

# **Geography of the impacts of climate change**

Session 3

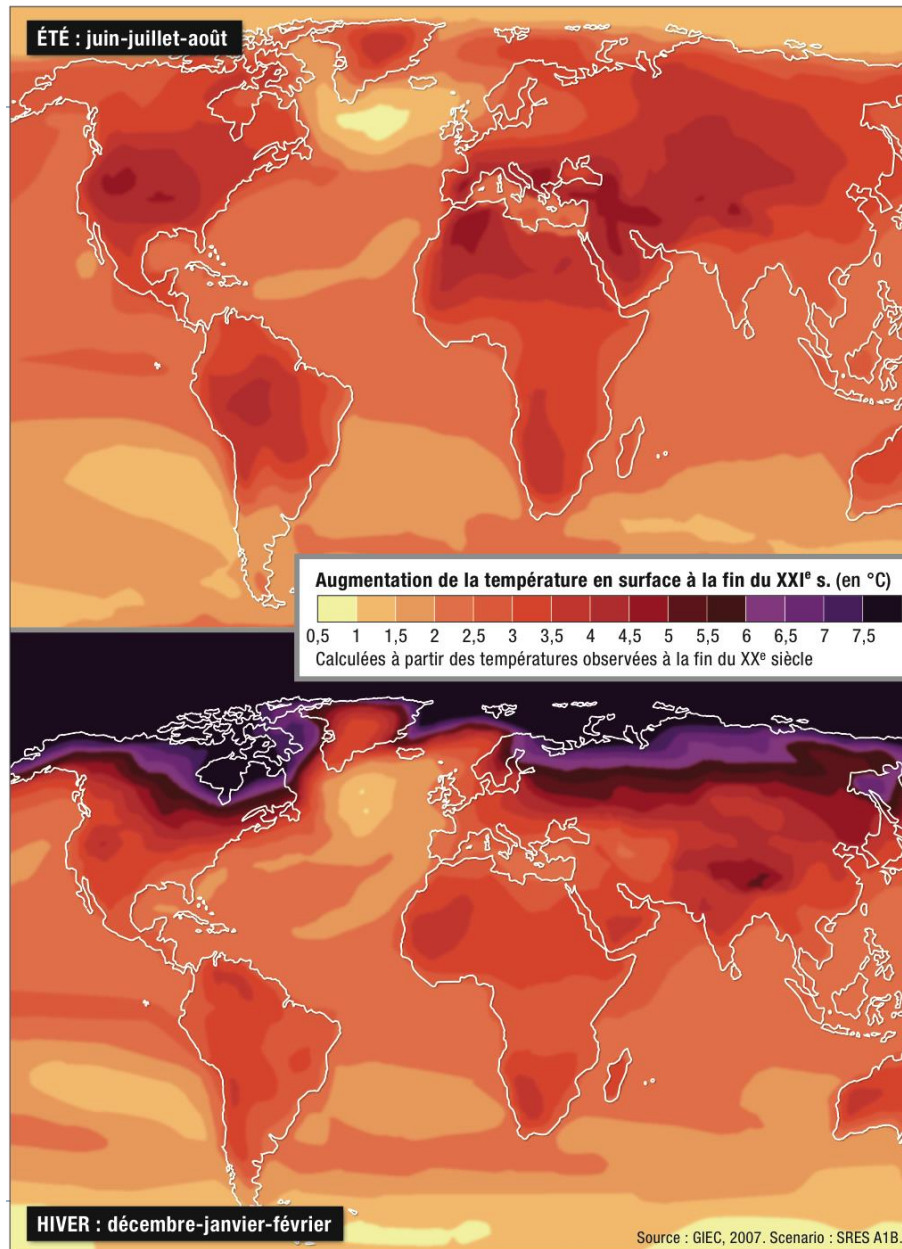
# Temperature rise

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- ▶ The IPCC forecasts that the average temperature rise will be comprised between  $1.8^{\circ}\text{C}$  and  $4.0^{\circ}\text{C}$  by the end of the century.
- ▶ Most scientists agree however that we are set for a temperature rise of  $4^{\circ}\text{C}$ .
- ▶ Current pledges of emission reductions would result in a rise of  $3.5^{\circ}\text{C}$ .
- ▶ These are average temperatures however: the rise will not be uniform.



