

# **Creating Opportunities from Today's Challenges**

**Bob Watson**

**Chief Scientific Advisor for Defra**

**Director for Strategic Development, University of  
East Anglia**

**Thinking Outside the Box: Borderless Strategies  
to Combat Climate Change**

**IMO**

**April 30, 2009**

# Climate Change

- Climate change is an environmental, development and security issue undermining:
  - poverty alleviation and the livelihoods of the poor
  - human health
  - personal, national and regional security
- Climate 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

# Climate Change Resilient Development

Requires cost-effective and equitable mitigation and adaptation

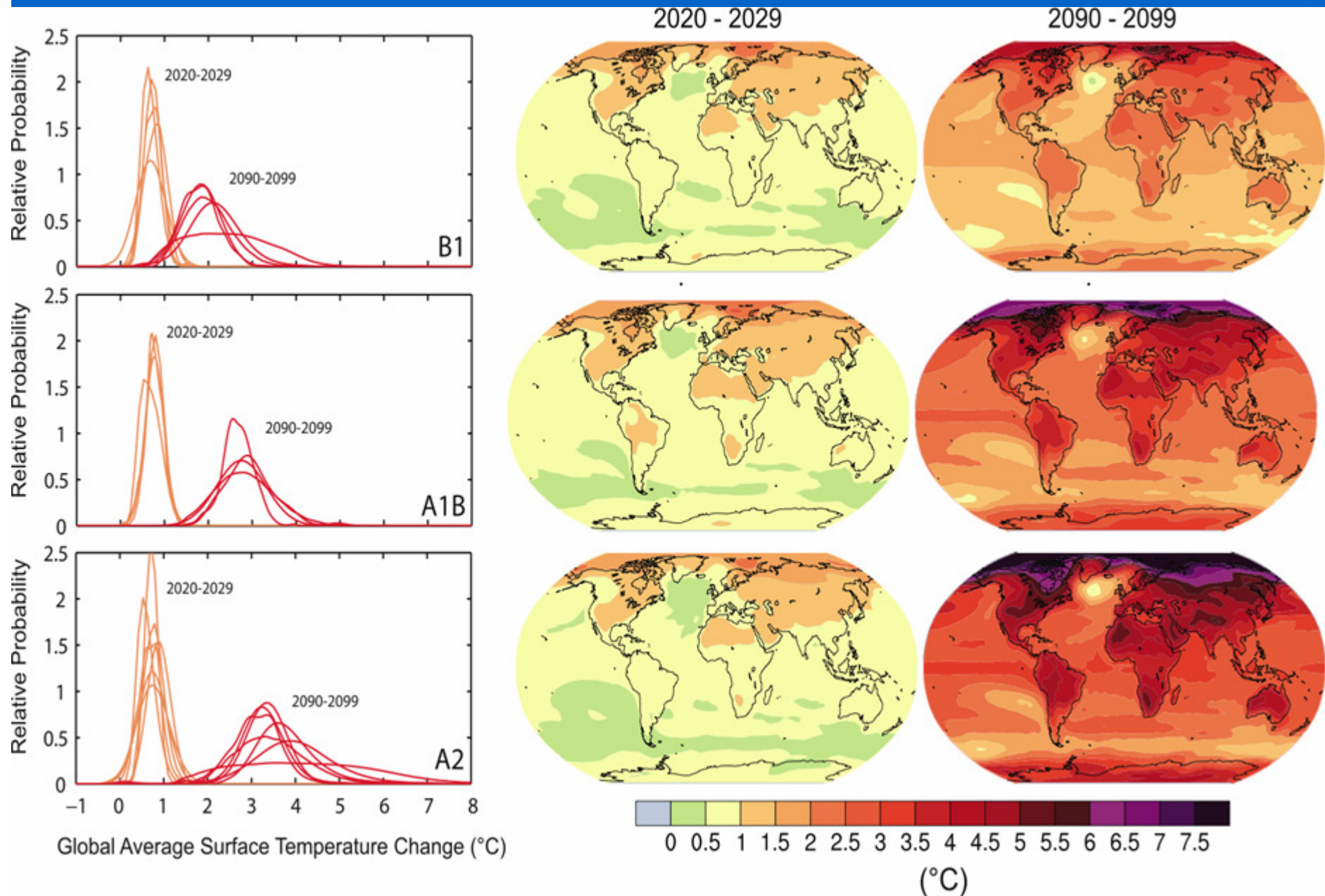
- **Mitigation:** While minimizing the emissions of greenhouse gases and transitioning to a low-carbon economy, access to affordable energy in developing countries is a pre-requisite for poverty alleviation and sustainable economic growth
- **Adaptation:** Requires integrating current climate variability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

