



The Economics of Climate Change

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8th November 2006

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What is the **economics of climate change**
and how does it depend on the **science**?

Analytic foundations

Climate change is an externality with a difference:

- Global
- Long-term
- Uncertain
- Potentially large and irreversible

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The economics of climate change: Key questions for the Review

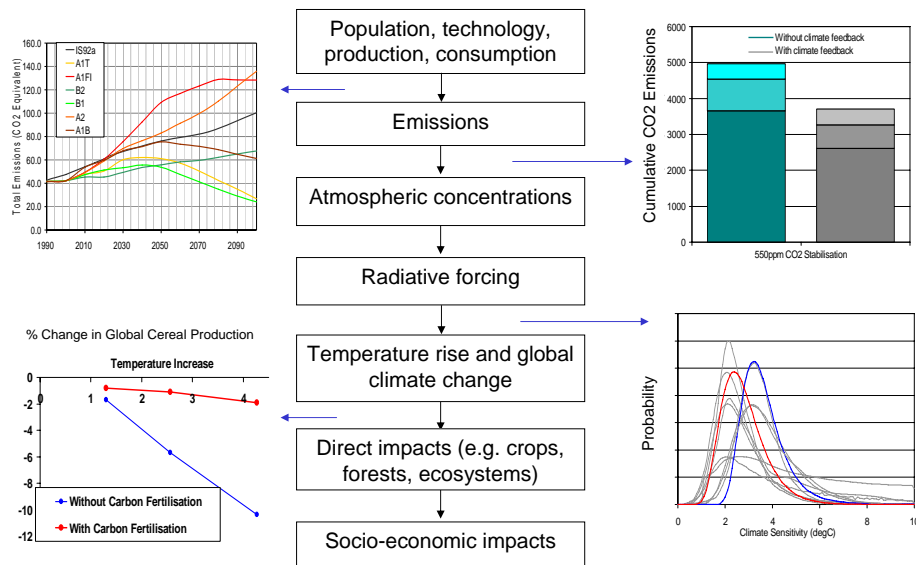
- What are the **risks** arising from the impacts of climate change, what are the probabilities, and **on whom do the impacts fall**?
- What are the **options** for mitigation, and what do they **cost**? What do the risks, options and costs imply for the economics of the choice of paths to stabilisation for the world, and for the timing and scale of action?

Policy

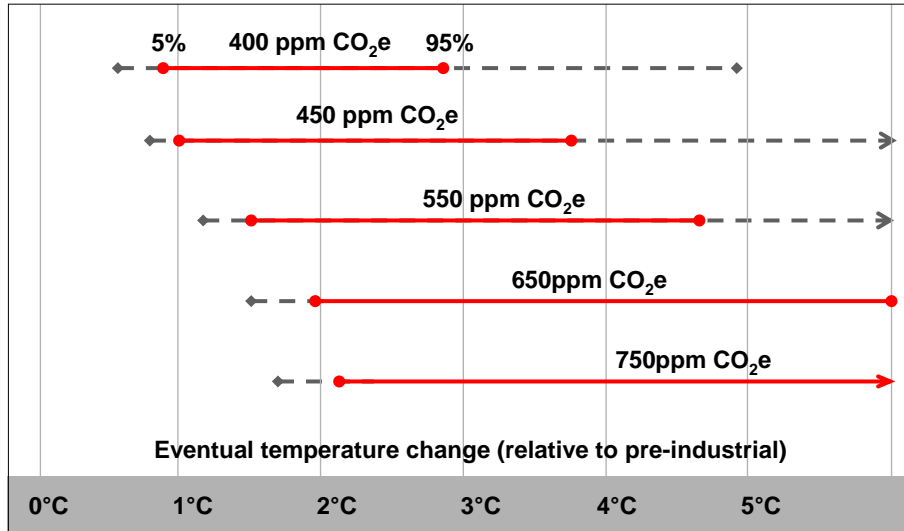
- For **mitigation**, what kind of **incentive structures** and policies will be most **efficient** and **equitable**?
- For **adaptation**, what **approaches** are appropriate and how should they be **financed**?
- How can approaches for both mitigation and adaptation work at an **international level**?

