

The EU & China, climate change, challenges and opportunities



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**The EU & China – Partners for a Green World, EU
Committee of the Regions, Brussels, 19-4-2012**

**NB: The support of the Belgian Science Policy
Office is gratefully acknowledged**

Outline



- **Climate Change**
- **Challenges**
- **Opportunities**

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Completed IPCC Reports

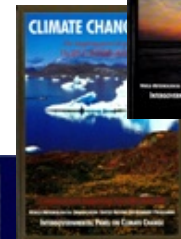
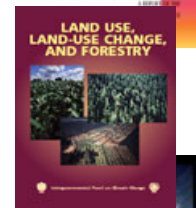
4 Assessment Reports (1990, 1995, 2001, 2007)

1992 Supplementary Report and 1994 Special Report

9 Special Reports (1997, 1999, 2000, 2005, 2011)

Guidelines for National GHG Inventories, Good Practice
Guidance (1995-2006)


6 Technical Papers (1996-2008)



IPCC Structure



- **3 Working Groups, 1 Task Force**
- WG1: Physical basis for climate change
- WG2: Impacts, adaptation & vulnerability
- WG3: Mitigation (emission reductions)
- TF: Emission inventories (methodologies)



IPCC Reports are
policy-relevant,
NOT
policy-prescriptive

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Climate Change

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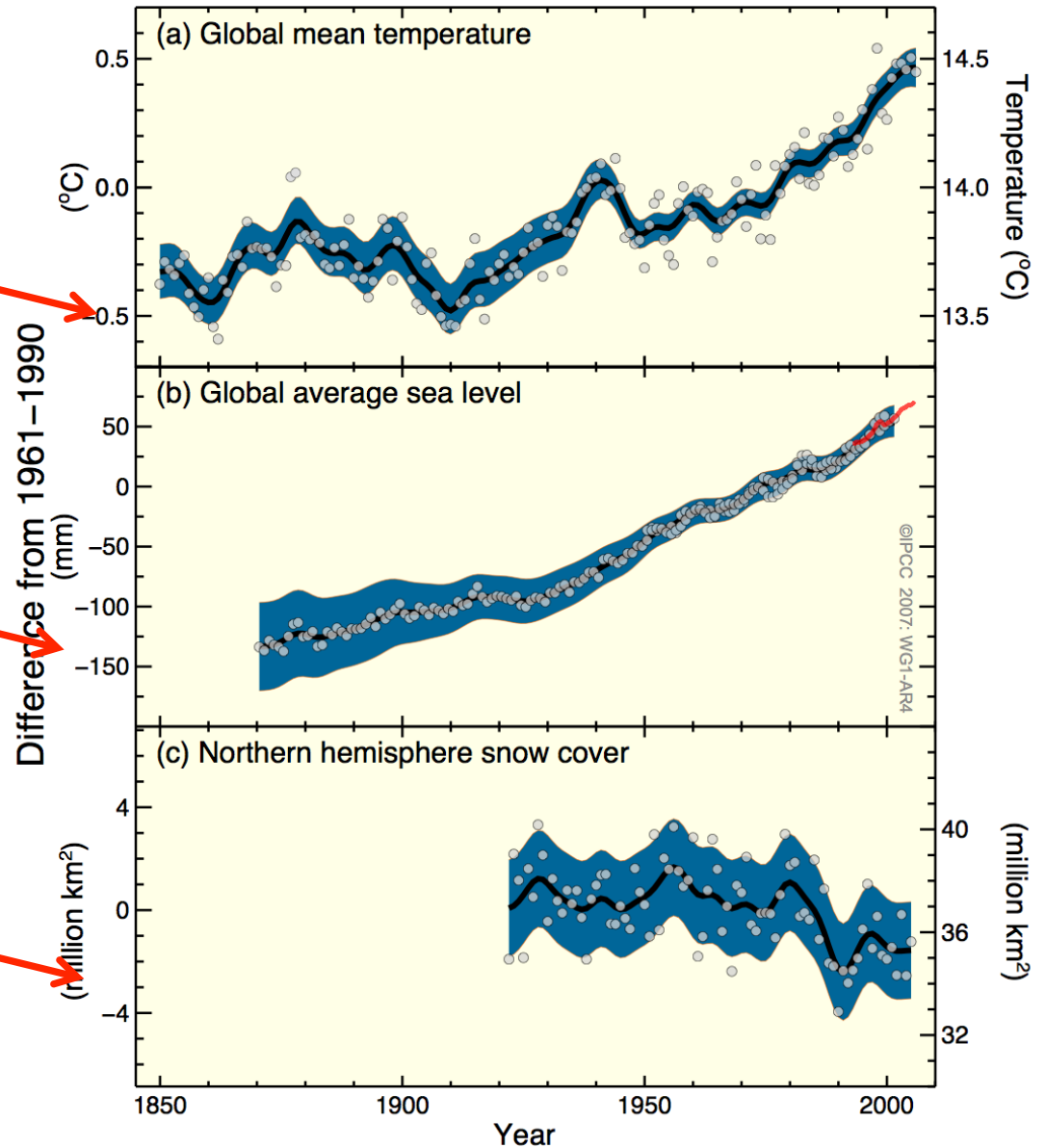
Warming is Unequivocal

Rising atmospheric temperature

Rising sea level

Reductions in NH snow cover

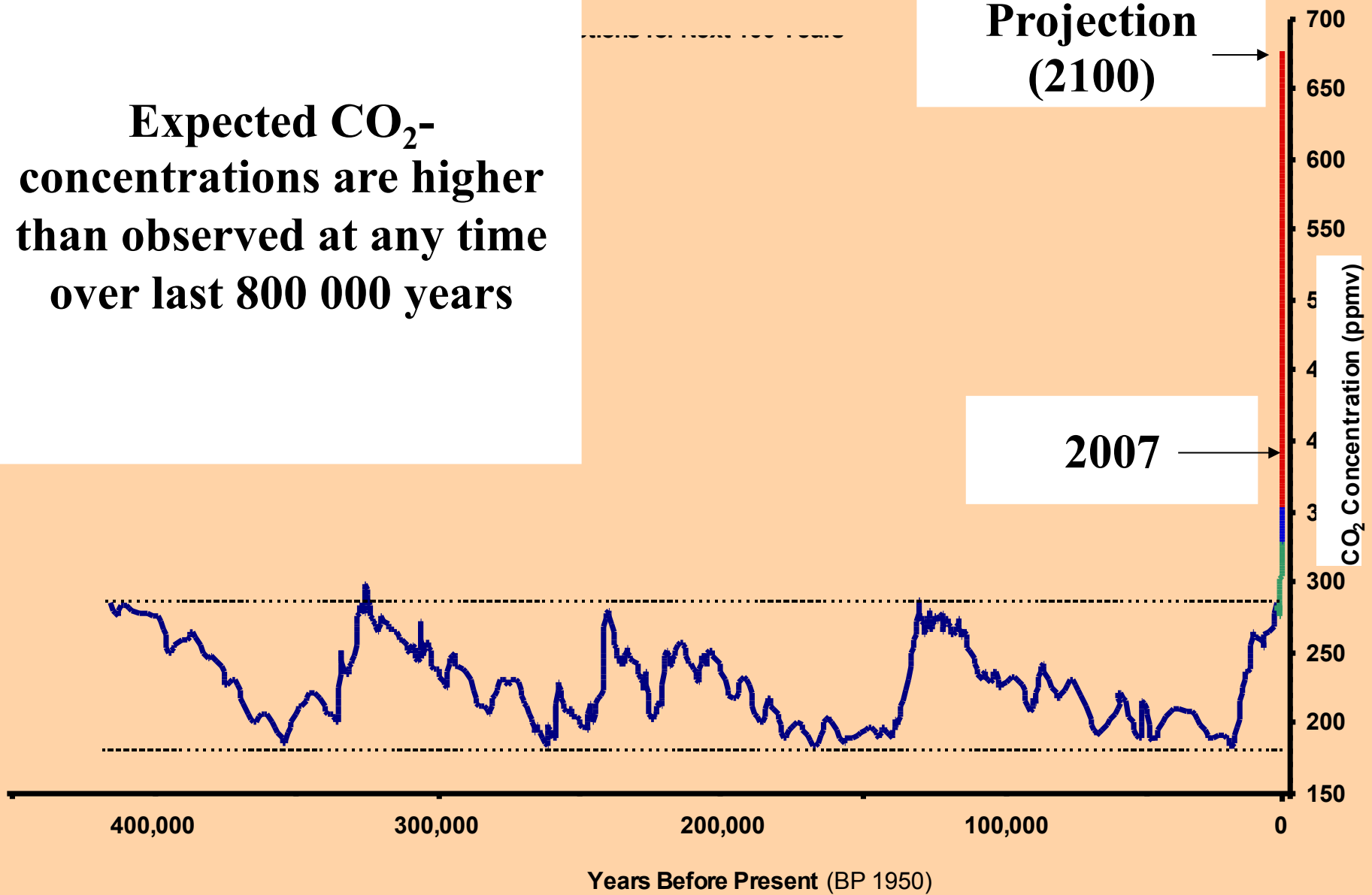
Changes in Temperature, Sea Level and Northern Hemisphere Snow Cover