# Climate Change

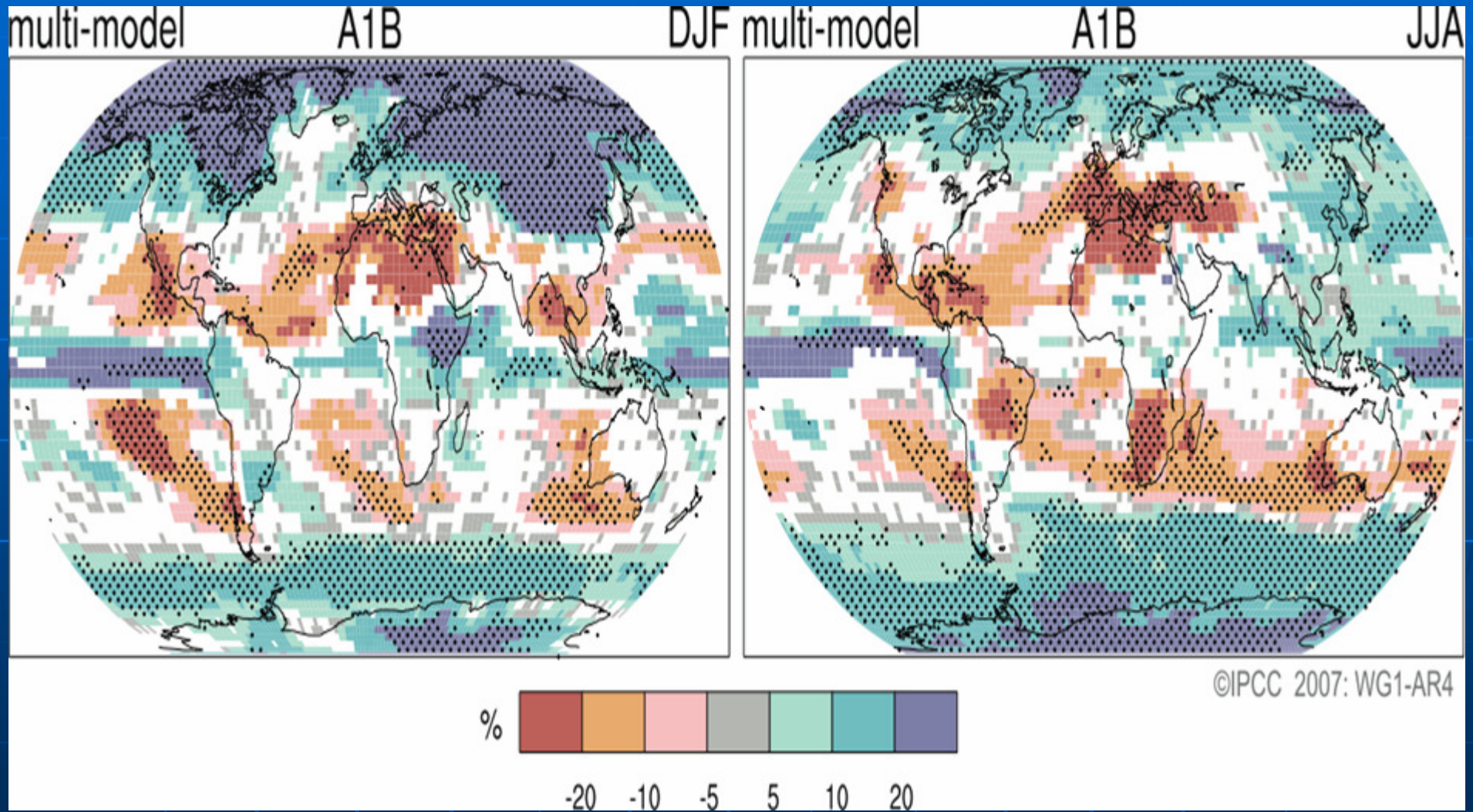
- The composition of the atmosphere, and the Earth's climate has changed, mostly due to human activities (highly certain), and is projected to continue to change, globally and regionally:
  - Increased greenhouse gases and aerosols
  - Warmer temperatures
  - Changing precipitation patterns – spatially 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, e.g., hurricanes in the Atlantic



