

Climate Change: current understanding and issues

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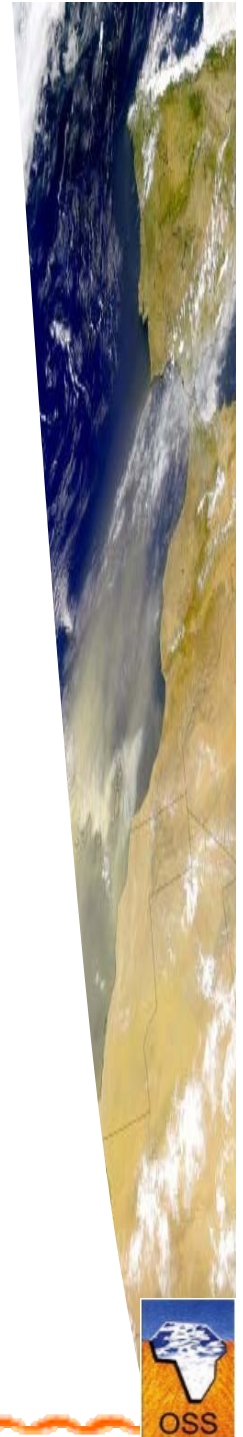


**Climate Change:
current understanding and issues**

Outlines...

- Policy-relevant results from AR4 and some
- latest findings to be assessed in AR5

The AR4 Synthesis Report	<u>WG I</u> The Physical Science Basis	WG II Impacts, Adaptation and Vulnerability	WG III Mitigation of Climate Change
			

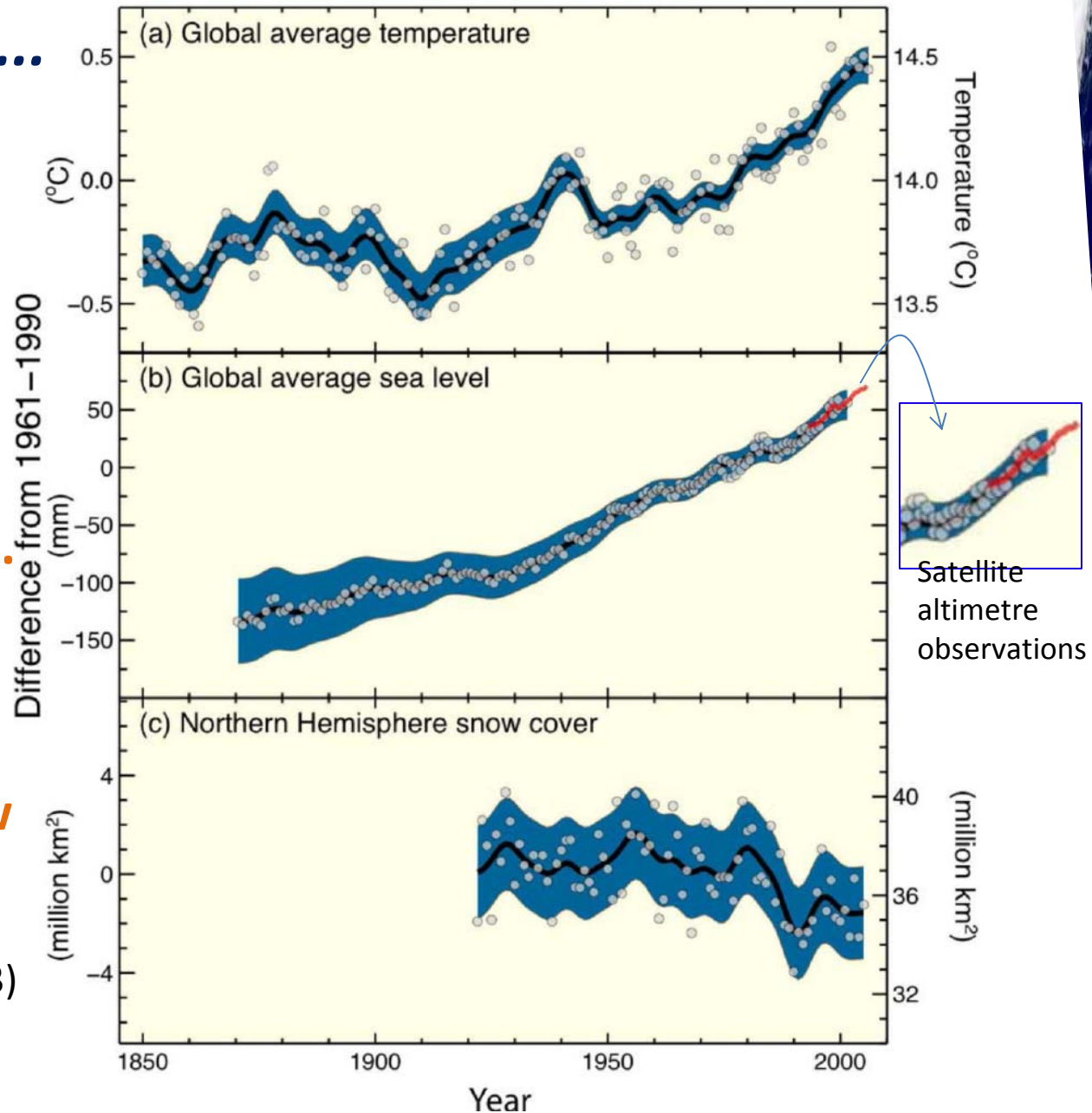


Warming in the climate system is unequivocal...

