

The Social Cost of Carbon:

Use of the Values in Policy



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6th July 2006

Presentation Outline

- Background to UK policy and SCC
- Review of use of SCC in UK
- Consultation and decision variables
- Recommendations
- Additional work undertaken and research gaps



Policy Making in UK Government

- All UK government policies (all departments and agencies) have to undergo a regulatory impact assessment (RIA)
- RIA is largely based around cost benefit analysis, where benefits include non-market effects
- Also translates through to project appraisal (e.g. UK transport appraisal guidance, economic regulator and infrastructure investments, etc)
- UK government adopted pro-active policy on economic instruments

UK Climate Policy

Strong UK commitment to climate change

- Kyoto - UK agreed to reduce emissions by 12.5% (legally binding target)
- PLUS - UK domestic target (20% reduction in CO₂ by 2010 from 1990)
- Energy White Paper (2003) - Accepted UK should put itself on a path to reducing carbon dioxide emissions by ~ 60% (from 1990 levels) by 2050 (*)
- Progress recently reviewed and new Climate Change Programme (06)
- Adaptation policy framework (2005) - *To successfully adapt to unavoidable climate change*

UK Social Cost of Carbon

- In 2002, the UK Government Economic Service recommended a SCC
 - SCC = Marginal global social cost of climate change
 - Illustrative central value of £70/tonne of carbon (tC) \$100/tC or 30 Euro/tCO₂
 - Within a range of £35 to £140/tC
 - All rising at £1/tC/yr
 - Based on 1999 FUND and Open Framework values (ExternE)
 - Recommended to 'value' carbon in project and appraisal in Government.
 - Also recommended periodic review

Periodic Review

- In late 2004 two studies commissioned:
- Modelling and uncertainties – investigate lines of evidence
 - Tom Downing, David Anthoff, Ruth Butterfield, Megan Ceronsky, Michael Grubb, Jiehan Guo, Cameron Hepburn, Chris Hope, Alistair Hunt, Ada Li, Anil Markandya, Scott Moss, Anthony Nyong, Richard Tol, Paul Watkiss
- Application in Policy - how SCC been used.....and could best be used
 - Paul Watkiss, David Anthoff, Tom Downing, Cameron Hepburn, Chris Hope, Alistair Hunt, Richard Tol.
- Published by Defra in late 2005:
<http://www.defra.gov.uk/environment/climatechange/carboncost/index.htm>

Policy Applications

- Survey of decision makers and experts (UK focused) on where could use SCC (global social cost), concluded
 - Project appraisal
 - Policy appraisal
 - Design of economic instruments (taxes and charges, or subsidies)
 - Setting long-term climate change policy goals
- Note also applications for social cost of climate change from regional/national studies on risk assessment and through to adaptation
 - Bottom-up analysis (cross regional research)

Existing Government Applications of SCC

Review where values used (£35 to £140, and central value of £70)

- Used in project appraisal, e.g. investment, transport appraisal
- Used in policy appraisal, e.g. F gas, renewables obligation, building reg.s
- Used as input to design of taxes and charges, e.g. aviation tax consultation, road user charging analysis
- For above
 - Use across water, transport, energy, building and waste sectors
 - Reductions and increases in GHG
- Not used in long-term policy (referenced in energy white paper)

How does the UK compare

Survey of use of social cost values in policy in other countries/organisations

- UK unique
- Energy project appraisal EIB switching values of Euro 1.5/tCO₂ to 35/tCO₂
- Most other countries/organisations not using shadow price values
- Those that do, typically based on abatement costs or traded prices
 - EC was using MAC from ECCP of €12/tCO₂ in 2010, €20/tCO₂ in 2020
 - EBRD (WB) EU ETS or CDM prices

