

The impact of climate change on countries in development

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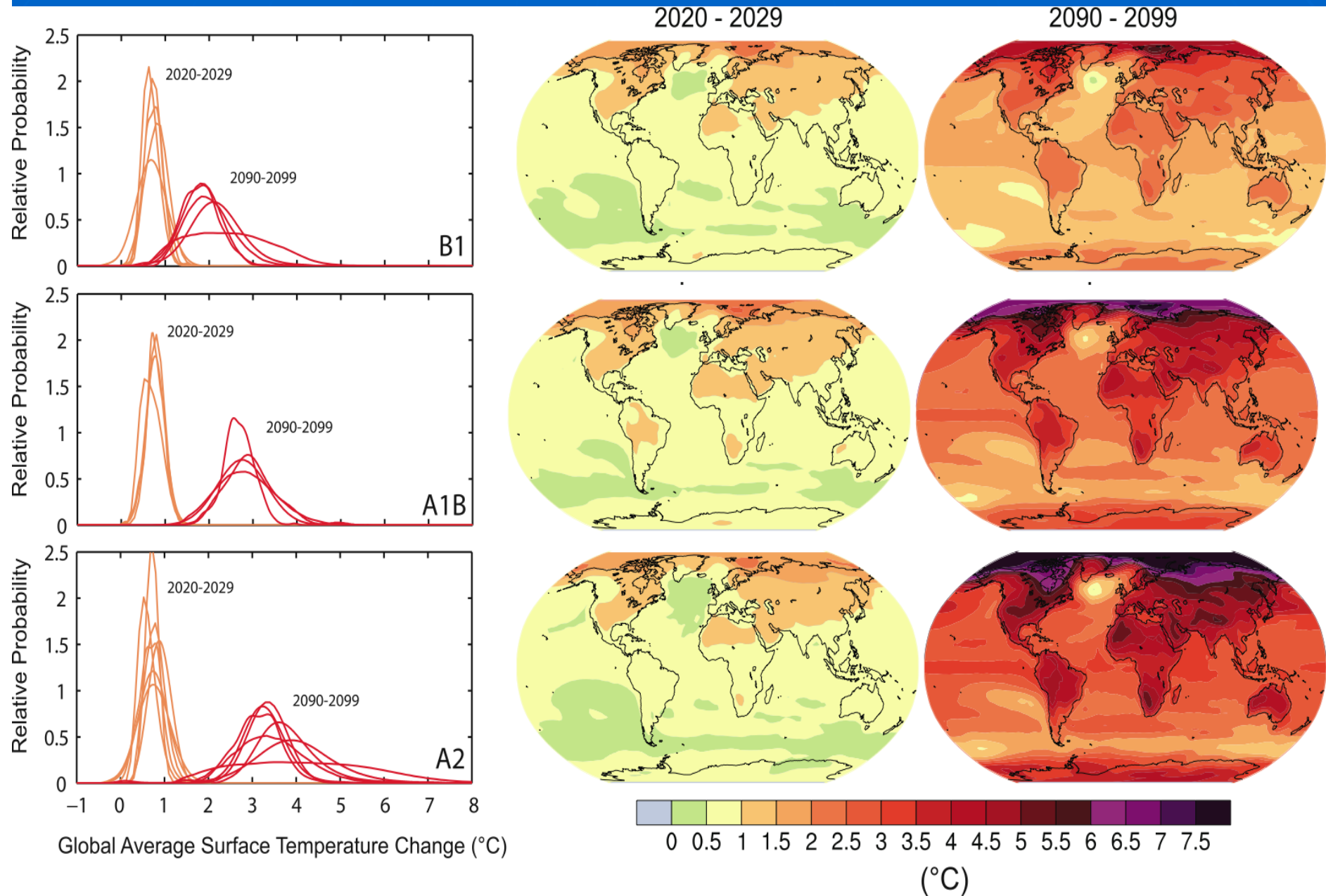
Climate Change

- Climate change, in conjunction with loss of biodiversity, land degradation, water pollution and air pollution are development and security issues undermining:
 - food, water and energy security
 - poverty alleviation and the livelihoods of the poor
 - human health
 - personal, national and regional security
- Climate change and ecosystem degradation are inter- and intra-generational equity issues:
 - developing countries and poor people in developing countries are the most vulnerable
 - the actions of today will affect future generations

