Translating scientific findings into policy recommendations for the Clean Air Policy Package proposed by the European Union

Frontiers in Air Quality Science -
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Origin of PM2.5 - 2009

Netherlands
- average of the urban AIRBASE stations

Lyon, Centre Ville

Source: IIASA GAINS
Origin of PM2.5 - 2009

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Emissions will change in the future – even without further air quality policies

Commission assumption on future economic development

Energy: PRIMES 2013 Reference

Livestock units (million LSU)

Agriculture: CAPRI 2013 Scenario

GDP, Population, GDP/capita, relative to 2005

Livestock

Coal
Biomass
Liquid
Gas
Oth. Renewables
Nuclear
Range of future SO$_2$ and NO$_x$ emissions

In the long run, further emission reductions of SO$_2$ and NO$_x$ from:
• further climate policies, and/or
• further air pollution controls.

The EU Climate policy proposal will lead to lower SO$_2$ and NO$_x$ emissions – not included in Clean Air proposal.

Source: IIASA – recent GAINS calculations
Range of future PM2.5, NH₃, and VOC emissions

Climate policy will not greatly affect emissions of PM2.5, NH₃ and VOC

Future emissions will be determined by air pollution regulations

Source: IIASA – recent GAINS calculations
IIASA’s GAINS systems approach to identify cost-effective international emission reduction strategies

- Energy/agricultural projections
- Emission control options (~2000 measures)
  - Emissions
  - Costs
- Atmospheric dispersion
- Air pollution impacts, Basket of GHG emissions

Optimization

Environmental targets
The target of the Thematic Strategy on Air Pollution for 2030

Current legislation 2030:
5 months life shortening

Commission proposal:
67% ‘gap closure’ in 2030:
-50% health impacts compared to 2005

Maximum additional controls:
3.6 months life shortening

Loss in statistical life expectancy

Total health benefits vs. total emission control costs

Marginal health benefits vs. marg. emission control costs

Optimal range for gap closure
The Commission proposal for National Emission Ceilings (NECs) in 2030

<table>
<thead>
<tr>
<th></th>
<th>EU-28 (relative to 2005)</th>
<th>EU-28 (in addition to Baseline)</th>
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<tbody>
<tr>
<td>SO₂</td>
<td>-81%</td>
<td>-8%</td>
</tr>
<tr>
<td>NOₓ</td>
<td>-69%</td>
<td>-4%</td>
</tr>
<tr>
<td>PM2.5</td>
<td>-51%</td>
<td>-24%</td>
</tr>
<tr>
<td>NH₃</td>
<td>-27%</td>
<td>-20%</td>
</tr>
<tr>
<td>VOC</td>
<td>-50%</td>
<td>-9%</td>
</tr>
<tr>
<td>CH₄</td>
<td>-33%</td>
<td>-9%</td>
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</tbody>
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Diagram showing the % of 2005 emissions for SO₂, NOₓ, PM2.5, NH₃, and VOC, with sections for Baseline change, Cost-effective reduction, Further potential, and MTFR.
NH₃: Key measures for achieving the proposed NECs

Improved storage of manure (e.g., closed tanks) at large farms

Improved application of manure on soil, e.g., trailing hose, slot injection (for large farms)

Improved application of urea fertilizer or substitution by ammonium nitrate
Although the focus is on PM2.5 mass, the proposed measures will also improve other particle characteristics.

- PM2.5: -51%
- Particle numbers: -73%
- Black carbon: -58%
- Mercury: -33%
Costs and benefits of the additional measures

**Costs:**

Air pollution control measures:

€ 2.5 - 3.3 bn/yr
(0.016% - 0.021% of GDP)

Methane measures:

Cost savings € 2.4 - 4.0 bn/yr

Net costs:

Between costs of € 0.9 bn/yr
and savings of € -1.5 bn/yr
(0.006% to -0.010% of GDP)

**Benefits:**

Gains in statistical life expectancy from lower PM2.5:

4.4 months (-50% of 2005)

Additional Natura2000 areas protected against eutrophication:

150,000 km²

Monetized health benefits (mainly mortality)

€ 35 - 135 bn/yr
Gains in labour productivity

- Working time to pay for measures
- Reduced absence from work

Source: IIASA GAINS
PM2.5 in 2030: Commission proposal

Netherlands
average of the urban AIRBASE stations

PM2.5

Source: IIASA GAINS

Lyon, Centre Ville

Source: IIASA GAINS
Are we on track towards sustainability?

While the proposed NECs are important milestones, long-term sustainability will require further policy interventions.
Conclusions

• The Commission proposal for the ‘Clean Air Policy Package’ suggests a concrete path for solving the remaining air quality problems in Europe, based on
  – solid scientific understanding, especially on health impacts,
  – economic efficiency, and
  – fully utilizing the potential from international cooperation.

• Health impact information was most instrumental for reaching agreement on the ambition level of the proposal (i.e., the ‘70% gap closure’)

• However, there is significant resistance from governments against further measures. Highlighted (health) benefits are not always sufficient to convince stakeholders.

• More info: http://gains.iiasa.ac.at