

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 Organization
UNEP= United Nations Environment Programme

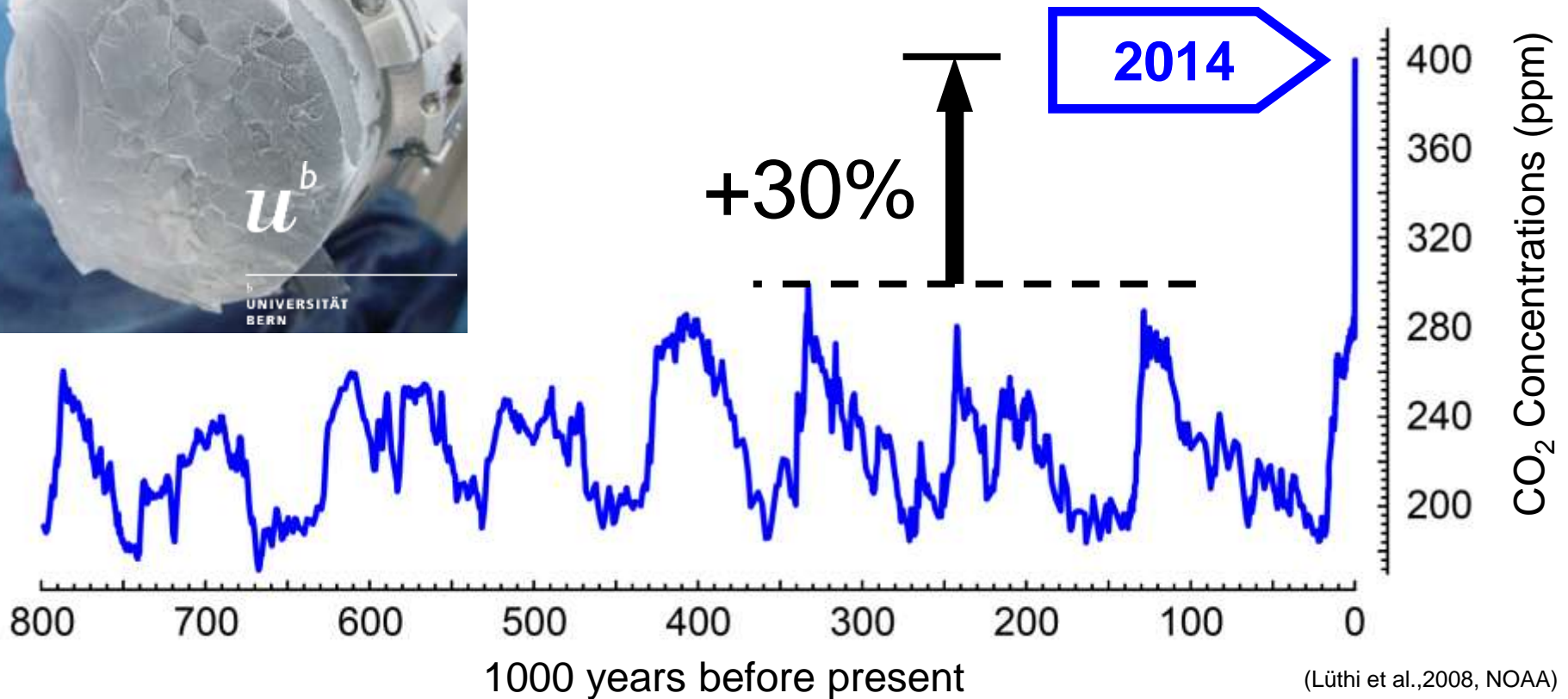


Key messages from IPCC AR5

