

# The NEC Directive, EU Climate Policy and air pollution in the UK

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# Acknowledgements

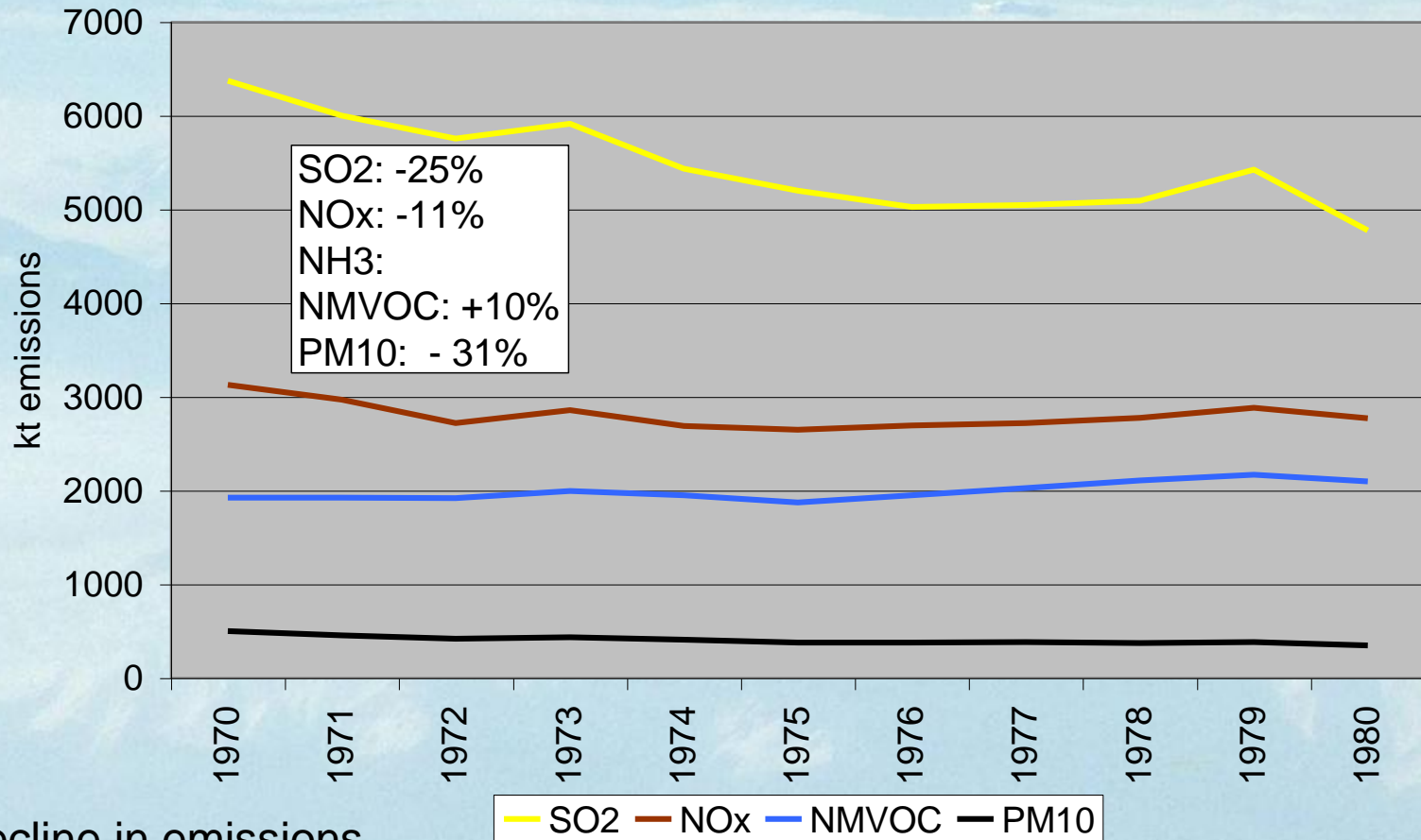
- Funding from:
  - European Commission, EEA
    - NEC Directive review
    - CBA of the revision of the NEC Directive
    - LIFE+ Programme's EC4MACS study
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- Alistair Hunt at Metroeconomica
- UNECE Task Forces, EC Project teams



# Overview

- Development of the National Emission Ceilings Directive / Gothenburg Protocol
- Implementation of the Directive to 2010
- Link to EU's Energy and Climate Package
- Revision of the Directive

# UK emissions of the NEC pollutants, 1970 to 1980



Some decline in emissions through spread of use of North Sea Gas, etc.

