Measures to Limit Near-Term Climate Change and Improve Air Quality

The UNEP/WMO Integrated Assessment of Tropospheric Ozone and Black Carbon

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Assessment Objectives

•To review the scientific literature on Black Carbon, tropospheric ozone and its precursors and assess the state of knowledge of their influence on climate and impacts as air pollutants

•To assess the extent by which carefully selected measures addressing BC and ozone can help protect near-term global and regional climate change

•Determine the size of the co-benefits of the selected measures on health and crop yield

•Identify how the selected measures can be widely implemented with reference to case studies

Selecting Packages of Measures for the Analysis

- Emissions considered are CO, CH_4, BC, OC, $SO_{2,}$ NO_X, nmVOCs, CO_2 other direct emissions of $PM_{2.5}$, NH_3

- IIASA ranked mitigation measures by their net impact on GWP100 of their CH_4/BC/OC/CO/SO_2 emission changes, picked the top measures that achieved ~90% of GWP reduction feasible with technological measures – only 16!

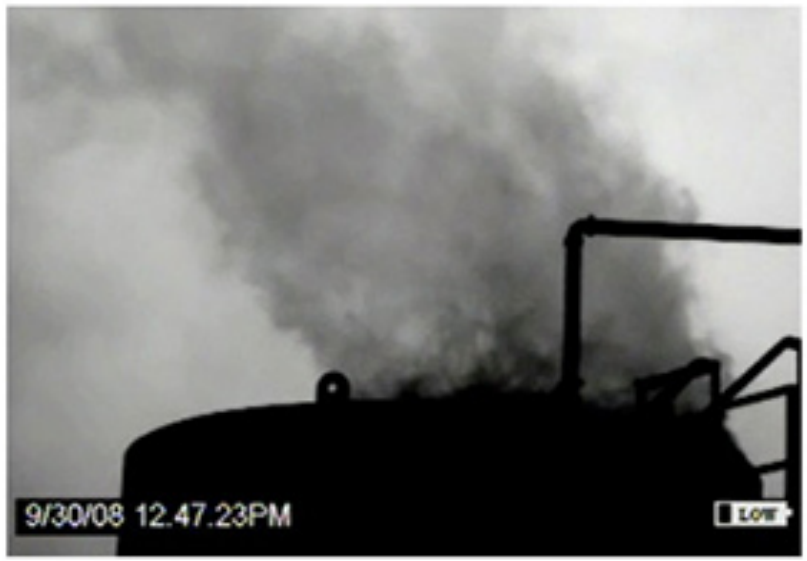
- This analysis explores only the theoretical potential from such measures, but not the cost or feasibility of their implementation

Emission Control Measures in the Analysis

‘Methane measures’

- extraction and long-distance transport of fossil fuels (~25%)
- waste management; municipal, landfills & wastewater (~10%
- agriculture; livestock manure & intermittent rice aeration (~5%)

(% reduction in 2030 relative to reference)



‘BC Measures’: those that reduce emissions of black carbon and co-emissions (e.g. OC, CO)

- Diesel vehicles (particle filters+)
- Eliminating high emitters*
- Coal briquettes replacing coal in residential stoves
- Pellet stoves & boilers replacing residential wood burning in Industrialized countries
- Clean-burning cookstoves in developing countries*
- Modern brick kilns
- Modern coke ovens
- Ban of open burning of agricultural waste*

3 groups of measures

- **'Methane only': Measures that affect emissions of methane**
  - to be implemented centrally by large multi-national and national energy companies, municipalities and through modified agricultural practices;

- **'BC Group 1': Technical measures that reduce emissions of black carbon and co-emissions (e.g. OC, CO)**
  - mainly at small stationary and mobile sources; biggest BC reduction is from diesel particulate filters

- **'BC Group 2': Technical & non-technical measures to eliminate the most polluting activities**
  - e.g., through improved enforcement of legislation or through economic and technical assistance to the poorest population; biggest BC reduction is from cookstoves

Hypothetical analysis to explore influence of selected measures fully implemented on relevant sources.

Impacts of the packages of measures on emissions

Scenario	**Description**[1]
Reference	Based on energy and fuel projections of the International Energy Agency (IEA) World Energy Outlook 2009 and incorporating all presently agreed on policies affecting emissions
CH_4 measures	Reference scenario plus the CH_4 measures
BC measures	Reference scenario plus the BC measures (the BC measures affect many pollutants, especially BC, OC, and CO)
CH_4 + BC measures	Reference scenario plus the CH_4 and BC measures
CO_2 measures	Emissions modelled using the assumptions of the IEA World Energy Outlook 2009 450 ppm CO_2e scenario and the IIASA GAINS database. Includes CO_2 measures only. The CO_2 measures affect other emissions, especially SO_2.[2]
CO_2 + CH_4 + BC measures	CO2 measures plus the additional CH_4 and BC measures