Climate Change

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Climate Change

- Research and Monitoring
- Scientific, Economic and Technological Assessments
- Policy Formulation
- Technology Development
- Financing

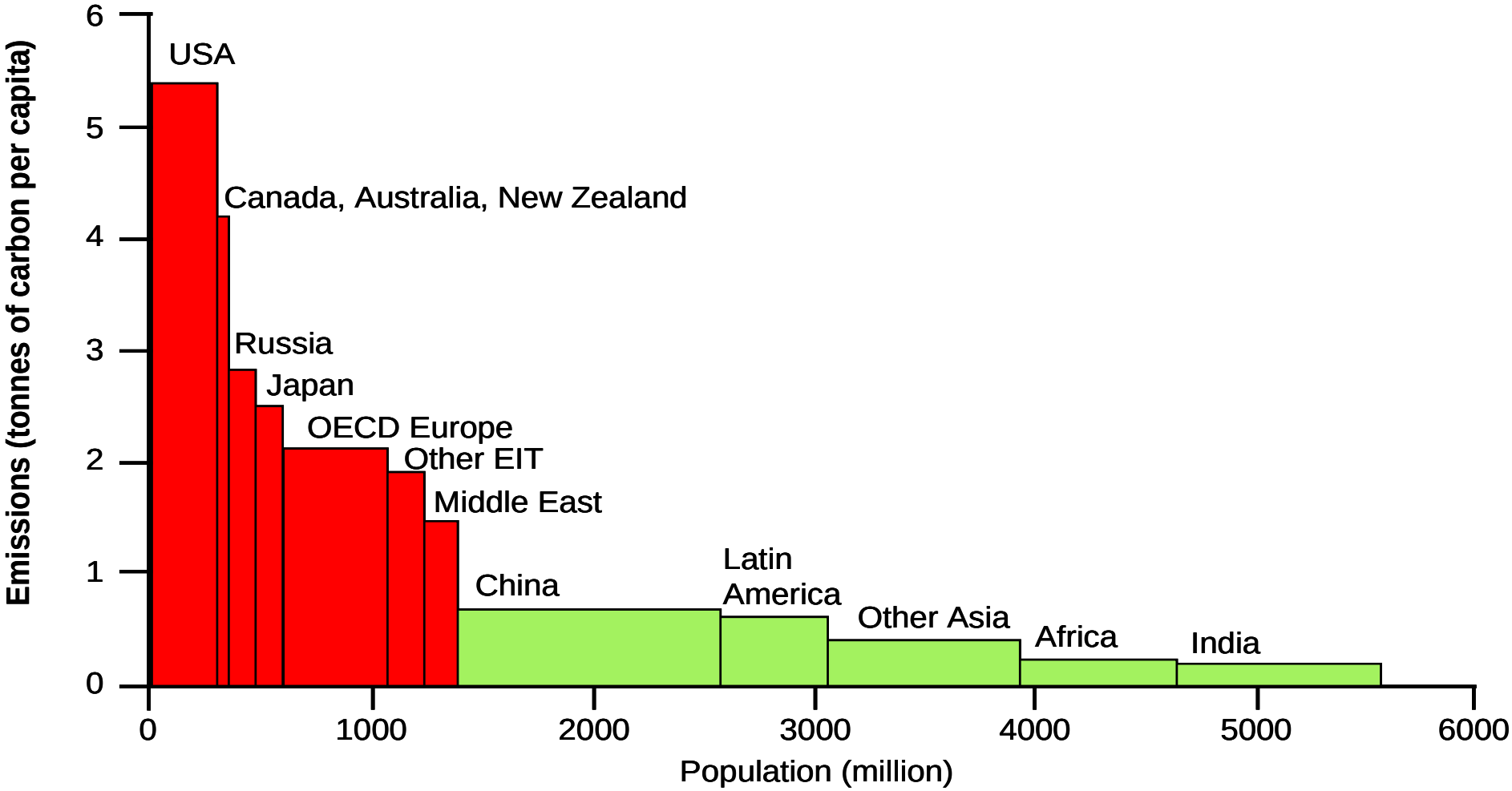
National and Global

Climate Change

- Climate change is a global development, security and economic issue, which undermines:
  - environmental sustainability
  - poverty alleviation and the livelihoods of the poor
  - human health
  - personal, national and regional security

- Climate change is an inter- and intra-generational equity issue:
  - developing countries and poor people in developing countries are the most vulnerable
  - the actions of today will affect future generations

Can Development be Equitable and Climate-friendly?



Climate Change Resilient Development

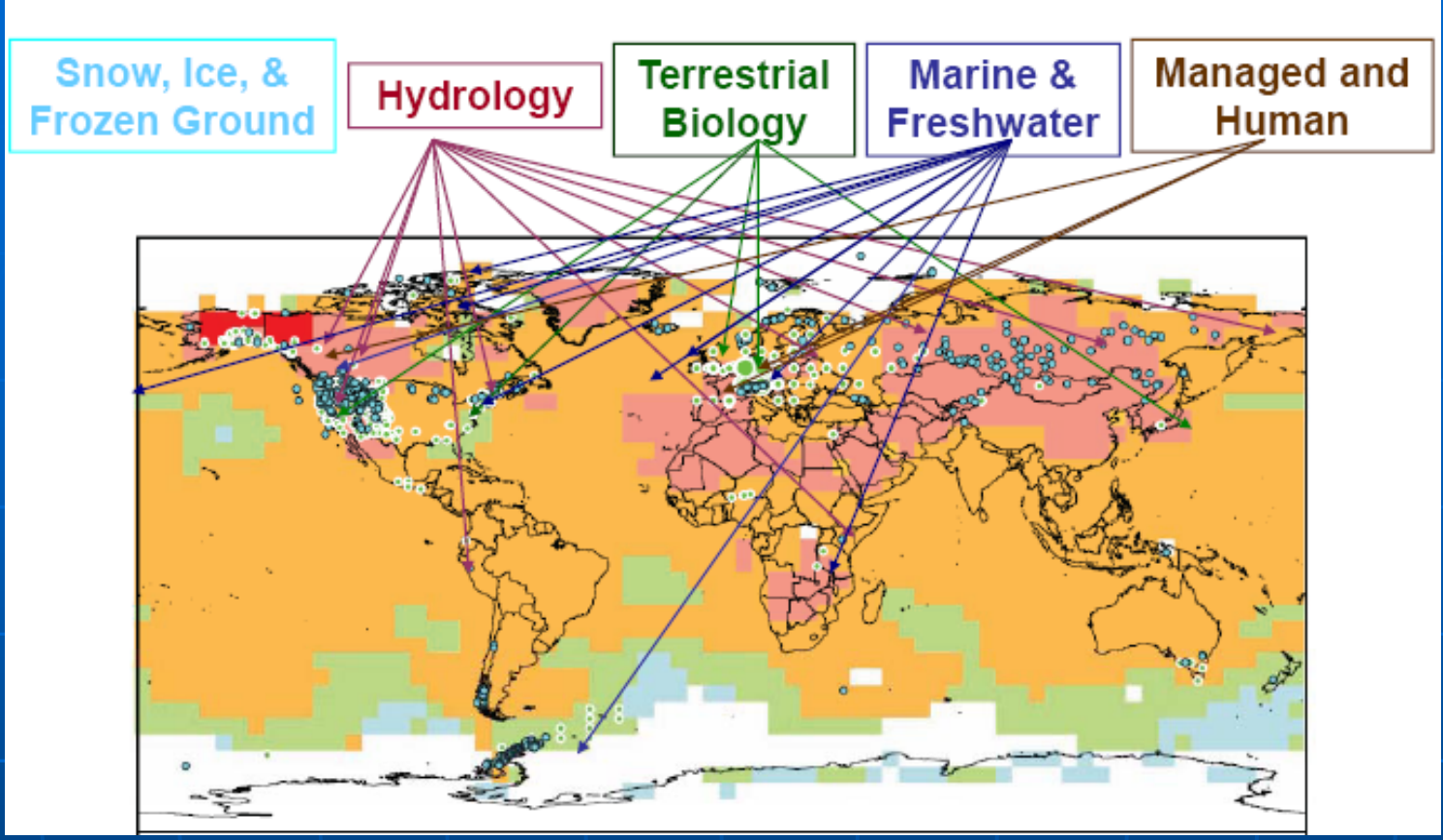
Requires cost-effective and equitable mitigation and adaptation

