



the London School of **Economics**  
and **Political Science**

CHATHAM HOUSE



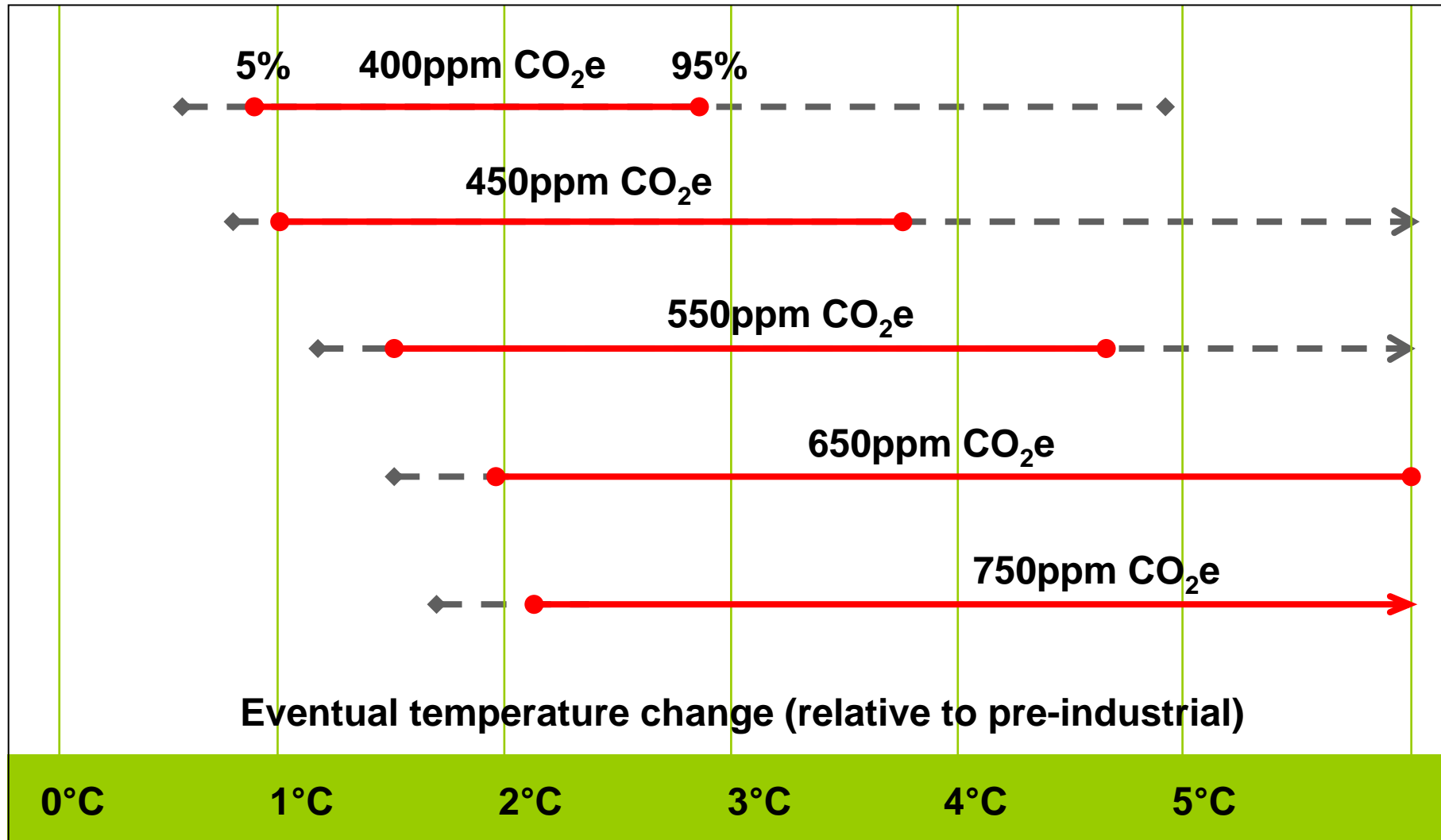
