

The Science of Climate Change: Challenges & Opportunities for Business

Sir David King

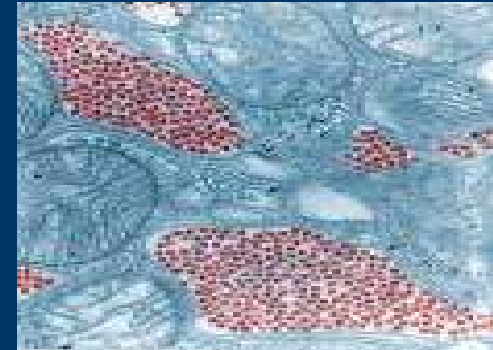
Chief Scientific Adviser to HM Government

23 April 2007

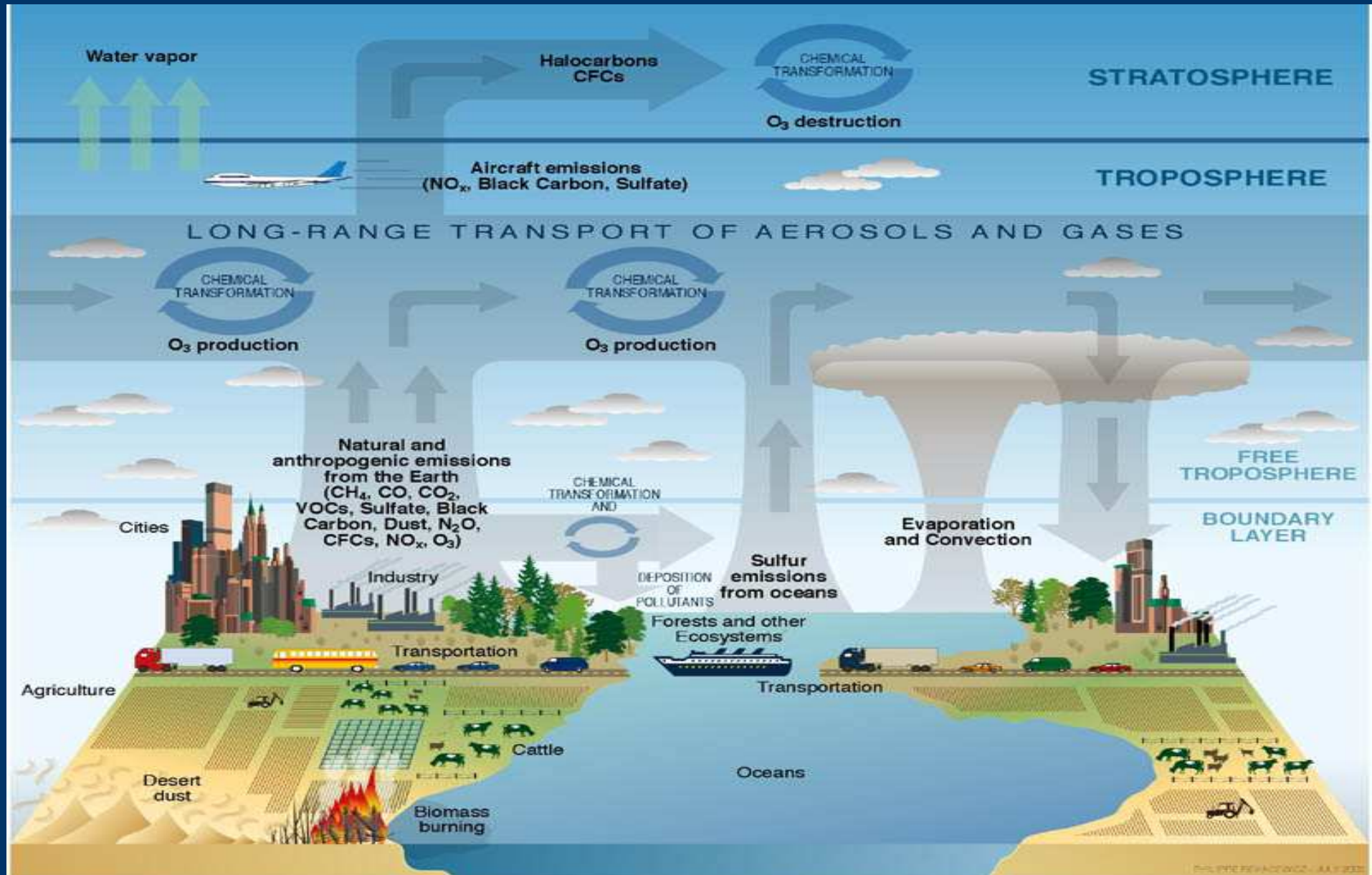
Industry and Climate Change Mitigation
Conference, Prague

21st Century Challenges

- Population growth
- Resources
- Infectious diseases
- Environment
- Climate Change

