

Challenges and Opportunities of Climate Change - An Overview Based on the IPCC Fifth Assessment Report (AR5), with particular attention to Iran

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**Thanks to the Belgian Federal Science Policy Office (BELSPO)
and the Ministry of Foreign Affairs, and to my team at the
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Why the IPCC ?

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

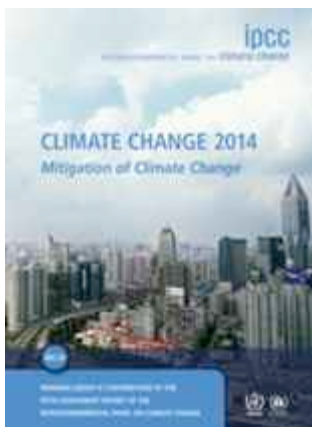




What is happening in the climate system?



What are the risks?



What can be done?

Key messages from IPCC AR5

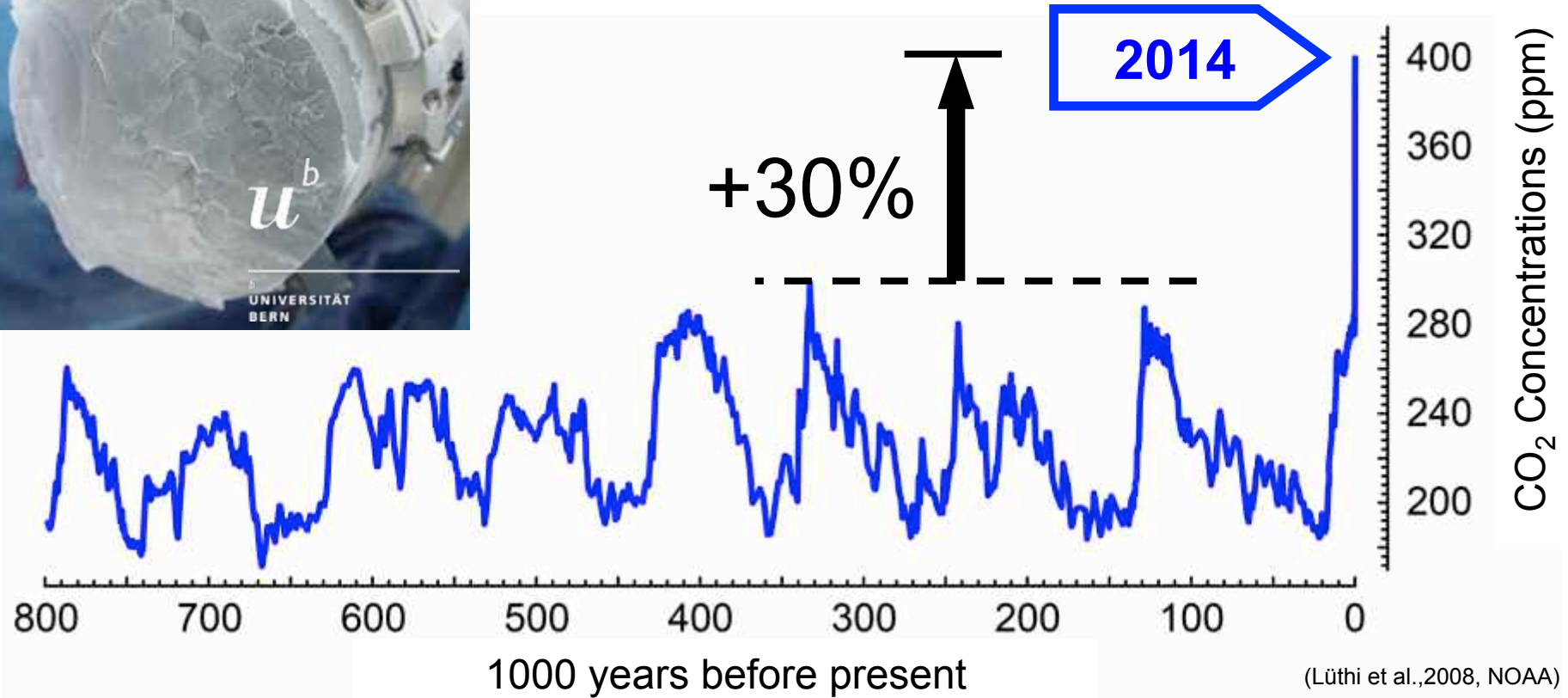
- **Human influence on the climate system is clear**
- **Continued emissions of greenhouse gases will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems**
- **While climate change is a threat to sustainable development, there are many opportunities to integrate 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**

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

Atmospheric concentrations of CO₂



The concentrations of CO₂ have increased to levels unprecedented in at least the last 800,000 years.

