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Regional Air Pollution In Developing Countries

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The European Experience of Air Pollution and Development of Inter-governmental Policy Responses

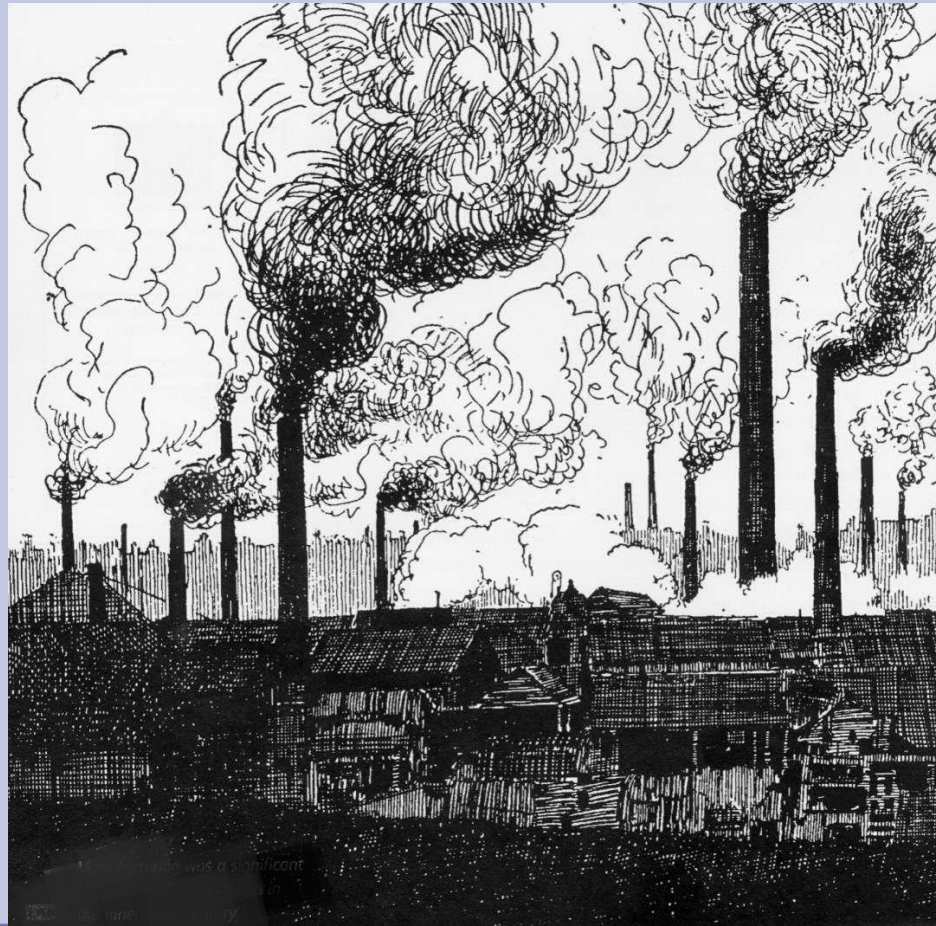
Johan Kuylenstierna, SEI

***Aspects covered*:**

- History of Air Pollution in Europe: problems and responses
- London as a case study of urban air pollution
- the European regional air pollution problems
- The UN/ECE Convention on LRTAP and European Union Directives

‘We have first raised a dust and then complain we cannot see.’

From ‘*Principles of Human Knowledge’* by Bishop Berkely (1685-1753)



Air Pollution is as Old as Civilisation

Air Pollution in Ancient Rome

Seneca, Nero's tutor suffered ill-health. In AD61, no sooner had he left 'Rome's oppressive fumes' than he felt better

Wood smoke

Indoor air pollution from wood smoke gave rise to high levels of sinusitis in Anglo-Saxon Britain (600-1100 AD)

In 1157, Eleanor, Henry II's wife, left her home in Nottingham, England because the pollution caused by burning wood was "unbearable."

Early legislation on coal use:

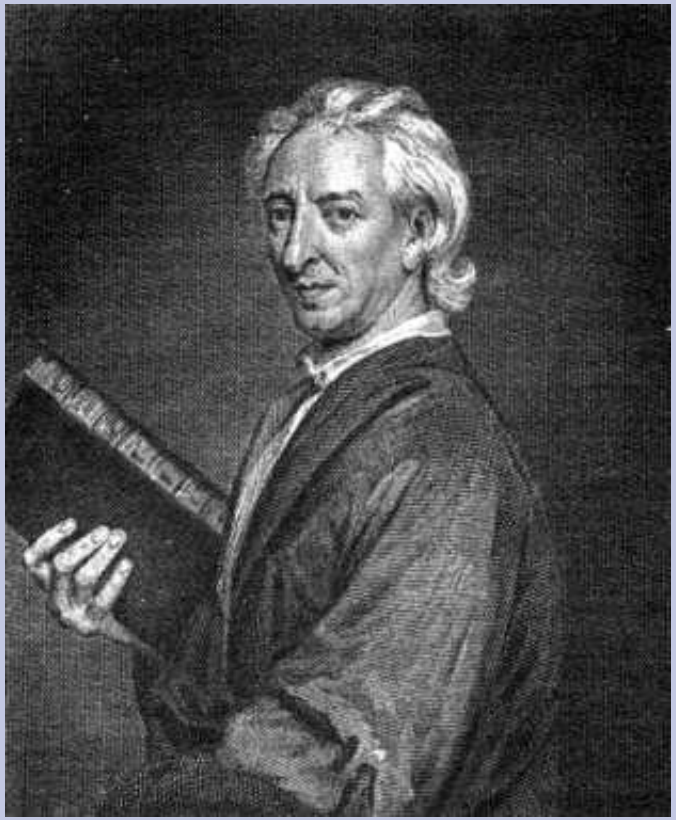
In the 1300s England began to use coal instead of wood for heat. To clean up London's air, King Edward I outlawed coal burning exclaiming:

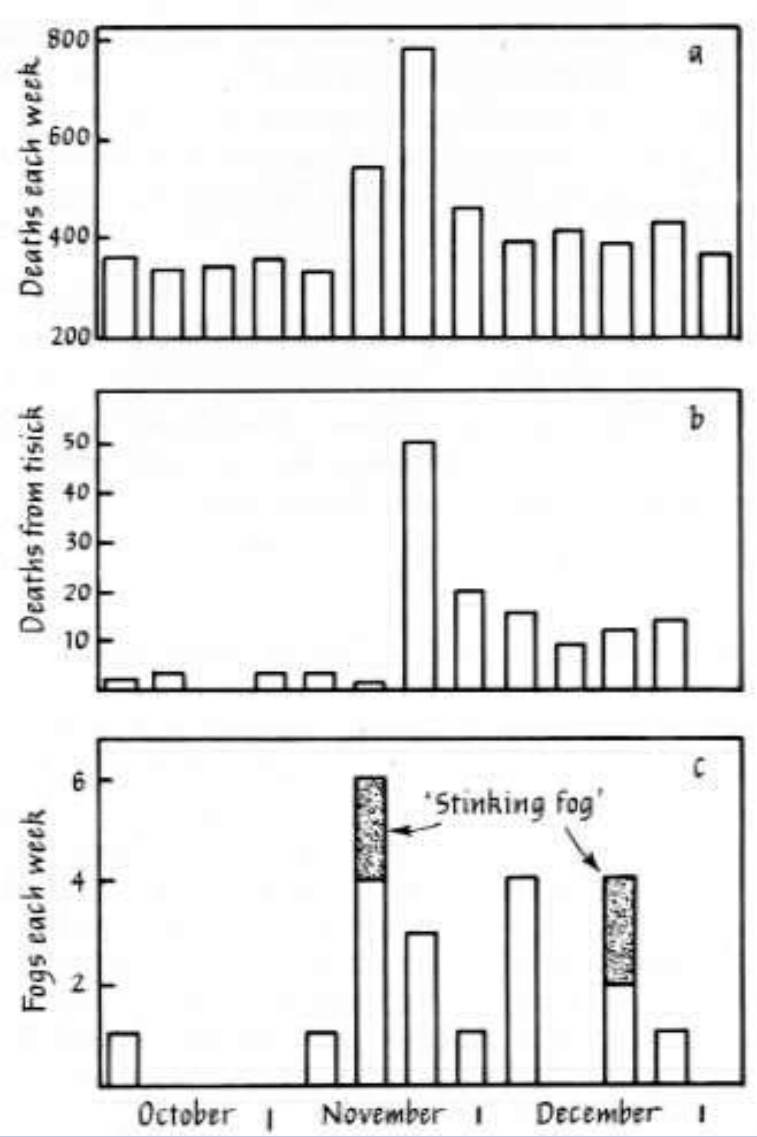
"…*whosoever shall be found guilty of burning coal shall suffer the loss of his head*."

Air Pollution in Medieval London

‘This coale….flies abroad…
and in the Spring-time besoots all the Leaves,
so as there is nothing free from its universal contamination..
….and kills our Bees and Flowers abroad,
suffering nothing in our gardens to bud,
display themselves or ripen.’

