The Challenges and Opportunities of Climate Change

An Overview Based on the IPCC Fifth Assessment Report (AR5)

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Why the IPCC (Intergovernmental Panel on Climate Change) ?
Established by WMO and UNEP in 1988

to provide policy-makers with an objective source of information about

- causes of climate change,
- potential environmental and socio-economic impacts,
- possible response options (adaptation & mitigation).

WMO=World Meteorological Organizatior

UNEP= United Nations Environment Programme

Key messages from IPCC AR5

- **Human influence on the climate system is clear**
- **Continued emissions of greenhouse gases will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems**
- **While climate change is a threat to sustainable development, there are many opportunities to integrate mitigation, adaptation, and the pursuit of other societal objectives**
- **Humanity has the means to limit climate change and build a more sustainable and resilient future**

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Atmospheric concentrations of CO_2

The concentrations of CO_2 have increased to levels unprecedented in at least the last 800,000 years.

Since 1950, extreme hot days and heavy precipitation have become more common

There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes

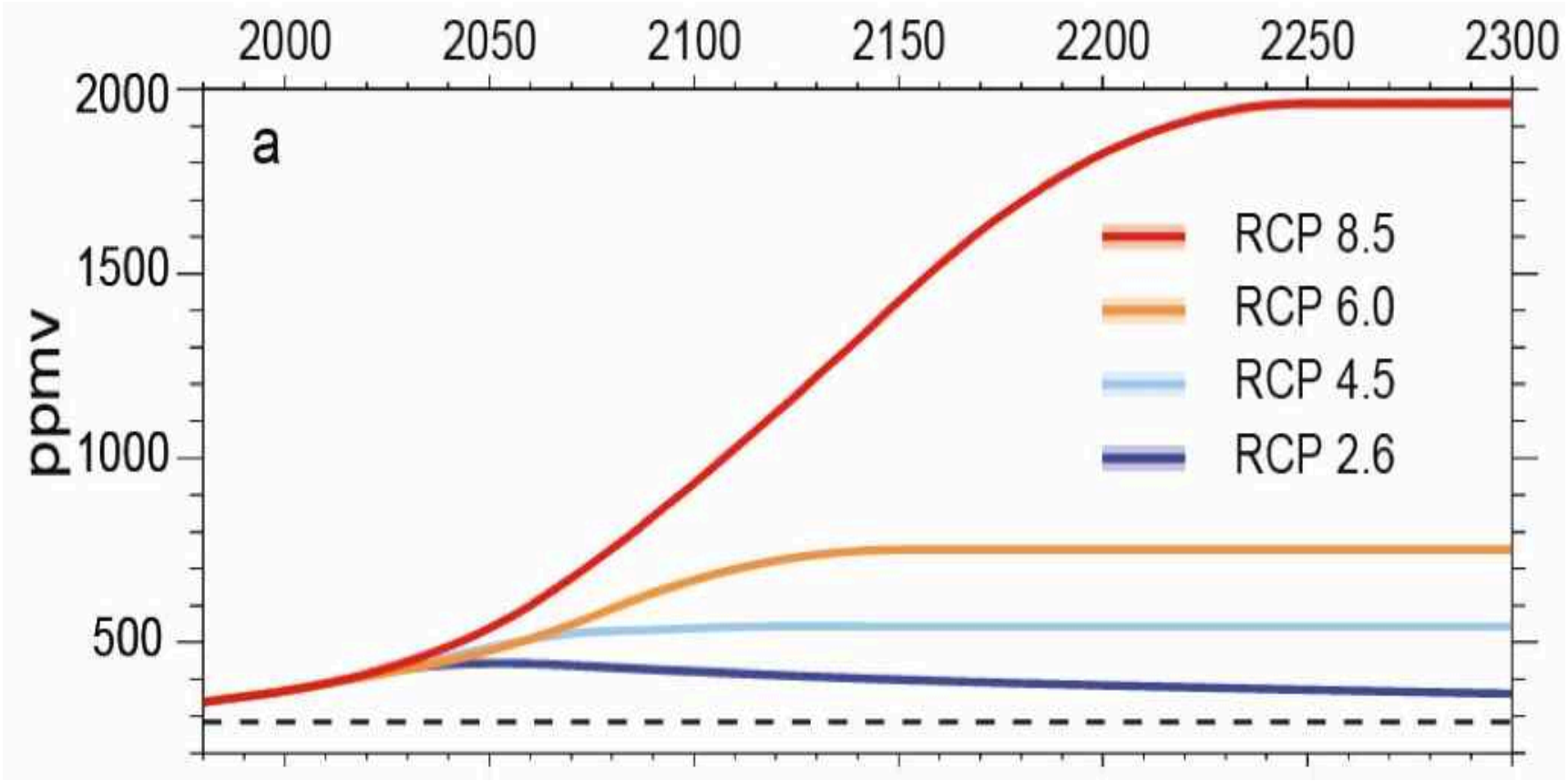
Impacts are already underway

- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries (but the poor are more vulnerable everywhere)



