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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50 contributors, over 100 reviewers.

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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 using existing technology to address BC and ozone can help protect near-term global and regional climate change

- Determine the co-benefits of the selected measures on health and crops

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

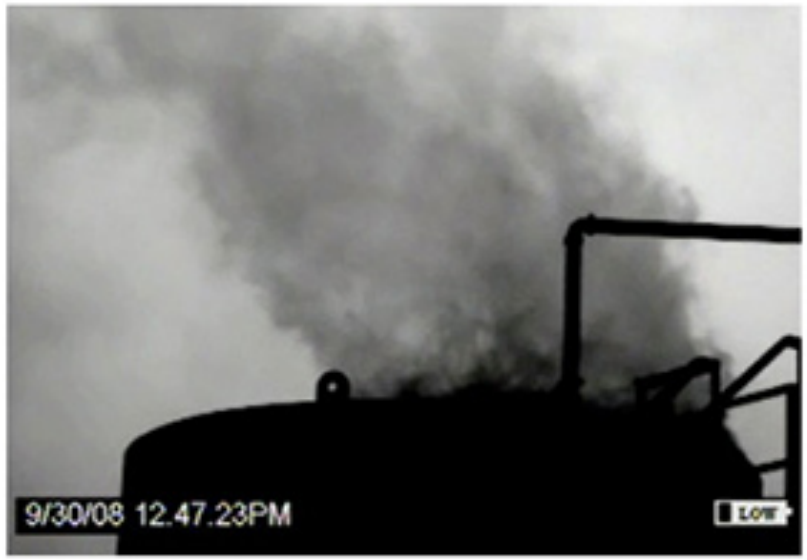
Emission Control Measures in the Analysis

IIASA ranked mitigation measures by the net GWP of their emission changes (considering CO, CH_4, BC, OC, SO_2, NO_X, nmVOCs, and CO_2), picked the top measures

'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)



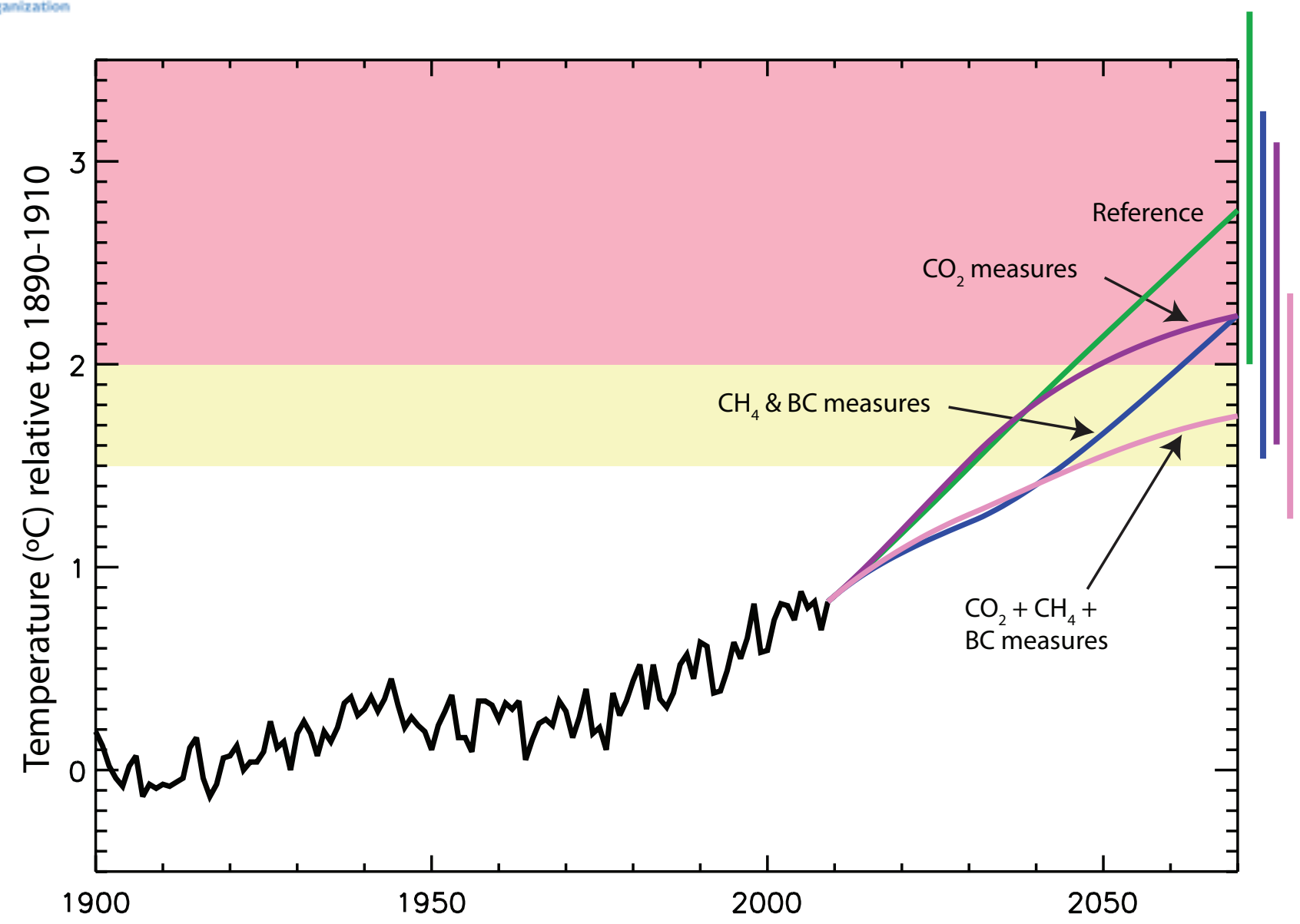
‘BC Measures’: those that reduce emissions of black carbon and co-emissions (e.g. OC, CO)