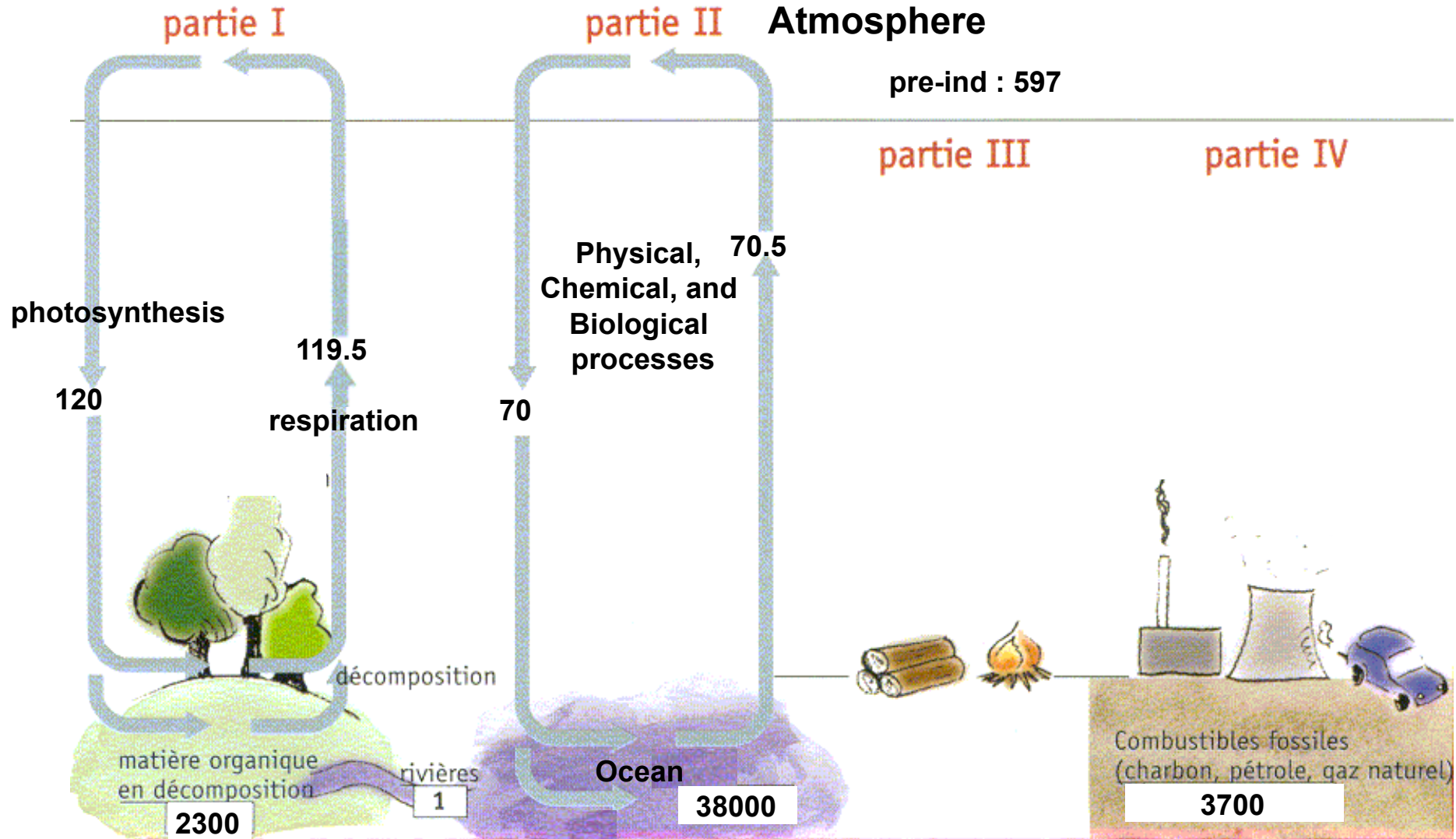
**Expected CO₂-
concentrations are higher
than observed at any time
over last 800 000 years**