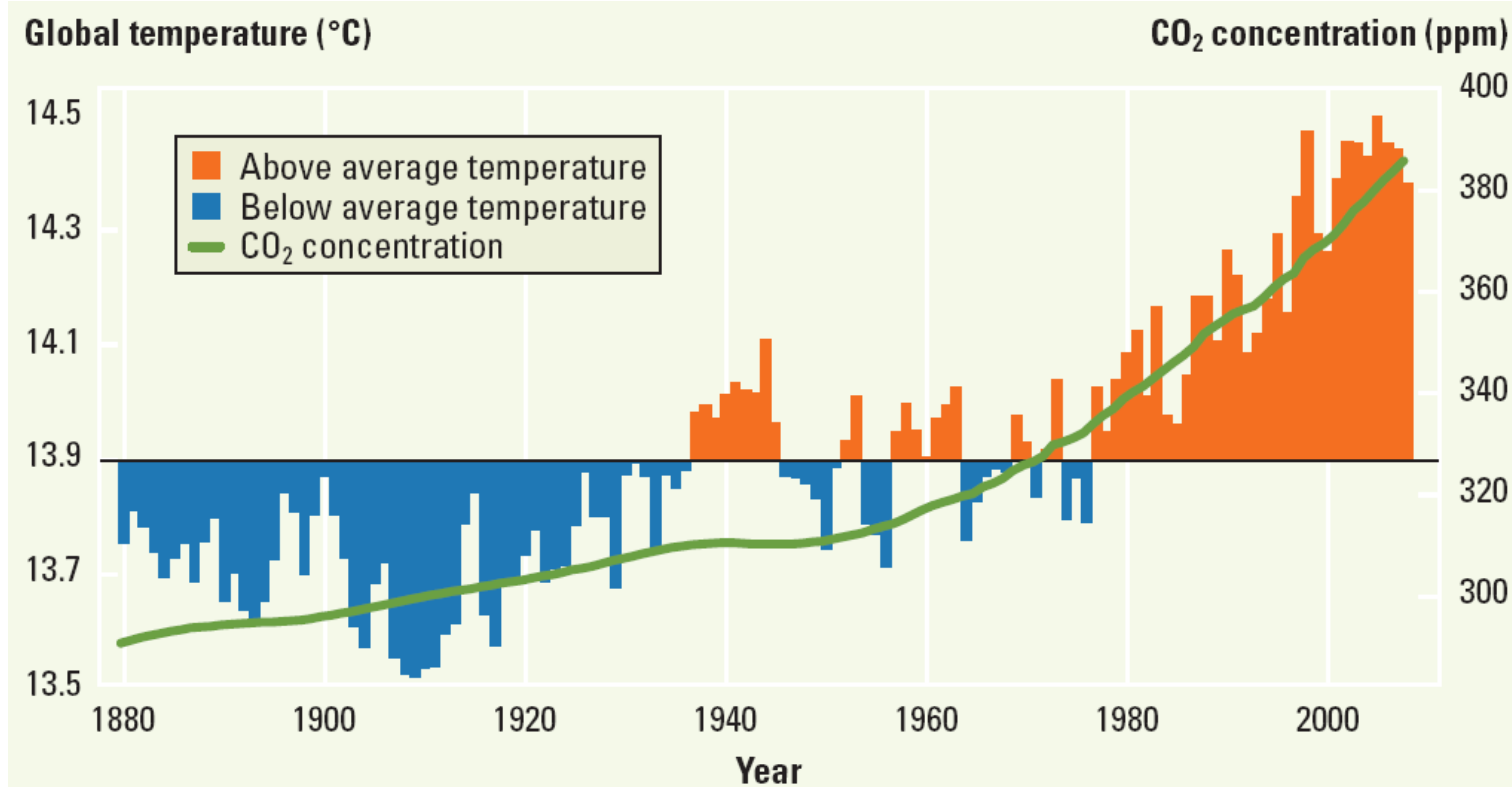
There are many observations of increasing
air and ocean temperatures,
rising sea levels,
and
widespread melting of snow and ice

(IPCC, 2007, Fig. SPM-3)

IPCC (2007):



Global annual average temperature and CO₂ concentration continue to climb, 1880–2007

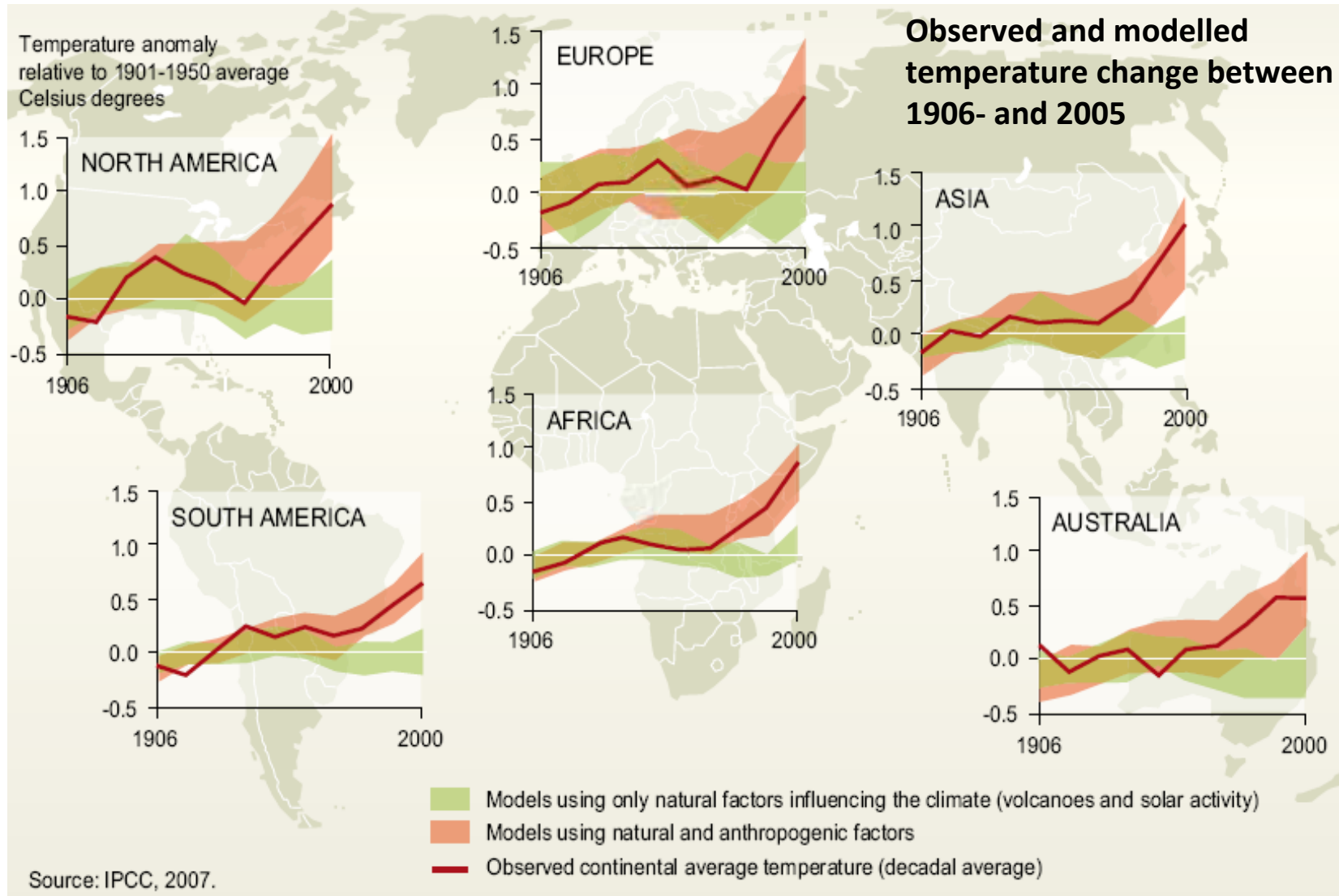


Source: Adapted from Karl, Melillo, and Peterson 2009.