# Stern Review and the Global Deal

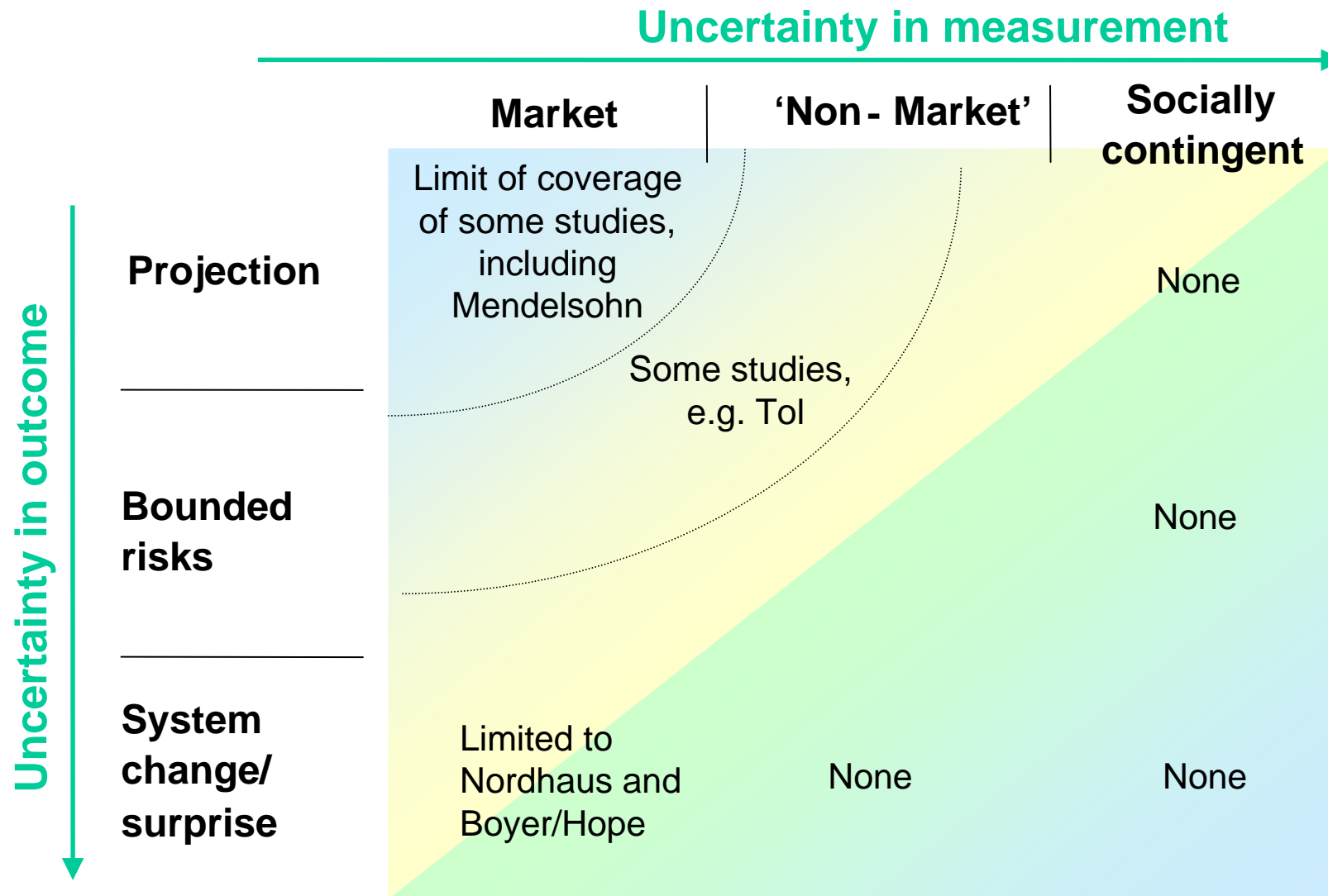
## Global Economic impacts of Climate Change