**Projection
(2100)**

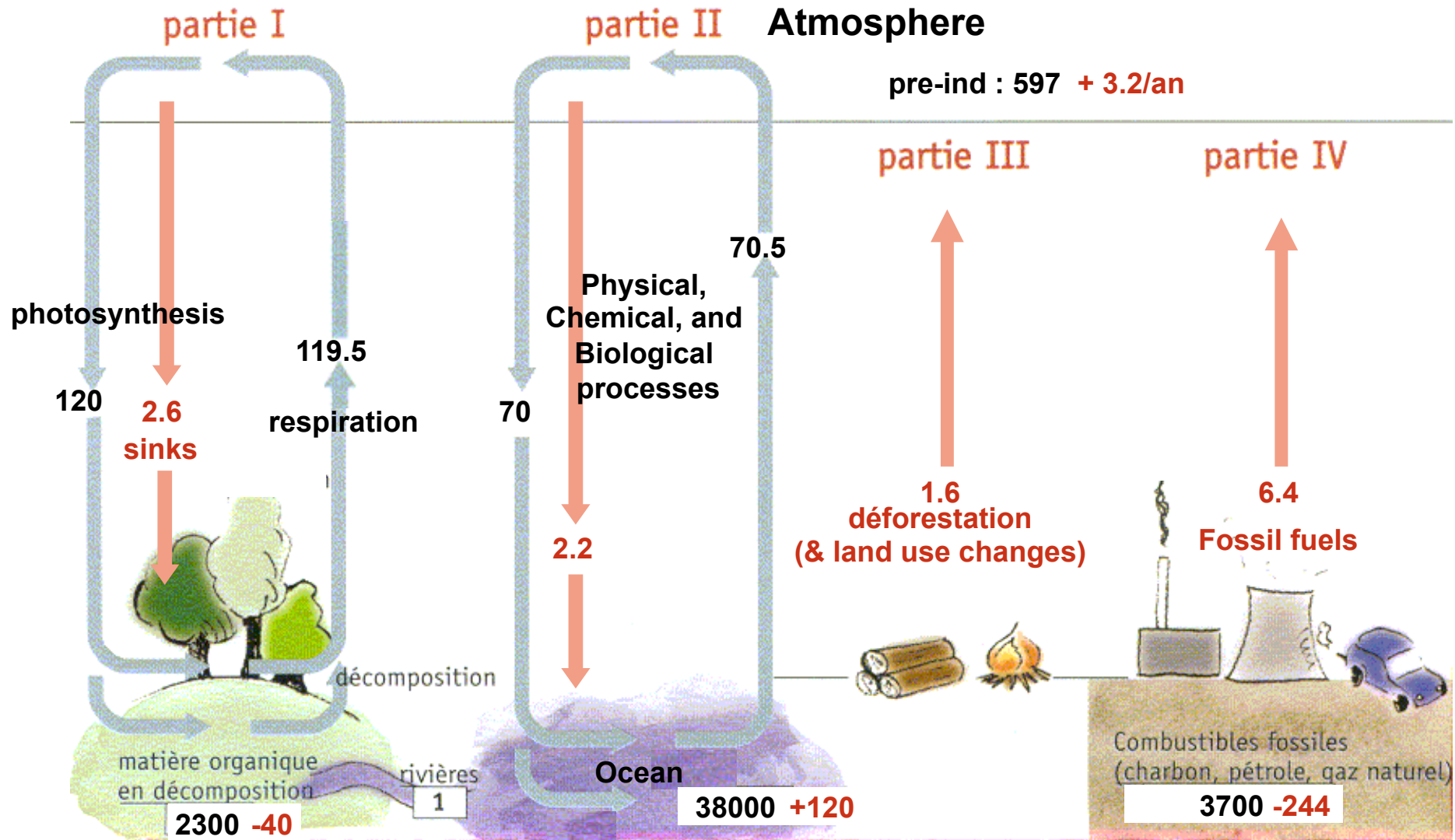
2007



Carbon cycle



Carbon cycle

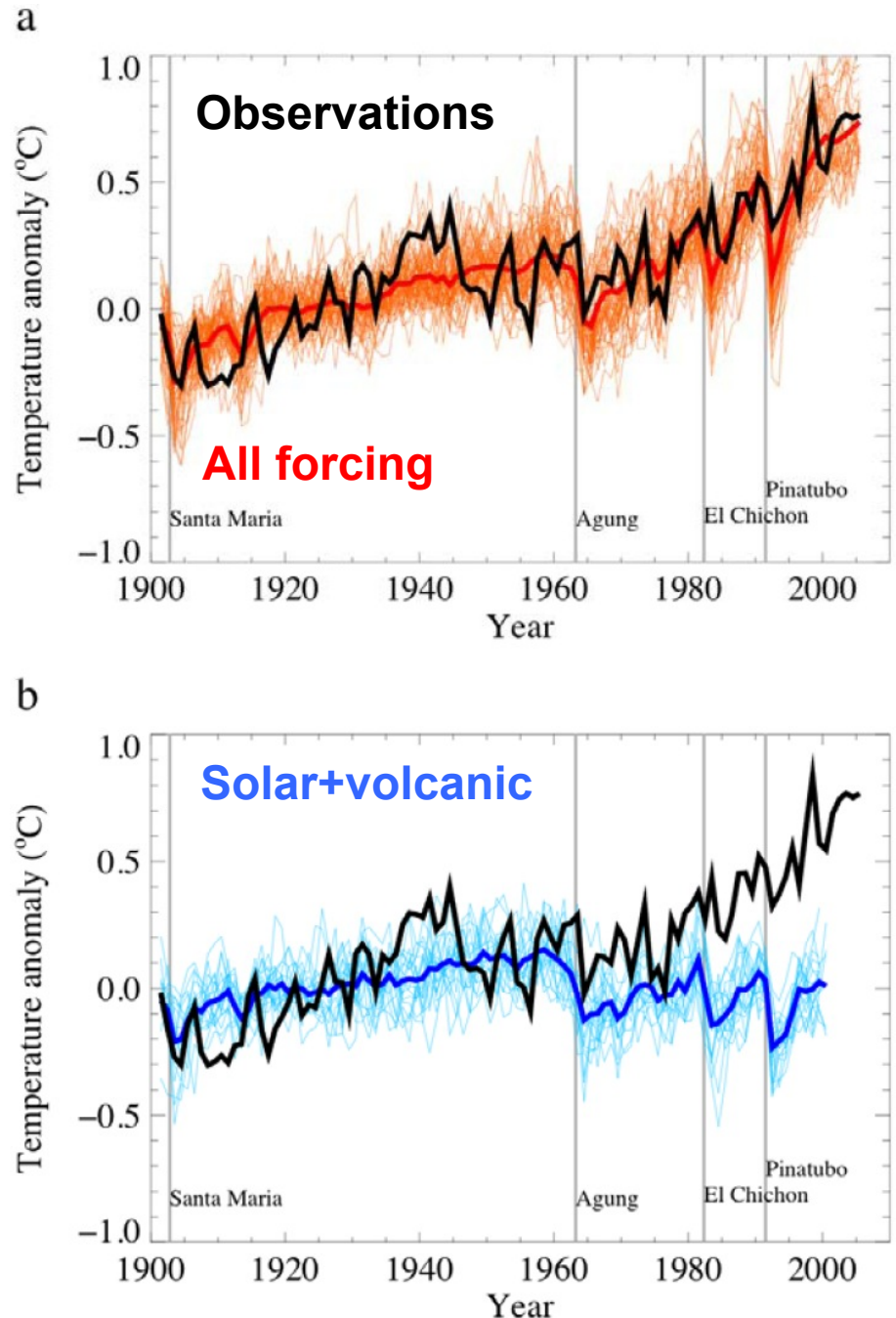


Units: GtC (billions tons of carbon) or GtC/year

Attribution

Are observed changes consistent with expected responses to natural forcings?

IPCC (2007):
“Warming is unequivocal, and most of the warming of the past 50 years is very likely (90%) due to increases in greenhouse gases.”

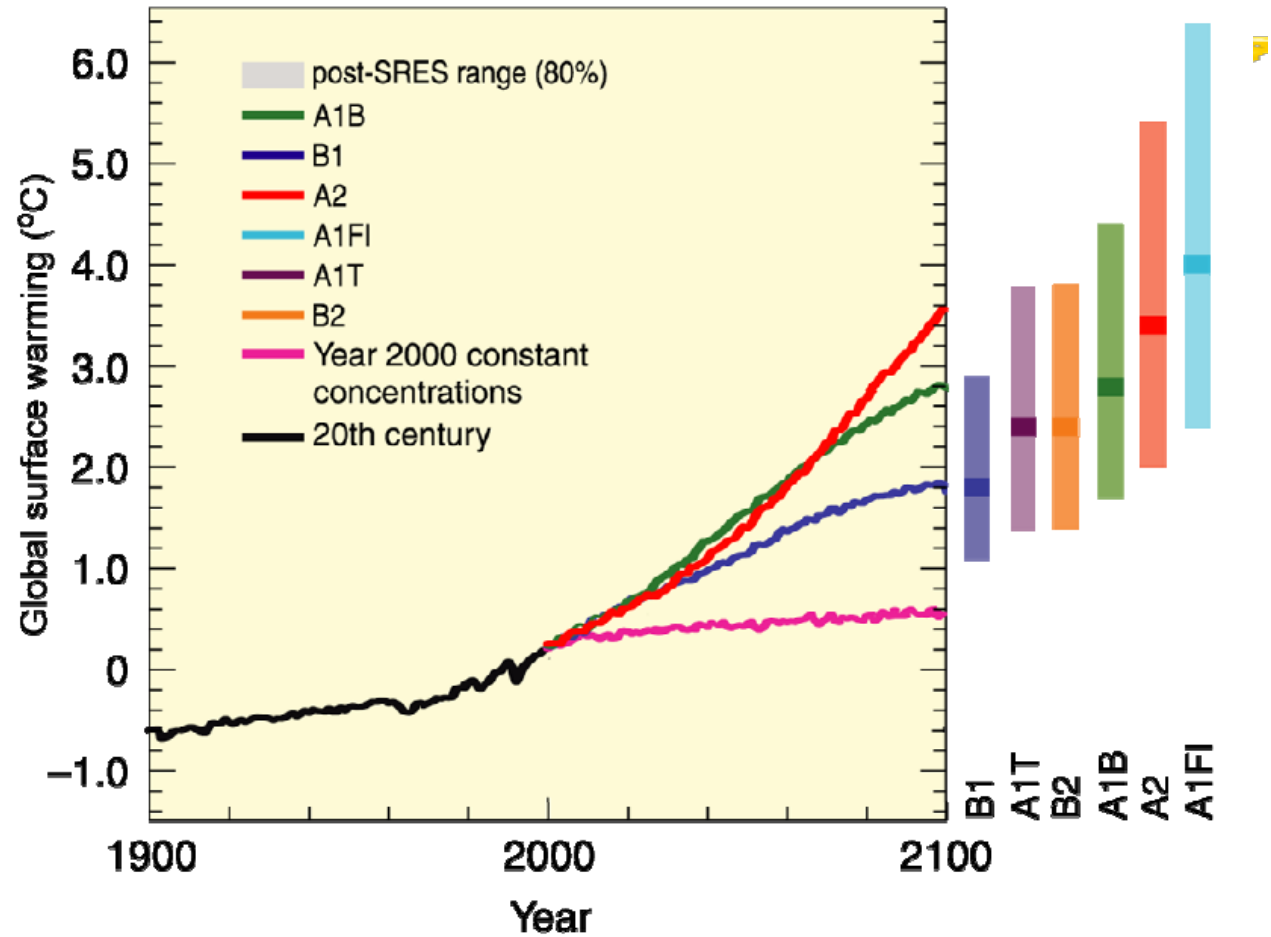
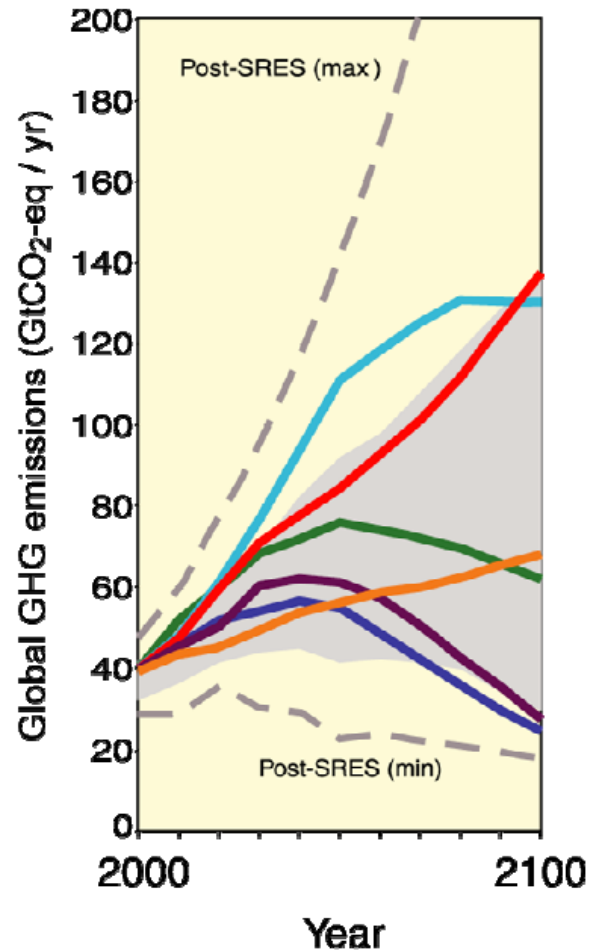