- Diesel vehicles (particle filters+)
- 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

Methane and BC measures vs CO_2 measures

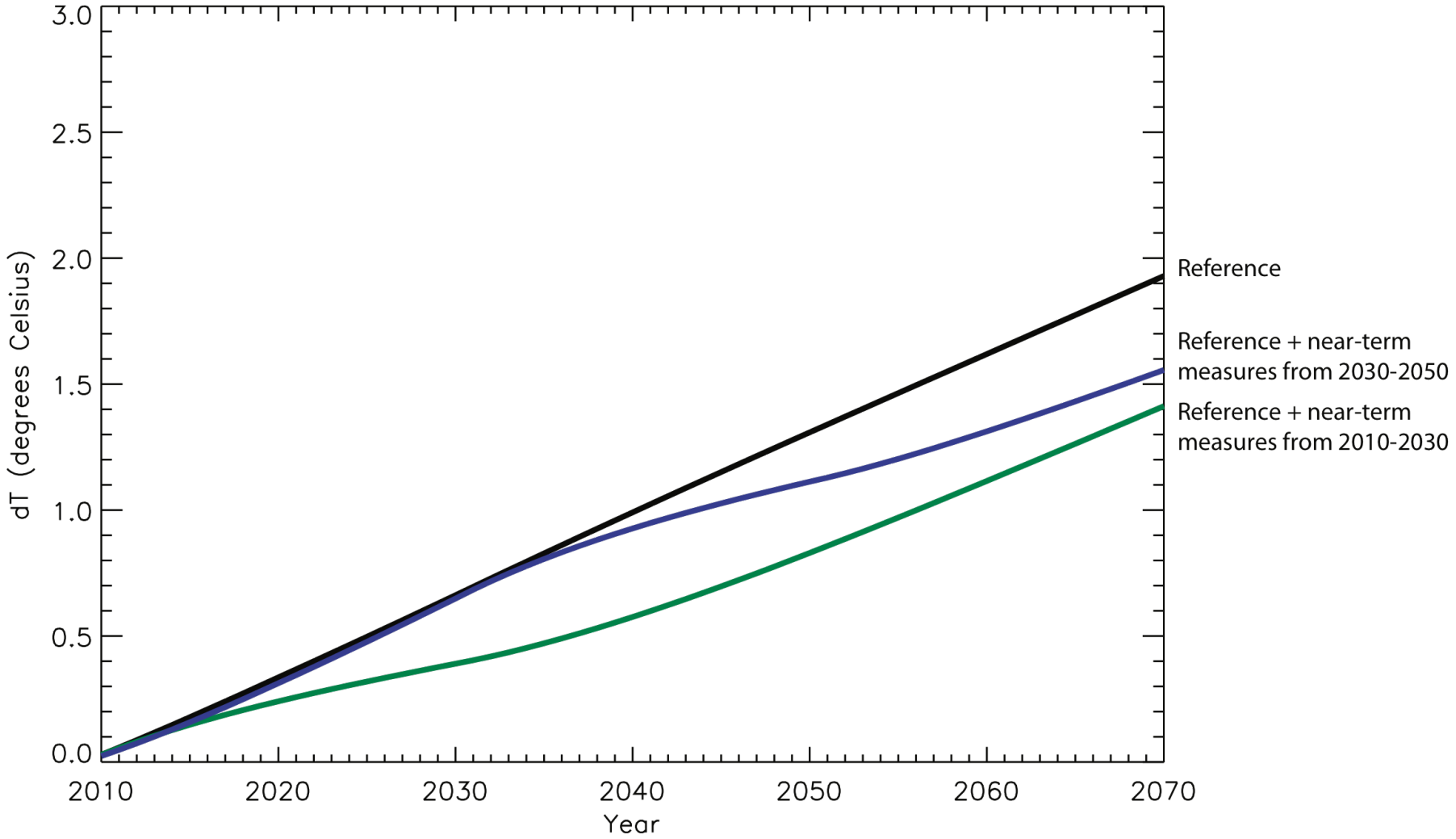
- Emissions reductions from the methane and BC measures were almost identical when the measures were applied to the reference scenario or to the CO_2 measures scenario
- CO_2 measures target power plants and large industry
- Methane and BC measures largely target other sectors
- Even for transportation, which emits substantial CO_2 and BC/OC/CO, diesel particulate filters impact the latter but not CO_2
- Emissions would be more related in a world with very substantial shifts to low carbon (e.g. electric cars/public transport) or with certain regulatory/behavioral changes not examined (e.g. fuel economy)