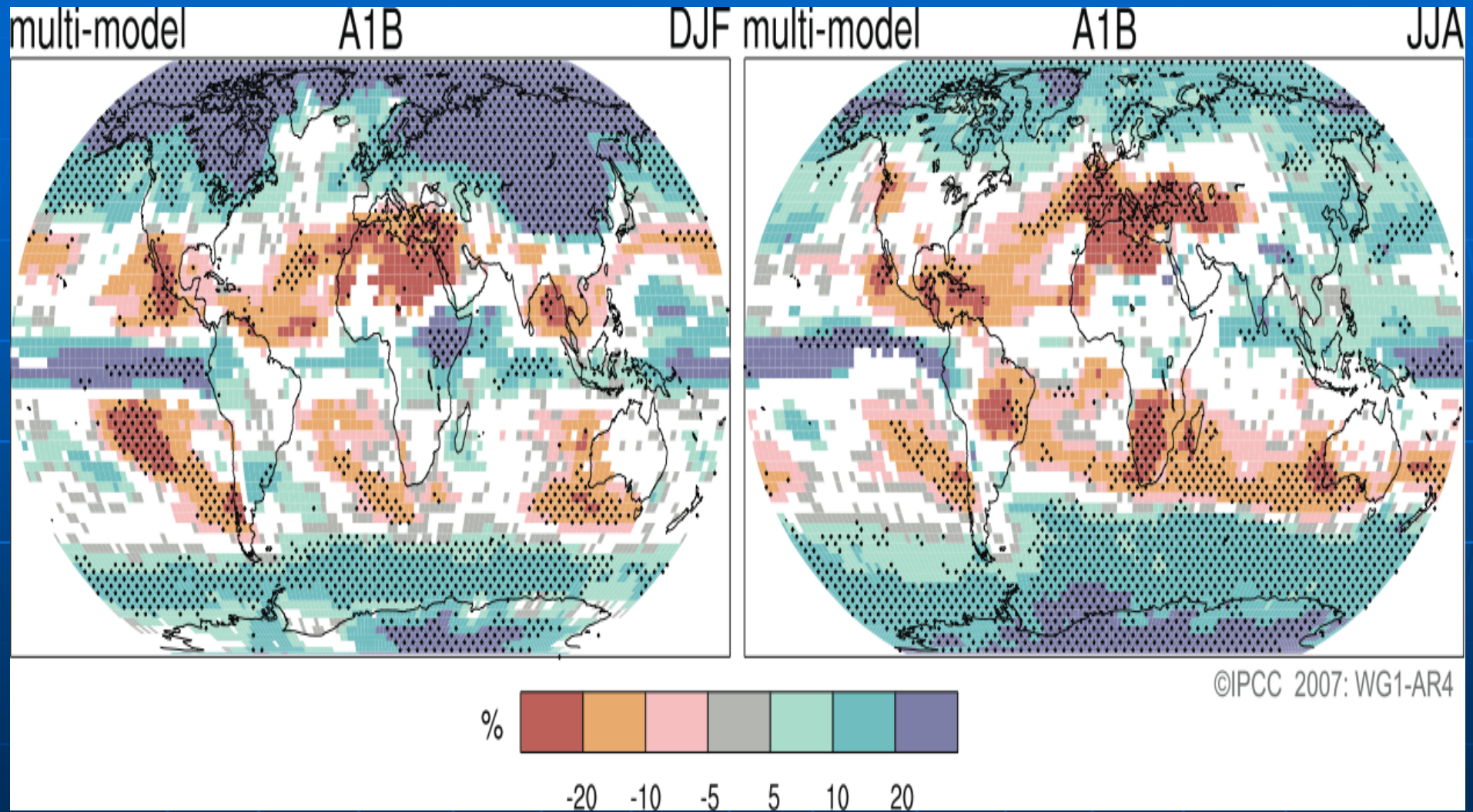
Climate Change

- The composition of the atmosphere, and the Earth's climate has changed, mostly due to human activities, and is projected to continue to change, globally and regionally:
 - Increased greenhouse gases and aerosols
 - Warmer temperatures
 - Changing precipitation patterns – spatially and temporally
 - Higher sea levels – higher storm surges
 - Retreating mountain glaciers
 - Melting of the Greenland ice cap
 - Reduced arctic sea ice
 - More frequent extreme weather events
 - heat waves, floods and droughts
 - More intense cyclonic events

Surface Temperature



Precipitation



Projected Impacts of Human-induced Climate Change

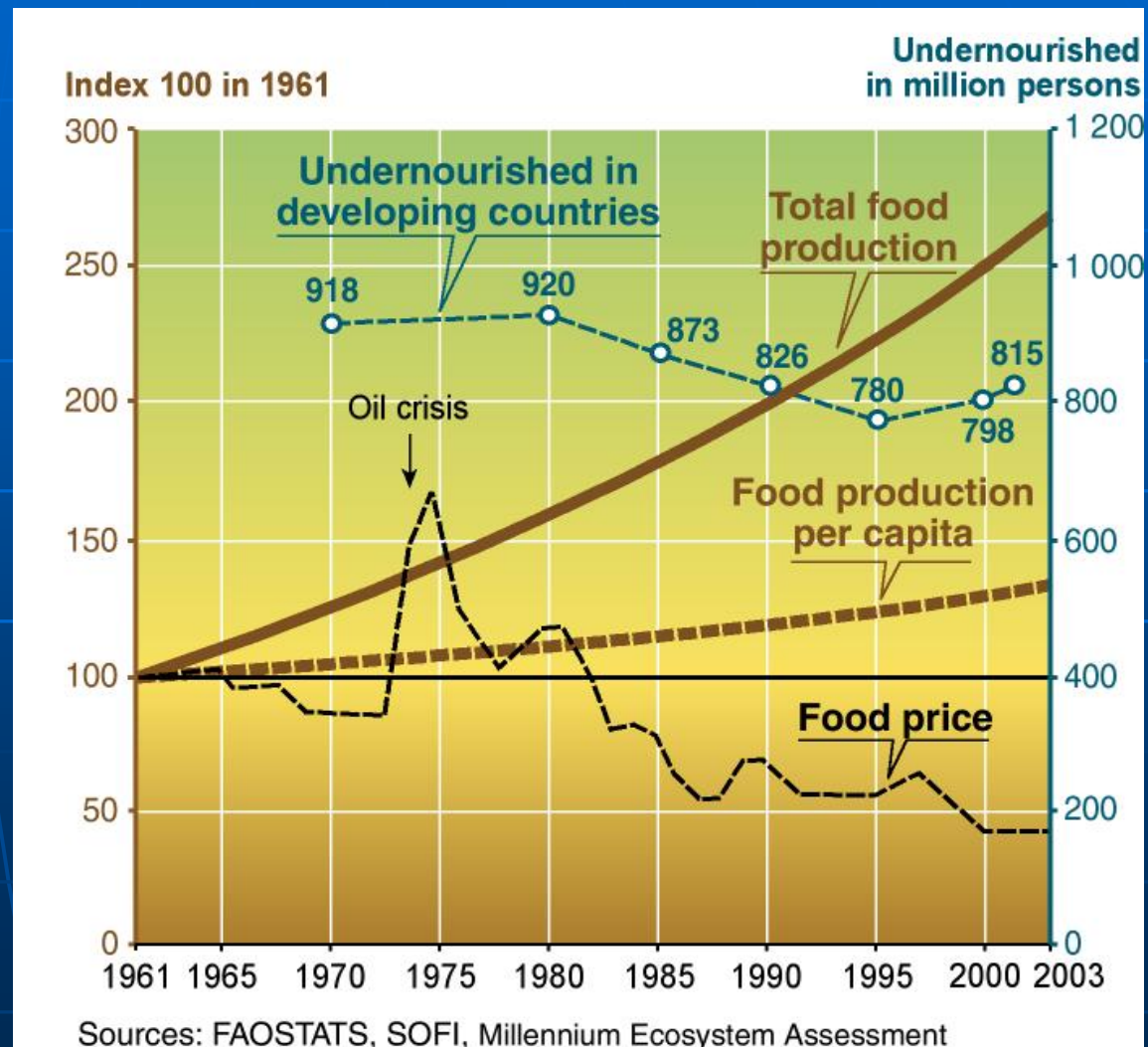
- Decrease water availability and water quality in many arid- and semi-arid regions – increased risk of floods and droughts in many regions
- Decrease agricultural productivity for almost any warming in the tropics and sub-tropics and adverse impacts on fisheries
- Increase the incidence of vector- (e.g., malaria and dengue) and water-borne (e.g., cholera) diseases, heat stress mortality, threats nutrition in developing countries, increase in extreme weather event deaths
- Adversely effect ecological systems, especially coral reefs, and exacerbate the loss of biodiversity and critical ecosystem services



