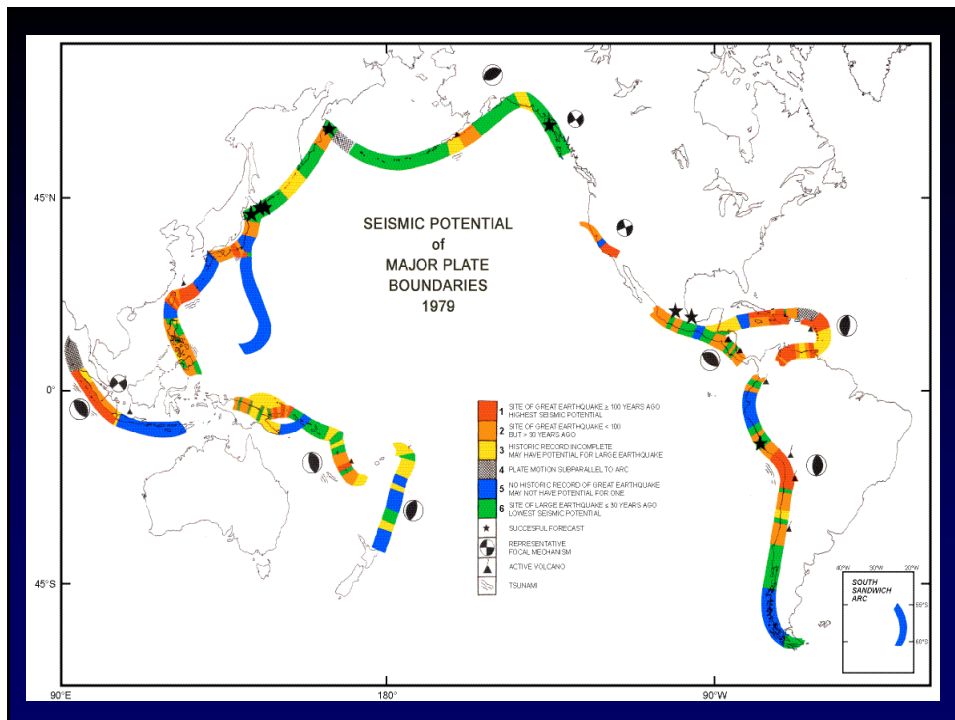


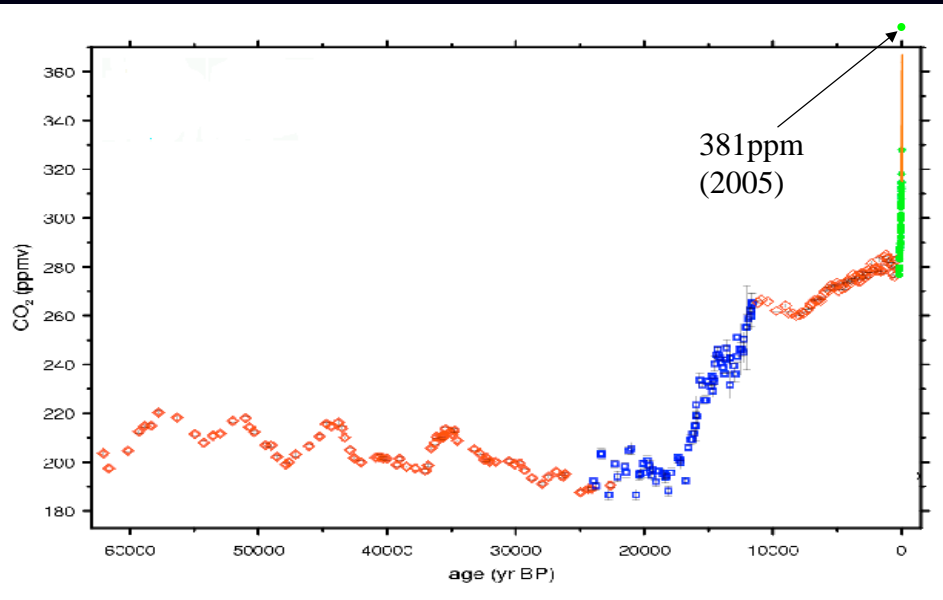
Global warming: causes, consequences and solutions