Report entitled: *Fumifugum, or the inconvenience of the Air and Smoke of London dissipated*, written for King Charles II in 1661 by John Evelyn – “England’s first environmental radical” (Brimblecombe)





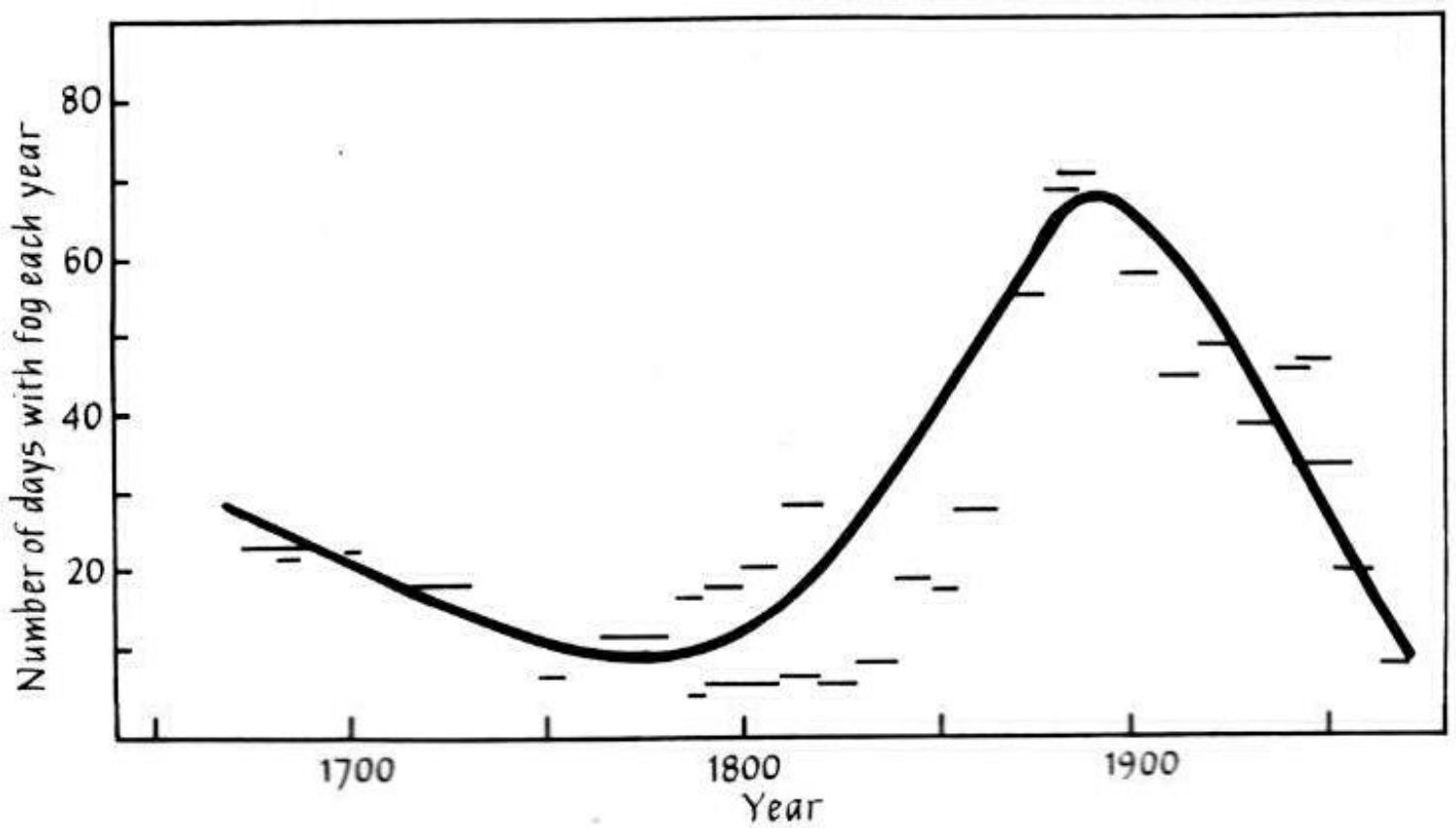
Deaths from ‘Stinking Fogs’ in Medieval London

Death rates each week during severe fogs in November 1679 in London

a. Total deaths

b. Deaths from *Tisick* a lung disease

Number of Foggy Days each year in London since 1670



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Monet depicted London Smogs around 1900

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Sunset
1904

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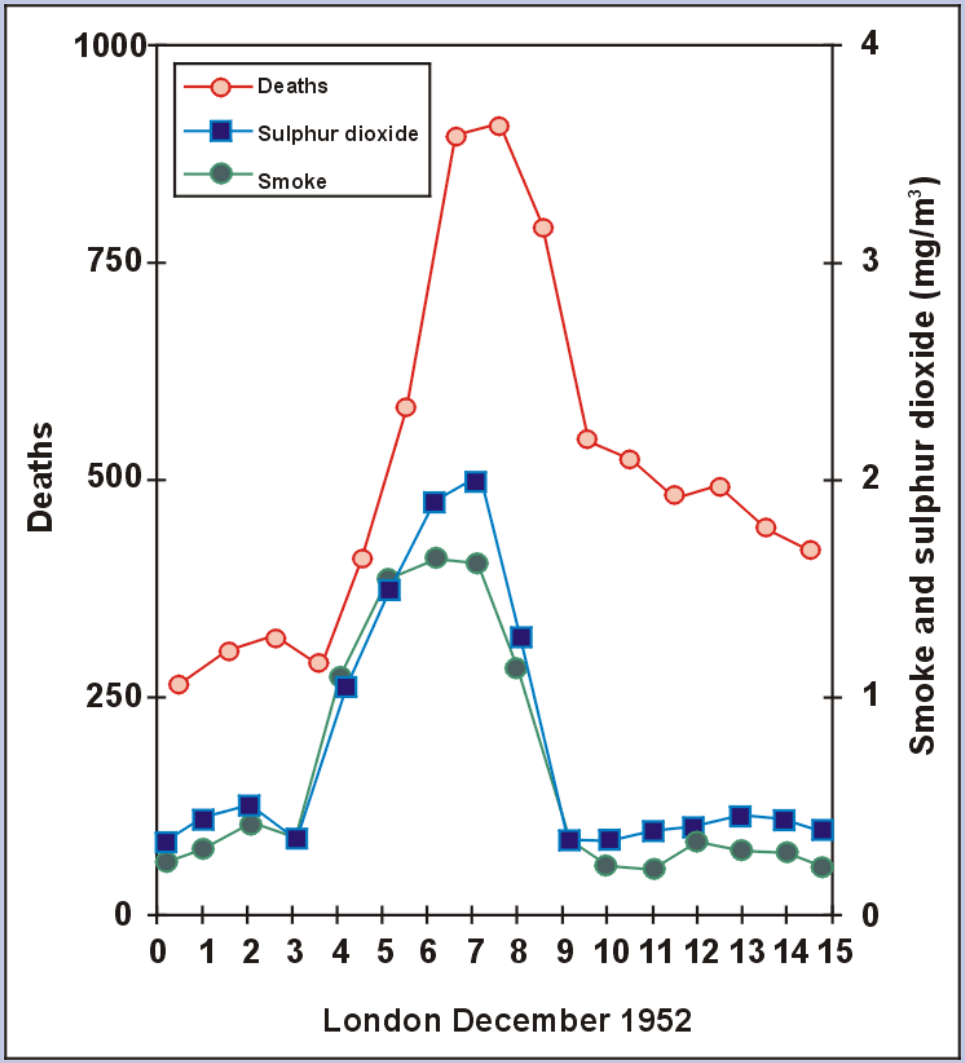
Deaths from major air pollution episodes

Date	Place	Excess Deaths
December 1873	London	270-700
February 1880	London	1000
December 1892	London	1000
December 1930	Meuse Valley	63
December 1952	London	4000-12000

The Great London Smog Disaster, 1952

London Smog Disaster – Deaths and Air Pollution



The Alkali Act 1863, 1874

Emission limits set for first time in 1874 (for HCl from lime kilns)

Development of Alkali Inspectorate (from 1874)

Developed idea of ‘Best Practicable Means’ (now ‘Best Available Technique’) to reduce pollution