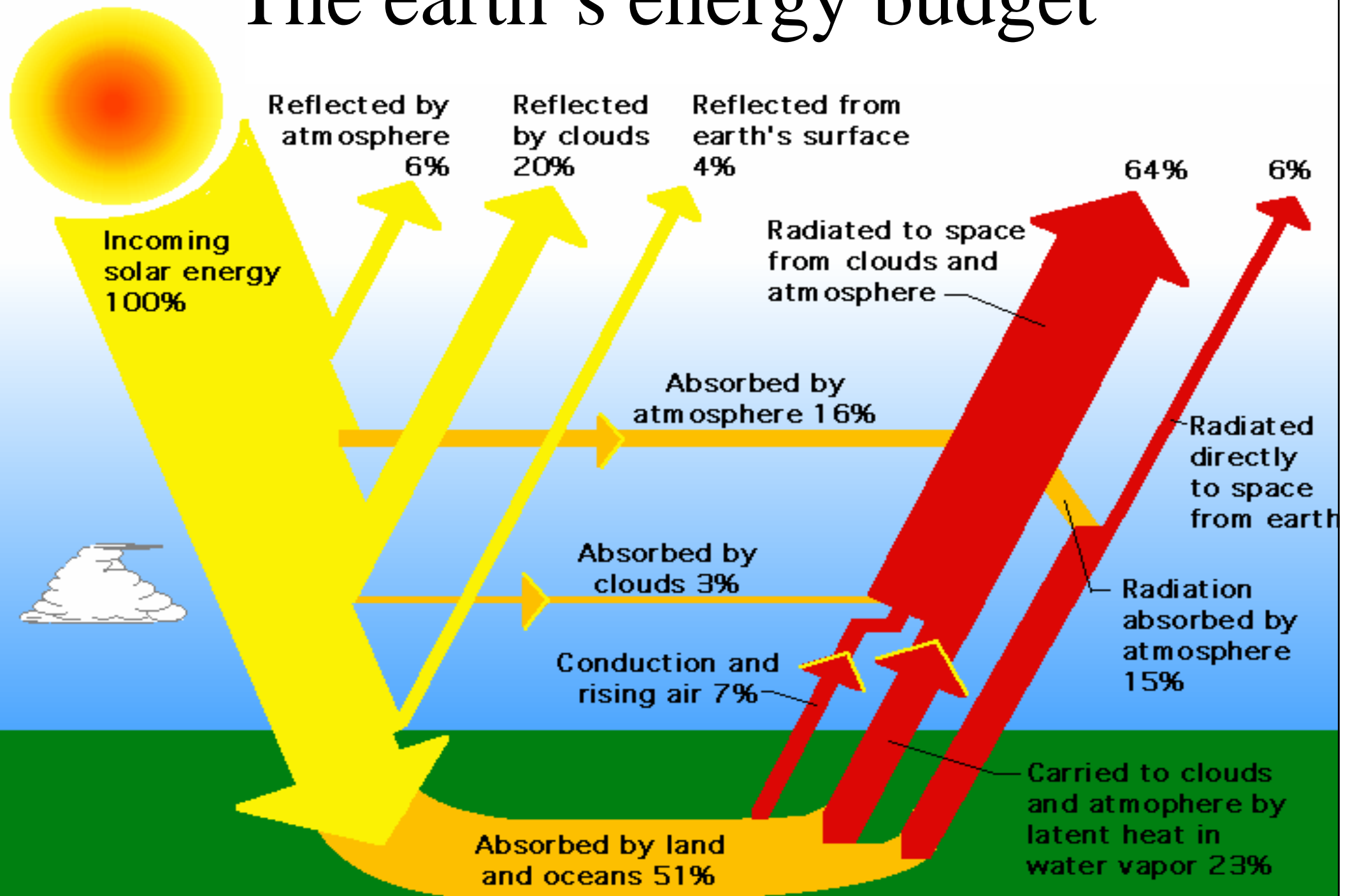


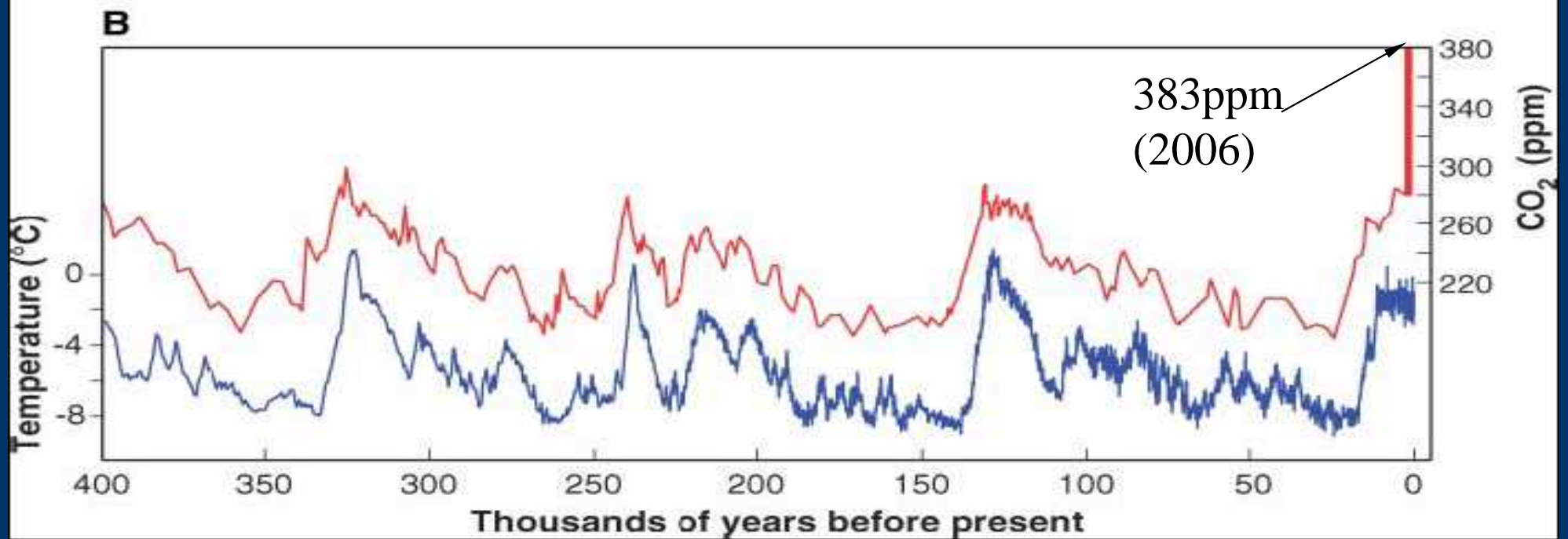
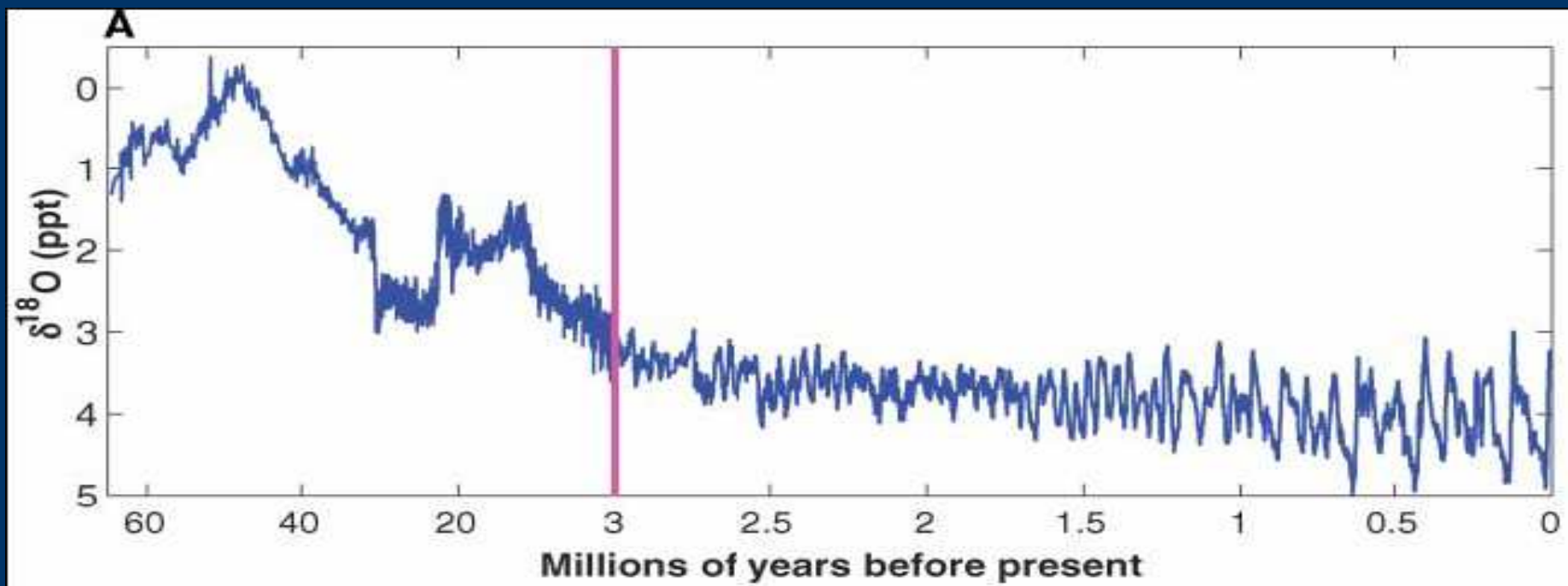
Earth's Atmosphere



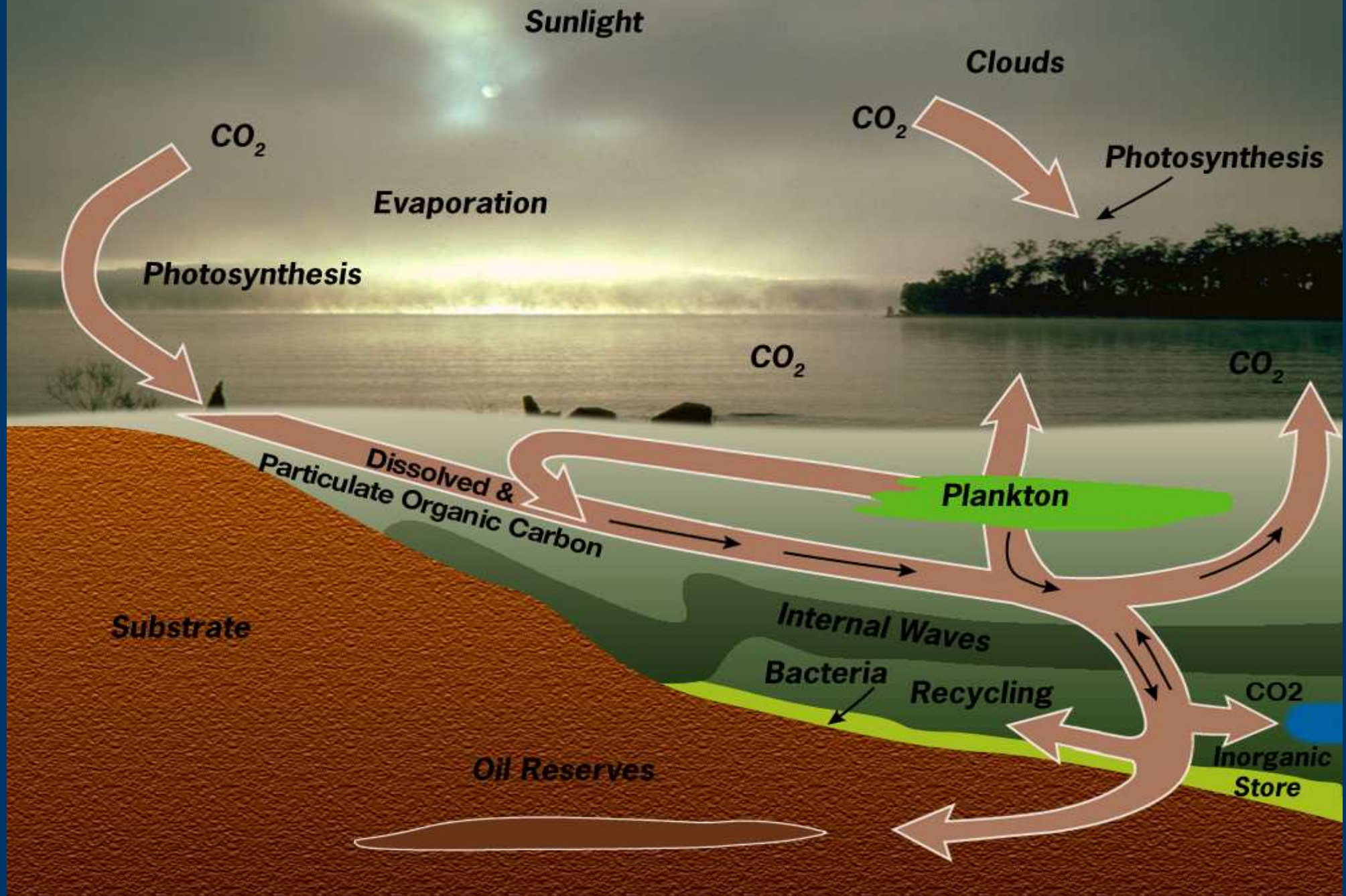
Source: Strategic Plan for the U.S. Climate Change Science Program, A Report by the Climate Change Science Program and the Subcommittee on Global Change Research (July 2003) [figure 3.1]