Sir David King
Chief Scientific Adviser to HM
Government

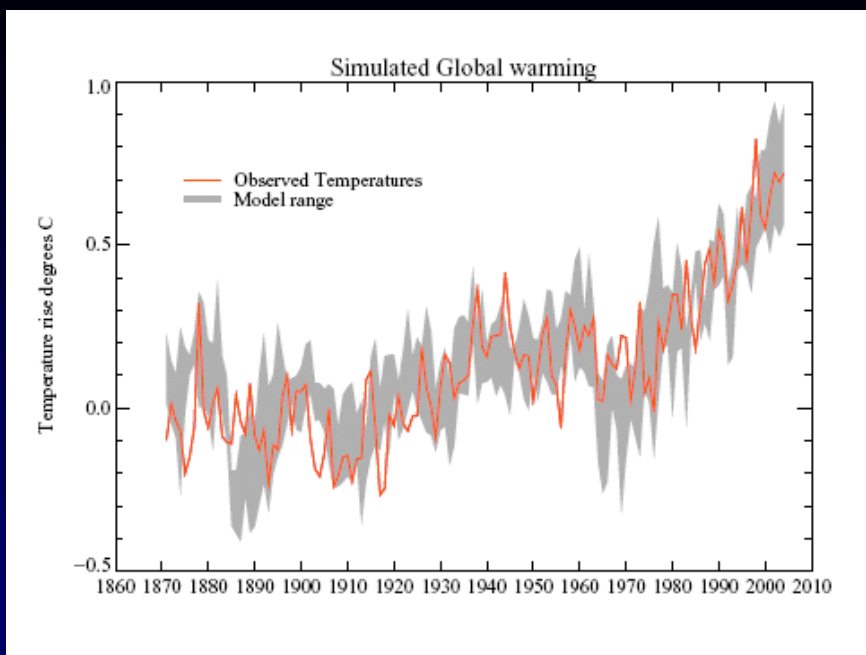
22 November 2005



Carbon dioxide levels over the last 60,000 years

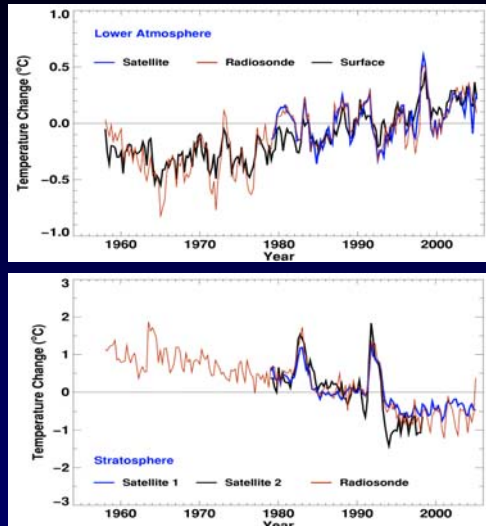


Source University of Berne and National Oceanic and Atmospheric Administration



Source: Hadley Centre

The lower atmosphere is indeed warming



There is now good agreement between in-situ and satellite measurements

Source: Hadley Centre

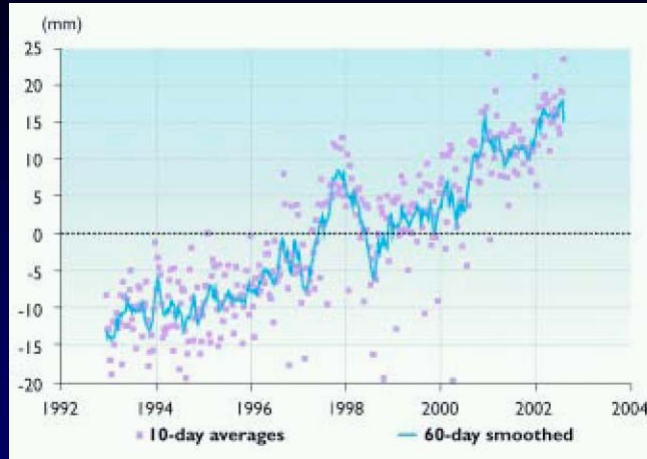
The Radiative Signature of Upper Tropospheric Moistening