Temperatures today are already 0.8°C above preindustrial levels

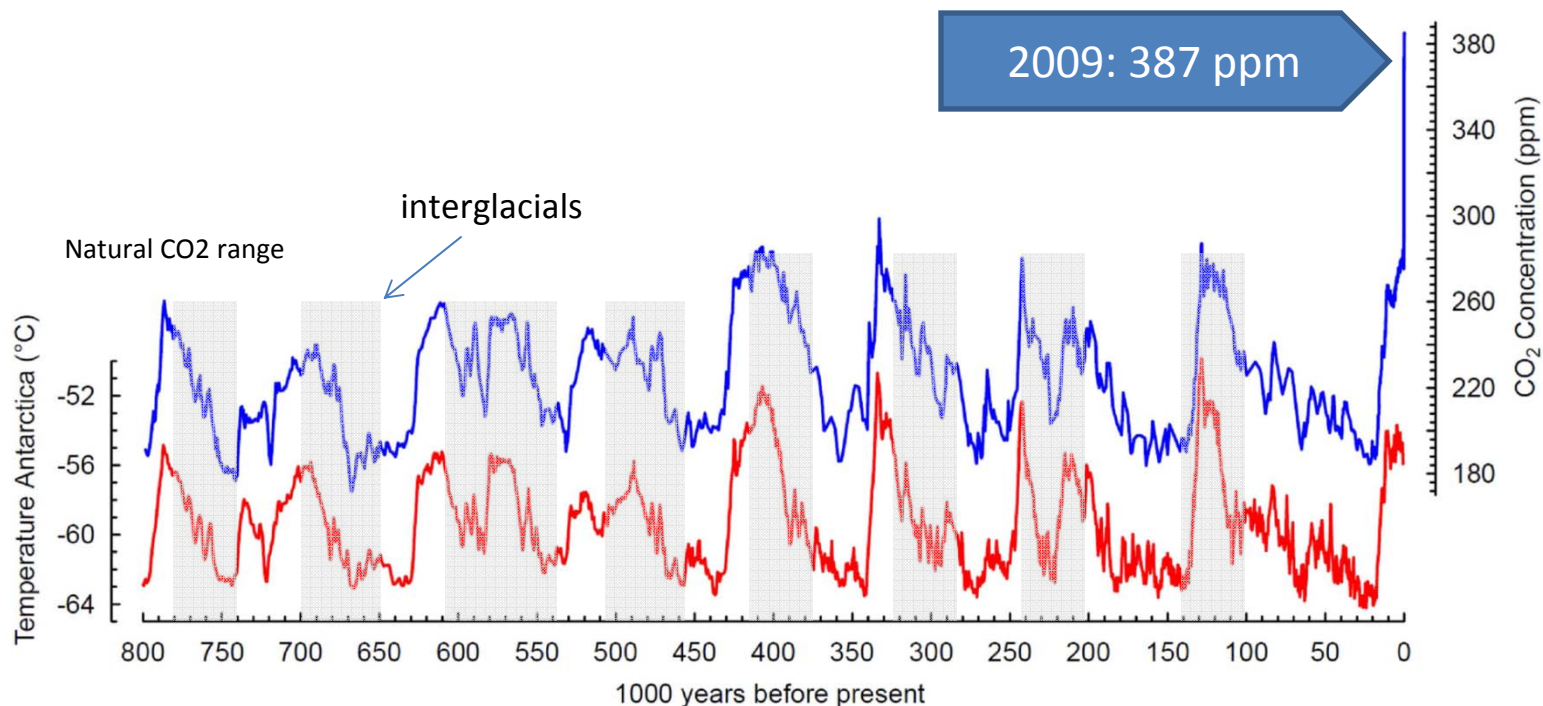
9 of the 10 warmest years on record have occurred during the past decade

Most of the observed increase in global averaged temperature ... is very likely due to ... increase in GHG concentrations. IPCC (2007):



Some policy-relevant findings to be assessed in AR5:

CO₂: Higher levels and more rapid increase

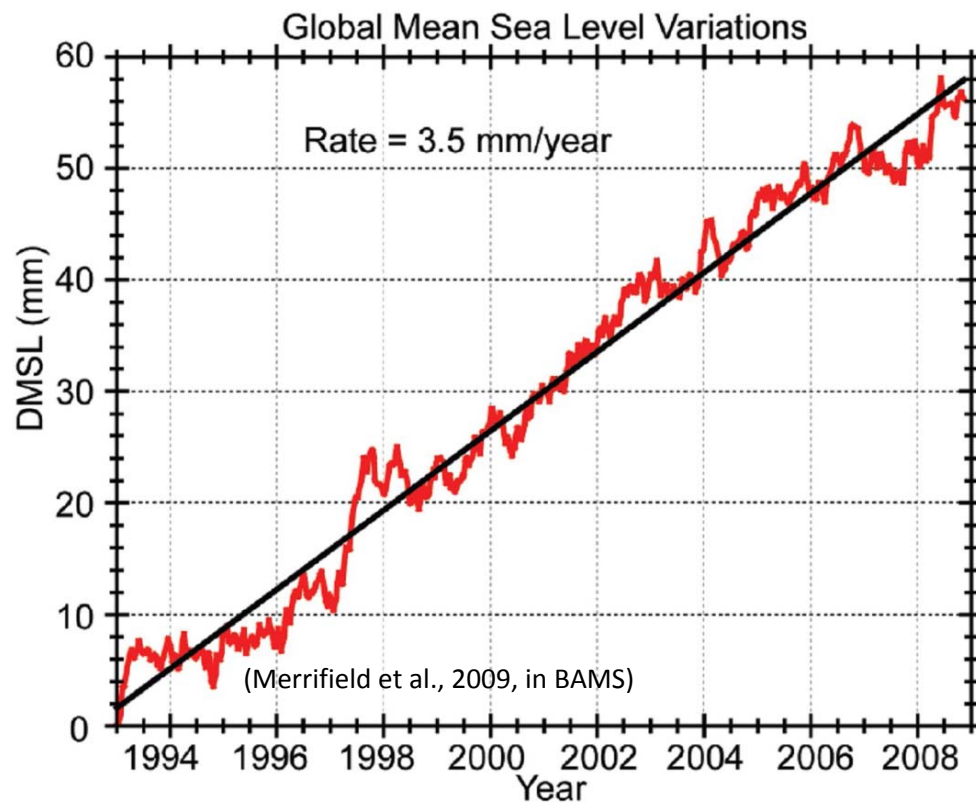


(Siegenthaler et al., 2005; Lüthi et al., 2008, NOAA)

Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. IPCC 2007

Some policy-relevant findings to be assessed in AR5:

Persistent sea-level rise consistent with earlier estimates



Merrifield et al., 2009:

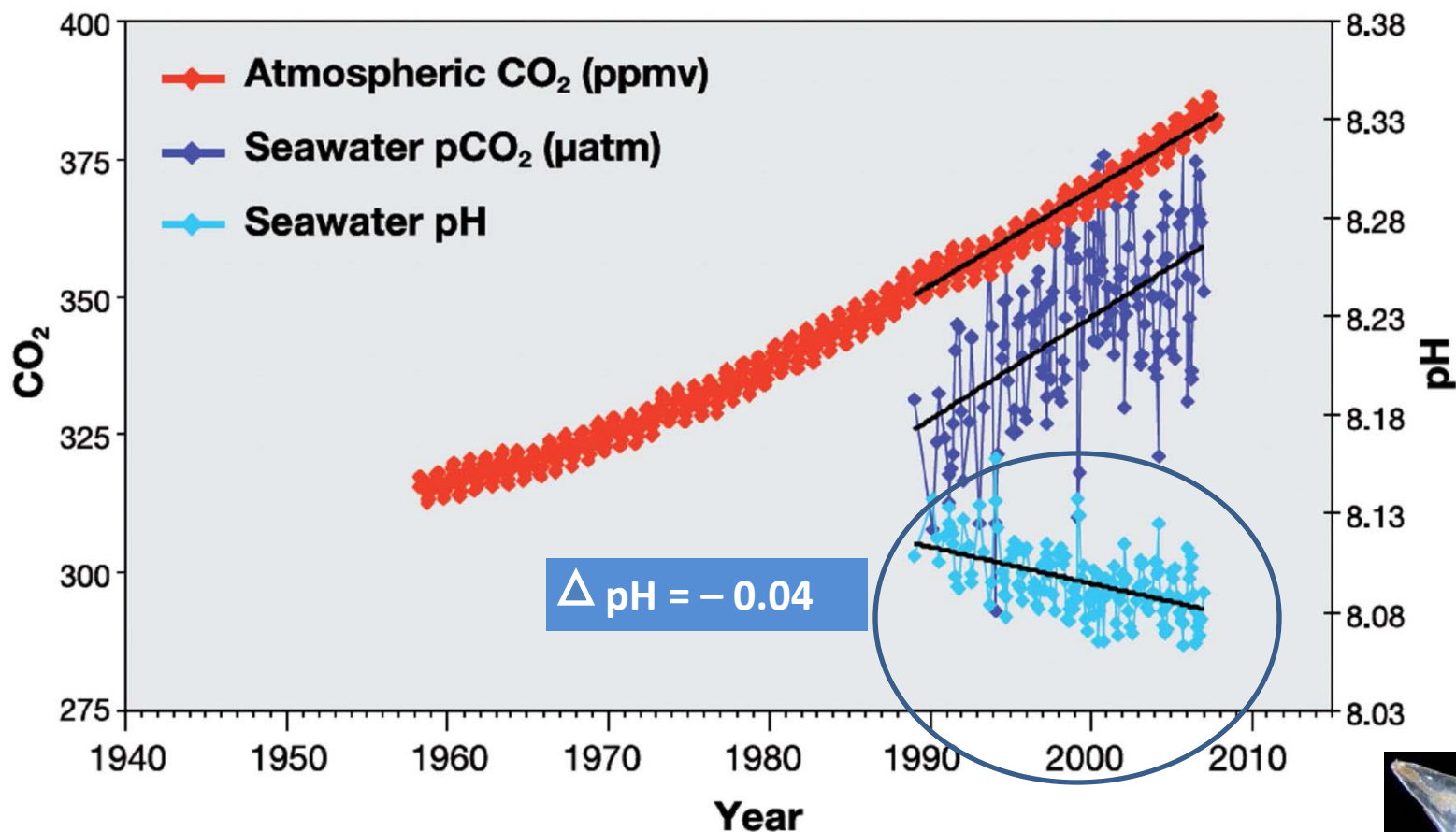
[1993–2008] (3.5 ± 0.4) mm/yr

IPCC 2007:

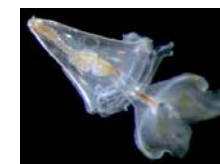
[1993–2003] (3.1 ± 0.7) mm/yr

Some policy-relevant findings to be assessed in AR5:

Acidification of world ocean due to increase of CO₂

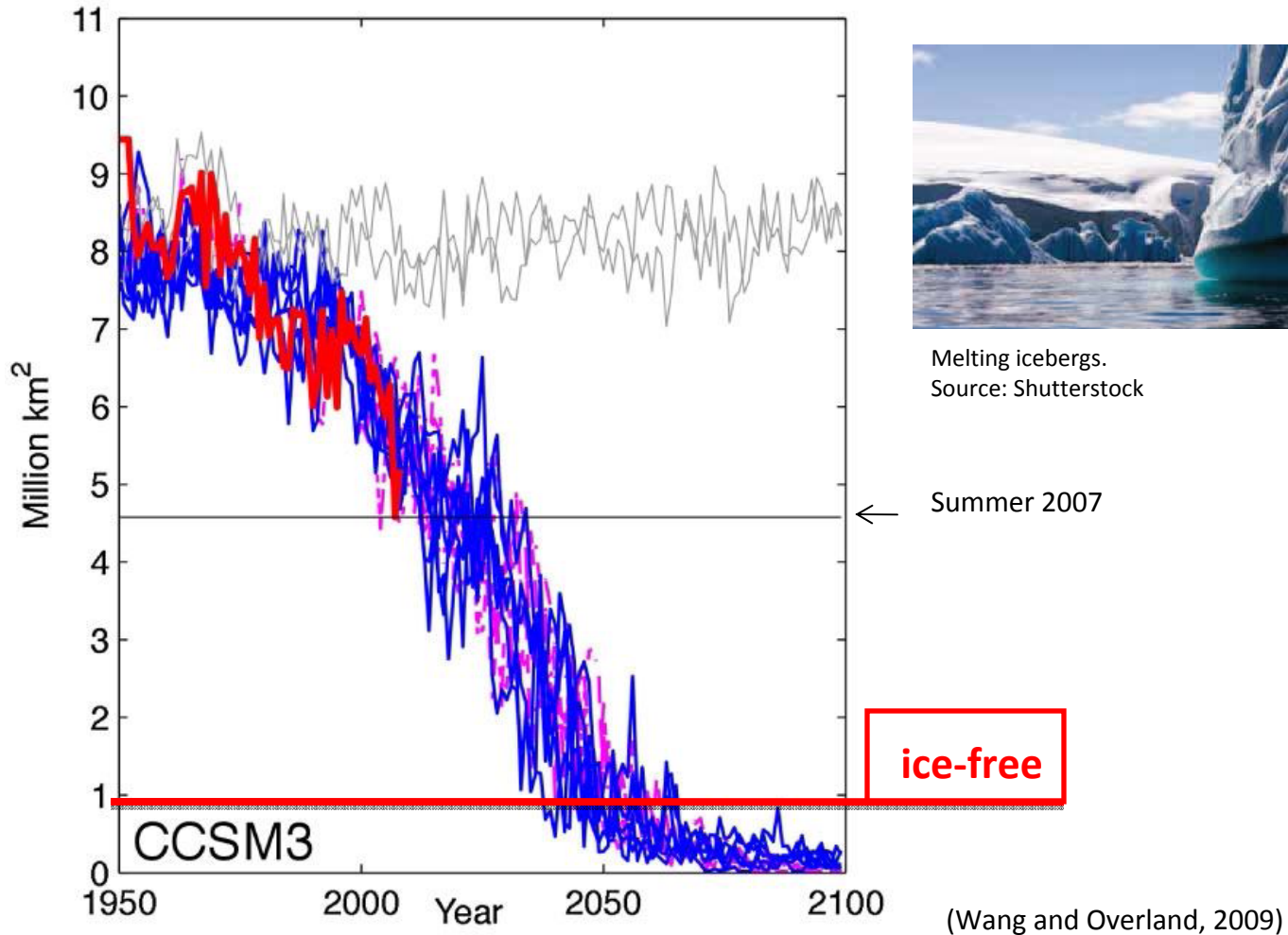


(Feely, 2008, in BAMS)