The earth's energy budget

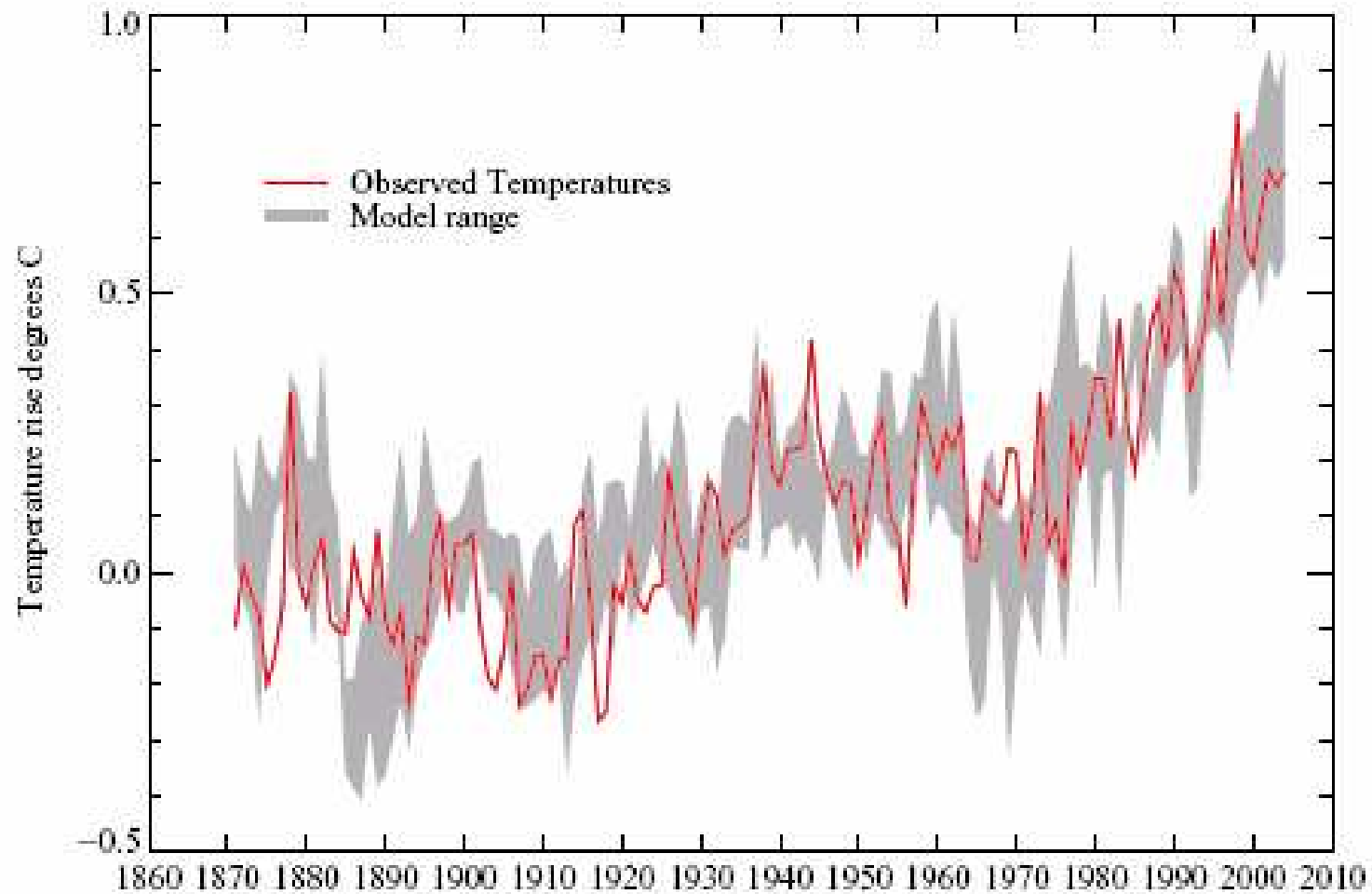




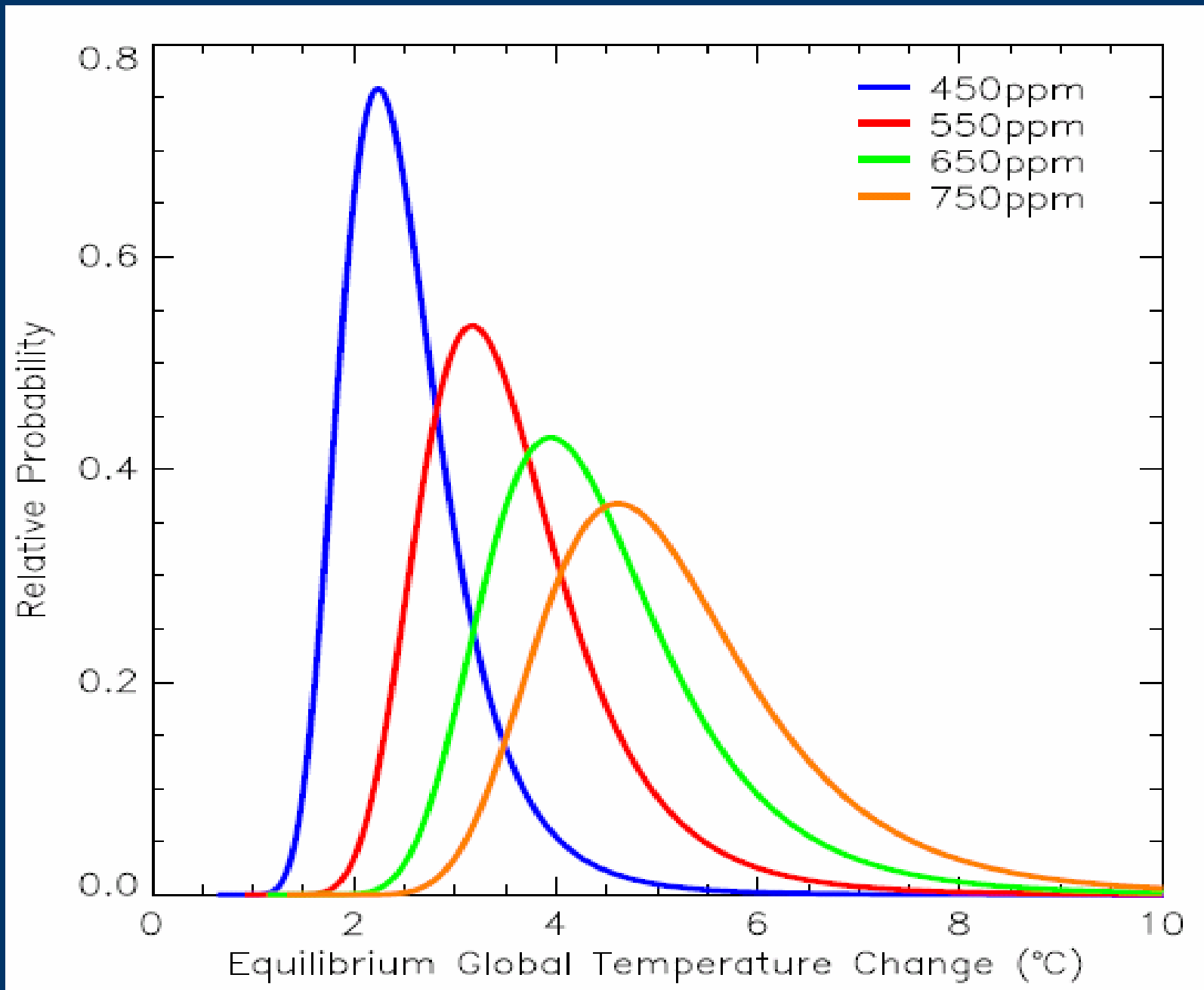
Carbon cycles



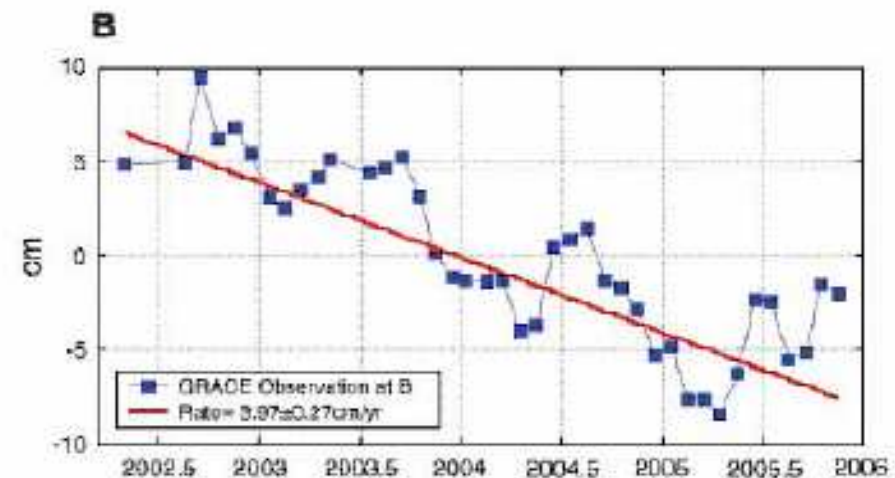
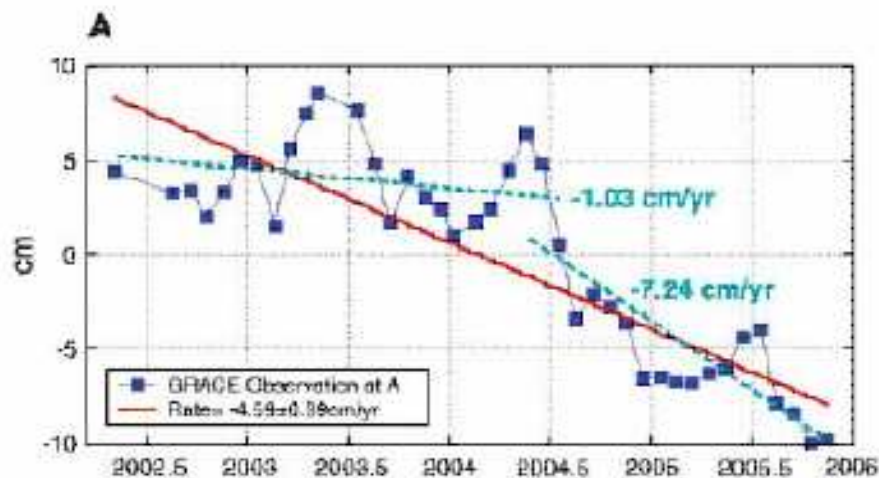
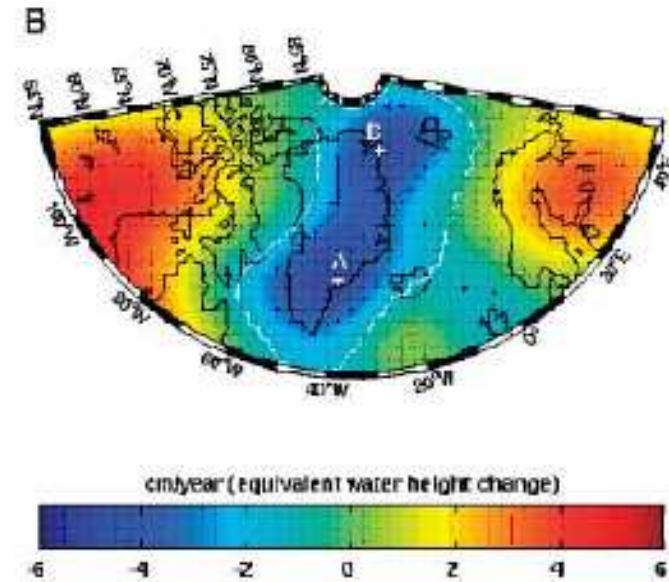
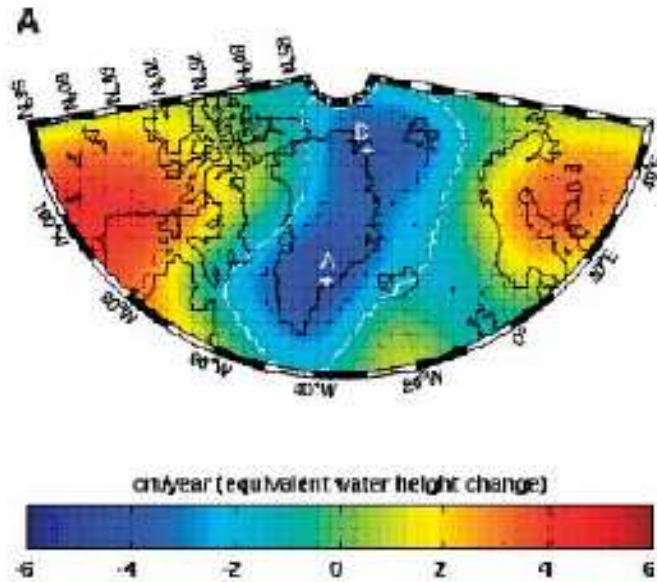
Simulated Global warming



