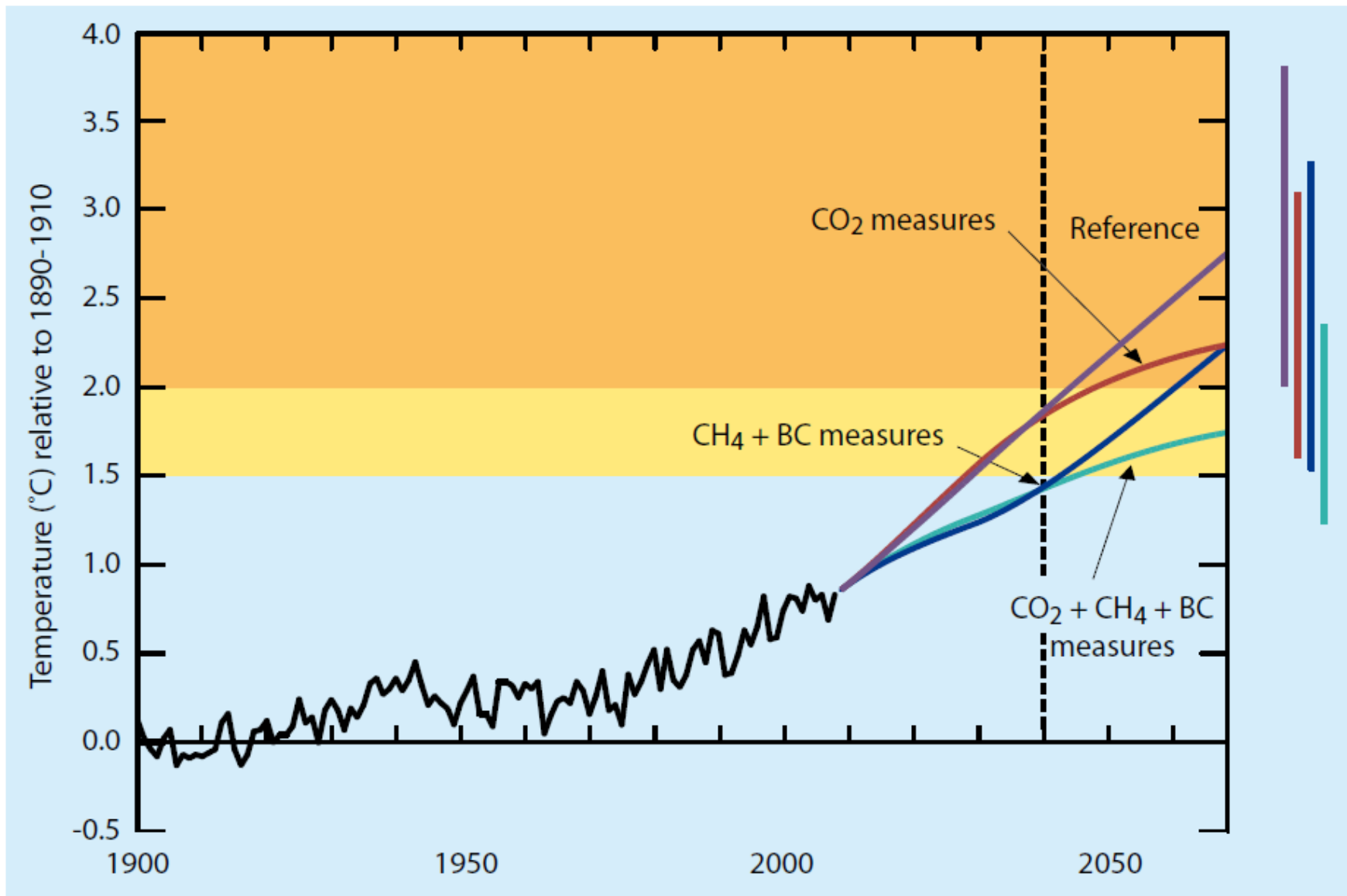