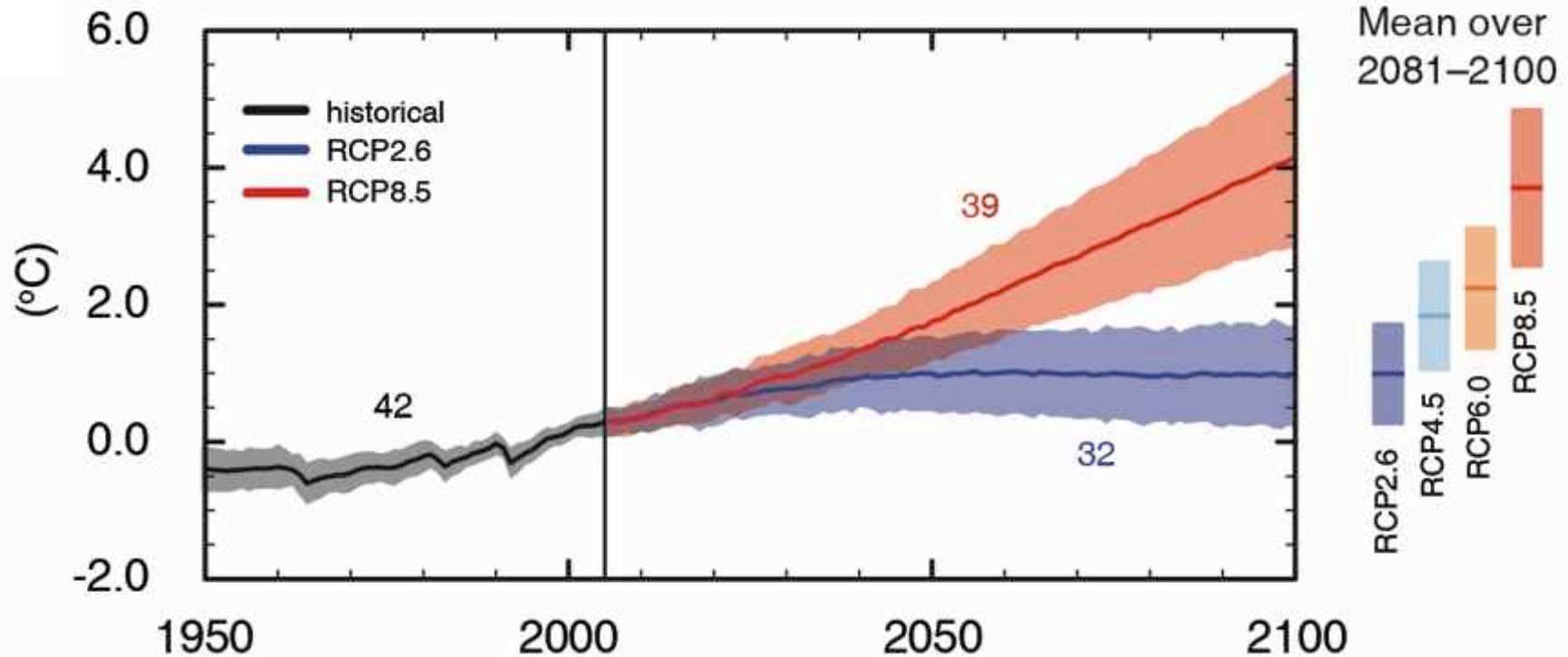
Impacts are already underway

- **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

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

18-20000 years ago (Last Glacial Maximum)

With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



Sea level was 120 m lower than today

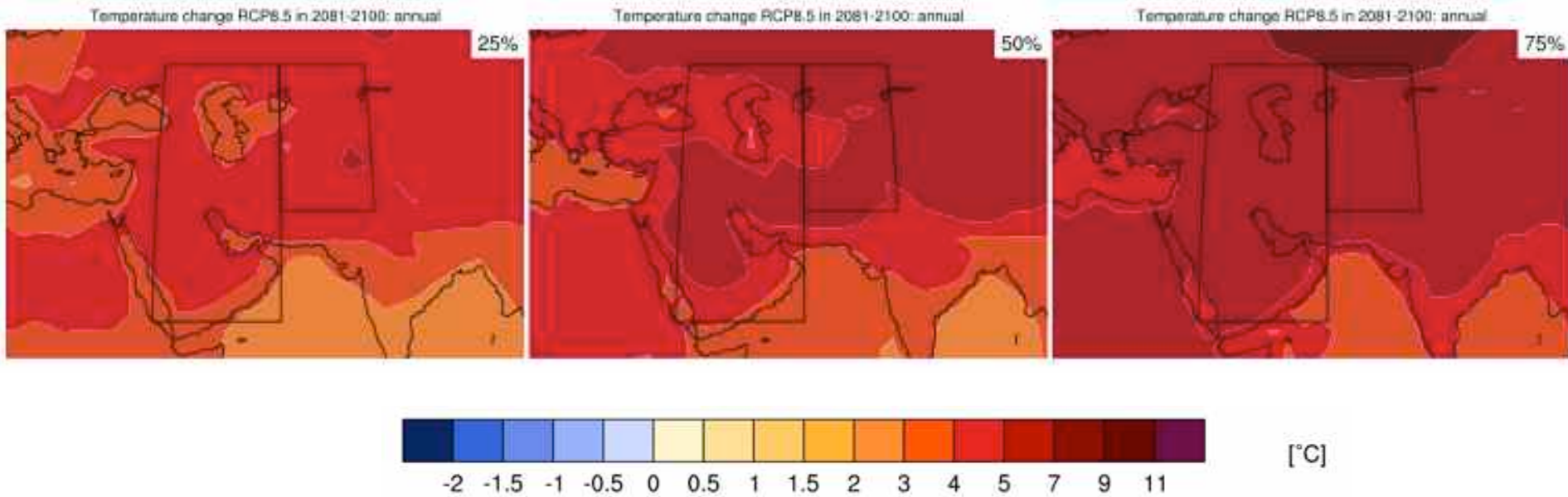
Today, with +4-5°C globally

With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.