Climate sensitivity



Accelerated melting of Greenland ice sheet



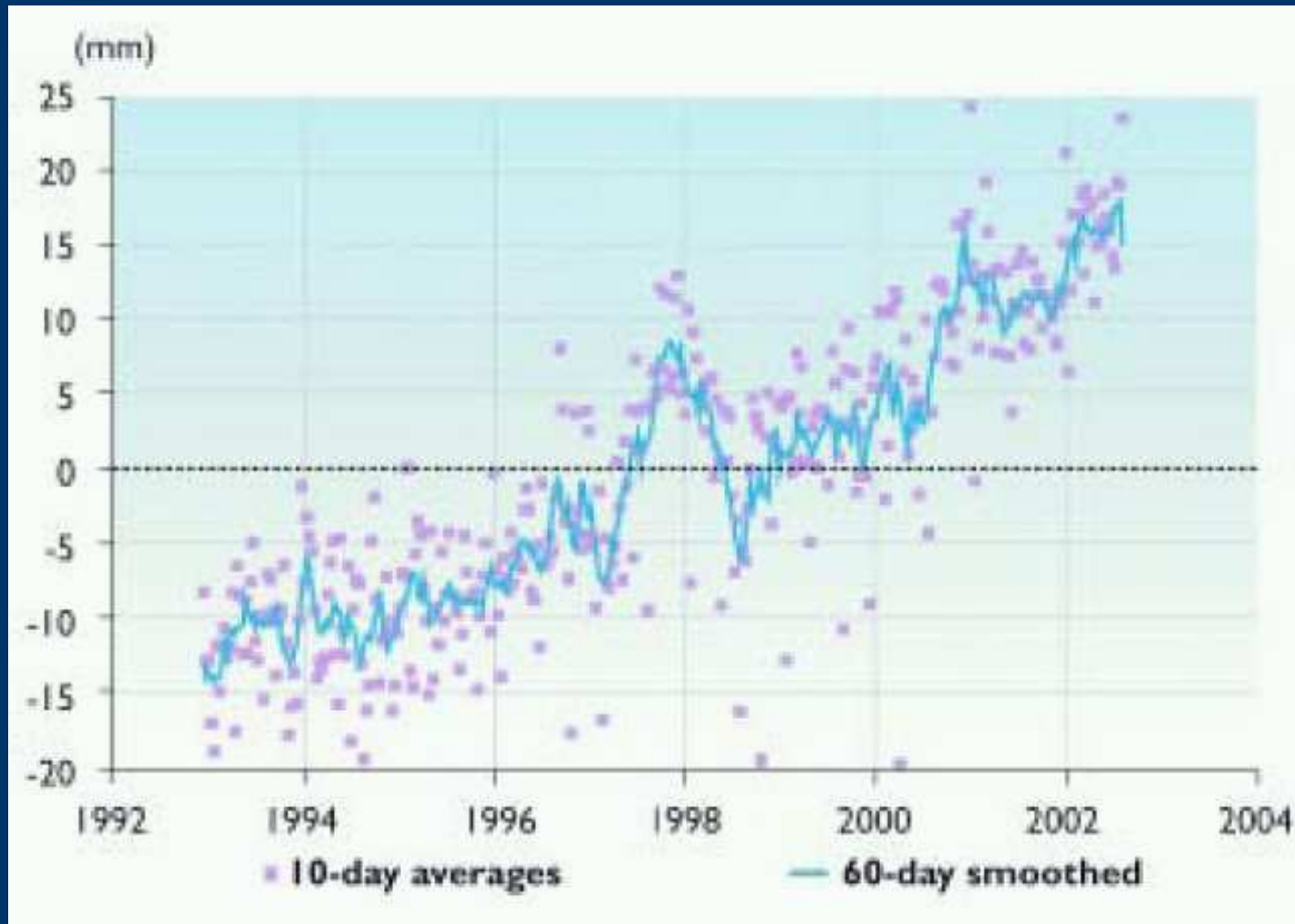
Surface Melt on Greenland

Melt descending into a moulin, a vertical shaft carrying water to ice sheet base



Source: Roger Braithwaite, University of Manchester

Observed Global Sea Level Rise

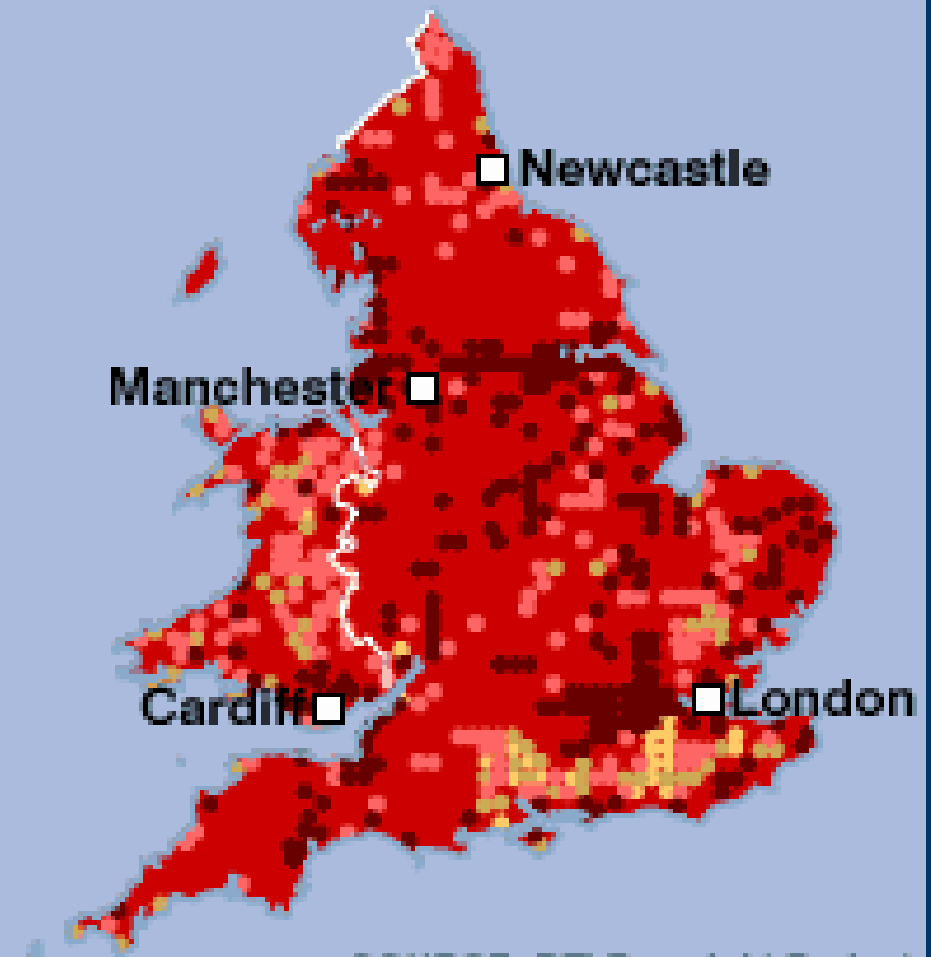
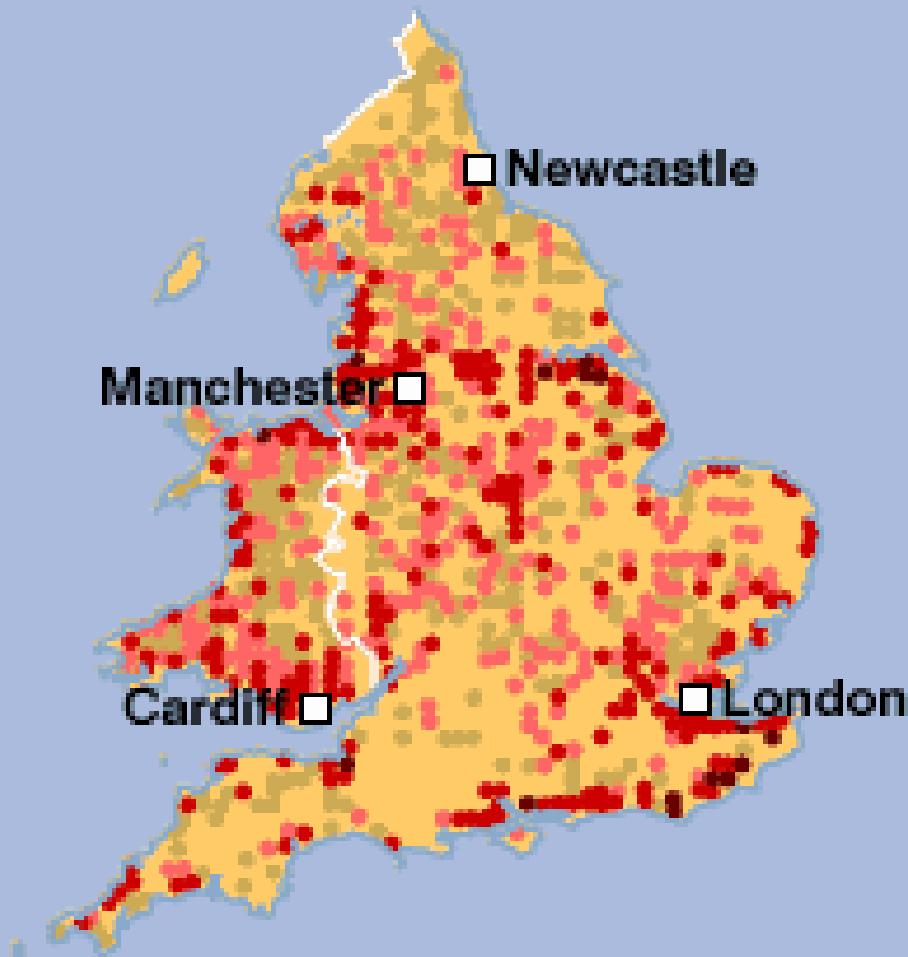