# Surface Temperature



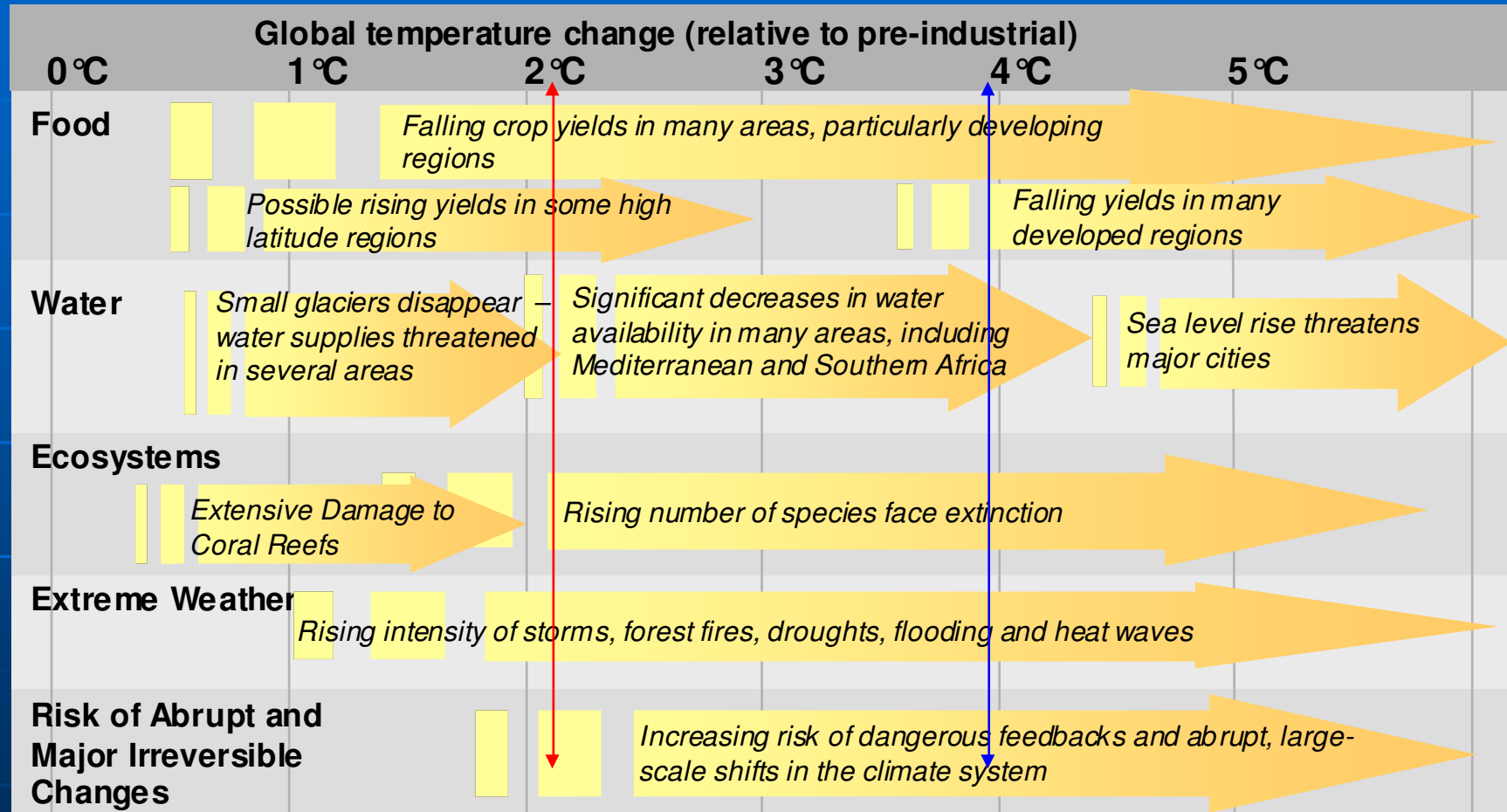
# Precipitation



# 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

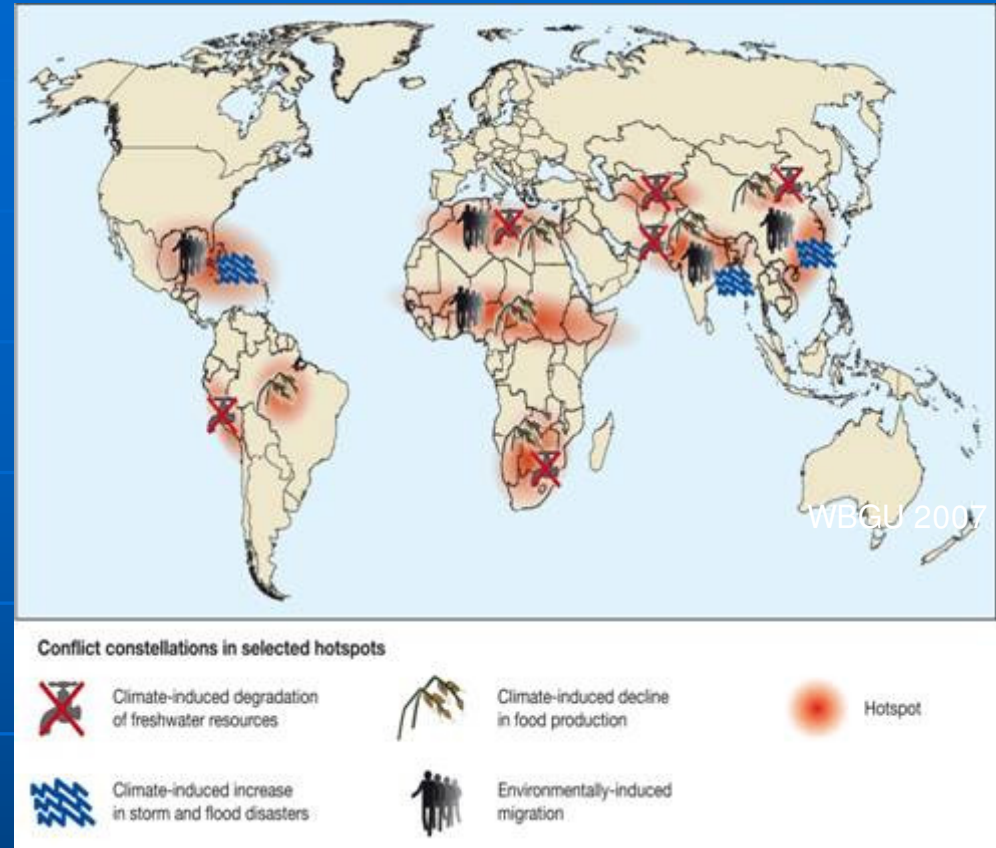
# Climate change impacts are now inevitable: adaptation is about how we respond – the less mitigation, the more adaptation is required



The risk of serious irreversible impacts increases strongly as temperatures increase