Dimitri Zenghelis

Club de Roma, November 2009

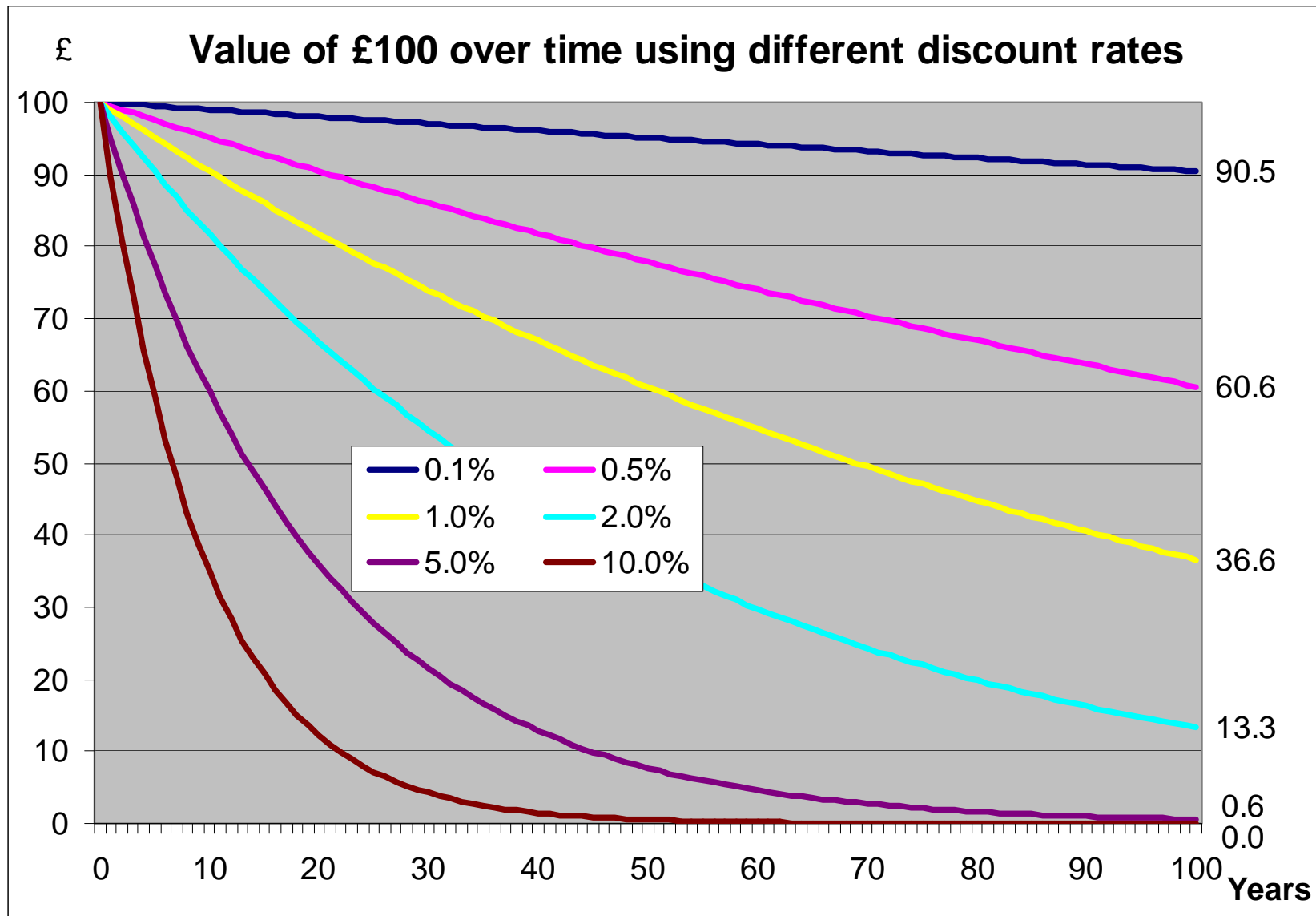
# Stabilisation and eventual change in temperature