## Carte 8 : Évolution des températures



At the moment, it looks like this:

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**4°**

**Turn Down  
the Heat**

**Why a 4°C Warmer World  
Must be Avoided**

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**November 2012**

A Report for the World Bank  
by the Potsdam Institute for  
Climate Impact Research and  
Climate Analytics

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That would result in this:





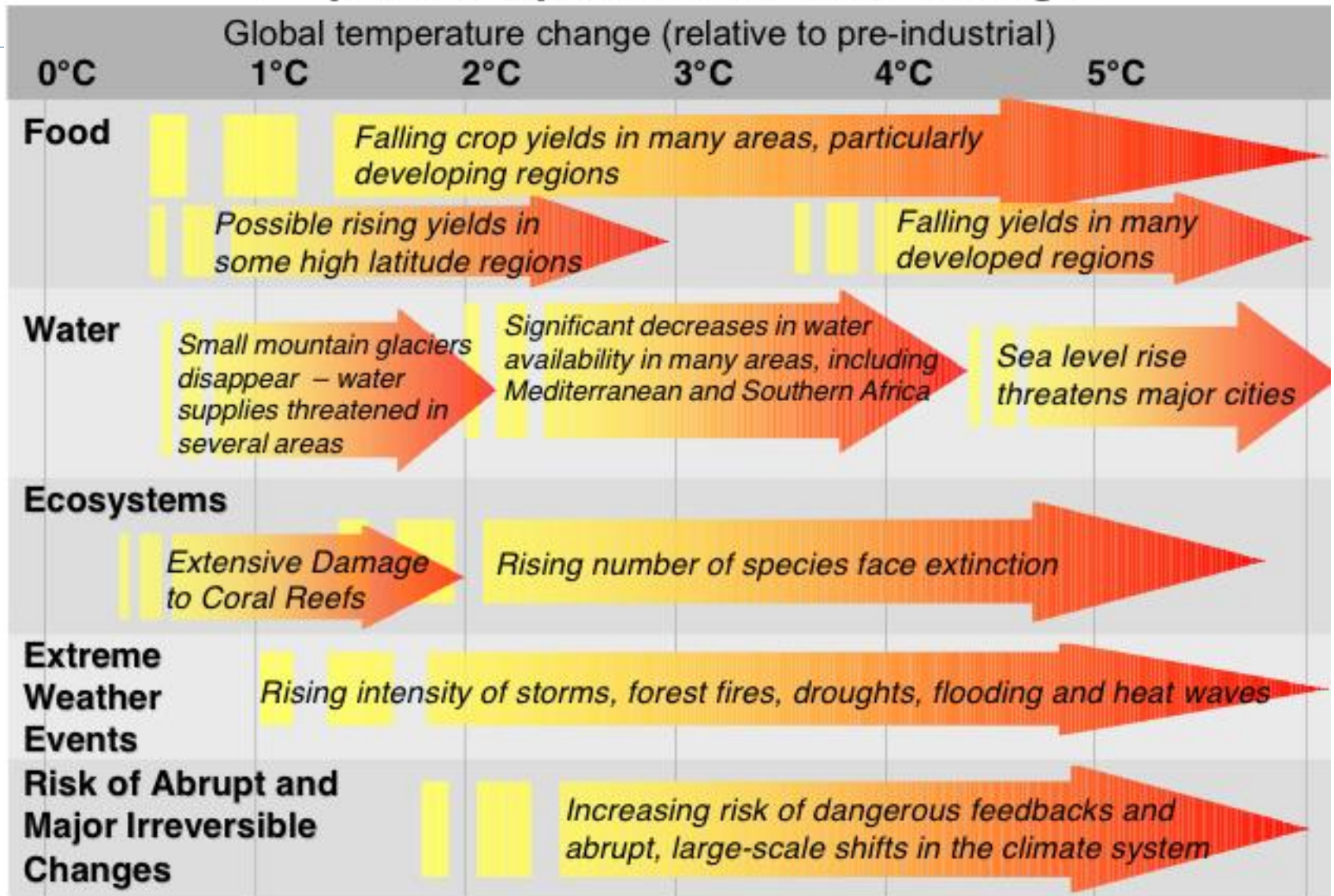
# An unequal distribution of the impacts

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- ▶ Some regions will be more affected than others.
  - ▶ *The countries that will be first and most affected are also the countries that are the least responsible for the problem.*
  - ▶ *The generations that will be most affected by the impacts are also those that are the least responsible for the problem.*
  - ▶ *Double injustice of climate change.*
- ▶ It is still difficult, however, to forecast impacts on a regional or local level.
- ▶ These impacts also depend on political uncertainty: mitigation and adaptation policies.