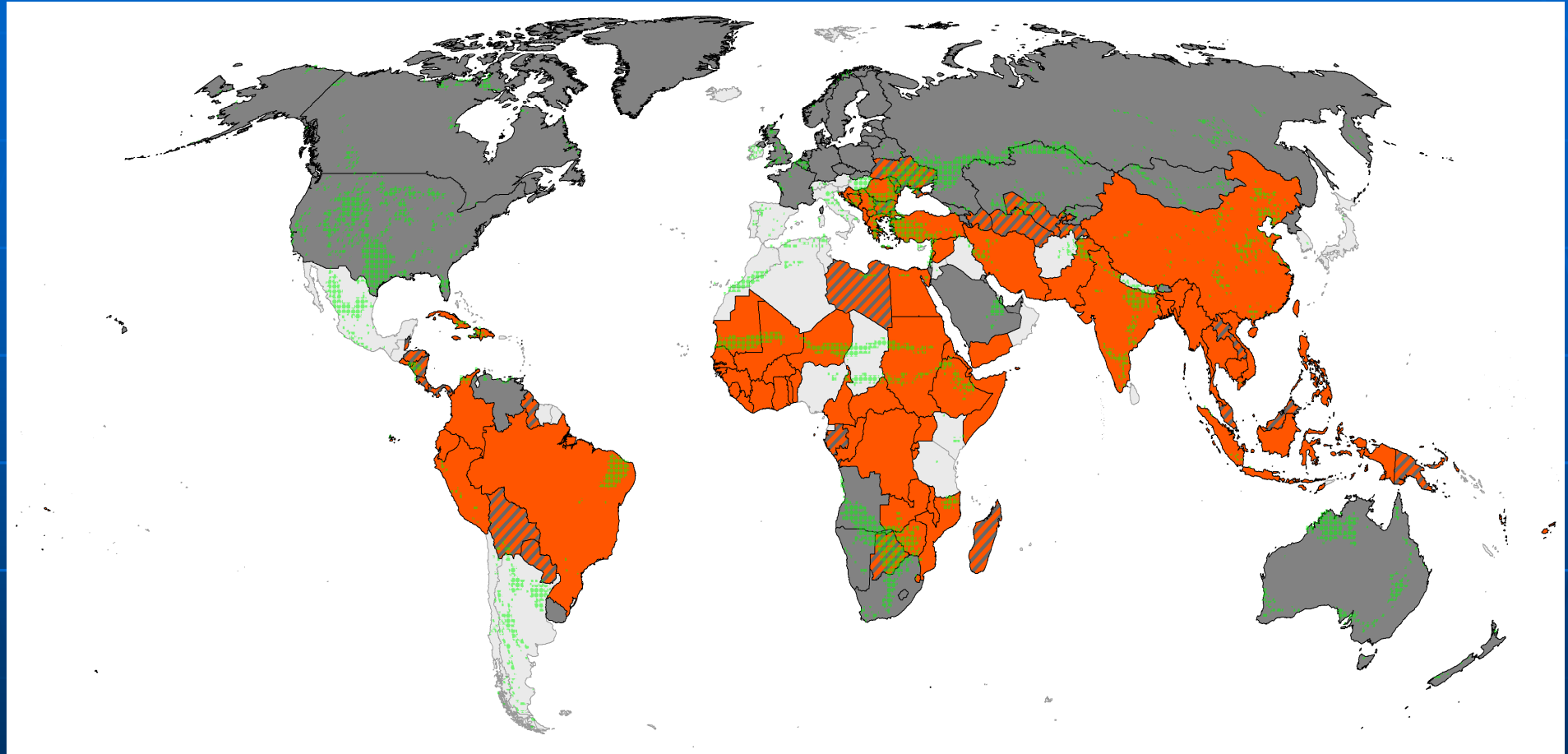
# Climate Change and Conflict

- 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**

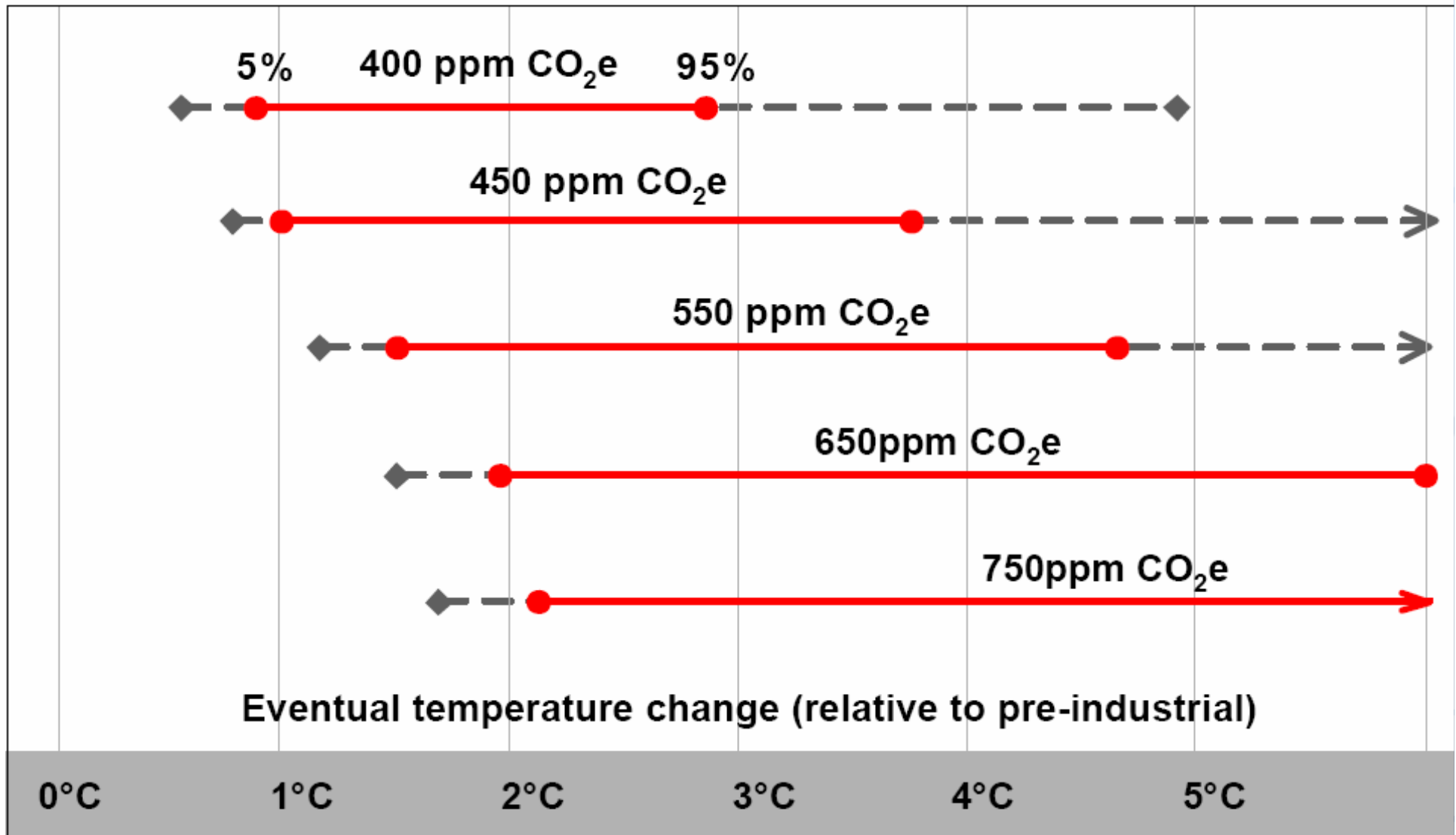
# Emissions and Vulnerability to Climate Change



Highest vulnerability towards climate change vs. largest CO<sub>2</sub> 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<sub>2</sub> emitters
- Highest social and / or agro-economic vulnerability
- ▨ Largest per capita CO<sub>2</sub> emitters, and highest social and / or agro-economic vulnerability
- Areas with highest ecological vulnerability