These data, from a satellite launched in 1992, show the rise in global average sea level over the last decade

Possible flooding in the UK by 2080s

Best case scenario

Worst case scenario



SOURCE: DTI Foresight Project

Change in risk of flooding damage (from 2004)

Decrease

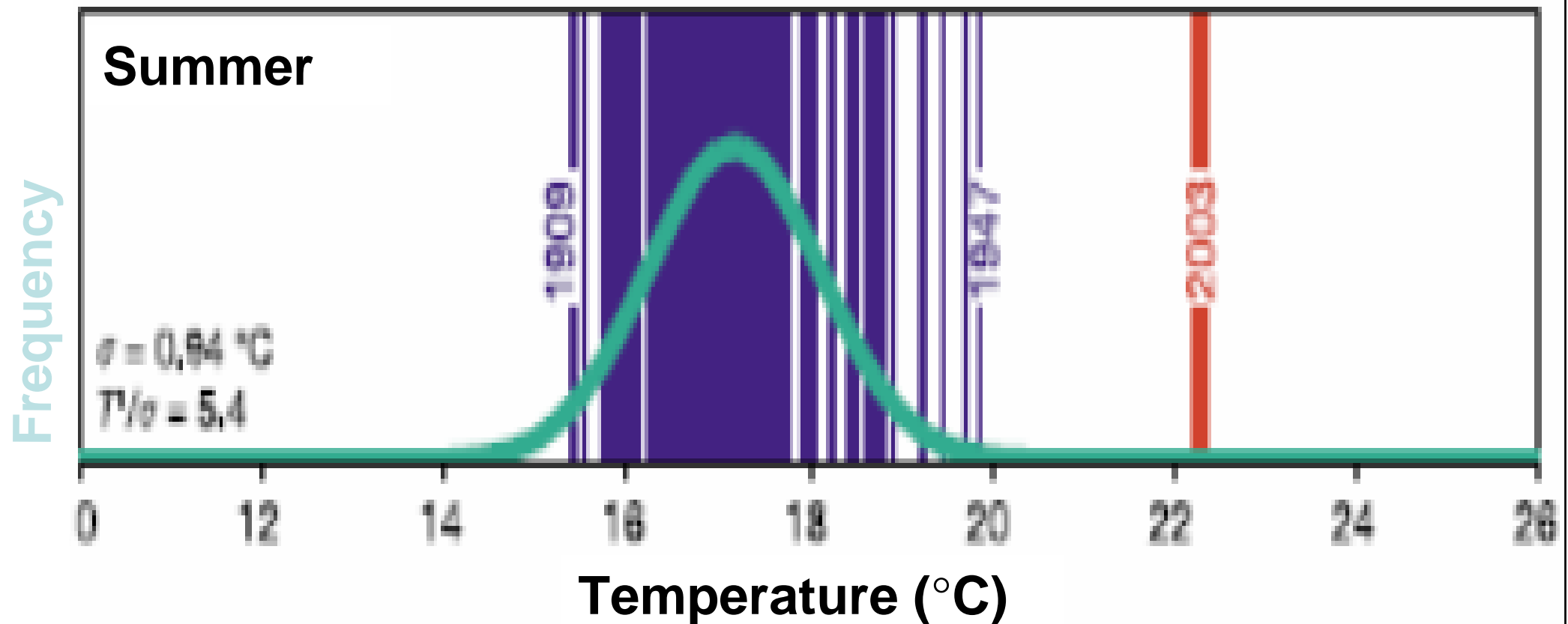
Negligible

Low increase

Medium increase

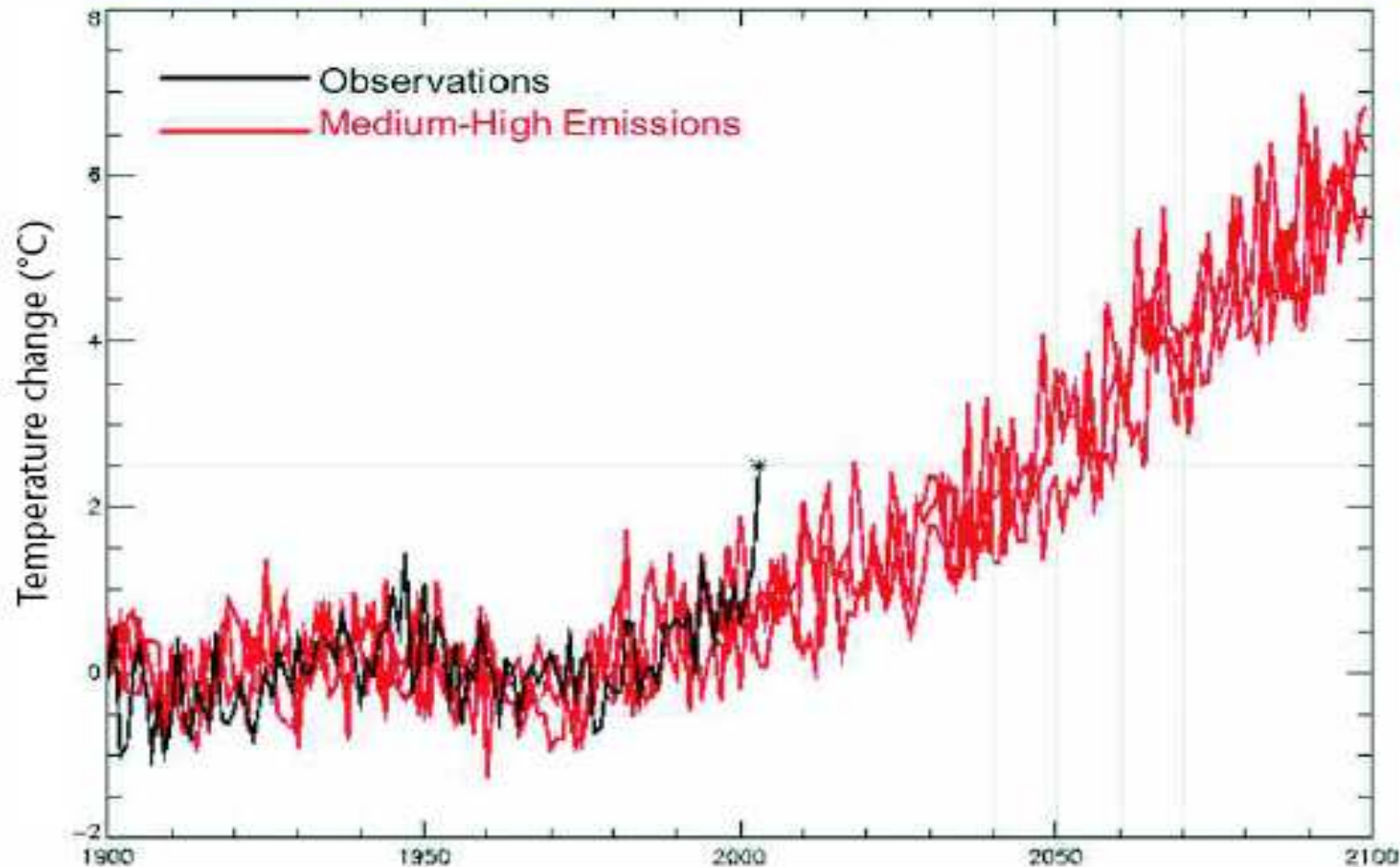
High increase

Distribution of seasonal summer temperatures 1864-2003



European Temperatures 1900-2100