Brian J. Soden,^{1*} Darren L. Jackson,² V. Ramaswamy,³
M. D. Schwarzkopf,³ Xianglei Huang⁴

Climate models predict that the concentration of water vapor in the upper troposphere could double by the end of the century as a result of increases in greenhouse gases. Such moistening plays a key role in amplifying the rate at which the climate warms in response to anthropogenic activities, but has been difficult to detect because of deficiencies in conventional observing systems. We use satellite measurements to highlight a distinct radiative signature of upper tropospheric moistening over the period 1982 to 2004. The observed moistening is accurately captured by climate model simulations and lends further credence to model projections of future global warming.

SCIENCE VOL 310 4 NOVEMBER 2005

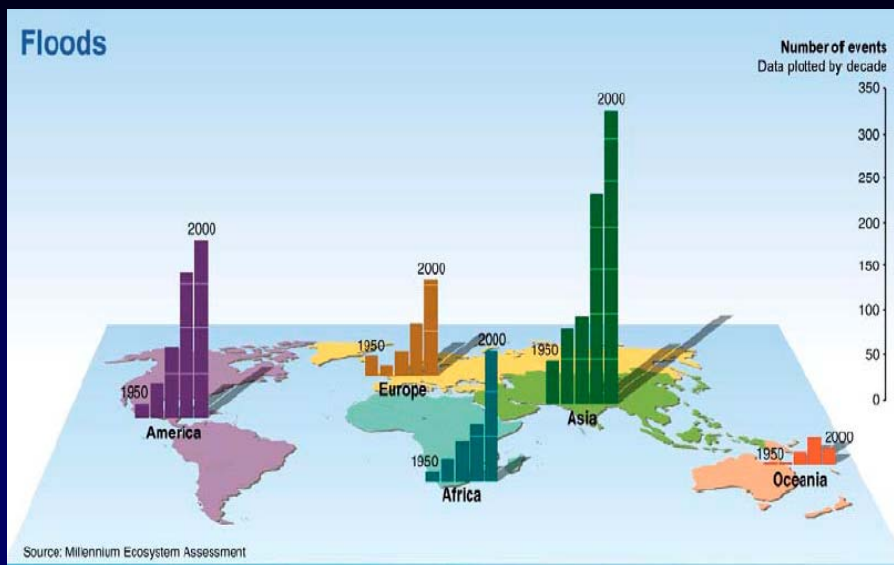
Observed Global Sea Level Rise



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

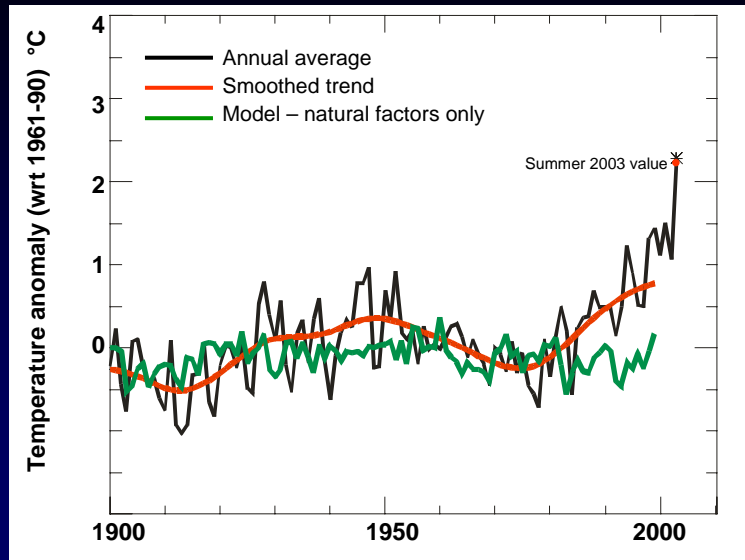
Source: Arctic Climate Impact Assessment 2004