# Emissions Paths to Stabilization



# Mitigation is cost effective relative to inaction

**Do nothing**



**Costs equivalent to a 5-20% loss in global GDP.**

**50% chance of exceeding a 5° temperature rise<sup>^</sup>**

**Move to a 550ppm CO<sub>2</sub>e trajectory**



**Costs of mitigation estimated at 1% of global GDP in 2050.**

**50% chance of exceeding a 3° rise in temperatures<sup>^</sup>**

**Move to a 450ppm CO<sub>2</sub>e trajectory**



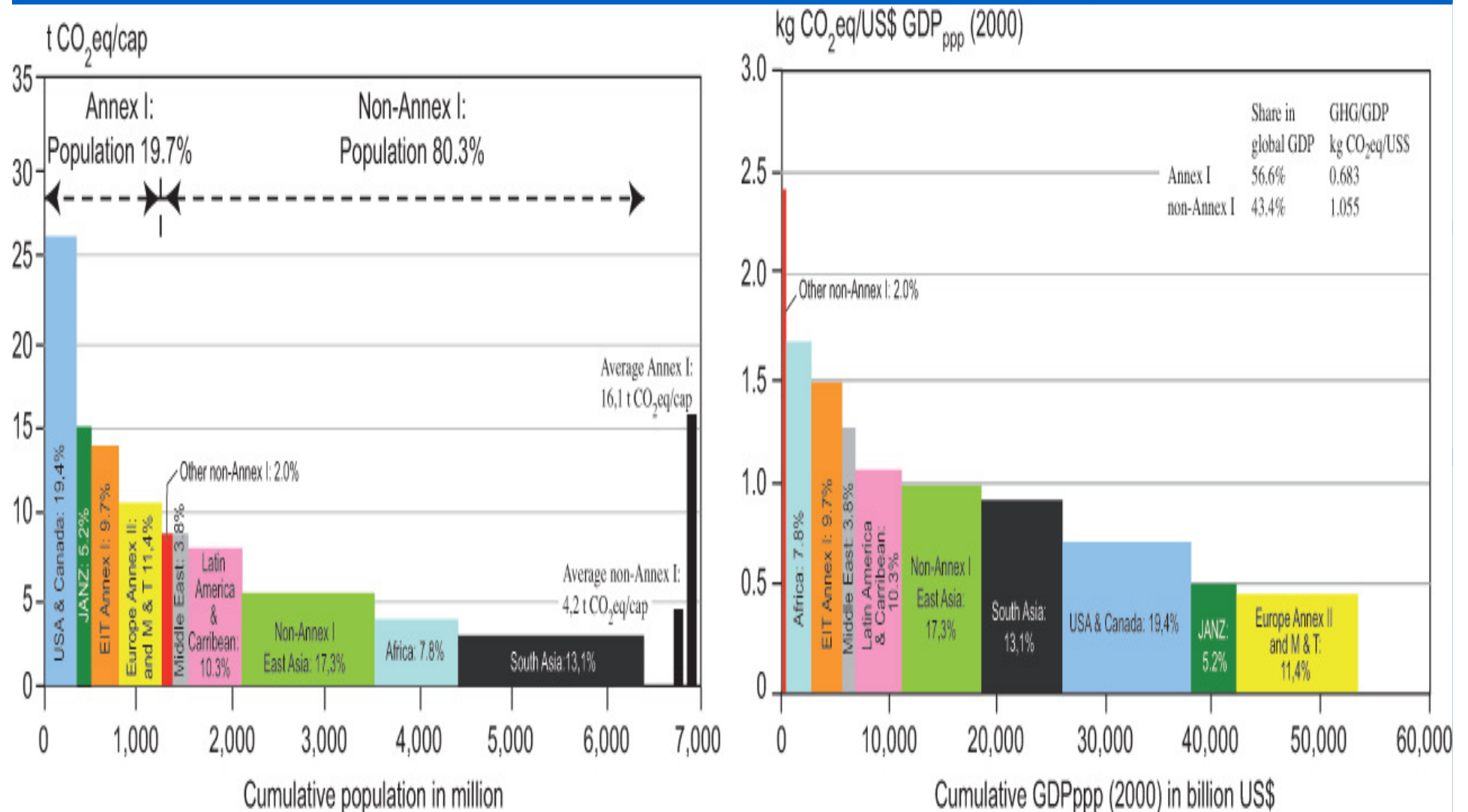
**Mitigation costs could be 3 times the cost of 550ppm trajectory.**

**May be no more than a 50% chance of remaining below a 2° change<sup>^</sup>.**

All temperature changes quoted are relative to pre-industrial temperature levels. <sup>^</sup>Temperature increases by end of the next century.

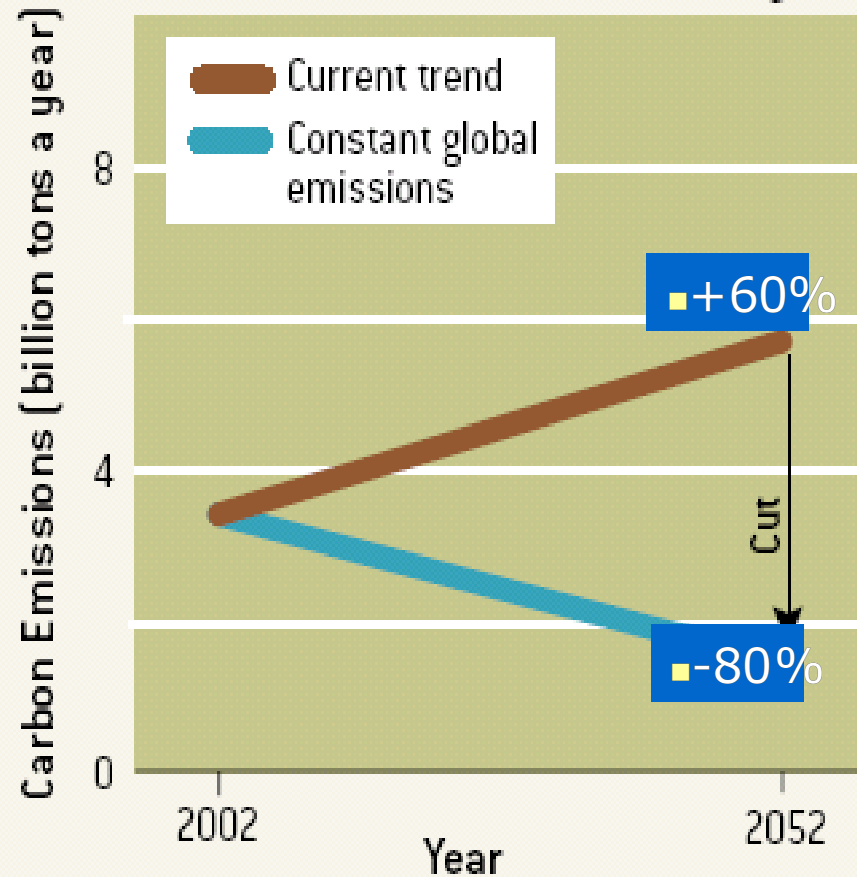
\*Global income loss (5-20%) is equivalent to an "average" annual loss of GDP each year now and forever.