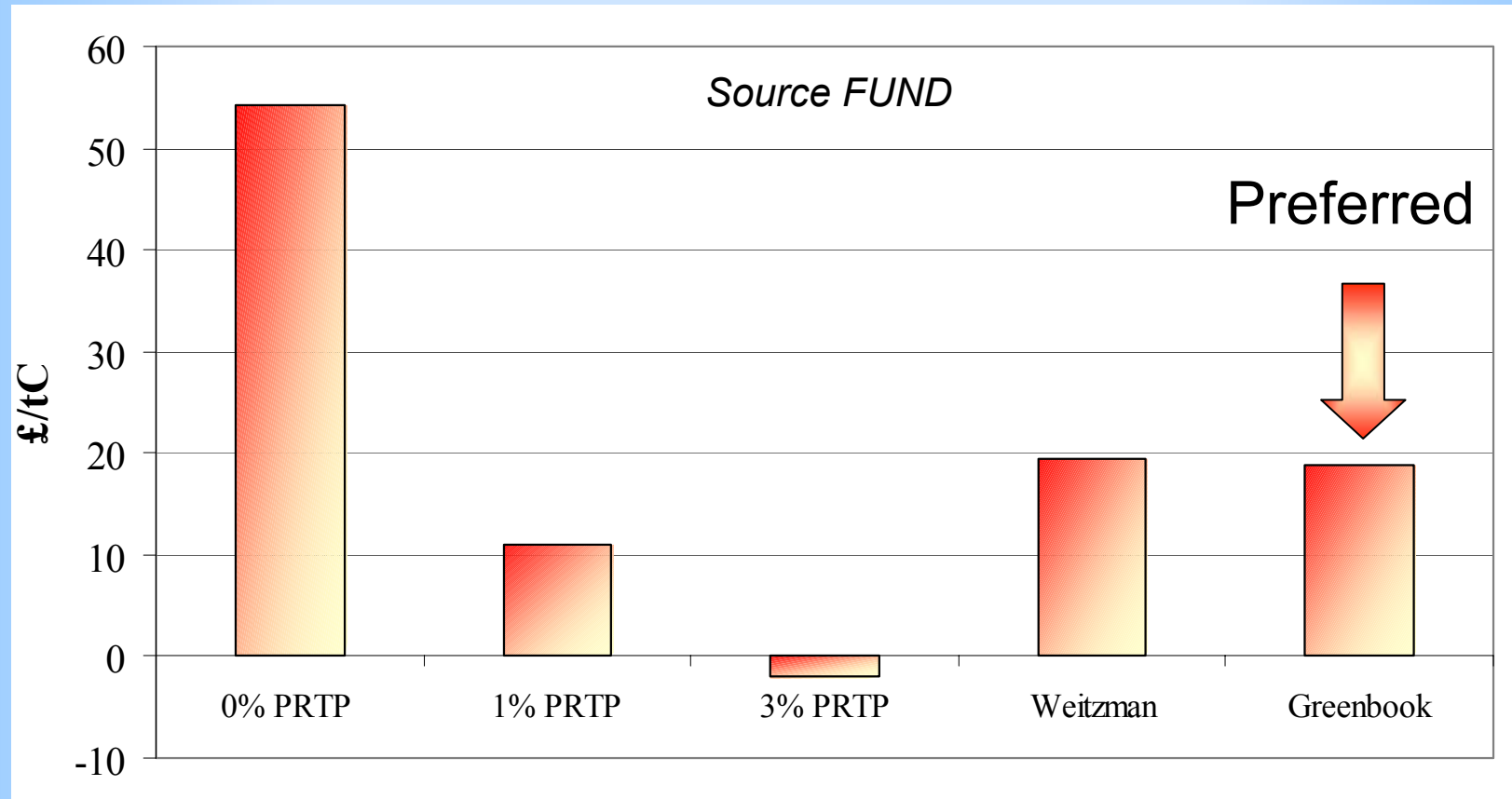
Consultation (1)

- 25 interviews carried out – leading experts - or senior/chief economist level across different government departments
- Asked which of 4 applications SCC should be applied to:
 - Very different views
 - Recognition (by all) need a shadow price for appraisal
 - though difference of opinion how derive shadow prices
 - Major concerns by many on application to long-term targets