Number of flood events by continent and decade since 1950



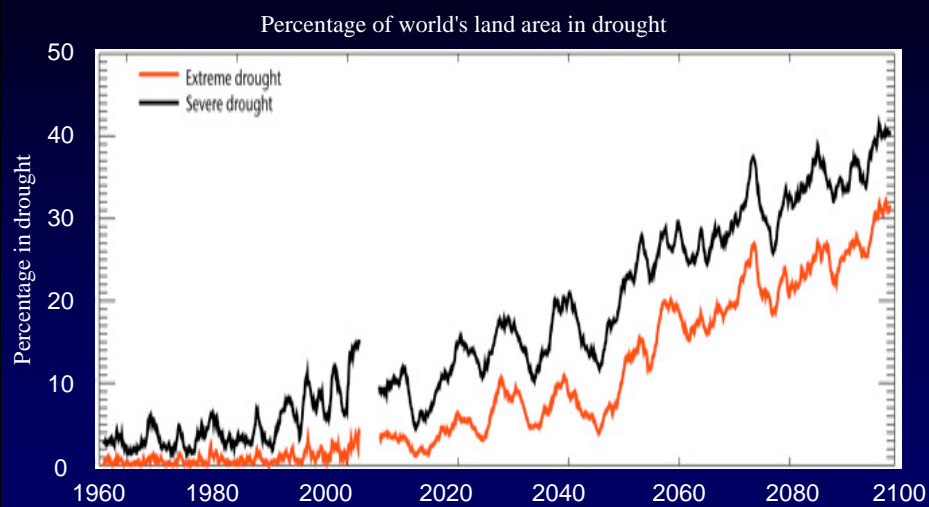
Source: Millennium Ecosystem Assessment

Annual European summer temperatures



Source: Hadley Centre

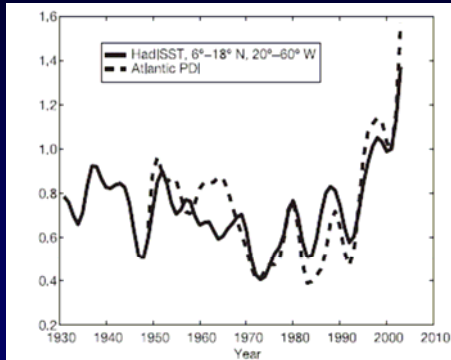
Drought areas already expanding and predicted to expand further



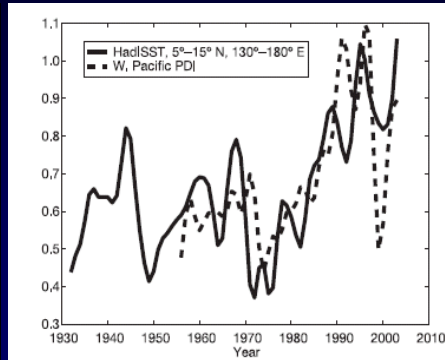
Source: Burke, EJ and SJ Brown. Modelling the recent evolution of global drought and projections for the 21st century. Submitted to the Journal of Hydrometeorology, 2005

