Identifying promising measures that could help reducing near-term forcing

State of play of the UNEP BC assessment

38th Session of the Task Force on Integrated Assessment Modelling, Dublin, May 17-19, 2010
Approach for UNEP BC assessment

1. Develop emission projections for all substances

2. Determine future RF by sector and gas

3. Rank measures by net RF of their BC/OC/CO/CH4/SO2 reduction

4. Choose a set of efficient measures

5. Estimate their overall mitigation potentials
BC inventories 1990-2010 and trends to 2030
GAINS calculation for IEA World Energy Outlook 2009

Work in progress!
BC, OC and other PM2.5 emissions
IEA baseline and 450 ppm scenario

Work in progress!
Emission trends 1990-2030
GAINS calculation for IEA World Energy Outlook 2009

OECD
BRICS
Others

What is the impact on radiative forcing?

Work in progress!
GWPs used for screening of mitigation measures

<table>
<thead>
<tr>
<th></th>
<th>20 yrs</th>
<th>100 yrs</th>
<th>Source</th>
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<tbody>
<tr>
<td>CO2</td>
<td>1</td>
<td>1</td>
<td>IPCC, AR4</td>
</tr>
<tr>
<td>CH4</td>
<td>72</td>
<td>25</td>
<td>IPCC, AR4</td>
</tr>
<tr>
<td>N2O</td>
<td>289</td>
<td>298</td>
<td>IPCC, AR4</td>
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<td>SO2</td>
<td>-140</td>
<td>-40</td>
<td>Fuglestvedt et al., 2009 (ATTICA)</td>
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<td>BC</td>
<td>2200 (690-4700)</td>
<td>680 (210-1500)</td>
<td>Bond and Sun, 2006</td>
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<tr>
<td>OC</td>
<td>-240</td>
<td>-75</td>
<td>Bond et al., 2007</td>
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<td>VOC</td>
<td>12</td>
<td>3.4</td>
<td>IPCC, AR4</td>
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<tr>
<td>CO</td>
<td>4.5</td>
<td>1.9</td>
<td>IPCC, AR4</td>
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<tr>
<td>NOx</td>
<td>&lt;0</td>
<td>±0</td>
<td>various sources</td>
</tr>
</tbody>
</table>
CO₂eq emissions by gas
1990-2030, IEA WEO2009 baseline

Work in progress!
GWP20 from BC+OC by sector
IEA WEO 2009

OECD

BRICS

Others

Work in progress!
Global mitigation potential for BC+OC in 2030
Net impact on GWP20 for IEA WEO2009 baseline

Assumptions:
- Only realistically available technical measures:
  - No pellets and ESP for households in developing countries
  - No tunnel kilns in India
- Full turn-over of capital stock by 2030
- Feasibility of non-technical measures to be determined

Impacts in 2030:
- -35% from technical measures
- -40% from non-technical measures

Work in progress!
Regional mitigation potential for BC+OC in 2030
Net impact on GWP20
for IEA WEO2009 baseline

Of global potential: 8%+1%
28%+23%
8%+27%
BC/OC mitigation from a low-carbon scenario
GWP20 IEA WEO2009 REF vs 450 ppm scenario

Work in progress!
Top-10 mitigation measures for methane in 2030 for IEA WEO2009 baseline

Source: IIASA GAINS

- Coal mines
- Oil & gas production
- Gas transmission
- Solid waste disposal
- Wastewater treatment
- Rice cultivation
- Livestock
- Other

*Work in progress!*
Radiative forcing from long- and short-lived GHGs
IEA WEO 2009, baseline and 450ppm scenarios

Radiative forcing over 100 years

Radiative forcing over 20 years

with measures for BC/OC and CH4

with measures for BC/OC and CH4

With measures for BC/OC and CH4

Work in progress!
Some key uncertainties

- Reduction efficiency for BC of improved/new biomass cooking stoves in developing countries
- Emission factors for brick kilns and coke ovens
- Some activity data (e.g., open burning of biomass and waste)
- Quantification of super-emitting vehicles (present and future)
- Quantification of radiative forcing of aerosols
- Feasibility of non-technical measures
Conclusions

- Globally, implementation of 10 measures could lead to a 75% reduction in short-term forcing of BC/OC in 2030.
- However, some of these improvements in RF will be compensated by associated reductions in SO$_2$ emissions (DPF).
- 50% of this potential emerges in BRICS countries, 33% in other developing countries.
- 30% of the potential depends on reduction efficiency of improved biomass cook stoves for BC. Phase-out of biomass as alternative?
- 45% of the mitigation potential could be achieved through technical measures, 55% require non-technical interventions.
- A health-targeted strategy would not necessarily reduce near-term forcing, but all BC measures also reduce health impacts (although not as efficiently).