# Projected Impacts of Climate Change





# The 2° C target

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- ▶ The 2° C limit is a political compromise:
  - ▶ Between the emission reductions that seem achievable
  - ▶ Between the impacts that seem acceptable
- ▶ The 2° C target was formally agreed upon in Copenhagen, and reinstated in Cancun, despite the opposition from small member states.
- ▶ It corresponds to a GHG concentration of about 450 ppm, or about 15 Gt of CO<sub>2</sub> emissions/year. But these figures are not mentioned.

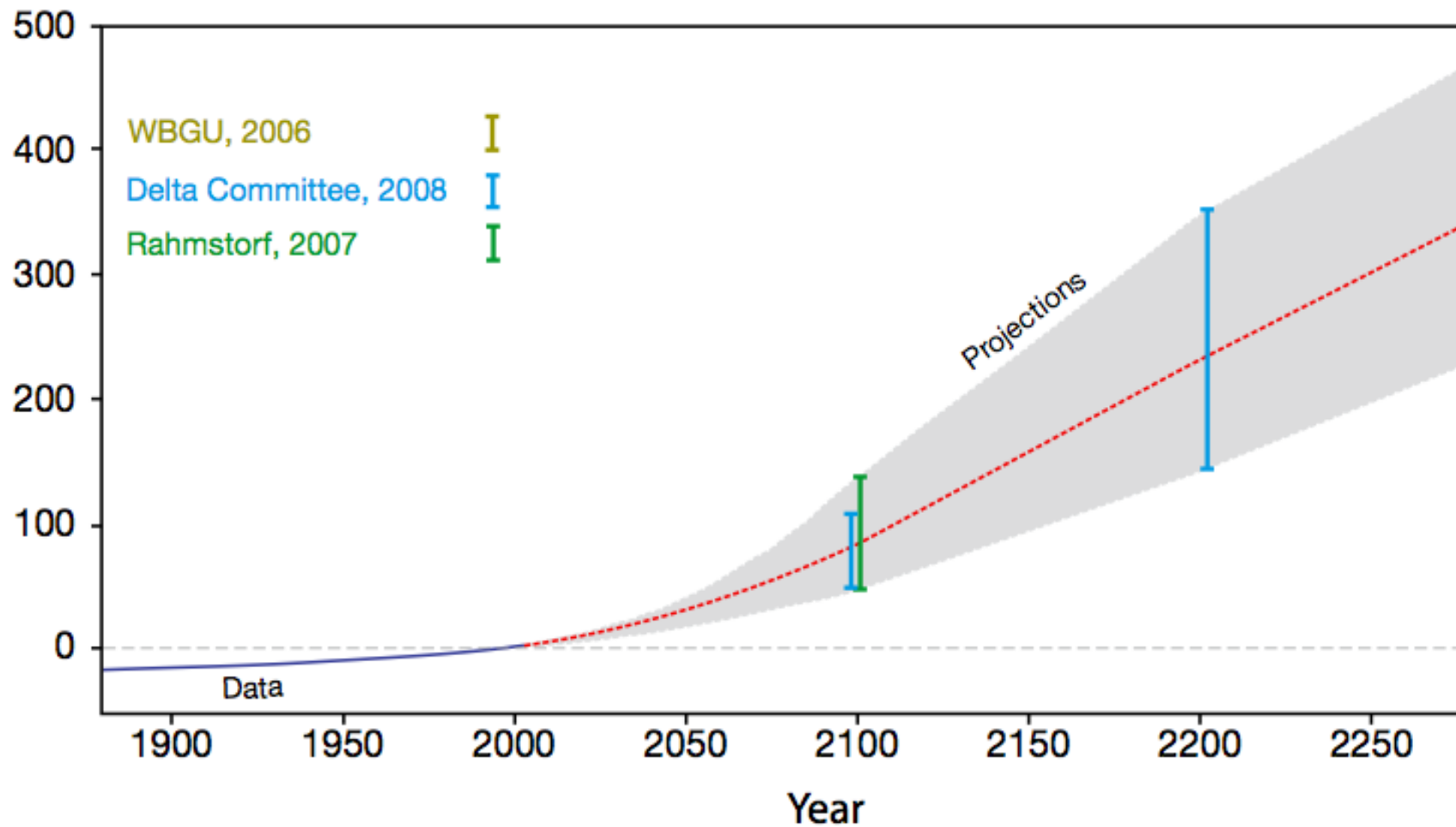


# Sea-level rise

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- ▶ Due to the thermic expansion of oceans and the melting of glaciers and ice caps.
- ▶ It is estimated that the average sea-level rise will be about 1 metre by 2100.
- ▶ This is an average: sea-level rise will not be uniform.
- ▶ Sea-level rise also impacts upon freshwater resources.