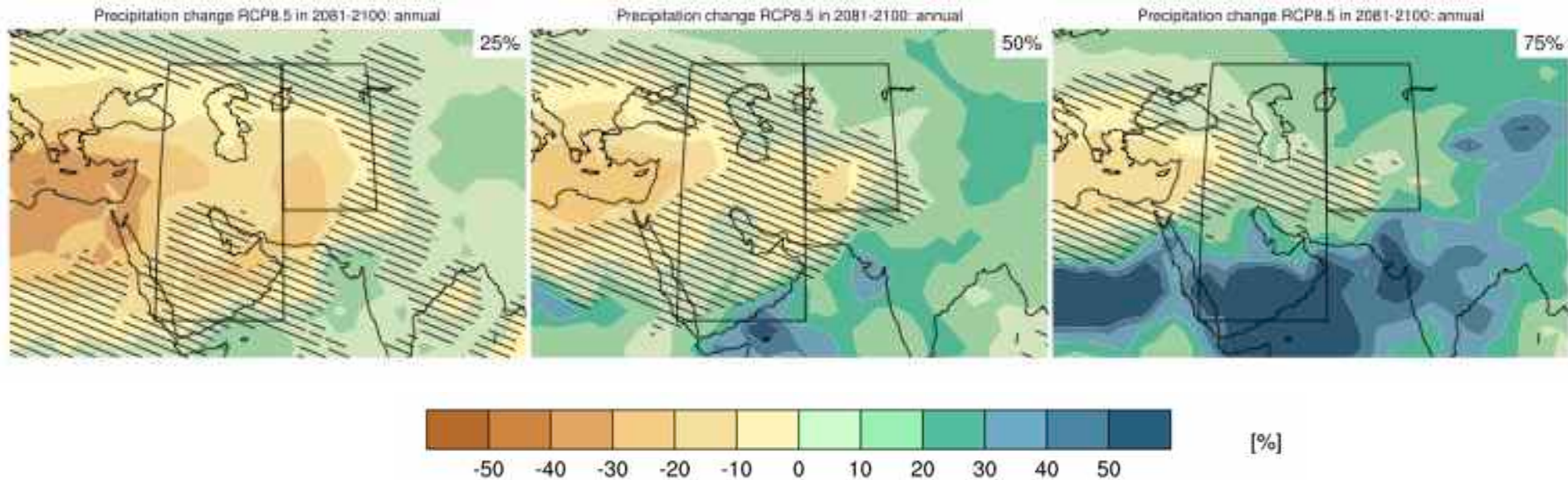


Aujourd'hui

West Asia: Maps of temperature changes in 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario



West Asia: Maps of precipitation changes in 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario



Potential Impacts of Climate Change



Food and water shortages



Increased displacement of people



Increased poverty



Coastal flooding

AR5 WGII SPM

Risk = Hazard x Vulnerability x Exposure (Katrina flood victim)





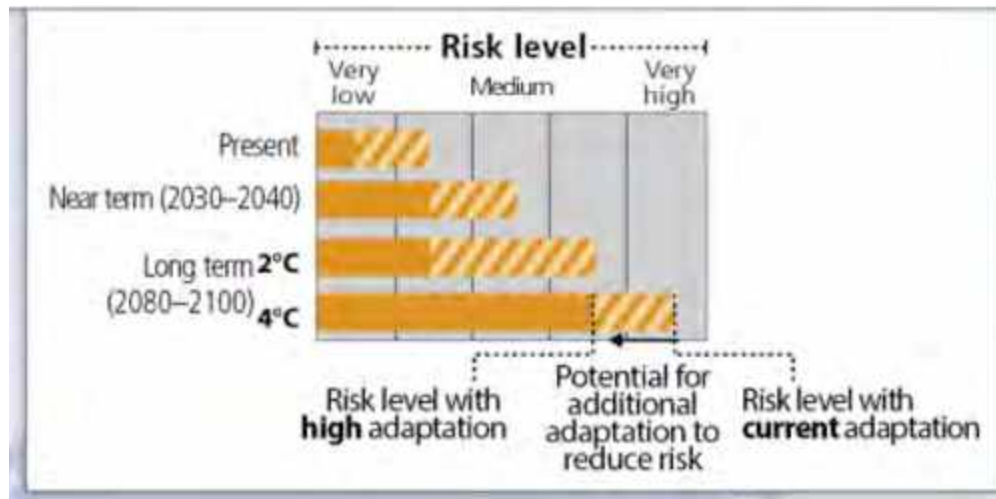
ADAPTATION IS ALREADY OCCURRING

Regional key risks and potential for risk reduction through adaptation: limits exist

Representative key risks for each region for

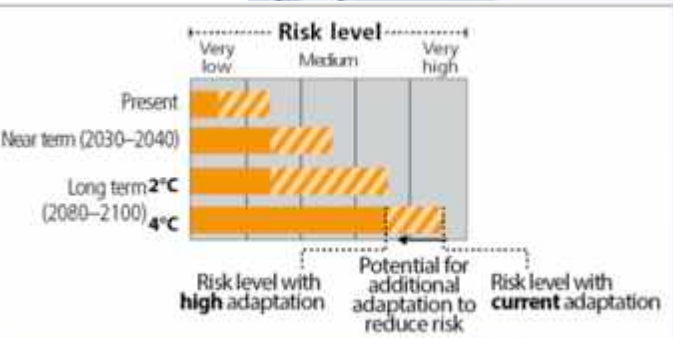
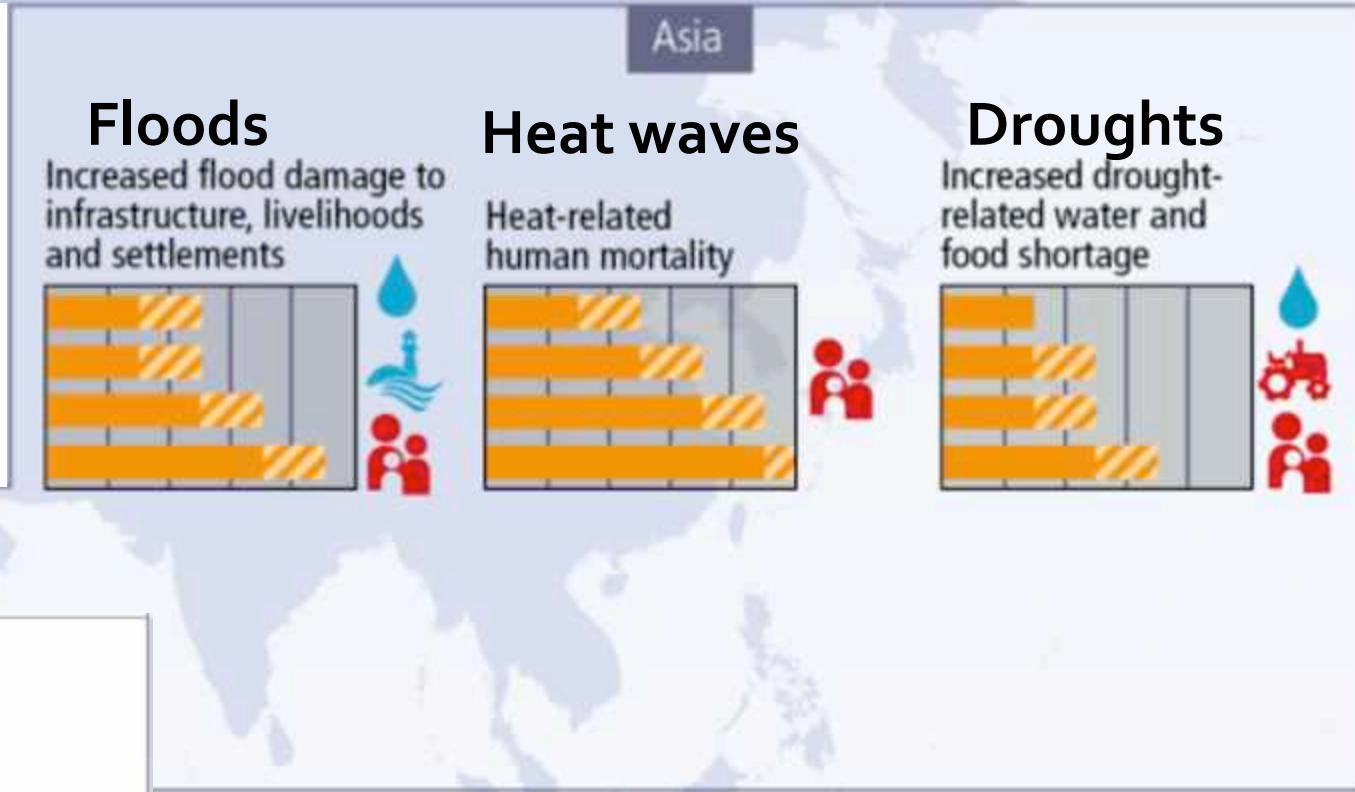