- **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**



Atmospheric concentrations of CO₂



The concentrations of CO₂ 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

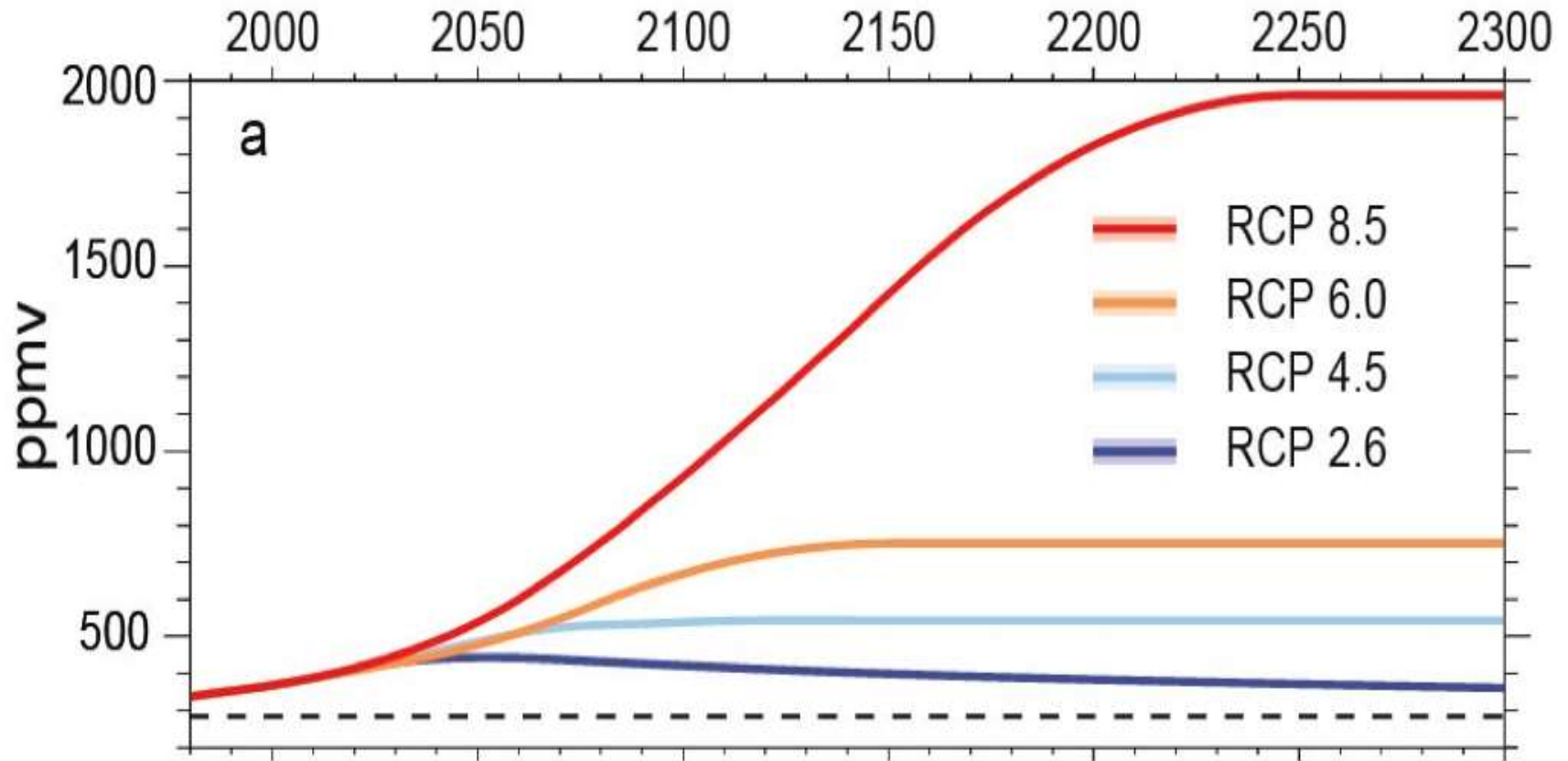
Impacts are already underway

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



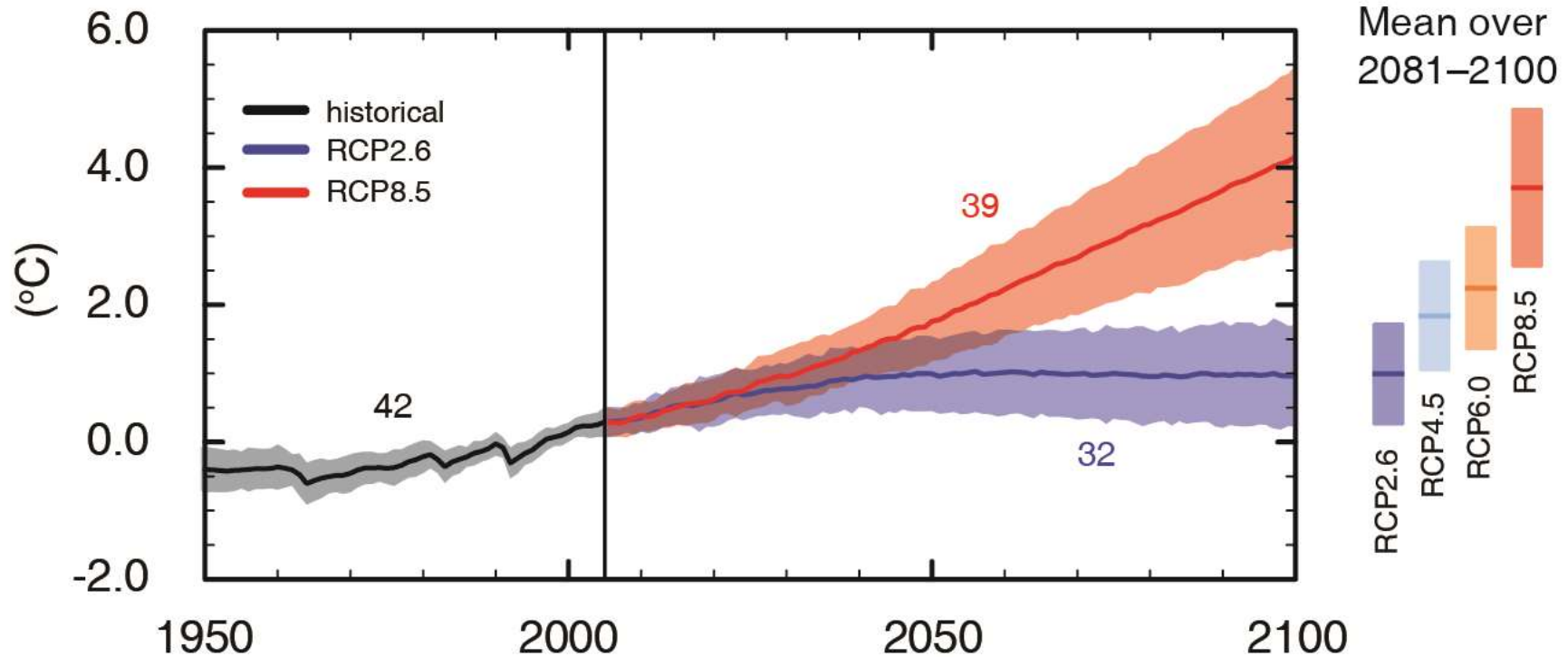
AR5 WGII SPM