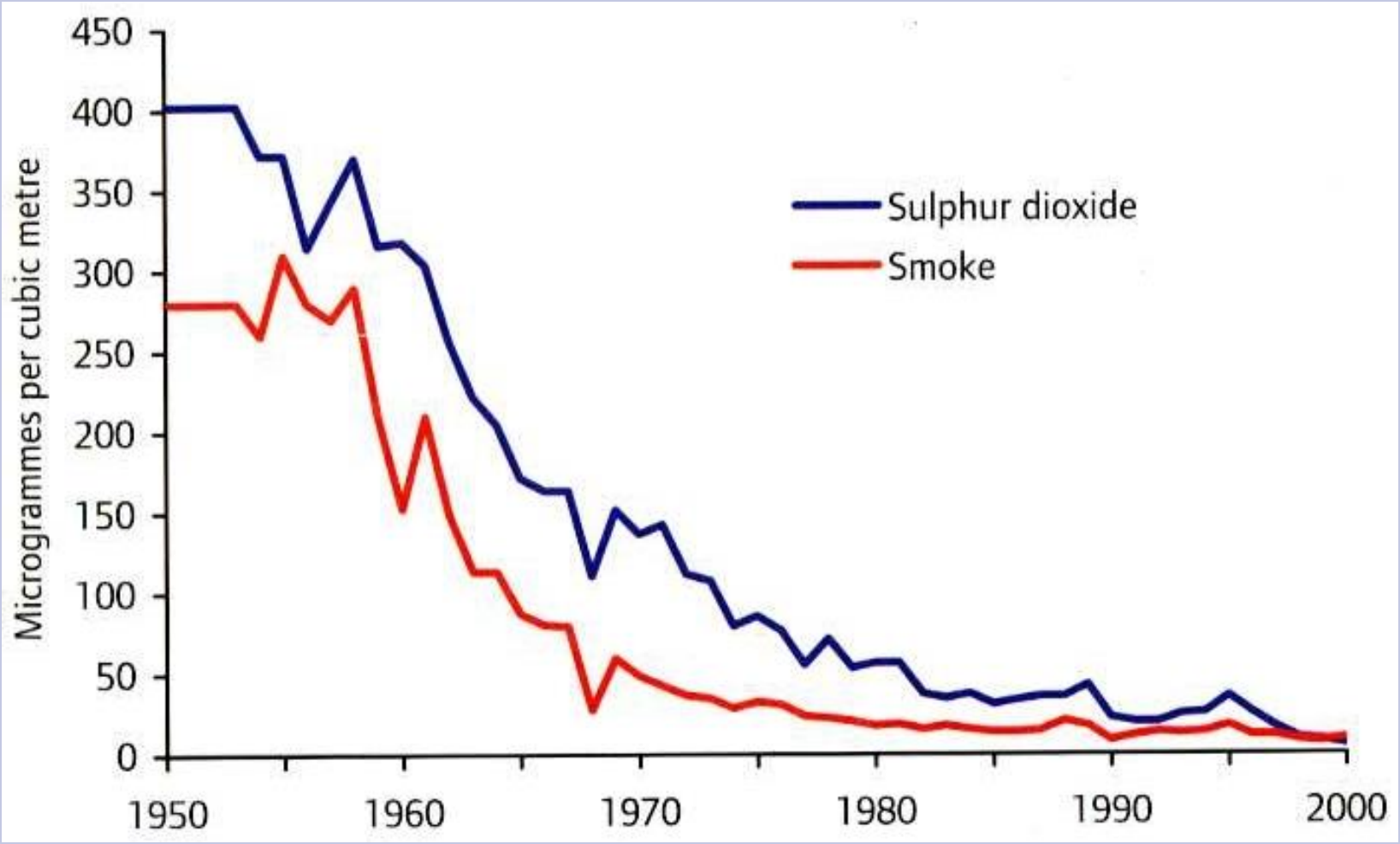
The Clean Air Act 1956, amended 1968

Limited pollution by smoke, grit and dust from domestic, commercial and industrial sectors

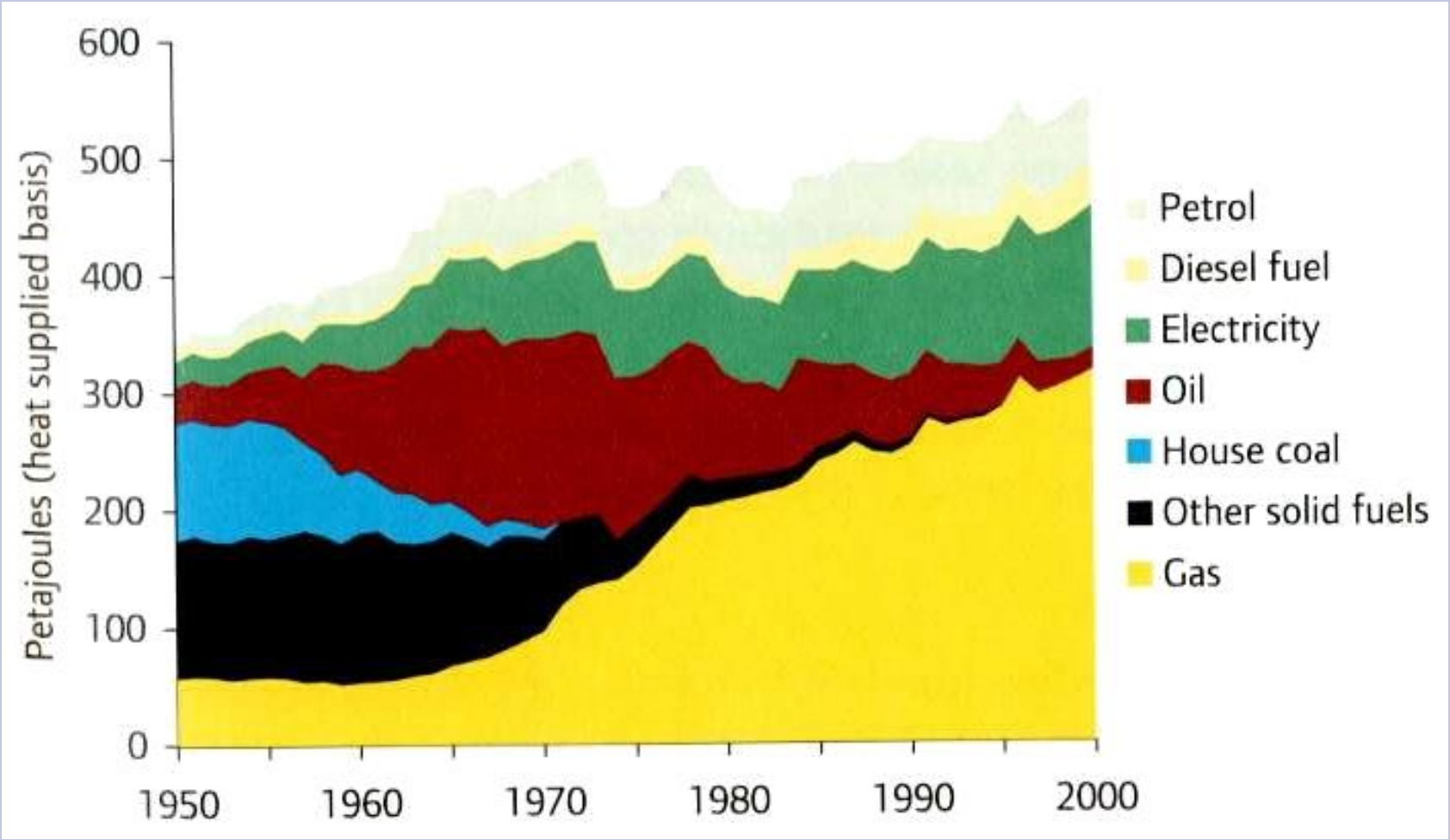
‘Smokeless Zones’ – only smokeless fuels may be used

Controlled heights of new industrial chimneys – the ‘Tall Stacks Policy’

Annual average smoke and sulphur dioxide concentrations in London



Energy Use in London



Acid Rain

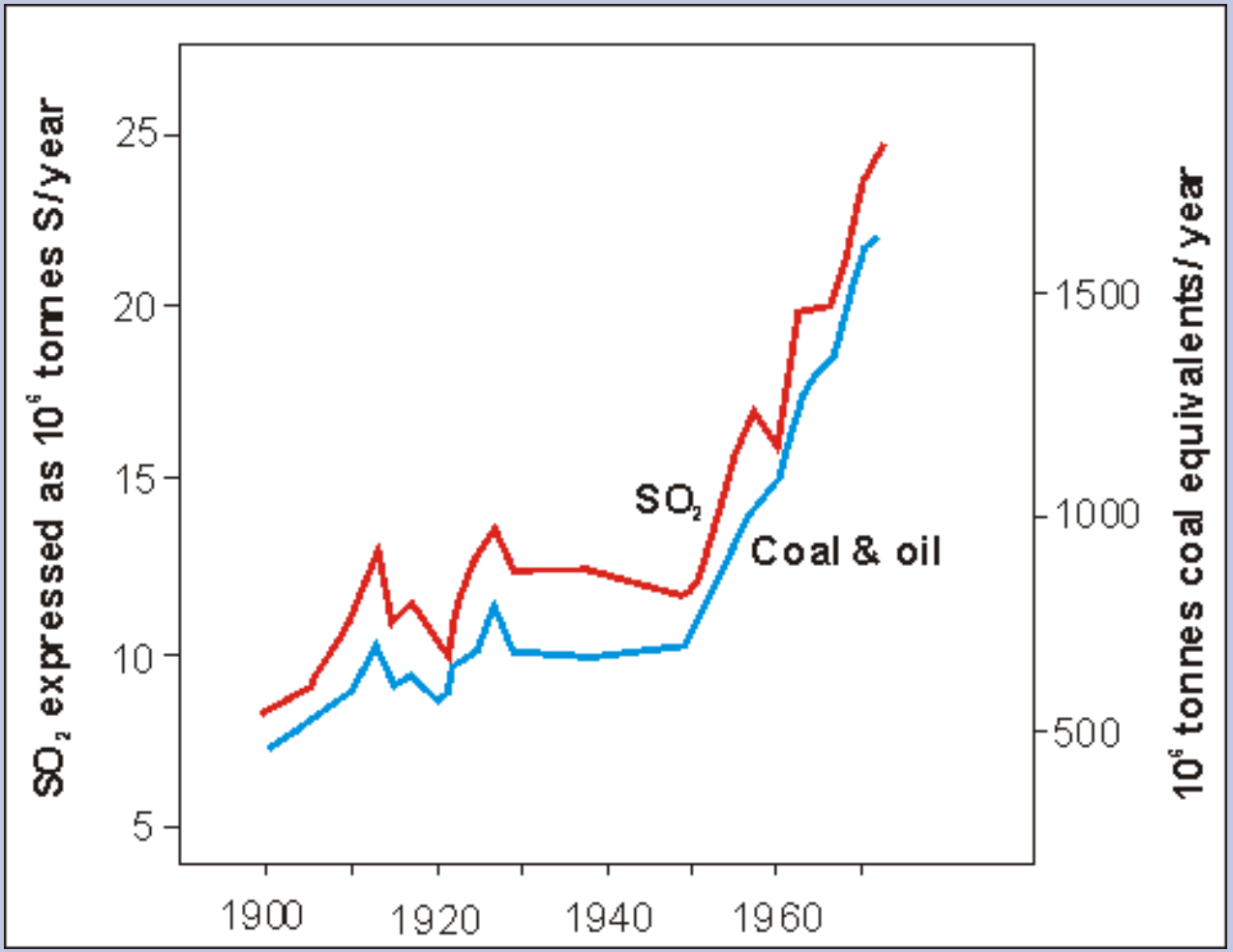
‘I do not mean to say that all rain is acid; it is found with so much ammonia in it as to overcome the acidity; but in general, I think, the acid prevails in the town.’

