Article 2: Preventing Dangerous Interference with the Climate System

CAN Side Event

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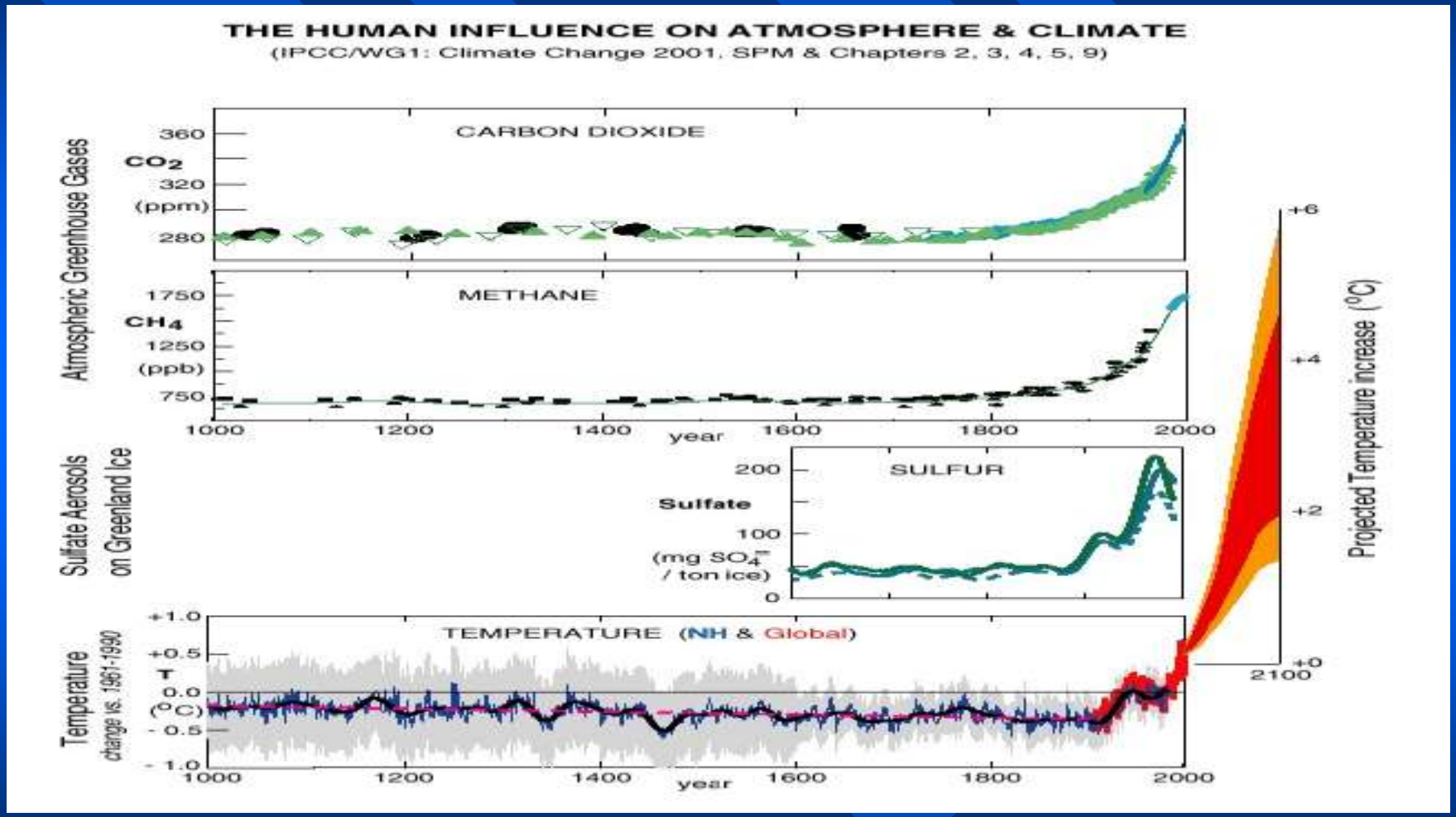
COP10

Article 2: What it says

Ultimate objective to prevent dangerous anthropogenic **interference with the climate system** ... within a time frame sufficient to allow:

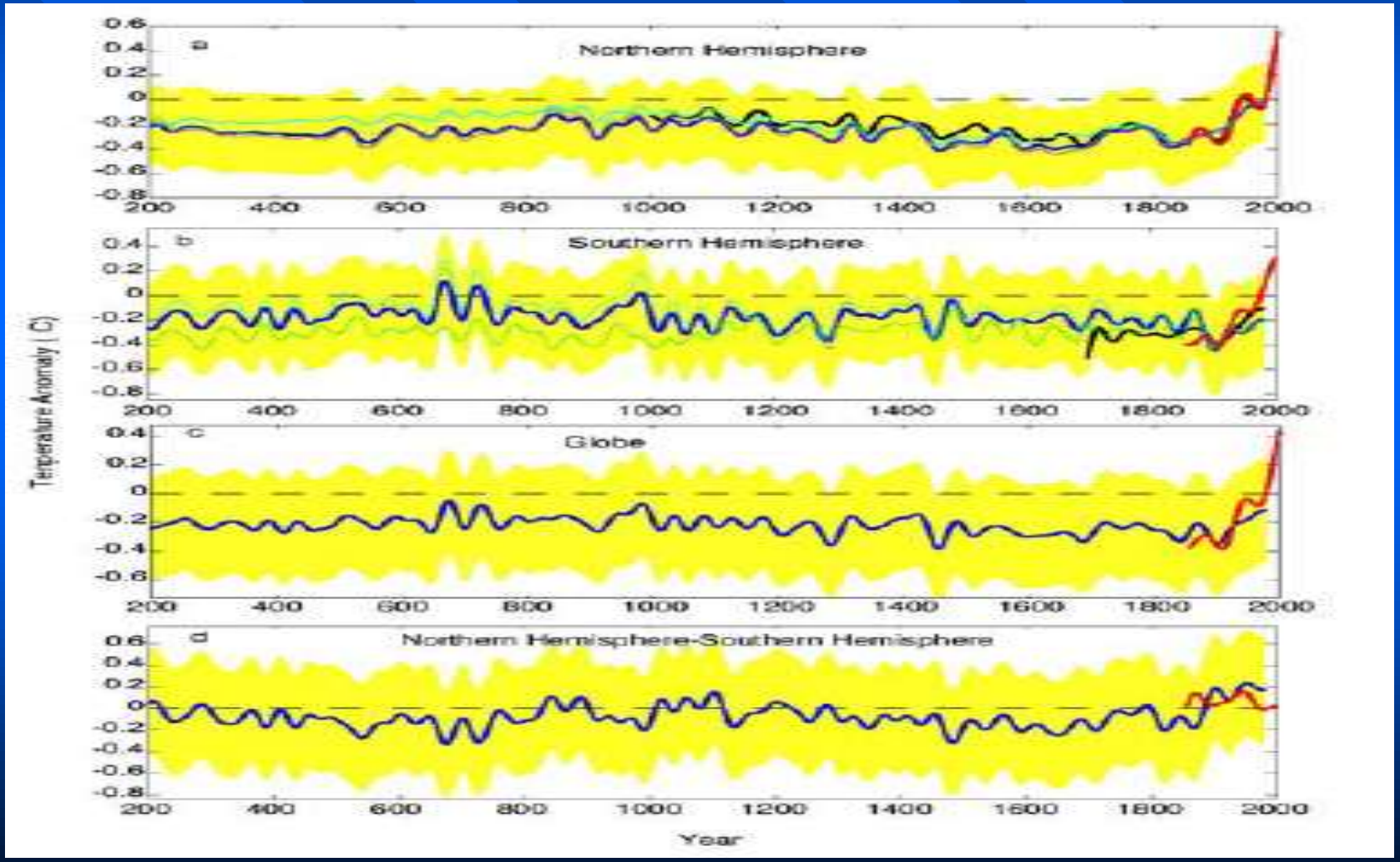
- » ecosystems to adapt naturally to climate change
- » ensure that food production is not threatened
- » enable economic development to proceed in a sustainable manner

Where is the climate system now?

