

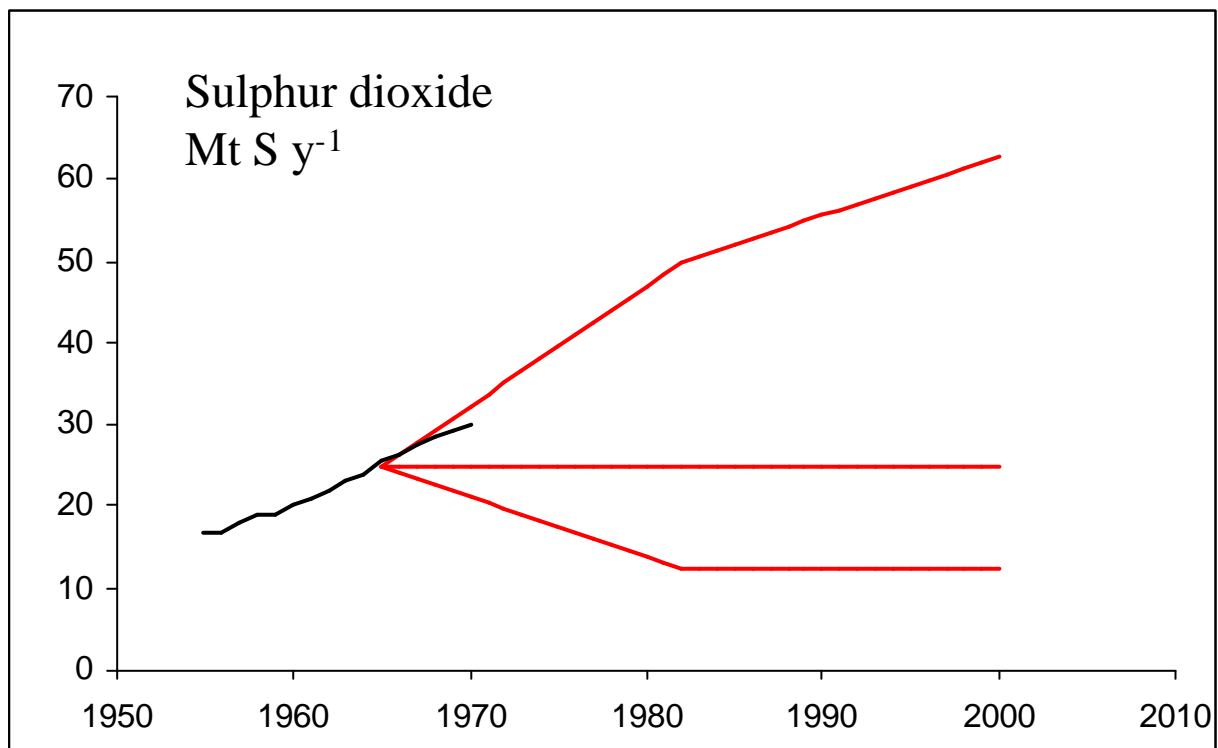


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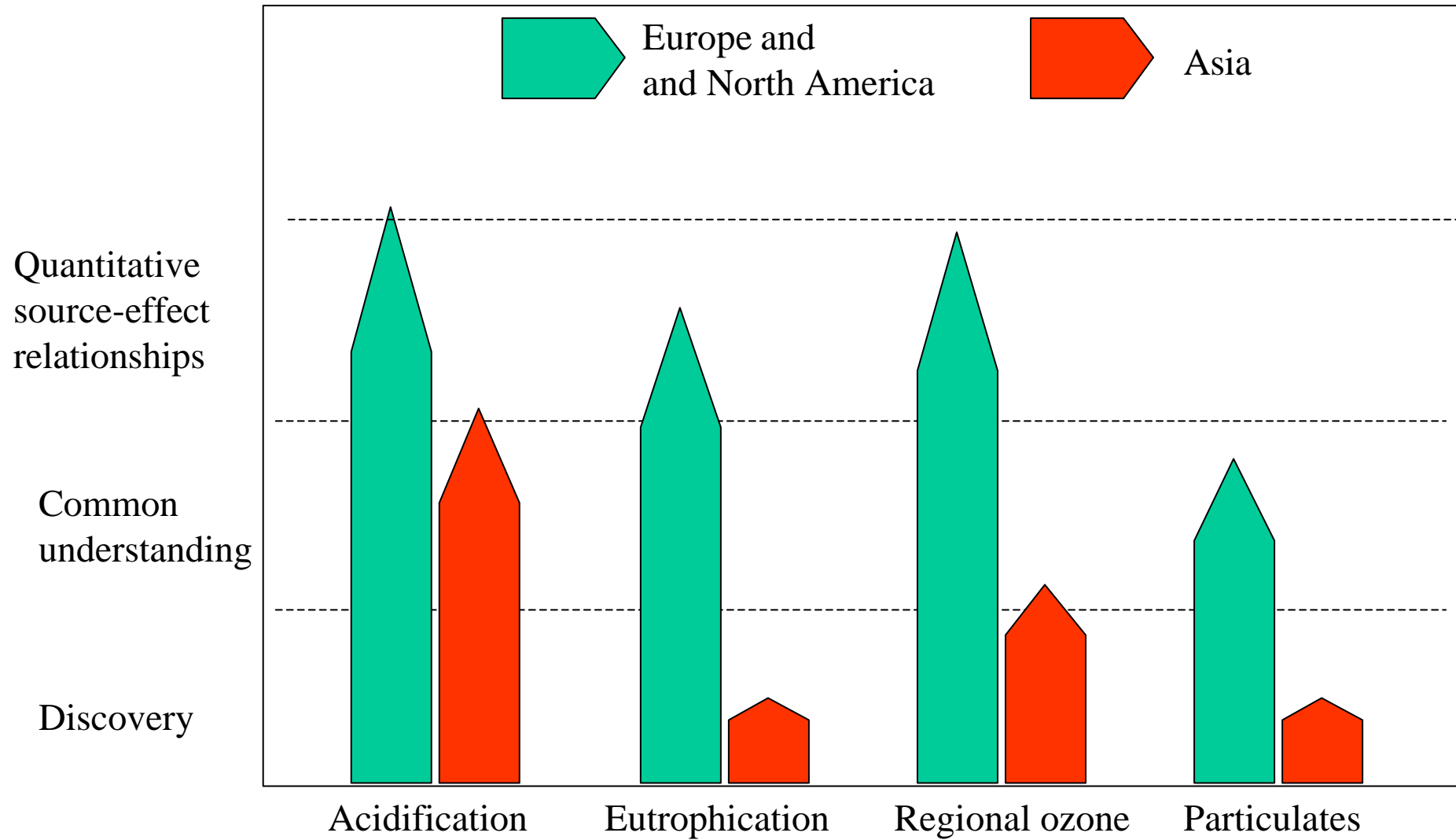
30 years since the first international study on air pollution in Europe