# Political perspective - distribution of emissions

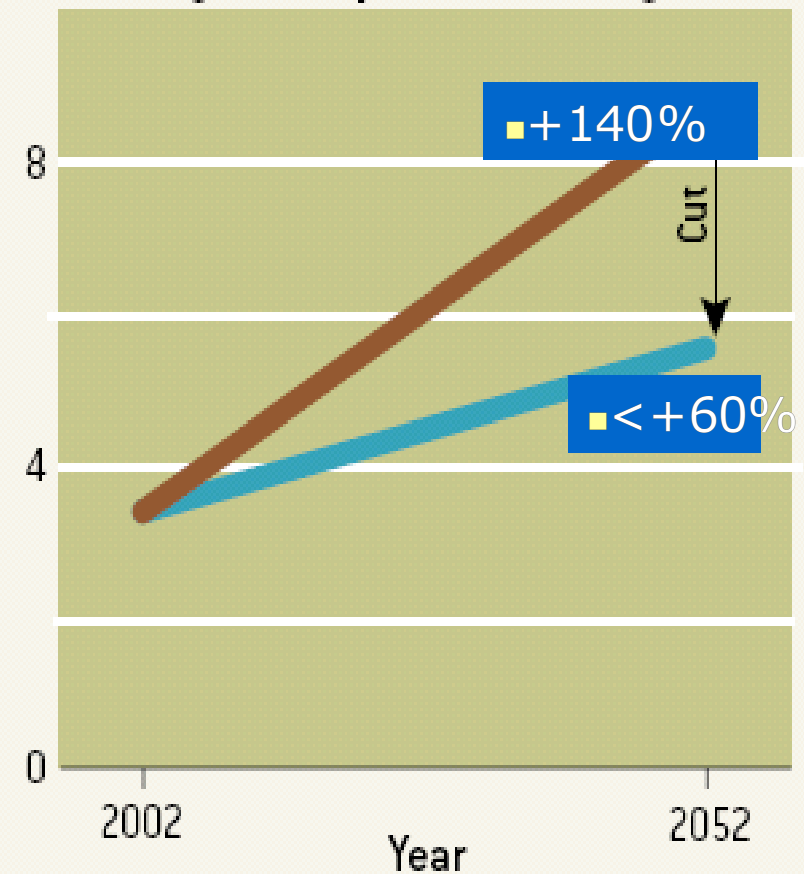


# OECD and non-OECD shares - 50-year view

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

- 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
  - Citizens
  - Business
  - Public sector

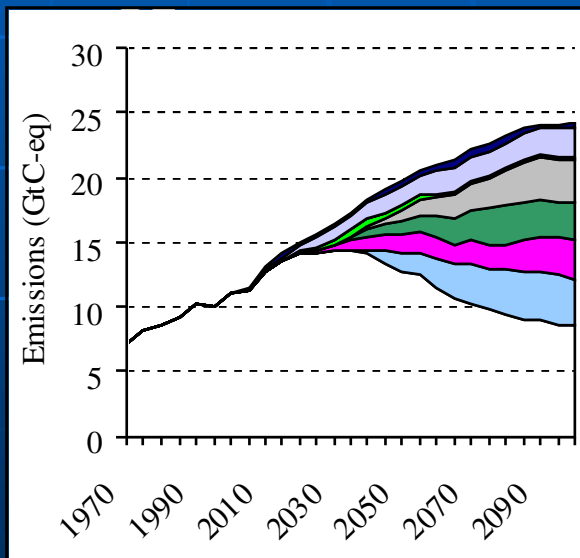
# Potential technological options

- **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; wave and tidal power; small and large-scale hydropower; bio-energy (including biofuels)
- **CO<sub>2</sub> Capture and Storage:** Capture CO<sub>2</sub> in the production of electricity followed by geological storage (e.g., IGCC – CCS)
- **Nuclear fission:** Nuclear power
- **Forests and Agriculture:** Reduced deforestation; reforestation; afforestation; and conservation tillage, agricultural and livestock practices to reduce methane and nitrous oxide emissions)