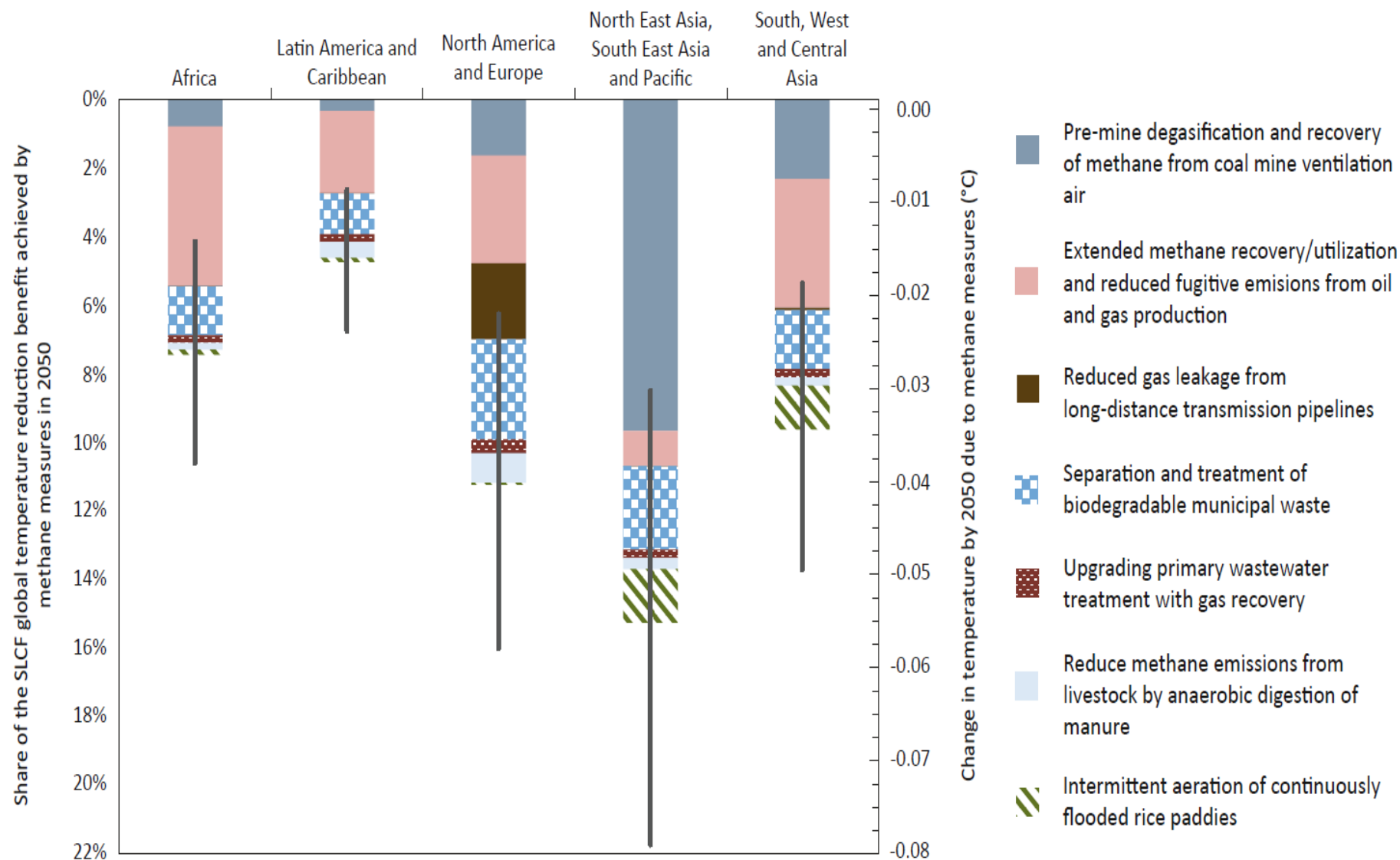