# Legislation pre-NEC Directive

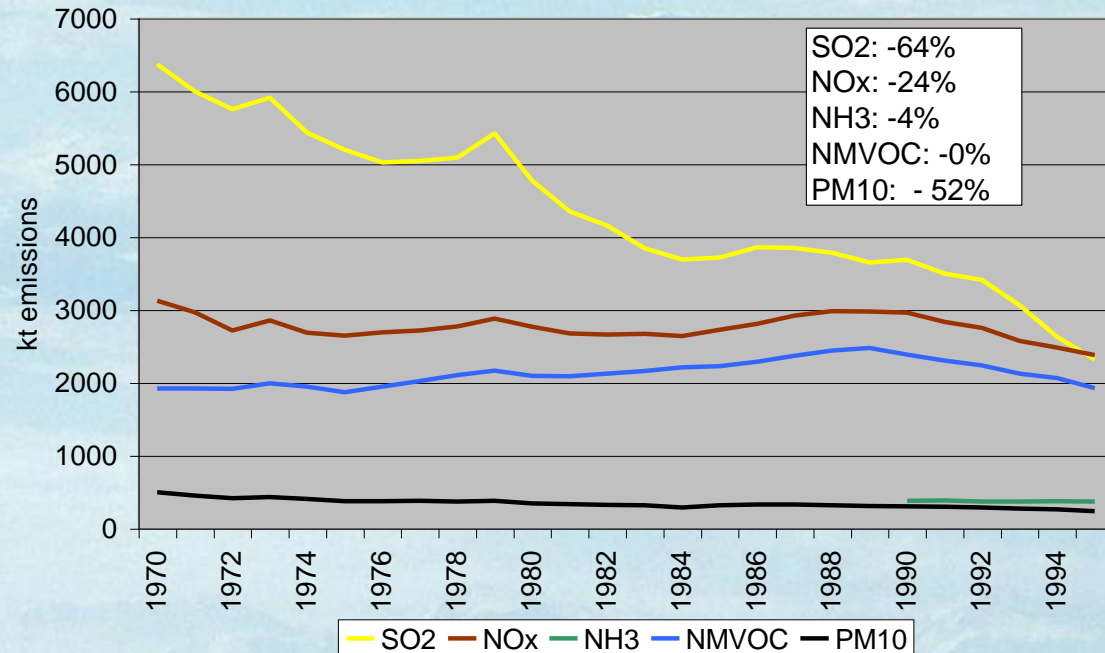
- Single pollutants
- Specific industries
  - $\text{TiO}_2$
  - Waste
  - LCPs
- Command and control approach
  - Most EC environment legislation based on competition policy, not environment policy

# UK emissions of the NEC pollutants, 1970 to 1995

SO<sub>2</sub> and PM decline via switch from coal to gas, closure of large industrial plant

Same for NO<sub>x</sub> though end of period includes first Euro standards on vehicles

VOCs also affected by Euro standards



# The NEC Directive

- Key elements
  - SO<sub>2</sub>, NO<sub>x</sub>, VOCs and NH<sub>3</sub>
  - Focus on ecosystem damage
  - Each EU Member State has an emission ceiling for each pollutant...
  - ...to be met by 2010
  - Promise of more cost-effective controls by wider coverage and flexibility in implementation
- Similar to UNECE Gothenburg Protocol

# NEC and Gothenburg

- Ceilings for each country generally very similar
- Gothenburg includes all of Europe, not just EU
- NEC Directive is legally binding, Gothenburg is not
- Gothenburg backed by extensive scientific collaboration

# Logic behind the NEC Directive

|                              | SO <sub>2</sub> | NO <sub>x</sub> | VOCs | NH <sub>3</sub> | PM <sub>2.5</sub> |
|------------------------------|-----------------|-----------------|------|-----------------|-------------------|
| Tropospheric ozone formation |                 | ✓               | ✓    |                 |                   |
| Ecosystem acidification      | ✓               | ✓               |      | ✓               |                   |
| Ecosystem eutrophication     |                 | ✓               |      | ✓               |                   |
| Damage to buildings, etc     | ✓               | ✓               |      |                 | ✓                 |
| Health impacts               | ✓               | ✓               | ✓    | ✓               | ✓                 |

Note: health impacts not formally part of the original NEC Directive, but highlighted as important in the cost-benefit analysis done for the Commission. Primary PM<sub>2.5</sub> and health now major components of the revision of the NEC Directive.