From Air and Rain – The Beginning of a Chemical Climatology by Robert Angus Smith, 1872

1881 – Norway tracks first signs of acid rain on its western coast (Mongillo, 2001)

Ibsen (1880s) notes that when weather blows from Britain the snow turns black

Development of European Sulphur Emissions from 1900 to 1970



Concern over acid rain grows in Sweden

In 1967 Svante Odén published a newspaper article claiming that acidifying coal-derived pollution from the continent was transported to Sweden and deposited.

He based his conclusions on monitoring over 15-20 years, when the zone with rain pH <4.7 was growing

Few people believed him

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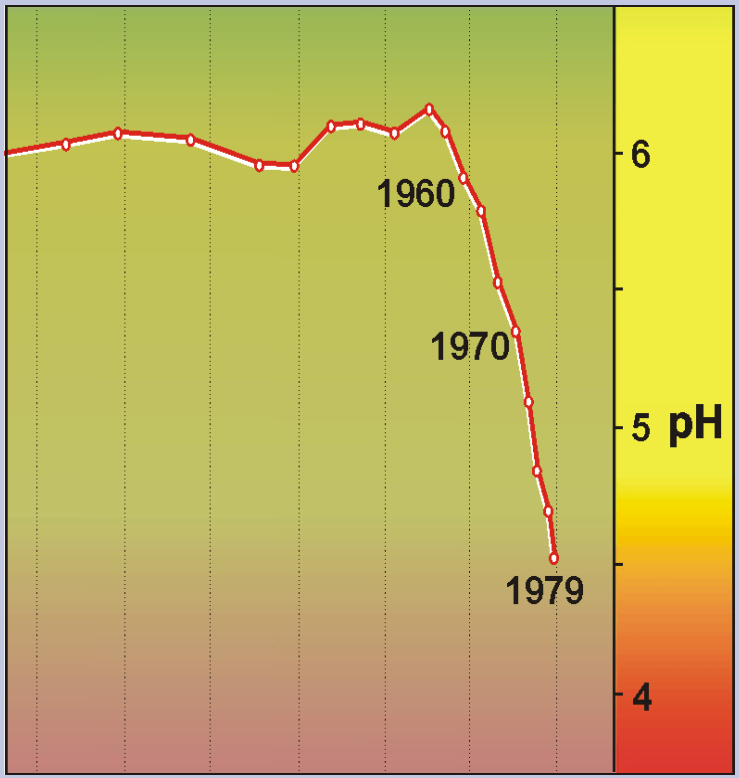
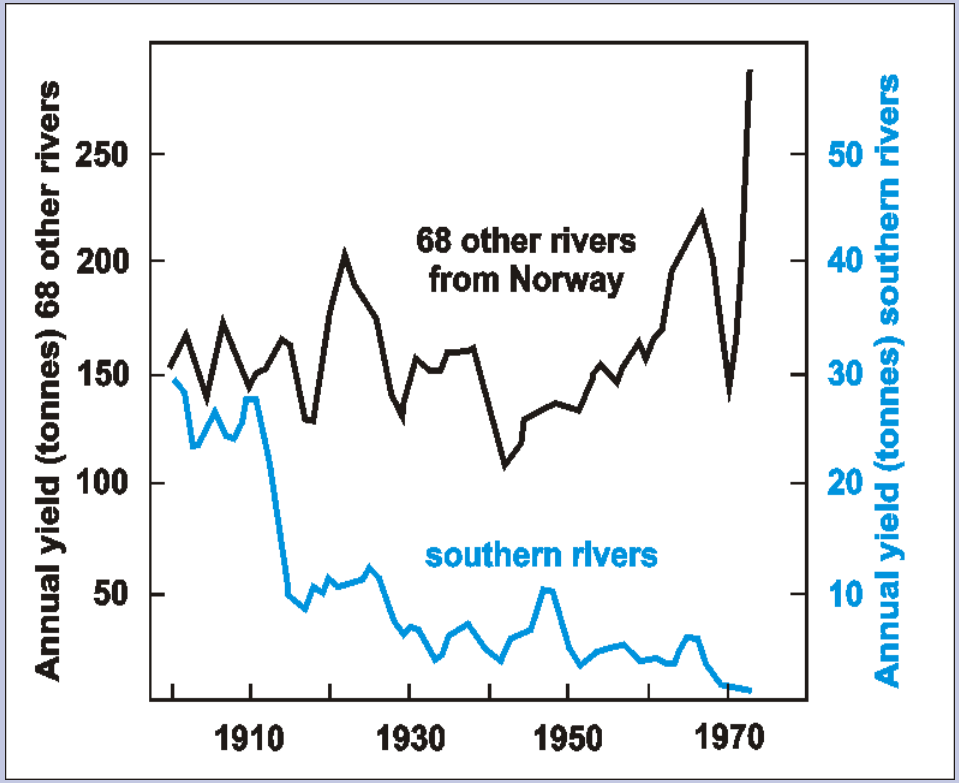
Acidification of Surface Waters in Europe



The pH of lake Gårdsjön, SW Sweden



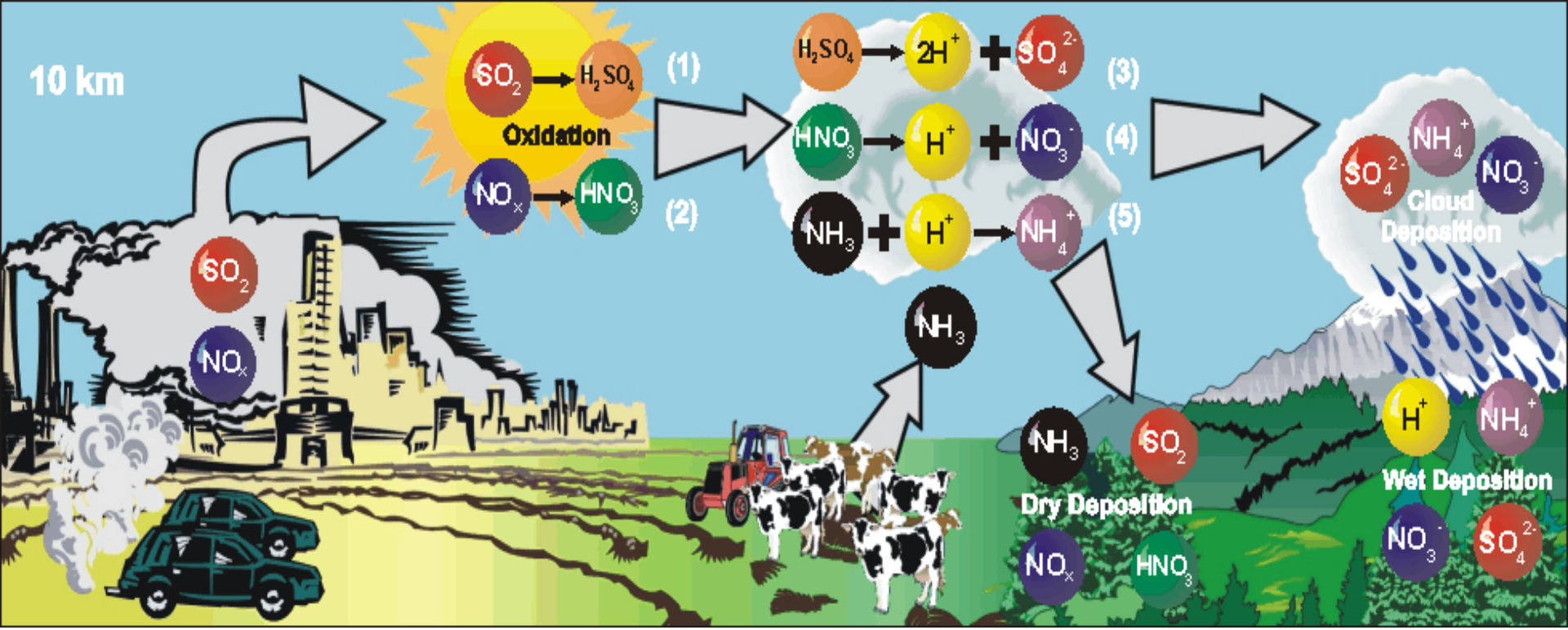
Salmon decline in the acidified waters of southern Norway

Concern over acid rain grows in Sweden

1972 UN Conference on the Human Environment in Stockholm signalled the start for active international cooperation to combat acidification

Between 1972 and 1977 studies confirmed that air pollutants could travel several thousands of kilometres

international Cooperation was clearly necessary



Atmospheric Transfer and Chemical Transformation of Air Pollutants

1977: An OECD study confirmed that sulphur pollution was a cross-border phenomenon

This project later evolved into the Cooperative Programme for Monitoring and Evaluation of Long-Range Transmissions of Air Pollutants in Europe (EMEP)

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80% of Sweden's acid rain came from other countries in Europe duering the 1970s

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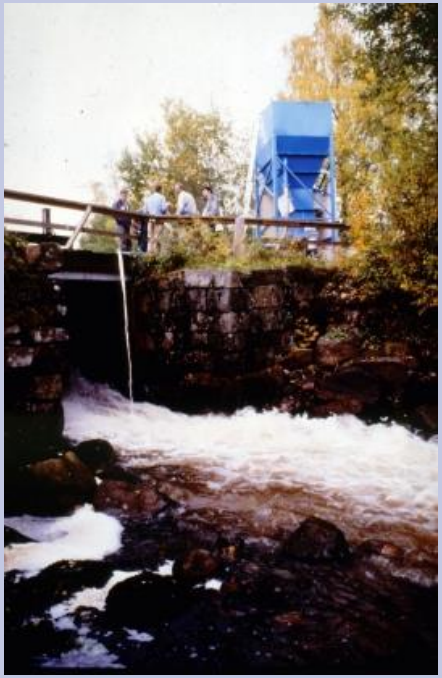
By the late 1970s over 10,000 Swedish lakes became acidified and fish populations died

extensive and expensive liming was carried out to maintain fish in lakes



European Countries Agree to Cooperate on Acid Rain

A High-level Meeting within the Framework of the UN/ECE on the Protection of the Environment was held at ministerial level in November 1979 in Geneva.