Challenges

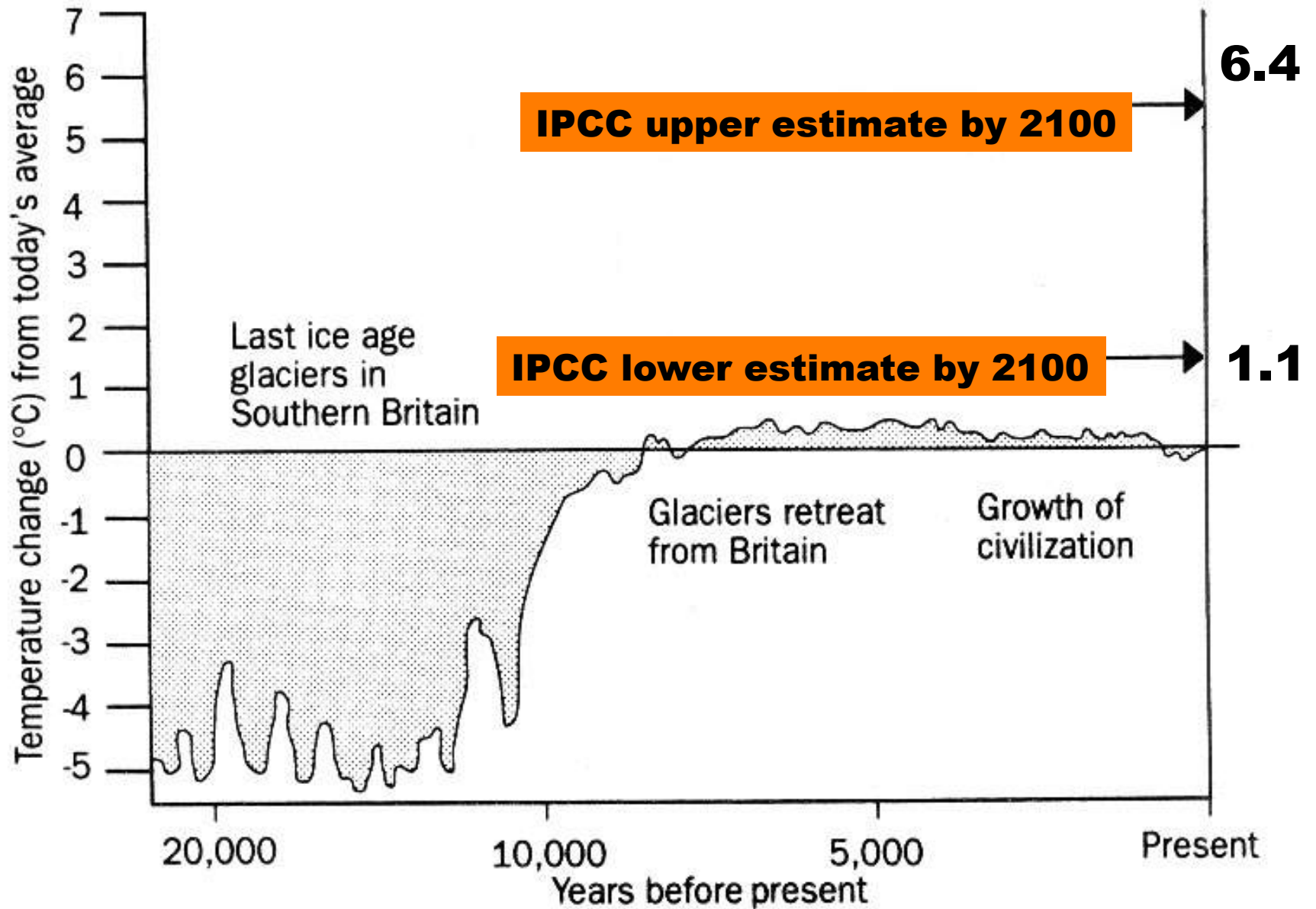


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Climate projections without mitigation