**Result for Global Temperature Change:
CO₂ and SLCF measures are complementary strategies**

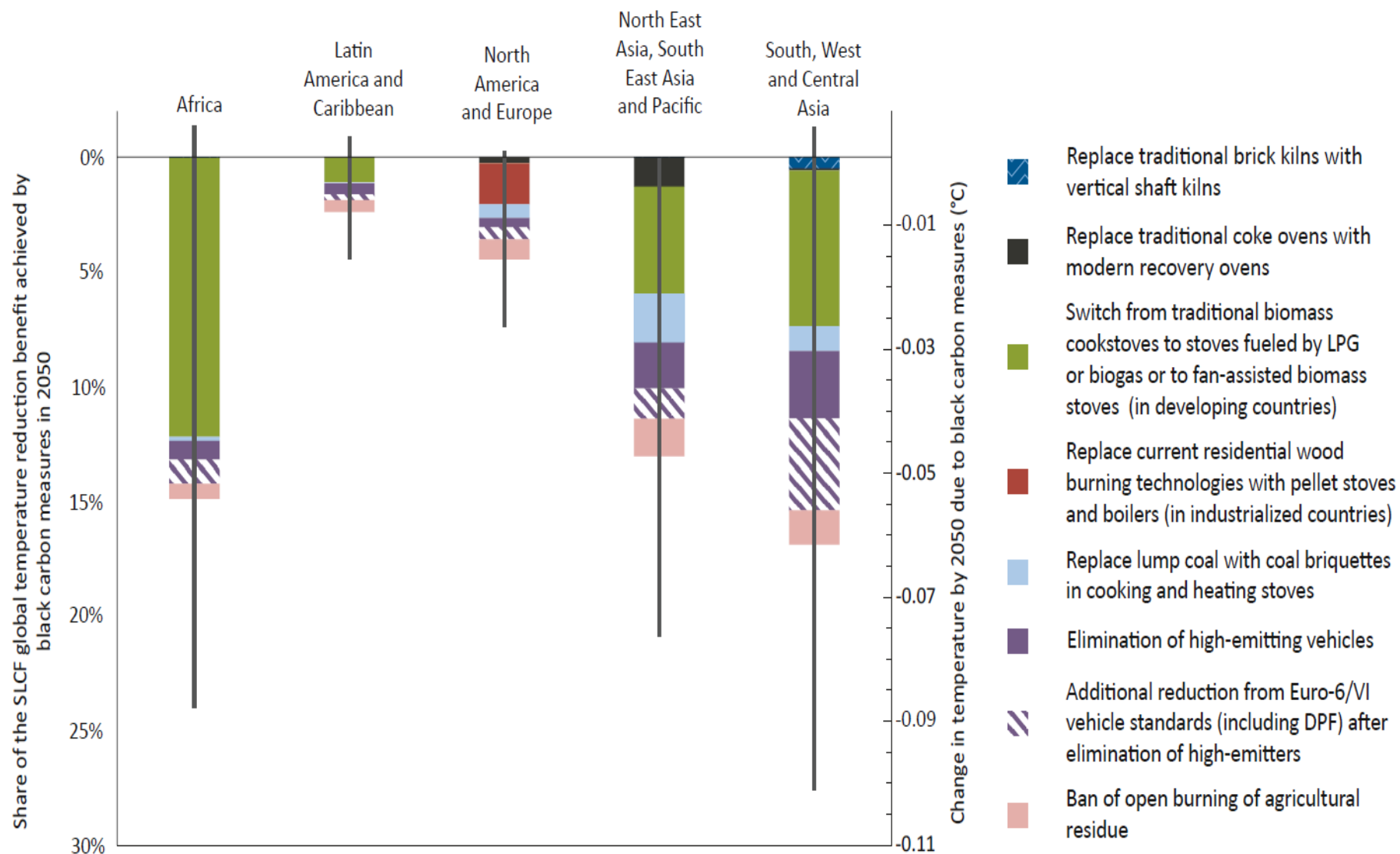


Source: UNEP/WMO (2011). Integrated Assessment of Black Carbon and Tropospheric Ozone. UNEP, Nairobi

The share of global temperature reduction from methane measures



The share of global temperature reduction from methane measures



Near-term framing

Slowing down near term global warming. **How much?**

16 measures *reduce global warming* up to 2040 $\approx 0.4/0.5^{\circ}\text{C}$ relative to baseline
→ *almost halving* of temperature rise; 0.7°C reduction in Arctic

Why slow down near term global warming?

- Bursting glacier lakes;
- increasing heat waves
- Melting arctic land ice, ice caps, → sea level rise