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Working with Uncertainty

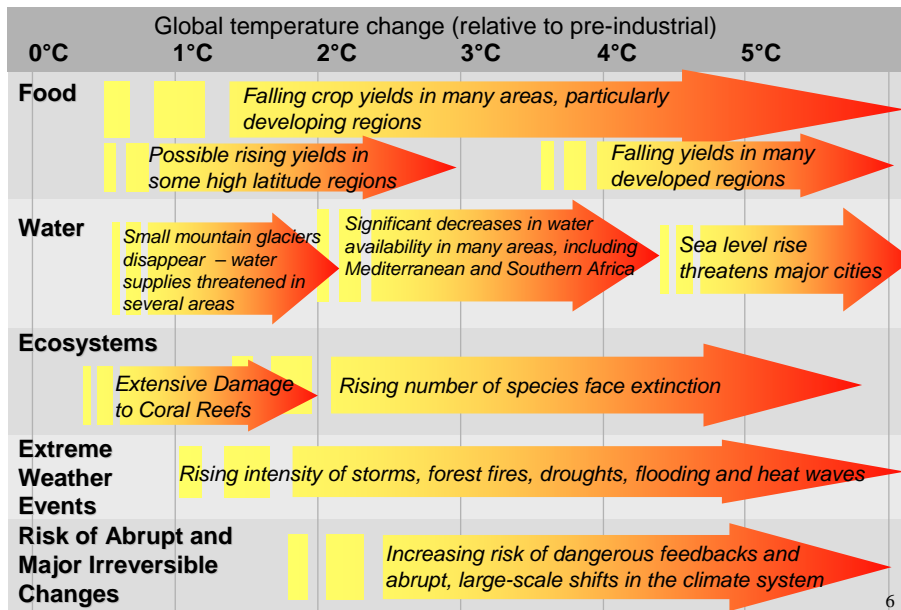


Stabilisation and Commitment to Warming



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Projected Impacts of Climate Change

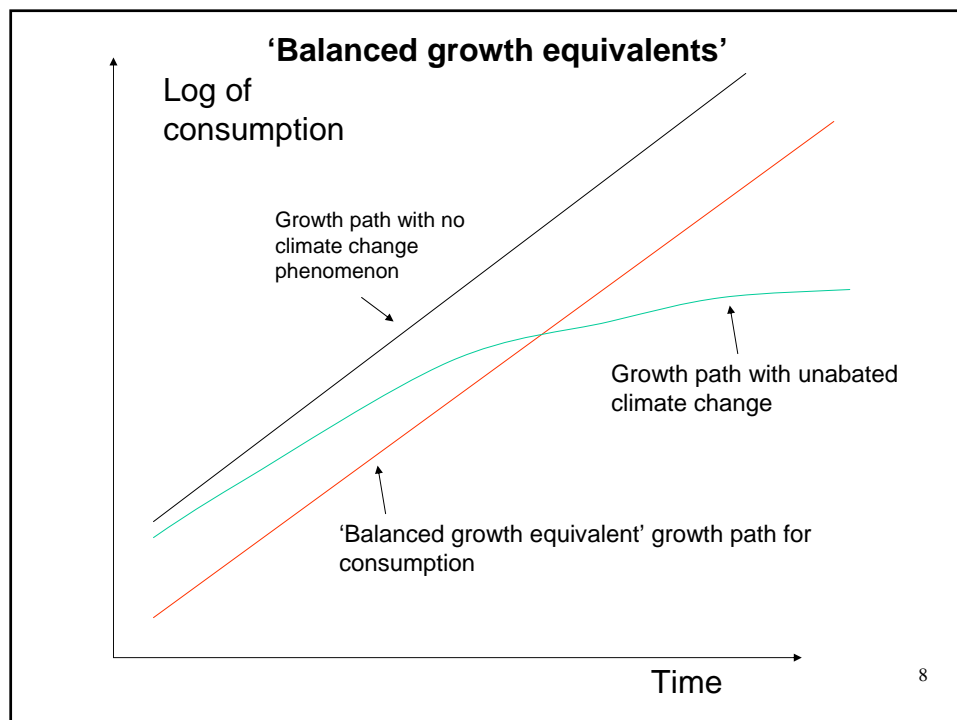


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Understanding Disaggregated Impacts

- Developing countries are especially vulnerable
 - Rising water stress in many areas (over one billion people suffer water shortages by the 2080s, many in Africa).
 - Falling farm incomes
 - Malnutrition and disease
 - Pressure for migration and conflict (dislocation, for example, due to desertification and sea level rise)
- Developed countries are not immune
 - Water stress in southern Europe and California
 - Costs of extreme weather events (hurricanes, floods and heatwaves)
 - More volatility implies higher costs of insurance, with implications for capital markets

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Losses in per capita consumption