Result for Global Temperature Change (hybrid of results from GISS and ECHAM models and assessment of literature) added to the historical record

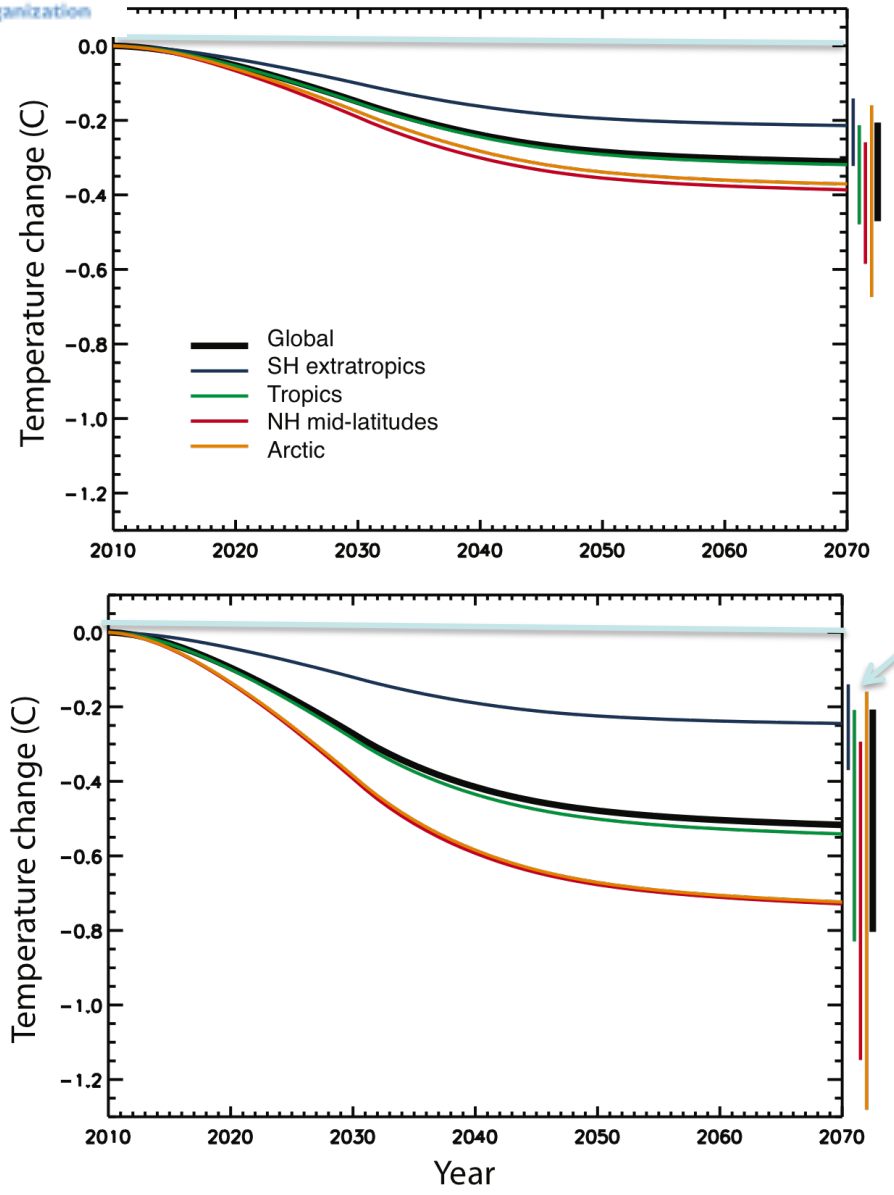


Phasing in measures early gives strong near-term benefit

Early action relative to late has little long-term impact



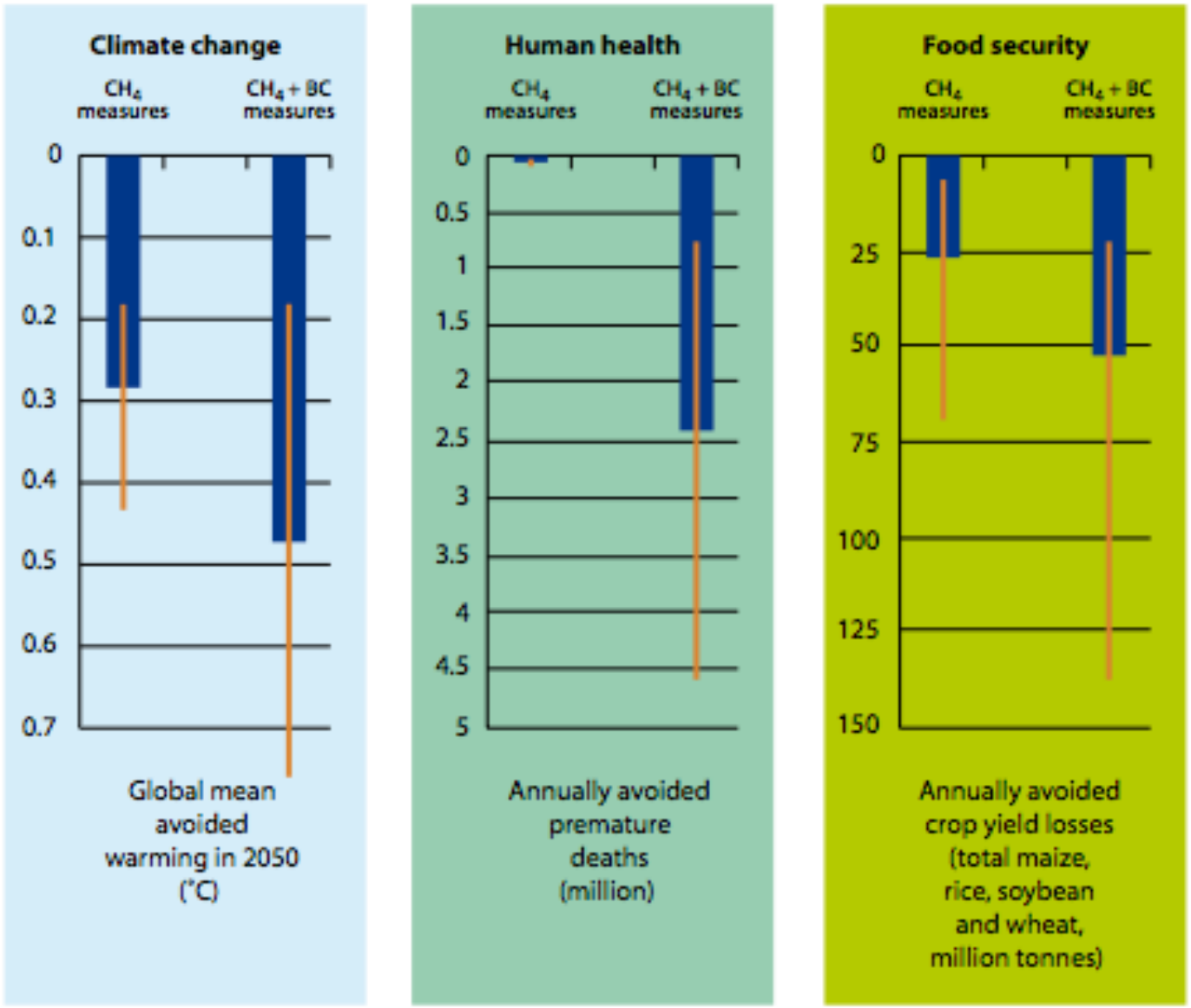
Global and Regional Temperature Change Relative to the Reference Scenario (hybrid modelling of GISS & ECHAM, informed by the literature)



Methane measures:
Relatively uniform benefits, low uncertainty

BC measures:
Larger benefits in North, greater uncertainty for temperature (large regional precipitation & glacial melting benefits)

Reduced Arctic warming by 0.7 ^{o}C by 2040 compared to the reference scenario, with measures taken 2010-2030. **Mitigating ~2/3 of projected 1.2 ^{o}C warming**



Air quality benefits for 2030 and beyond.
Health & crop benefits greatest in regions that reduce emissions.

Policies to Implement the Measures

- **The identified measures are all currently in use in different regions around the world to achieve a variety of environment and development objectives (case studies).**

- **Much wider and more rapid implementation is required to achieve the full benefits identified in this Assessment.**

- Accounting for near-term climate co-benefits could leverage additional action and funding on a wider international scale which would facilitate more rapid implementation of the measures.

- Many measures achieve cost savings over time. However, initial capital investment could be problematic in some countries, necessitating additional strategic support and investment.