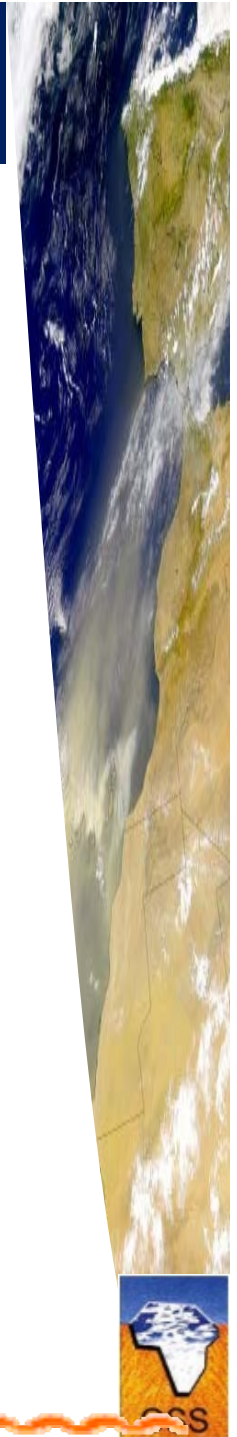


Some policy-relevant findings to be assessed in AR5:

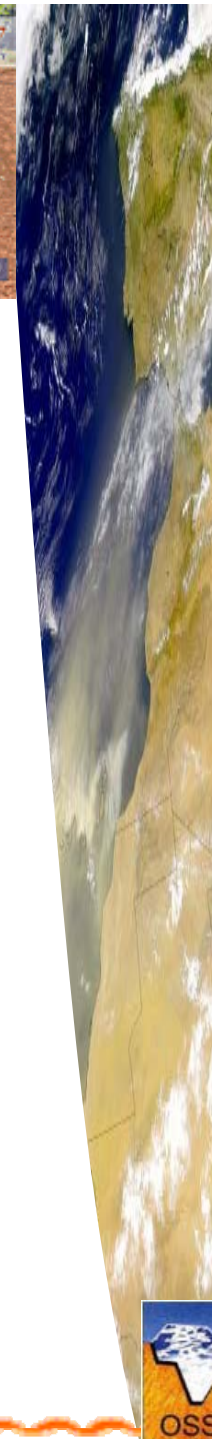
A sea ice free summer Arctic within 30 years?



Melting icebergs.
Source: Shutterstock



Policy-relevance of the Working Group II Contribution to IPCC AR4 (Fourth Assessment Report)



The issues have remained largely the same over the past 20 years:

1. the impacts on key areas: food, water, security of settlement, human health
2. how can we best adapt?

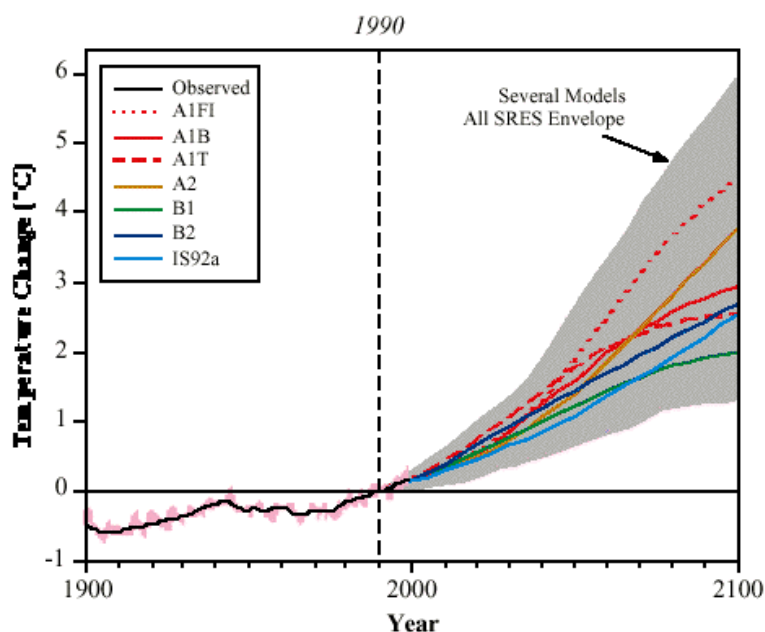
But the level of knowledge has been steadily refined, especially concerning:

1. the location of the projected impacts (spatial resolution)
2. their timing (temporal resolution)
3. the nature of the impact
4. adaptation and vulnerability
5. current observation of effects

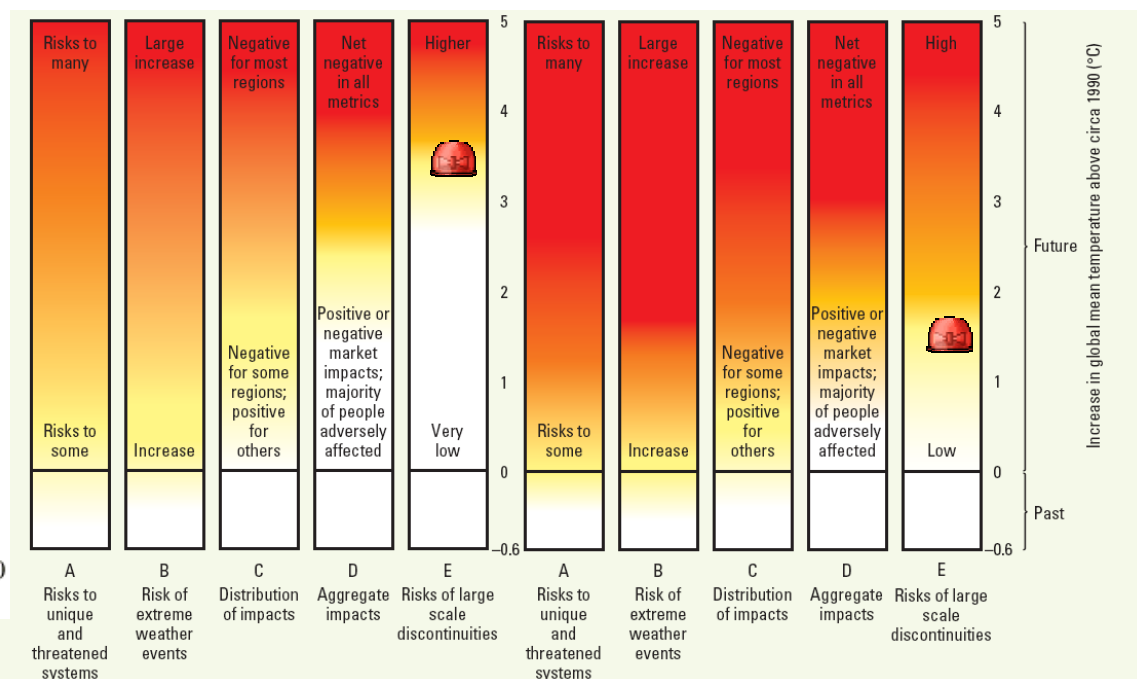
Policy-relevance of the Working Group II Contribution to IPCC AR4 (Fourth Assessment Report)

Increasing spatial resolution:
Identifying most vulnerable places and sectors

risks from climate change



TAR (2001) Reasons for concerns Updated Reasons for concerns



Source: Reproduced from Smith and others 2009

Assesment of risks and damages has increased from 2001 to 2009

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INCREASING SPATIAL RESOLUTION: AR4 named most vulnerable regions and sectors

Regions most affected: The Arctic,
Sub-Saharan Africa, Small islands,
Asian & African megadeltas