Concept:



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

Representative key risks for each region for



Urgency

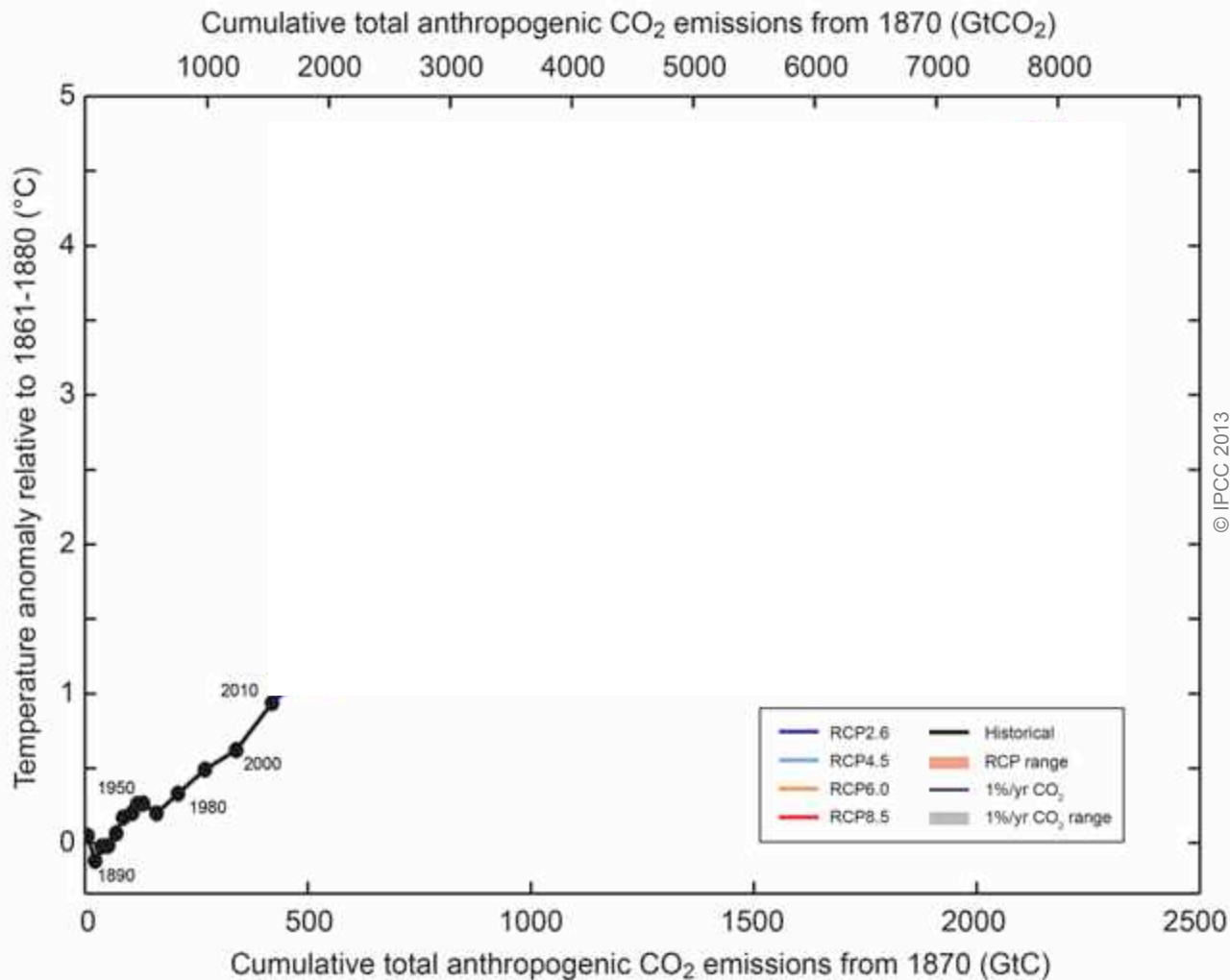


Fig. SPM.10

Cumulative emissions of CO₂ largely determine global mean surface warming by the late 21st century and beyond.