- **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

Assessments
Global and Sub-Global

- Intergovernmental Panel on Climate Change
- Millennium Ecosystem Assessment
- Global Environmental Outlook
- International Assessment of Agricultural Science and Technology for Development
- Stern Report (UK)
- CBD AHTEG reports on climate change and biodiversity



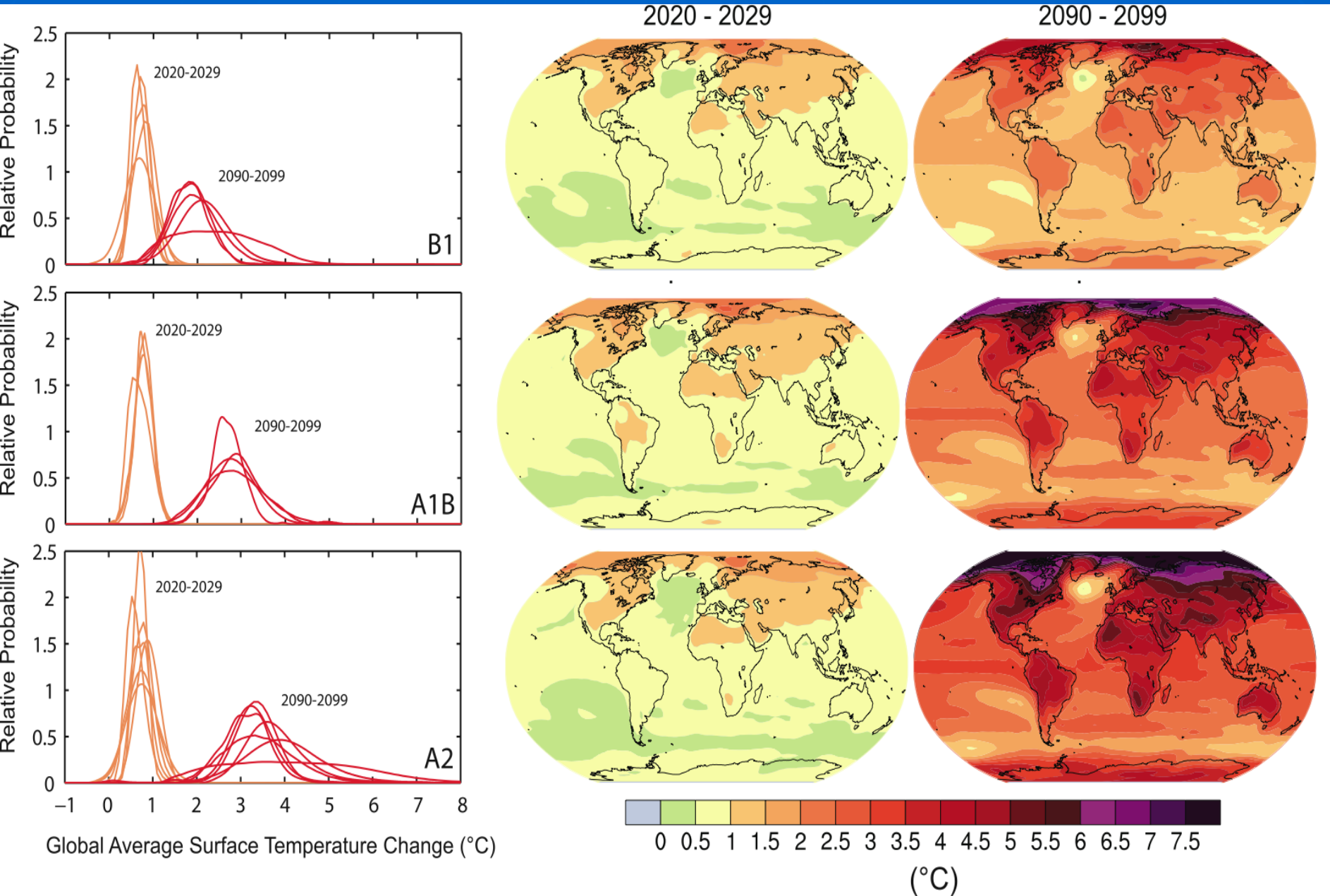
Physical	Biological
Number of significant observed changes	Number of significant observed changes
Percentage of significant changes consistent with warming	Percentage of significant changes consistent with warming