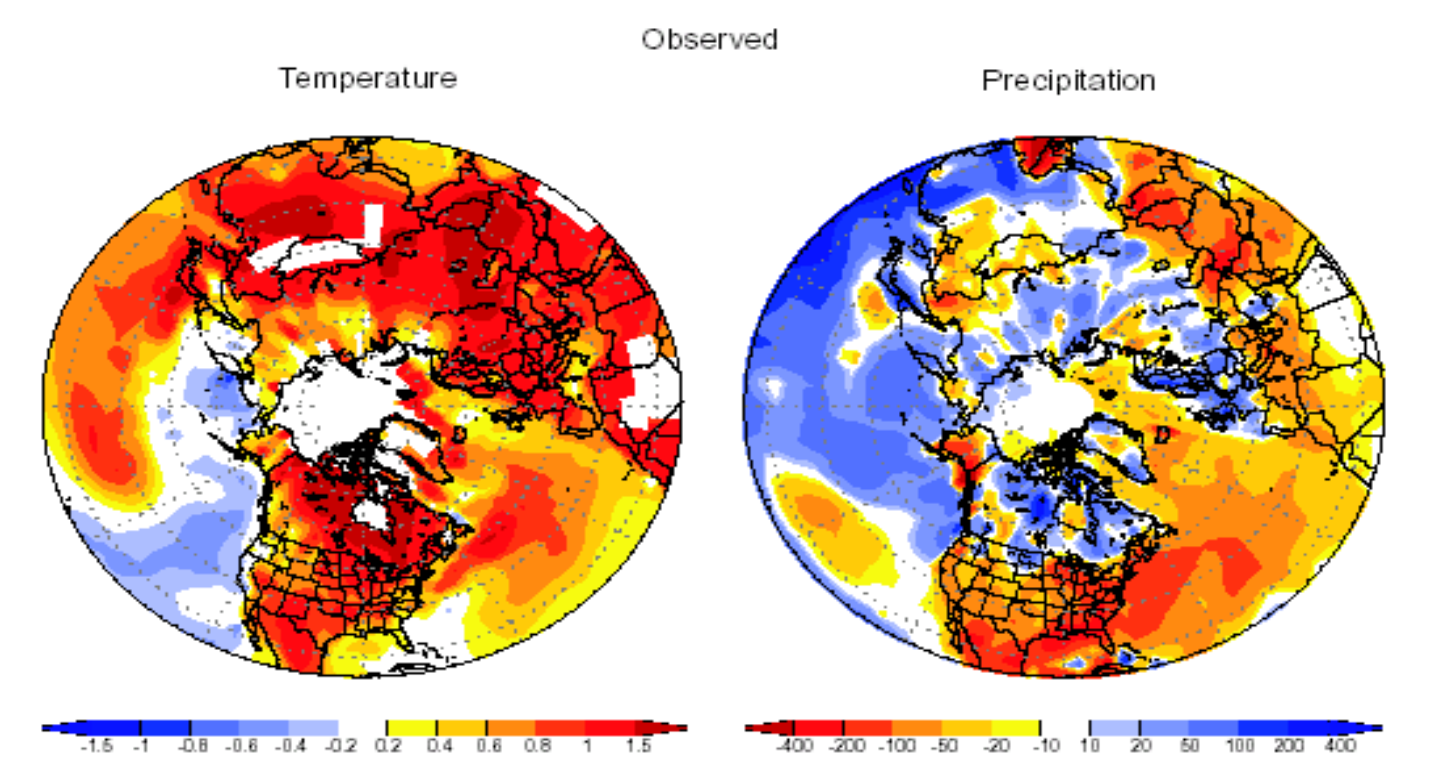


- The climate system is now in an unprecedented state when viewed over last 400-800,000 years and maybe longer.

Warmer than last 2000 years



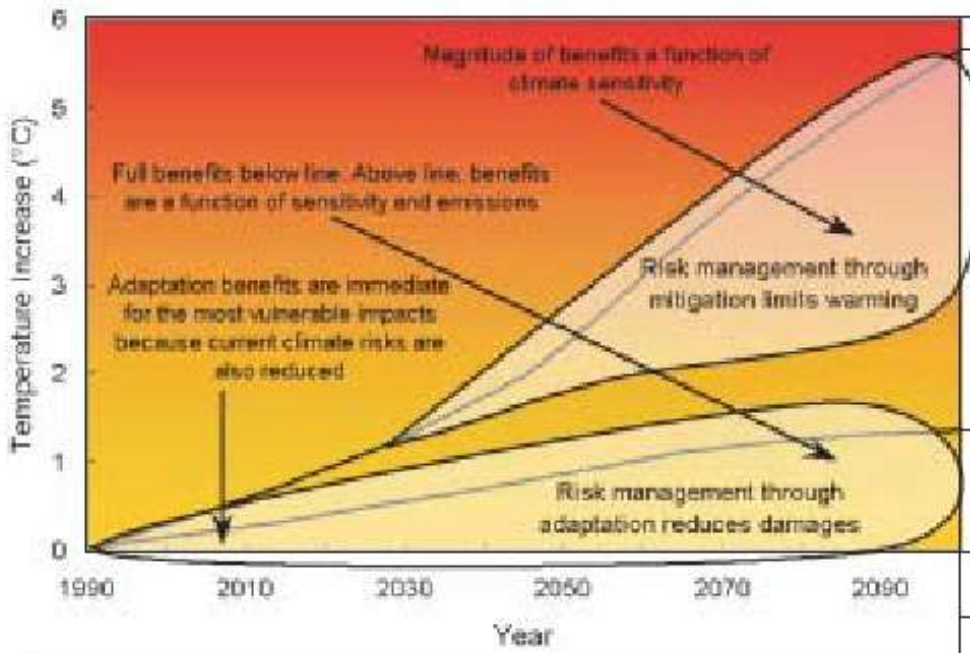
1998-2002 Globally synchronized drought: Anthropogenic origin?



Hoerling 2003 Fig. 1. Observed, annually averaged surface temperature (**left**)and precipitation (**right**)anomalies

during the 4-year period June 1998–May 2002. Temperature departures are degrees Celsius computed relative to a 1971–2000 climatology. Precipitation departures are mm/year computed relative to a 1979–1995 climatology. The largest warm and dry departures are highlighted in red.

The Future: Risks rise with temperature



Low probability, extreme outcomes	
Least likely	Considerable damage to most systems
Moderately likely	Increased damage to many systems, fewer positives
Highly likely	
Almost certain	Damage to the most sensitive, many positives
Happening now	Vulnerable to current climate
Probability	Consequence

Core benefits of adaptation and mitigation

Probability — the likelihood of reaching or exceeding a given level of global warming