It resulted in the signature of the Convention on Long-range Transboundary Air Pollution by 34 Governments and the European Community (EC).

The Convention was the first international legally binding instrument to deal with problems of air pollution on a broad regional basis.

The UN/ECE LRTAP Convention

- The Convention laid down the general principles of international cooperation for air pollution abatement
- It also set up an institutional framework bringing together research and policy
- Core funding for EMEP was secured
- The Convention on Long-range Transboundary Air Pollution entered into force in 1983.
- It has been extended by eight specific protocols

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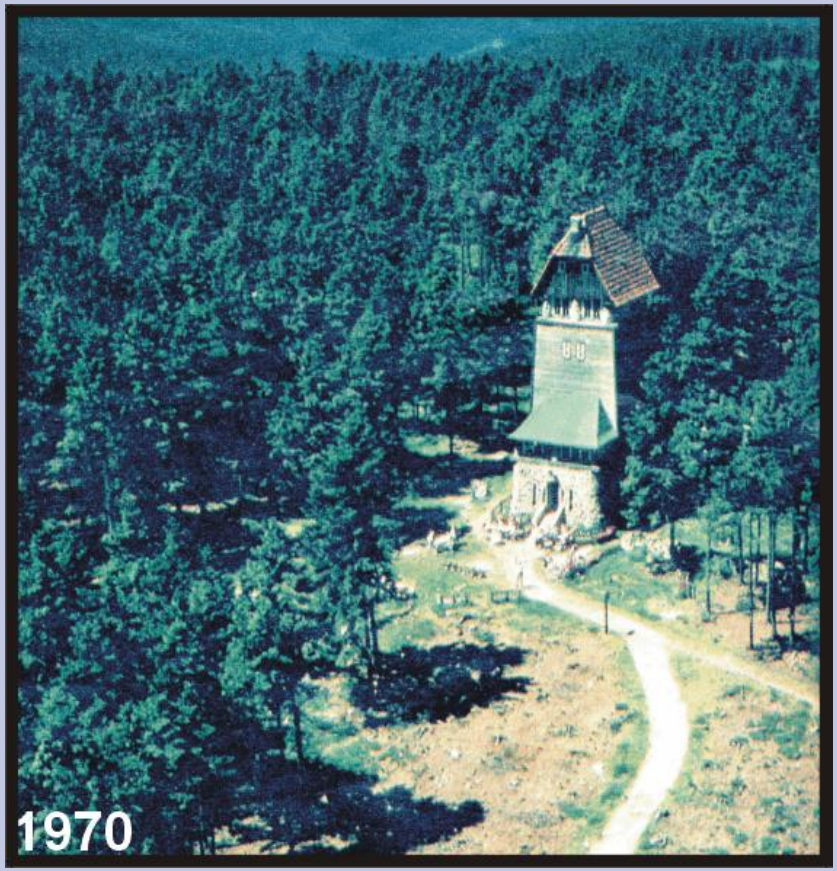
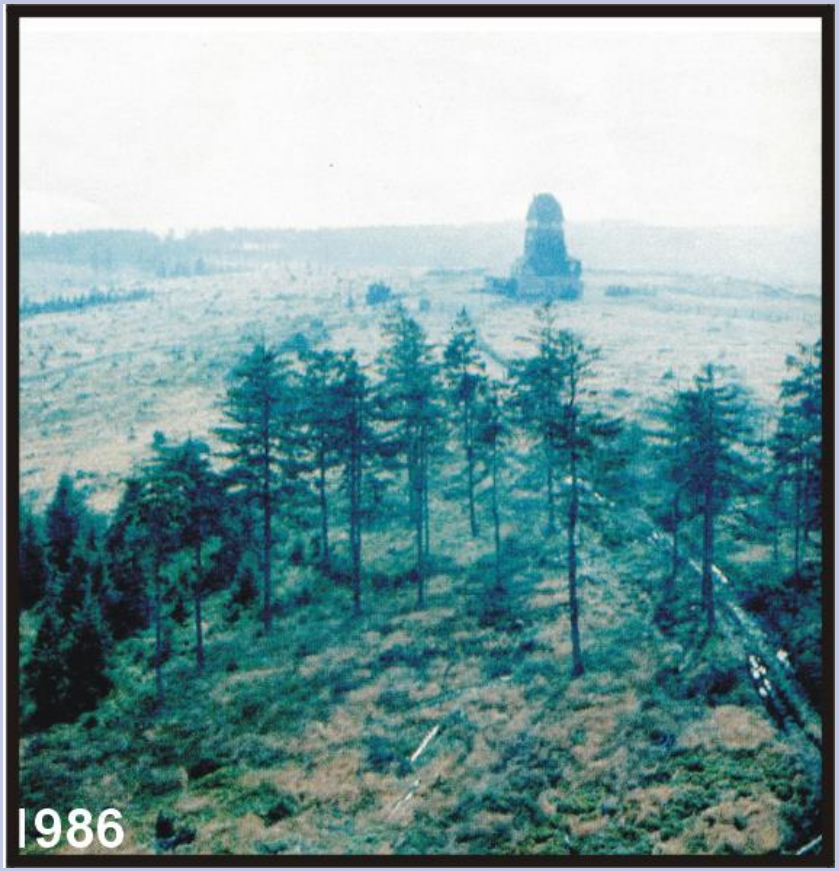
Initial political scepticism in Germany switched in favour of action when forest damage started in the 1980s





Nordic Countries Put on the Pressure

Nordic countries and Canada wanted binding agreements on emission reductions.

This led to the 1st Sulphur Protocol in 1985 (the 30% Club)

Some big polluters (e.g. UK) disputed the acid rain problem and did not sign

NGOs Become Active

Swedish NGO secretariat on Acid Rain formed in 1982

They regularly attend important UN/ECE LRTAP Convention meetings

Greenpeace and Friends of the Earth very Active in the UK

'*Pressure did much to change opinion on emission control*'

Richard Skeffington, former scientist and advisor in UK Power Industry

Science and Politics

Discord between UK and Nordic countries over the existence of acid rain led to collaborative scientific study by independent UK and Scandinavian scientists:

SWAP – Surface Water Acidification Project

Scientists agree on phenomenon leading to climb-down by UK government in a publication by CEGB

'Acid Lakes in Scandinavia - An Evolution of Understanding' by P.F. Chester, CEGB, 1986

Margaret Thatcher announces on a visit to Norway in 1986 that the UK would take steps to reduce sulphur emissions

Executive Body

Implementation Committee

Working Group on Effects

- ICP Forests Task Force — Programme Coordinating Centre
- ICP Integrated Monitoring Task Force — Programme Centre
- ICP Modelling and Mapping Task Force — Coordination Center for Effects
- ICP Materials Task Force — Main Research Centre
- ICP Vegetation Task Force — Programme Centre
- ICP Waters Task Force — Programme Centre
- Task Force Health

EMEP Steering Body

- Task Force on Emission Inventories and Projections
- Task Force on Measurement and Modelling
- Chemical Coordinating Centre
- Meteorological Synthesizing Centre-West
- Meteorological Synthesizing Centre-East
- Task Force on Integrated Assessment Modelling
- Centre for Integrated Assessment Modelling
- Task Force on Hemispheric Transport of Air Pollution

Working Group on Strategies and Review

- Expert Group on Ammonia Abatement
- Task Force on Heavy Metals
- Network of Experts on Benefits and Economic Instruments
- Expert Group on Techno-economic Issues
- Task Force on POPs
- Expert Group on Particulate Matter