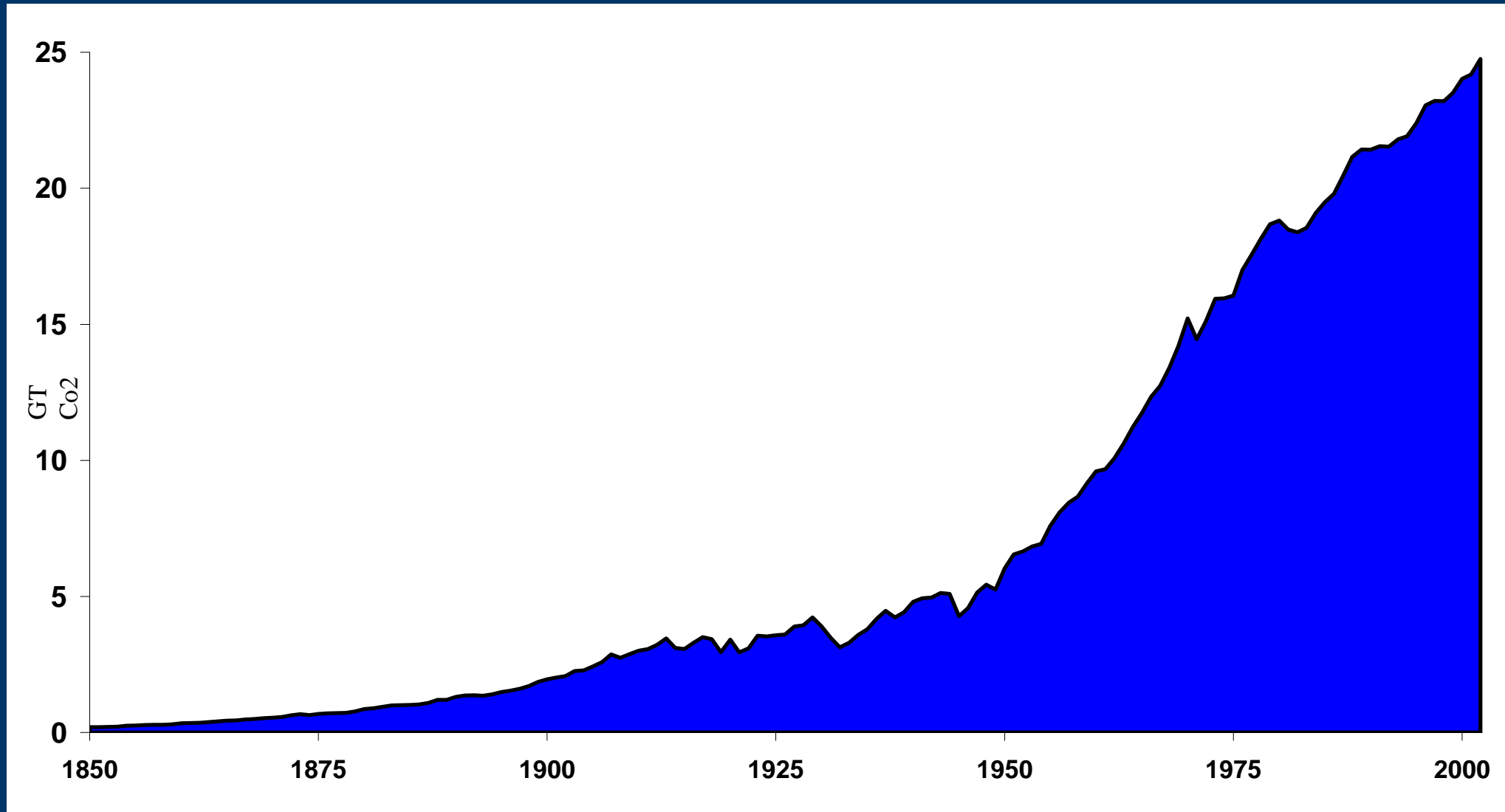
European 2003 summer temperatures could be normal by 2040s; cool by 2060s



Adapt *and* Mitigate

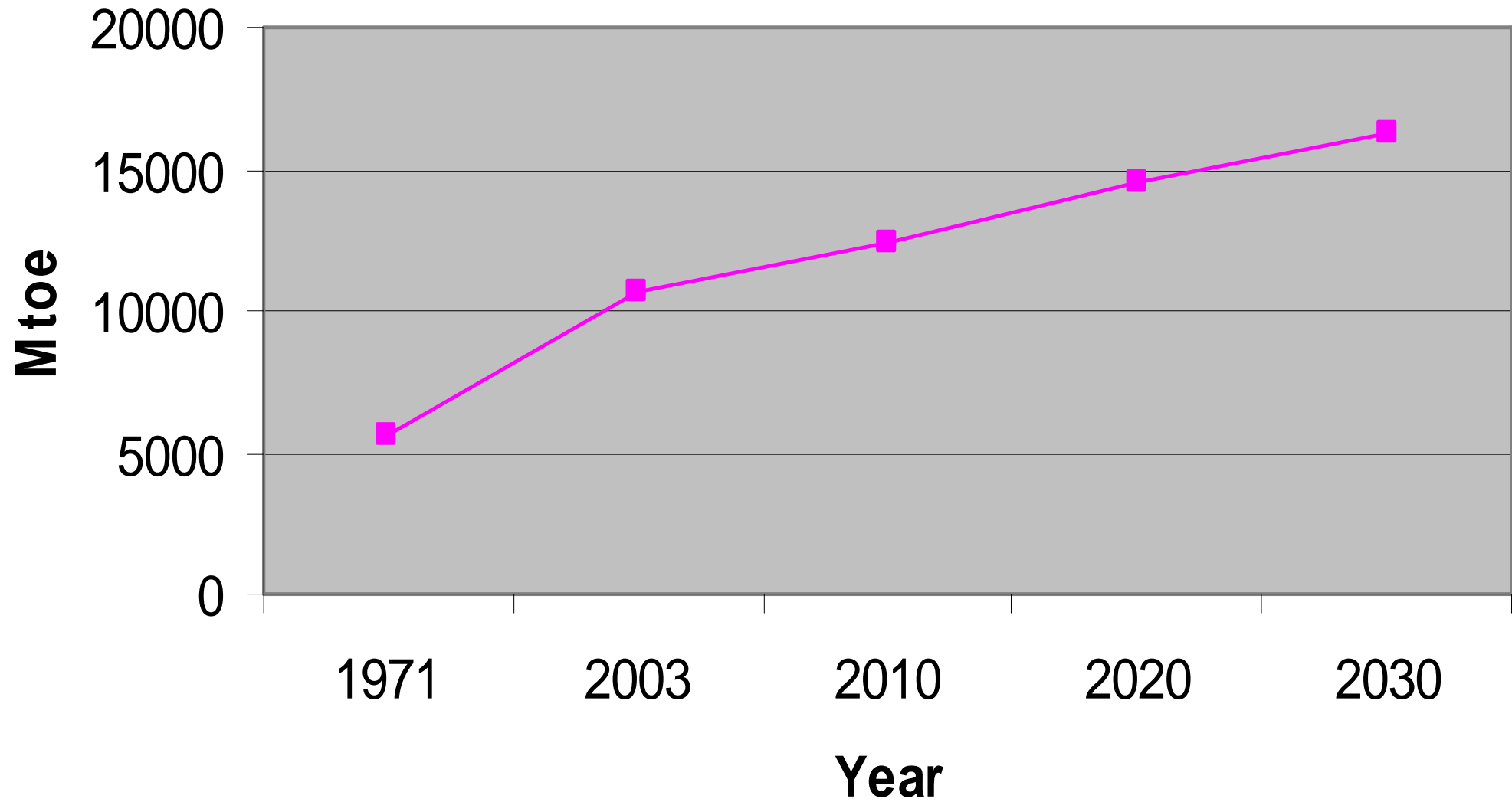
- We must adapt in preparation for the significant changes ahead and manage the risks country by country
- We have to actively mitigate against the production of greenhouse gases by:
 - Switching to low carbon energy sources; and
 - Energy efficiency
- Businesses must adapt and mitigate against the changing climate