Global

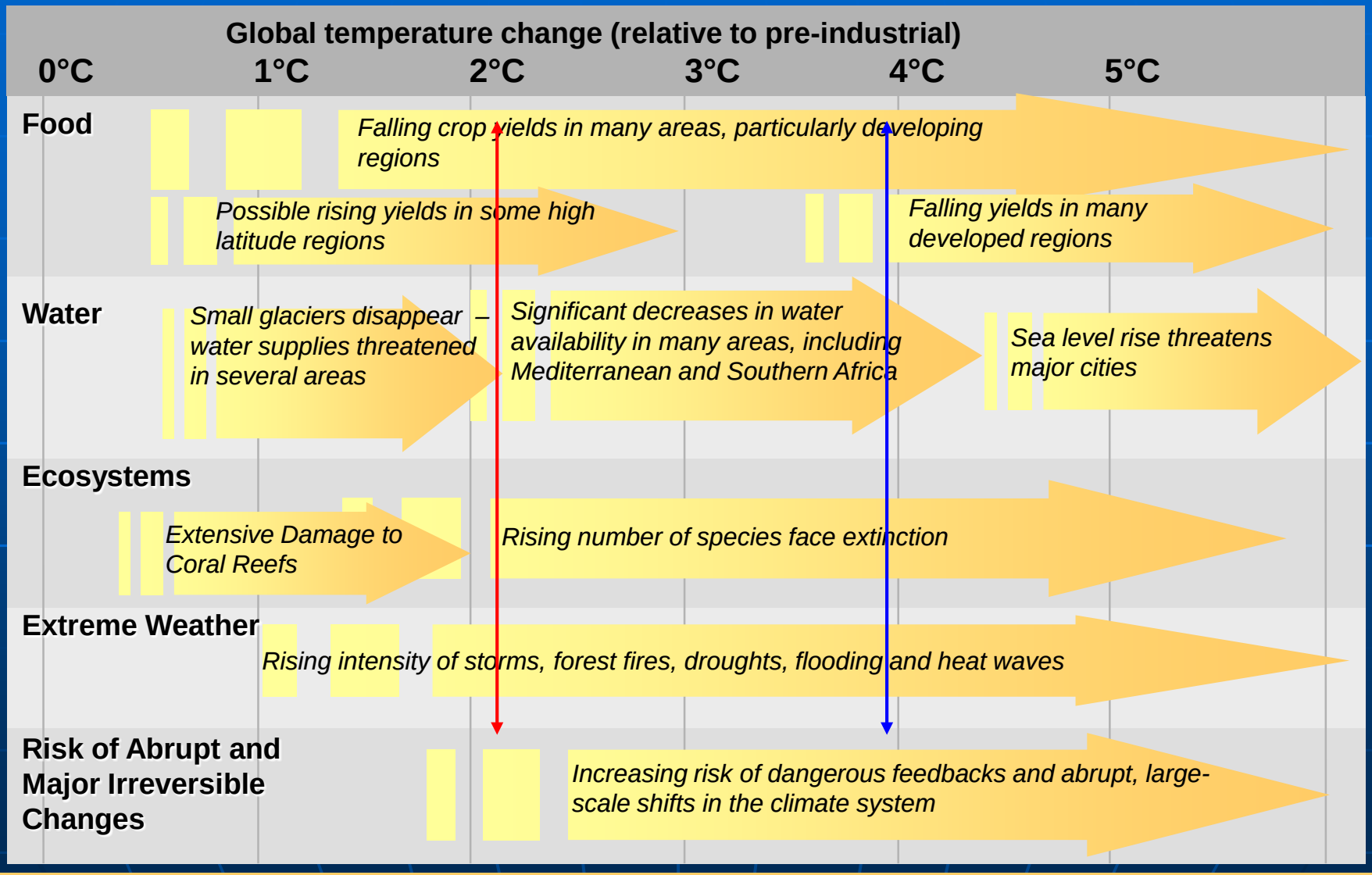
765	28671
94%	90%

Source IPCC AR4 WG2

Projected Changes in Temperature



Climate change impacts are already occurring and more are inevitable



The risk of serious irreversible impacts increases strongly as temperatures increase

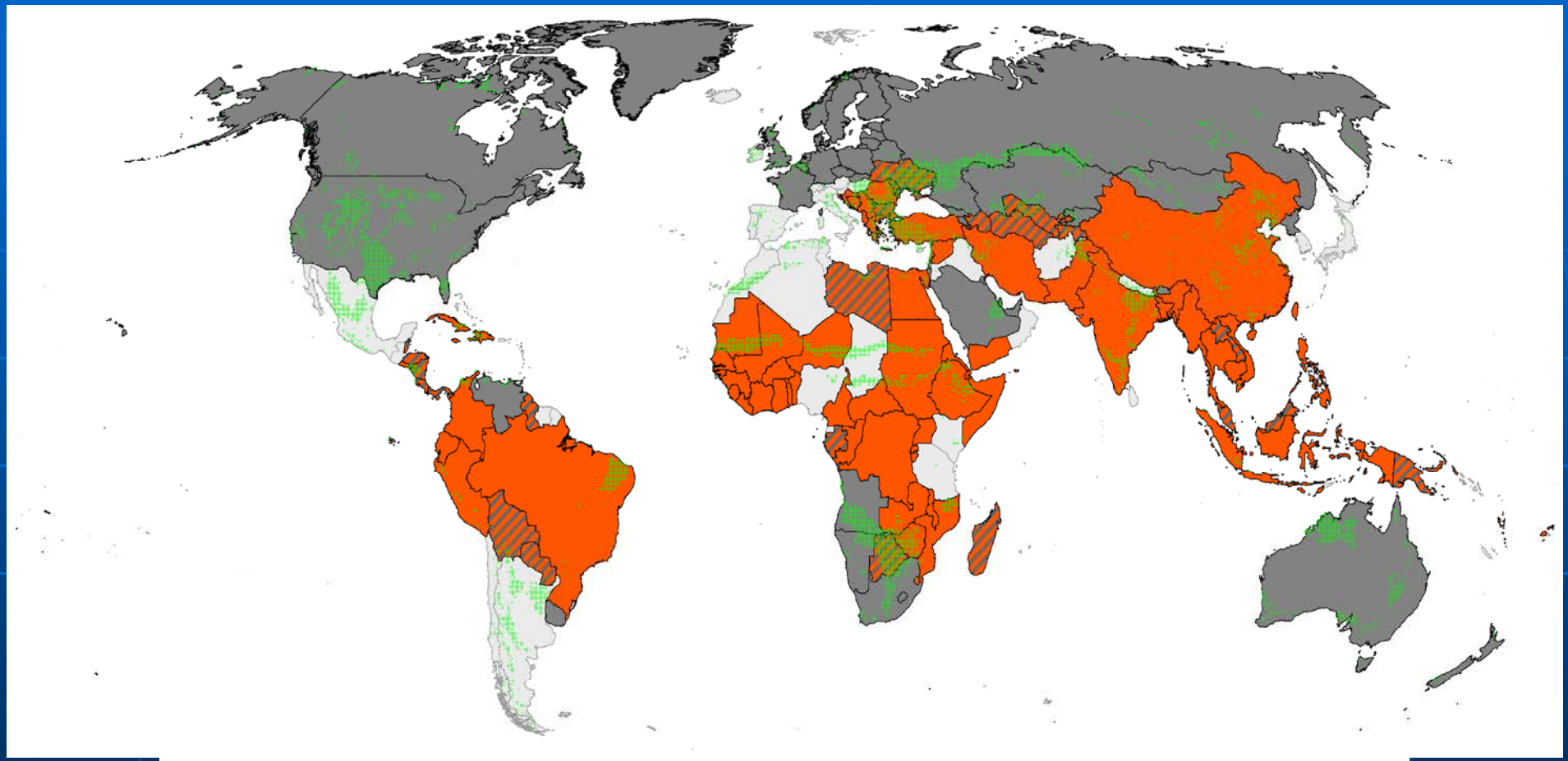
Food Security

Drivers of recent increase in food prices

- Increased demand from rapidly developing countries
- Poor harvests due to variable weather - possibly related to human-induced climate change
- Increased use of biofuels, especially maize in the US
- High energy prices
- Export bans from some large exporting countries
- Speculation on the commodity markets