Food and Water Security:
critical issues in most developing
countries

Agriculture: Successes and Failures

- Today over one billion people go to bed hungry every night – the problem is acute in Sub-Saharan Africa and parts of Asia



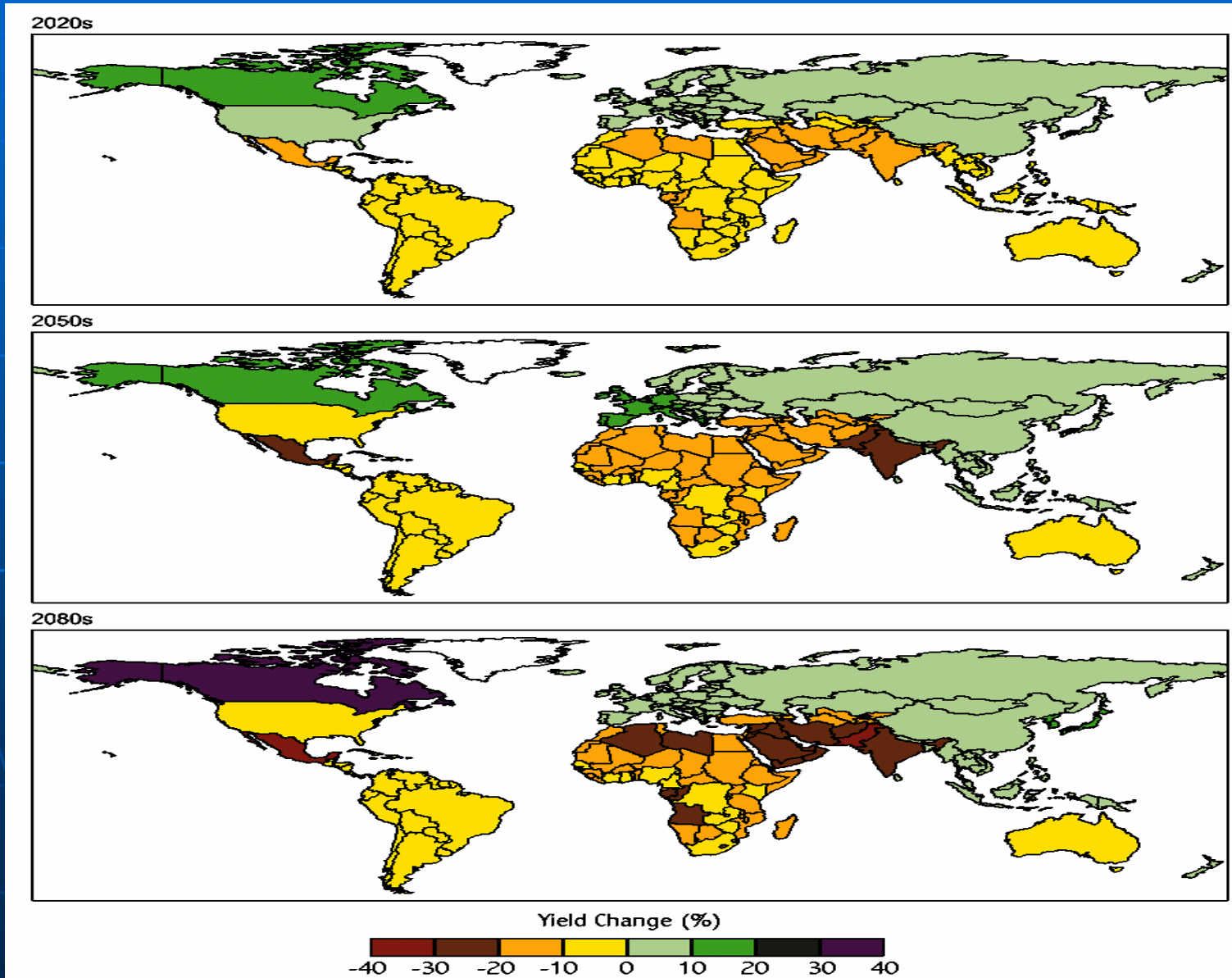
The Challenge of Food Security

- The demand for food will double within the next 25-50 years, primarily in developing countries, and the type and nutritional quality of food demanded will change
- Less labor – disease, rural to urban migration
- Less water – competition from other sectors
- Less arable land – competition from energy crops
- High energy prices
- Distorted trade policies – OECD subsidies
- Land policy conflicts
- Loss of biodiversity: genetic, species and ecosystem
- Increasing levels of air and water pollution

and

the biggest challenge of all: Human-Induced Climate Change

Crop yields are projected to decrease in the tropics and sub-tropics, but increase at high latitudes