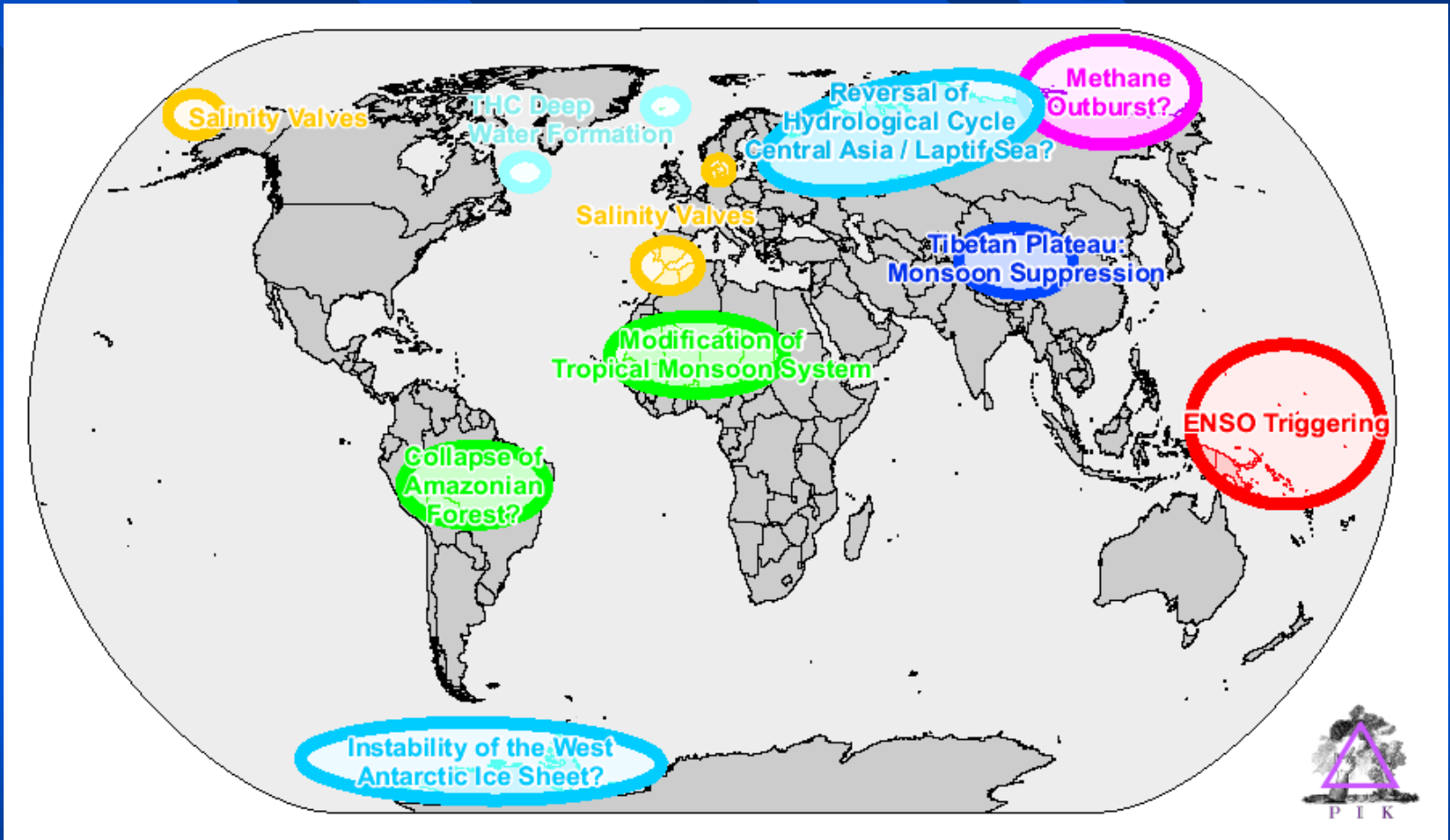
Consequence — the effect of reaching or exceeding a given level of global warming