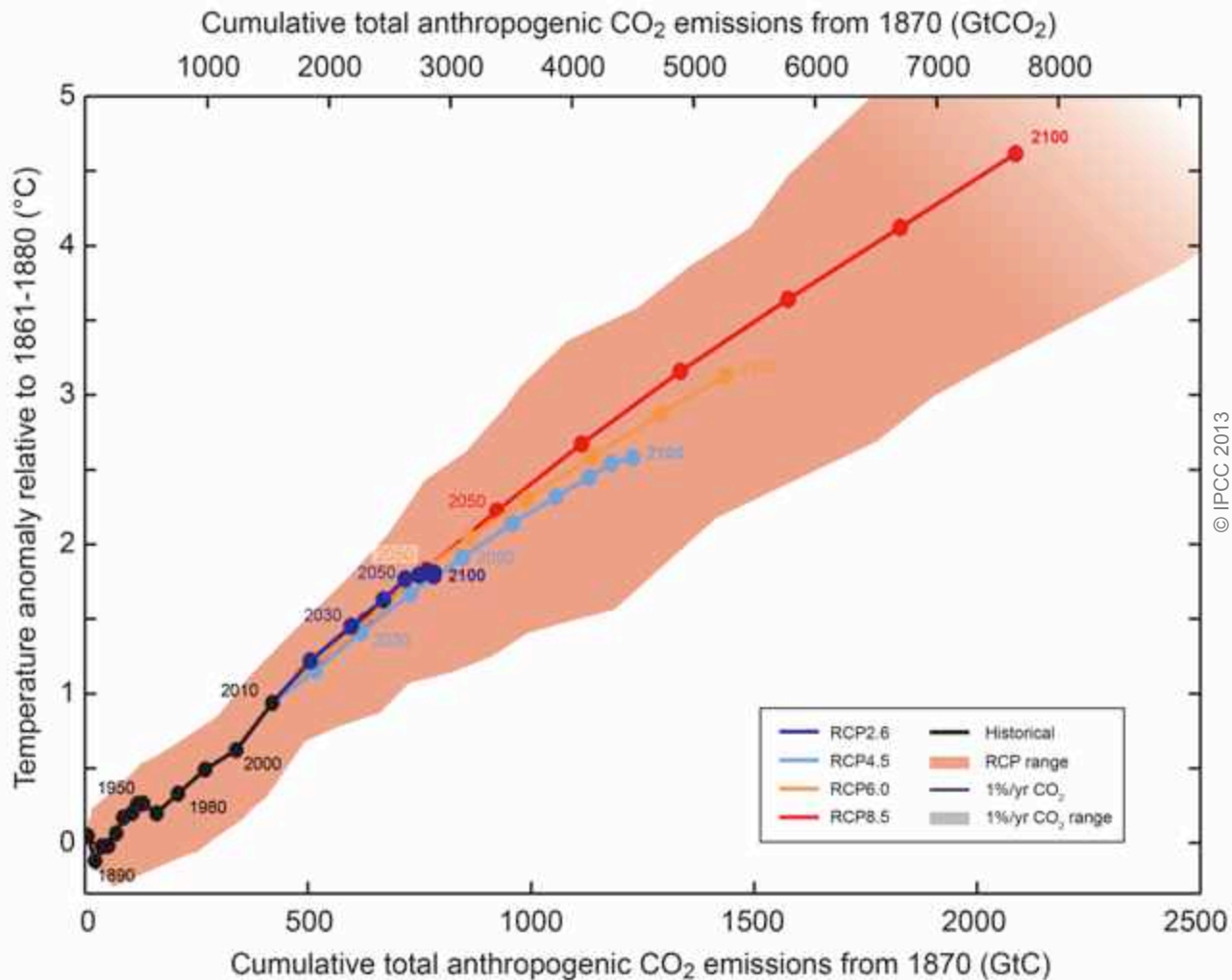
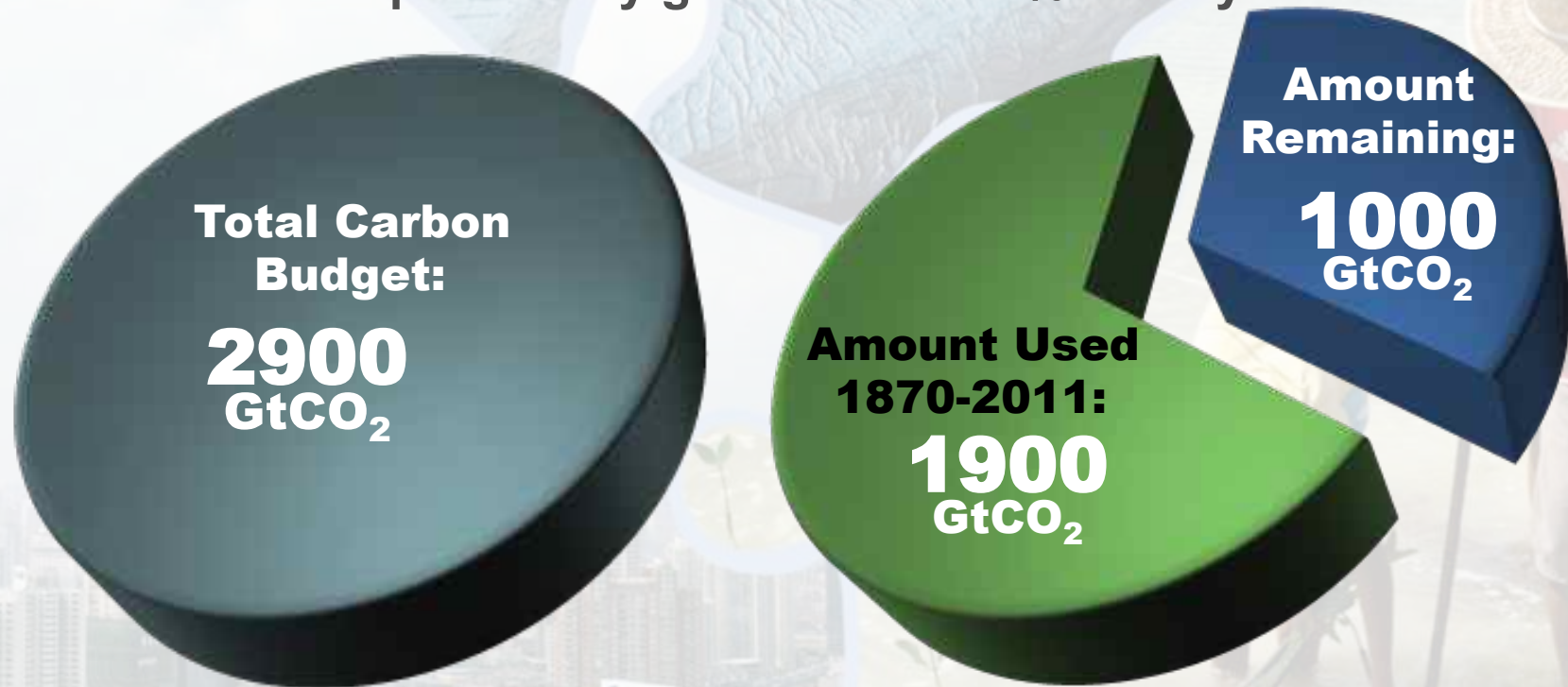