RCP Scenarios: Atmospheric CO₂ concentration



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

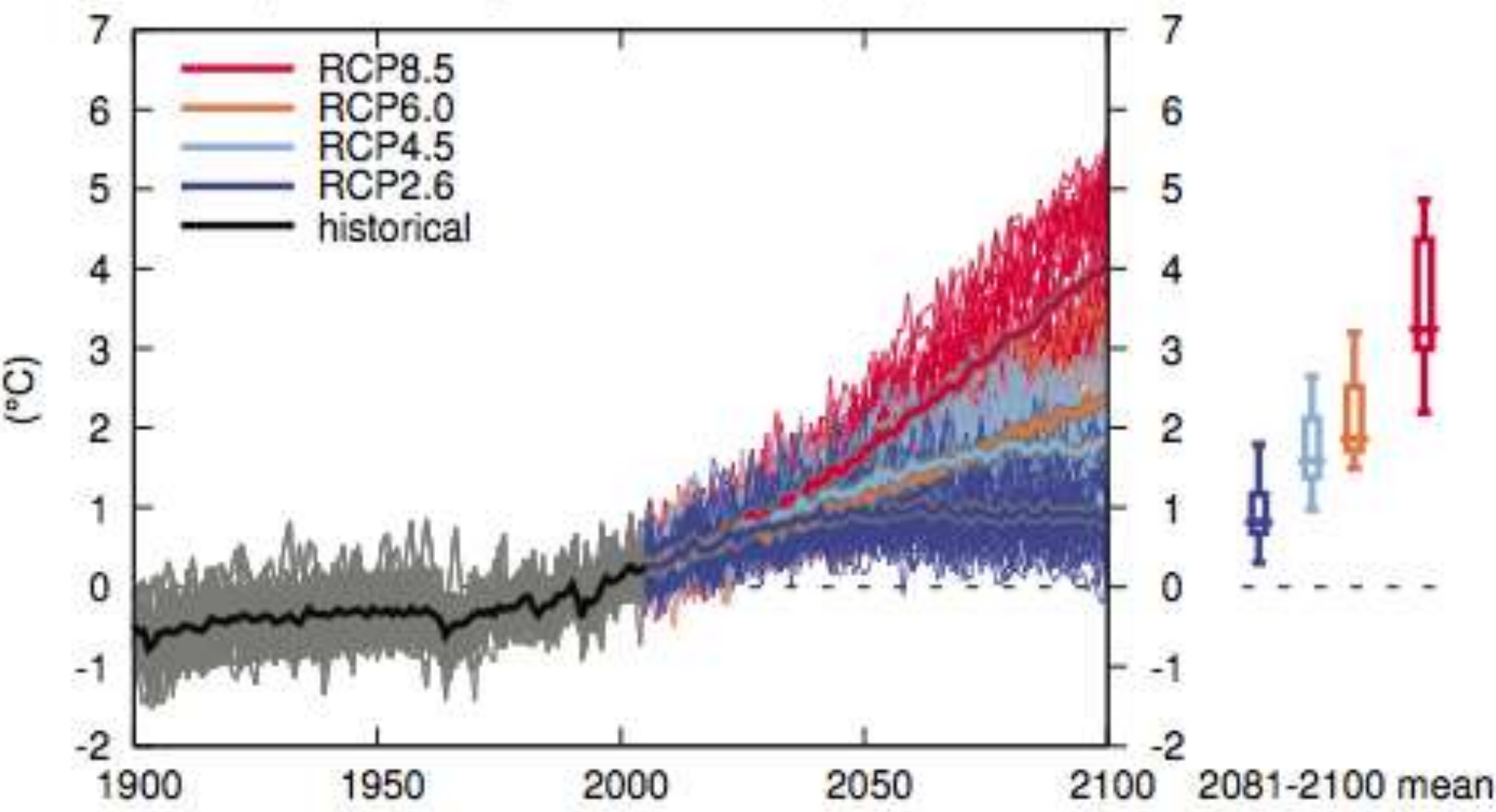
Global average surface temperature change