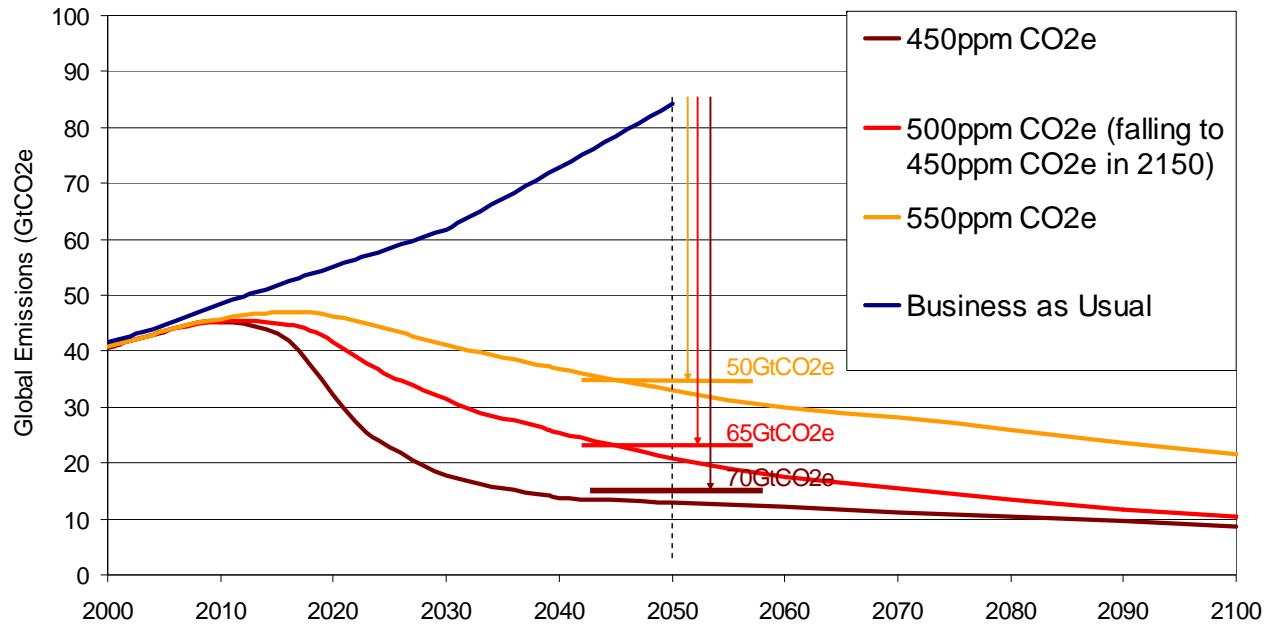


***Models only have partial coverage of impacts***  
***Values in the literature are a sub-total of impacts***

# Sensitivity analysis: discounting



# Delaying mitigation is dangerous and costly



Stabilising below 450ppm CO<sub>2</sub>e would require emissions to peak by 2010 with 6-10% p.a. decline thereafter.

If emissions peak in 2020, we can stabilise below 550ppm CO<sub>2</sub>e if we achieve annual declines of 1 – 2.5% afterwards. A 10 year delay almost doubles the annual rate of decline required.

# Basic arithmetic

- Current 40-45 GtCO<sub>2</sub>e p.a.
- **50% reduction by 2050 requires per capita global GHG emissions of 2-3T/capita** (20-25 Gt divided by 9 billion population)
- Currently US ~ 20+, Europe ~10+, China ~5+, India ~2+ T/capita
- **At the COP15 meetings in 2009, developed countries should commit to cutting emissions by 80-90% from 1990 levels by 2050 together with credible interim targets**
- Many developing countries would have to cut strongly too if world average of 2-3 T/capita is to be achieved

# Efficiency

Least cost options must be global in scope with **efficient institutions** and implementation mechanisms

Harness power of markets, **limit transaction costs and distortions**  
**BUT address numerous market failures**

- **Pricing** the externality- carbon pricing via tax or trading, or implicitly through regulation: broadly uniform, **credible, long term, global price**
- Bringing forward lower carbon **technology**- research, development and deployment
- Overcoming **information** barriers and transaction costs– regulation, standards
- Promoting a shared **understanding** of responsible behaviour across all societies – beyond sticks and carrots

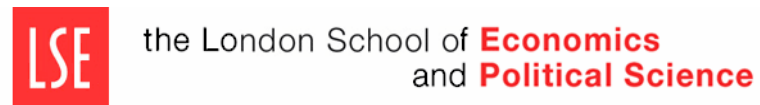
# Equity

- **Common understanding** of the global problem
  - Who is hit? Historic responsibility?
- **Regional differentiation**, asymmetric impacts of climate change
- **Regional differentiation** of costs of action
- Understanding of the **opportunities** and costs of mitigation
- Understanding costs/risks of **moving at different speeds**

# Conclusion

- Our understanding of the **risks** of climate change has advanced strongly
- We understand the **urgency and scale** of action required
- We know that the **technologies and economic incentives for effective action are available or can be created**
- We are in a much better position now to use our **shared understanding** to agree on what goals to adopt and what action to take
- The right policy framework, founded on global commitment, can mean a future of **market dynamism, entrepreneurship and creativity**
- Opportunities for business and humanity
- The next year will determine the future shape of the planet

[dzenghel@cisco.com](mailto:dzenghel@cisco.com)  
[d.a.zenghelis@lse.ac.uk](mailto:d.a.zenghelis@lse.ac.uk)