Also reduce regional climate change impacts

Glacier melting; arctic ice melting; precipitation patterns

*Glacier lake
outburst floods*

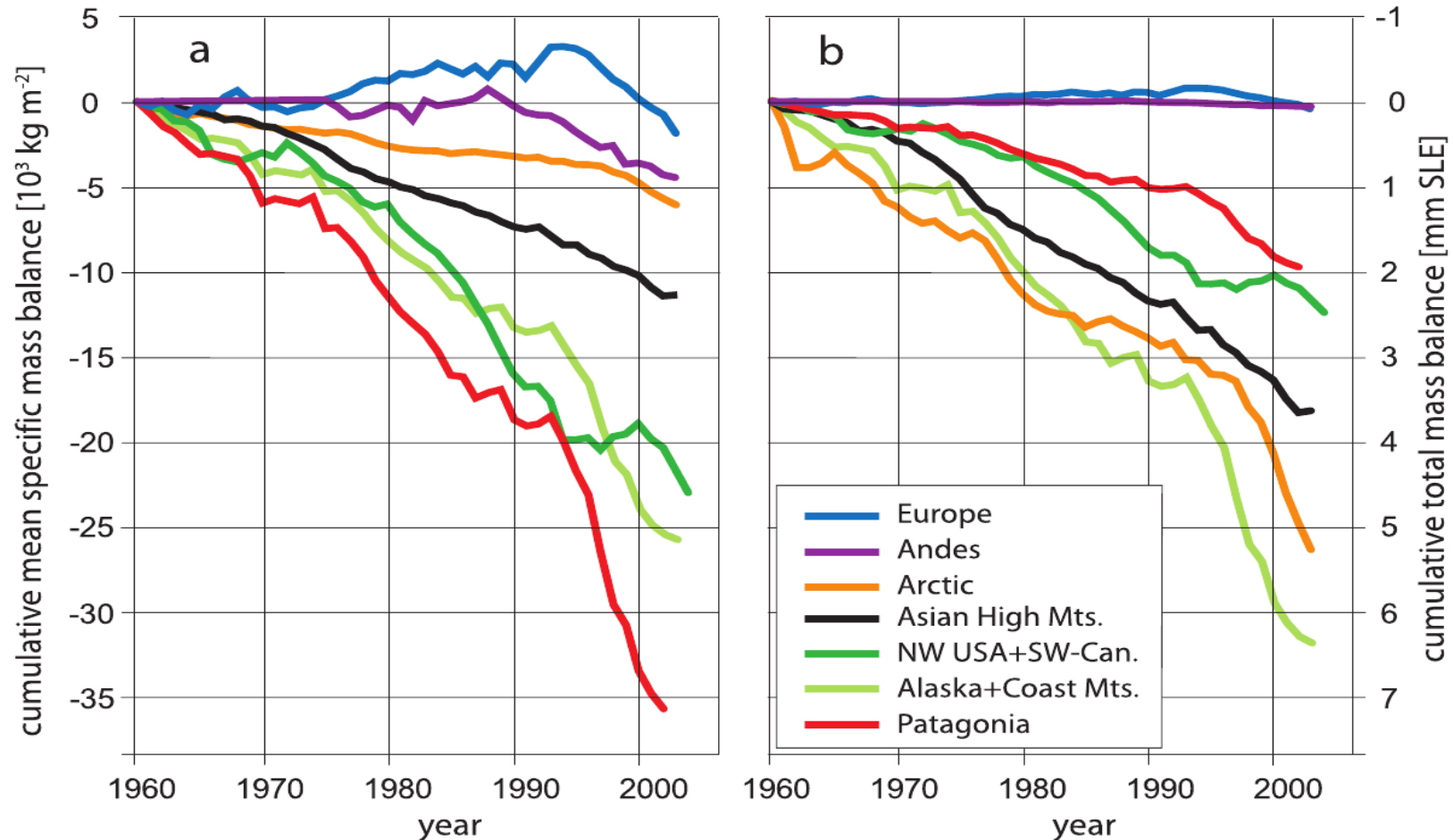


Cannot replace CO₂ reductions

Need both –

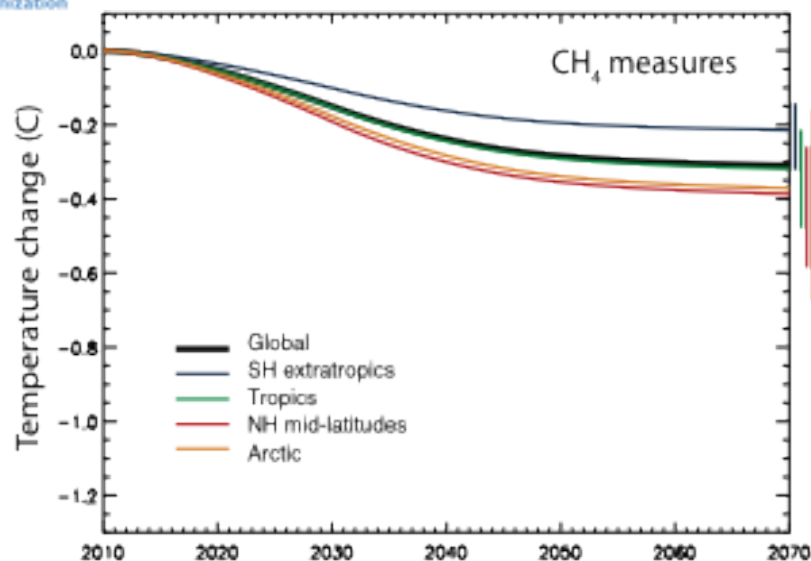
1. Reducing short-lived climate forcers: slow down near-term global warming
2. CO₂ reductions for long term climate protection

Time series estimates of glacier mass balance in different regions of the world (from Kaser et al., 2006).