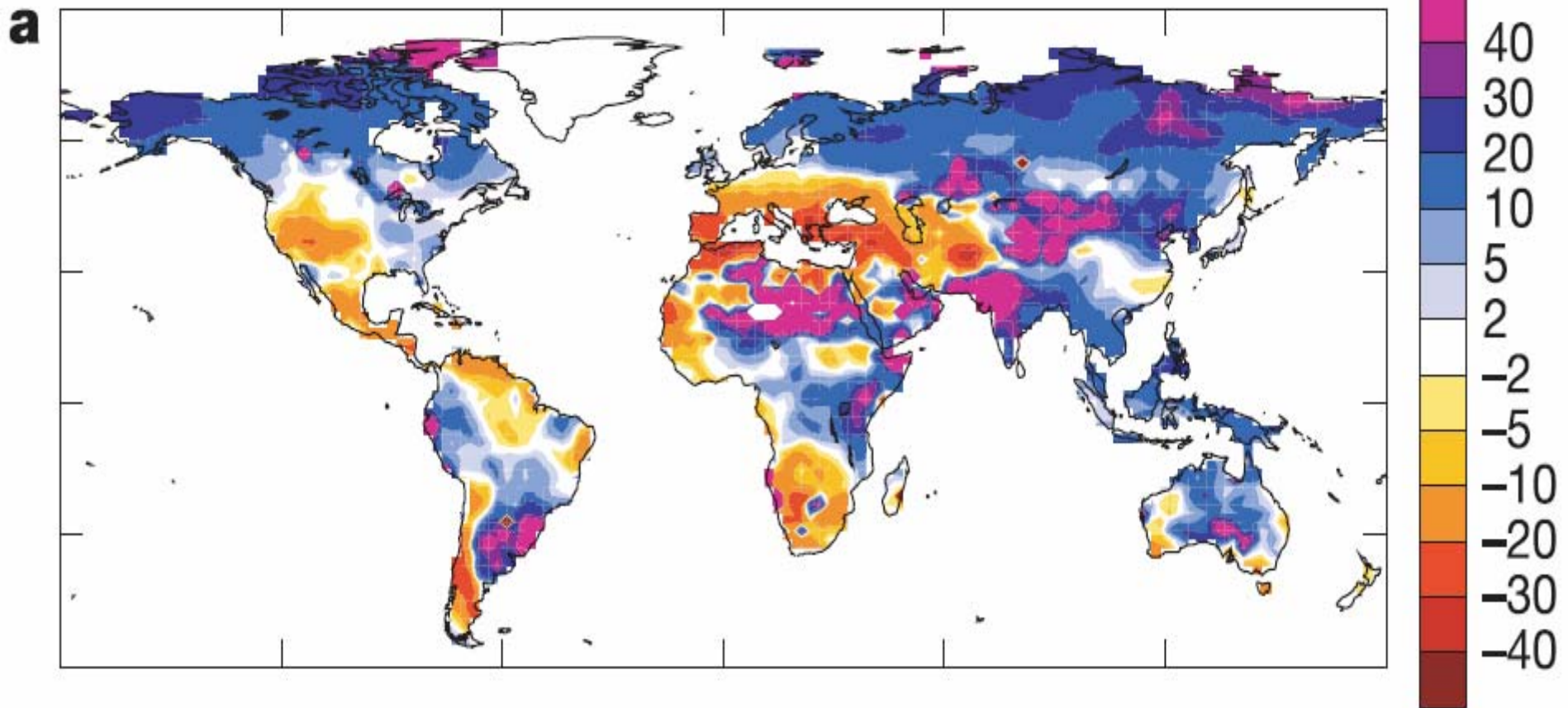


The Challenge of Water Security

- Water scarcity is growing - by 2025 more than half of the world's population is projected to live under conditions of severe water stress
- Water quality is declining in many parts of the world
- 70% of all freshwater is used for irrigation - 15-35% of all irrigation systems are currently unsustainable with demand exceeding supply
- Water has the lowest rate of cost recovery among all infrastructure sectors (about 20%)

Human-induced climate change is projected to decrease water quality and availability in many arid- and semi-arid regions

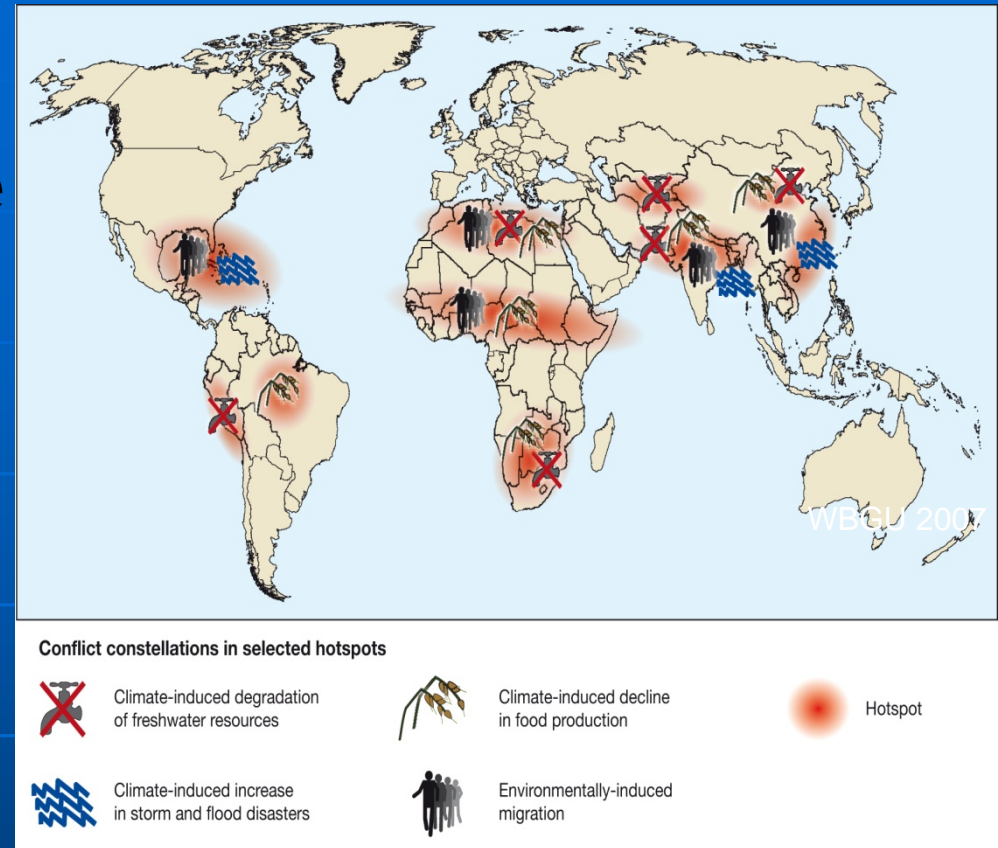
Percent change in runoff by 2050



Many of the major "food-bowls" of the world are projected to become significantly drier