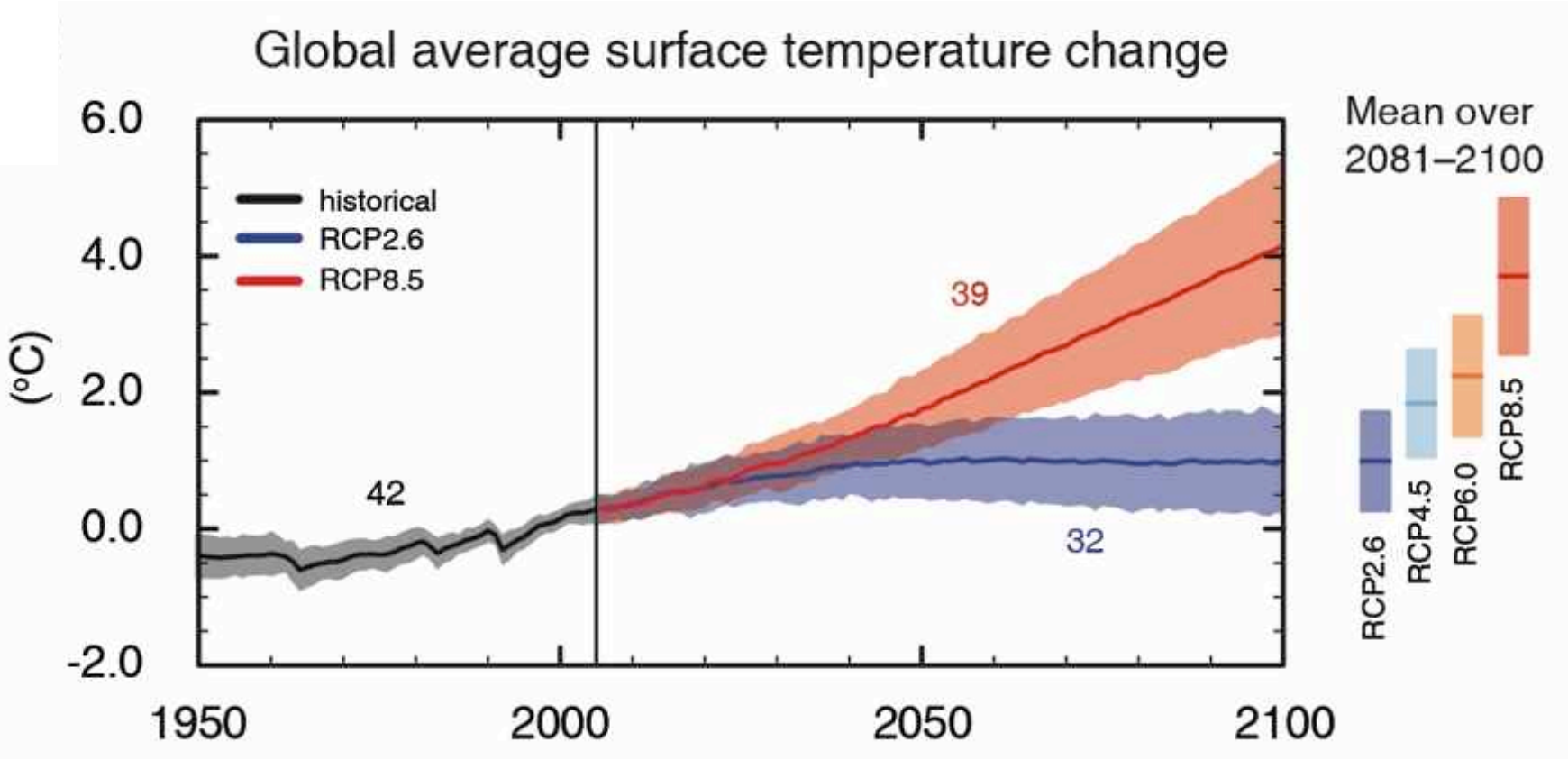

AR5 WGII SPM

RCP Scenarios: Atmospheric CO_2 concentration



Three stabilisation scenarios: RCP 2.6 to 6
One Business-as-usual scenario: RCP 8.5