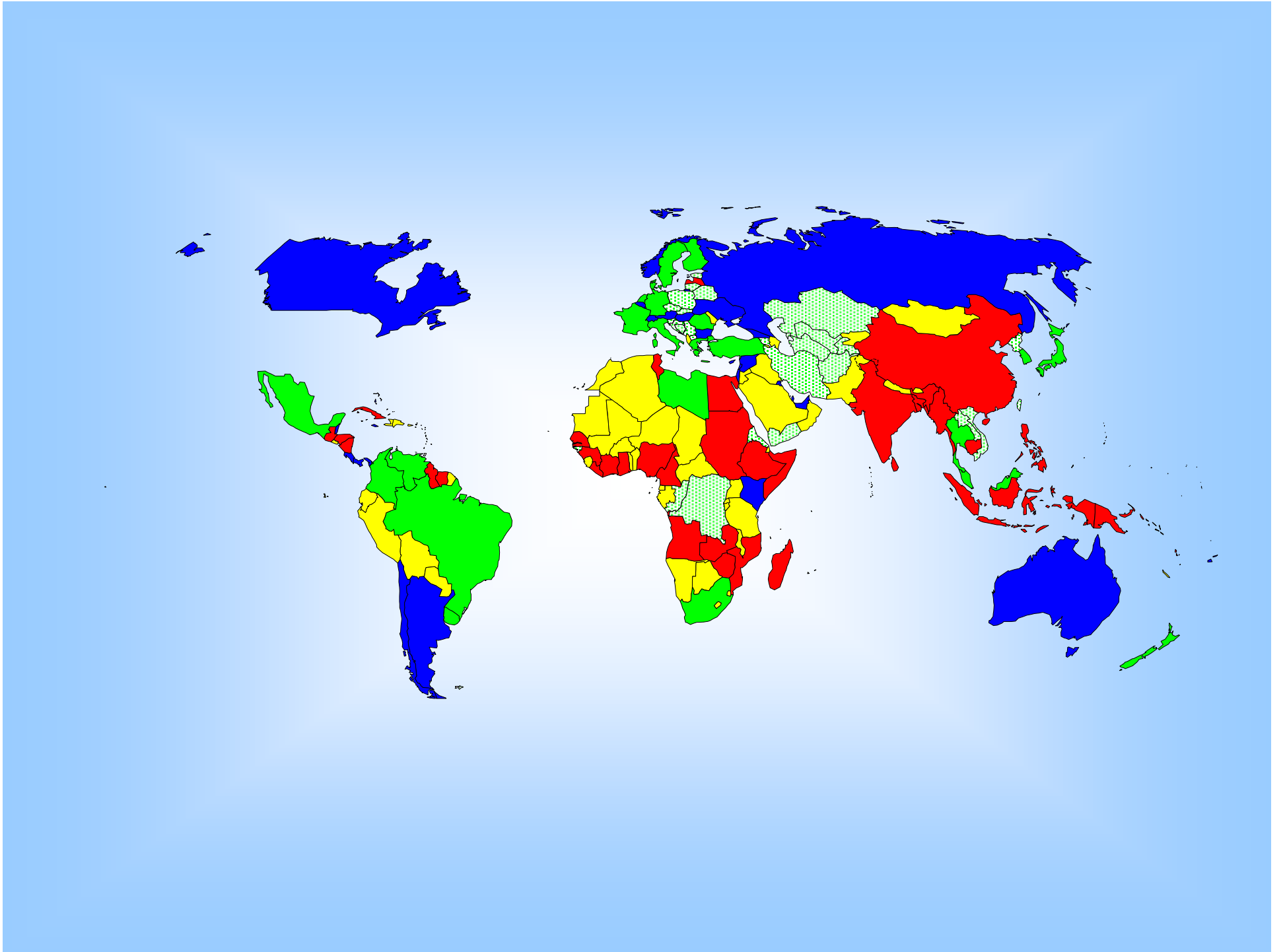
Consultation (2)

- Discussion of discount rate, equity weighting, risk aversion and uncertainty
 - Use declining discount rates (almost all) – Green book scheme
 - Use equity weighting (almost all) – issue of consistency with other policy - trade and aid
 - Use mean values (not median)
 - And conflict between theory (experts) and users (policy) on best approach for uncertainty – central values vs ranges, narrow range vs full uncertainty