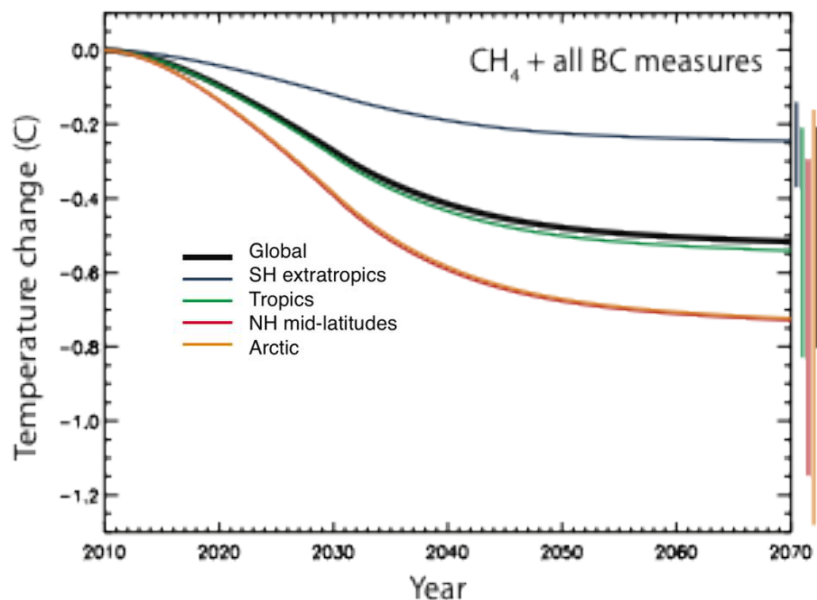


Panel a. shows mass balance normalized to the glacierized area in each region (specific mass balance), a measure of the relative response of each region, while Panel b. shows change in total mass balance, reported in millimetres of sea-level equivalent (SLE)

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



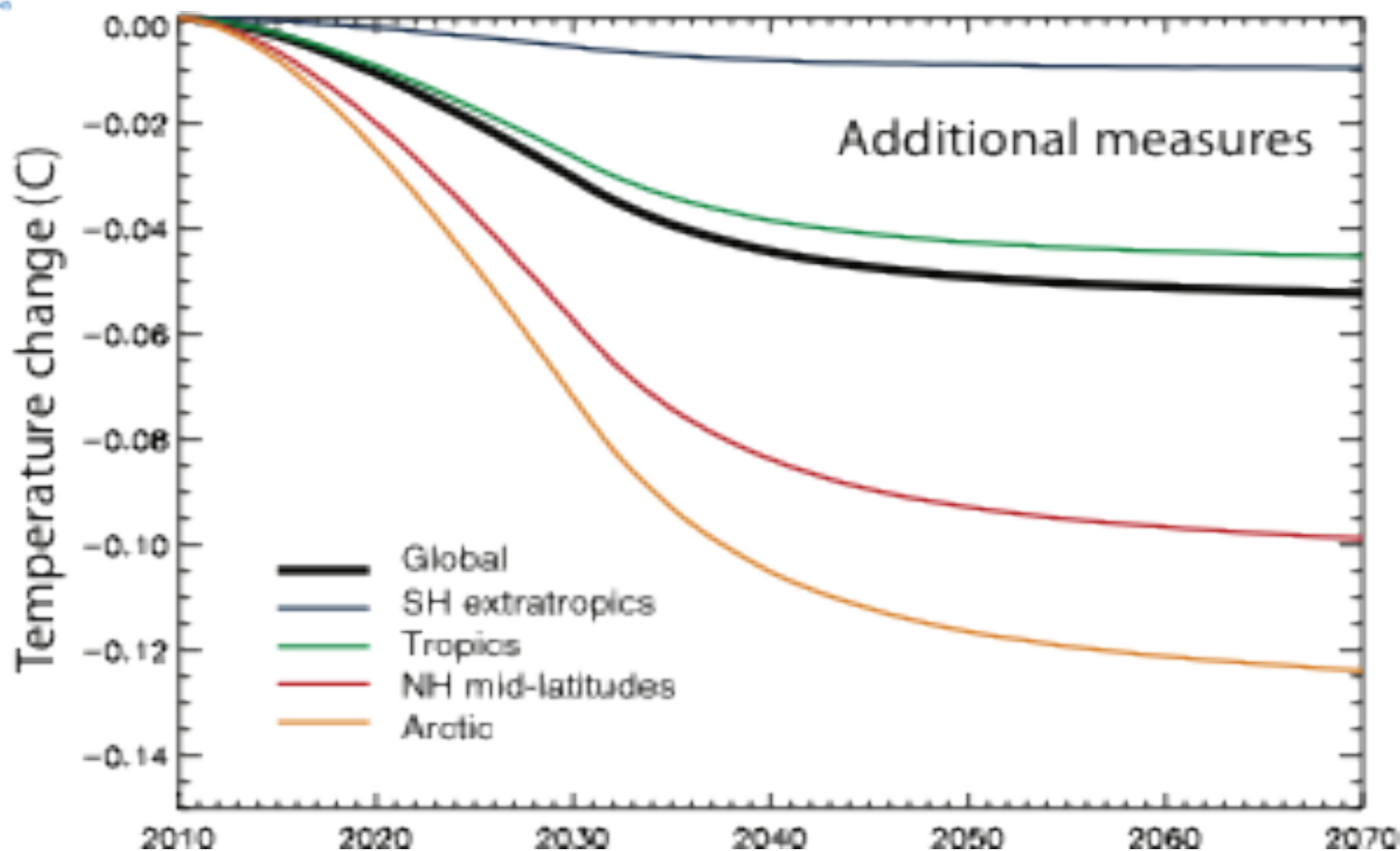
Methane measures:
Relatively uniform benefits,
low uncertainty