# Setting the ceilings

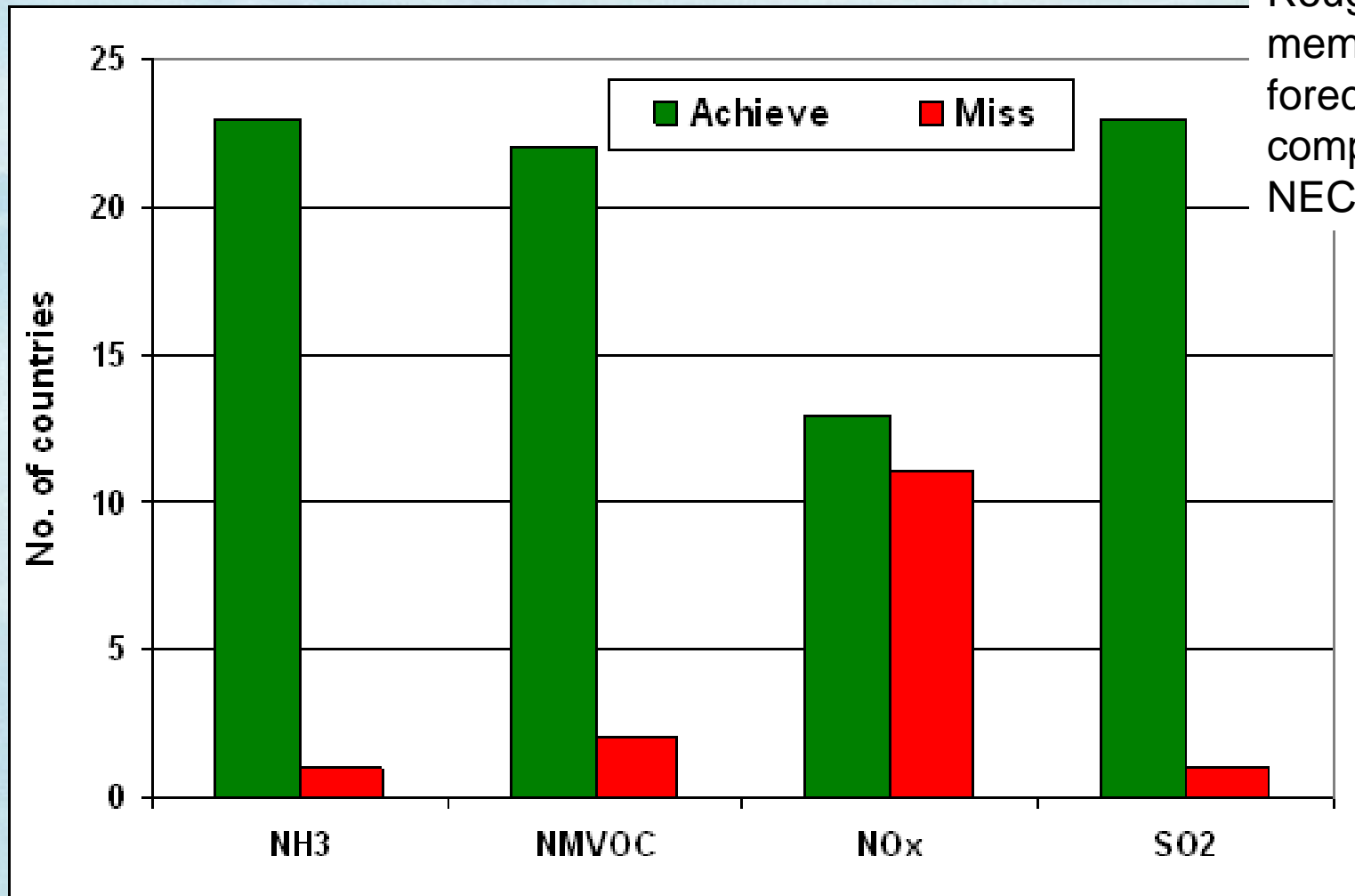
- Targets for ecological protection defined
  - Areas at risk, extent of exceedance of critical loads and levels
- RAINS optimisation model used to assess most cost effective way of meeting targets
  - How much to control each pollutant?
  - Where to control pollutants?
  - Which measures to use?
- CBA to assess whether costs < benefits