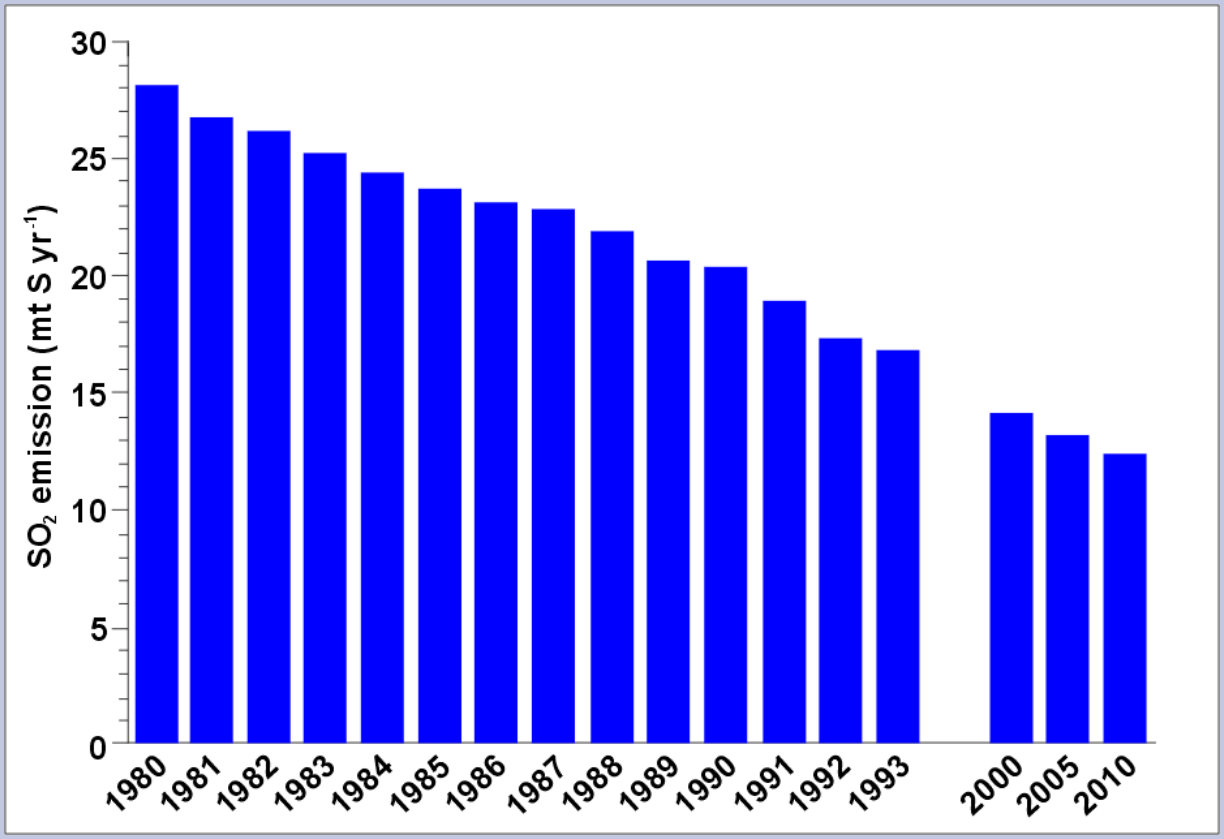
The Protocols of the UN-ECE Convention on LRTAP and EC Legislation

1985	First Sulphur Protocol ('*30% club*'): 18 countries join
1988	NOx Protocol: 26 countries agree to maintain or reduce NOx emissions at or below 1987 levels after 1994
	'Critical loads' concept is adopted
1988	Environment Ministers of EC adopt Large Combustion Plants Directive
1989	EU Ministers of Environment set stricter requirements for cars (catalytic converters)
1991	21 countries sign VOC Protocol

The Protocols of the UN-ECE Convention on LRTAP and EC Legislation

1994	2nd Sulphur Protocol: 26 countries agree to different reductions based on using critical loads and IAMs
1995	EU Environment Ministers adopt Acidification Strategy with long-term objective for acidification that there should be no exceedance of critical loads
1996	EURO standards for cars from Auto-Oil Programme (of EC, car industry and oil industry): adopted in 1998-99
1999	EU Directive limits S content of gas oil to 0.1%, HFO to 1.0%
1999	Göteborg Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (S – 63%; NOx – 40%; VOC – 40%; NH3 – 17% by 2010 from 1990 levels)

Sulphur Emissions in Europe since 1980



Countries free to decide how to meet targets

UK- Dash for Gas; Germany – FGD on coal power stations

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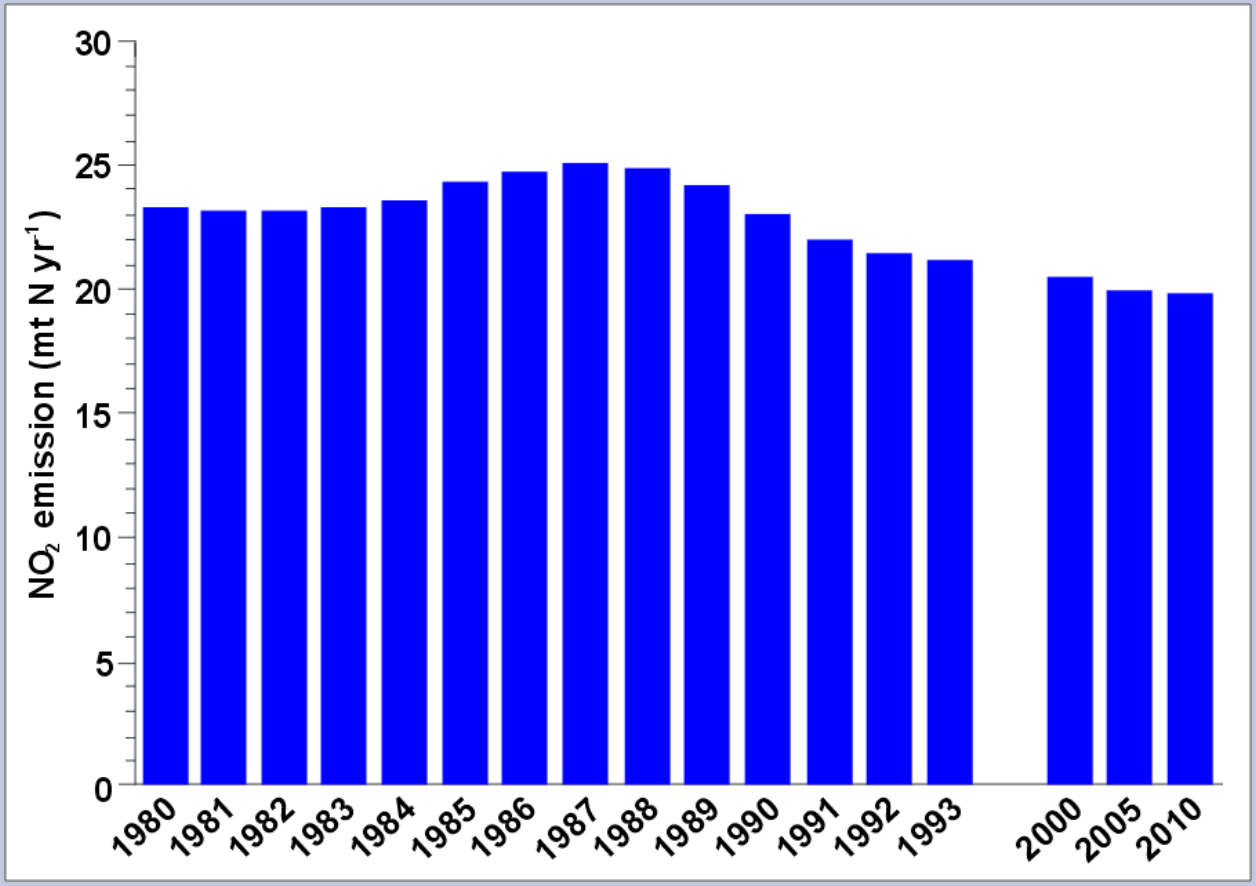
Nitrogen Oxide Emissions Emissions in Europe since 1980