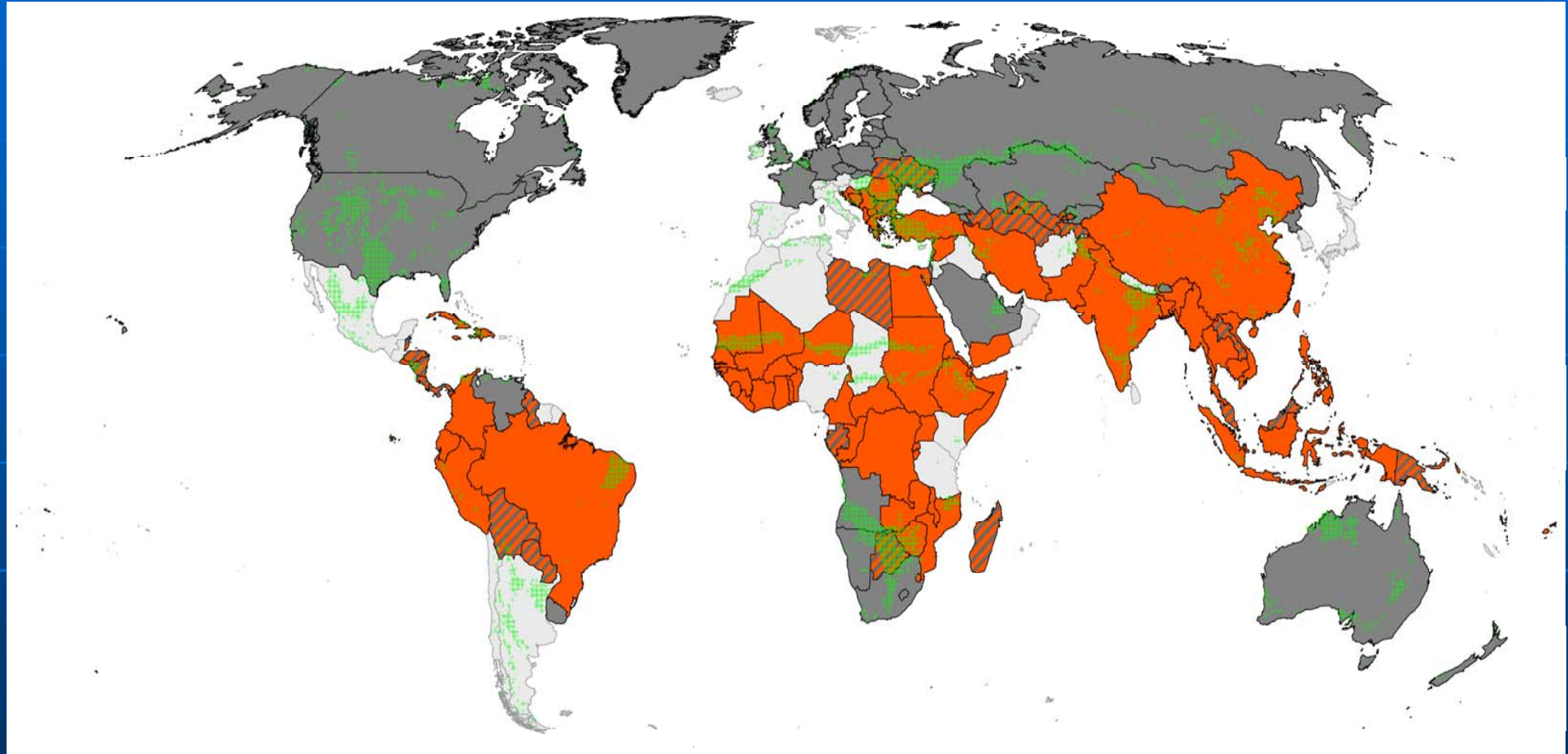
Climate Change and Conflict

- Tens of millions of people displaced
 - Low lying deltaic areas
 - Small Island States
- Food shortages where with hunger and famine today
- Water shortages in areas already with water shortages
- Natural resources depleted with loss of ecological goods and services
- Increased incidence of disease
- Increased incidence of severe weather events



Climate Change, coupled with other stresses, can lead to local and regional conflict and migration depending on the social, economic and political circumstances

Emissions and Vulnerability to Climate Change



Highest vulnerability towards climate change vs. largest CO₂ emissions (from fossil fuel combustion and cement production, and including land use change, kg C per person and year from 1950 - 2003)

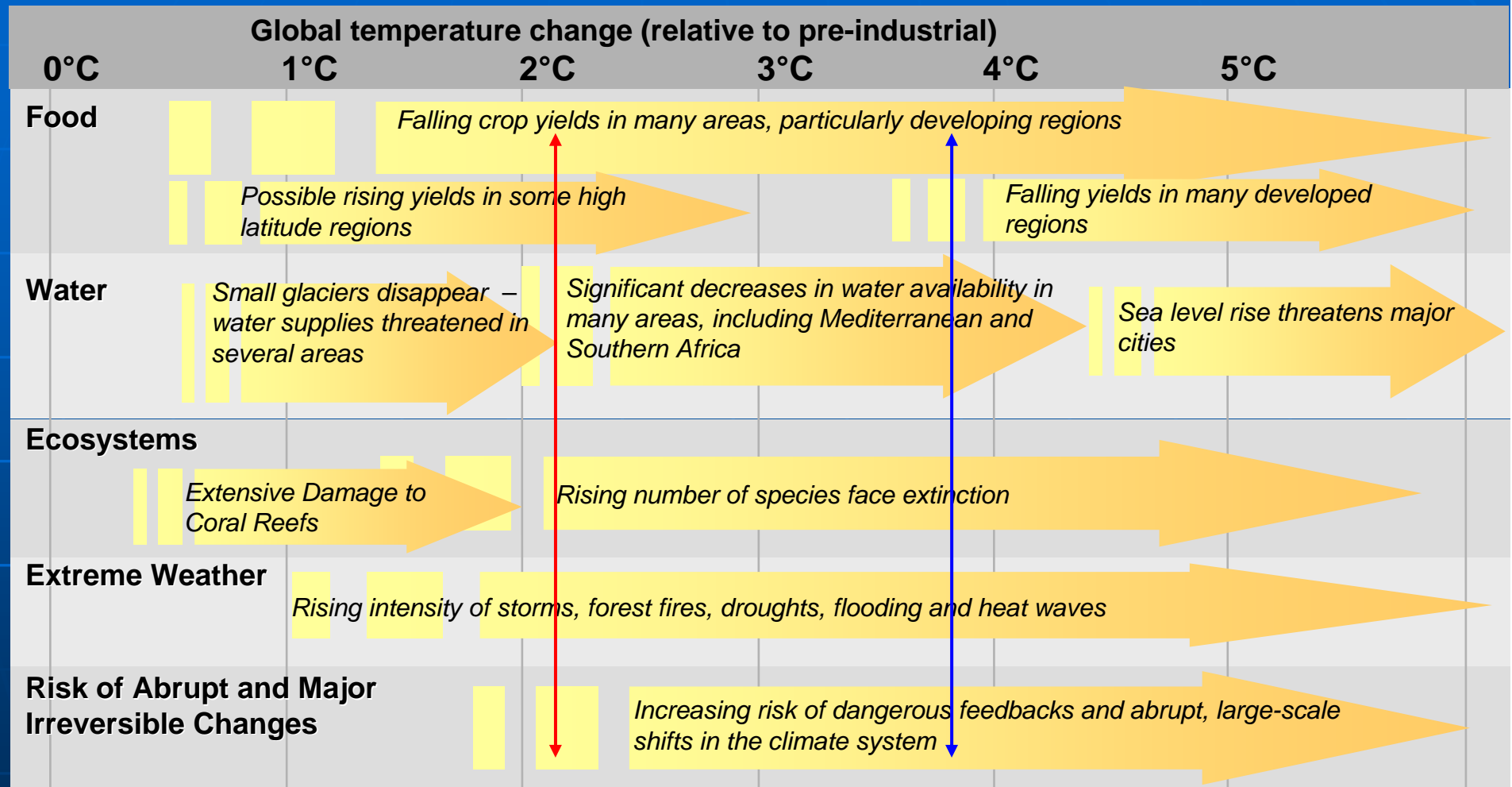
- Largest per capita CO₂ emitters
- Highest social and / or agro-economic vulnerability
- ▨ Largest per capita CO₂ emitters, and highest social and / or agro-economic vulnerability
- Areas with highest ecological vulnerability

