

# The Shadow Price of Carbon

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March 2008

# New guidance

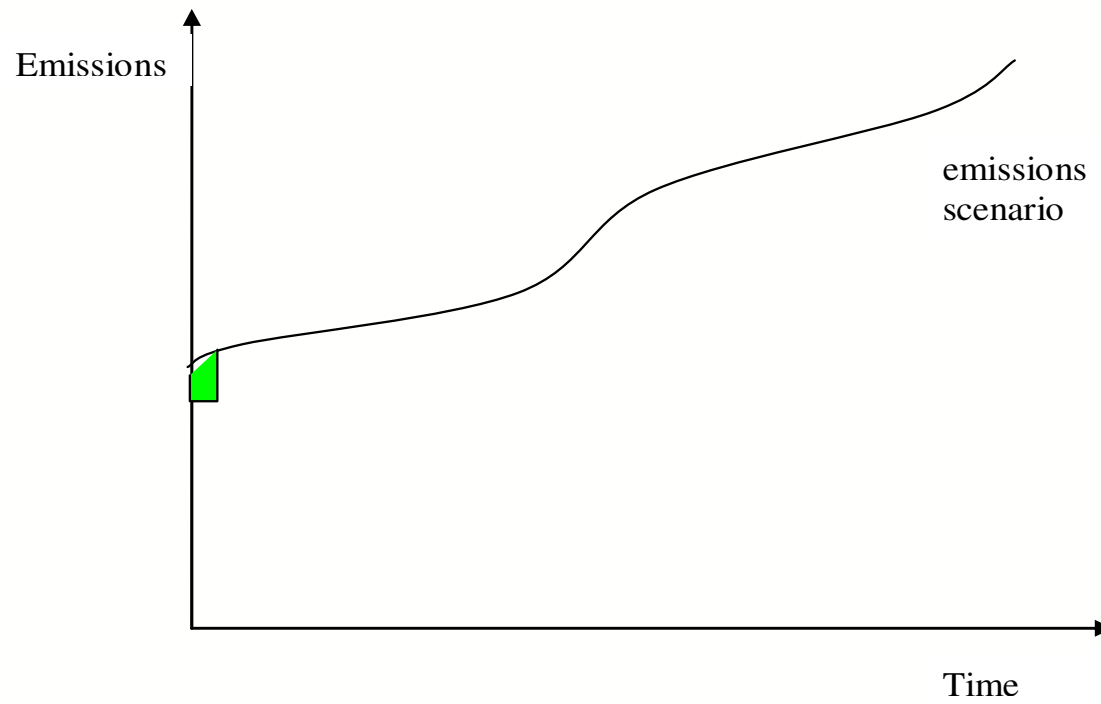
- Defra's new guidance on incorporating GHG emissions into policy/project appraisal – the Shadow Price of Carbon (SPC)
- To be used across Government → reaches further than cost effectiveness metrics.
- 2008 figure (2008 prices): £26.50/tCO<sub>2</sub>e
- Rises at 2% p.a. in real terms

# SPC – Basis & estimation

- The SPC is based upon a social cost of carbon from the Stern Review
- The SCC estimation involves specifying different emissions pathways, and depends upon the differences in damages on these pathways

$$SCC = \frac{PV(Damages(Emissions^1) - Damages(Emissions^2))}{Emissions^1 - Emissions^2}$$

# Social cost of carbon - estimation



Source: Chris Hope

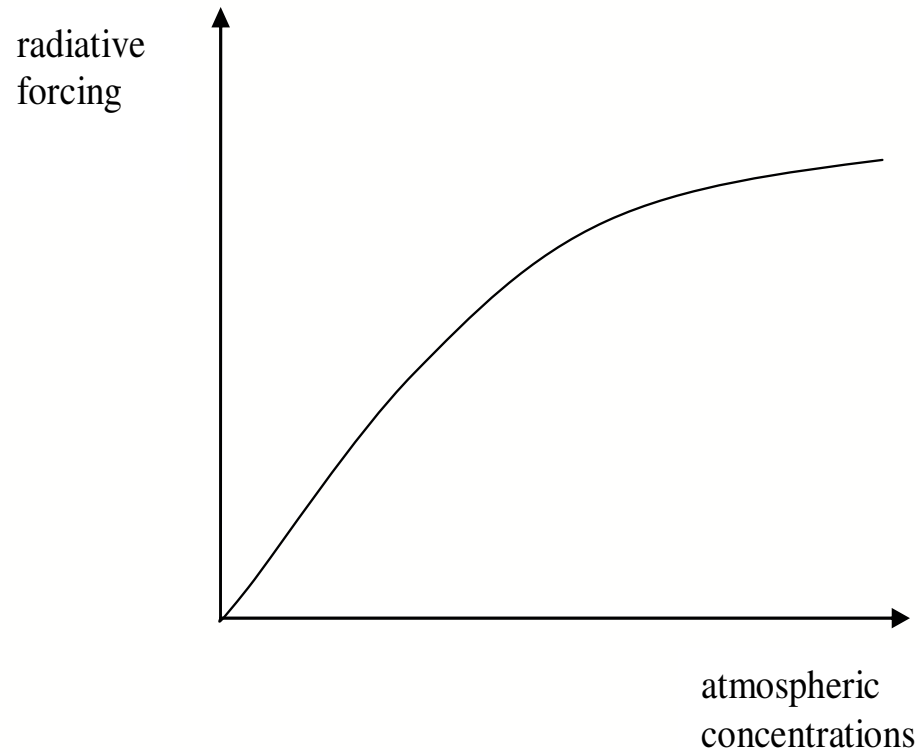
# Path-dependency

- Unlike some previous modelling, the Stern Review found that the SCC was dependent upon the prevailing atmospheric concentrations during an emission's lifetime
  - Stern's SCC's vary:
    - 450ppm: \$25/tCO<sub>e</sub>
    - 550ppm: \$30/tCO<sub>2e</sub>
    - Business as usual: \$85/tCO<sub>2e</sub>
    - This reflects two underlying relationships...