Fig. SPM.10

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

The window for action is rapidly closing

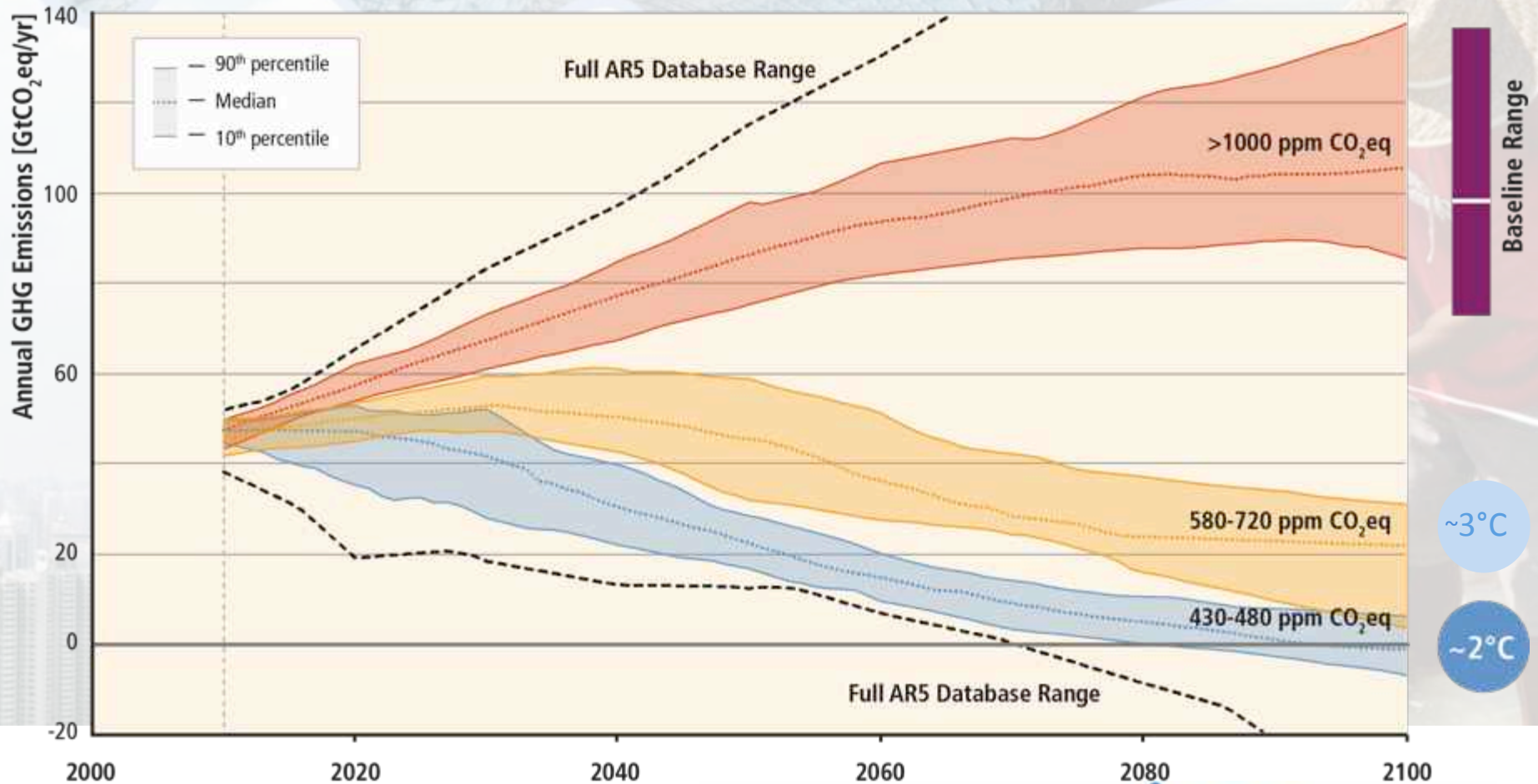
65% of the carbon budget compatible with a 2°C goal is already used
NB: this is with a probability greater than 66% to stay below 2°C