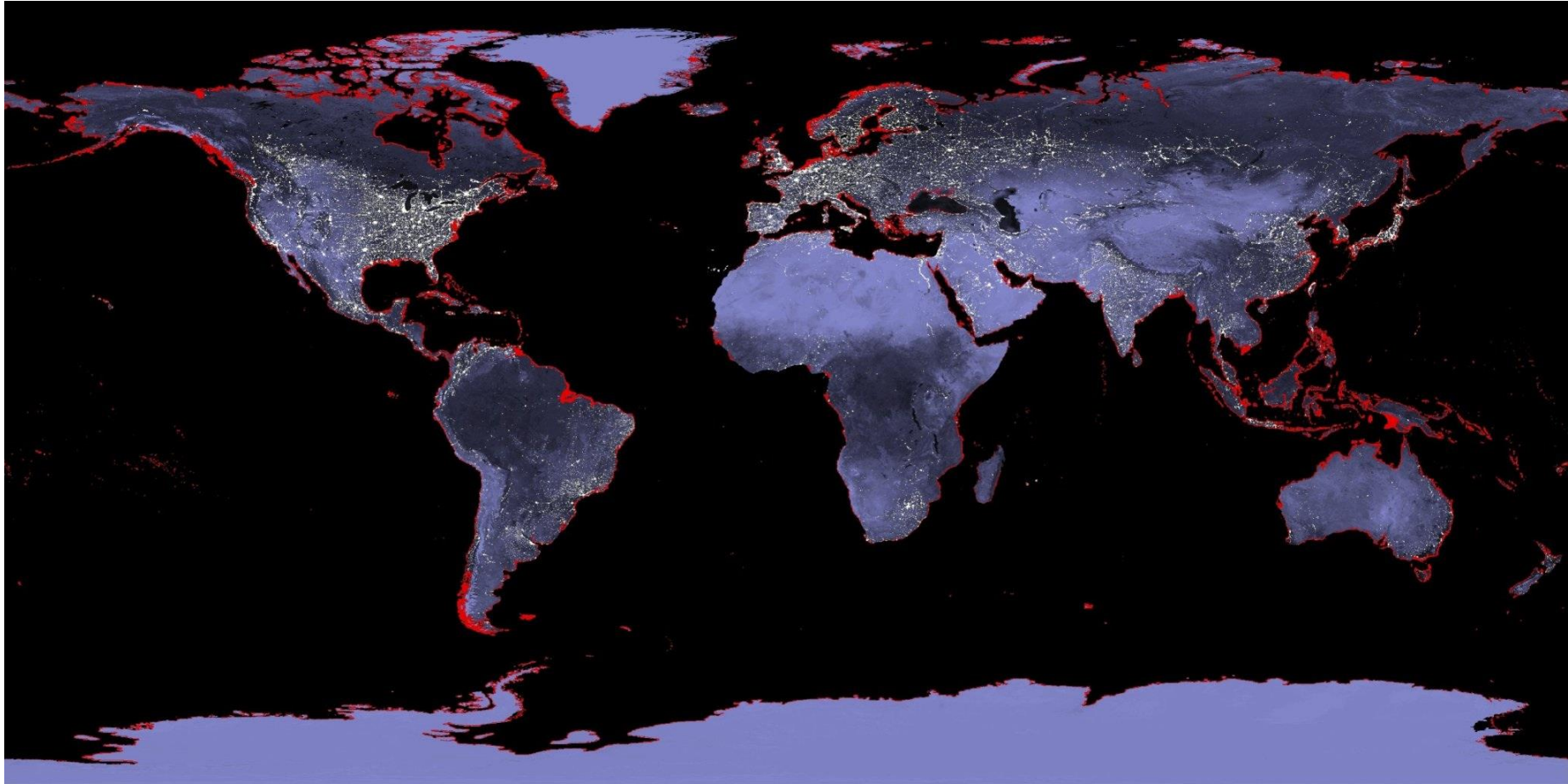


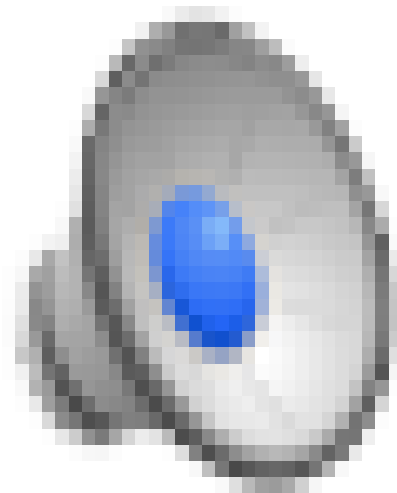


