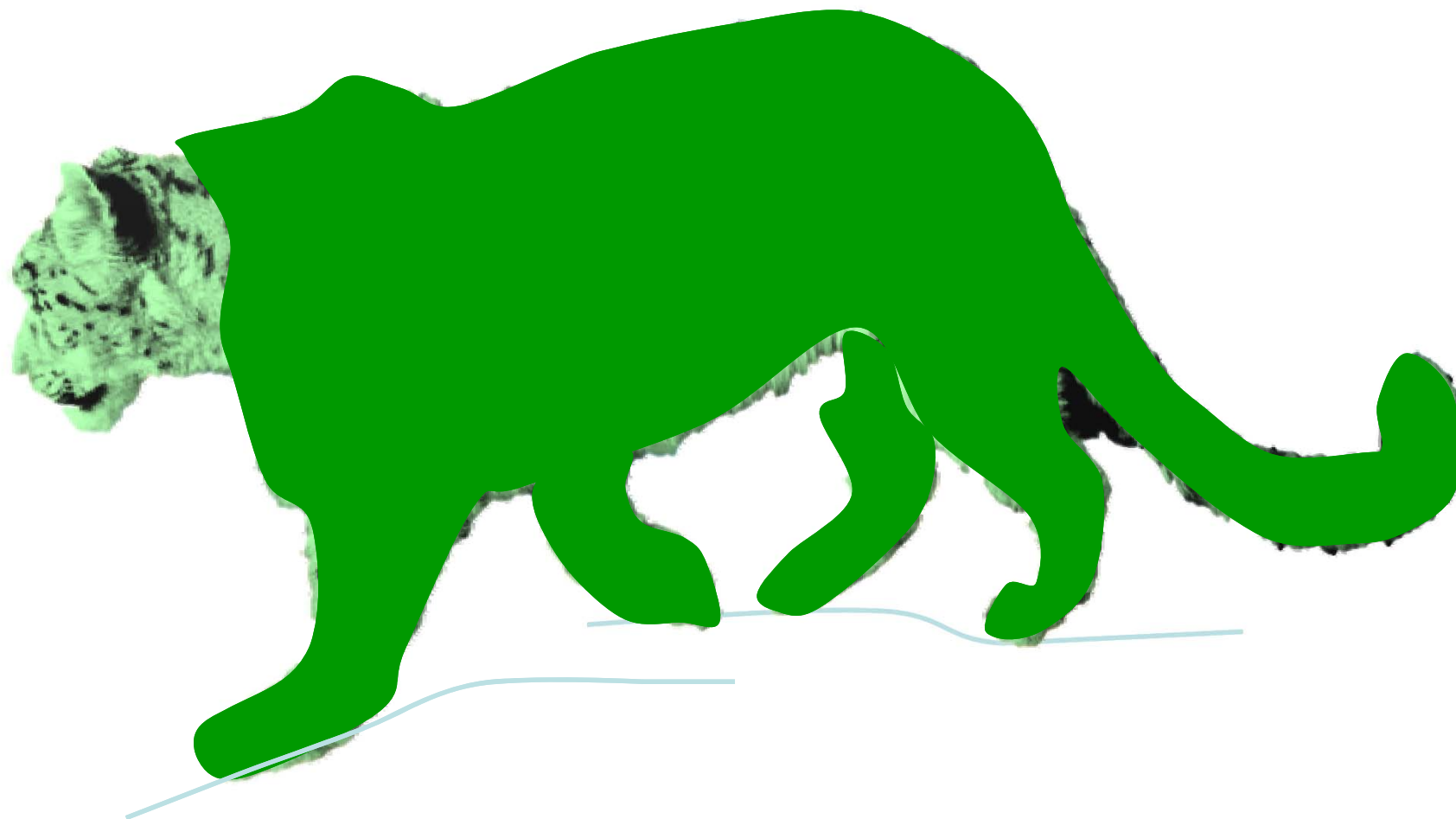
SG2
Natural sources
Source
allocation

SG3
Emissions

SG4
Model
Benchmarking

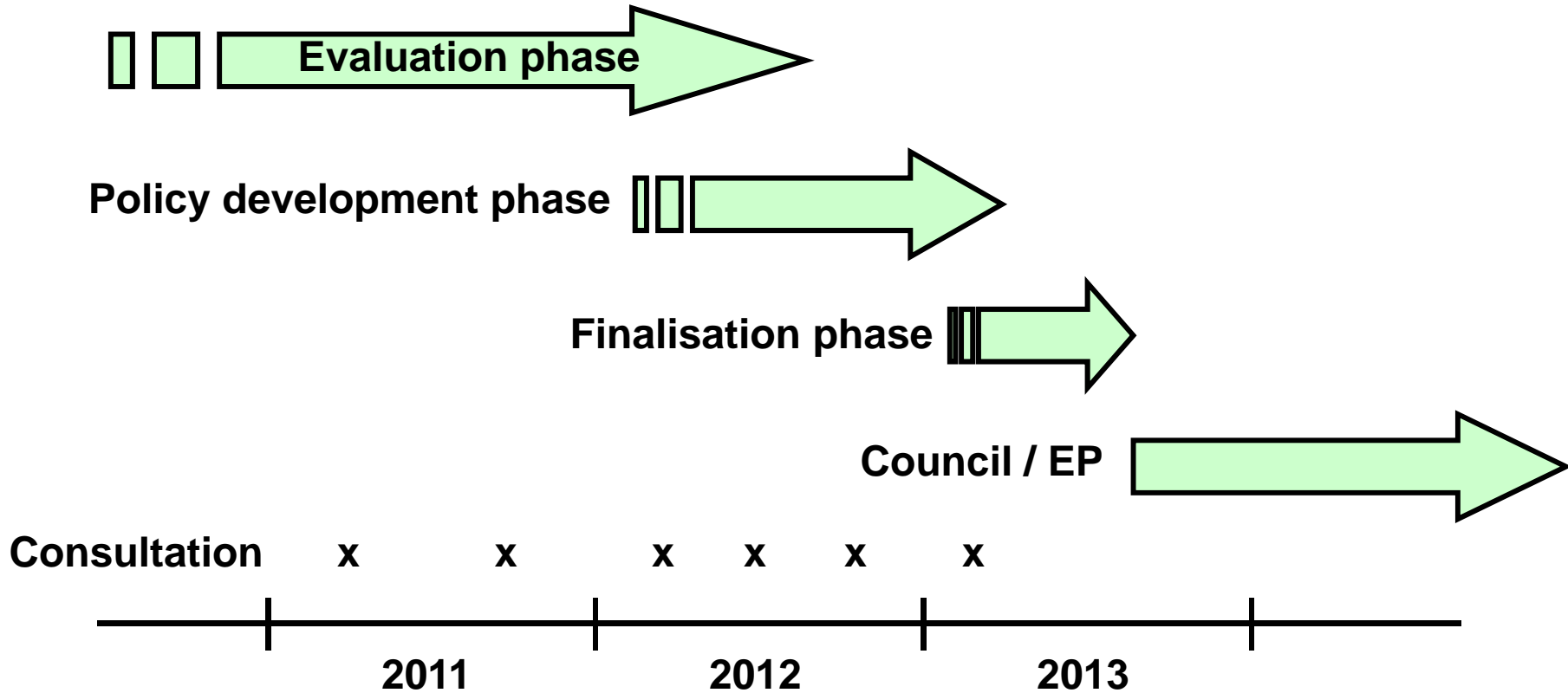


Leopard fur effect



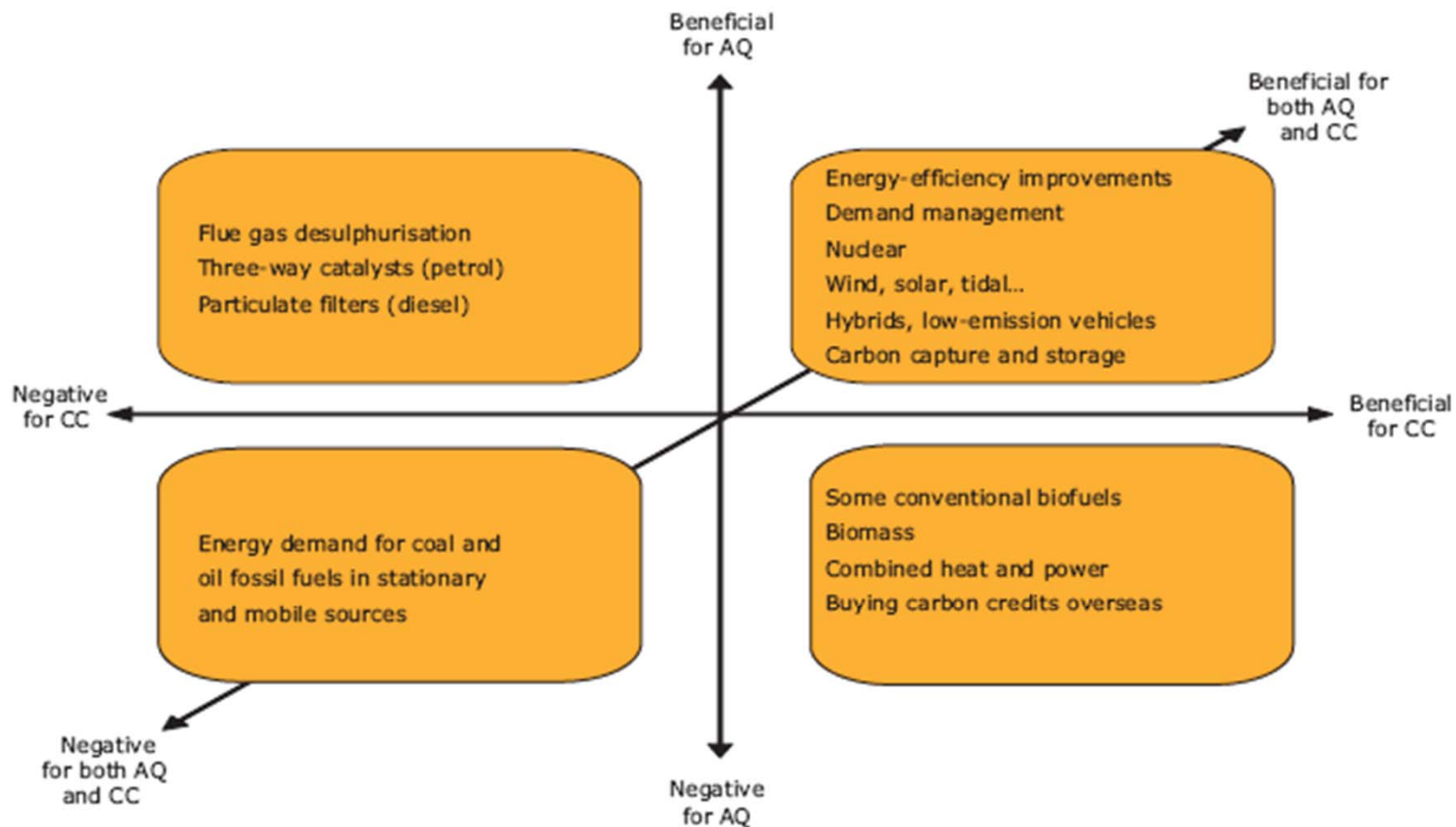
- **Review of the current air quality legislation** (including reasons for non-compliance)
- **Review of the current air quality limits and targets**
 - PM_{2.5} as required by Directive
 - Latest scientific evidence of air pollution impacts for ozone, PM₁₀, heavy metals, PAHs
 - new targets – long term objectives (2020 – 2030 – 2050?)
- **Possible new measures**
- **Link to climate change** (eg. co-benefits, short lived climate species)

- Updated Health and Environment Standards