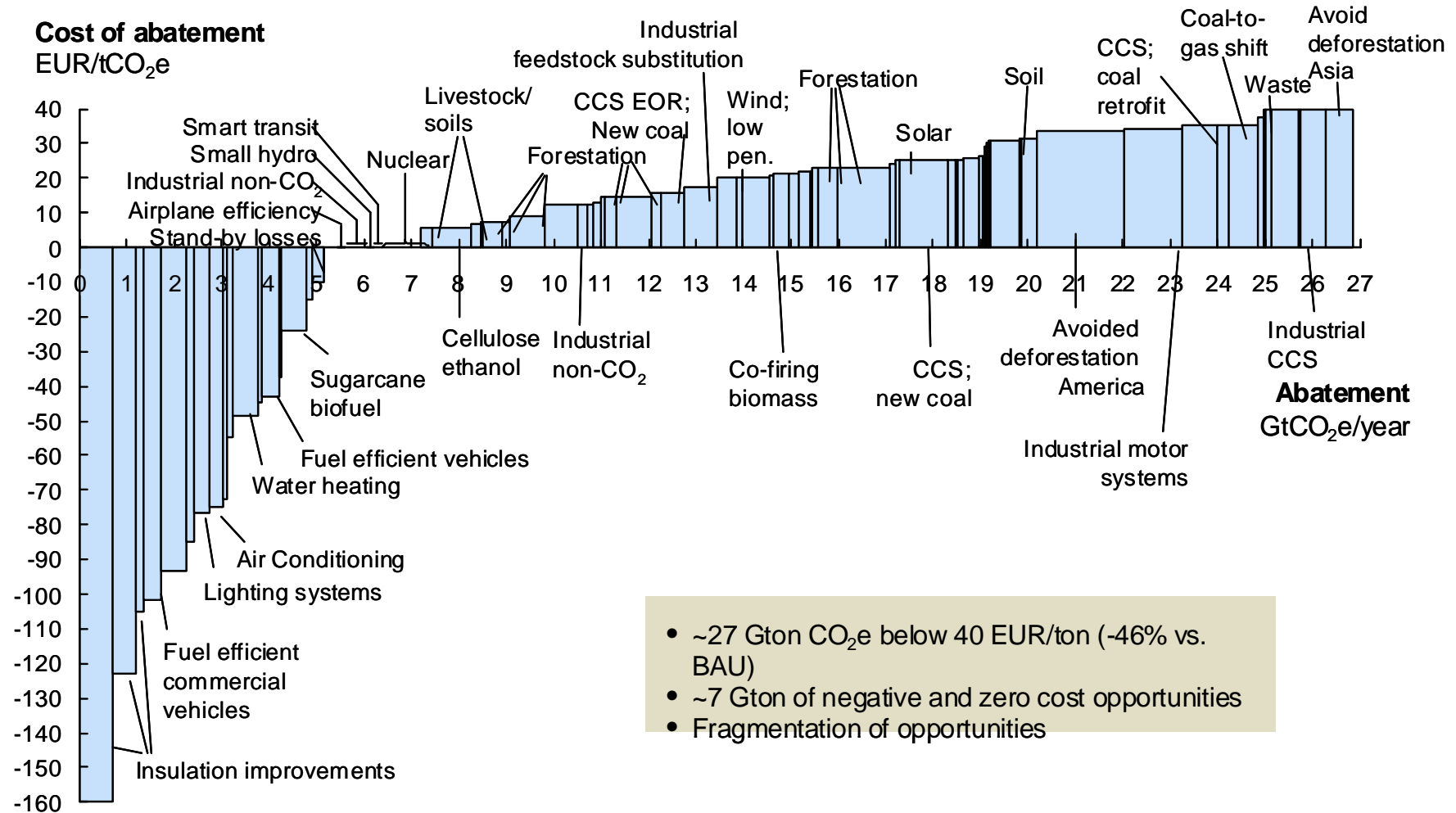
[www.lse.ac.uk/climateNetwork](http://www.lse.ac.uk/climateNetwork)  
[www.sternreview.org.uk](http://www.sternreview.org.uk)

# Cost estimates

- Review examined results from bottom-up (Ch 9) & top-down (Ch 10) studies: concluded that world could stabilise below 550ppm CO<sub>2</sub>e for around 1% of global GDP
- Subsequent analyses Edenhofer/IPCC top down have indicated lower figures
- So too have bottom-up IEA and McKinsey
- Options for mitigation: McKinsey analysis examines approach of chapter 10 of Review in more detail
- Starting planning now with clear targets and good policies allows measured action and keeps costs down. Delayed decisions/actions (or “slow ...”), lack of clarity, bad policy will increase costs