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

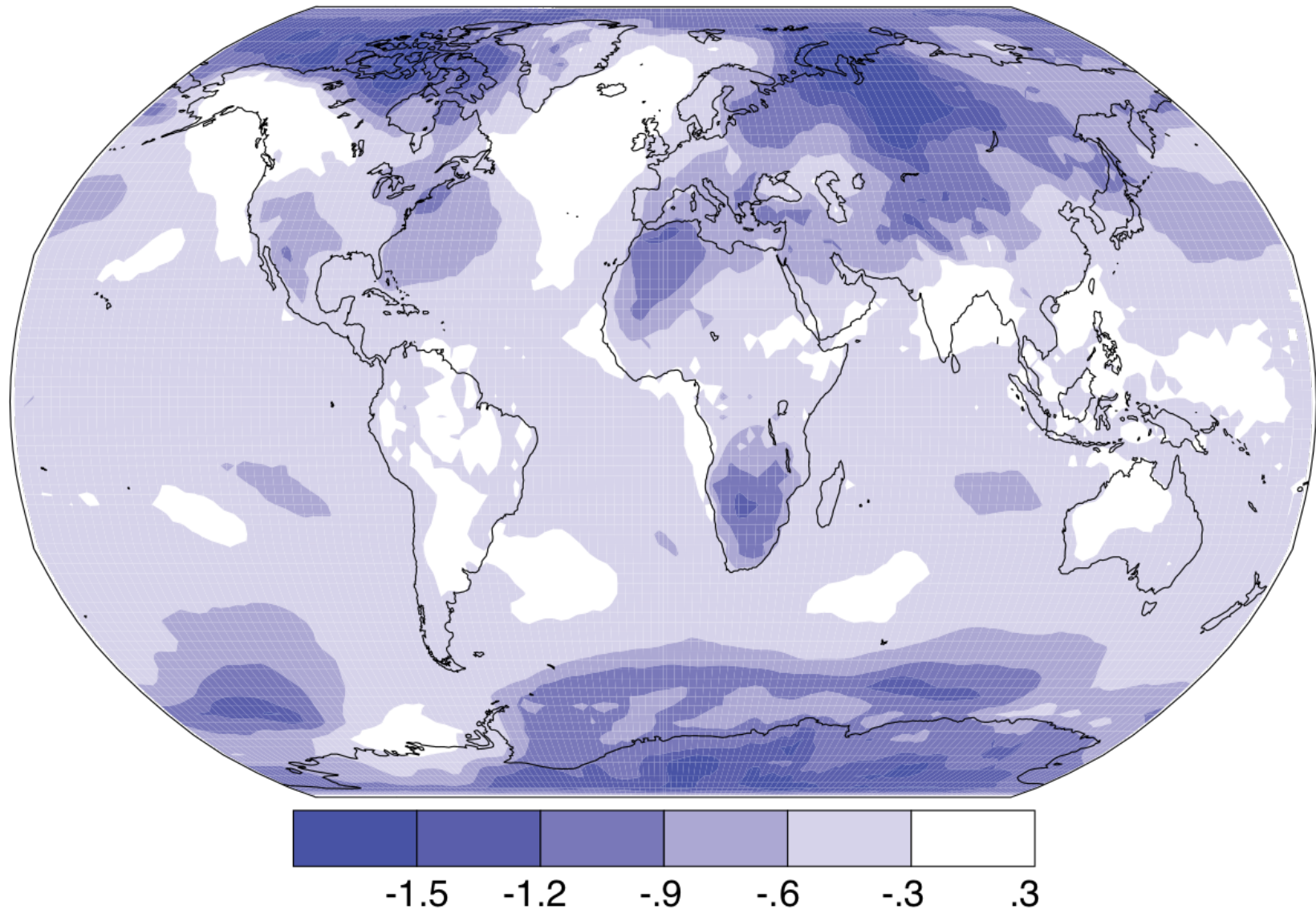
Reduced Arctic warming by 0.7°C by
2040 compared to the reference
Scenario, with measures taken
2010---2030. **Mitigating ~2/3 of
projected 1.2°C warming**

Global and Regional Temperature Change Relative to the Reference Scenario (modelling using of GISS)