NB: écart par rapport à la moyenne 1980-1999

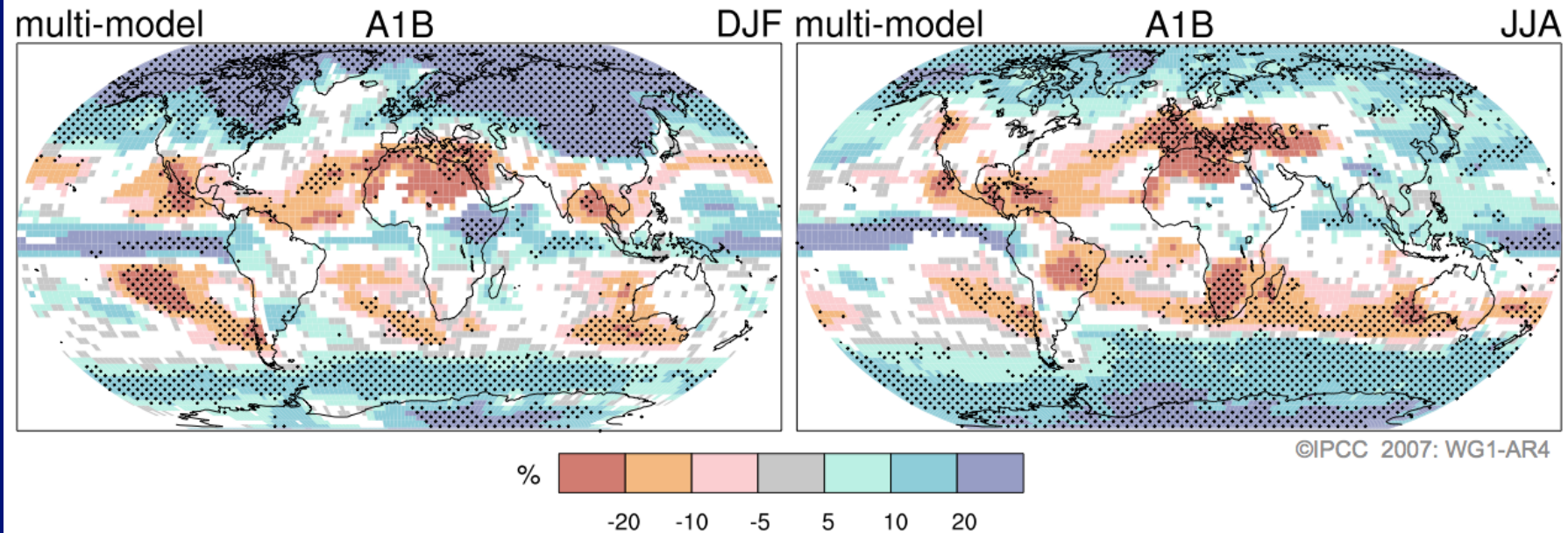


Ice sheet melting

- Melting of the Greenland ice sheet
 - Total melting would cause 7 m SLR contribution
- Melting of the West Antarctic Ice Sheet
 - Total melting would cause 5 m SLR contribution
- Warming of 1 – 4°C over present-day temperatures would lead to partial melting over centuries to millennia

Projections of Future Changes in Climate

Projected Patterns of Precipitation Changes



Brand new in AR4: Drying in much of the subtropics, more rain in higher latitudes, continuing the broad pattern of rainfall changes already observed.

Climate change and extremes

(IPCC AR4 WG1)

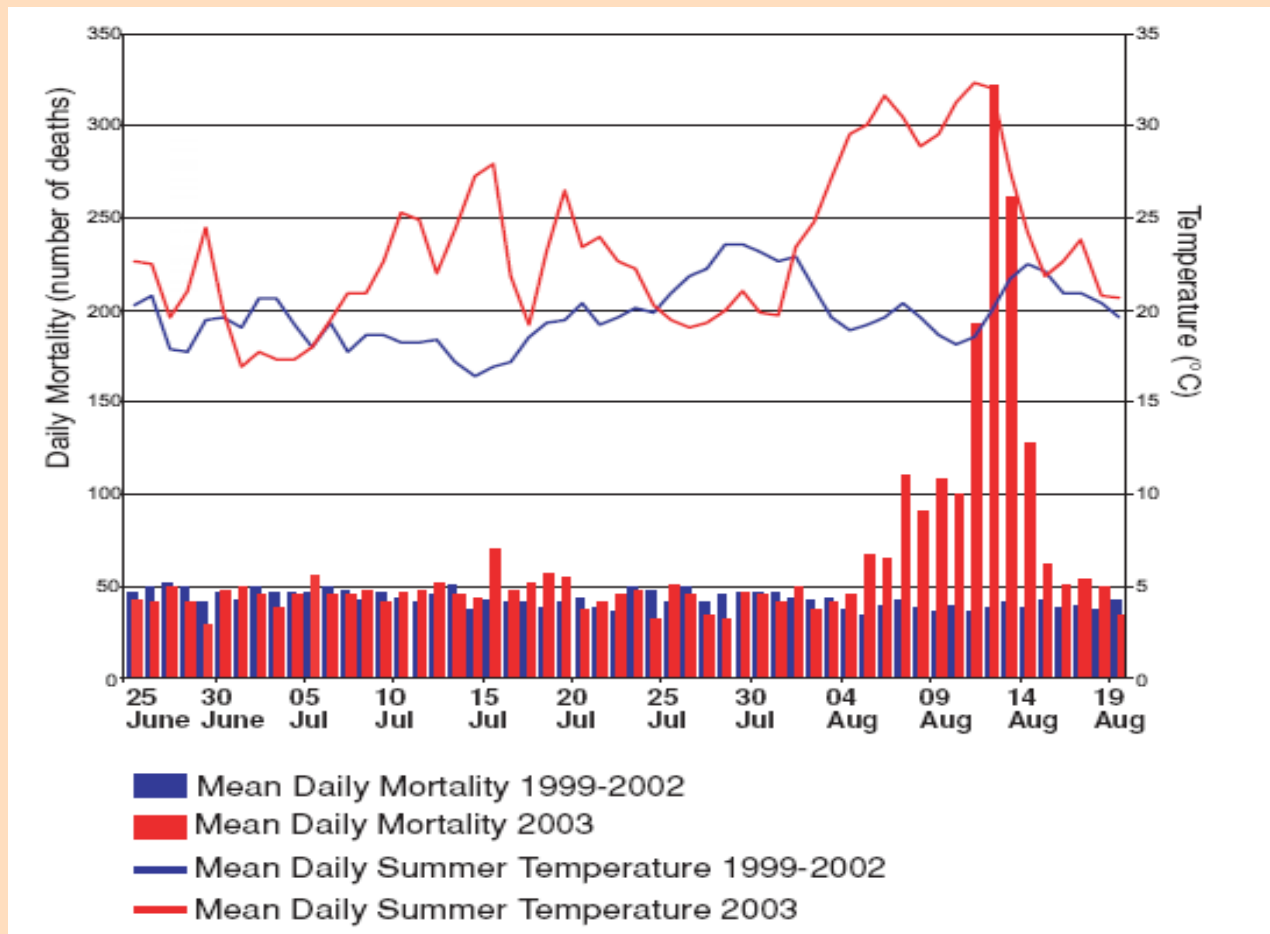
Post 1960

21th century

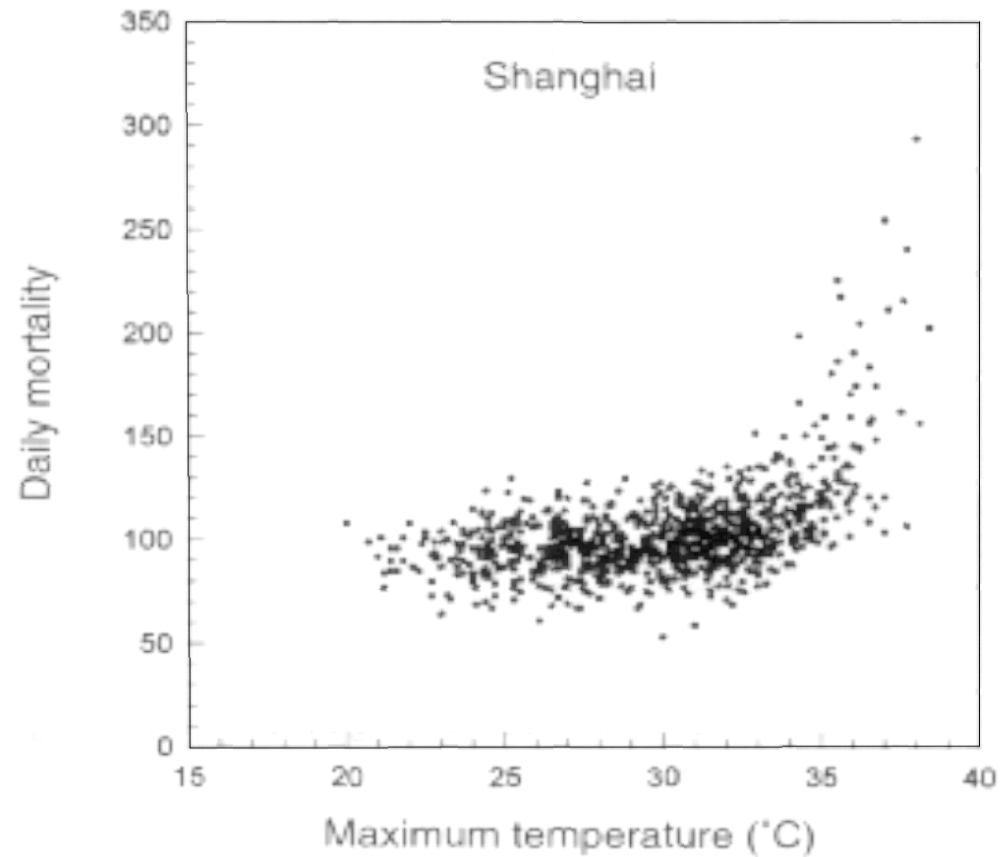
Phenomenon ^a and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend ^b	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	<i>Very likely^c</i>	<i>Likely^d</i>	<i>Virtually certain^d</i>
Warmer and more frequent hot days and nights over most land areas	<i>Very likely^e</i>	<i>Likely (nights)^d</i>	<i>Virtually certain^d</i>
Warm spells / heat waves. Frequency increases over most land areas	<i>Likely</i>	<i>More likely than not^f</i>	<i>Very likely</i>
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	<i>Likely</i>	<i>More likely than not^f</i>	<i>Very likely</i>
Area affected by droughts increases	<i>Likely in many regions since 1970s</i>	<i>More likely than not</i>	<i>Likely</i>
Intense tropical cyclone activity increases	<i>Likely in some regions since 1970</i>	<i>More likely than not^f</i>	<i>Likely</i>
Increased incidence of extreme high sea level (excludes tsunamis) ^g	<i>Likely</i>	<i>More likely than not^{f, h}</i>	<i>Likelyⁱ</i>