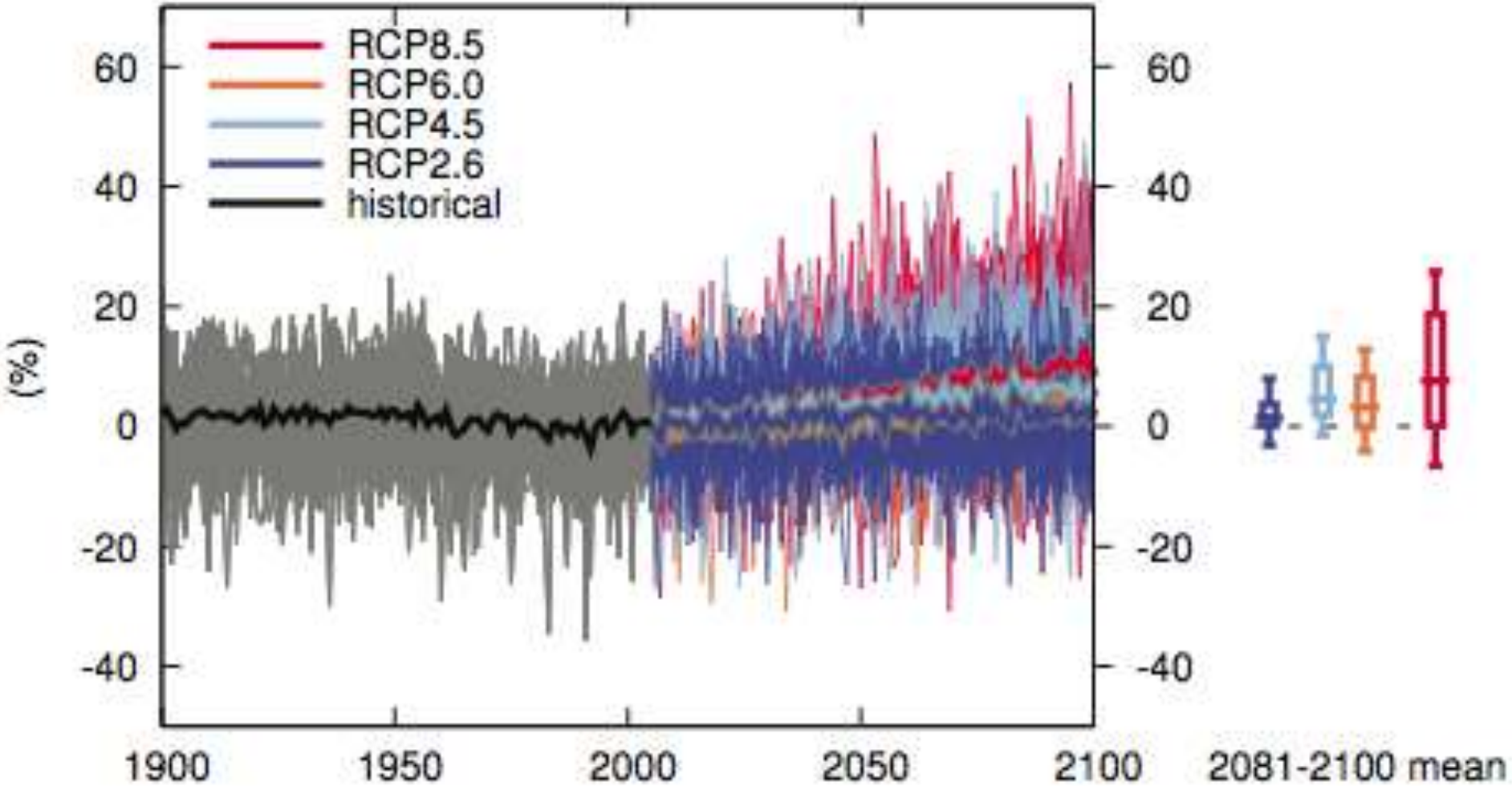
(IPCC 2013, Fig. SPM.7a)