# Problems with the modelling

- Health effects not recognised
- Geographic resolution very crude (150km x 150 km resolution)
- Costs overestimated
  - Focus on end of pipe measures
  - Lack of knowledge of what would be done
  - Assumption of little or no improvement in technologies

# Findings of the NEC Review

- Overview of compliance

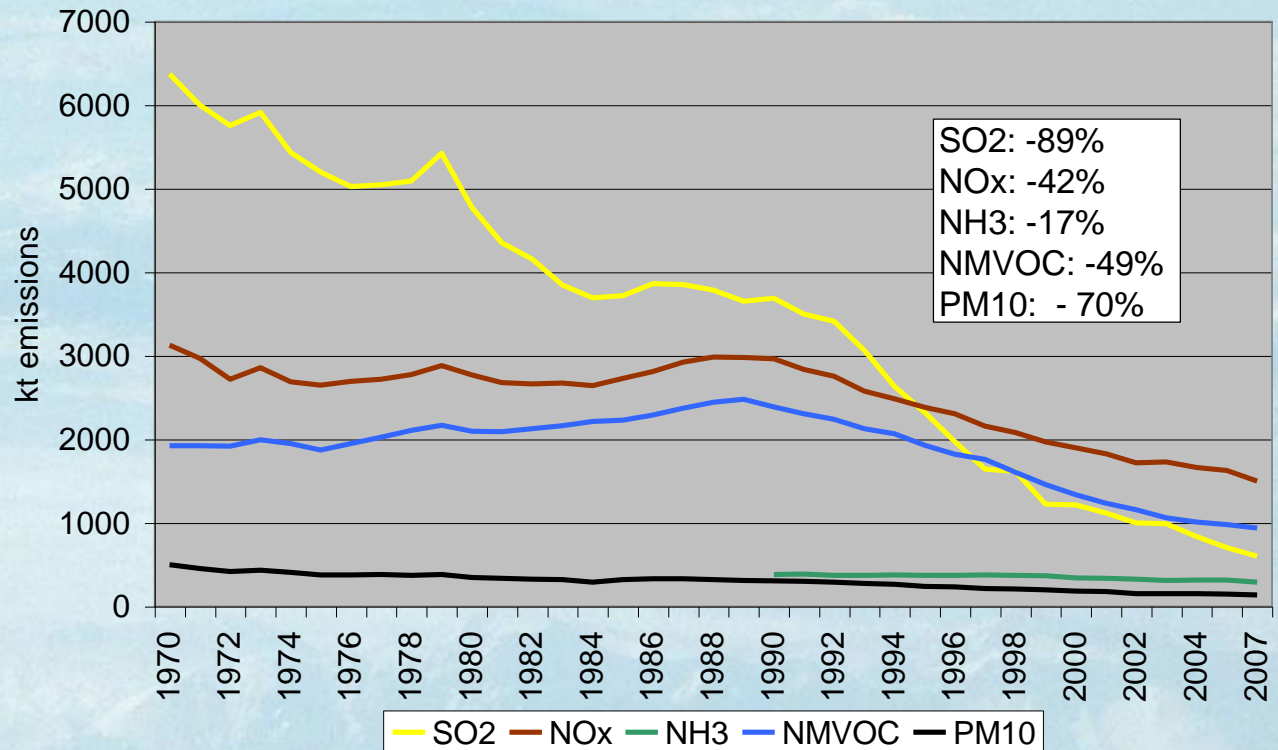


Roughly half of member states forecast not to comply with the NECD for NOx

# UK emissions of the NEC pollutants, 1970 to 2007

Continued and substantial decline in SO<sub>2</sub>, NO<sub>x</sub>, NMVOC and PM<sub>10</sub>.