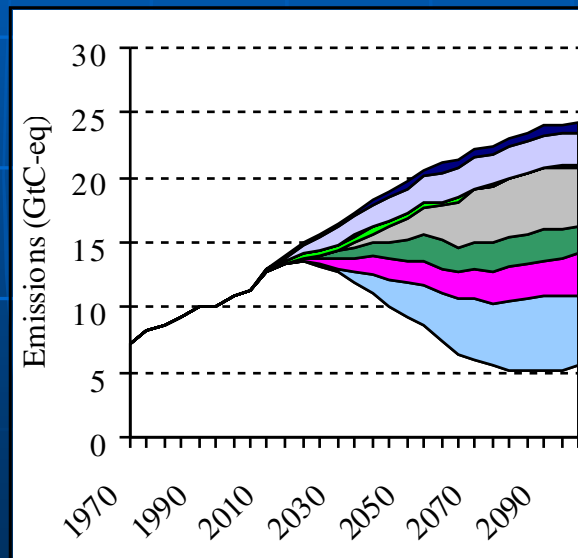
# Technology Will Be Part Of The Answer

- 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

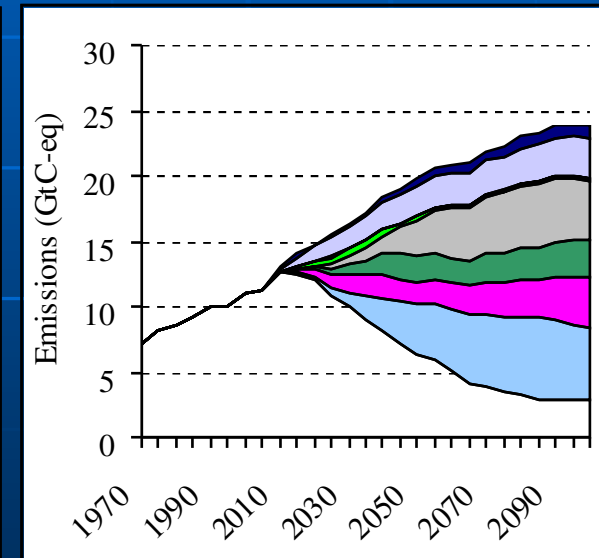
■ 650 CO<sub>2</sub>-eq



■ 550 CO<sub>2</sub>-eq



■ 450 CO<sub>2</sub>-eq



■ Sinks

■ Other

■ CCS

■ Nuclear, renewable

■ Non-CO<sub>2</sub>

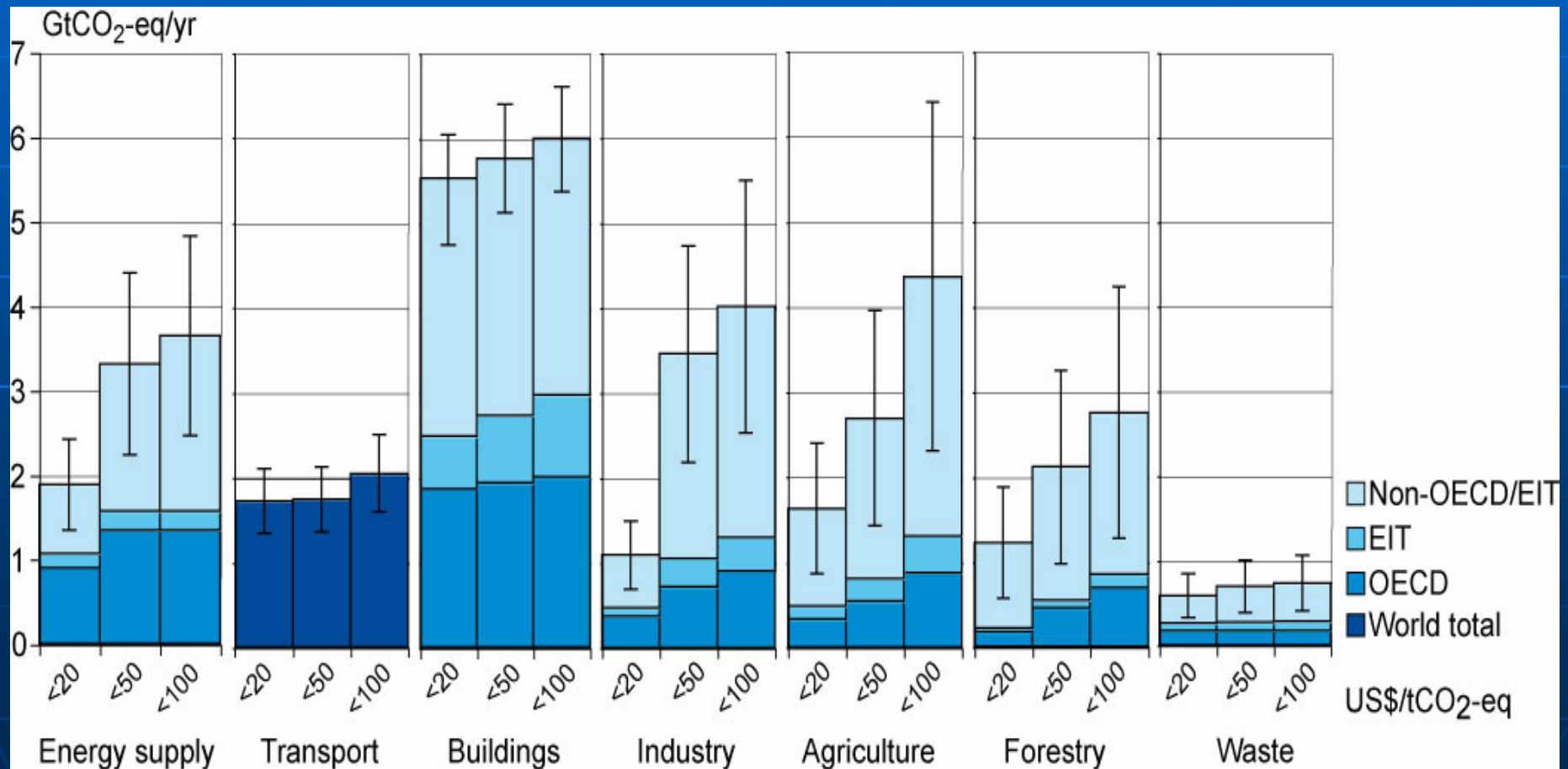
■ Fuel switch

■ Biofuels

■ Efficiency

# 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 2°C target



# Segment willingness and ability

Ability to act High

High ability and willing

Low

Willing to Act High

Low

Low ability and unwilling

**2: Waste watchers**  
*'Waste not, want not' that's important, you should live life thinking about what you are doing and using.*  
12%

**3: Concerned consumers**  
*I think I do more than a lot of people. Still, going away is important, I'd find that hard to give up..well I wouldn't, so carbon off-setting would make me feel better.*  
14%

**1: Positive greens**  
*I think it's important that I do as much as I can to limit my impact on the environment.*  
18%

**7: Honestly disengaged**  
*Maybe there'll be an environmental disaster, maybe not. Makes no difference to me, I'm just living life the way I want to.*  
18%

**5: Cautious participants**  
*I do a couple of things to help the environment. I'd really like to do more, well as long as I saw others were.*  
14%

**6: Stalled starters**  
*I don't know much about climate change. I can't afford a car so I use public transport.. I'd like a car though.*  
10%

**4: Sideline supporters**  
*I think climate change is a big problem for us. I know I don't think much about how much water or electricity I use, and I forget to turn things off..I'd like to do a bit more.*  
14%

# Geo-engineering Options

- **There are two classes of geo-engineering options**
  - **Decrease net carbon dioxide emissions**
  - **Decrease incoming solar radiation**
  
- **Decrease net carbon dioxide emissions**
  - **Ocean fertilization**
  - **Artificial trees**
  
- **Decrease incoming solar radiation**
  - **Reflectors in space**
  - **Tropospheric aerosols**
  - **Stratospheric aerosols**