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

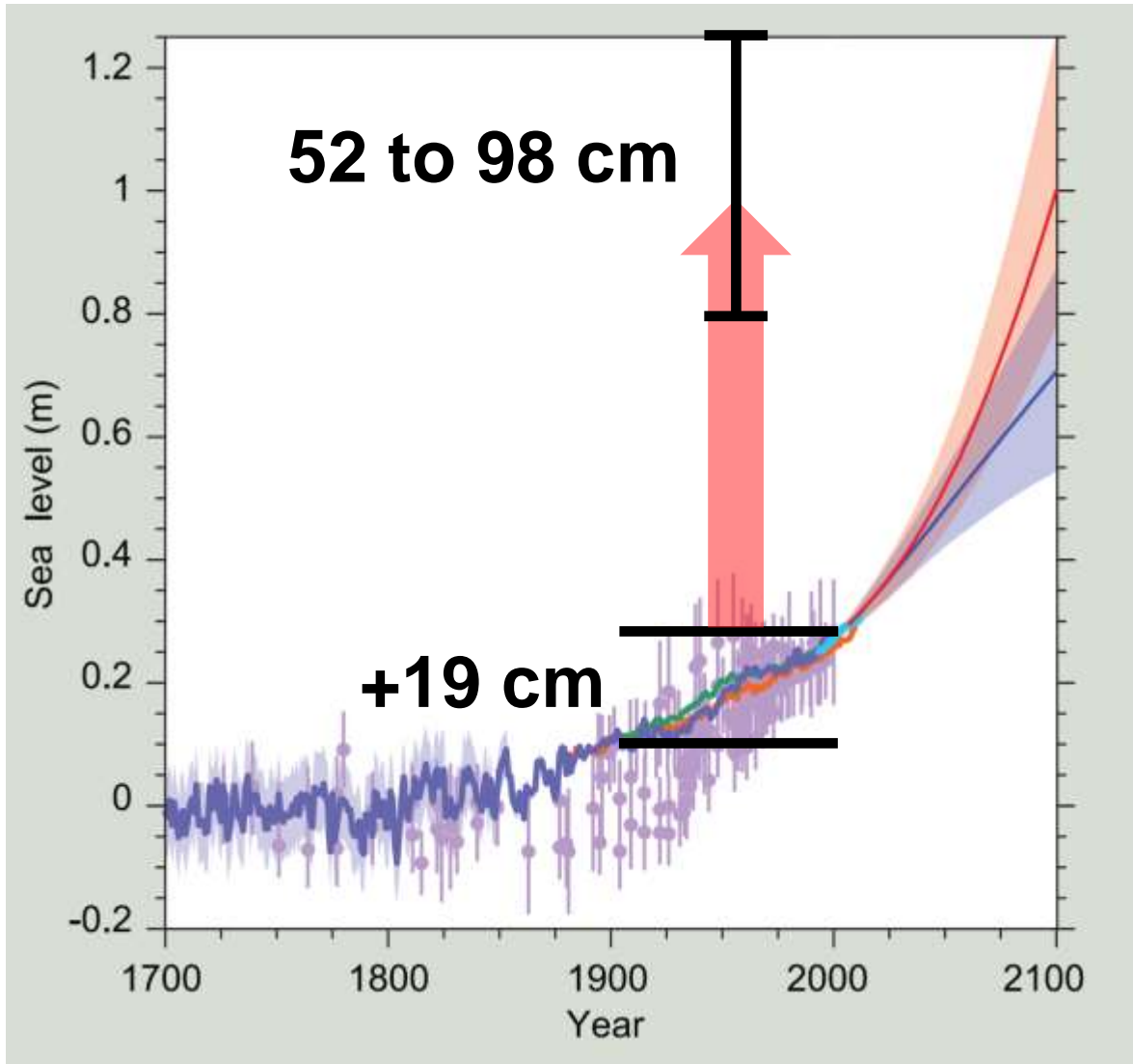
Temperature change Southeast Asia (land) annual