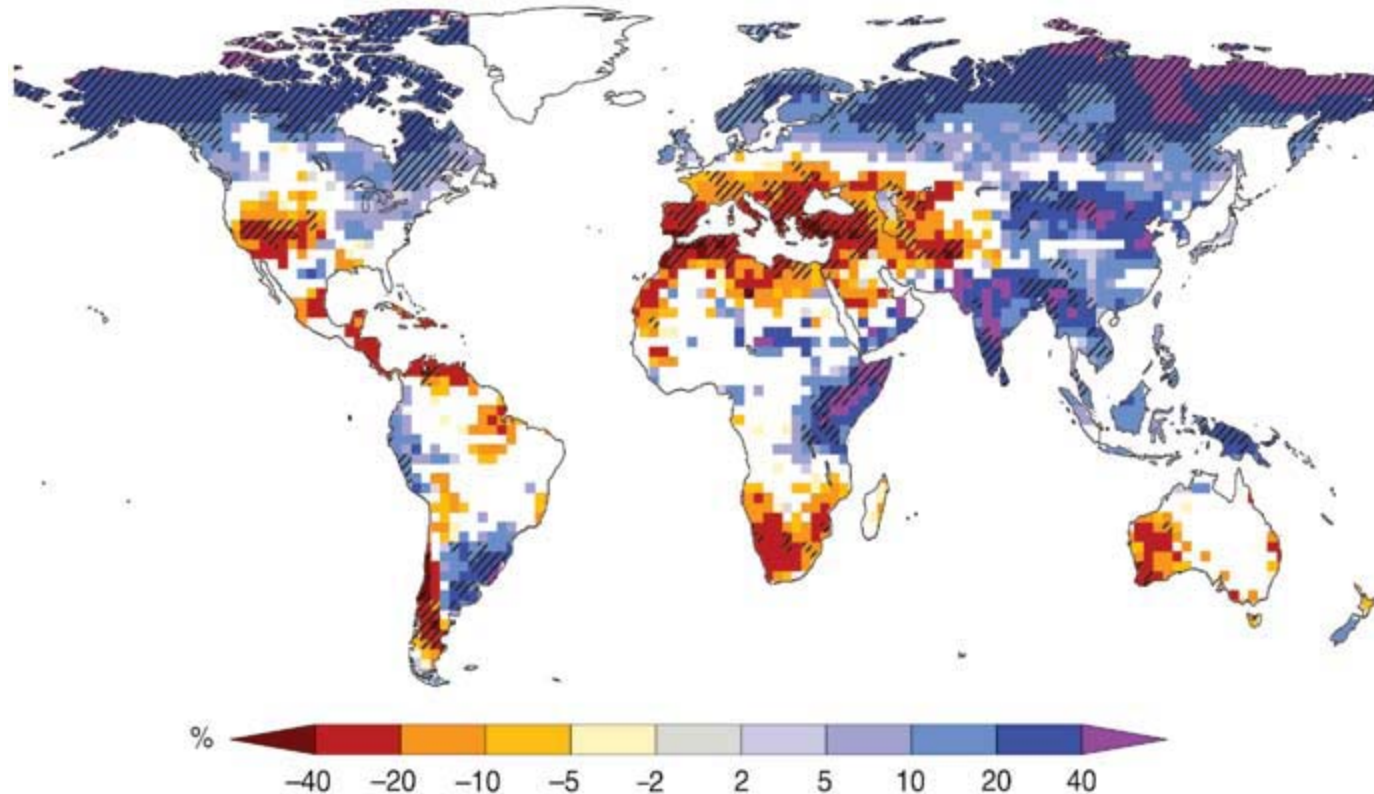
Most vulnerable sectors

- Water in the dry tropics
- Agriculture in low latitudes
- Human health in poor countries
- Where activities depend on sensitive ecosystems, especially:
tundra, boreal, mountain; or ecosystems already stressed
e.g. mangroves, coral reefs

**In all regions , there are some areas and communities
which are particularly vulnerable:** The poor, Young
children, The elderly

THE NATURE OF PROJECTED IMPACTS: e.g.

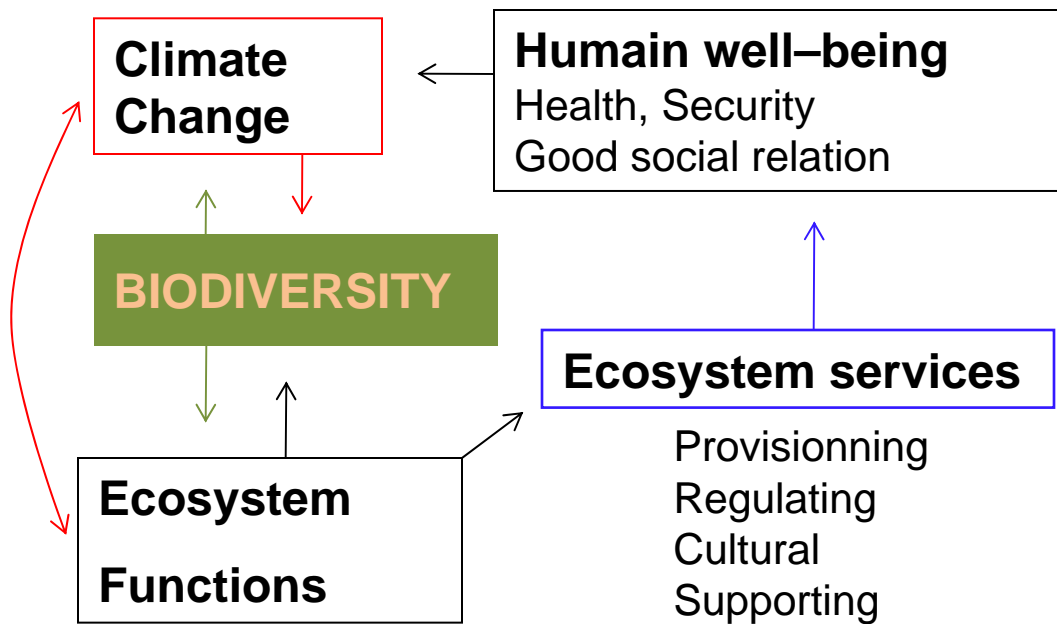
Water Water at the end of the 21st century for SRES A1B