- The sulphur and acidification problem was presented at the UN Conference on Human Environment 1972.
- Assessment describing alternative scenarios and their consequences
- Challenged science and policy

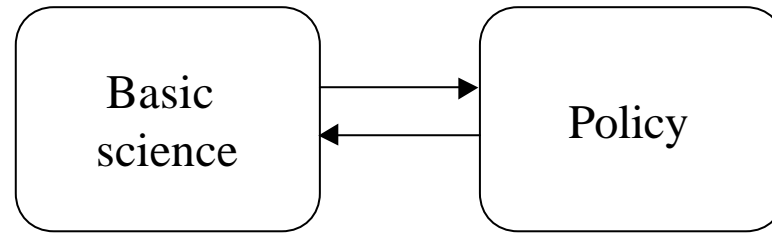
Sulphur Emissions scenarios for Europe 1965-2000 and actual emissions 1955-1970



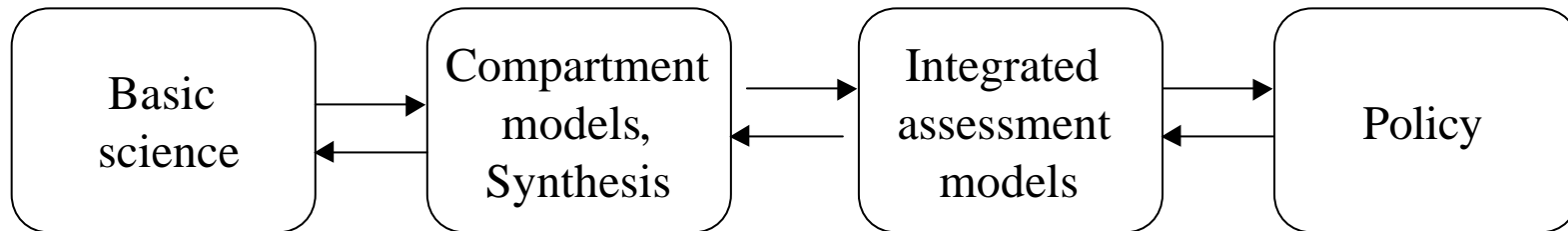
Maturity of regional air pollution understanding



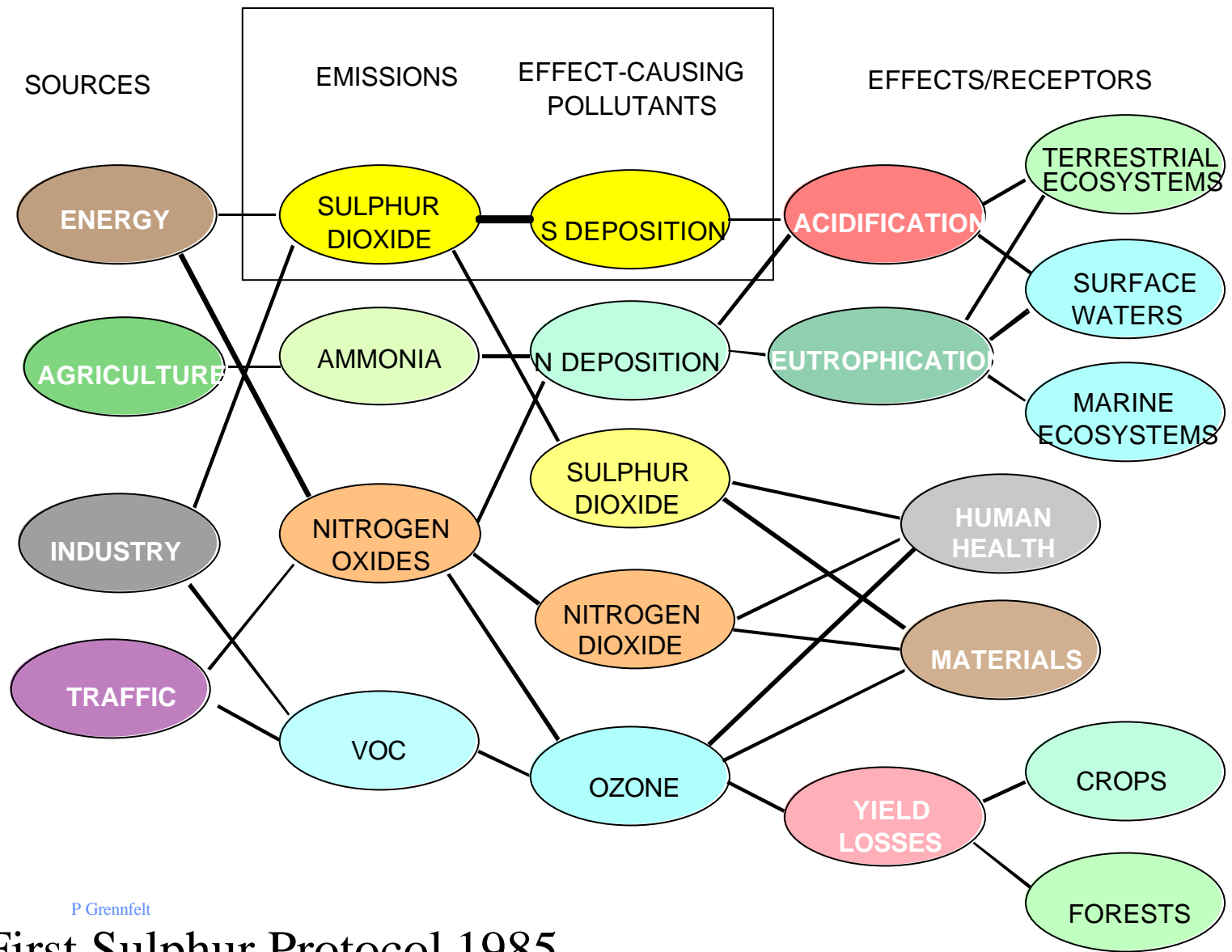
Relations between science and policy for new and mature environmental problems