Precipitation change Southeast Asia (land) annual



Sea Level



IPCC 2013, TFE.2, Fig. 2

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

Representative key risks for each region for

Physical Systems

Glaciers, snow, ice and/or permafrost

Rivers, lakes, floods and/or drought

Coastal erosion and/or sea level effects

Biological Systems

Terrestrial ecosystems

Wildfire

Marine ecosystems

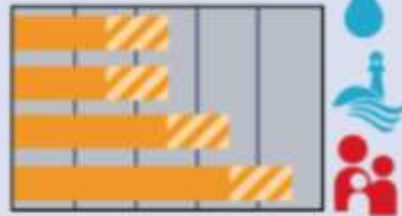
Human & Managed Systems

Food production

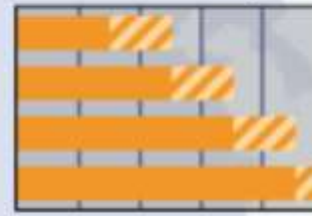
Livelihoods, health and/or economics

Asia

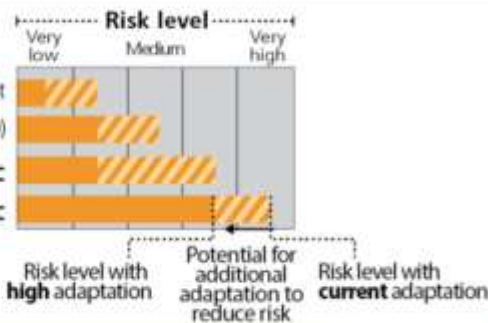
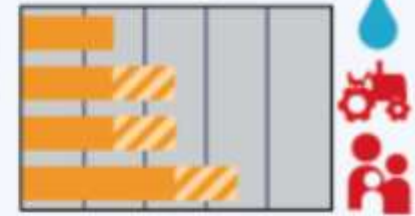
Increased flood damage to infrastructure, livelihoods and settlements