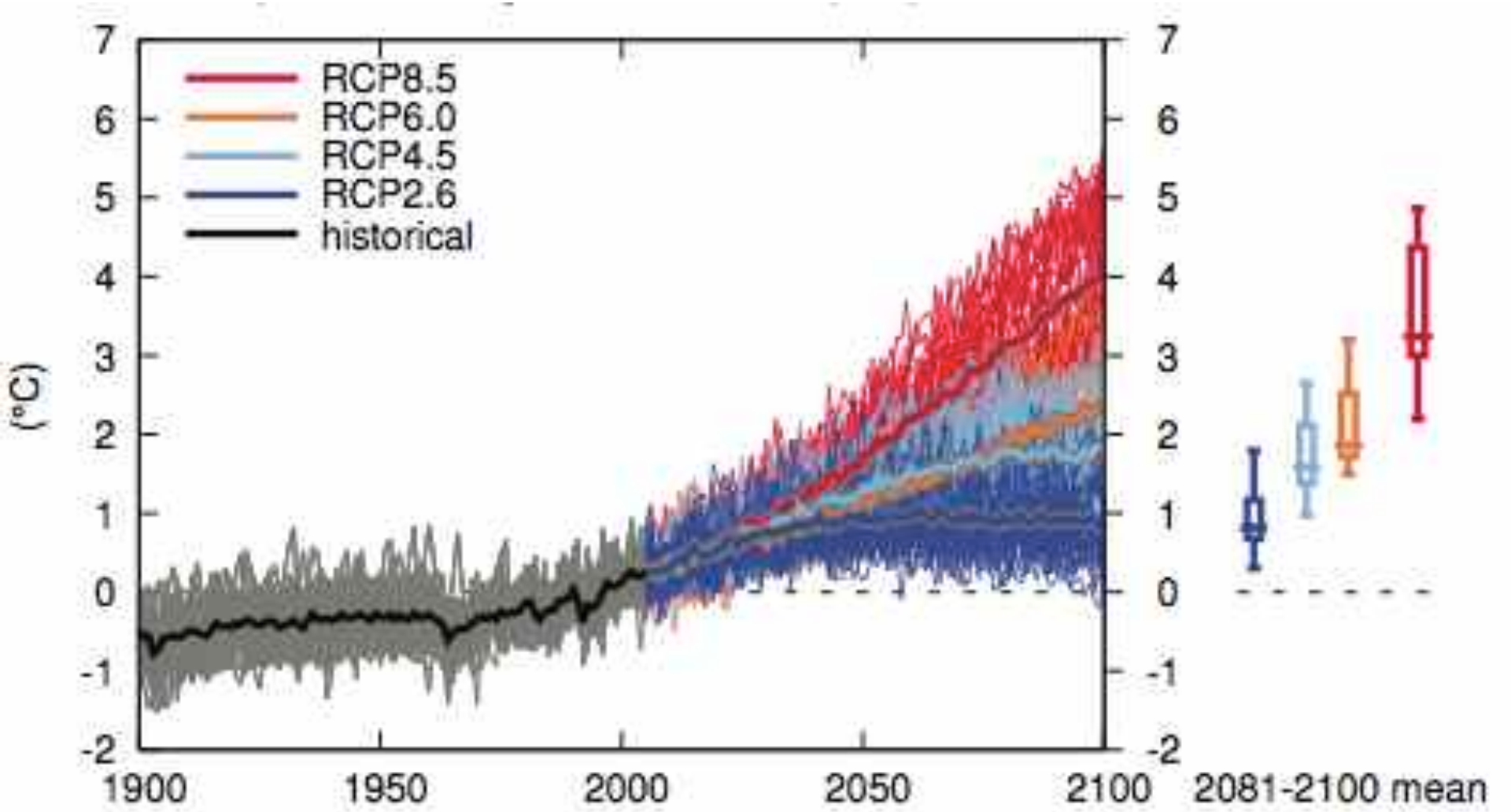
AR5, chapter 12. WGI



(IPCC 2013, Fig. SPM.7a)

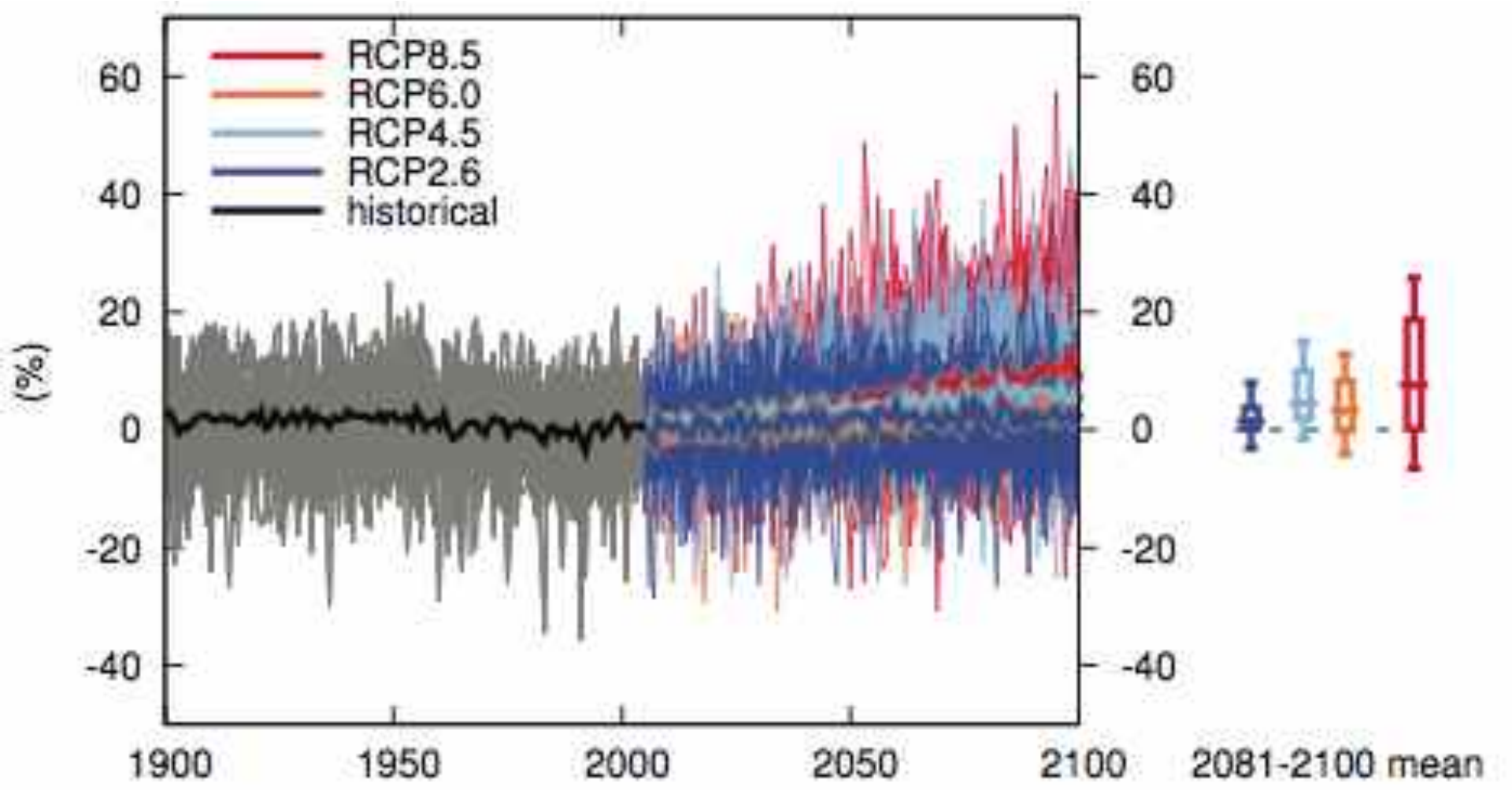
Only the lowest (RCP2.6) scenario maintains the global surface temperature increase above the pre-industrial level to less than 2°C with at least 66% probability