Virtually certain > 99%, very likely > 90%, likely > 66%, more likely than not > 50%

Daily mortality in Paris (summer 2003) (IPCC AR4 Ch 8)



Relationship between maximum temperature and mortality in Shanghai, China, 1980-89



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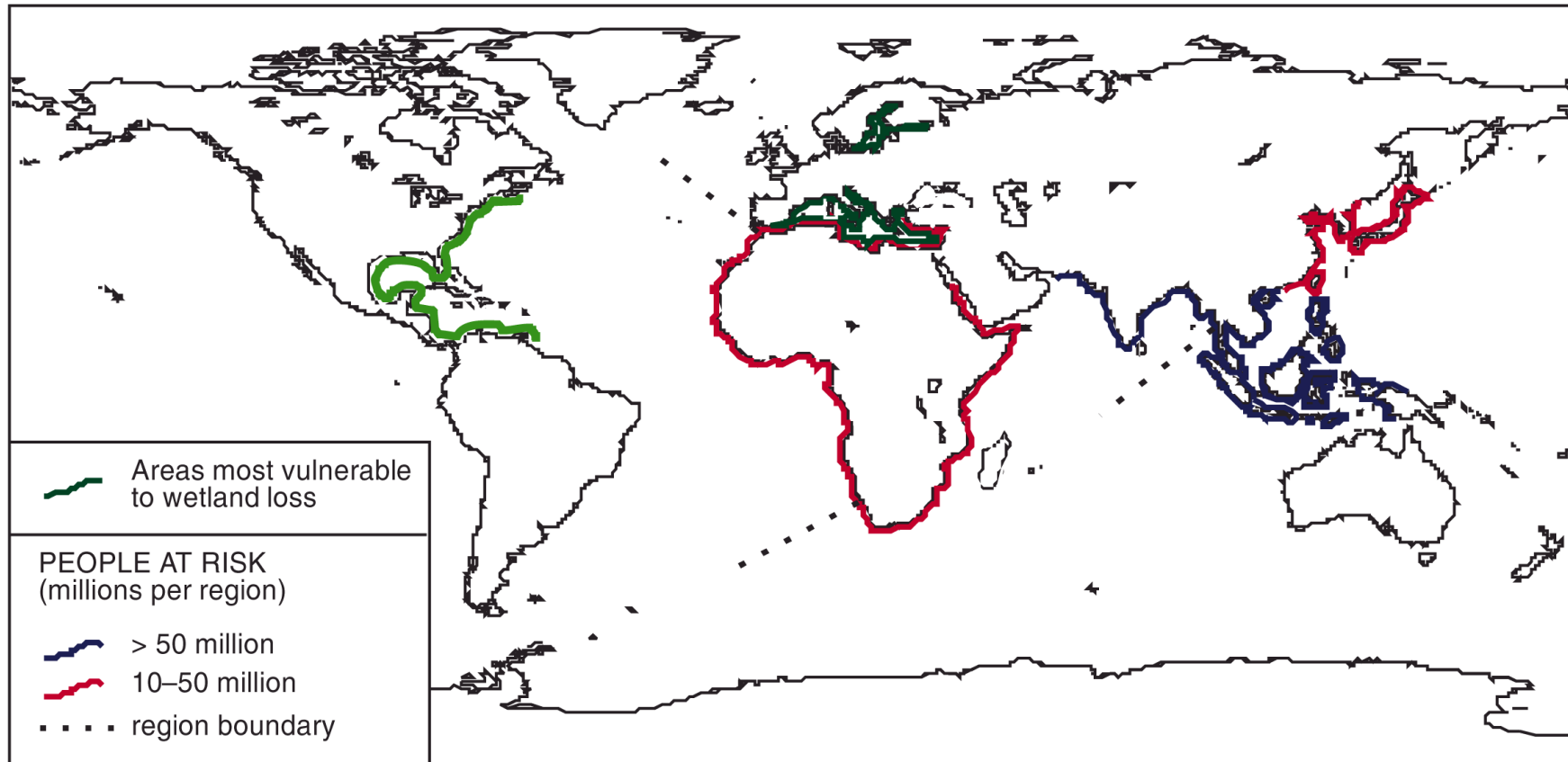
**With 8 metre sea-level rise: 3700 km² below sea-level in Belgium
(very possible in year 3000)
(NB: flooded area depends on protection)**



Source: N. Dendoncker (Dépt de Géographie, UCL), J.P. van Ypersele et P. Marbaix (Dépt de Physique, UCL) (www.climate.be/impact)

Tens of millions of people are projected to be at risk of being displaced by sea level rise

Assuming 1990s Level of Flood Protection



Source: R. Nicholls, Middlesex University in the U.K. Meteorological Office. 1997. *Climate Change and Its Impacts: A Global Perspective*.

Excerpts from IPCC AR4 WG2 (Chapter Europe)

- **For the first time, wide ranging impacts of changes in current climate have been documented in Europe**
 - retreat of glaciers, lengthening of growing season, shift of species, heat wave in 2003, ...
- **Climate-related hazards will mostly increase, although changes will vary geographically**
 - More winter floods in maritime regions, snowmelt-related floods in Central and E. Europe, flash floods throughout Europe.
 - Coastal flooding related to increasing storminess and sea level rise is likely to threaten up to 2.5 million additional people annually.
 - Some impacts may be positive, as in reduced risk of extreme cold events. However, on balance, health risks are very likely to increase.

Excerpts from IPCC AR4 WG2 (Chapter Europe)

- **It is anticipated that Europe's natural (eco)systems and biodiversity will be substantially affected by climate change. The great majority of organisms and ecosystems are likely to have difficulty in adapting to climate change.**
 - **A large percentage of the European flora is likely to become vulnerable, endangered, or committed to extinction by the end of this century.**
 - **Options for adaptation are likely to be limited for many organisms and ecosystems.**
 - **Low-lying, geologically-subsiding coasts are likely to be unable to adapt to sea-level rise.**
 - **New sites for conservation may be needed.**

Excerpts from IPCC AR4 WG2 (Chapter Europe)

- **Climate change is estimated to pose challenges to many European economic sectors and alter the distribution of economic activity.**
 - **Agriculture will have to cope with increasing water demand for irrigation in S. Europe.**
 - **Peak electricity demand is likely to shift in some locations from winter to summer.**
 - **Winter tourism in mountain regions is anticipated to face reduced snow cover.**

Excerpts from IPCC AR4 WG2 (Chapter Asia)

New evidences show that climate change has affected many sectors in Asia (medium confidence).