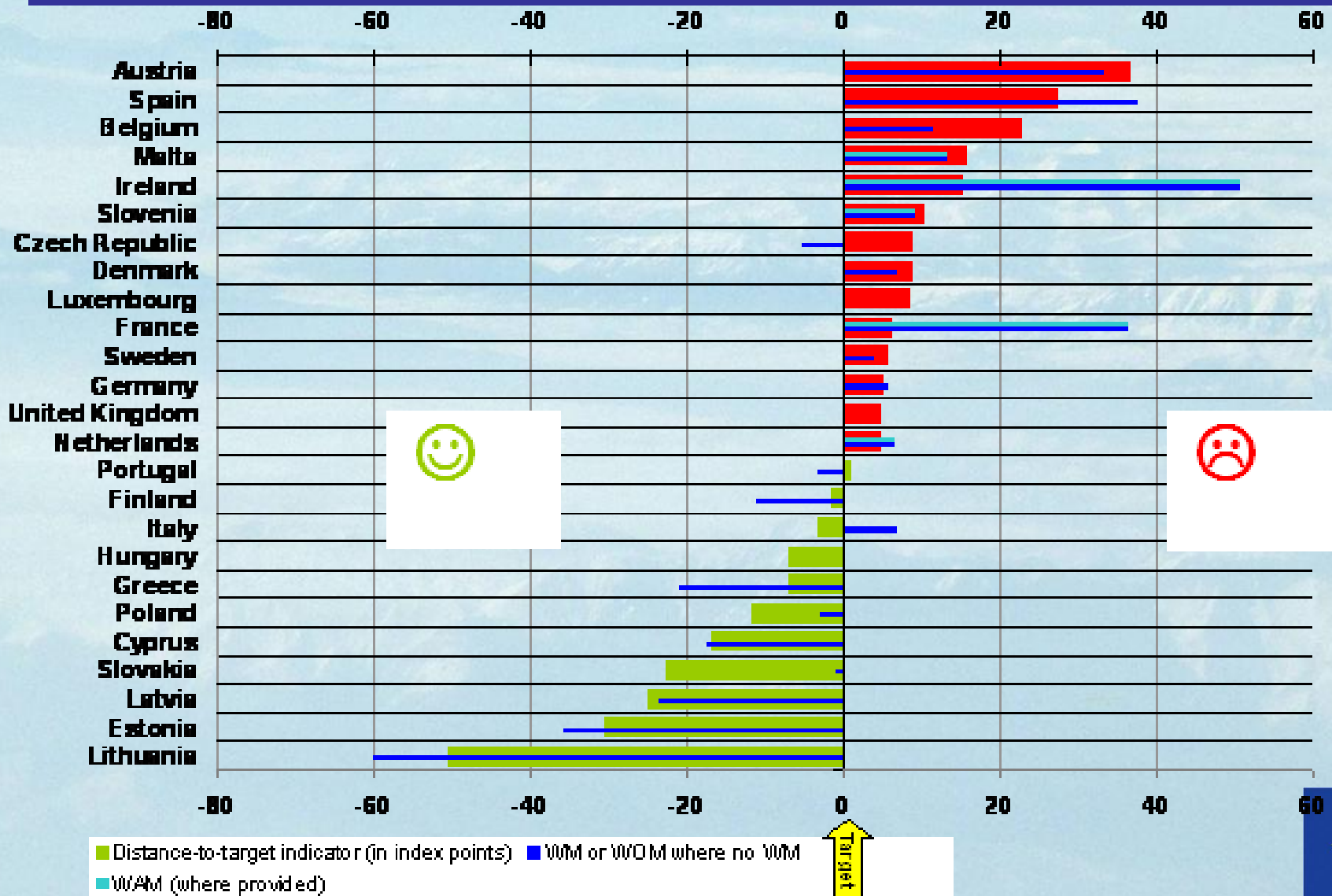
Smaller decline for NH<sub>3</sub>.