Temperature change Southeast Asia (land) annual



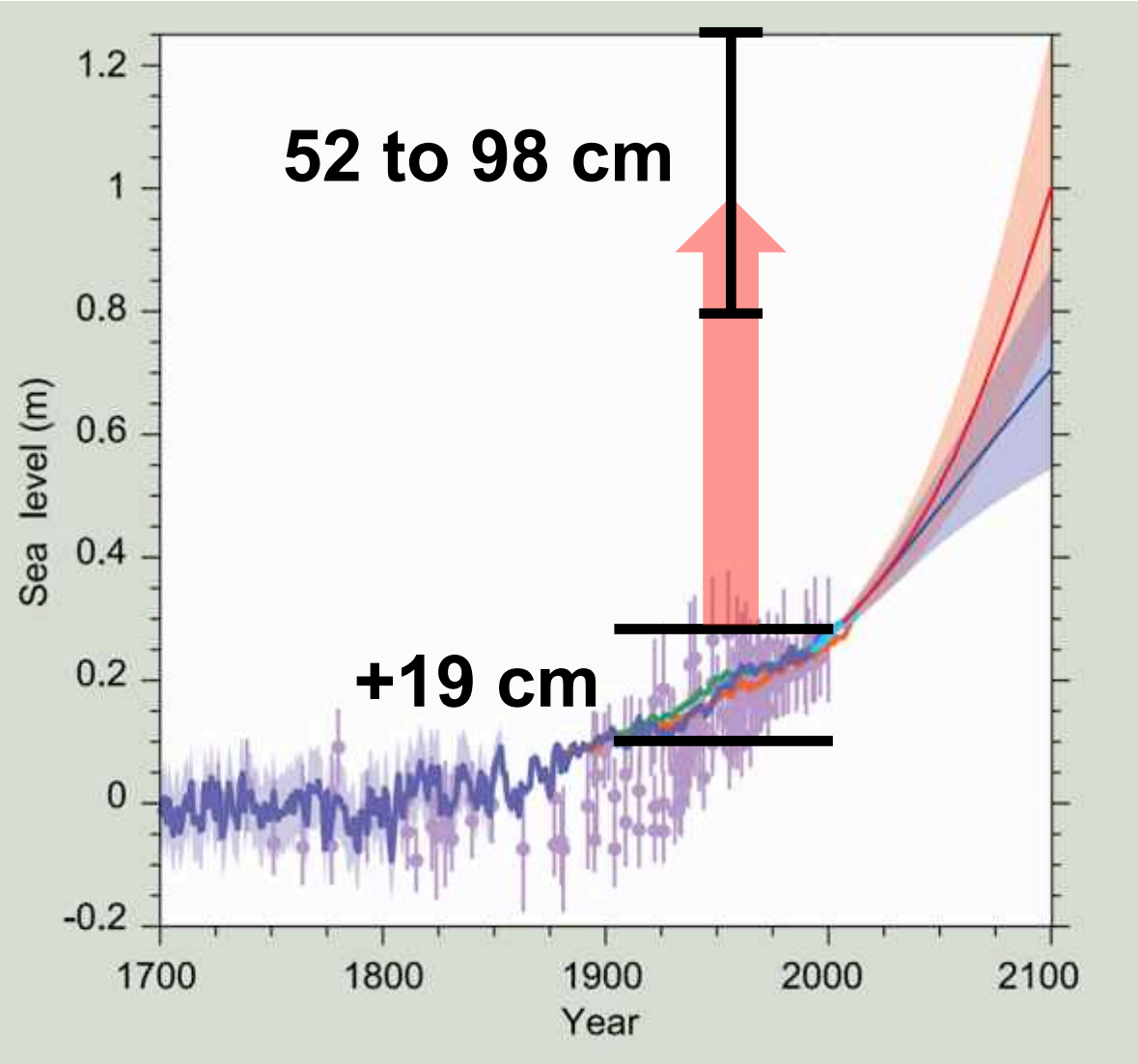
IPCC, WGI, Annex I: Atlas of Global and Regional Climate Projections Supplementary Material RCP8.5