Increasing destructiveness of tropical cyclones over the past 30 years

North Atlantic



North Pacific



Source: Emanuel, K. Nature 436 (2005) 686

Extent of ice melt in Greenland, 1992 and 2002



Source: Arctic Climate Impact Assessment 2004

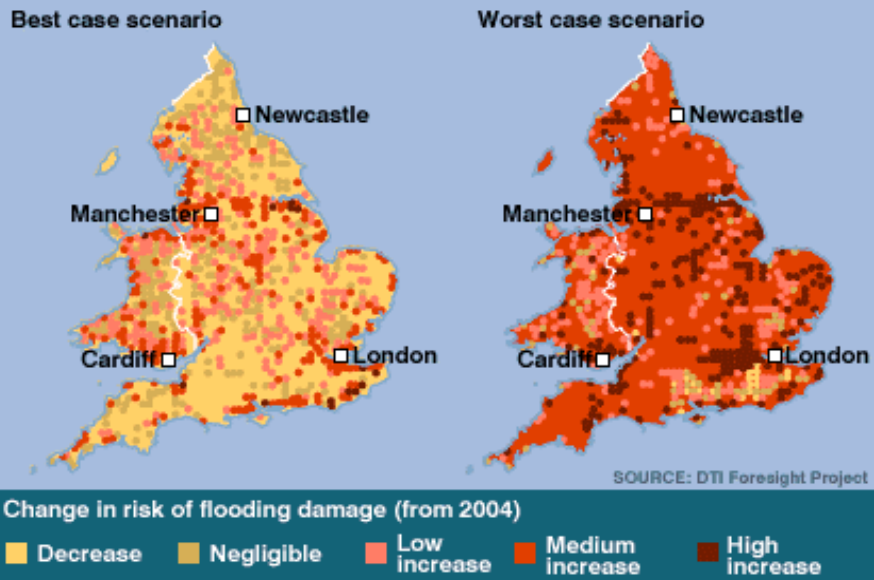
Warming could destabilise parts of the climate system – rapid non-linear change

- Collapse of North Atlantic circulation? Ice age trigger?
- Loss of Greenland and West Antarctic Ice Sheets?
- Carbon cycle feedback?
- Destabilise methane hydrates?
- Ocean acidification?

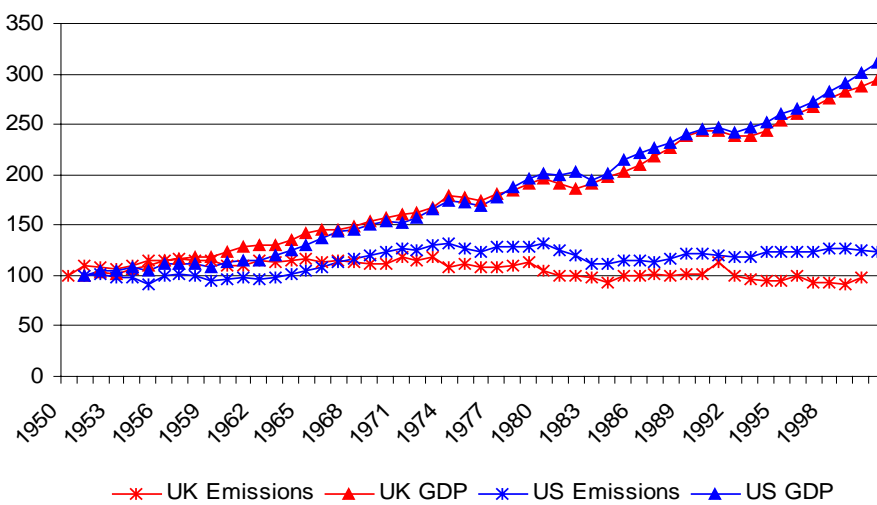
Adapt and Mitigate

- 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 have Foresight....