Risk = Probability × Consequence

Risks of Non Linear and Abrupt Changes

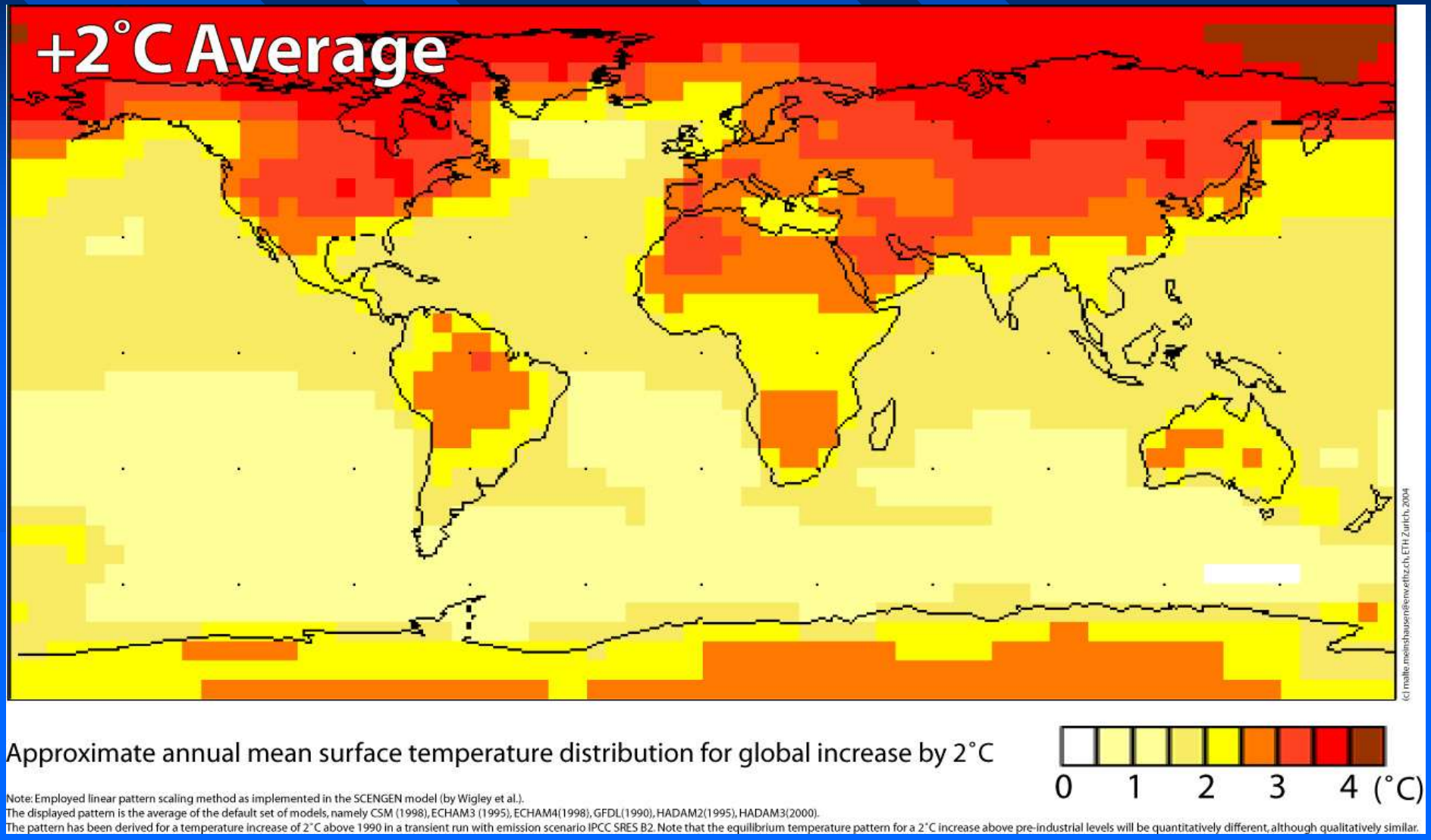
- Carbon Cycle feedbacks leading to more warming and controllability problems
- Ocean thermohaline circulation slowdown or abrupt cessation
- Greenland Ice Sheet decay– Likely
- West Antarctic Ice Sheet instability is still unknown but risk seems to be increasing
- Abrupt ecological changes -loss or severe damage - likely
- Changes in Extreme Events Frequency and Severity – likely in many case
  - Shift towards El Nino mode of climate as the world warms?
  - Increased Monsoon variability
- Abrupt socio-economic risks
  - Agriculture and food security in developing countries
  - Water supply?