 - Review of existing ambient air quality legislation (PM2.5, streamlining)
 - Review of national emissions ceilings (2020, PM, streamlining)
- New Actions to Reduce Emissions for Meeting Interim Objectives
 - Measures on Industrial Emissions (VOC, IED) (small combustion plants...)
 - Measures in the Energy Sector (Renewable Energy, Energy Efficiency)
 - Measures in the Transport Sector (vehicle EURO standards, Fuel Standards)
 - Measures in the Agricultural Sector (Ammonia)
 - Measures at the International Level (IMO, CLRTAP, ...)
- Cost & Benefits
 - Health Benefits: ca. €42 billion per annum
 - Additional benefits from avoiding damage to ecosystem, reduced damage to crops, buildings, heritage, ...
 - Implementation Costs: ca. €7.1 billion per annum.



Applications for the AQD	Local-Hot spot (dx ~ m)	Urban/Agglom (dx ~ 1- 5 km)	Regional (dx ~ 10 – 50 km)
Compliance / Assessment Data Assimilation Fusion		TRANSPHORM	EURODELTA AQMEII
	COST 732		CITYZEN
			MEGAPOLI
			MACC
			PASODOBLE
Mitigation & Planning Emission scenarios		TRANSPHORM	MEGAPOLI EC4MACS
			EURODELTA CITYZEN
Source Apportionment			PASODOBLE
			MEGAPOLI
		TRANSPHORM	MACC
Public information AQ near real time forecast			
		PASODOBLE	
			MACC COST 602 Chemical Weather

Figure 4.1 Air quality (AQ) and climate change (CC) synergies and tradeoffs



Source: Adapted from Defra, 2010.