Precipitation change Southeast Asia (land) annual



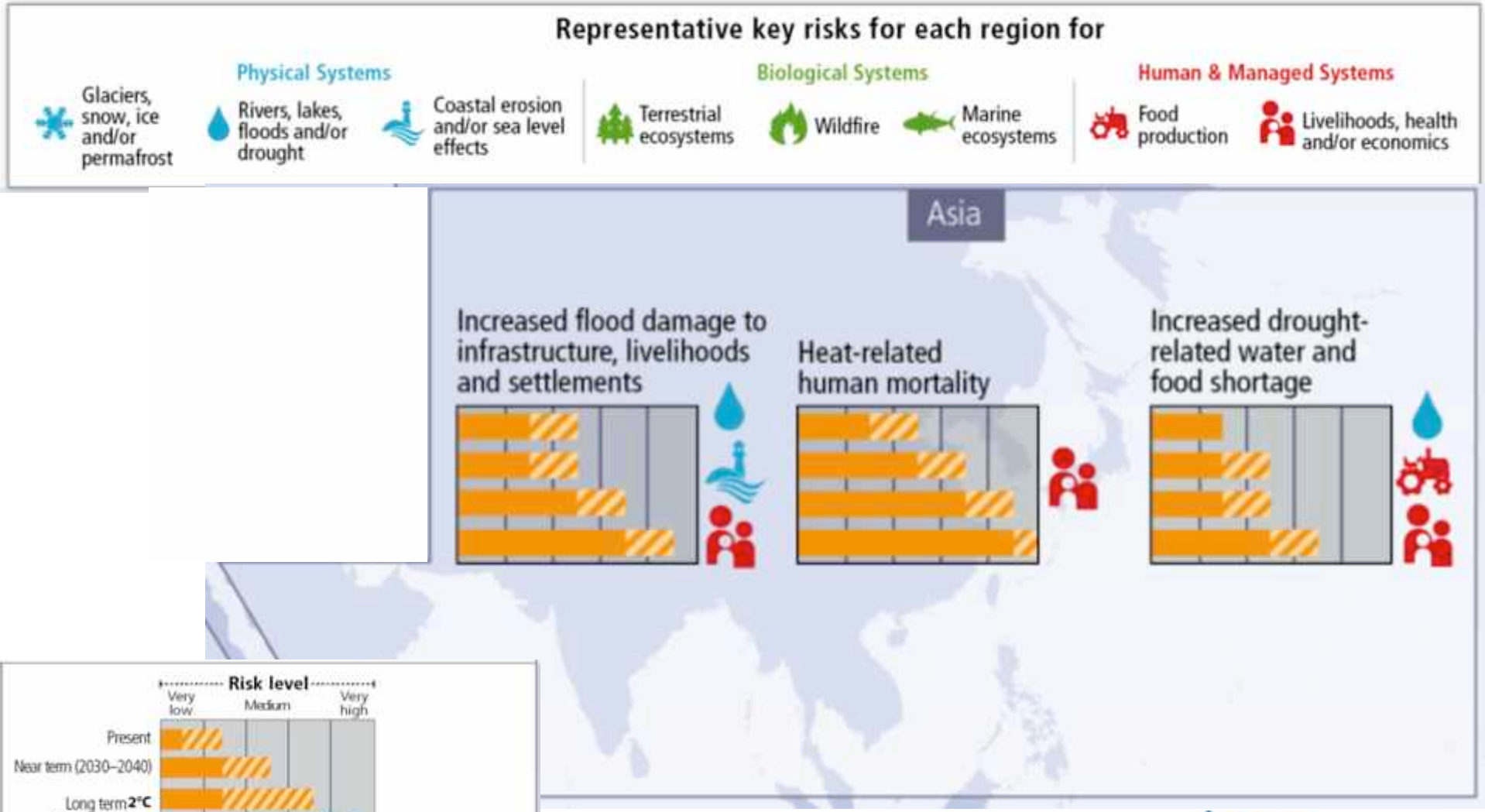
IPCC, WGI, Annex I: Atlas of Global and Regional Climate Projections Supplementary Material RCP8.5

Sea Level



IPCC 2013, TFE.2, Fig. 2

Regional key risks and potential for risk reduction: Asia (IPCC, AR5, SPM, Figure SPM.8)