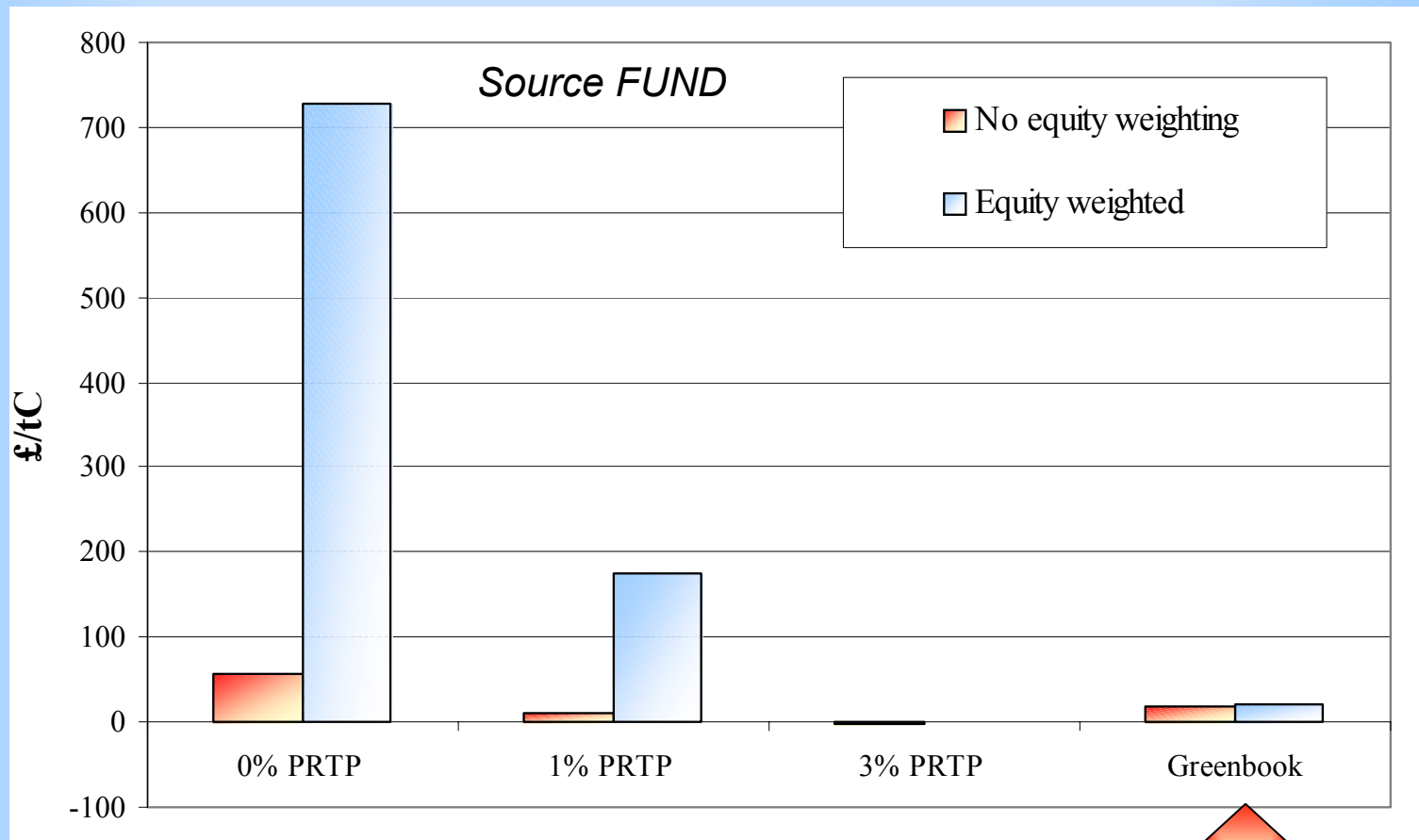
Discounting



Period of years	0-30	31-75	76-125	126-200	201-300	301+
Discount rate	3.5%	3.0%	2.5%	2.0%	1.5%	1.0%



The Effect of Equity Weighting

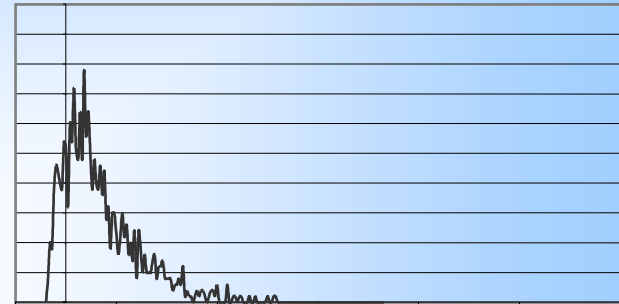


UK steering group / peer review decided probably should equity weight, but issue of consistency with other international policy