# Physical relationship – Atmospheric concentrations and radiative forcing



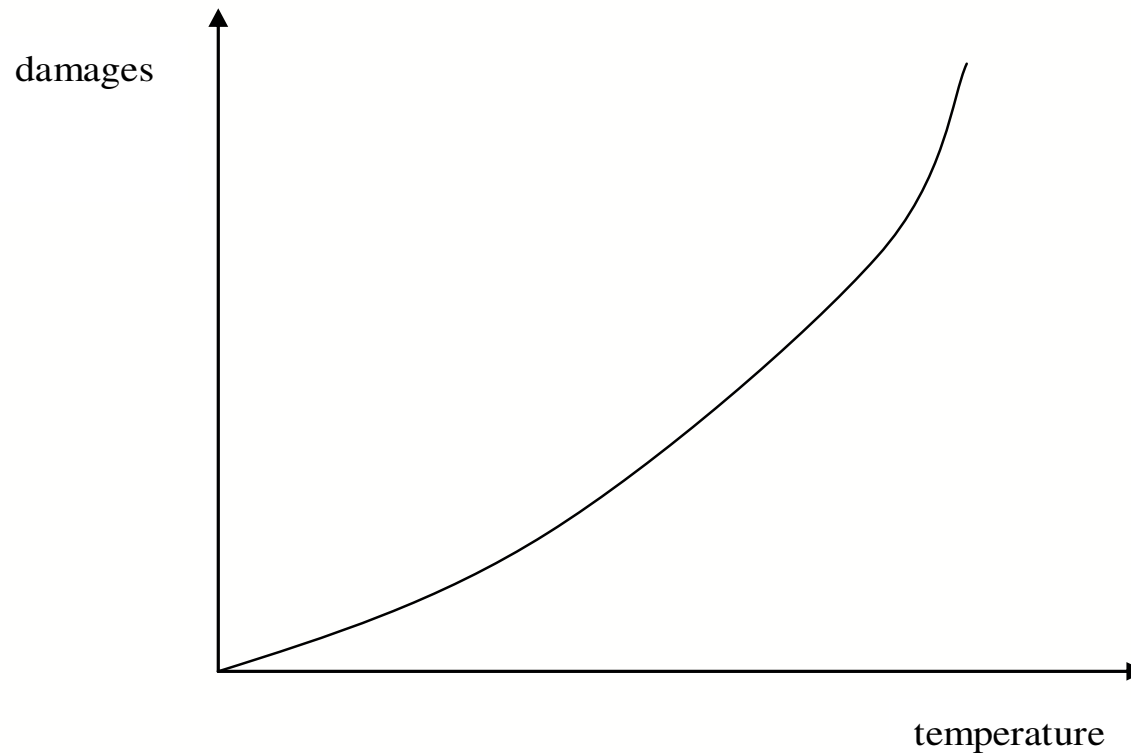
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# Physical/Economic relationship – Temperature and damage costs



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# Path-dependency - Discounting

- ...and discounting
  - which in the Stern Review was both endogenous and low
- Although path-dependency has not necessarily emerged from previous models, it was somewhat implicit in previous Defra/Treasury guidance

# The appropriate SPC

- As a result of path-dependency, it is necessary to make an assumption about the future state of the world
- What atmospheric concentrations trajectory will the world reach/will other countries also act?
  - $SCC = f$  (future global concentrations (global emissions))

# Why 550ppm?

- BAU implies no action to mitigate climate change,
- Dynamically inconsistent
- Theoretically, optimal solution:  
$$SCC = MAC \text{ over all } t = 1, 2, \dots, n$$
- Stern's suggested stabilisation range: 450-550ppm
- Given uncertainties, SCC (550ppm) more prudent

# Some issues

- not guaranteed that this will meet the goal at which we are aiming
- in reality, stabilisation is a useful policy concept, however, is not necessarily an end-point
- Difficult to find the 'optimum' in any case

# Potential new approach

- Peer reviews of the SPC made some very helpful comments and suggestions
- Emphasised uncertainty surrounding SCC estimate, and suggested alternative approach
  - A ‘target-consistent’ SPC

# Target-consistent SPC

- UK has domestic, European and international obligations regarding mitigation of carbon emissions
- These imply a carbon price – should the SPC be this implied carbon price?
- Uncertainty surrounding SCC estimates vs uncertainty surrounding MACs

# Potential roles of the SCC/SPC

- SCC's would still play a role, but at a higher-level - optimality.
- Potential new SPC would be the “downstream” carbon valuation - cost effectiveness
- Some complexities though

# Other considerations

- There are other important policy interventions in addition to carbon pricing
- Innovation market failures
- Barriers to behaviour change

# Links/Contacts



Defra SPC webpage:

<http://www.defra.gov.uk/environment/climatechange/research/carboncost/index.htm>

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- Questions/discussion