New problems

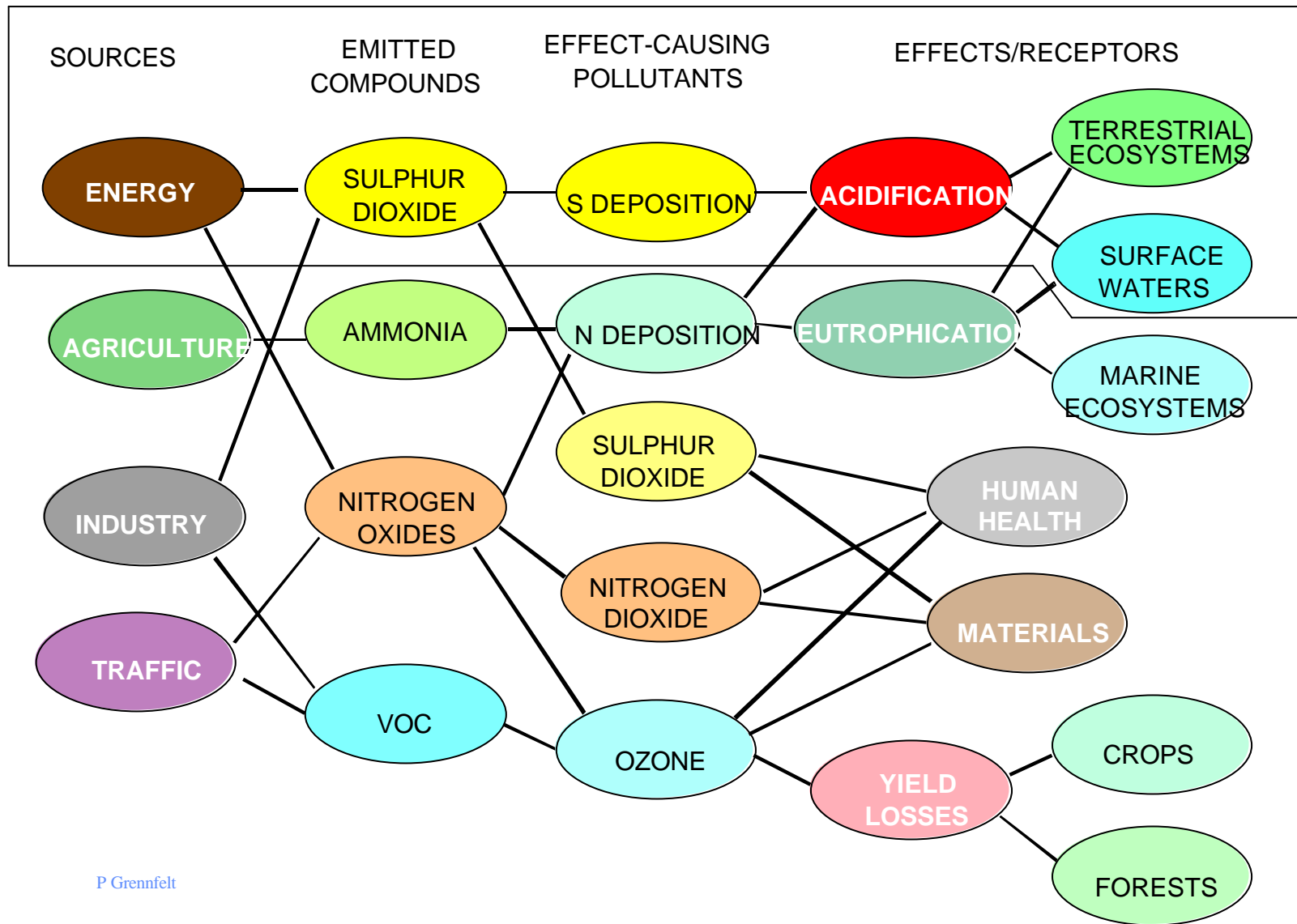


Mature problems



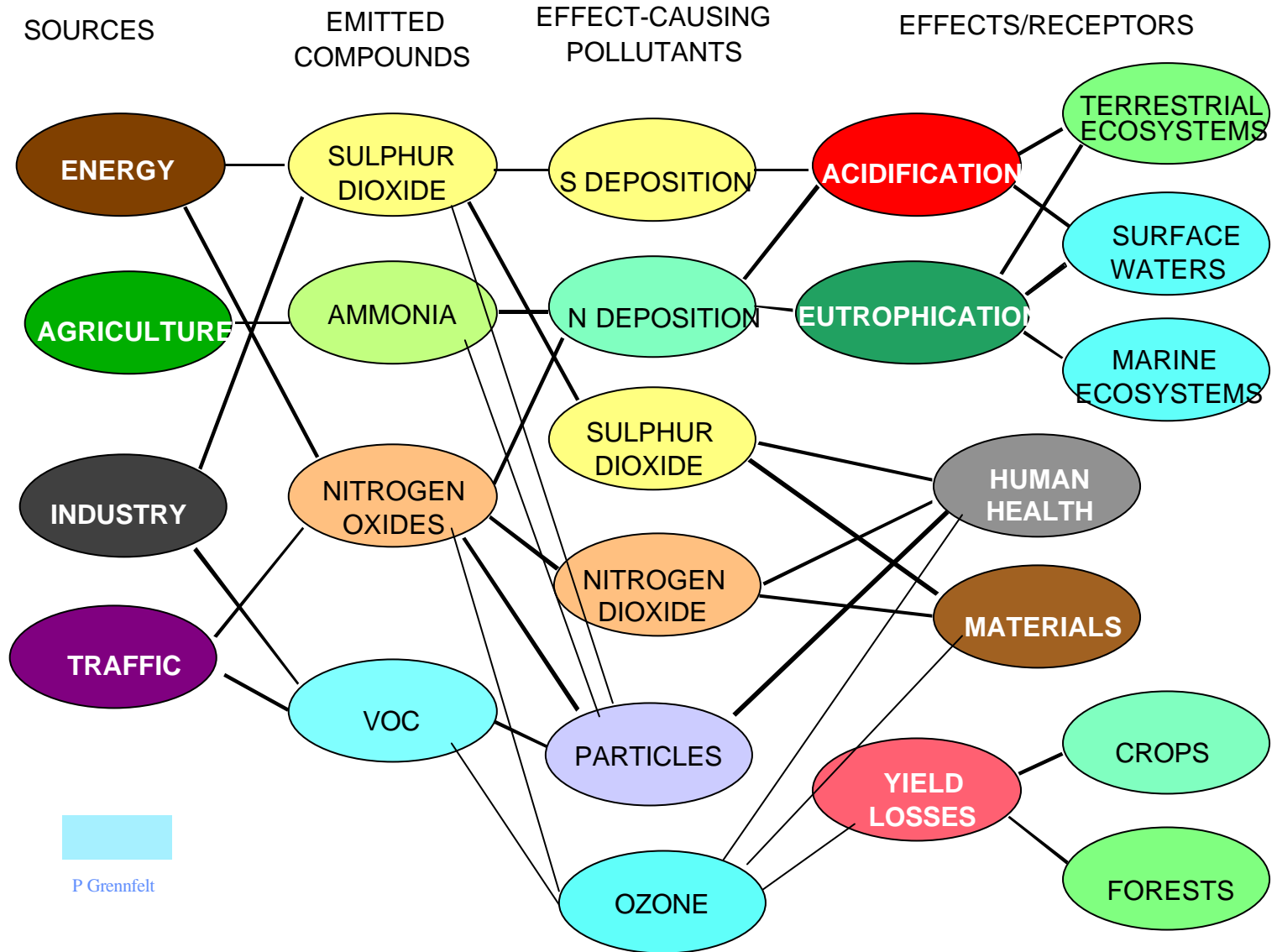
P Grennfelt

First Sulphur Protocol 1985



P Grennfelt

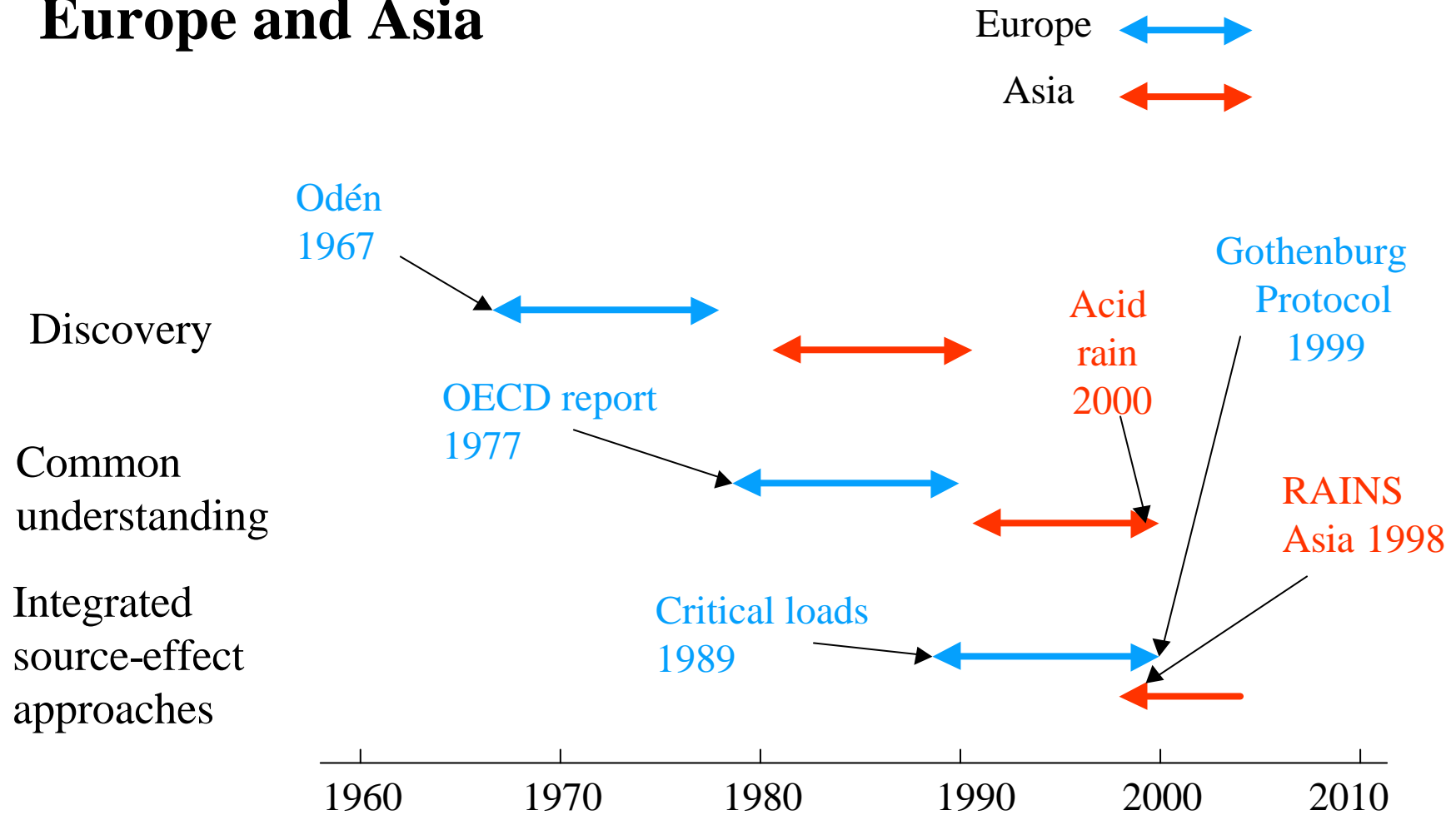