# Sea-level rise

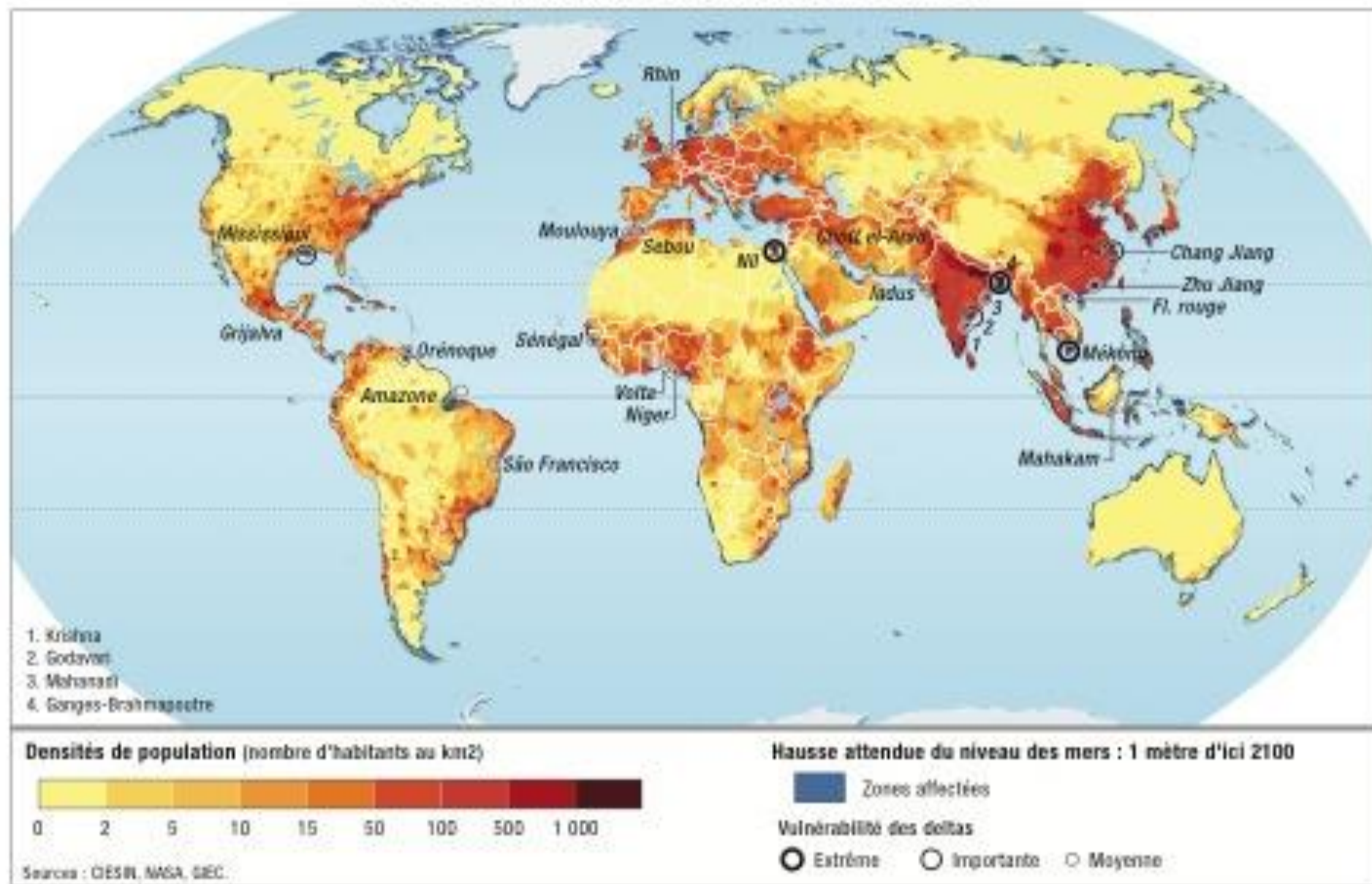
*(this is what will happen if everything goes well)*