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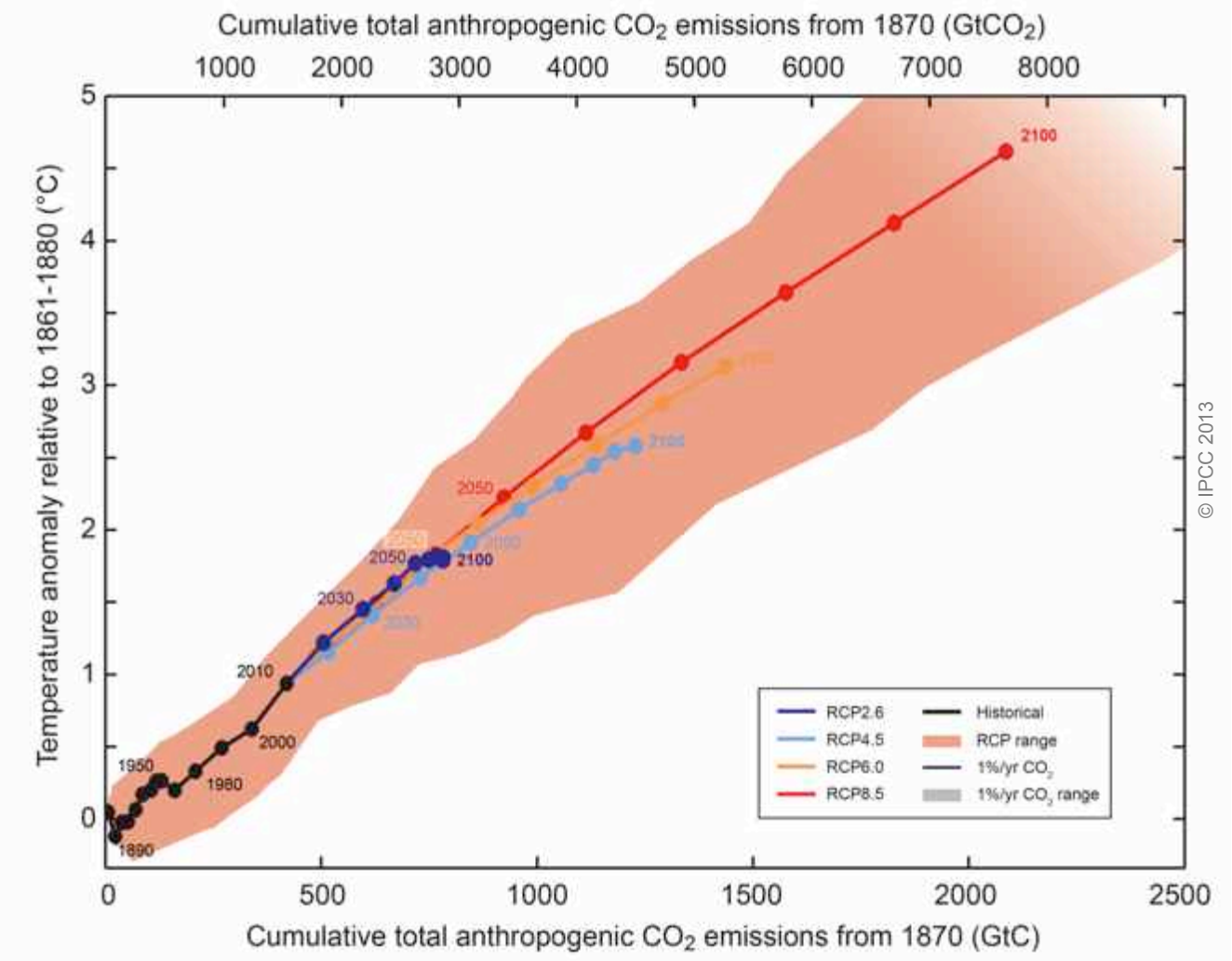
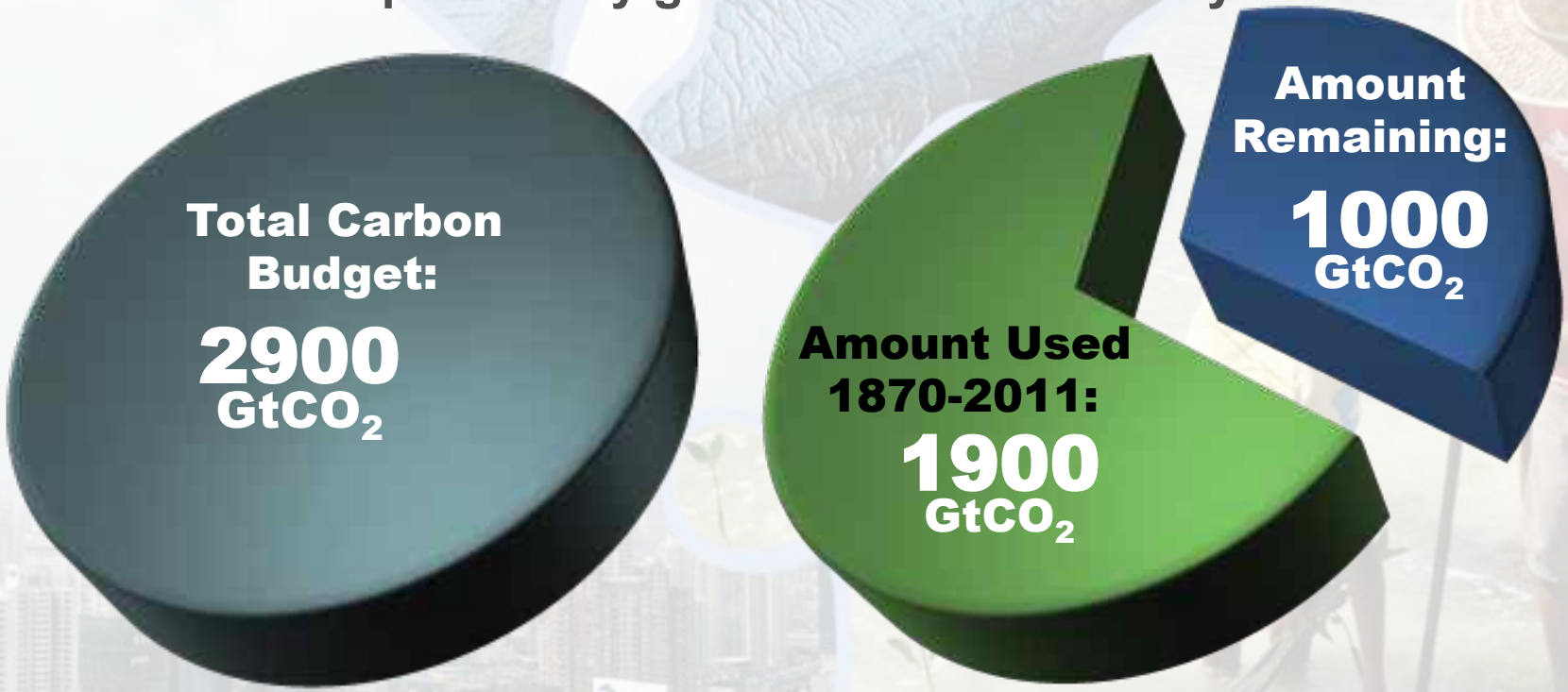