Climate Change Resilient Development

Requires cost-effective and equitable mitigation and adaptation – developing countries need financing, technology and knowledge transfer

- **Mitigation:** While minimizing the emissions of greenhouse gases and transitioning to a low-carbon economy, access to affordable energy in developing countries is a pre-requisite for poverty alleviation and sustainable economic growth
- **Adaptation:** Requires integrating current climate variability and projected changes in climate in sector and national economic planning while recognizing the aspirations of local communities

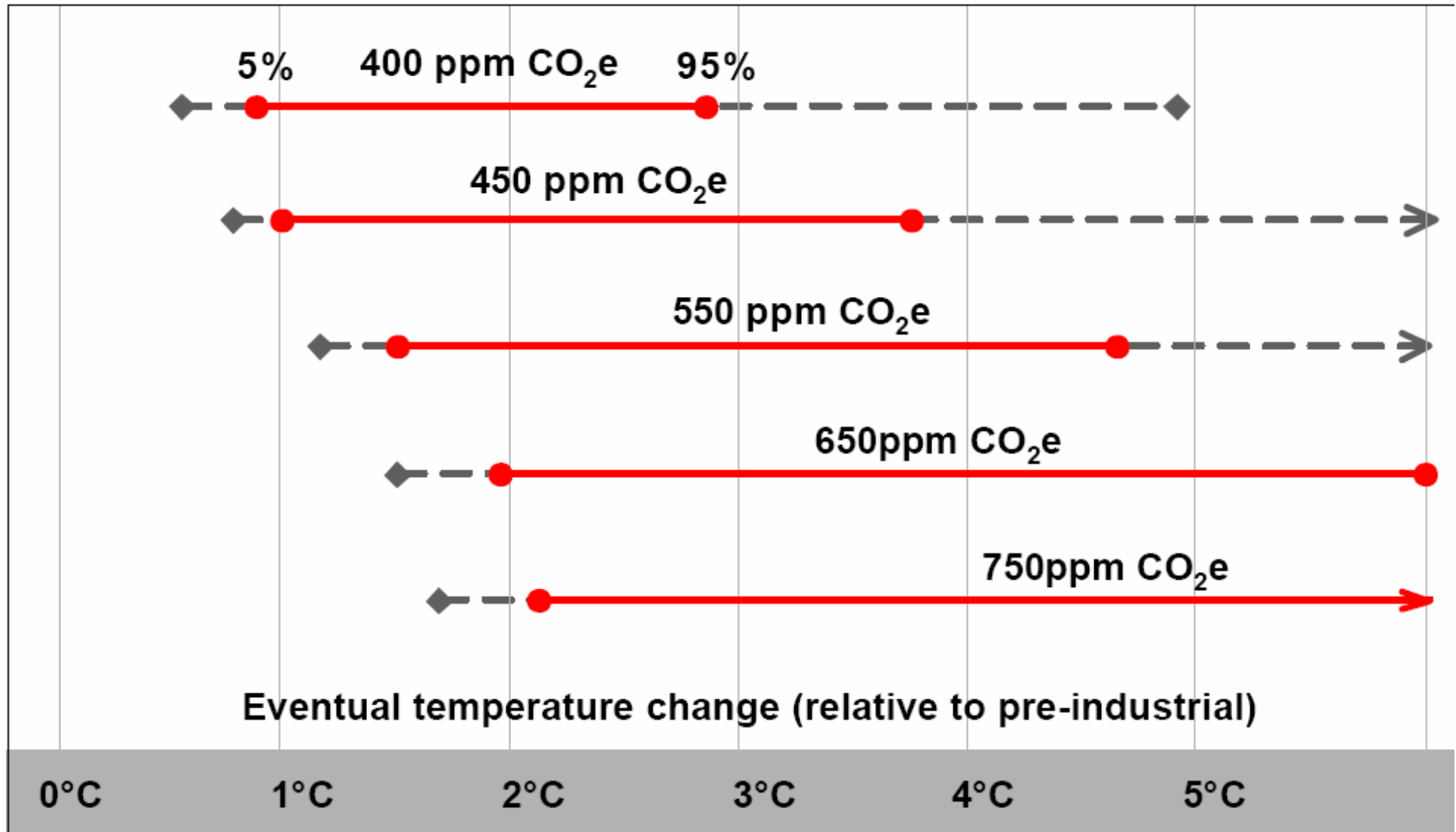
Climate change impacts are now inevitable: the less mitigation, the more adaptation is required