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**Carte 6 : La hausse du niveau des mers**



# Two processes of habitat loss that induce migration



# Fresh water resources

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- ▶ Annual average river runoff and water availability are projected to increase by 10-40% at high latitudes and in some wet tropical areas, and decrease by 10-30% over some dry regions at mid-latitudes and in the dry tropics
- ▶ Drought-affected areas will likely increase in extent. Heavy precipitation events, which are very likely to increase in frequency, will augment flood risk.
- ▶ Water supplies stored in glaciers and snow cover are projected to decline, reducing water availability in regions supplied by meltwater from major mountain ranges, where more than one-sixth of the world population currently lives.







A house in the relatively higher land in the char.  
During the monsoon season, most of the area is  
flooded and people have to move from one house to  
another in boats.

Photo: Faruq Shahriar Isu; Faridpur, July 20

# Ecosystems

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- ▶ The resilience of many ecosystems is likely to be exceeded this century.
- ▶ Approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5 - 2.5° .



# Crops

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- ▶ Crop productivity is projected to increase slightly at mid to high latitudes for local mean temperature increases of up to 1-3° C depending on the crop, and then decrease beyond that in some regions.
- ▶ At lower latitudes, especially seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1-2° C), which would increase risk of hunger.
- ▶ Globally, the potential for food production is projected to increase with increases in local average temperature over a range of 1-3° C, but above this it is projected to decrease.
- ▶ Increases in the frequency of droughts and floods are projected to affect local production negatively, especially in subsistence sectors at low latitudes.



# Coastal systems / low-lying areas

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- ▶ Coasts are projected to be exposed to increasing risks, including coastal erosion, due to climate change and sea-level rise and the effect will be exacerbated by increasing human-induced pressures on coastal areas.
- ▶ Many millions more people are projected to be flooded every year due to sea-level rise by the 2080s.