Key question is how important are these factors in the future

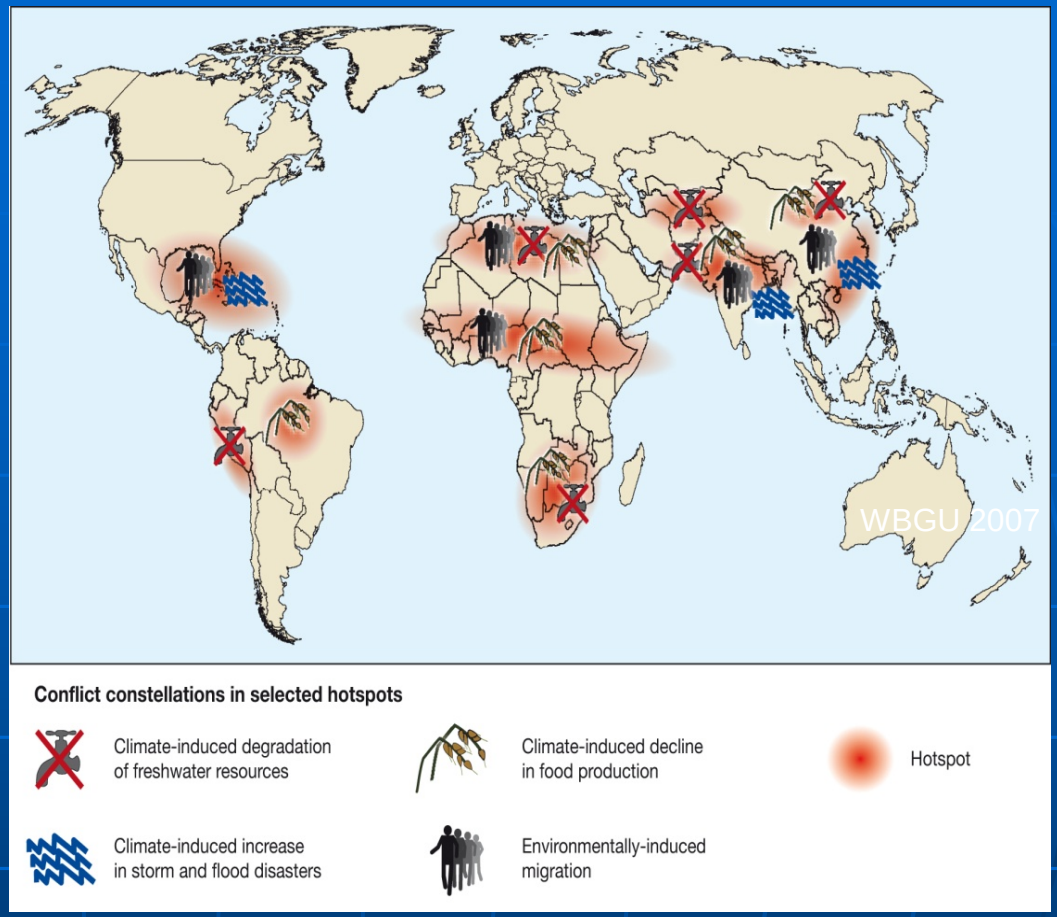
Emissions and Vulnerability to Climate Change



Highest vulnerability towards climate change vs. largest CO_2 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 CO_2 emitters
- Highest social and / or agro-economic vulnerability
- Largest per capita CO_2 emitters, and highest social and / or agro-economic vulnerability
- Areas with highest ecological vulnerability

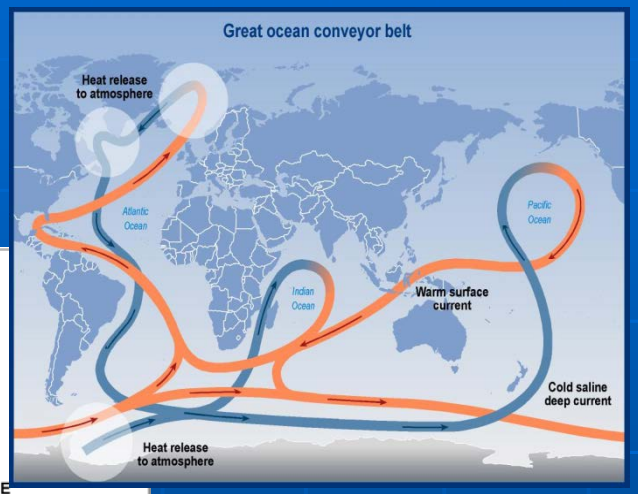
Climate Change, Migration and Conflict

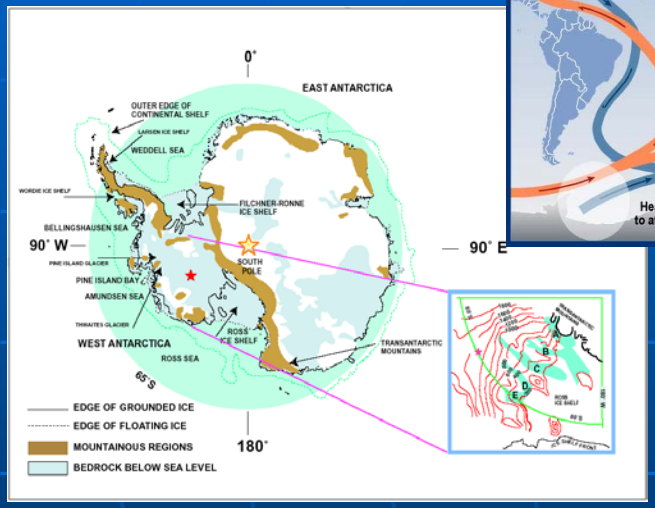


- Tens of millions of people displaced
  - Low lying deltaic areas
  - Small Island States
- Food shortages where with hunger and famine today
- Water shortages in areas already water scarce
- Natural resources depleted with loss of ecological goods and services
- Increased incidence of disease
- Increased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

What constitutes dangerous climate change?