Some global pressure points



Source: Schellnhuber/PIK

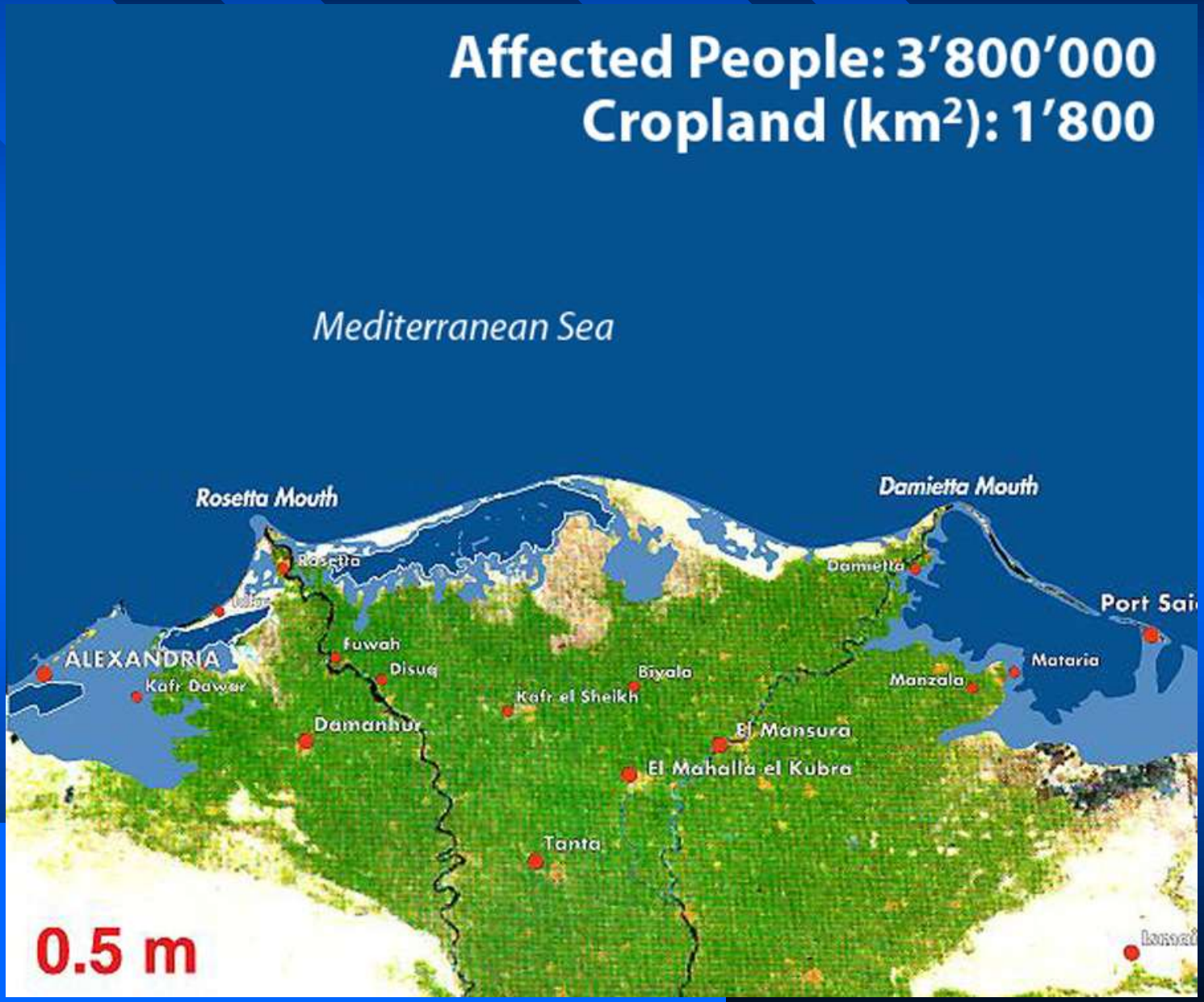
Temperature increase higher over land



Approximate annual mean surface temperature distribution for global increase by 2°C

Note: Employed linear pattern scaling method as implemented in the SCENGEN model (by Wigley et al.).
The displayed pattern is the average of the default set of models, namely CSM (1998), ECHAM3 (1995), ECHAM4(1998), GFDL(1990), HADAM2(1995), HADAM3(2000).
The pattern has been derived for a temperature increase of 2°C above 1990 in a transient run with emission scenario IPCC SRES B2. Note that the equilibrium temperature pattern for a 2°C increase above pre-industrial levels will be quantitatively different, although qualitatively similar.

Potential Impact of Sea Level Rise: Nile Delta



Sources: Otto Simonett, UNEP/GRID Geneva; Prof. G.Sestini, Florence; Remote Sensing Center, Cairo; DIERCKE Weltwirtschaftsatlas

Global mean warming
of 1.2-3.0^{o}C
could trigger
Greenland meltdown…

Sea level rises 3-5 meters by 2300 for 3°C

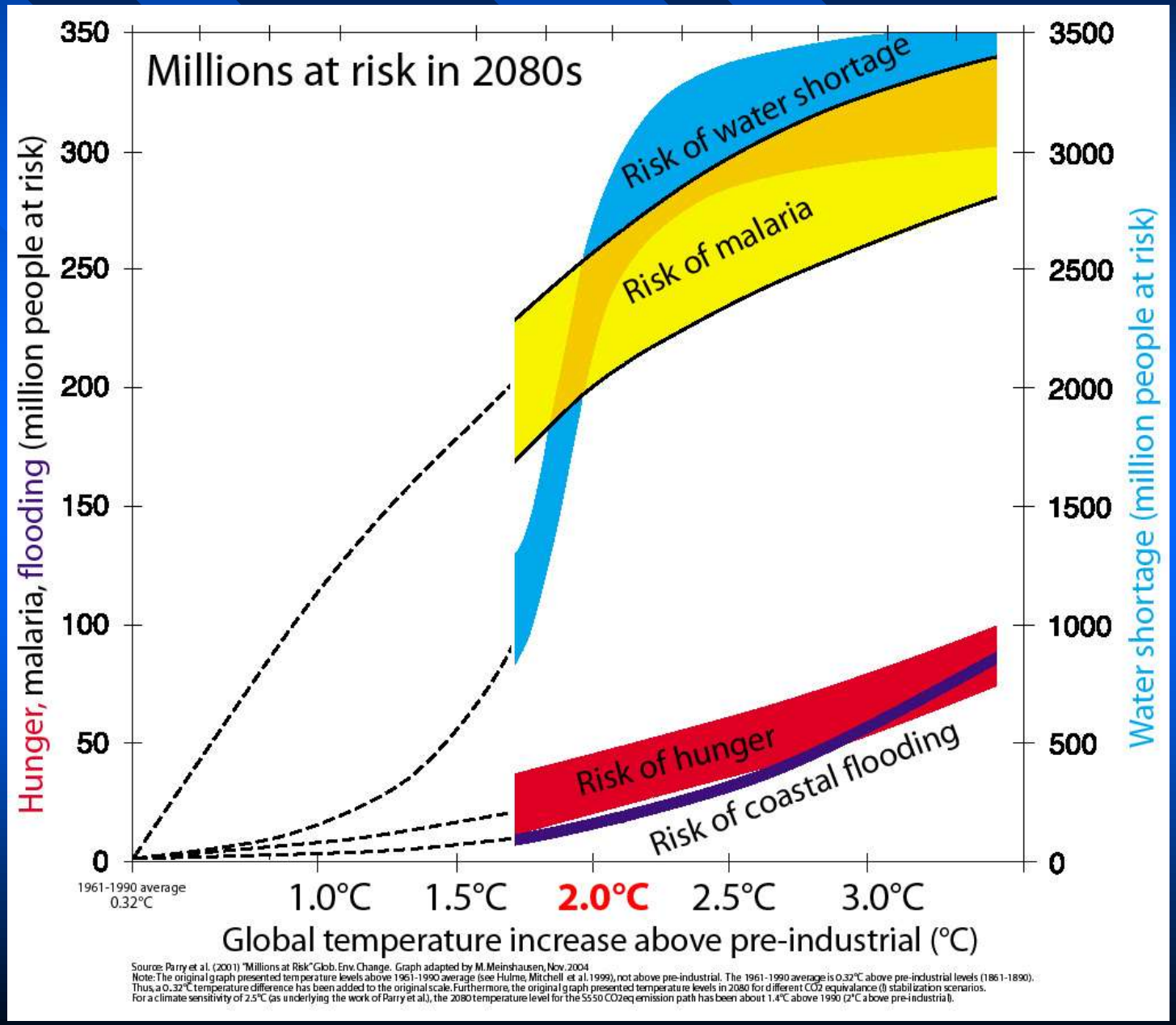
Source: Rahmstorf, S., C. Jaeger (2004)