NB: Emissions in 2011: 38 GtCO₂/yr

AR5 WGI SPM

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

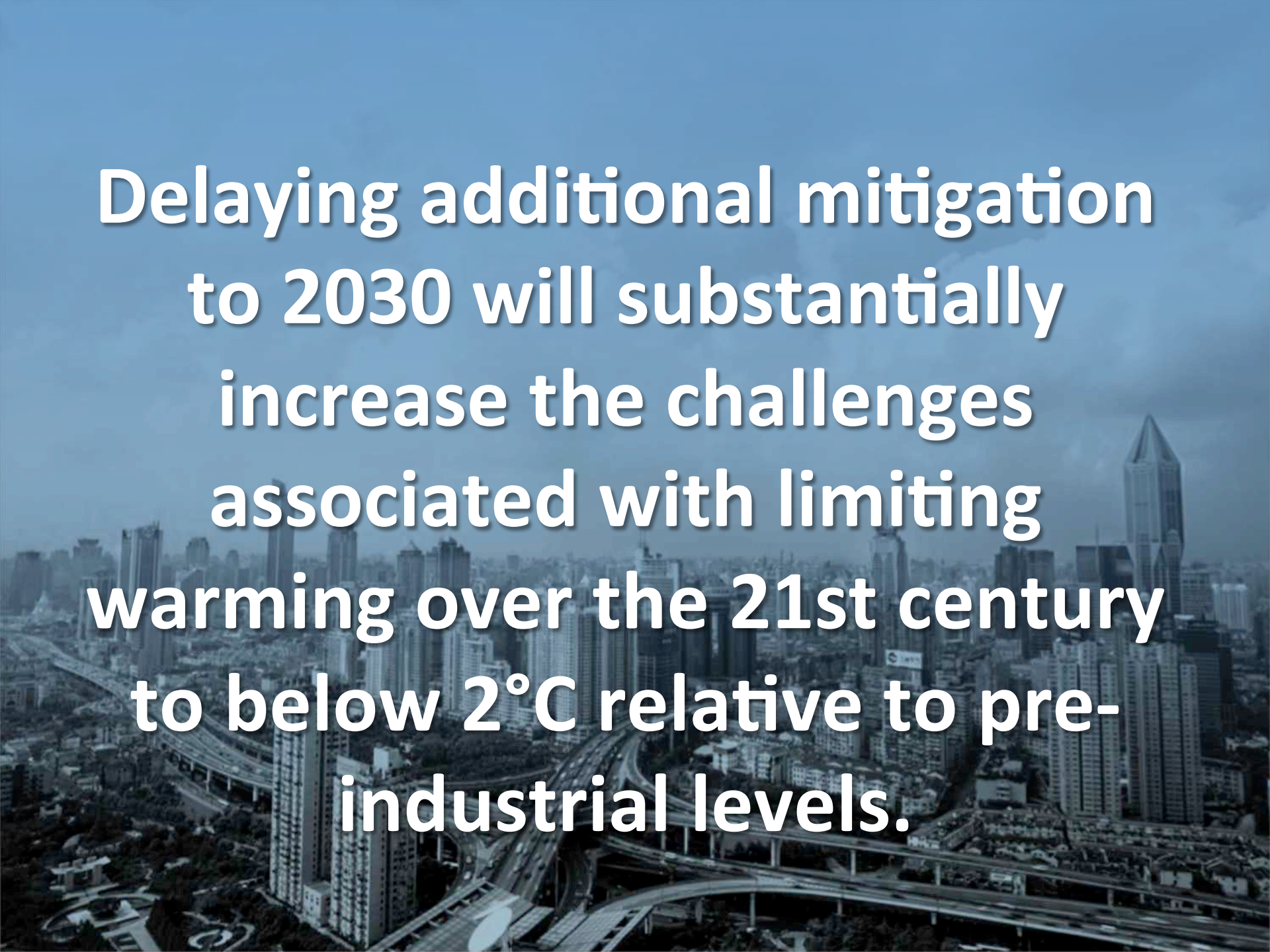


Based on Figure 6.7

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 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.**

Ambition

An aerial photograph of a city skyline, likely Hong Kong, featuring a complex highway interchange and numerous high-rise buildings. The image is overlaid with white text.

Delaying additional mitigation to 2030 will substantially increase the challenges associated with limiting warming over the 21st century to below 2°C relative to pre-industrial levels.

NB: Ambition *before* 2020 is essential as well (lock-in & entrainment effects)

Mitigation Measures



More efficient use of energy



Greater use of low-carbon and no-carbon energy

- Many of these technologies exist today
- But worldwide investment in **research** in support of GHG mitigation is small...



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

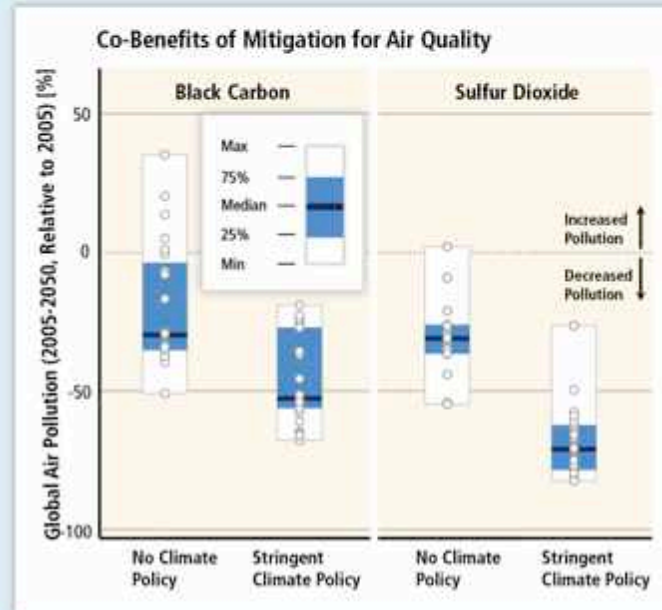
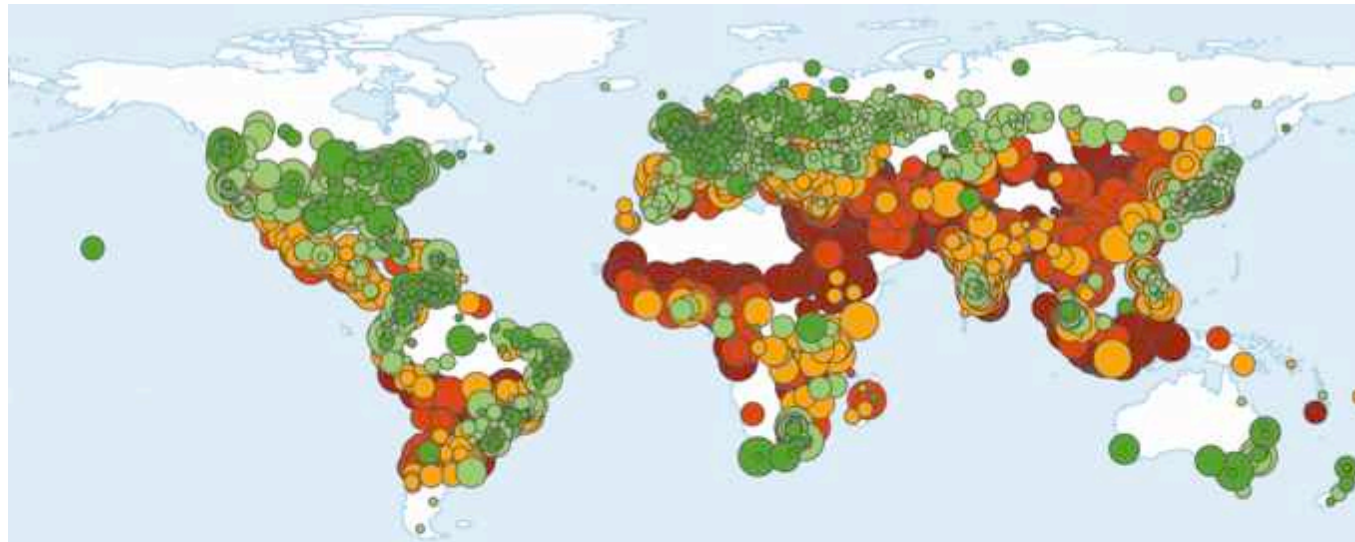
AR5 WGIII SPM