The risk of serious irreversible impacts increases strongly as temperatures increase

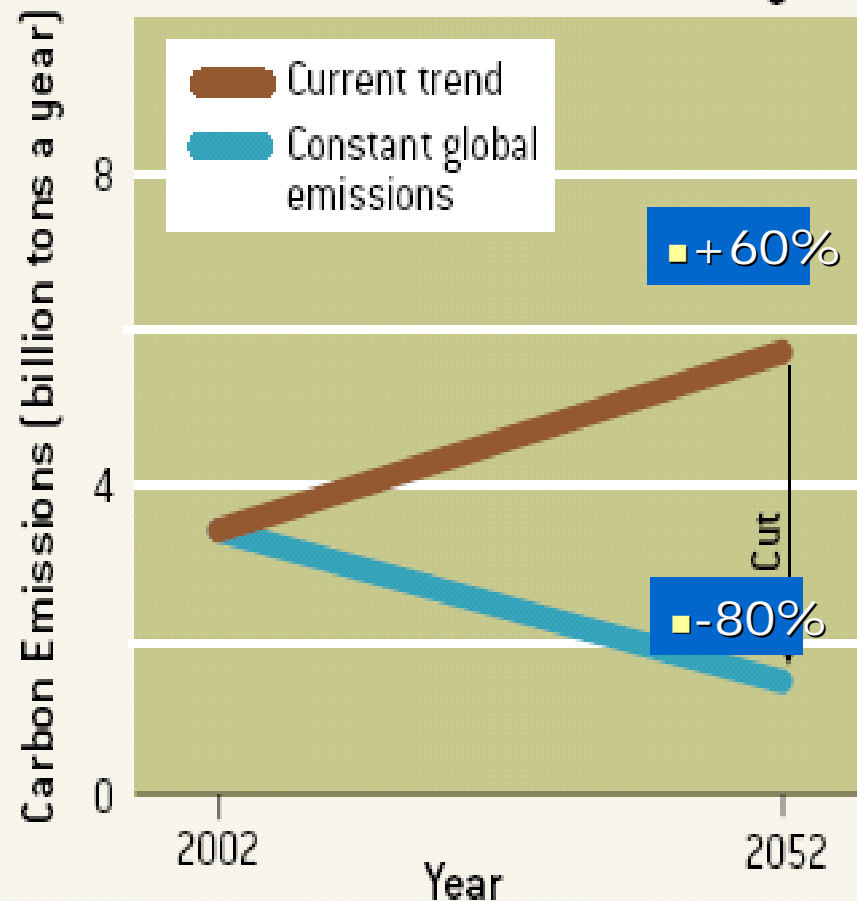
Aim to mitigate to 2°C but prepare to adapt to 4°C

Emissions Paths to Stabilization

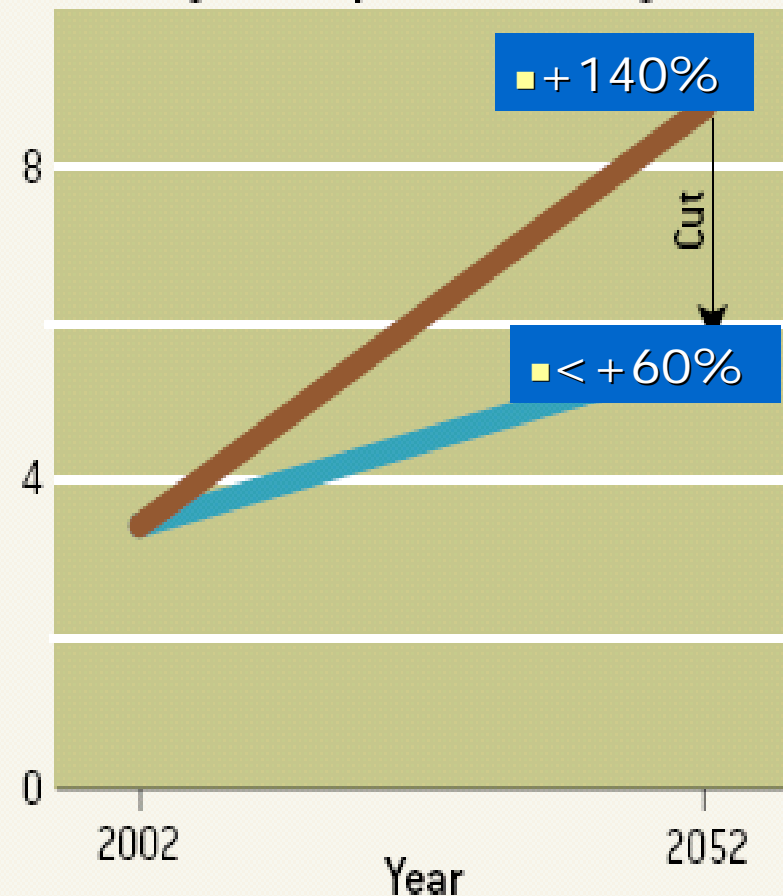


OECD and non-OECD shares - 50-year view to stabilize at about 450-500ppm

To hold global emissions flat, the OECD must emit less than today ...



...to let non-OECD nations emit more as they develop economically



Mitigation Strategy

- Technology transformation, transfer and diffusion
 - Carbon capture and storage, and future generation biofuels
- Mobilising behaviour change
 - Citizens, private sector and public sector
- Putting a price on carbon (\$20-100 tCO_{2eq}) through
 - emissions trading, taxation and regulation - national, regional and global
- Policy tools including reducing energy subsidies, energy efficiency standards, labelling, education,

The challenge is to maximize the market potential for low carbon technologies by minimizing the gap between their technical, economic and market potential