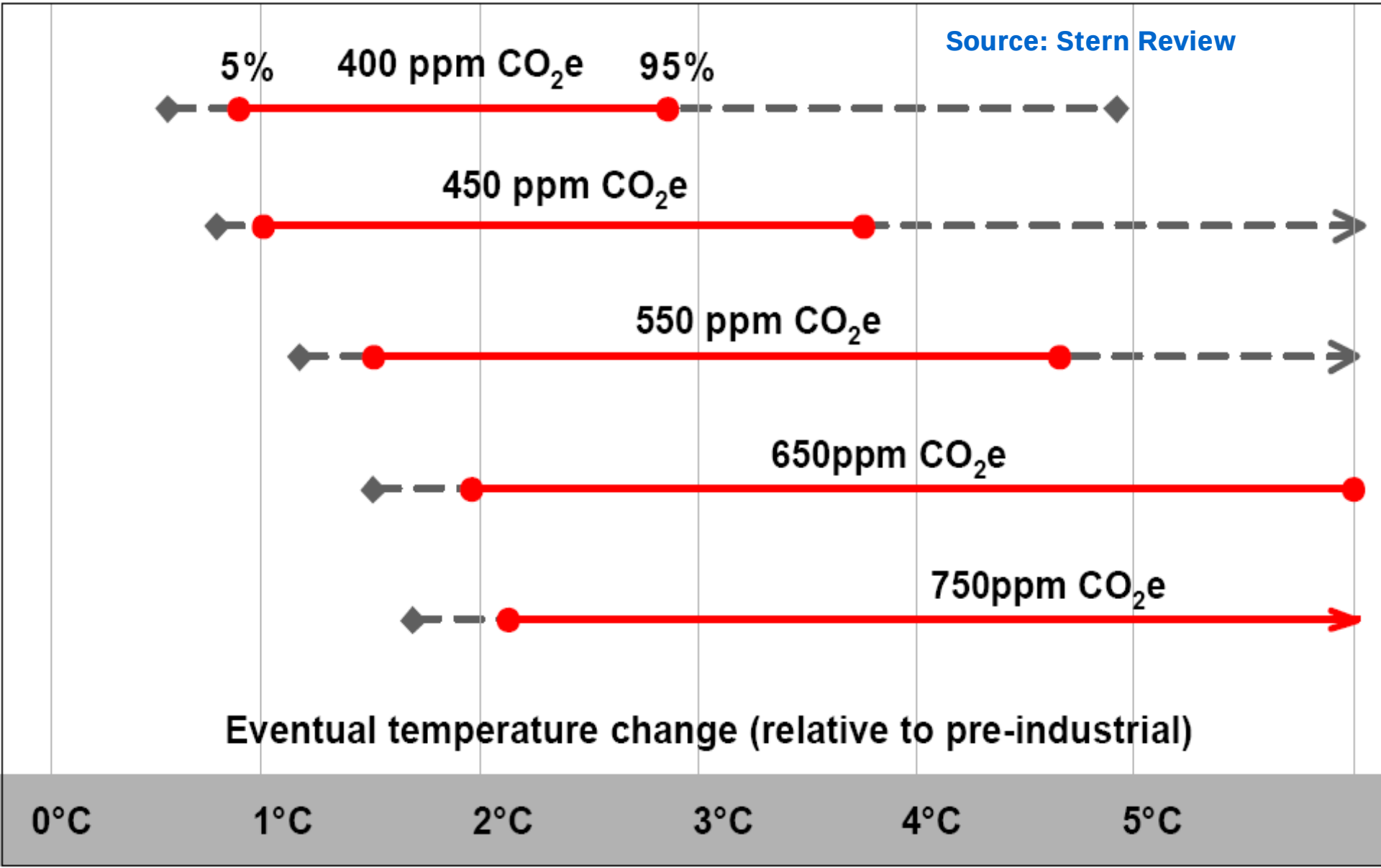


Deciding what constitutes "dangerous anthropogenic interference to the climate system" is a value judgment determined through socio-political processes informed by scientific, technical and socio-economic information

- **Physical or social outcomes?**
- **Danger for all or danger for some?**
- **Who defines danger?**

- **Article 2 of UN Convention on Climate Change requires …**
  - ***"… stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."***
  - ***"… allow ecosystems to adapt naturally, ensure food production, and allow sustainable economic development.***

Emissions Paths to Stabilization



Can we avoid dangerous climate change?

What are the chances of exceeding 2 and 4ºC above pre-industrial levels if we stabilise greenhouse gases?

- 2ºC

CO_2e	Stern (based on Meinhausen)	Met Office Hadley Centre
450 ppm	25 - 75%	77%
550 ppm	65-99%	99%
650 ppm	80-99%	99%

- 4ºC

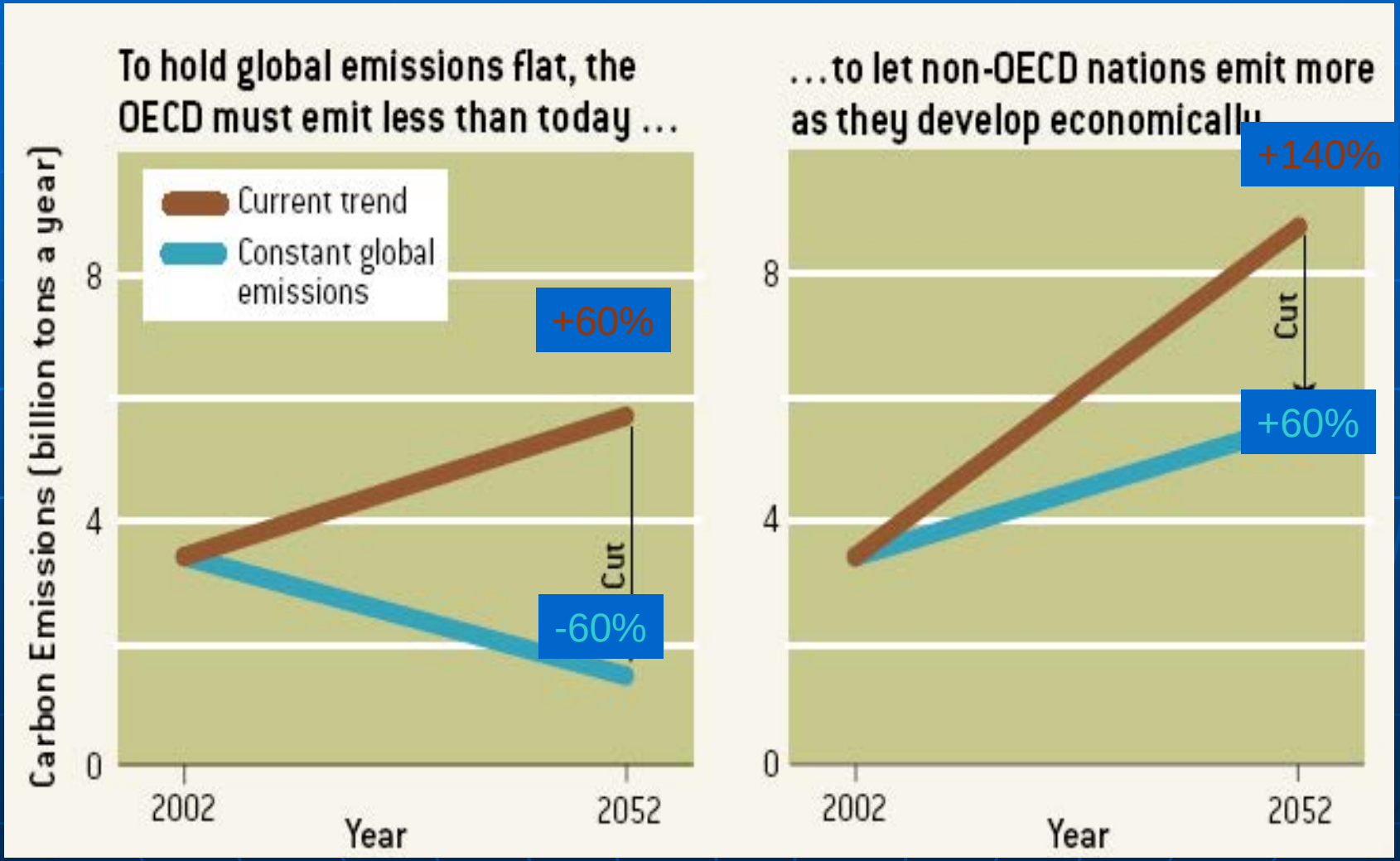
CO_2e	Stern (based on Meinhausen)	Met Office Hadley Centre
450 ppm	1-30%	3%
550 ppm	5 - 50%	25%
650 ppm	15 - 65%	60%