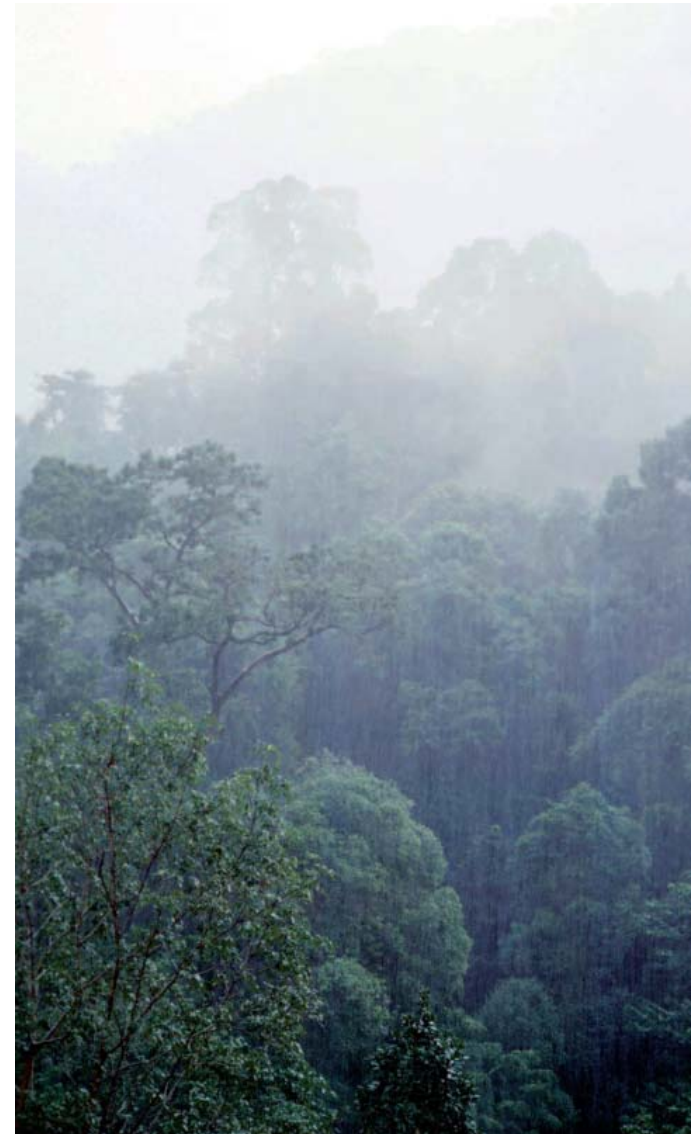
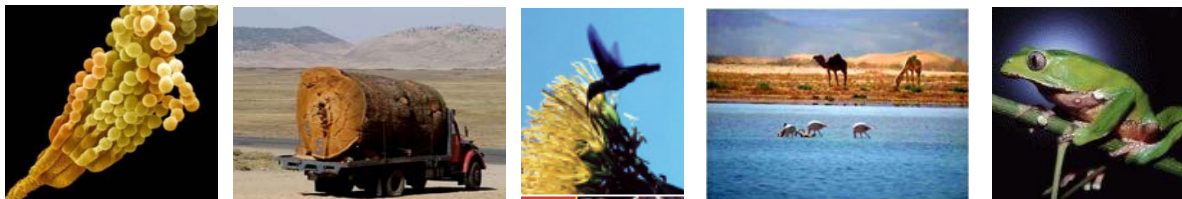
Large-scale relative changes in annual runoff for the period 2090–2099, relative to 1980–1999. White areas are where less than 66% of the ensemble of 12 models agree on the sign of change, and hatched areas are where more than 90% of models agree on the sign of change (Milly et al., 2005). [Based on SYR Figure 3.5 and WGII Figure 3.4]

IPCC Technical Paper VI , June 2008

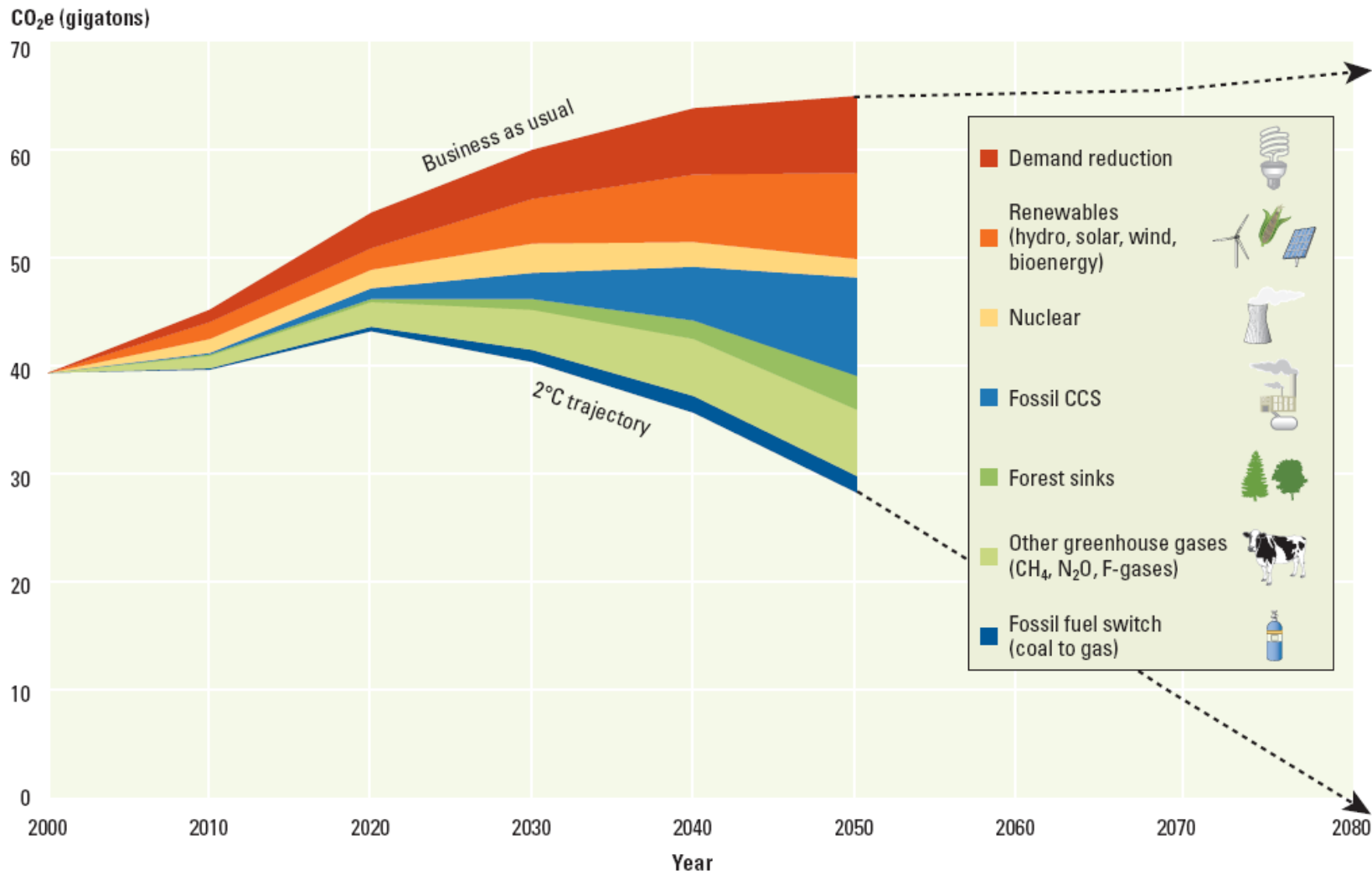
20% -30% of plants and animals species at increased risk of extinction *if ΔT 1.5°C -2.5°C (above 1990 temperature)*



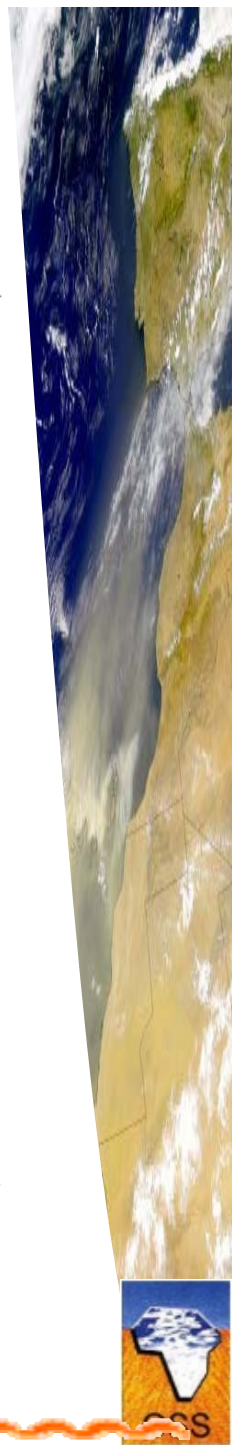
source: MA (2005) modified



The full portfolio of existing measures and advanced technologies, not a silver bullet, will be needed to get the world onto a 2°C path



Source: WDR team with data from IIASA 2009.