- The crop yield in many countries of Asia has declined, partly due to rising temperatures and extreme weather events. The retreat of glaciers and permafrost in Asia in recent years is unprecedented as a consequence of warming. The frequency of occurrence of climate-induced diseases and heat stress in Central, East, South and South-East Asia has increased with rising temperatures and rainfall variability. Observed changes in terrestrial and marine ecosystems have become more pronounced

Excerpts from IPCC AR4 WG2 (Chapter Asia)

Future climate change is likely to affect agriculture, risk of hunger and water resource scarcity with enhanced climate variability and more rapid melting of glaciers (medium confidence).

- **About 2.5 to 10% decrease in crop yield is projected for parts of Asia in 2020s and 5 to 30% decrease in 2050s compared with 1990 levels without CO2 effects (medium confidence).**
- **Freshwater availability in Central, South, East and South-East Asia, particularly in large river basins such as Changjiang, is likely to decrease due to climate change, along with population growth and rising standard of living that could adversely affect more than a billion people in Asia by the 2050s (high confidence)**

Excerpts from IPCC AR4 WG2 (Chapter Asia)

Marine and coastal ecosystems in Asia are likely to be affected by sea-level rise and temperature increases (high confidence).

- **Projected sea-level rise is very likely to result in significant losses of coastal ecosystems and a million or so people along the coasts of South and South-East Asia will likely be at risk from flooding (high confidence).**
- **(...) Coastal inundation is likely to seriously affect the aquaculture industry and infrastructure (...) (high confidence).**
- **Stability of wetlands, mangroves and coral reefs around Asia is likely to be increasingly threatened (high confidence).**
- **(...) Between 24% and 30% of the coral reefs in Asia are likely to be lost during the next 10 years and 30 years, respectively (medium confidence).**

Excerpts from IPCC AR4 WG2 (Chapter Asia)

Climate change is likely to affect forest expansion and migration, and exacerbate threats to biodiversity resulting from land use/cover change and population pressure in most of Asia (medium confidence).

- Increased risk of extinction for many flora and fauna species in Asia is likely as a result of the synergistic effects of climate change and habitat fragmentation
- In North Asia, forest growth and northward shift in the extent of boreal forest is likely
- The frequency and extent of forest fires in North Asia is likely to increase in the future (...)

Excerpts from IPCC AR4 WG2 (Chapter Asia)

Future climate change is likely to continue to adversely affect human health in Asia (high confidence).

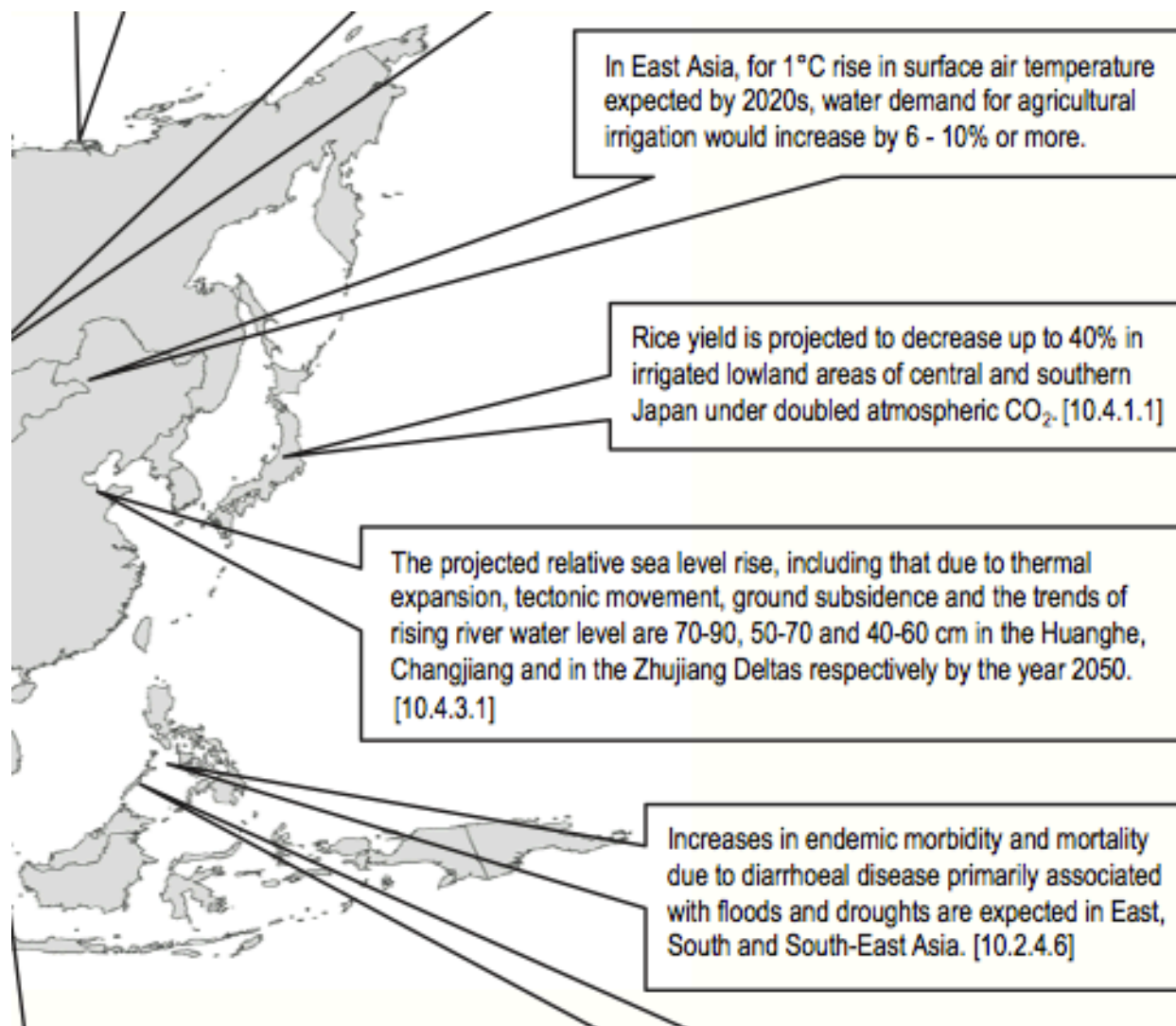
- **Increases in endemic morbidity and mortality due to diarrhoeal disease primarily associated with climate change are expected in South and South-East Asia** (high confidence).
- **Increases in coastal water temperature would exacerbate the abundance and/or toxicity of cholera in south Asia** (high confidence).
- **Natural habitats of vector-borne and water-borne diseases in north Asia are likely to expand in the future** (medium confidence).

Excerpts from IPCC AR4 WG2 (Chapter Asia)