Emissions of CO₂ from burning fossil-fuels have risen rapidly since 1950



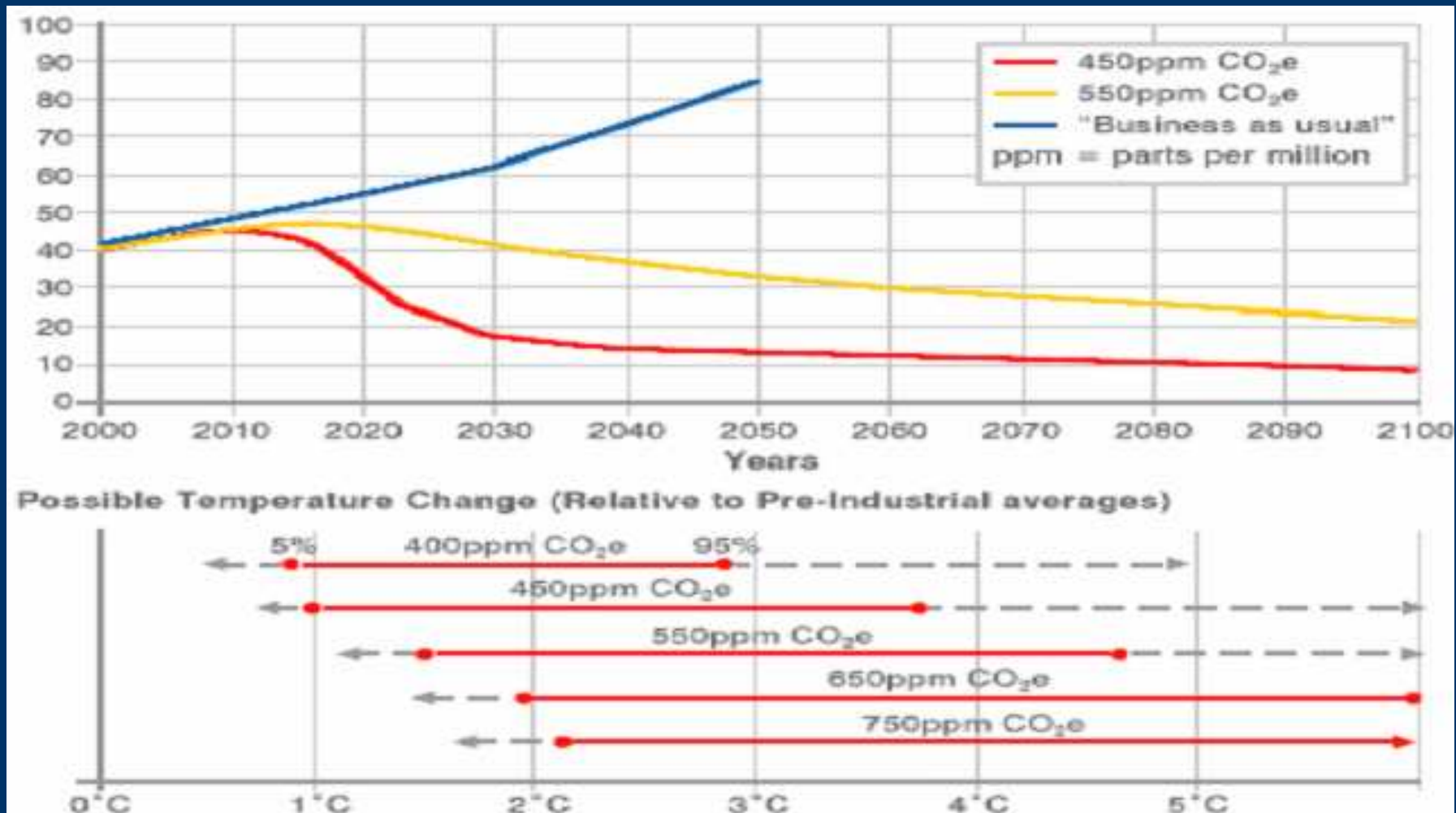
Source: WRI CAIT

Future World Energy Demand



Emissions path to stabilisation

Global emissions (gigatonnes of CO₂ equivalent gases per year)



Source: Stern Review

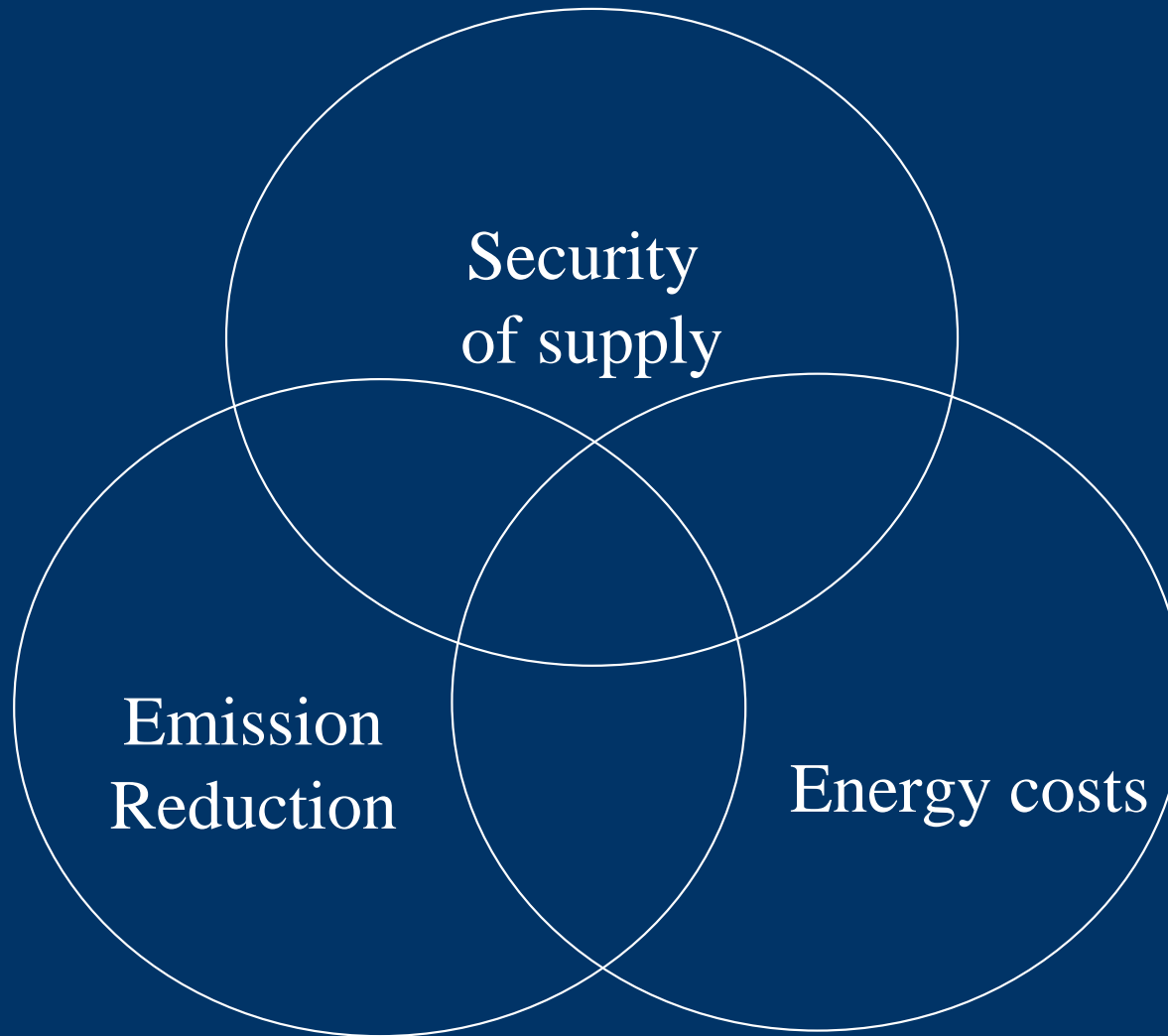
Energy consumption

- Energy demand driven by population growth, economic growth and technological developments
- World population is projected to grow from 6.5 billion people today to 9 billion in 2050
- By 2025 demand for primary energy is expected to rise by over 50% whilst our demand for electricity will almost double over the same period
- Energy-related CO₂ emissions will be 52% higher in 2030

Taking global action

- 1988 - IPCC
- 1992 - United Nations Framework Convention on climate change
- 1997 - Kyoto
- 2003 - UK Government's 60% target
- 2005 - Emissions trading
- 2005 - G8+5 Dialogue started
- 2006 - UNFCCC COP 12, Nairobi
- 2007 - EU agree to cut CO₂ emissions by 20% by 2020

Energy Policy



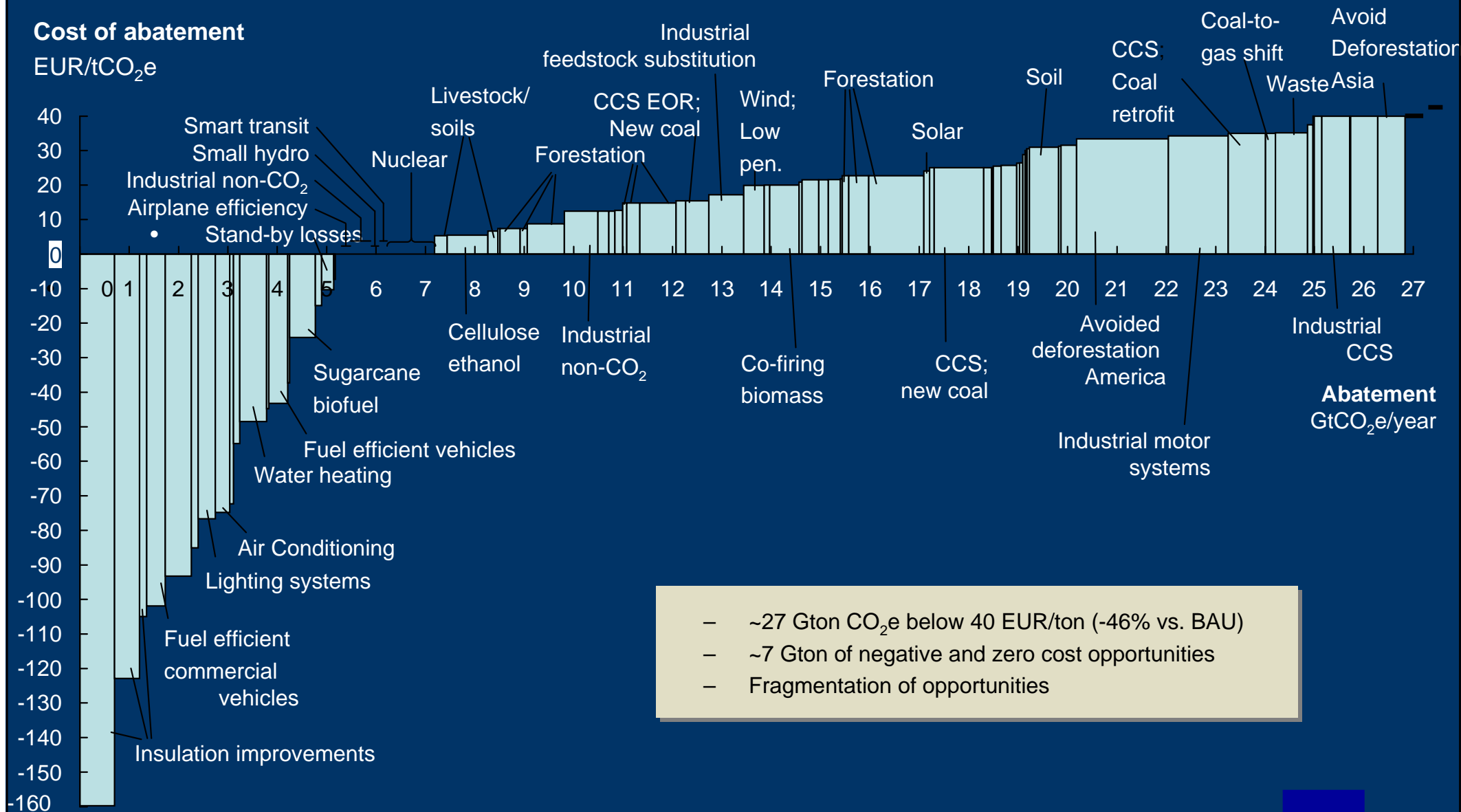
Improved energy
efficiency...