*Changes with scheme and if dynamic EQ

Statistical Data and Reporting

- Mean or median values?
- Uncertainty is strongly right-skewed
- Mean is higher than median
- PAGE quotes mean, FUND quotes median
- FUND median \$10, trimmed mean (1%) \$27/tC
- Policy steering group considered ‘mean’ most appropriate measure of central tendency – in line with principle of maximising expected utility and at least conveying some of the risk of nasty surprises



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Applying the Value – Modelling conclusions

- Our understanding.... is improving, but knowledge of the SCC is still low
- questions a central estimate of the social cost of carbon with confidence
- A lower benchmark of 35 £/tC might be acceptable for a global decision context
 - committed to reducing the threat of dangerous climate change and includes a modest level of aversion to extreme risks, relatively low discount rates and equity weighting
 - Note with different estimates will get different values
- An upper benchmark is more difficult, but the risk of higher values for the social cost of carbon is significant.

Policy Recommendations

Based on stakeholder interviews, and evidence, (starting at top and working down)

- Economic benefits of climate change policy should be considered when setting long-term targets and goals.
- Some benefits can be directly estimated as monetary values, but a wider framework is needed to take all relevant effects into account.
- Single monetary estimates of the SCC should be avoided for such policy decisions.
- The framework should include a disaggregated analysis of economic winners and losers by region and sector, and a disaggregated analysis of the impacts of climate change including key indicators such as health and ecosystems.
- The full risk matrix (including risk of major change) should be considered, and the analysis should include extensive uncertainty analysis.
- Green Book for discounting, but with sensitivity analysis. The uncertainty analysis should also consider equity. Should consider ancillary effects (but separate).
- This is an informed process leading to a long-term goal.