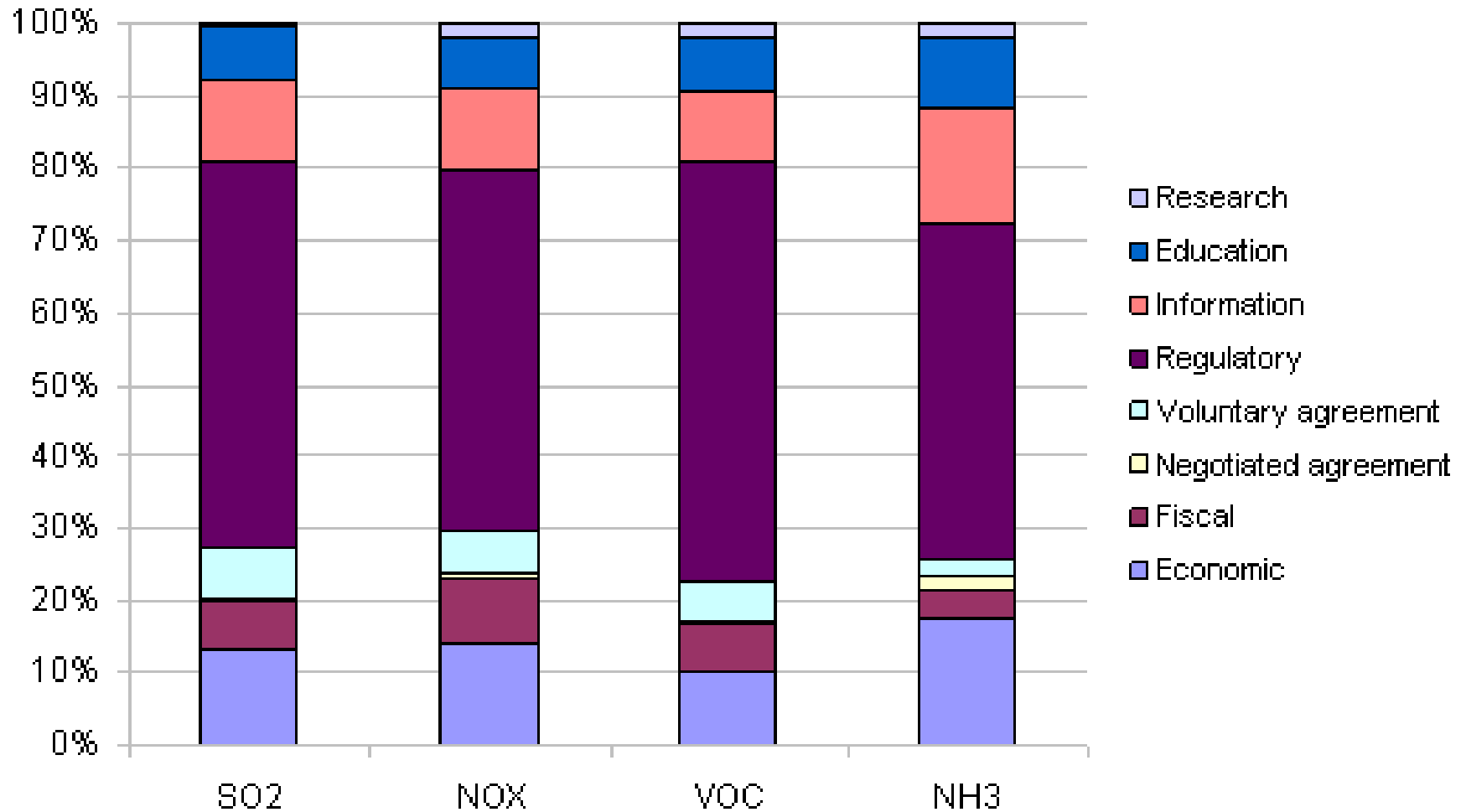
# UK performance against targets

|                 | 1999  | 2007  | 2010 ceiling |
|-----------------|-------|-------|--------------|
| SO <sub>2</sub> | 1,227 | 589   | 585          |
| NO <sub>x</sub> | 1,969 | 1,485 | 1,167        |
| NH <sub>3</sub> | 367   | 290   | 297          |
| NMVOCS          | 1,459 | 940   | 1,200        |

# National performance for NOx across EU25 (excludes Romania, Bulgaria)



# Types of measures used



# Revision of the NEC Directive

- New features
  - Extended to 2020
  - Include health impacts
  - Include PM<sub>2.5</sub> emissions
  - Finer resolution modeling, 50 x 50 km, and with urban increment added
- But subject to significant delay
  - Climate and energy package
  - Economic crisis

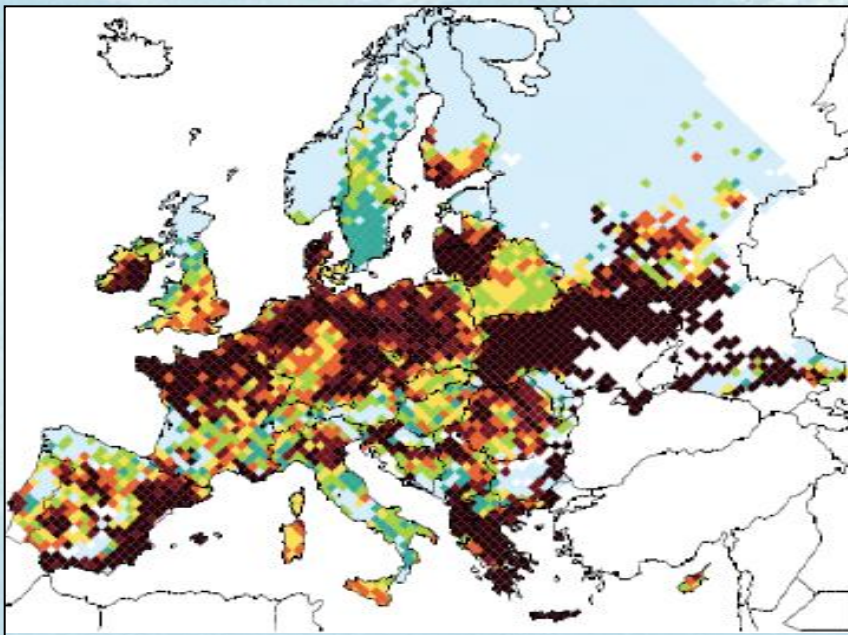
# Targets under the Thematic Strategy on Air Pollution