Fig. SPM.10

Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

The window for action is rapidly closing

65% of the carbon budget compatible with a 2°C goal is already used
NB: this is with a probability greater than 66% to stay below 2°C



NB: Emissions in 2011: 38 GtCO2/yr

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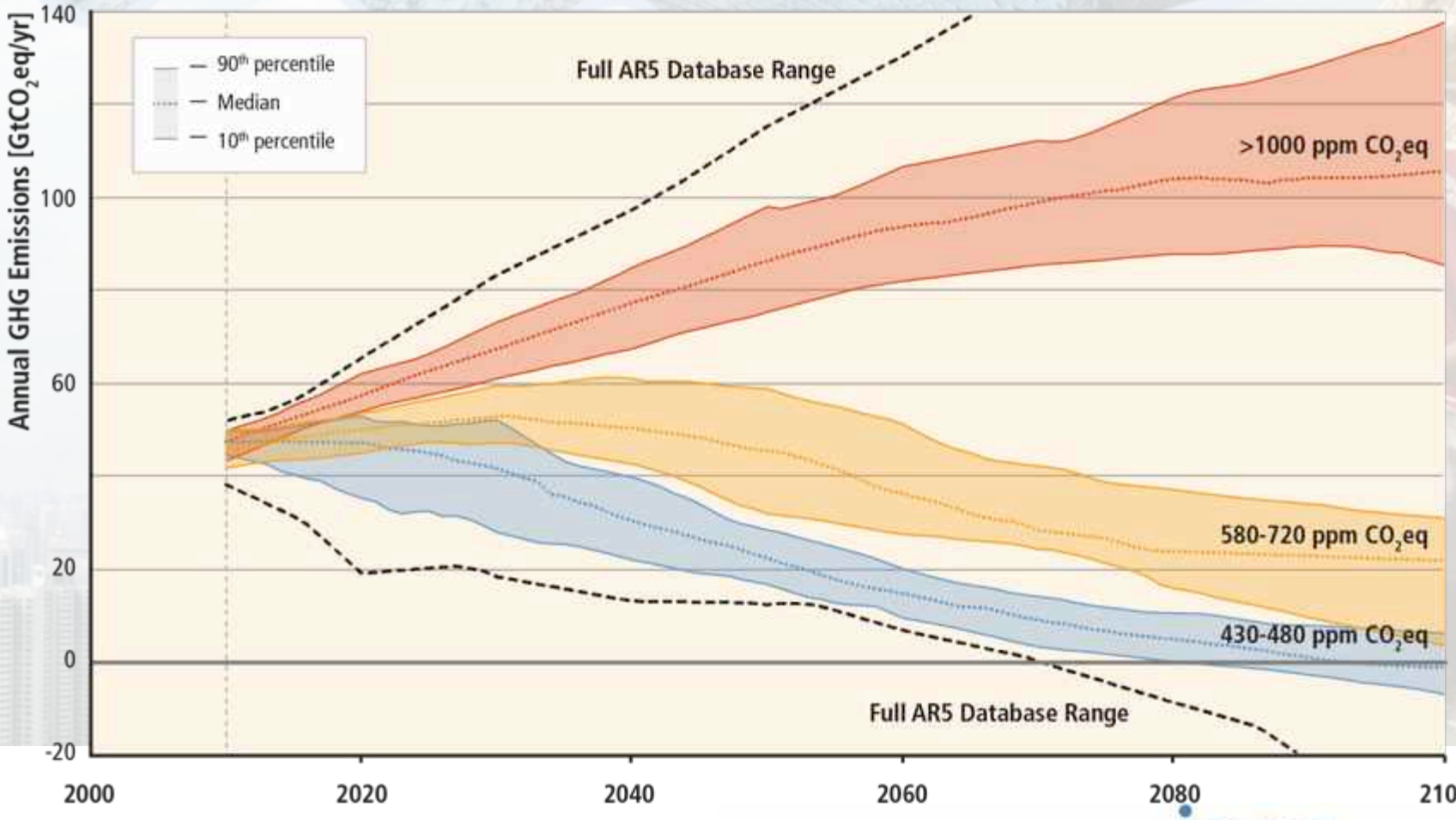
Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.



Based on Figure 6.7

AR5 WGIII SPM

IPCC AR5 Synthesis Report

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Can temperature rise still be kept below 1.5 or 2°C (over the 21st century) compared to pre-industrial ?