Second sulphur protocol 1994



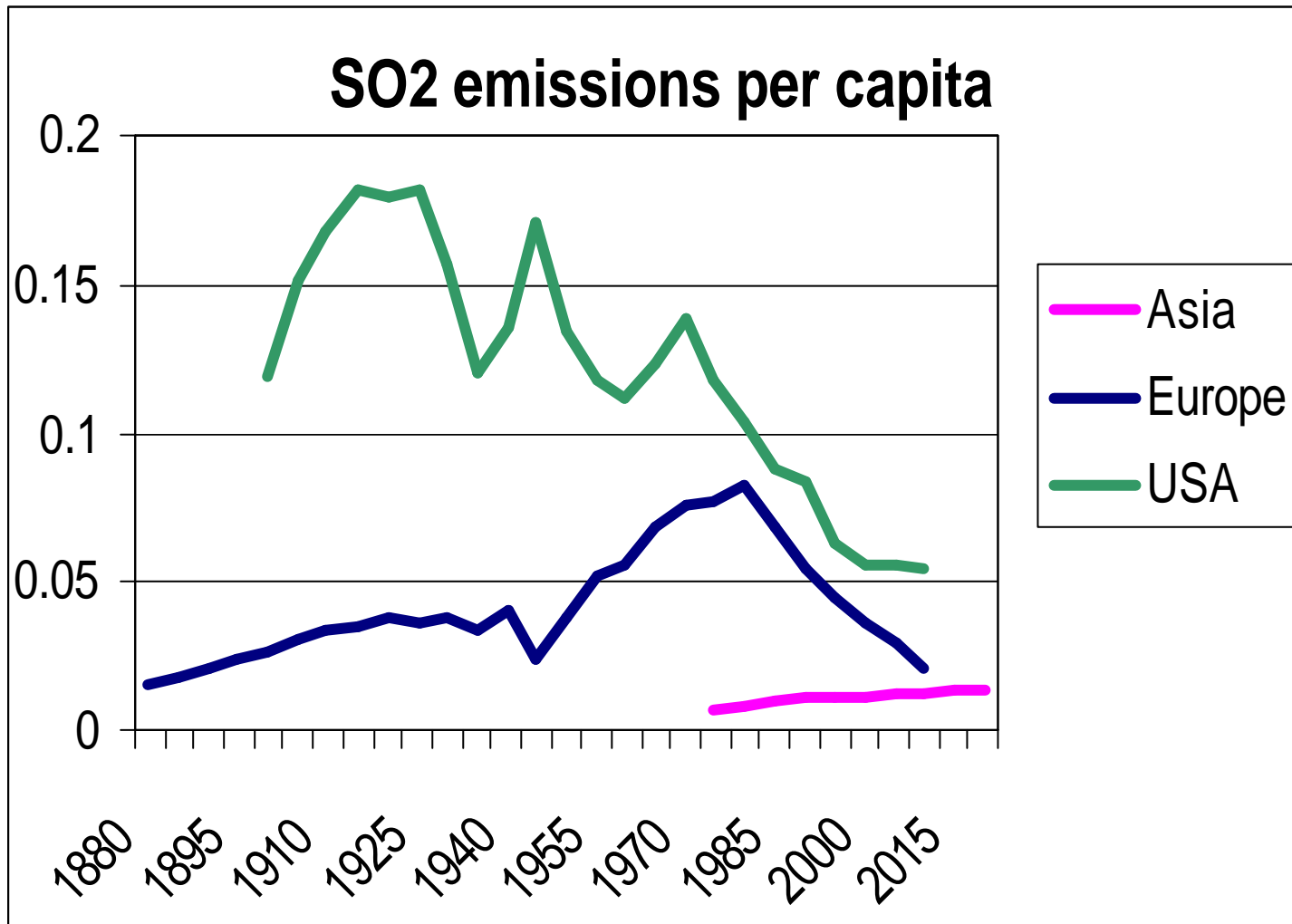
Protocols

- A protocol or strategy should
 - be scientifically sound, transparent and understandable
 - be robust in relation to uncertainties in underlying data and models
 - be possible to evaluate
 - be fair
 - be in line with priorities in each of the signing countries
 - include enough many parties to fulfil its purpose