Scenario	Economic	Balanced growth equivalents: % loss in current consumption due to climate change		
		Mean	5 th percentile	95 th percentile
Baseline Climate	Market impacts + risk of catastrophe	5.0	0.6	12.3
	Market impacts + risk of catastrophe + non-market impacts	10.9	2.2	27.4
High Climate	Market impacts + risk of catastrophe	6.9	0.9	16.5
	Market impacts + risk of catastrophe + non-market impacts	14.4	2.7	32.6

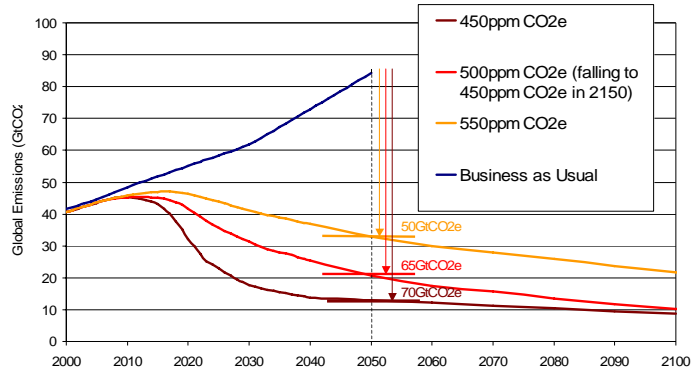
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Key assumptions

- Discounting, and the role of the **pure rate of time preference**
- Higher rate of economic growth (increased emissions, higher discounting)
- Disaggregated analysis and possibility of very high temperatures under 'business as usual' suggest these models may be underestimating damages

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Economics of stabilisation



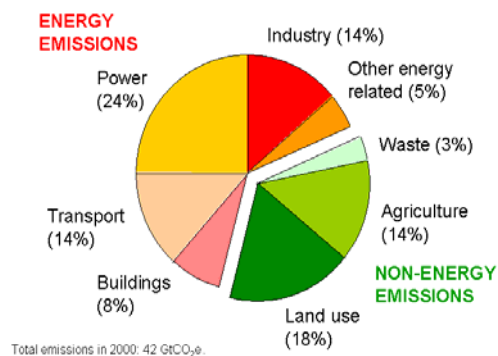
Stabilising below 450ppm CO₂e would require emissions to peak by 2010 with 6-10% p.a. decline thereafter.

If emissions peak in 2020, we can stabilise below 550ppm CO₂e if we achieve annual declines of 1 – 2.5% afterwards

A 10 year delay almost doubles the annual rate of decline required

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Strategies for emission reduction



Four ways to cut emissions:

- reducing demand;
- improving efficiency;
- using lower-carbon technologies;
- tackling non-energy emissions.

Costs of mitigation

Expected cost of cutting emissions consistent with a 550ppm CO₂e stabilisation trajectory is 1% of GDP in 2050. This is the result of two approaches to costing:

- Resource cost: 1% of GDP in 2050, in range –1% to +3.5%.
- Macroeconomic models: 1% of GDP in 2050, in range +/- 3%.

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Growth, change and opportunity

Strong mitigation is fully consistent with the aspirations for growth and development in poor and rich countries. Business as usual is not.

Costs will not be evenly distributed:

- Competitiveness impacts can be reduced by acting together.
- New markets will be created. Investment in low-carbon electricity sources could be over \$500bn a year by 2050.

Mitigation policy can also be designed to support other objectives:

- energy - air quality, energy security and energy access
- forestry - watershed protection, biodiversity, rural livelihoods

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Policy for mitigation: Establishing a carbon price

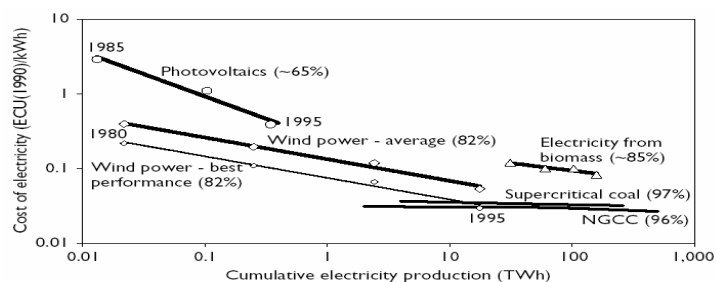
Price signals can be established in different ways: greenhouse gas taxes; capping emissions and setting up a market in permits; or implicitly through regulation.

Emissions trading is one powerful route to support international co-operation.