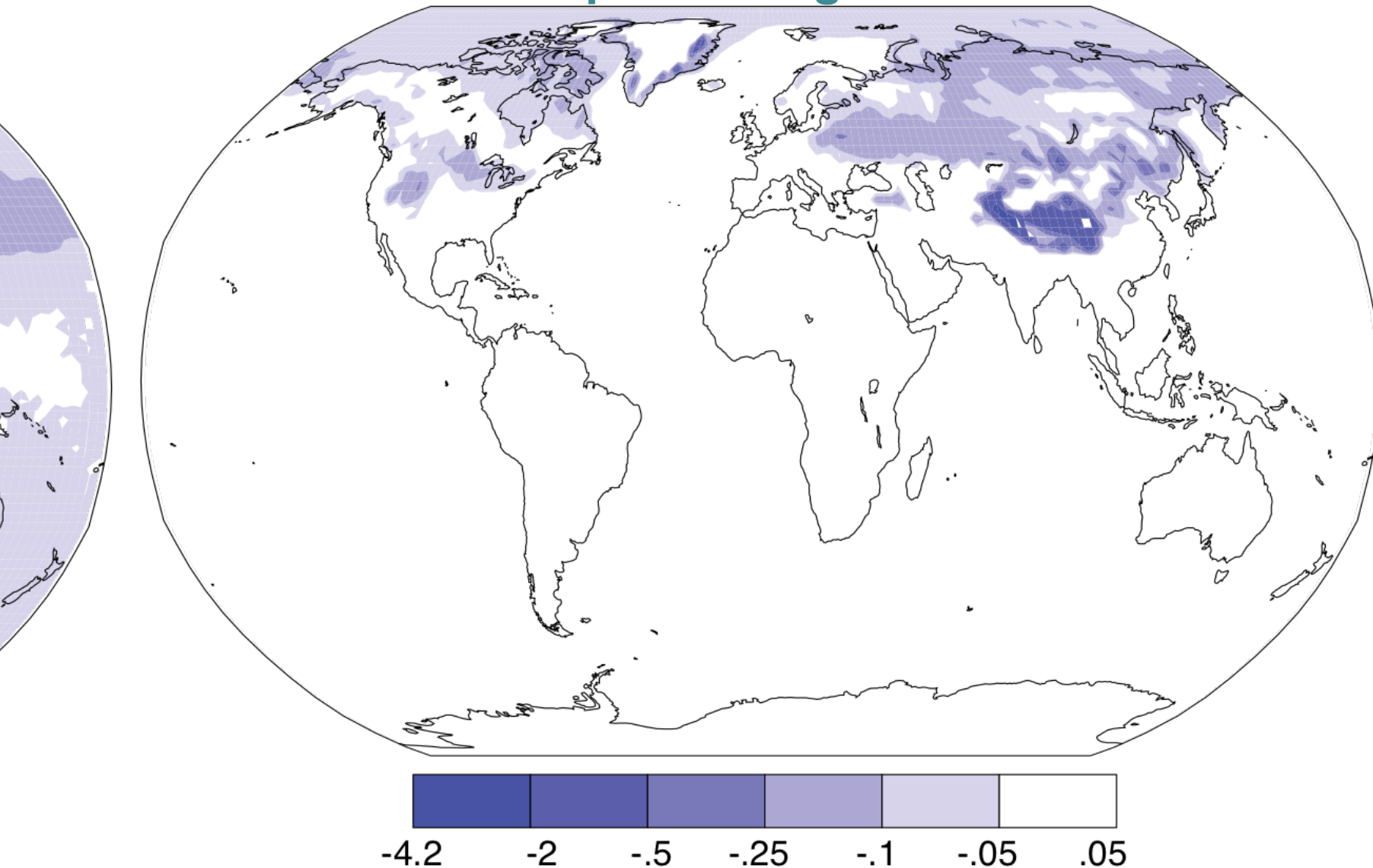
Global and regional temperature changes due to widespread use of pellet stoves and boilers in industrialized countries and coal briquettes in the residential sector in China.

