Transboundary Air Pollution in Europe

Perception, Solutions, Future

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Where does the German PM2.5 go?
Where does German PM2.5 come from?
Air pollution policy process in Europe

1979: UN/ECE Convention on Long-range Transboundary Air Pollution (CLRTAP) signed

1981: European Monitoring and Evaluation Programme (EMEP) established

1985-1994: A number of Protocols signed under the CLRTAP; \( \text{SO}_2 \), \( \text{NO}_x \), NMVOC, HM

1997: EU Acidification Strategy


2001: EU National Emission Ceilings Directive (\( \text{SO}_2 \), \( \text{NO}_x \), \( \text{NH}_3 \), NMVOC)

2005: EU Clean Air For Europe (CAFE) strategy proposed (includes for the first time targets for Particulate Matter emissions)

2006: Review of the EU NEC Directive
Uniform or effect-based scenarios?

The graph illustrates the relationship between the population exposure index (in million persons.ppm.hours) and the costs above REF (in billion EURO/yr) for different scenarios:

- **G5/3**: Uniform per capita emissions
- **G5/2**: Uniform emissions
- **G5/1**: % reduction

The graph shows a downward trend, indicating that as the population exposure index increases, the costs above REF decrease for all scenarios. The cost data points are labeled as follows:

- **REF**: Baseline scenario
- **G5/3**: Higher emission scenario
- **G5/2**: Moderate emission scenario
- **G5/1**: Lower emission scenario

The x-axis represents the population exposure index, while the y-axis shows the costs above REF. The graph visually compares the economic implications of uniform and effect-based scenarios.
Models help to separate policy and technical questions

Identify cost-effective and robust measures:

- Balance controls over different countries, sectors and pollutants
- Regional differences in Europe
- Side-effects of present policies
- Maximize synergism with other air quality problems
- Search for robust strategies

Decide ambition level - environmental objectives

Value the importance of uncertainties/risk
GAINS: GHG-Air pollution INteractions and Synergies

Synergies between air pollution control and greenhouse gas mitigation

• Focus on cost-effective mitigation measures and co-benefits

• Focus on policy-relevant scales of analysis:
  – Up to 2030
  – Country-by-country. Currently implemented for 43 countries in Europe, plans for China and India

• Extension of RAINS(-Asia) integrated assessment model for air pollution to GHGs:
  – Model the chain of (air) pollution from sources to effects
  – Assessment of emission reduction potentials and costs:
    • RAINS: SO$_2$, NO$_x$, VOC, NH$_3$, PM (~400 control options)
    • GAINS: CO$_2$, CH$_4$, N$_2$O, HFC, PFC, SF$_6$ (260 control options)