| Indicator                   | Unit            | % improvement vs 2000 |
|-----------------------------|-----------------|-----------------------|
| PM <sub>2.5</sub> mortality | YOLL            | 47%                   |
| Forest acidification        | km <sup>2</sup> | 74%                   |
| Freshwater acidification    | km <sup>2</sup> | 39%                   |
| Ecosystems eutrophication   | km <sup>2</sup> | 43%                   |
| Ozone mortality             | Cases           | 10%                   |
| Forest ozone damage         | km <sup>2</sup> | 15%                   |

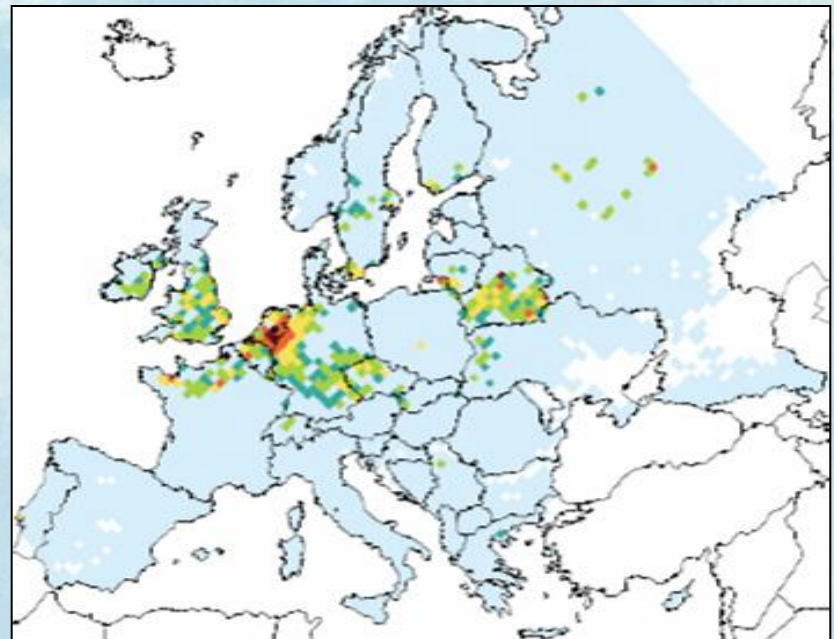
# Extent of ecosystem effects

- Maps showing exceedance of critical loads and levels. Examples:

**Eutrophication from air: 2020**

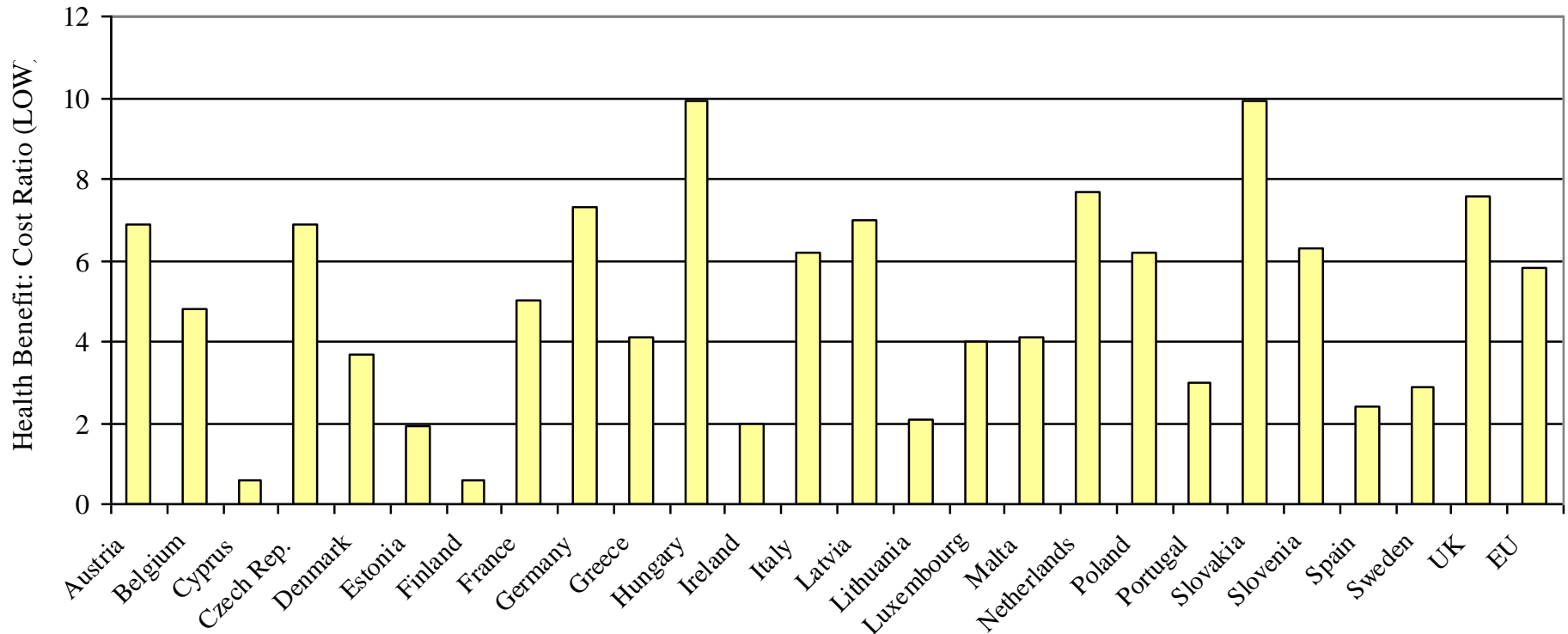


**Acidification of forests: 2020**



Risk from eutrophication still very widespread, even by 2020.

# Cost-benefit analysis results



Clear excess of benefit over cost except for Finland and Cyprus – being at the edge of Europe they receive limited benefit from emission reductions in other countries.

# Illustrative figures on new UK ceilings

|                   | 2007  | 2010  | 2020? |
|-------------------|-------|-------|-------|
| SO <sub>2</sub>   | 589   | 585   | 200   |
| NO <sub>x</sub>   | 1,485 | 1,167 | 600   |
| NH <sub>3</sub>   | 290   | 297   | 250   |
| NMVOCs            | 940   | 1,200 | 700   |
| PM <sub>2.5</sub> | 86    |       | 50    |

Likely to see further substantial cuts in these pollutants in the next 10 years. In part linked to Climate Policy.

# EU Climate Policy for 2020

- Agreed
  - 20% cut in GHGs from EU by 2020
- Under discussion:
  - 25% internal cut + 5% external cut
  - 30% internal cut

# EU Climate Policy for 2020: Co-benefits of going beyond the current 20% target

Figures shown are the co-benefits of moving from a 20% cut in GHG emissions in the EU by 2020 to a 25% and 30% cut.

Not shown are the co-benefits of the agreed 20% cut which are roughly twice as large as the figures shown for the '30% internal' case

| Change compared to reference case  | 25% internal | 30% internal |
|--|--------------|--------------|
| SO <sub>2</sub> emissions (kt)   | -199         | -424         |
| NO <sub>x</sub> emissions (kt)   | -171         | -350         |
| PM <sub>2.5</sub> emissions (kt)   | -27          | -54          |
| Air pollution reduction (sum SO <sub>2</sub> , NO <sub>x</sub> and PM <sub>2.5</sub> ) | 4%           | 9%           |
| Health co-benefit (€ <sub>08</sub> billion/year) (mortality impacts only)              | 3.5 to 8.1   | 7.3 to 16.7  |
| Reduced air pollution control costs (€ <sub>08</sub> billion/year)                     | 2.8          | 5.3          |

# Summary

- Original ceilings set for 2010 based on ecological concerns
- NOx targets for 2010 unlikely to be attained everywhere
- Planned tightening of the ceilings for 2020, focus now on health and ecosystems
- Strong links with climate policy
- Further major reduction in emissions are forecast

# Summary regarding population exposure

- NEC Directive is not closely targeted on exposure reduction
- This will change to an extent under the revision of the Directive
- Effect will be on background exposures, Directive not well focussed on hot spots.