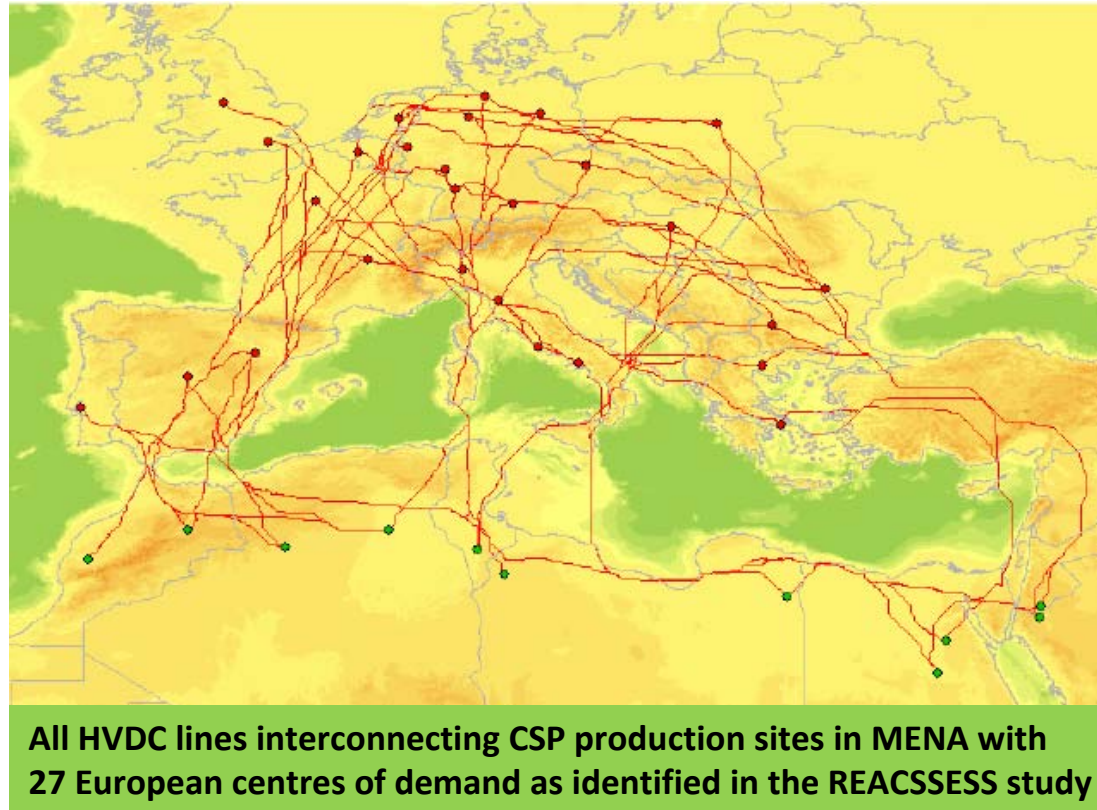
TREC: Trans-Mediterranean Renewable Energy Cooperation

DESERTEC Concept:

Desert + technology
for energy, water
and climate security

Sun-belt +
Technology belt:

- Interconnection
- Technology cooperation
- As if there were no borders



- renewable resources greatly exceed the present and future electricity demands
- **solar radiation** is by far the most abundant source of energy
- 1 km² of desert land avoids 200,000 tons CO₂ per year
- 1% of the Sahara desert can provide the electricity demand of the world

Robust findings

Observed changes in climate, their effects and their causes

→ Warming is unambiguous, as demonstrated by observations such as:

- rises in global average air and sea temperatures and average sea levels,
- widespread melting of snow and ice;

→ Most of the warming over the last 50 years is "very likely" to have been caused by anthropogenic increases in greenhouse gases.

Causes and projections of future climate changes and their impacts

→ Global GHG emissions will continue to grow over decades unless there are new policies to reduce climate change and to promote sustainable development.

Responses to climate change

→ Some planned adaptation to climate change is occurring, but much more is needed to reduce vulnerability.

→ Many technologies to mitigate climate change are already available or likely to be so by 2030. But incentives and research are needed to improve performance and cut cost.

uncertainties

Observed changes in climate, their effects and their causes

- Limited climate data coverage in some regions.
- There is still uncertainty about the scale of CO₂ emissions due to changes in land use, and the scale of methane emissions from individual sources.

Causes and projections of future climate changes and their impacts

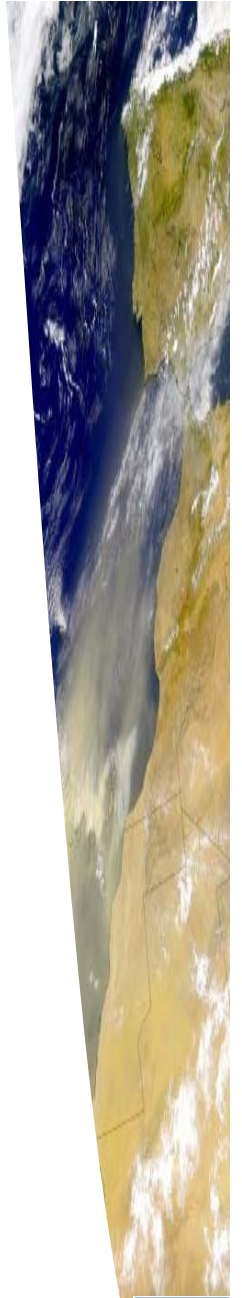
- Possible future changes in the Greenland and Antarctic ice sheets are a major source of uncertainty about rising sea levels

Responses to climate change

- Not enough is known about how policies unrelated to climate will affect emissions.

Conclusions:

- **Climate is changing fast due to GHG**
- **Wide-spread melting of ice margins is observed in Greenland and Antarctica with implications for sea level rise;**
- **Rapid and large changes of the statistics of extreme events will pose increasing challenges to adaptation;**
- **Adaptation is essential to cope with the unavoidable**
- **Mitigation is essential to prevent the avoidable**
- **Special report on Extremes and Disasters: available in 2011**
- **Special report on Renewable Energy Sources and CC Mitigation :available in 2011**
- **AR5-WGs contribution, available in 2014**





Thank you

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Air Quality in North Africa,
Tunis November 2009