- 3°C → dangerous interference
- *"Even a stabilisation target of 2ºC cannot necessarily be considered "safe" in terms of the sea level rise caused"*

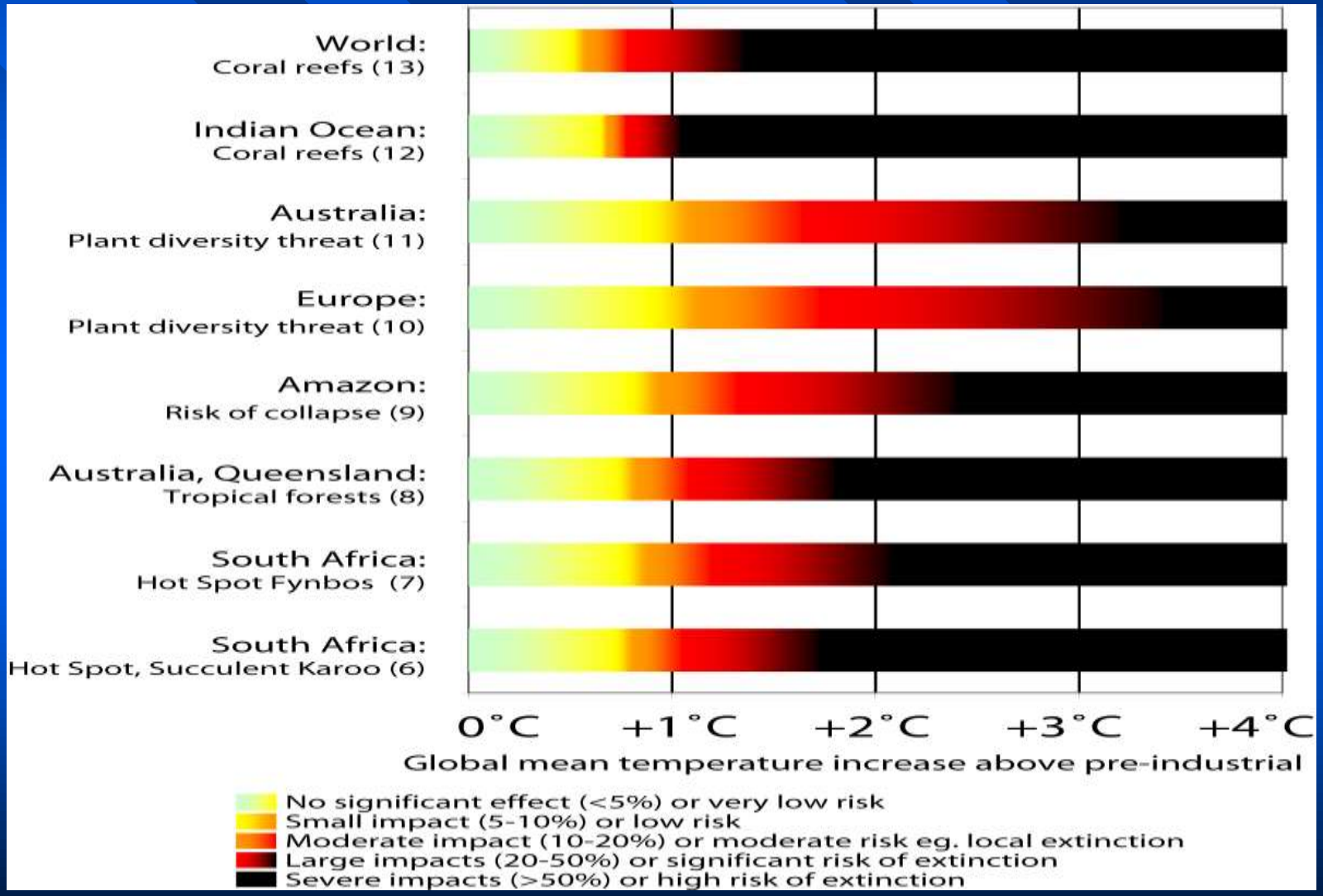
+ Antarctica	1.0 - 2.0 m	Estimate based on WAIS decay over 900-1800 years
+ Greenland	0.9 - 1.8 m	Lower: IPCC TAR Upper: doubled
+ Glaciers	0.4 m	IPCC TAR, assumed 80% loss of total
Thermal expansion	0.4 - 0.9 m	IPCC TAR, not fully considering THC
Total	**2.7 - 5.1 m**	