Credibility, flexibility and predictability are key if policy is to influence investment decisions by companies.

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Policy for mitigation: Technology



Carbon price alone not enough to bring forward the technologies we need

One way of doing this is through global public funding for technologies:

- R&D funding should double, to around \$20 bn
- Deployment incentives should increase 2 to 5 times, from current level of \$34 bn

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Policy for mitigation: Beyond pricing and technology

- **Regulation** has several important economic roles: supporting implicit prices for carbon, accelerating technology, overcoming other barriers.
- **Information** important to help people make sound decisions.
- Promote a **shared understanding of responsible behaviour** across all societies – beyond sticks and carrots

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Adaptation

Adaptation is inevitable: climate change is with us and more is on the way. Adaptation mainly driven by actions in private sector but public policy has crucial role.

Adaptation cannot be a substitute for mitigation. It can only reduce the costs of climate change; for severe impacts there are limits to what adaptation can achieve.

Extra costs of weather-related impacts, associated with climate change, are rising rapidly. Investment is required to reduce damage.

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Adaptation in developing countries

- Impacts will be felt earliest and strongest by the most vulnerable, including in developing countries.
- Development itself enhances capacity and flexibility – crucial for adaptation.
- Adaptation will put strong pressure on developing country budgets and ODA.
 - Increase in investment costs across the economy by tens of billions p.a. (World Bank).
 - Better information and appraisal tools can drive effective risk management and planning.
- International action has a key role in supporting
 - Disaster response
 - Crop varieties and technology
 - Forecasting climate and weather

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Where does this analysis lead? International action: principles

Effective action requires:

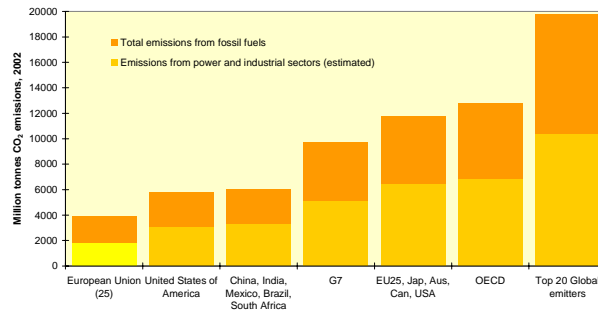
- Long-term quantity goals to limit risk; short-term flexibility to limit costs
- A broadly comparable global price for carbon
- Equitable distribution of effort
- Cooperation to bring forward technology
- Moving beyond sticks and carrots

The key foundations include:

- A common understanding of the scale of the problem;
- Transparency and mutual understanding of actions and policies;
- Structures that sustain cooperation, including institutional arrangements for monitoring emissions, emissions trading and technology collaboration

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Where does this analysis lead? Financing mitigation

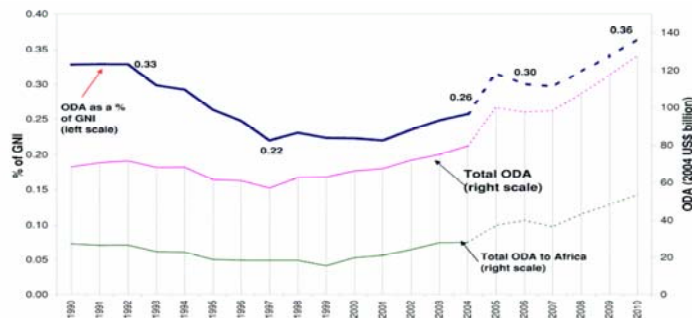


International finance flows should be scaled up for effective and equitable mitigation :

- Arrangements such as the Clean Development Mechanism must be transformed to support much larger flows.
- The IFIs can play a very strong role in shaping investment frameworks and piloting new approaches
- Increased resources are required for technology cooperation and transfer

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International action: Financing adaptation



The climate is already changing and will change further:

- All countries will face significant costs of adaptation, but developing countries will be hit earliest and hardest
- Development itself must be central to the response
- Crucial to deliver on commitments from Monterrey 2002 and Gleneagles 2005

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Conclusion

Unless emissions are curbed, climate change will bring high costs for human development, economies and the environment

- Concentrations of 550ppm CO₂e and above are associated with very high risks of serious economic impacts
- Concentrations of 450ppm CO₂e and below will be extremely difficult to achieve given where we are now and given current and foreseeable technology

Limiting concentrations within this range is possible. The costs are modest relative to the costs of inaction.

Action is urgent: delay means greater risks and higher costs

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