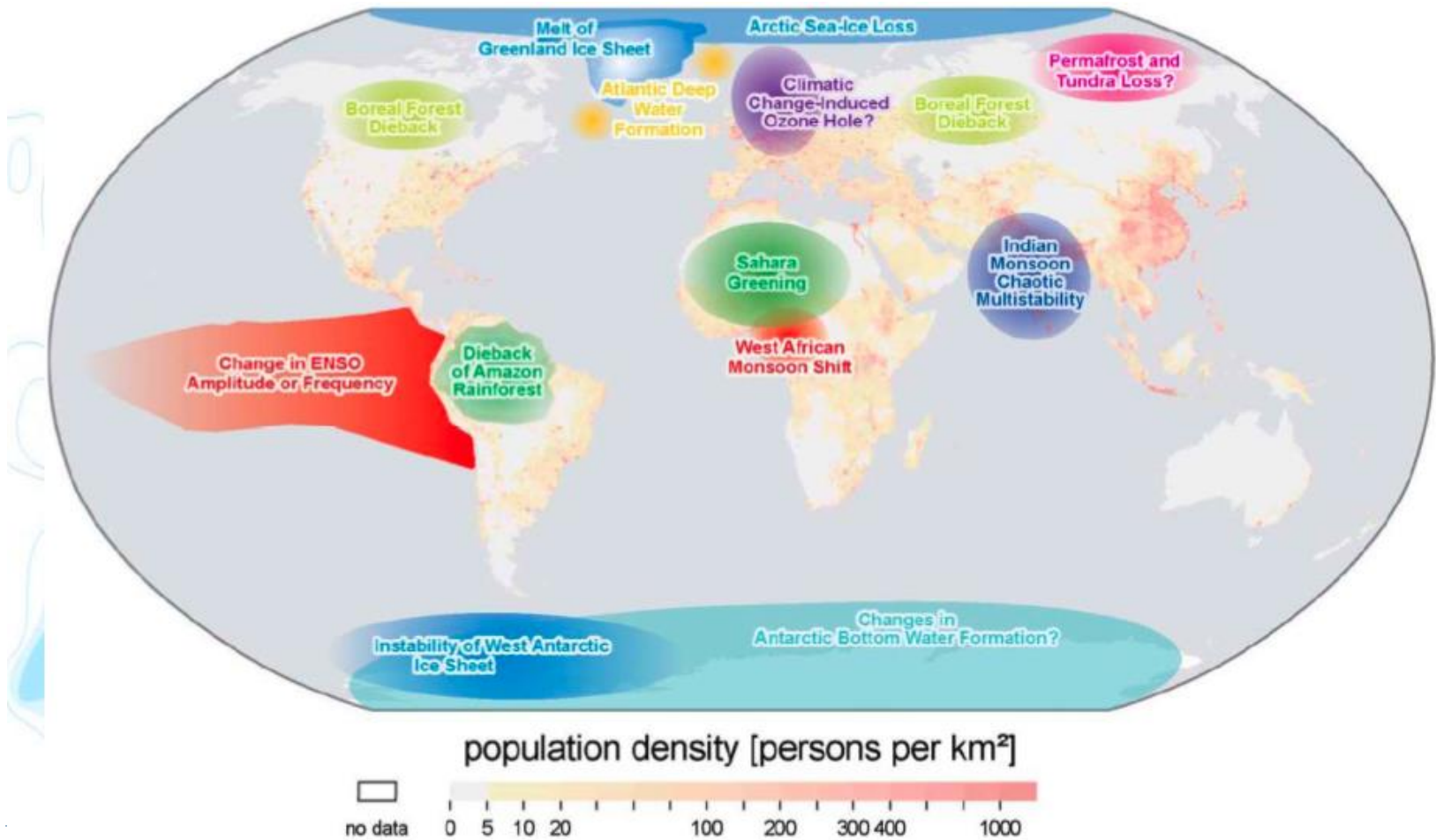


# Health

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- ▶ Increases in malnutrition and consequent disorders, with implications for child growth and development;
- ▶ Increased deaths, disease and injury due to heat waves, floods, storms, fires and droughts;
- ▶ Increased burden of diarrhoeal disease;
- ▶ Increased frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone related to climate change;
- ▶ Altered spatial distribution of some infectious disease vectors.
- ▶ Fewer deaths related to cold weather.

# Tipping points



# Mitigation and adaptation, two facets of the same problem

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- ▶ Initial focus on mitigation, increased attention paid to adaptation
- ▶ Key issue: balance between mitigation and adaptation
- ▶ Both concerned with equity and fairness, though equity is more discussed with regard to mitigation.
- ▶ Not the same goal:
  - ▶ Mitigation is about avoiding what would be impossible to manage
  - ▶ Adaptation is about managing what is impossible to avoid
- ▶ Adaptation is concerned with costs, mitigation might bring some benefits as well



# The costs of climate change

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- ▶ Adaptation is also about a trade-off between the costs of mitigation and of adaptation.
- ▶ How to estimate the costs of the impacts of climate change?
  - ▶ Difficult task:
    - ▶ Irreversibility
    - ▶ Difficulty to measure the costs of some impacts
    - ▶ Variety of the impacts
    - ▶ Futurity: discount rate
- ▶ Costs usually expressed as social costs of carbon (SCC), reported to the present through the discount rate.
  - ▶ In 2005, SCC were estimated at \$43/carbon ton, i.e. \$12/CO<sub>2</sub> ton.





# The rationale for adaptation

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*Used to be (and still is) considered as an option that should follow (and could possibly undermine) mitigation.*

- ▶ Justified because some of climate impacts are already under way, while others are unavoidable.
- ▶ Bargaining chip in the negotiation process.
- ▶ Considered by some as the most efficient way to fight climate change, especially after the failure of Copenhagen.