…and increasing further from there

Millions at Risk (Parry et al., 2001)



Ecosystems


World:
Coral reefs (13)
Indian Ocean:
Coral reefs (12)
Australia:
Plant diversity threat (11)
Europe:
Plant diversity threat (10)
Amazon:
Risk of collapse (9)
Australia, Queensland:
Tropical forests (8)
South Africa:
Hot Spot Fynbos (7)
South Africa:
Hot Spot, Succulent Karoo (6)
0°C
+1°C
+2°C
+3°C
+4°C
Global mean temperature increase above pre-industrial
No significant effect (<5%) or very low risk
Small impact (5-10%) or low risk
Moderate impact (10-20%) or moderate risk eg. local extinction
Large impacts (20-50%) or significant risk of extinction
Severe impacts (>50%) or high risk of extinction

IPCC: Developing countries most at risk

- Global increases in temperature produce net economic losses in many developing countries for all magnitudes of warming - losses greater the higher the warming.
- *"The effects of climate change are expected to be greatest in developing countries in terms of loss of life and relative effects on investment and the economy."*

Source :IPCC Working Group II TAR Impacts of Climate Change

IPCC: More people harmed than benefited

- *"More people are projected to be harmed than benefited by climate change, even for global mean temperature increases of less than a few degrees"*
- *"The projected distribution of economic impacts…would increase disparity in well-being between developed countries and developing countries.."*

Source :IPCC Working Group II TAR Impacts of Climate Change

Food and Article 2: <2°C

- At all levels of warming, a large group of poor, highly vulnerable developing countries are expected to suffer.
- 1°C Small damages - around 10 million more at risk) over the next century.
  - Nearly all developed countries benefit
  - Many developing countries in the tropics are estimated to experience small but significant crop yield growth declines.
- 1°C -> 2°C warming triples the number of people at risk of hunger in the 2080s.

Food and Article 2: 2°C

- 2°C increasing risk, with the risk increasing from the 2050s to the 2080s.
  - 4-5 fold risk increase from the 2050s to the 2080s (for the same temperature).
  - Many developed countries may still be gaining, although warning that this may not be robust for all regions or even in aggregate terms.
  - Agricultural production in developed countries finely balanced between the effects of increased temperature and changes in precipitation.
- 2.5°C warming by the 2080s, the Parry et al. (1999) analysis indicates 45-55 million extra people at risk of hunger, with the number at risk rising very rapidly with temperature.

Food and Article 2: 3°C

- 3°C warming by the 2080s, a very large number of people projected to be living in countries or regions experiencing large losses in crop production potential.

Climate Poverty Trap?

- "Can climate change cause a poverty trap? Recurring natural disasters can definitely contribute to poverty trap … Climate change seems likely to cause poverty traps in some places, and with some non-negligible change at a regional scale."
  - Tol (2003)

Conclusions - I

- Warming of 2°C threatens many tens of millions with increased risk of hunger, hundreds of millions with increased Malaria risk, millions with increased flooding and billions with risk of water shortage.
  - Damages fall largely on the poorest and developing countries
- Warming of 2°C risks major ice sheet responses with commitments to many metres of sea level rise over several centuries.
  - Ensuing sea level rise threatens large populations everywhere and particularly in developing countries
- Warming of 2°C threatens major ecosystems from the Arctic and Antarctic to the tropics
  - Loss of forests and species will affect the lives of all with economic costs falling disproportionately on the poor and developing countries
- Avoiding 2°C warming is going to be very difficult now, but not impossible

Conclusions – II

- Warming of 1oC entails substantial risk for many in developing countries – regional risks of hunger increasing, malaria exposure and water insecurity
- Non significant risk of the Greenland Ice Sheet melting down
- Substantial damages to some ecosystems seem inevitable eg coral reefs, Arctic systems, some forests in the tropics and in high latitudes.
- Significant increase in extreme event exposure
- Getting to 1oC limit will involve global temperatures peaking at a higher level before dropping

Conclusions – III

- Halting sea level rise may be nearly impossible except for many centuries. A sustained drop in global temperature after the point of peaking will be necessary to halt sea level rise.
- The interests of poor people everywhere lie in a long term global temperature limit of well below 2°C.