- **Many scenario studies confirm that it is technically and economically feasible to keep the warming below 2°C, with more than 66% probability ("likely chance").** This would imply limiting atmospheric concentrations to 450 ppm CO_2-eq by 2100.
- **Such scenarios** for an above 66% chance of staying below 2°C **imply reducing by 40 to 70% global GHG emissions compared to 2010 by mid-century, and reach zero or negative emissions by 2100.**

Mitigation Measures

More efficient use of energy

Greater use of low-carbon and no-carbon energy

- Many of these technologies exist today

Improved carbon sinks

- Reduced deforestation and improved forest management and planting of new forests
- Bio-energy with carbon capture and storage

Lifestyle and behavioural changes

AR5 WGIII SPM

- **Substantial reductions in emissions would require large changes in investment patterns e.g., from 2010 to 2029, in billions US dollars/year:**
  (mean numbers rounded, IPCC AR5 WGIII Fig SPM 9)
- **energy efficiency: +330**
- **renewables: + 90**
- **power plants w/ CCS: + 40**
- **nuclear: + 40**
- **power plants w/o CCS: - 60**
- **fossil fuel extraction: - 120**

Industries : CO_2 emissions

About 50 % of the electricity used by Thailand's cement industry in 2005 could have been saved (16 % cost-effectively), while about 20 % of the fuel use could have been reduced (80 % cost-effectively using a discount rate of 30 %) (Hasanbeigi et al., 2010a, 2011).

IPCC, AR5, WG III, Chap. 10, p. 766

Policies in developing countries

Utility *demand side management (DSM)* may be the **most viable option to implement and finance energy efficiency programs** in small developing countries *(Sarkar and Singh, 2010)*. In a developing country context, it is **common practice to house DSM programmes within the local utilities due to their healthy financial means and strong technical and implementation capacities**, for example, in Argentina, South Africa, Brazil, India, **Thailand**, Uruguay and Vietnam *(Winkler and Van Es, 2007; Sarkar and Singh, 2010)*.

IPCC, AR5, WG III, Chap. 9, p. 721

Co-bebefits of mitigation: Socio-economic, environmental, and health effects

Example: Reduced traffic congestion. Congestion (…) creates substantial economic cost.

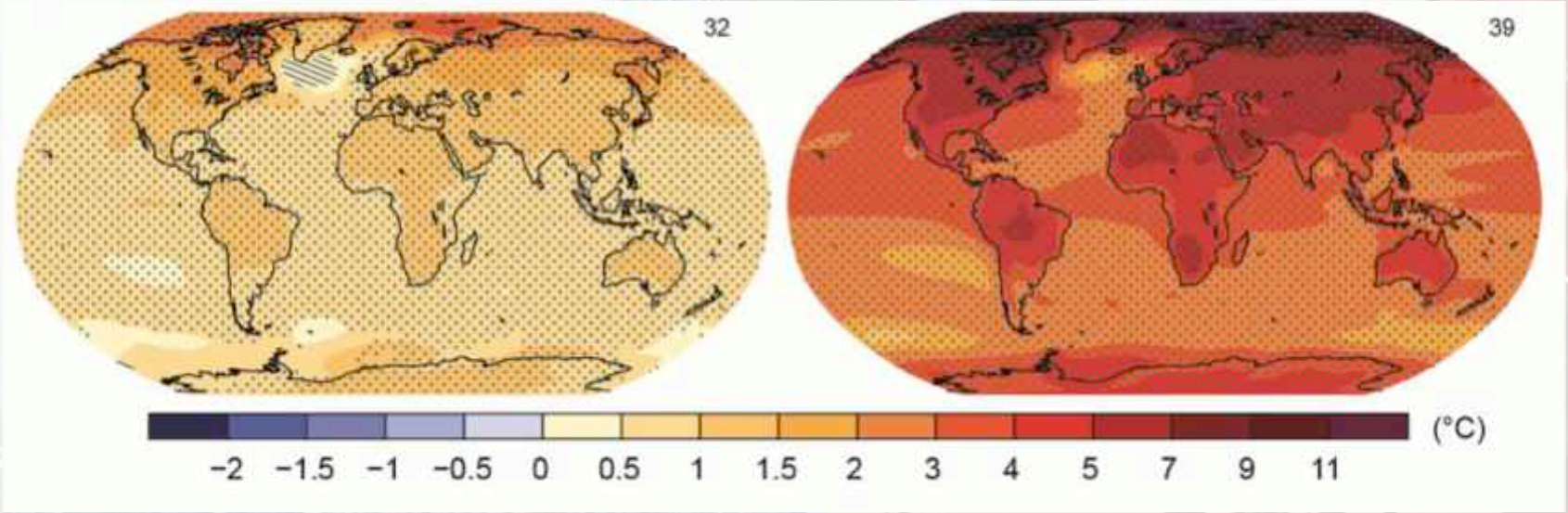
For example, (…) Time lost was valued at 1.2% of GDP in the UK; 3.4% in Dakar, Senegal; 4 % in Manila, Philippines; 3.3 % to 5.3 % in Beijing, China; **1 % to 6 % in Bangkok, Thailand *(World Bank, 2002)*** and up to 10 % in Lima, Peru where people on average spend around four hours in daily travel.

IPCC, AR5, WG III, Chap. 8, p. 631

The Choices Humanity Makes Will Create Different Outcomes (and affect prospects for effective adaptation)

With substantial mitigation

Without additional mitigation



Change in average surface temperature (1986–2005 to 2081–2100)

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Useful links:

- www.ipcc.ch : IPCC (reports and videos)
- www.climate.be/vanyp : my slides and candidature to become IPCC Chair
- www.skepticalscience.com: excellent responses to climate confusers' arguments
- **On Twitter: @JPvanYpersele and @IPCC_CH**