Phases in regional air pollution in Europe and Asia

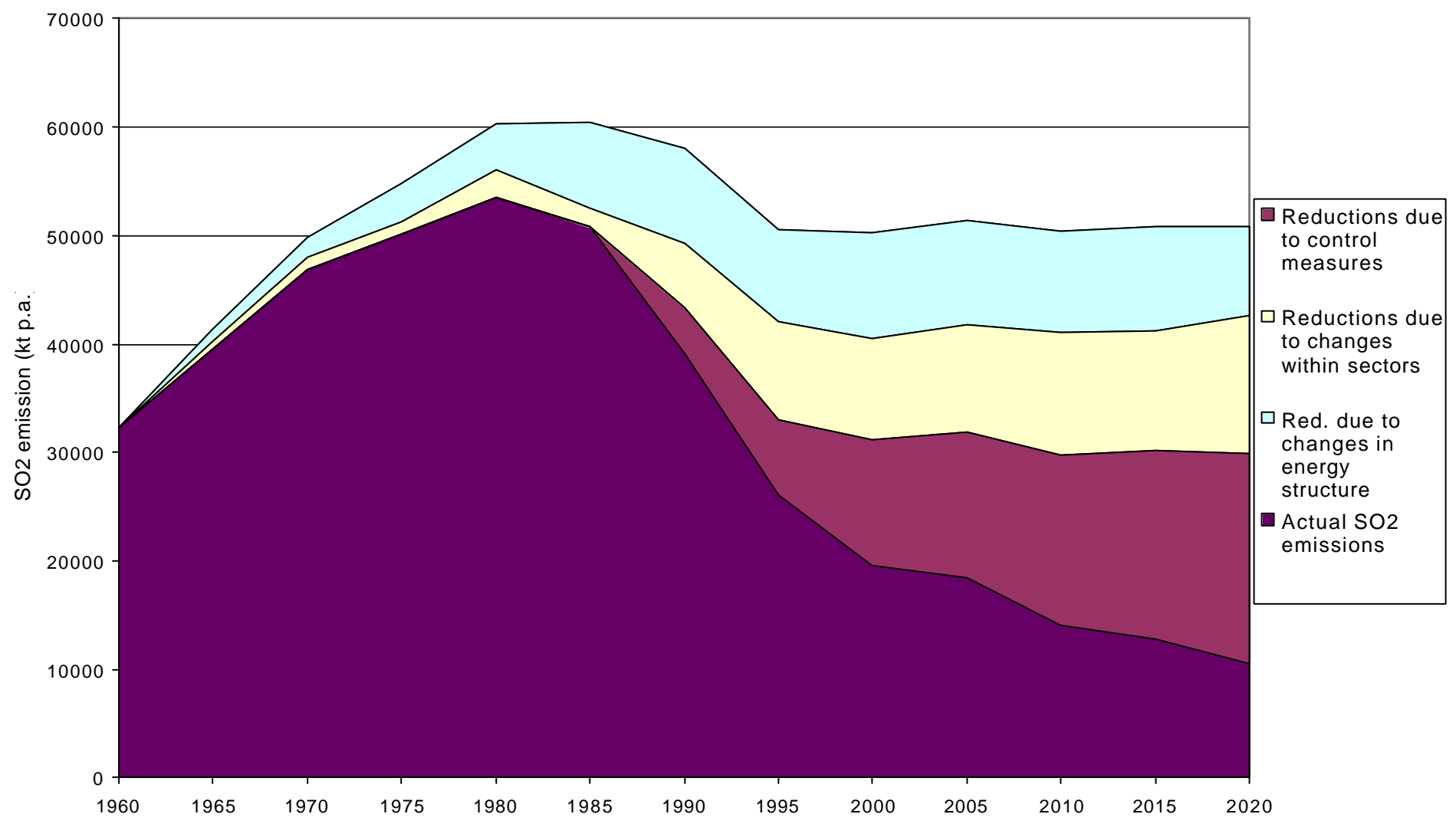


Motivation: Understanding changes in emissions



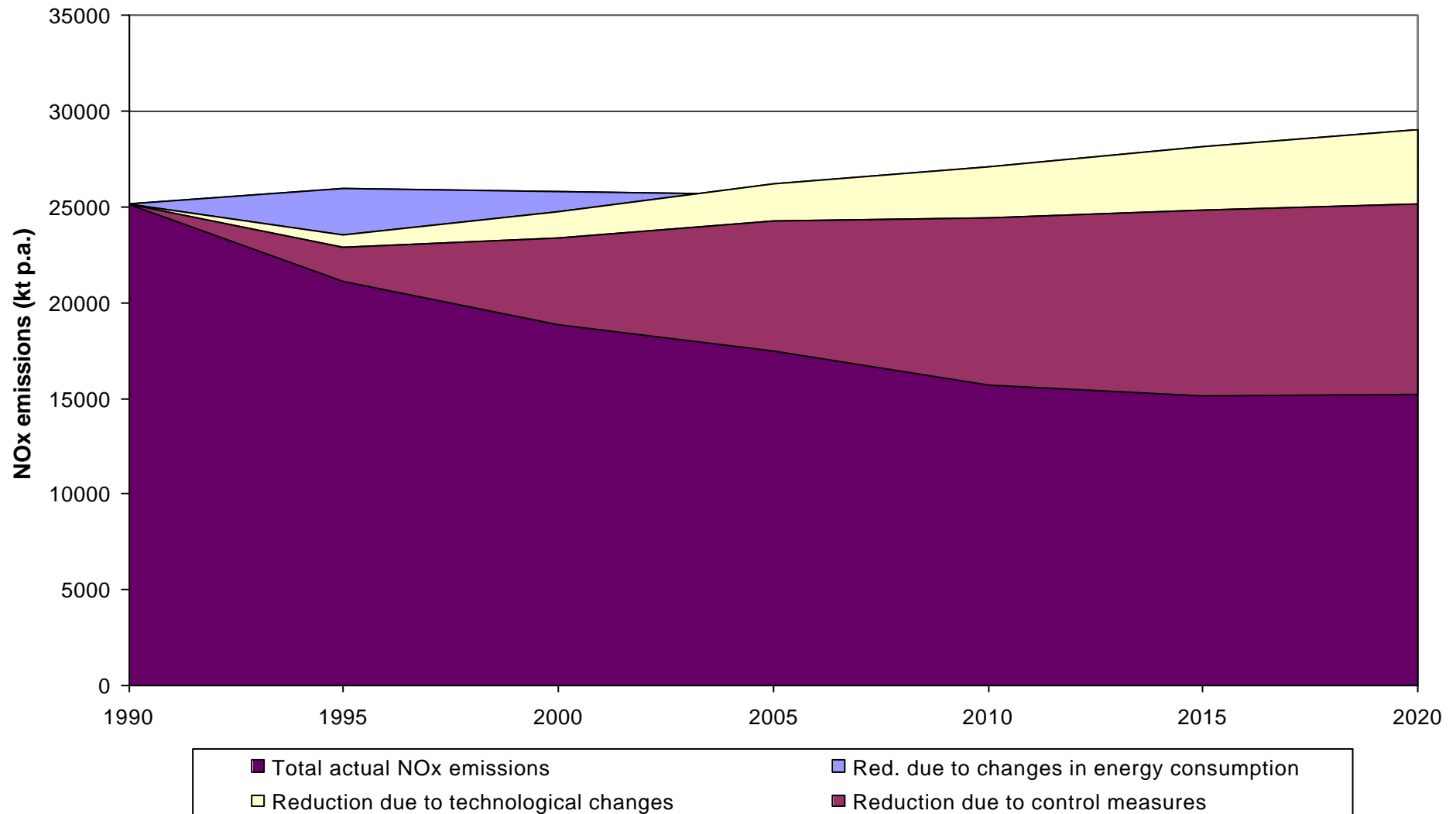
SO2 emissions: European total 1960-2020

(Avoided emissions compared to hypothetical levels due to energy growth)