Annual average surface temperature change (°C) from implementing all measures



- Dark areas: where the biggest temperature benefit occurs

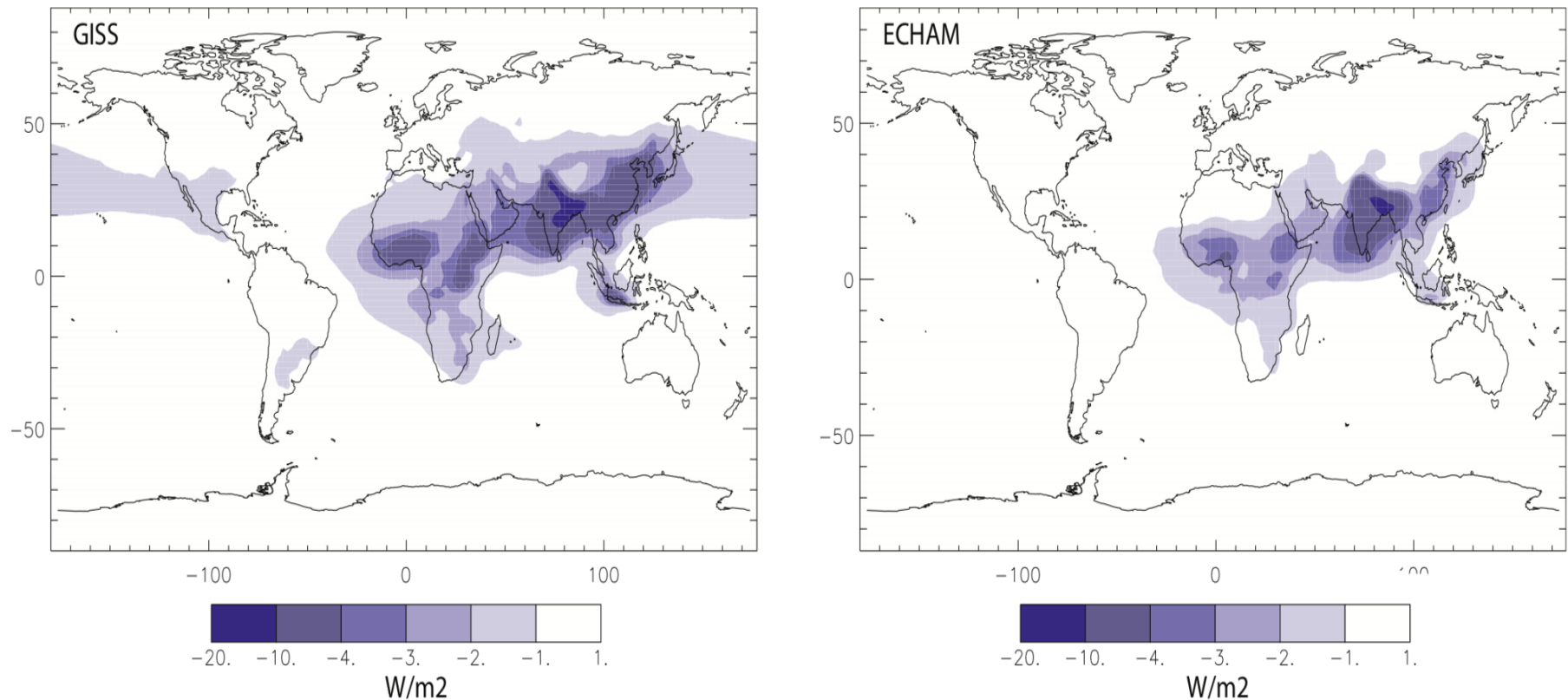
Annual average albedo forcing change (W/m^2) from implementing all measures



- Dark areas: where the forcing benefit from increased albedo occurs

Regional Climate Changes: Preventing Disturbance of Rainfall Patterns

Change in atmospheric forcing at 2030 relative to the reference case in the two models.

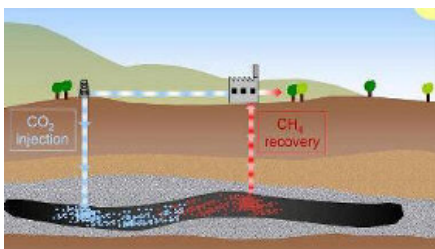


- Dark areas: where the biggest energy change to the atmosphere occurs
- This drives regional weather pattern changes

How much does it cost?

Costs of implementing 16 measures

50% of black carbon and methane emission reductions:
Low cost or no-cost → Recovery of methane, better fuel efficiency



Methane measures

- Recovery from fossil fuel production (coal mines; gas distribution)
- Waste / landfill management



Black carbon measures

- Improved stoves
- Upgraded brick kilns



Actions on the National, Regional and Global Scales

Why national action?

- Most health benefits close to emission sources; local sustainable development; unique mix of emission sources
- Fast action on obvious emission sources, National Action Plans



Why regional action?

- Reduce regional-scale pollution, e.g. black carbon transported long distances to Himalayas, Arctic
- Integrate abatement of black carbon and methane into existing or new regional air pollution agreements

Why global action?

- Support and catalyze national and regional action – awareness raising, financing, technical assistance
- Control international emission sources → Work within existing treaties: e.g. Reduce black carbon emissions through MARPOL?

Political action now: the Coalition

Coalition for Climate and Clean Air

February, 2012: 6 countries + UNEP

End 2012: + 10 countries + other partners ?

Action on Reducing Short-Lived Climate Pollutants

- Awareness raising
- National action plans
- Black carbon from vehicles, brick kilns
- Methane from landfills, oil & gas production
- HFCs from refrigeration & air conditioning



Conclusions

- **Addressing SLCPs is a development issue** – countries reducing emissions will benefit from improved health (avoid 2.4 million deaths), crop yields (avoid > 30 million tonnes loss) etc
- 16 identified measures, implemented by 2030, would **reduce global warming by 0.5°C** (0.2-0.7°C) in 2050 – half the warming projected by the Reference Scenario
- Near-term measures would **improve the chance of not exceeding 2°C target**, but only if CO₂ is also addressed, starting now (**complementary strategies; not alternatives**)
- Substantial regional climate benefits: e.g. in the **Arctic reduce warming by 0.7 °C** (range 0.2-1.3°C by 2040), for Himalayas and South Asian monsoon
- The identified **measures are all currently in use** in different regions around the world; much wider and more rapid implementation is required to achieve the full benefits
- Many **measures achieve cost savings** over time.