Policy Recommendations

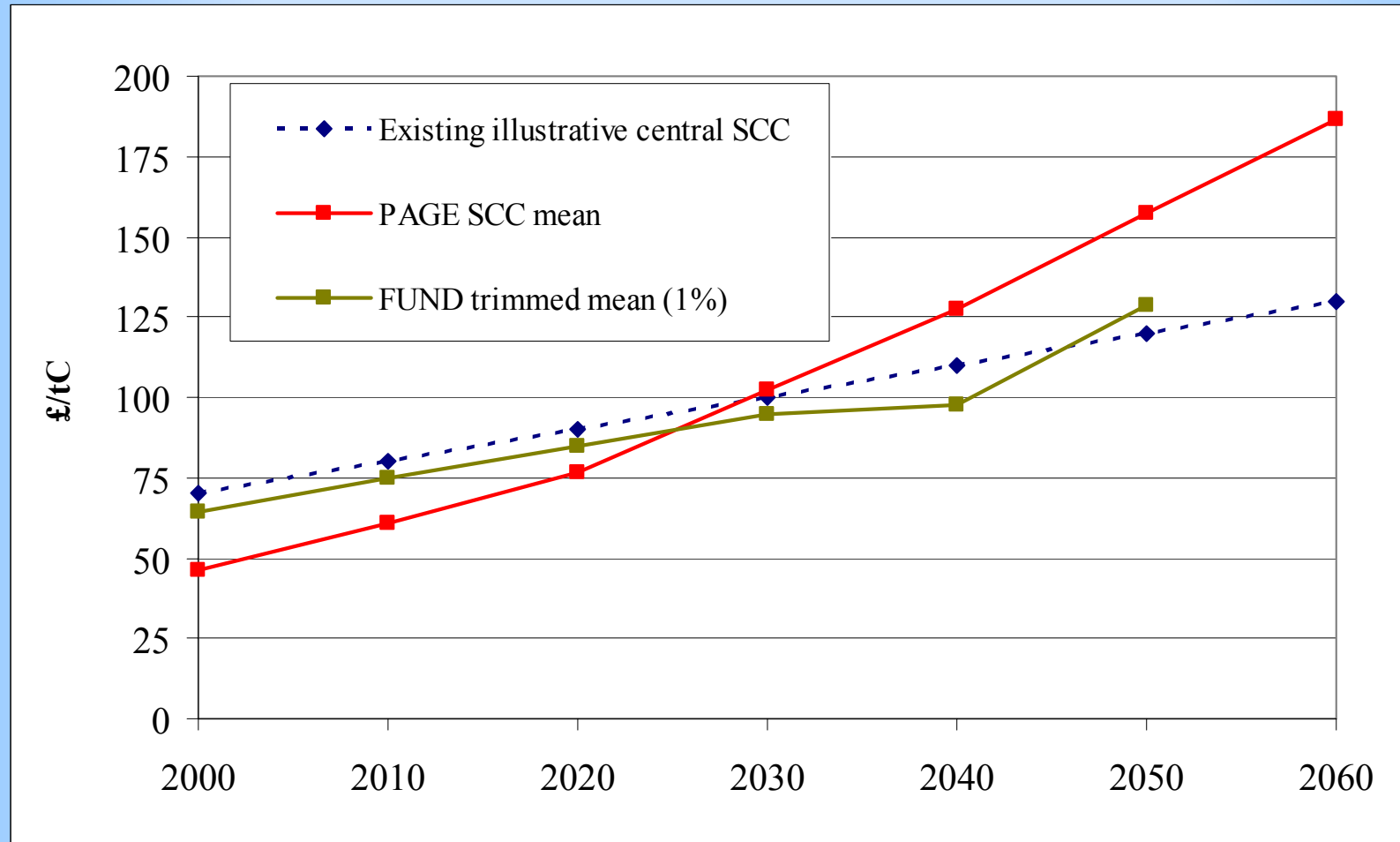
Working down from this

- Once set, detailed policies follow from, and should be consistent with long-term goal.
- The aim should be to ensure the long-term target is achieved in the most cost-effective way, and need for consistency in appraisal across policy areas to achieve this – use of carbon shadow price
- Tiered approach – long-term policy, policy appraisal & project appraisal
- Derived some illustrative numbers for second tier (appraisal)
- Note different approach relevant for adaptation (at country level)

Other Key Findings for Policy

- Considering SCC in a policy context raised wider issues
- Models work with 2000 emissions and marginal costs
 - Policy makers need values over time, in future decades
 - Re-ran PAGE and FUND models with marginal pulses in each decade over time
- Need specific values for different gases – GWP not enough b/c discounting
- Ideally want to change in costs for different stabilisation / reduction policies
 - Capture how the values change with long-term policy

How the SCC Increases over time



these SCC estimates still do not include consideration of the full risk matrix – they exclude socially contingent effects and major events, and (in particular in the case of FUND) only have a partial coverage of bounded risks and non-market impacts.

Latest Position

- Interim SCC numbers were used in climate change prog. appraisal/evaluation, though cost-effectiveness was main criterion
-
- STERN review announced – will build on this work
- Stern Review on the Economics of Climate Change, launched after G8, due to report to the Prime Minister and Chancellor in Autumn 2006

AndEuropean Union

Spring European Council meeting of 2004 (reconfirming 96 statement)

- *'global temperature increase should not exceed 2°C above pre-industrial levels'*

But also

- requested *'a cost benefit analysis which takes account both of environmental and competitiveness considerations*
- Recognised *'monetised avoided impact benefits (for CC), estimated globally, but with focus on European scale, enable fully informed policy making.'*

Research Recommendations

- Develop broader framework to inform long term decisions – including consideration of effects we cannot monetise
- Disaggregated effects of SCC value, by sector and region and impact
 - Include estimates of the physical impacts
- Consideration of the approach for (dynamic) equity weighing and discounting
- Analysis of SCC value in future years, under different scenarios, for different gases, for different policy projections
- Scope potential damages from rest of risk matrix with sensitivity
- Major focus on adaptation – moving from global SCC to sector/regional studies (with cost-benefit analysis) to investigate adaptation policy

Conclusions

- SCC has been used widely in UK policy – does make a difference
- Policy review - Can be used in climate policy
 - but only within wider framework – particularly capturing risk matrix – as gaps for impacts that are driving international policy (major events)
- Two tier approach – help inform on benefits, but then move to a cost-effectiveness analysis for (day to day) policy and project appraisal
- Study recommended mean value, green book DR, equity weighting
- Priority to improve the numbers
- Emerging use for local and regional studies (risk assessment and adaptation)