Possible flooding in the UK by 2080s

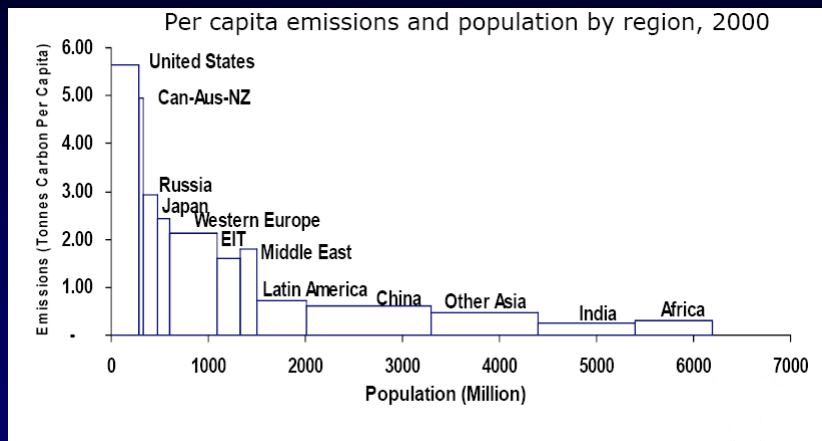


GDP per capita and emissions



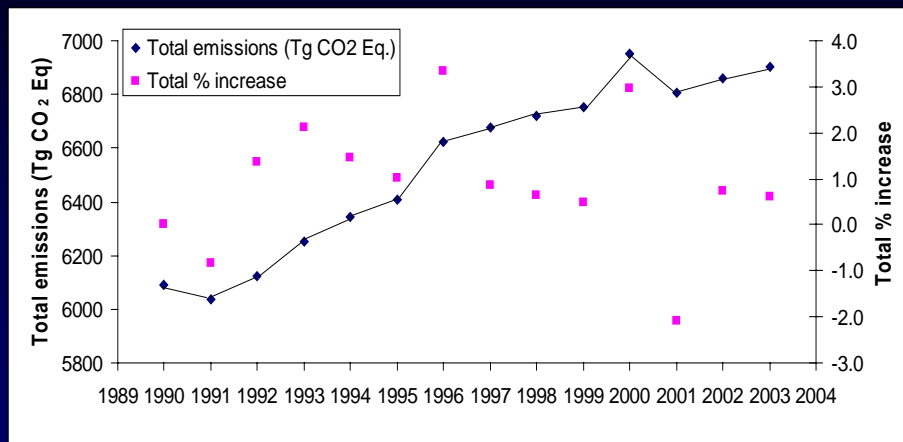
Sources: Penn World Tables and ORNL

Global dimensions of the mitigation problem



Source: Carbon Trust

US emissions since 1990



Source: US Environmental Protection Agency web site, US Emissions Inventory 2005, Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2003

Businesses that have tackled emissions voluntarily

HSBC

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

BP

- Introduced an internal emissions trading scheme, costing \$20m to implement; saved company over \$650m during a three year period

WalMart

- announced on 24 October that the company would aim to be supplied 100% by renewable energy, to improve its fleet efficiency 25% by 2008 and 50% by 2015; and to invest \$500million per year to reduce GHGs 20% by 2012.

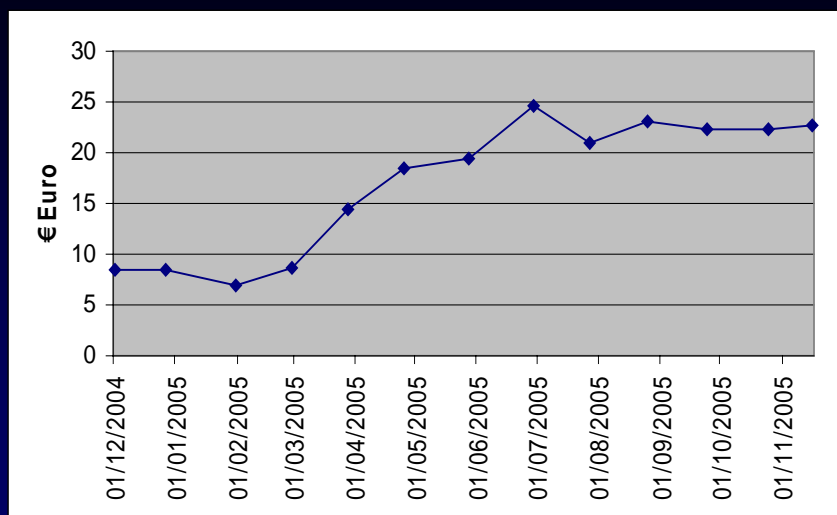
IEA World Energy Outlook Report: 2005

- World energy demand projected to increase by over 50% by 2030
- Investment of \$17 trillion will be needed
- Energy-related CO₂ emissions will be 52% higher in 2030

Global Action

- IPCC
- United Nations Framework Convention on climate change
- Kyoto
- UK Government's 60% target
- EU
- G8+5
- Asia/Pacific partnership
- Emissions trading

Carbon Dioxide price per tonne



Source: Point Carbon

GHG Emissions Relative to Kyoto Baseline