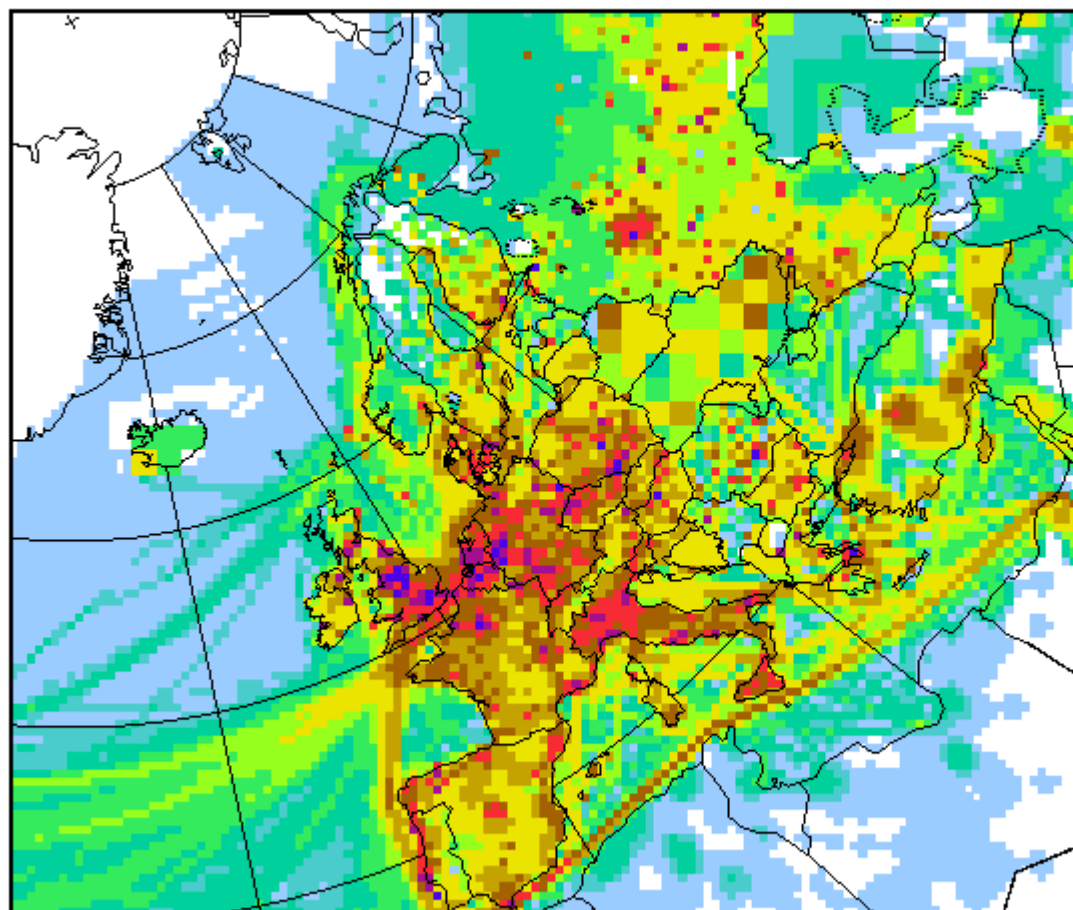


NOx emissions: European total 1990-2020

(Avoided emissions compared to hypothetical levels due to energy growth)



Emission of Nitrogen oxides in 1998
(50km x 50km EMEP grid)



tonnes of NO₂

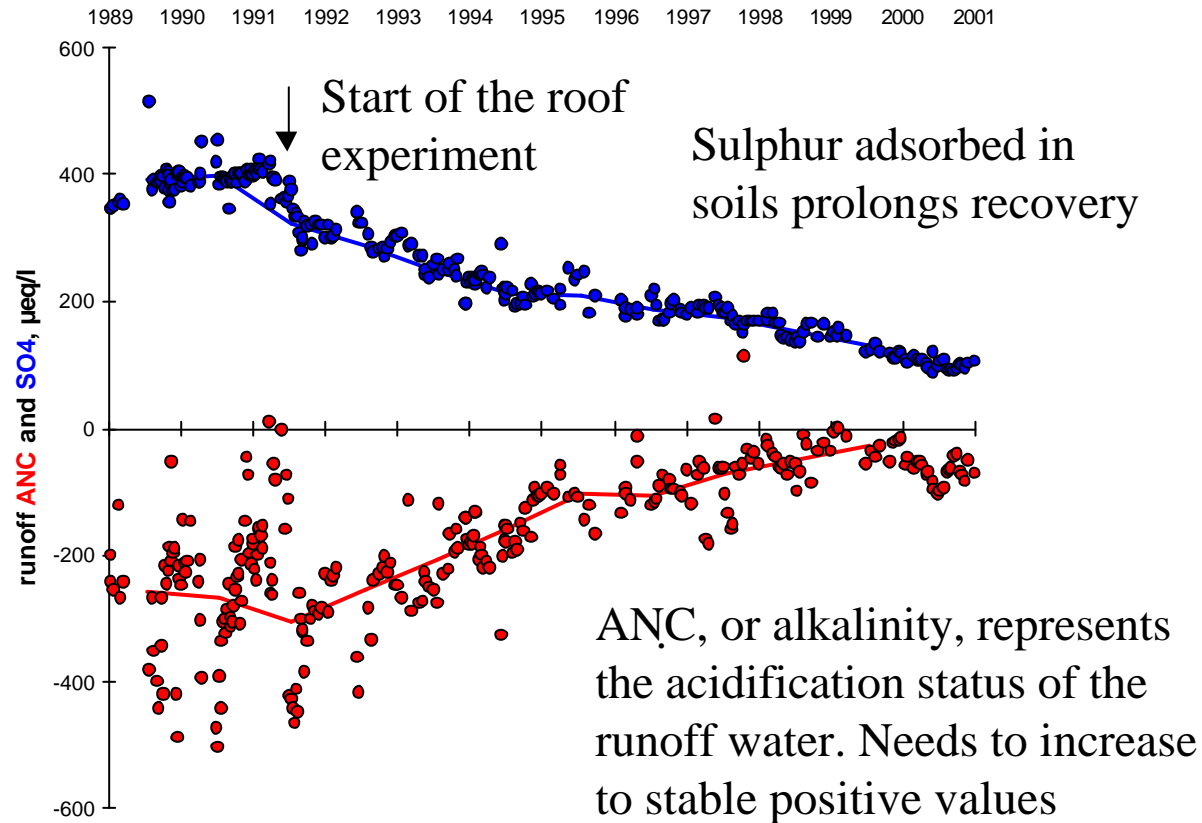
Dark Purple	Above	50000
Purple	25000 -	50000
Red	10000 -	25000
Brown	5000 -	10000
Orange	2500 -	5000
Yellow	1000 -	2500
Light Green	500 -	1000
Green	250 -	500
Teal	100 -	250
Light Blue	50 -	100
Very Light Blue	Below	50