- **Mitigation requires major technological and institutional changes including the upscaling of low- and zero carbon energy (quadrupling from 2010 to 2050 for the scenario limiting warming below 2°C)**

- **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**



Mitigation can result in large co-benefits for human health and other societal goals.

Cooperation

**Equity,
Justice, and
Fairness**

- **Sustainable development and equity provide a basis for assessing climate policies and highlight the need for addressing the risks of climate change**
- **Issues of equity, justice, and fairness arise with respect to mitigation and adaptation**

Equity is an integral dimension of Sustainable development *(high confidence)*

- Intergenerational equity underlies the concept of sustainability;
- Intra-generational equity is also often considered an intrinsic component of SD.
- In the particular context of international climate policy discussions, several arguments support giving equity an important role:
 - a moral justification that draws upon ethical principles;
 - a legal justification that appeals to existing treaty commitments ...;
 - and an effectiveness justification that argues that a fair arrangement is more likely to be agreed internationally ...

A few words about my platform as a candidate IPCC Chair

See details at:

www.climate.be/vanyp (« IPCC » page)

See also my long interview on:

www.carbonbrief.org (search « Ypersele »)

Keep the IPCC mandate

“When manoeuvring a vehicle in limited space, one **must be very well informed** about both the surrounding **risks and the available options**.

This is what the IPCC must do, and continue to do, in a scientifically rigorous, but policy-neutral, way: assess the risks, the options and the processes for reaching decisions.”

@JPvanYpersele for The Guardian, 16 March 2015

Inclusiveness & Team Spirit

“But the IPCC must do so in a manner even **more inclusive** than in the past, **involving more scientists from developing countries** in particular. It must encourage all authors to **work better across disciplinary boundaries**. The next assessment by the IPCC must ensure the best **team spirit**, with a **sense of accountability and ownership** that is shared by all.”

@JPvanYpersele for The Guardian, 16 March 2015

Improve Communication

For the IPCC to be relevant, it must also continue to improve its communication with policymakers and with the public. The IPCC products need to be **more accessible, more readable,...**

... reach out to **different audiences**, seek greater **transparency** in how it works and show more responsiveness on **social media**.

@JPvanYpersele for The Guardian, 16 March 2015

Full Time IPCC Chair needed

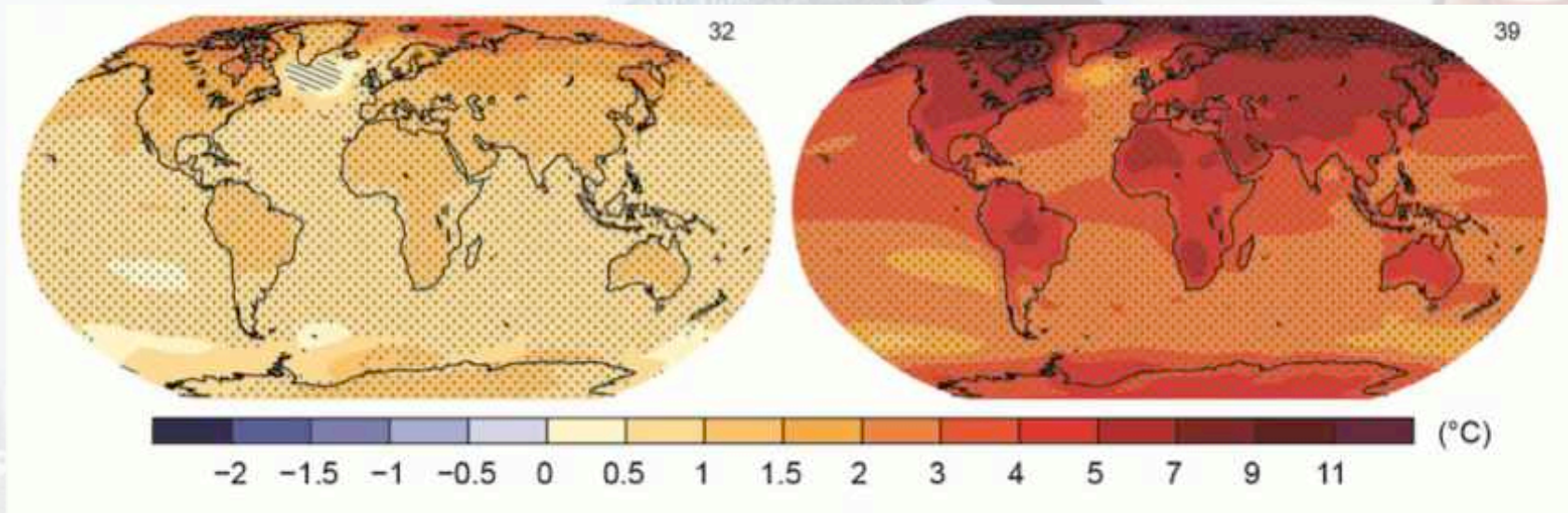
“To make sure all of this happens during the next assessment cycle, the IPCC needs a strong **leader, a team builder**, who dedicates herself or himself **full time** as IPCC Chair.”

@JPvanYpersele for The Guardian, 16 March 2015

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:



- 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 contrarians arguments
- **On Twitter: @JPvanYpersele
and @IPCC_CH**