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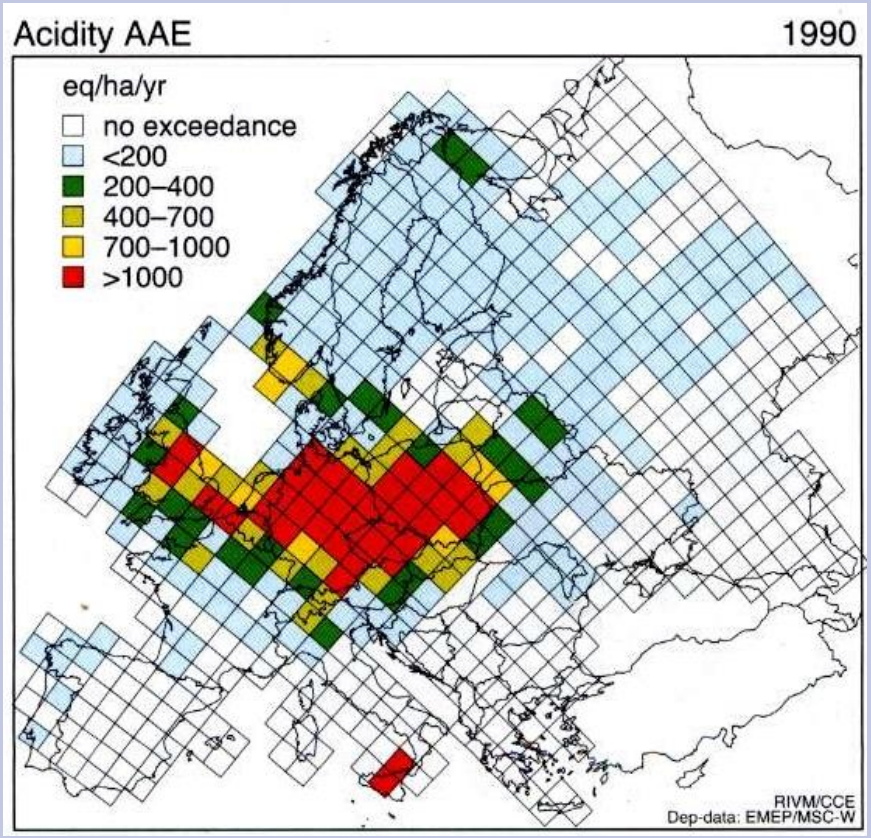
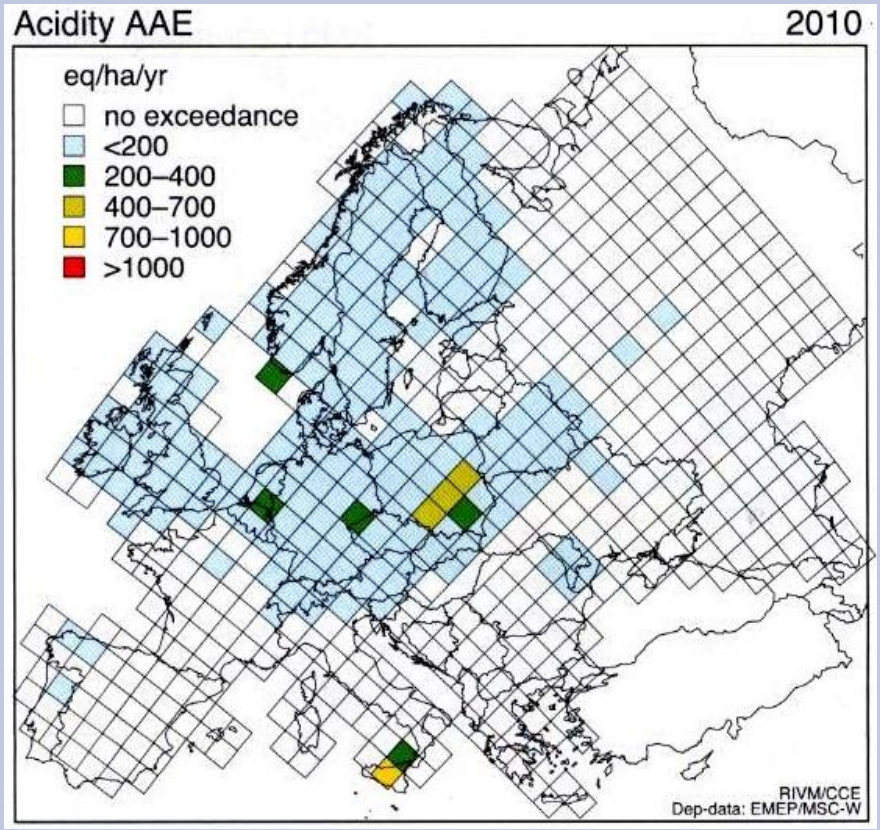
Modelled changes to excess of acid rain over critical loads from 1990 to 2010



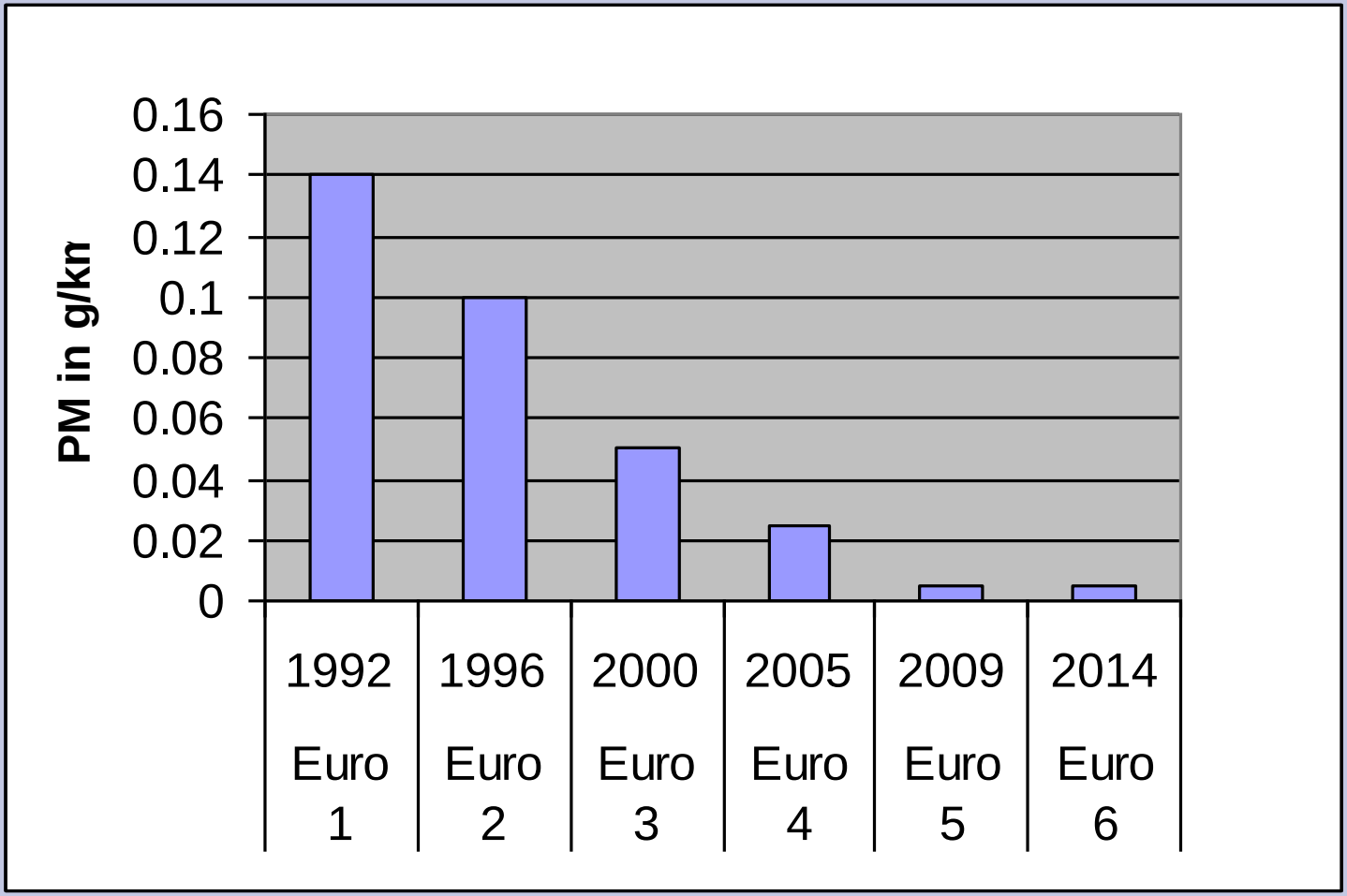


Success in reducting SO_2 emissions in Europe

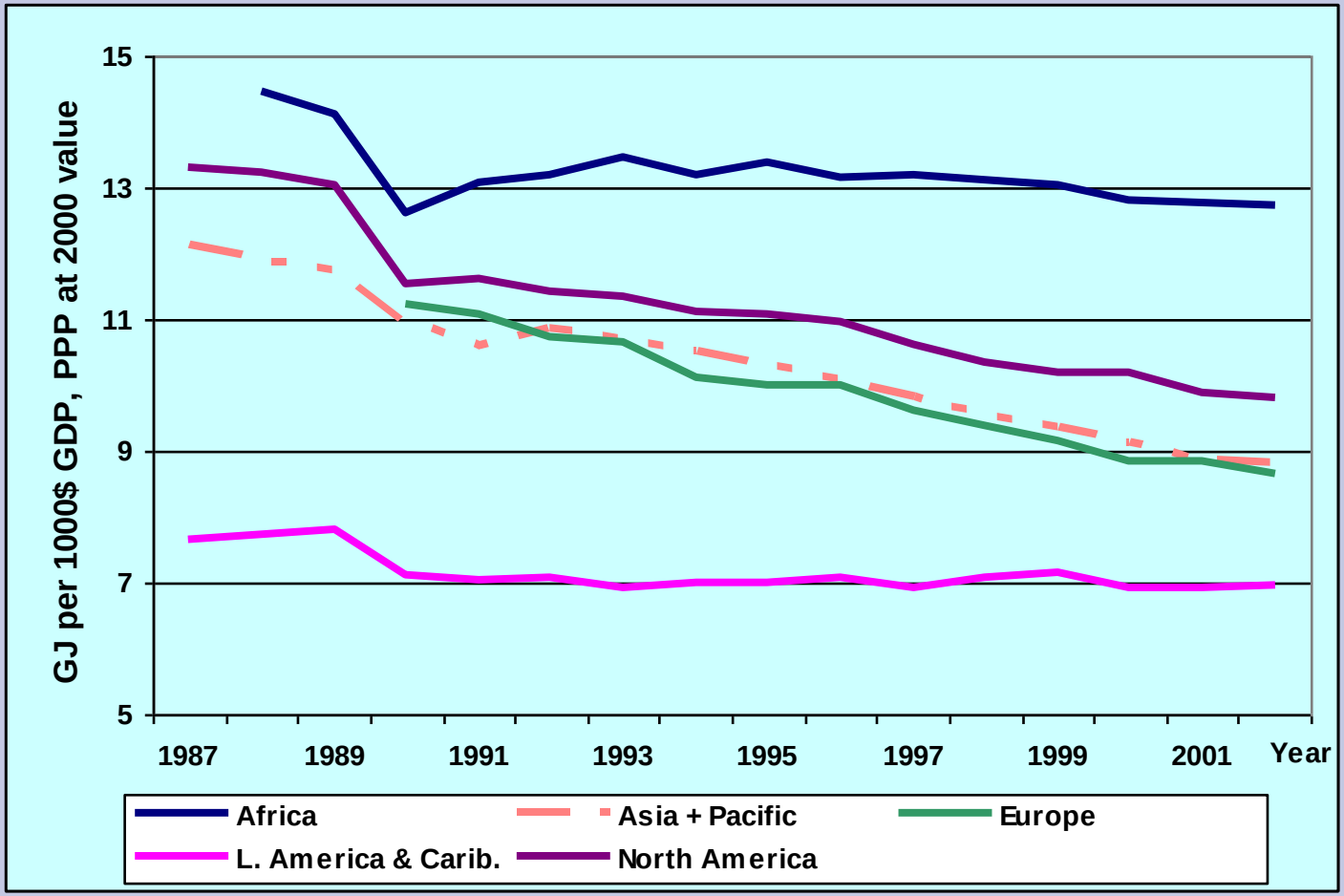
Achieved through a range of different pollution prevention and control strategies, including:

- changes in fuel type (from coal to natural gas)
- desulphurisation of emissions
- coal washing,
- use of fuels with a lower sulphur content and
- improved energy efficiency
- improved technology

EURO standards – example for diesel PM emissions



Decoupling energy consumption from economic activity (energy supply)



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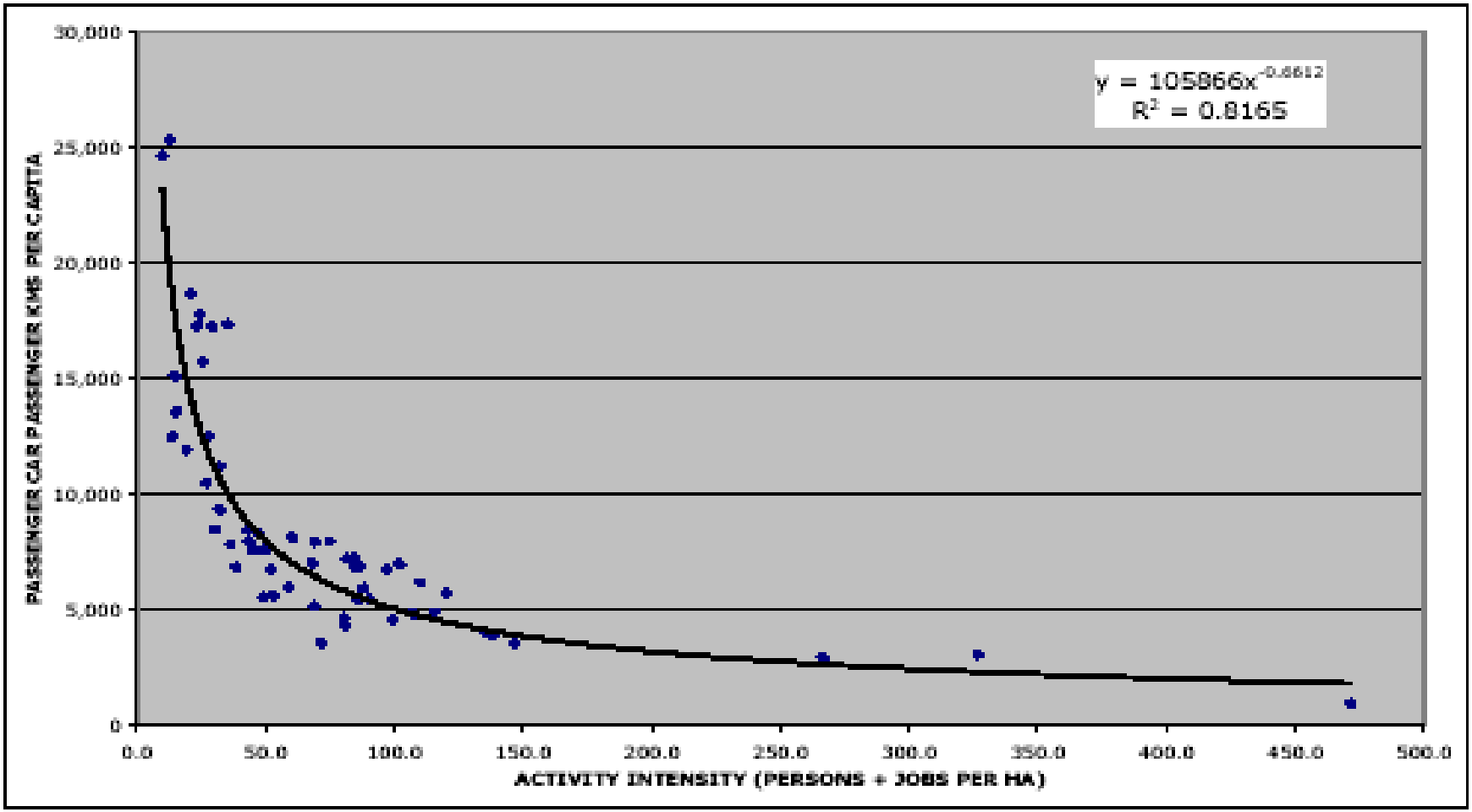
Influence of urban planning on car use



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Influence of transport planning

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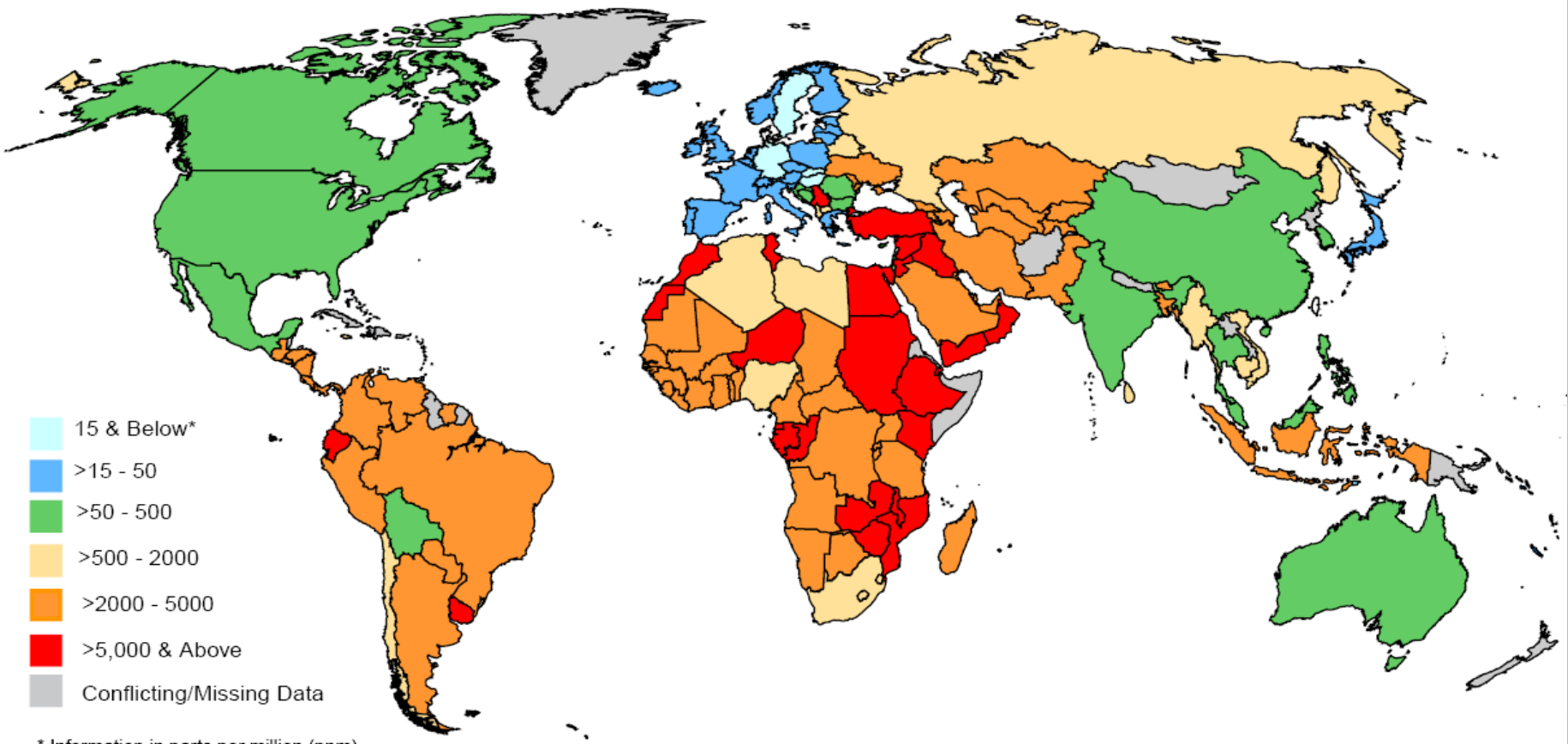
Diesel Fuel Sulphur Levels: Global Status



* Information in parts per million (ppm)

Sulphur levels are maximum allowable as of July 2006. For additional details and comments per country, visit www.unep.org/pcfv.

Summary: Benefits of International Co-operation within Regional Agreements

- Only way to deal with regional problems
- Even weak demands means some action taken by worst performers
- Exchange of information amongst national advisors and scientists
- Information for international agreements increases awareness
- Agreements attract media attention raising the profile

Chinese proverb:

‘A **clever** man learns from his mistakes….

….a **wise** man learns from other people’s’