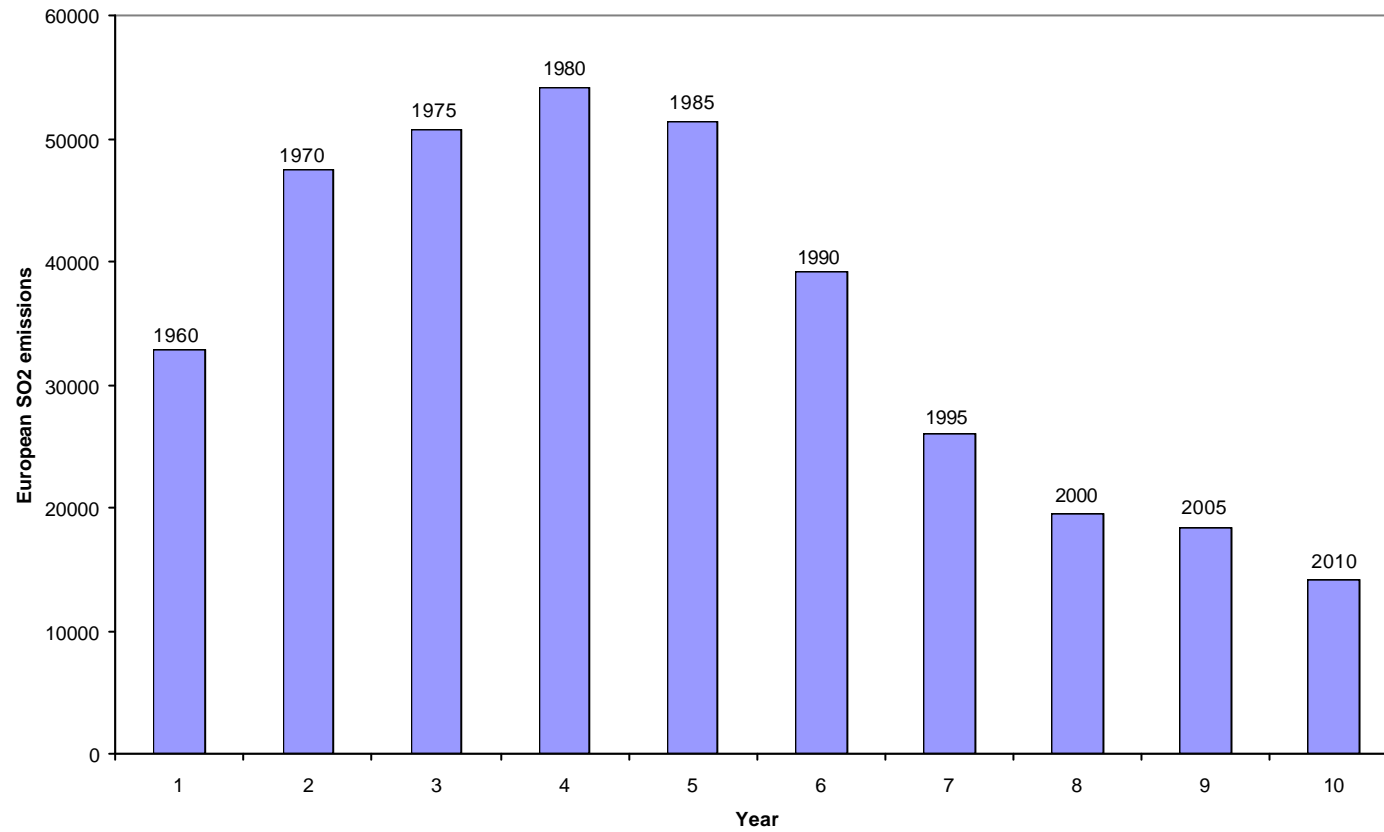
emep/msc-w

Recovery of acidification. The roof project at Lake Gårdsjön.



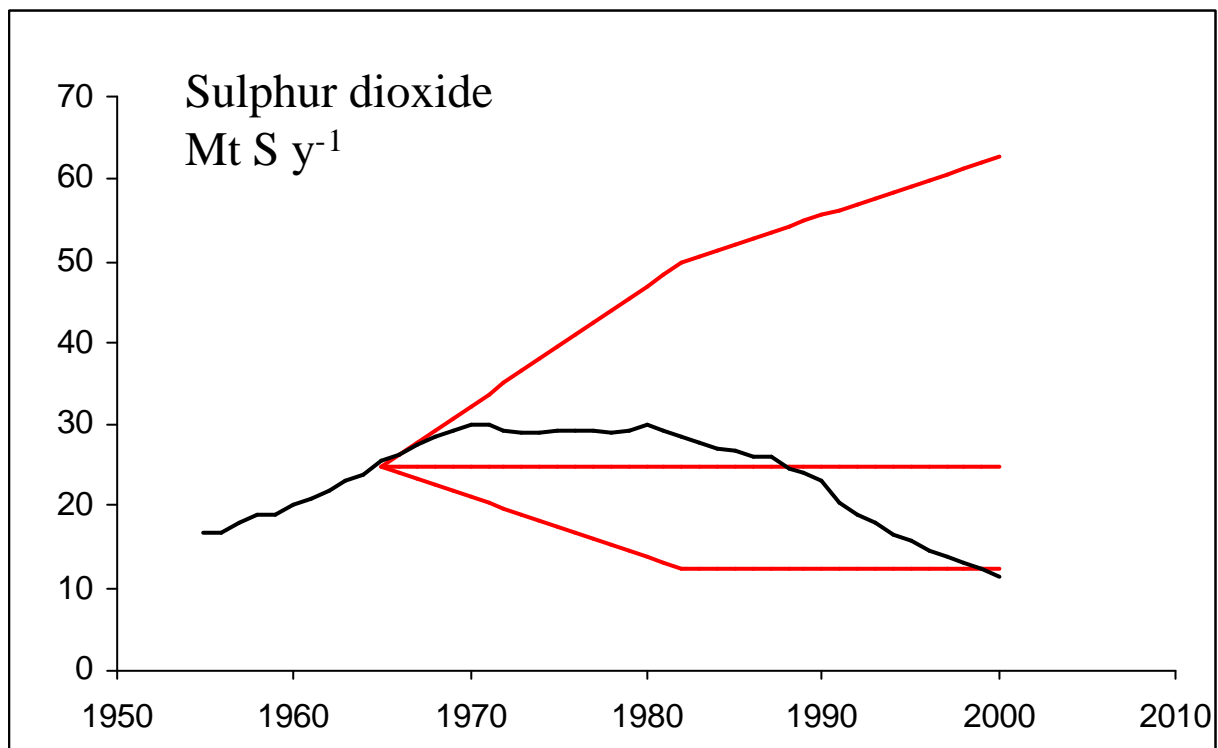
Recovery in the roof experiment 1991-2001. Changes in sulphur and alkalinity in runoff water





European SO₂ emissions 1960 to 2010 (Gothenburg protocol).

Sulphur Emissions scenarios for Europe 1965-2000 together with the real emissions between 1955 and 2000



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