# McKinsey bottom-up approach

2030



# Global spatial evidence – firms' location decisions

## **\$40CO<sub>2</sub>/T Equivalent to:**

- 35-40¢ for gas and diesel at the pump - just under 1¢ per 1\$ of tax
- Barrel of Brent crude - approx \$15-\$20/bbl
- Electricity - about 0.5-0.7¢/KWh approx on primary generation (between 1.5-2¢ on delivered ~ 20% increase in delivered price)

## **Firm's location decisions depend on:**

- Competitiveness effects firms and products that are energy intensive AND tradable
- Limited to steel, cement, ceramics, aluminium, minerals, paper
- access to markets; access to raw materials; access to skilled labour; access to technology; fiscal incentives; political stability, legal jurisdiction; infrastructural networks
- carbon costing of the kind suggested is a small factor

# Global spatial evidence – firms' location decisions

## Evidence from spatial location studies (Antweiler, Copeland and Taylor\* 2001)

- Rich evidence base
- US state and global cross-border activity following differential application of environmental policies
- Instrumental variable panel studies
- Relocation rare - only on margin
- Different sectors in different regions face different vulnerabilities

\*Is free trade good for the environment?' *American Economic Review* 91(4)

## **Evidence II: international global sector & industry studies - comparable findings**

### **UK Stern Input-Output studies (UK 2006)**

- Metals, paper, refining, chemicals are the exposed sectors (<3% GDP)

### **Carbon trust and Climate Strategies (EU 2008)**

- Metals, refining, ceramics, chemicals are the exposed sectors (<5% GDP)
- in EU ETS “free allocation won’t cure problem”

### **PIEE/WRI “Levelling the Carbon Playing Field” Study (US 2008)**

- Metals, minerals, paper, refining are the exposed sectors (~3% GDP)
- China – much smaller share of US imports of above than Canada, EU
- Chinese GHG-intensive exports to US small as % production (~1% for key commodities e.g. steel, cement aluminium)
- Recent China changes in tax policy ~ \$50/TCO<sub>2</sub> applied to steel exports
- Climate change policy generates winners & losers
- Free allocation of emissions allowances “may not prevent leakage”
- Sector standards, targets, taxes more effective than free allocations, tariffs

### **Australian Treasury “Australia's Low Pollution Future: The Economics of Climate Change Mitigation” (October 2008)**

- “Fears of carbon leakage may be overplayed”

# Opportunities & benefits from moving early

**Opportunities** to set standards, technologies, regulation, markets

- Case study analysis: **early-moving** can gain market share:
  - Shell/BP; Toyota/Honda; GE all v carbon exposed
  - Developing world producers too - Wal Mart and China
  - New world wines
- **Losers shout louder....**potential winners are potential

**Financing opportunities**

- Benefits from **selling credits**: CDMs, programmes, benchmarking
- Benefits from **new technology** transfer, demonstration
- But - **macro modelling** of flows needed

# Mitigation policy instruments

- **Pricing** the externality- carbon pricing via tax or trading, or implicitly through regulation
- Bringing forward lower carbon **technology**- research, development and deployment
- Overcoming **information** barriers and transaction costs— regulation, standards
- Promoting a shared **understanding** of responsible behaviour across all societies – beyond sticks and carrots

# Effectiveness - basic arithmetic

- Current 40-45 GtCO<sub>2</sub>e p.a.
- **50% reduction by 2050 requires per capita global GHG emissions of 2-3T/capita** (20-25 Gt divided by 9 billion population)
- Currently US ~ 20+, Europe ~10+, China ~5+, India ~2+ T/capita
- **Developed countries should commit to cutting emissions by 80-90% from 1990 levels by 2050, together with credible interim targets**
- Many developing countries would have to cut strongly too

# Effectiveness - commitments

All countries will eventually need to take on binding national targets

- G8 Heiligendamm – **50% by 2050 (consistent with stabilisation ~ 500ppm CO<sub>2</sub>e)**
- California (and **US** presidential candidates) - 80% from 1990 levels by 2050
- **France** – 75% by 2050 (Factor 4), relative~1990
- **EU** Spring Council: 60-80% by 2050 & 20-30% by 2020, relative~1990
- **Germany** – 40% by 2020, relative~1990