Mitigation is cost effective relative to inaction

Do nothing	Move to a 550ppm CO_2e trajectory	Move to a 450ppm CO_2e trajectory
Costs equivalent to a 5-20% loss in global GDP.	Costs of mitigation estimated at 1% of global GDP in 2050.	Mitigation costs could be 3 times the cost of 550ppm trajectory.
50% chance of exceeding a 5° temperature rise^	50% chance of exceeding a 3° rise in temperatures^	May be no more than a 50% chance of remaining below a 2° change^.

All temperature changes quoted are relative to pre-industrial temperature levels. ^Temperature increases by end of the next century.
*Global income loss (5-20%) is equivalent to an “average” annual loss of GDP each year now and forever.

OECD and non-OECD shares 50-year view



Mitigation Strategy

- Putting a price on carbon through
  - emissions trading
  - taxation
  - regulation - national, regional and global
- Technology transformation
  - Carbon capture and storage
  - Future generation biofuels
- Mobilising behaviour change - segmentation
  - Citizens
  - Business
  - Public sector

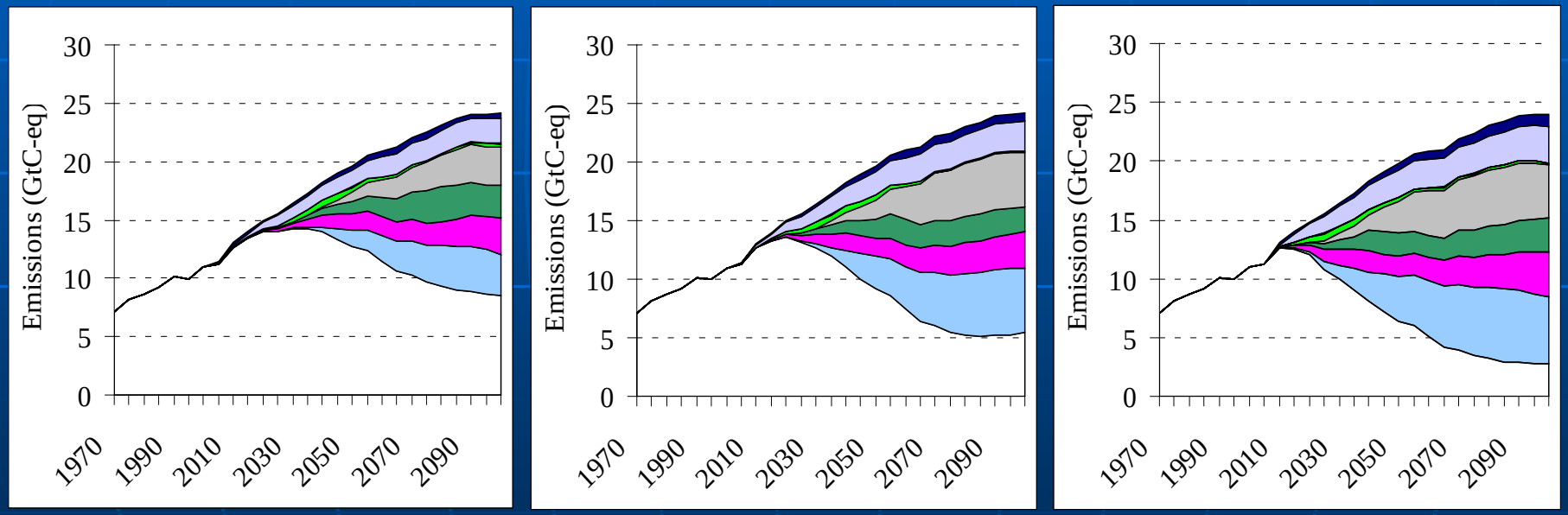
Potential technological options

- **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; bio-energy
- **CO_2 Capture and Storage:** Capture CO_2 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
- **Other GHGs:** Methane, nitrous oxide, halocarbons and tropospheric ozone precursors

Portfolio of Options to Stabilize GHG Concentraions

- The range of stabilisation levels can be achieved by
  - deployment of a portfolio of technologies that are currently available and those that are expected to be commercialised in coming decades