**All options have potential environmental problems – none are ready for serious consideration but several deserve more research, as long as it does not decrease funding for low carbon technologies**

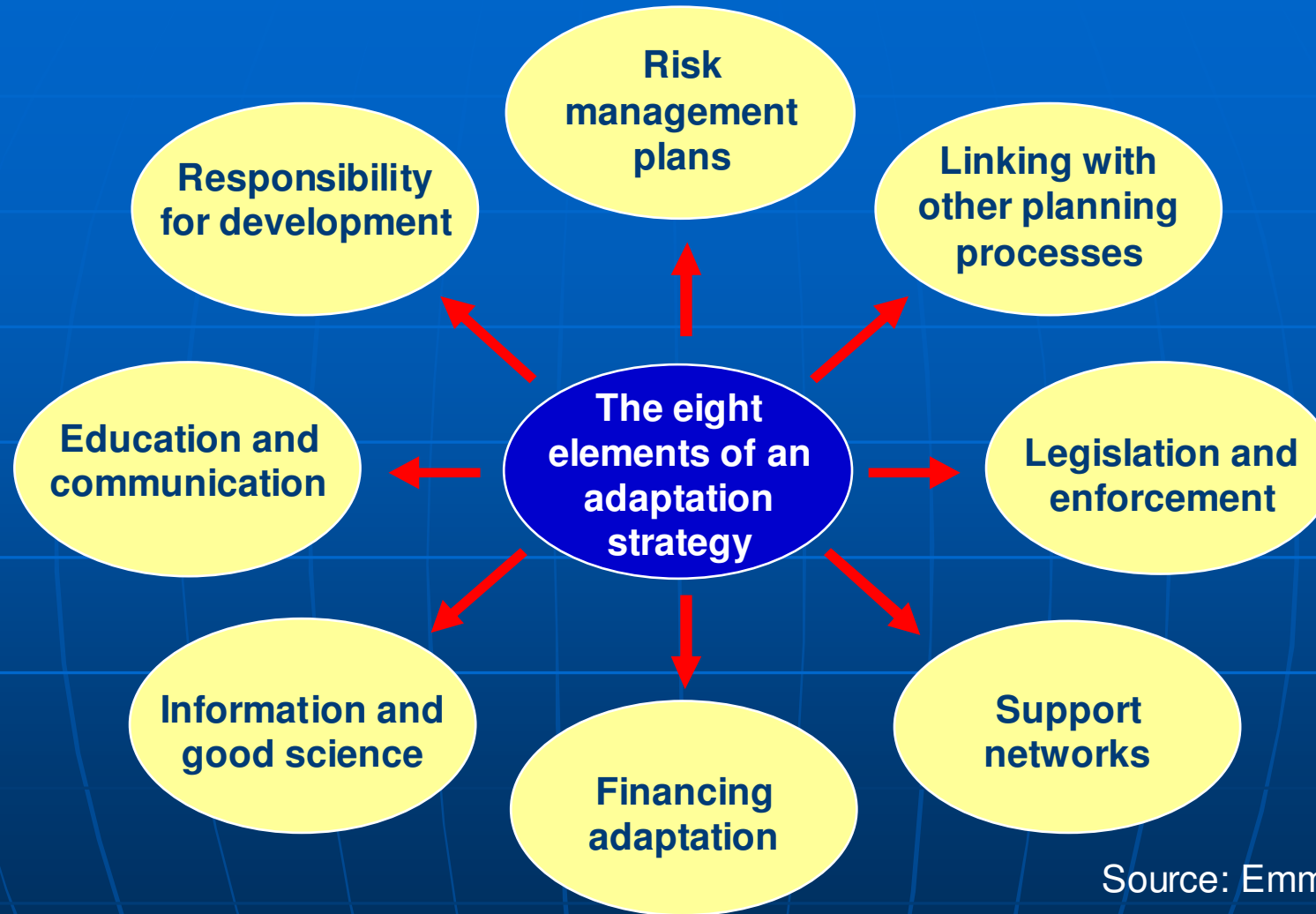
# Summary of the Major Mitigation Challenges

- 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, green investment schemes, energy efficiency standards, and exploring sectoral and programmatic approach
  - Key challenges include engaging USA, China and India

# Cost of Inaction and Adaptation

- Estimates of the costs of inaction cover a huge range:
  - \$10Bs to \$100Bs per year in developing countries by mid century
  - GDP losses range up to about 10% for developing countries for a doubling of atmospheric CO<sub>2</sub>
- A preliminary assessment shows that tens of billions dollars per year of ODA & concessional finance investments are exposed to climate risks
- Comprehensive project planning and additional investments to climate-proof development projects will require at least \$1 billion per year
- Primary public financial instruments available, which are technically adequate – but funds flowing through them need to be substantially increased

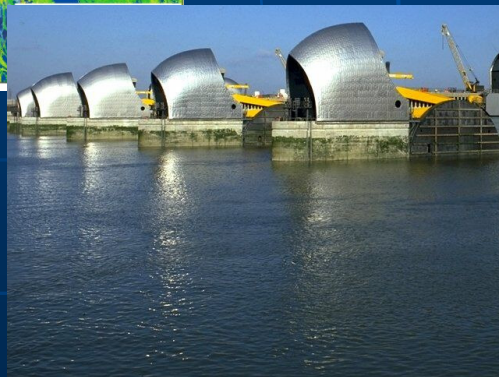
# Elements of an adaptation strategy



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

# 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 efficiency

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

# Why Act Now Even in the New Economic Environment

- The benefits of taking action (to limit climate change and to sustainably manage ecosystems) far exceed the costs of inaction
- Delaying action can significantly increase costs
- Effective action needs stable credible environmental policies supporting the long term shift to a low carbon economy and the sustainable use of natural resources
- A green economy will be a source of future employment and innovation
- Efficient use of resources save money for businesses and households
- We need not just a small improvement in resource efficiency, but a radical shift

# Can a global deal be delivered in Copenhagen in late 2009

- Copenhagen is not far away – getting a deal there will be challenging
  - 9 months is not long to negotiate a complex deal
  - Political conditions for radical agreement may not be there
  - US and China are key – new possibilities with President Obama
  - 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

# 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