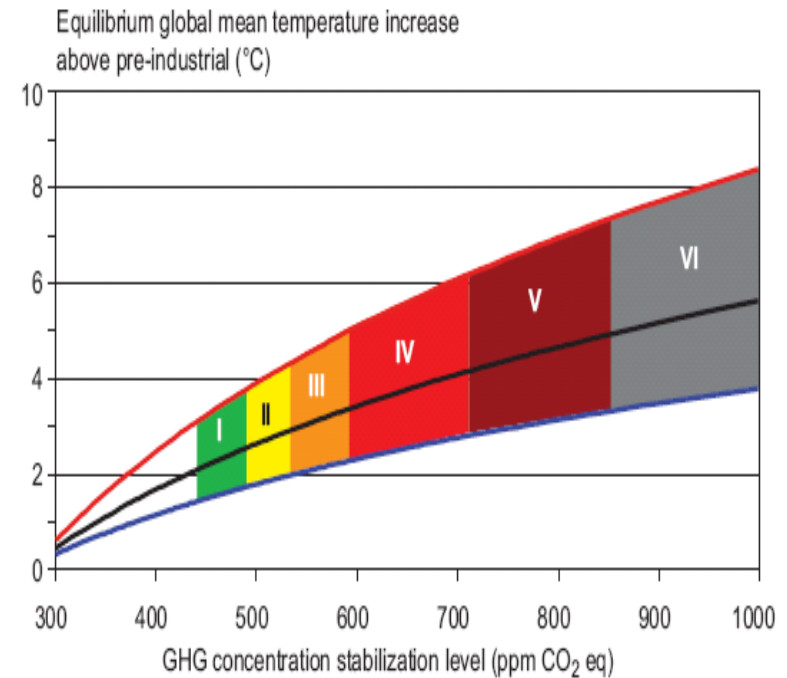
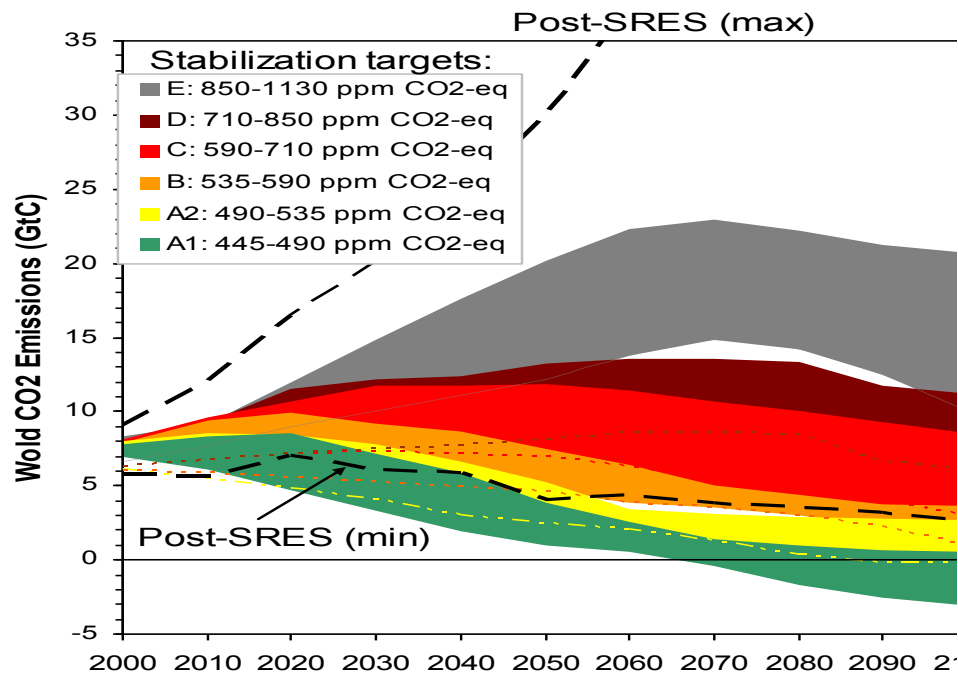
Multiple stresses in Asia will be compounded further due to climate change (high confidence).

- **It is likely that climate change will impinge on sustainable development of most developing countries of Asia as it compounds the pressures on natural resources and the environment associated with rapid urbanisation, industrialisation and economic development.**
- **Mainstreaming sustainable development policies and the inclusion of climate-proofing concepts in national development initiatives are likely to reduce pressure on natural resources and improve management of environmental risks**

Hotspots of key future climate impacts and vulnerabilities in East Asia



The lower the stabilisation level the earlier global emissions have to go down



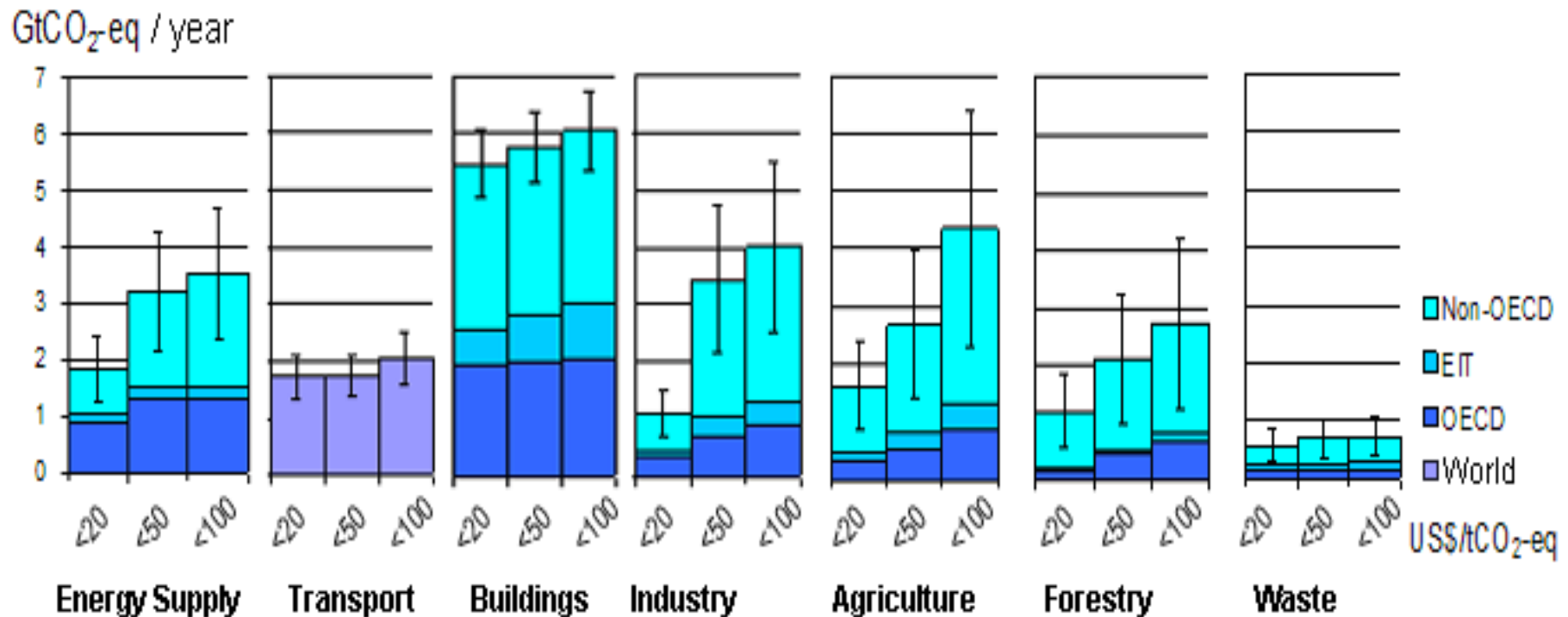
Multigas and CO₂ only studies combined

Opportunities



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All sectors and regions have the potential to contribute by 2030



Note: estimates do not include non-technical options, such as lifestyle changes.

There are also co-benefits of mitigation

- Near-term health benefits from **reduced air pollution** may offset a substantial fraction of mitigation costs
- Mitigation **can also be positive for: energy security, balance of trade improvement, provision of modern energy services to rural areas and employment**

BUT

- Mitigation in one country or group of countries could lead to higher emissions elsewhere (“carbon leakage”) or effects on the economy (“spill-over effects”).

The importance of a “price of carbon”

- **Policies that provide a real or implicit price of carbon could create incentives for producers and consumers to significantly invest in low-GHG products, technologies and processes.**
- **Such policies could include economic instruments, government funding and regulation**
- **For stabilisation at around 550 ppm CO_{2eq} carbon prices should reach 20-80 US\$/tCO_{2eq} by 2030 (5-65 if “induced technological change” happens)**
- **At these carbon prices large shifts of investments into low carbon technologies can be expected**
- **For stabilisation at around 450 ppm CO_{2eq} carbon prices should reach 100-200 US\$/tCO_{2eq} by 2030 (multiply by 25 for a tonne of CH₄)**

Stern Review (2006): *Climate change is the greatest market failure the world has ever seen*



- ***Three elements of policy are required for an effective global response.***
 - ***Pricing of carbon, implemented through tax, trading or regulation.***
 - ***Policy to support innovation and the deployment of low-carbon technologies.***
 - ***A to remove barriers to energy efficiency, and to inform, educate and persuade individuals about what they can do to respond to climate change***

Chinese Proverbs:



- ***If we do not change our direction, we are likely to end up where we are headed.***
- ***'It is better to light one candle than to curse the darkness'* (Lao-Tseu)**

Useful links:



- www.ipcc.ch : IPCC
- www.climate.be/vanyp : my slides and other documents