650 CO2-eq **550 CO2-eq** **450 CO2-eq**



Biofuels

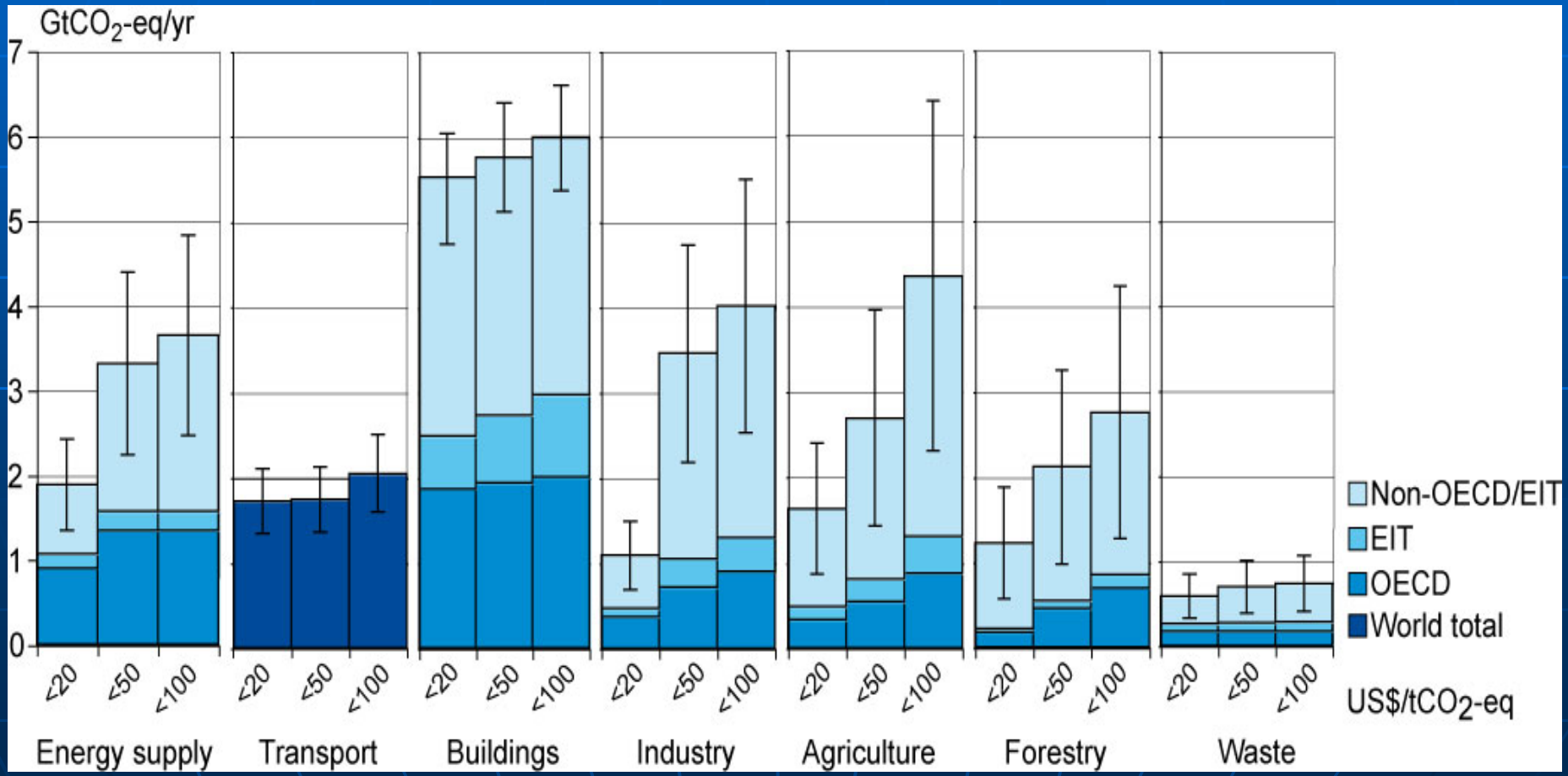
- Two major sources of biofuels
  - Bioethanol from sugar and maize
  - Biodiesel from palm oil, soy and rapeseed
- Rarely economic - normally heavily subsidized
- Serious questions regarding environmental sustainability
  - Greenhouse gas emissions - direct and indirect emissions
  - Loss of biodiversity, soil and water degradation
- Serious Questions regarding social sustainability
  - Food price increases
  - Involuntary displacement of small-scale farmers by large-scale plantations

Policy Instruments

- Policies, which may need regional or international agreement, include:
  - Energy pricing strategies and taxes
  - Removing subsidies that increase GHG emissions
  - Internalizing the social costs of environmental degradation
  - Tradable emissions permits--domestic and global
  - Voluntary programs
  - Regulatory programs including energy-efficiency standards
  - Incentives for use of new technologies during market build-up
  - Education and training such as product advisories and labels
- Accelerated development of technologies requires intensified R&D by governments and the private sector

Mitigation Potential Exists For All Sectors & Regions

- *At least* a 50% reduction global greenhouse gas emissions by 2050 is needed for a chance of meeting the EU 2ºC target



Summary of the Major Mitigation Challenges

- A long-term (2030 – 2050) global regulatory framework, involving all major emitters, with an equitable allocation of responsibilities and intermediate targets
- Expand the range of eligible CDM activities, including:
  - avoided deforestation
  - green investment schemes
  - energy efficiency standards, and
  - sectoral and programmatic approaches
- Key challenges include engaging USA, China and India

Financing options for a transition to a low carbon economy

- Conventional MDB Bank lending
- Bilateral donor support
- Global Environmental Facility (GEF)
- Carbon finance – CDM
- Climate Investment Funds
- Private sector

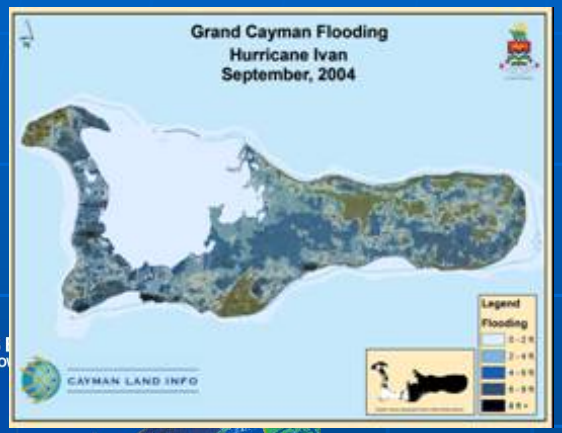
Adapting to Climate Change

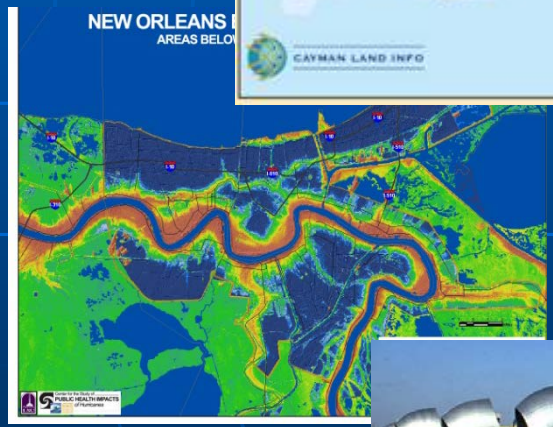
Elements of an adaptation strategy

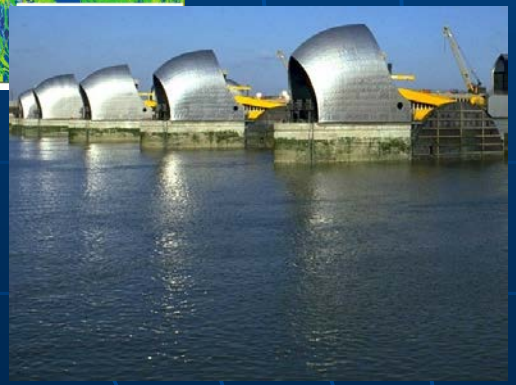
Source: Emma Tompkins

- Delivery of adaptive responses depends on **governance** mechanisms
- Adaptive capacity and society's self-organisation is determined by **governance**
- Distribution of costs and benefits in society is determined by **governance**

Are there 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

The Political Situation

The UK (and EU) goal is to limit the projected increase in global mean surface temperature to 2ºC above pre-industrial levels

and

reduce carbon dioxide emissions by at least 60% by 2050

The UK Government Response

- The UK response is embedded within an EU and global framework, taking a non-partisan leadership role in the global debate – strongly support the need for a long-term regulatory agreement

  - ***Government Processes***
    - Climate change bill
    - Public Sector Agreement, (PSA-27) led by Defra>DECC
      - New Department of Energy and Climate Change
    - Committee of Chief Scientific Advisors - sub-group on climate change