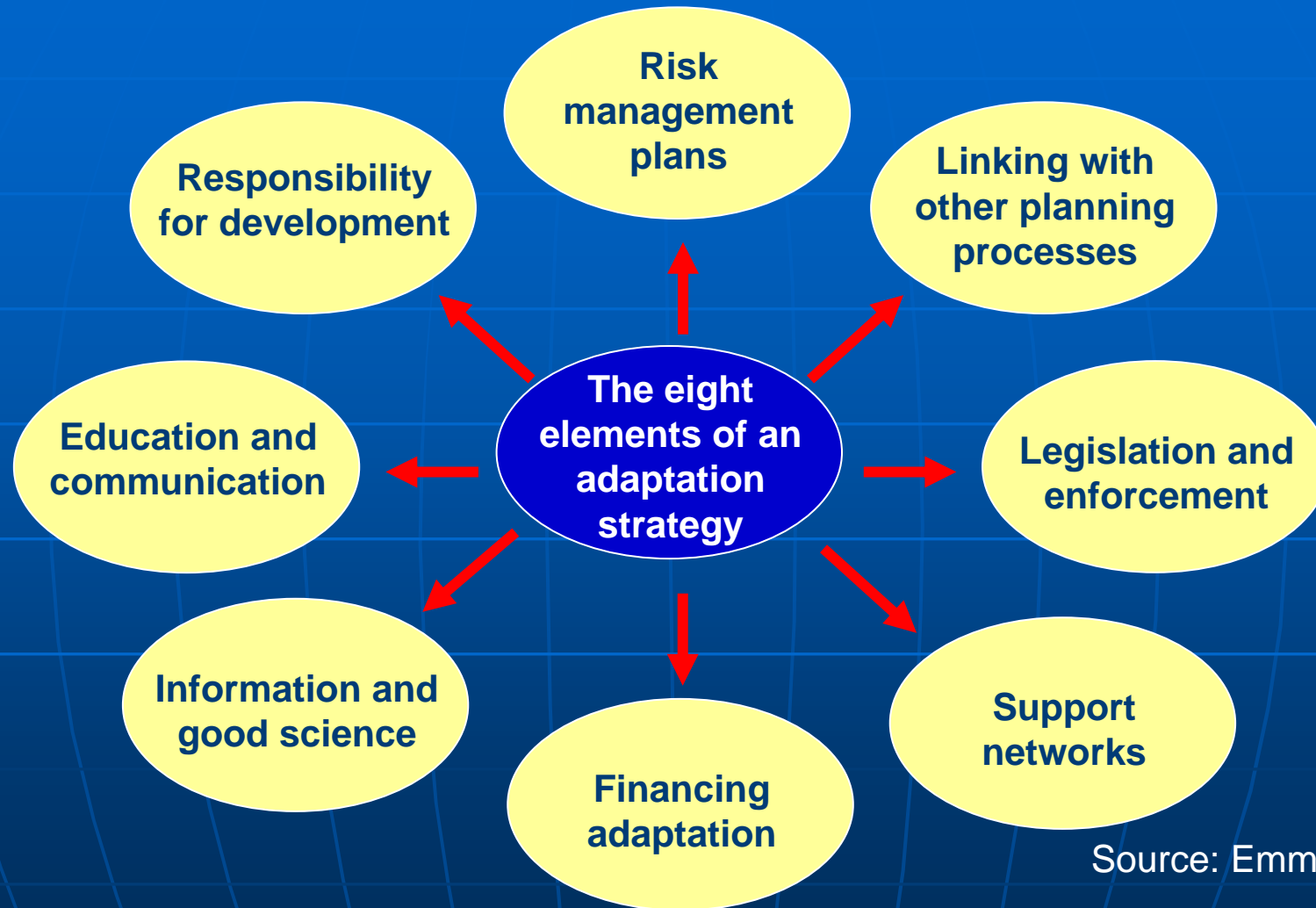
Potential technological options

- **Efficient production and use of energy:** coal plants (e.g., re-powering old inefficient plants and developing IGCC); vehicles (e.g., fuel cell cars) and reduced use of vehicles (e.g., mass transit and urban planning), buildings, and industries
- **Fuel shift: coal to gas**
- **Renewable Energy and Fuels:** Wind power; solar PV and solar thermal; small and large-scale hydropower; geothermal; bio-energy; wave and tidal power
- **CO₂ Capture and Storage:** Capture CO₂ in the production of electricity followed by geological storage (e.g., IGCC – CCS)
- **Nuclear fission:** Nuclear power
- **Forests and Agricultural Soils:** Reduced deforestation; reforestation; afforestation; and conservation tillage

Major Mitigation Policy Challenges

- International policy
 - A long-term (2030 – 2050) global regulatory framework, involving all major emitters, with an equitable allocation of responsibilities – with intermediate targets
 - Kyoto plus 5 years will not provide the right signals to the private sector or national governments
 - Expand range of eligible CDM activities, including avoided deforestation, and forest degradation and exploring sectoral and programmatic approaches
 - Key challenges include engaging USA, and in an equitable manner China and India

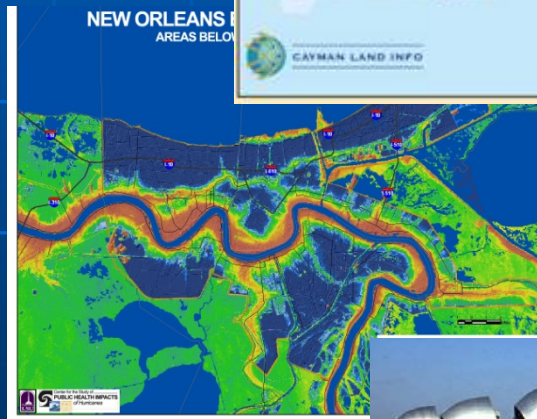
Elements of an adaptation strategy



Source: Emma Tompkins

Delivery of adaptive responses; adaptive capacity and society's self-organisation; and distribution of costs

There are limits to how much we can adapt? ...physical, behavioural and technological limits



- **Physical limits:** there are physical limits to potential adaptation on small low lying islands e.g. Cayman Islands
- **Behavioural limits:** there are behavioural constraints that influence where we live and why, e.g. New Orleans
- **Technological limits:** there are technological limits to the flood defences that can be constructed, e.g. Thames Barrier, London

In Conclusion

- Climate change is an additional stress on food and water security, human health and human settlements
- There is no dichotomy between addressing climate change and economic growth – indeed the cost of reducing greenhouse gas emissions is less than the cost of inaction
- Need to get the economics right – eliminate perverse subsidies –internalize externalities - set a price on carbon
- There are cost-effective and equitable solutions to address climate change, but political will and moral leadership is needed – required changes in policies, practices and technologies are substantial and not currently underway
- Public and private sector decision-makers need to take a longer-term perspective
- Advances in science and technology are required
- Developing countries need financial and technical assistance