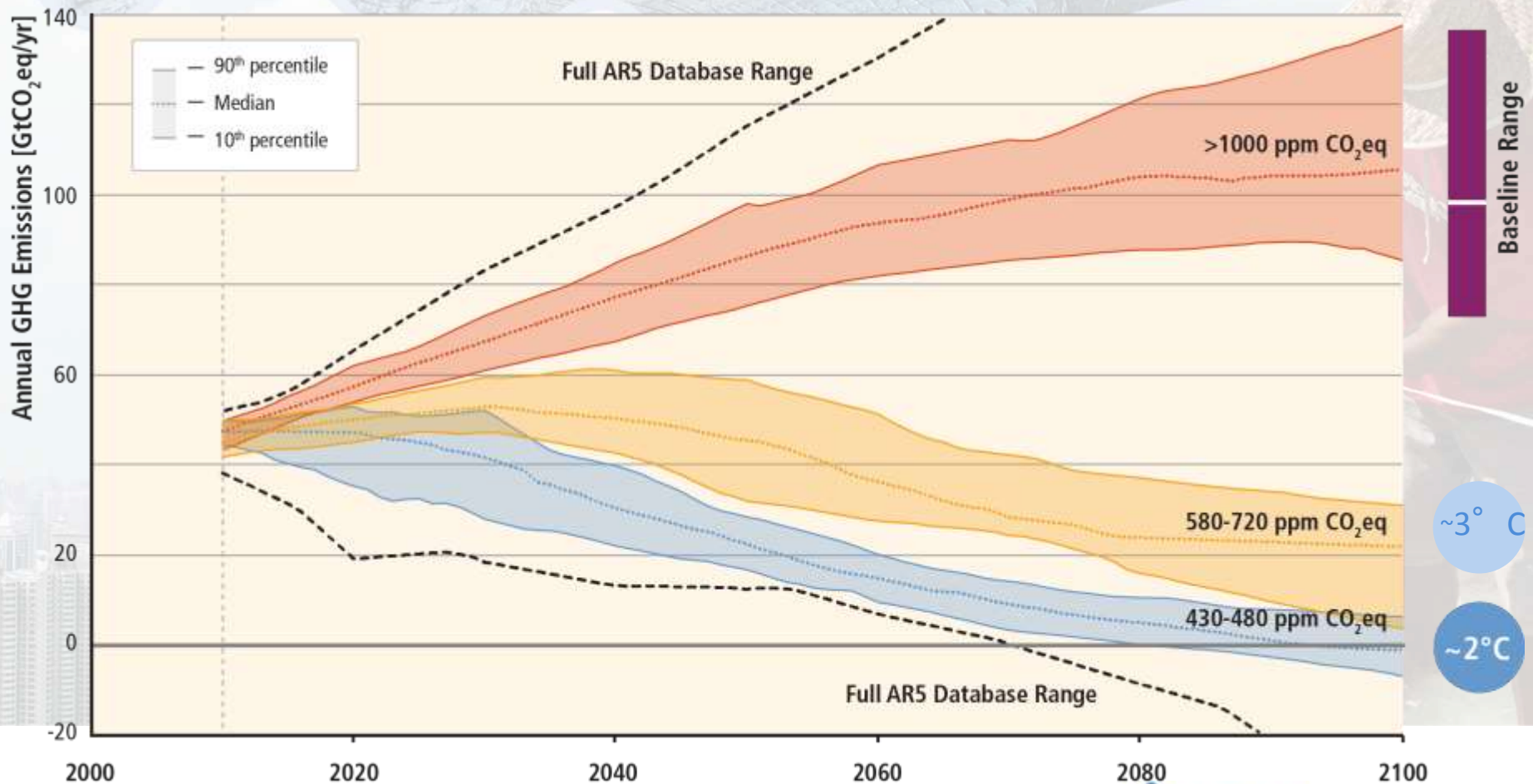
Heat-related human mortality



Increased drought-related water and food shortage



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



Based on Figure 6.7

- **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 CO₂-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 : CO₂ 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).

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*).

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INTERGOVERNMENTAL PANEL ON climate change



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

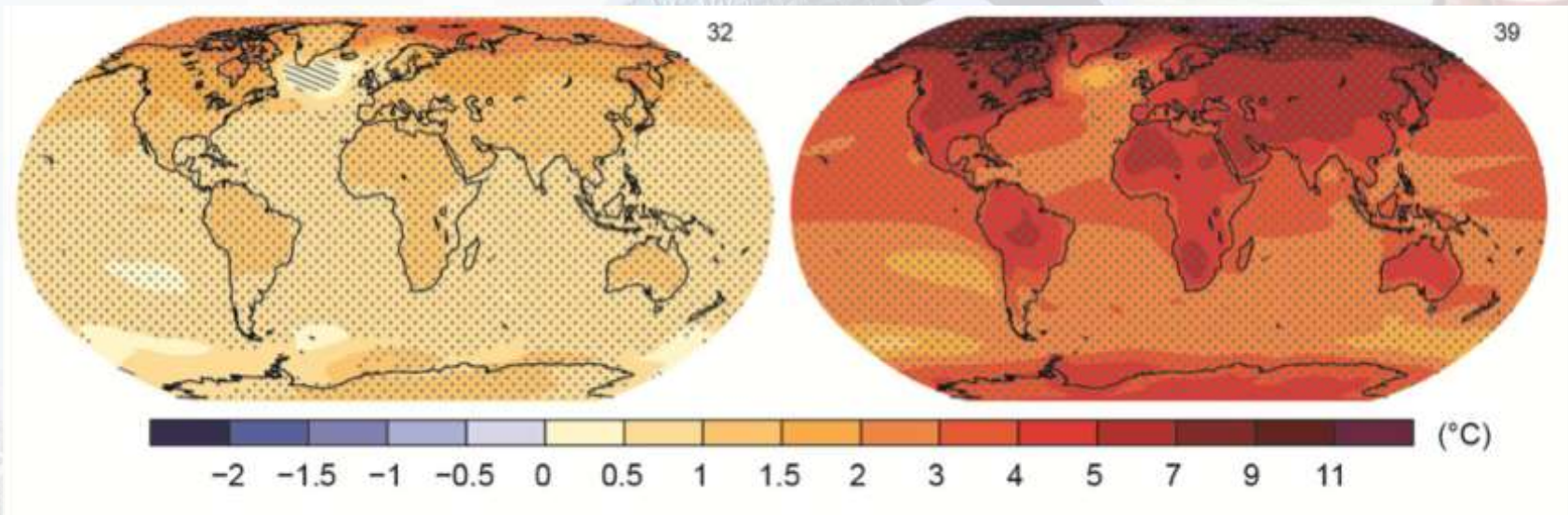
Example: Reduced traffic congestion. Congestion (...) creates substantial economic cost.

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.

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)

AR5 WGI SPM

Useful links:



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