  - ***Developing evidence: Research, Monitoring and Analysis***
    - Key R@D programs within NERC, Defra and Dfid
    - Primary objective of within Living With Environmental Change (LWEC)
    - Primary contributor to IPCC
    - Commissioned the Stern Report

The UK Government Response (cont)

- ***Mitigation and Adaptation Activities***
  - Energy Research Partnership - public private partnership
    - Energy Technology Institute
  - Environmental Transformation Fund
    - Domestic (primarily mitigation, e.g., carbon trust)
    - International (mitigation, adaptation and forestry)
  - National risk assessment – UKCIP-08
  - Act on CO2 public information campaign

- ***Climate Change Policies***
  - Ratified the Kyoto Protocol and support the EU 2020 obligations (20% reduction in greenhouse gas emissions by 2020, 30% if others agree)
  - Committed to developing a post-Kyoto Agreement, i.e., a long-term global equitable agreement involving all major emitters - would include reducing deforestation
  - Support the European Trading System for Carbon
  - Support the private sector developing standards for voluntary carbon offsets
  - RFTO - biofuels obligation (likely to be modified given the review by Gallagher – slow down the introduction of biofuels)

Mitigation and the UK

- UK government acknowledges that climate change is a serious issue and that action is urgently needed to adapt to, and mitigate, human-induced climate change
  - Action is needed now to limit the costs and to avoid unavoidable consequences of climate change given there are limits to adaptation in ecological systems and socio-economic systems
- The UK/EU position of limiting the change in global mean surface temperature to 2ºC above pre-industrial levels is required to limit damages
- There is a need for a long-term, equitable, global regulatory framework, with intermediate targets, that involves all major emitters that limits climate change to about 2 degrees Centigrade above pre-industrial
- The UK government has proposed a climate bill:
  - mandating a 60% reduction in carbon dioxide emissions by 2050 – likely to increase to 80% based on CCC recommendation
  - a climate change committee advising government on a pathway to cost-effectively meet this long-term goal

Adaptation and the UK

- Government Approach
  - Promote a bottom-up stake-holder led engagement process
  - Funding the evidence base, decision-making tools, and UKCIP-08
  - National Risk Assessment
  - Bilateral projects in India, China and Africa

- UK Climate Impacts Program (UKCIP)
  - Assist decision-makers (public and private) to mainstream climate into all sectors in all sectors by
    - Raising awareness, providing evidence, developing climate scenarios

- Developing a structured approach to the role of Government
  - adaptation policy framework
  - Transparent and formal reporting mechanism to Parliament – CC Bill

Climate Change Bill – a framework for setting and delivering our ambitions

Targets	Cut CO_2 emissions by at least 60% by 2050 and 26-32% by 2020
Budgets and accountability	Five-year carbon budgets set three periods ahead Annual progress reports to Parliament
Committee on Climate Change	To advise Government on carbon budgets and targets and cost effective emissions savings
Measures to reduce emissions	Report to Parliament on policies to meet budgets Powers to introduce emissions trading schemes
Adaptation	Provisions relating to taking action and reporting to Parliament

The Kyoto Protocol

- All industrialized governments, except the US have ratified the Kyoto Protocol, which contains:
  - A commitment to reduce GHG emissions, on average, by about 5% between 2008-2012 relative to 1990

- The US stated that the Kyoto Protocol was flawed policy because it was neither fair nor effective and not in the best interests of the US
  - scientific uncertainties – Article 3 (precautionary principle)
  - high compliance costs – inconsistent with IPCC
  - ineffective without the participation of the large developing countries

- There is now movement in the US:
  - Legislation proposed in Senate and House
  - Actions by States, e.g., in CA and NE and NW States
  - Private Sector, e.g., GE, Wall Mart, Dupont
  - Evangelicals
  - Presidential candidates

Elements of a Post-2012 framework

1. Long-term goal	(2C) 50% cut by 2050 on 1990 level
2. Developed country targets	30% cut by 2020 and 60-80 by 2050 for developed countries
3. Developing countries	Graduated approach to commitments
4. Carbon market	Broader, deeper, longer carbon market
5. Technology	Technology Protocols, IFI financing, R&D, energy fficiency
6. Adaptation	Adaptation integrated into development and finance strategies
7. LULUCF inc Deforestation	LULUCF integrated in post-2012 framework. Incentives to tackle deforestation
8. Aviation & maritime	Global sectoral approach

Can a global deal be delivered in Copenhagen (2009)

- Copenhagen is not far away – getting a deal there will be challenging
  - 18 months is not long to negotiate a complex deal
  - Political conditions for radical agreement may not be there
  - US and China are key – one needs to move first, but each waiting for the other
  - The US may not be ready by end 2009
    - The new US Administration and key people will be less than a year into office
    - US legislation may not be in place until 2010
- While the UNFCCC provides the legitimate formal process for negotiations, informal fora such as the G-8/G+5, the MEM, and bilaterals are highly complementary

Roles of Key Actors

- ***Intergovernmental Process:***
- Short- and long-term global emissions targets with an equitable allocation
- Carbon trading system
- ***National governments:***
- National policy and regulatory environment - energy sector reform, energy pricing policies, carbon taxes, elimination subsidies, internalization of environmental externalities, market scale-up of climate-friendly technologies, energy efficiency standards, labeling systems, education and training;
- Invest in energy R&D - efficiency, renewables, carbon capture and storage, and hydrogen;
- Domestic allocation of emissions rights - national tradable emissions systems;
- Appropriate IPR regime, coordinate bilateral aid programs;
- Fund the Global Environment Facility; and
- Integrate climate variability and change into national economic and sector planning.
- ***Local governments:***
- Local markets for climate-friendly (CF) technologies.
- Assume voluntary emissions targets;

Roles of Key Actors

- ***Private sector:***
- Investment for RDDD of CF technologies; voluntary standards; efficient emissions trading systems.
- ***International financial institutions:***
- Financing for CF technologies; promote energy sector reform and market scale-up of CF technologies; promote energy efficiency standards, training and capacity building; stimulate CF technologies in developing countries through carbon financing; assist countries reduce vulnerability to CC by mainstreaming into sector and national economic planning.
- ***Global Environment Facility:***
- Grant resources for regulatory and policy frameworks to promote CF technologies, aggregate markets for CF technologies, build capacity for mitigation and adaptation, and financing for adaptation measures.
- ***Academia:***
- Research, monitoring and data management – energy, climate system and vulnerability
- ***Local communities:***
- Energy conservation - strategies to adapt to CC and CV.
- ***Media, NGO and CSOs:***
- Awareness raising

Overall Conclusions

- Climate change is an additional stress on an already highly stressed world
- Climate change undermines most of the Millennium Development Goals
- There are cost-effective and equitable solutions, but political will and moral leadership is needed
- The future is not pre-ordained - we can limit changes in the Earth's climate, but substantial changes will be needed in current policies, practices and technologies
- Public and private sector decision-makers need to take a long-term perspective