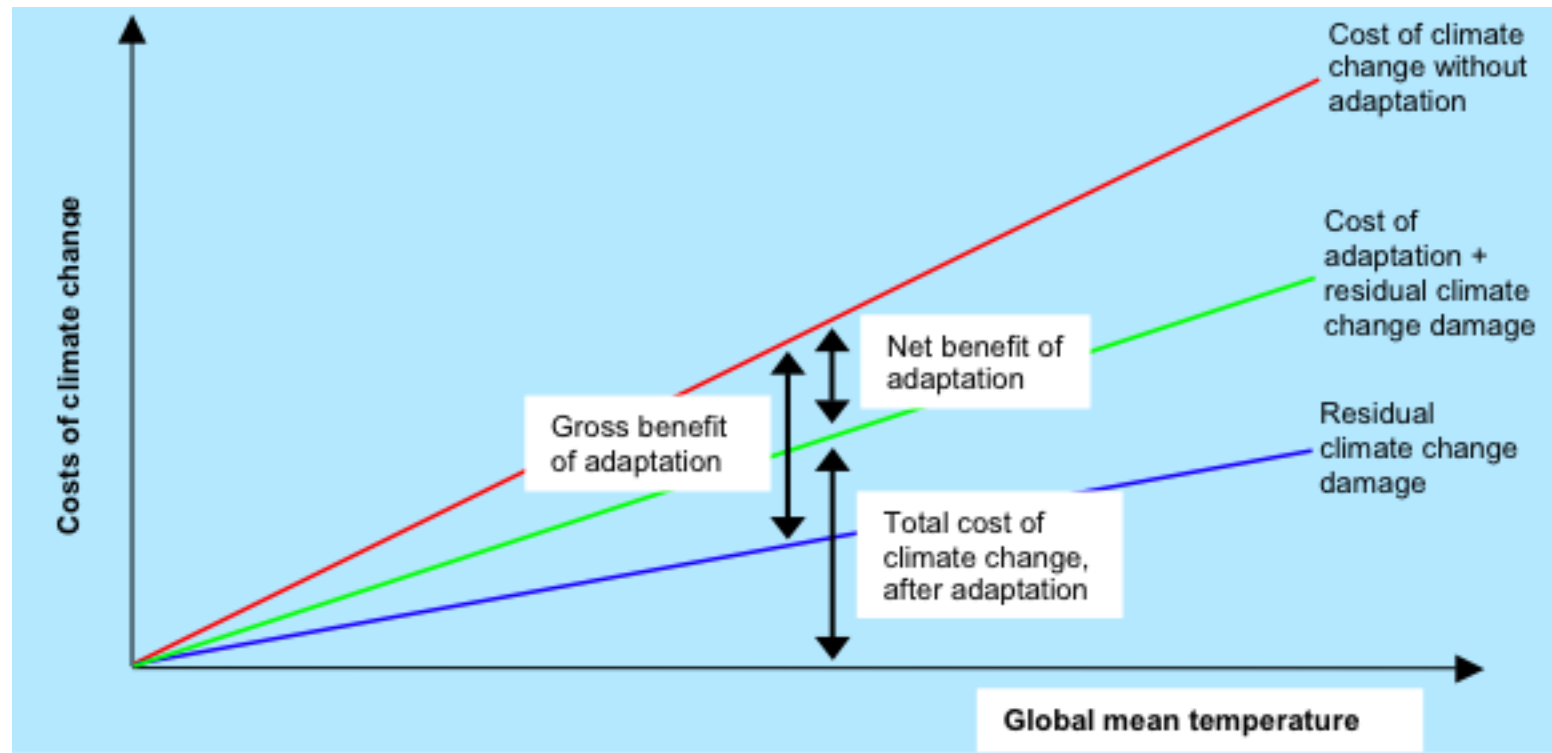
# What is it?

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- ▶ Mitigation aims at avoiding unmanageable events, while adaptation aims at managing unavoidable events.
- ▶ IPCC definition:
  - ‘The adjustment of natural or human systems in the face of a new or changing environment’
- ▶ Key concept: flexibility.
  - ▶ Ex ante: Anticipation
  - ▶ Ex post: Resilience
- ▶ Adaptation should be conceived as a process rather than as a stable state.
- ▶ Can take place at various levels: states, communities, households.



# Role of adaptation in reducing the damages





DELTA Plan, Netherlands

# Hulhumale, Maldives



# Defining vulnerability

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- ▶ How tricky can it be? A simple example:

	Affected population (% of the total population)	Affected population (absolute numbers)	Territory at risk (in km <sup>2</sup> )
<b>Maldives</b>	100	400 000	298
<b>Tuvalu</b>	100	11 000	26
<b>Bangladesh</b>	14	26 000 000	10 800
<b>Egypt</b>	12	12 000 000	2 100
<b>Vietnam</b>	9,6	10 000 000	25 000
<b>India</b>	5	60 000 000	n.d.



# Fairness in adaptation

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- ▶ How to identify the countries that are the most vulnerable?
- ▶ Article 4.8 of UNFCCC acknowledges a particular vulnerability for:
  - ▶ Small-island countries
  - ▶ Countries with low-lying coastal areas
  - ▶ Countries with arid and semi-arid areas, or forested areas
  - ▶ Countries with areas prone to natural disasters
  - ▶ Countries with areas liable to drought and desertification
  - ▶ Countries with areas of high urban atmospheric pollution
  - ▶ Countries with areas with fragile ecosystems
  - ▶ Countries whose economies are highly dependent on fossil fuels
  - ▶ Land-locked and transit countries