...and a diverse mix of
zero carbon sources



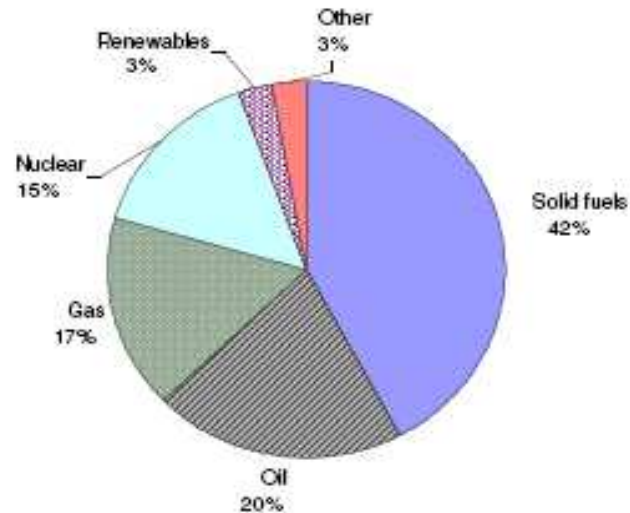
Global cost curve of GHG abatement opportunities beyond business as usual



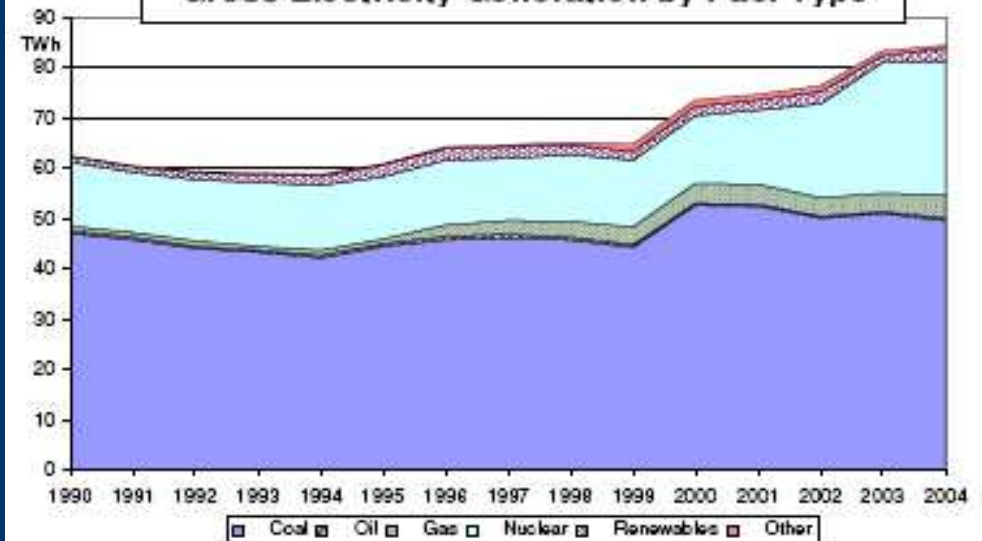
- ~27 Gton CO₂e below 40 EUR/ton (-46% vs. BAU)
- ~7 Gton of negative and zero cost opportunities
- Fragmentation of opportunities

Czech Energy Mix

2004 Primary Energy Supply



Gross Electricity Generation by Fuel Type



Source: EU Commission,
http://ec.europa.eu/energy/energy_policy/doc/factsheets/mix/mix_cz_en.pdf

Foresight Project on Sustainable Energy and the Built Environment



www.foresight.gov.uk



Energy Technologies Institute

dti

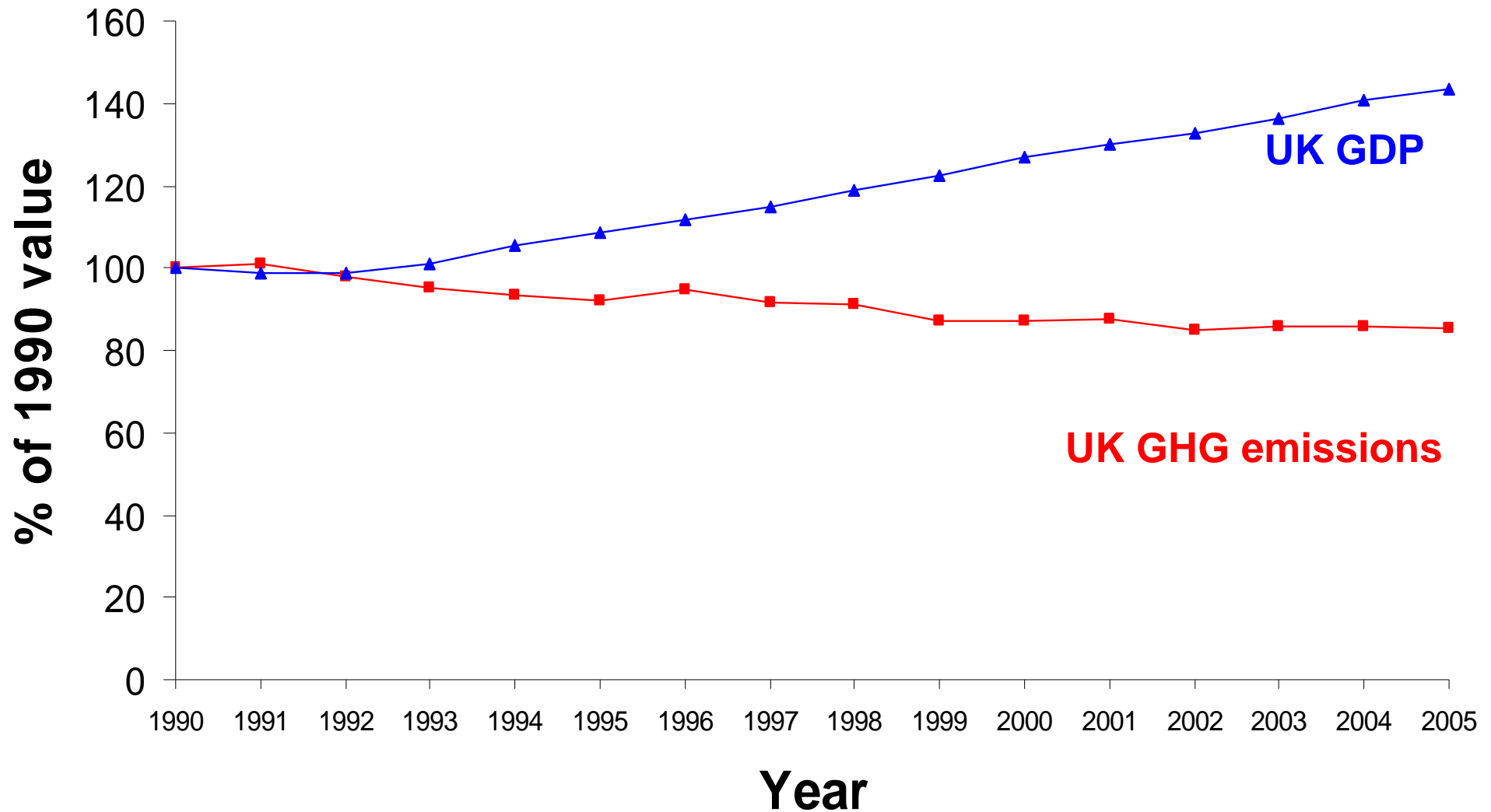
ENERGY TECHNOLOGIES
INSTITUTE

Prospectus

SEPTEMBER 2006

- Public-Private partnership between UK Government and industry
- BP, Shell, EDF, E:On, Rolls-Royce, Caterpillar and S&SE all core partners
- Will invest £1bn in energy research, design, demonstration and development over 10 years
- Looking to develop links with other countries

UK GDP and emissions



Sources: Defra e-Digest of Environmental Statistics
and National Statistics UK National Accounts

Business tackling emissions

Barclays:

Only financial institution to join UK Emissions Trading Scheme, forerunner to the EU ETS

HSBC:

In 2004 became the first bank in the world to become carbon neutral

IBM:

Reduced greenhouse emissions by 66% from 1990 levels

BP:

\$20m internal emissions trading scheme, saved over \$650m during a three year period

Marks & Spencer's 'Plan A'

Reducing energy use:

- Since 2003, M&S have reduced CO2 emissions by 30% in UK/Irish shops and by 25% from lorries

Aiming to:

- reduce energy used in their shops by a further 25%
- achieve a 20% improvement in fuel efficiency

Begin switching to 'green' alternatives by:

- powering all their UK and Irish shops with green energy including 'anaerobic digestion' – energy generated by waste from shops and farms
- making sure all M&S lorries run on at least 50% bio-diesel

Source: <http://www.marksandspencer.com/>

Future Challenges

- Climate change requires both national and global solutions (including EU ETS, post 2012)
- Developing a robust and coherent strategy is vital – working with key business partners
- Development of Energy Technologies Institute (ETI) – further international co-operation needed
- Action is affordable – Inaction is not!

Solar Land Area Requirements



6 Boxes at 3.3 TW Each

Source: Nathan Lewis