LOW-CARBON AND COST-BENEFIT ANALYSIS: A STUDY OF CENTRAL GOVERNMENT IN THE UK

SUMMARY REPORT

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10/02/2012

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INTRODUCTION

Cost-benefit analysis (CBA) is a decision-making model, originating in business, used across UK government to appraise proposed policies and projects. The costs and benefits of a project are attributed a monetary value. Where the costs and benefits occur in the future, they are discounted to a present value, to account for 'time preference'; the notion that society prefers to receive benefits now than in the future. The net of these costs and benefits is calculated to give a net present value (NPV) for the option. CBA compares a policy option to the 'do minimum' scenario in order to justify government intervention.

The global drive to reduce CO_2 emissions is increasing, with voluntary commitments from various countries following the Kyoto agreement, and talks in Durban now agreeing that targets will be legally binding for both developed and developing countries (December 2011) [1]. In order for these reductions to be met, policy and projects must be assessed in terms of their potential contribution to CO_2 emissions. There is therefore a requirement that low-carbon considerations, including energy security, are incorporated into the CBA framework, and the method by which this is achieved is brought into question.

LOW-CARBON AND COST-BENEFIT ANALYSIS

For CBA, businesses are presented with a free market which provides information on the amount that consumers are willing to pay for benefits however, in the case of policy there is no free market and estimates for benefits need to be obtained by other means which can be controversial. For example, valuing a human life based on the wage difference between two equally skilled jobs with different risks (e.g. the premium wage received by a miner) [2].

Although there are difficulties associated with CBA, it can be a valuable tool. Arguments for CBA include increased efficiency of spending, in terms of achieving the best results for the lowest cost, and increased objectivity and transparency; decision makers are forced to take an objective viewpoint and there is complete transparency about attributed costs and what has been included in the analysis.

The value placed on carbon emissions depends on the sector they are from. Sectors in the European Union Emissions Trading System (EU ETS), including electricity generation, energy-intensive industry and aviation after 2012, use 'traded sector' values from the EU ETS allowance prices which reflect abatement costs in these sectors. Emissions from the 'non-traded sector' are currently valued using marginal abatement costs (MAC), the cost of reducing emissions by one unit, which are consistent with government's targets on greenhouse gas emissions. The predicted values converge towards 2030, at which point they follow the same projected path, reflecting the prediction that by 2030 there will be a global carbon market.

There is now a large and growing literature on whether CBA can incorporate issues of environmental sustainability, something which is discussed further in the following sections.

EMERGING PRACTICES

This section gives an overview of practices across UK government, looking at HM Treasury, DECC (leads on CO_2 emissions mitigation), DEFRA (leads on climate change adaptation), and DfT. This research has been carried out through a combination of literature reviews, interviews and comprehensive document analysis through desk-based research.

HM Treasury's Green Book gives guidance on policy appraisal methods for all UK government departments, however each department has its own individual model and there is no standard approach to valuing the impact of climate change. A standard cost is attributed to emissions levels either through MAC or the EU ETS, however, additional considerations differ between different departments. Whilst DECC, DEFRA and DfT all use the standard discount rate (of 3.5%), consider distributional implications and use sensitivity analysis and scenarios to address risk and uncertainty as advised by the Green Book, there are also differences between their approaches. Impacts which are difficult to attribute a monetary value to are valued by different methods in different departments. DECC focuses on energy generation and associated CO_2 emissions and DEFRA on climate change impacts, with the DfT considering both. DEFRA uses Real Options Analysis and highlights the benefits of this in policy appraisals where climate change may have a large impact, however DfT do not use this method and there is no mention of it in DECC guidance. DfT use a benefit-cost ratio to compare different options, however DECC and DEFRA do not mention a similar approach. In addition, DECC notes the importance of considering energy security [3, page 16] in the valuation of a policy with significant impacts on energy production or consumption.

THE STRATEGIC SELECTIVITY OF CBA AND THE QUESTION OF VALUE

In the following section the potential flaws of current policy appraisal methods, and CBA in general, are discussed with particular reference to the inclusion or exclusion of key factors in decision-making and the impact that such factors can have.

The Green Book provides discount rates for converting costs and benefits into present values [4]. It has been suggested [2] that the counter-intuitive practice of devaluing the future is at odds with day-to-day activities of society. In particular, it is noted that daily activities are often performed with a view to achievement of a long-term goal, without that goal being discounted to a present value. Discounting is used based on the argument that society prefers benefits now and costs to be delayed, which is fair when considering the lifespan of an individual. However, when the impact is either on this generation or future ones the argument becomes rather less persuasive. One consideration that cannot be argued with is the possibility that humans will become extinct and therefore investment for the future is of no use. Some have argued (John Roemer in [5]) that ethically, this should be the only consideration in the calculation of a discount rate.

In 2002, Richard Tol addressed the question of whether uncertainties surrounding climate change are too large for CBA [6]. He points to the risk of climate change causing a poverty trap where damage from climate change requires investment, with investment and savings used to restore and prevent further damage, resulting in low economic growth and a fragile economy that is then at greater risk of damage due to future climate change. He concludes that CBA is only appropriate if catastrophic scenarios have sufficiently low probabilities and that ultimately, uncertainty about climate change *is* too large to apply CBA.

It has been noted [2] that the two features of CBA that differentiate it from other methods of appraisal for environmental policy are the monetisation of life, health and the natural environment and the discounting of these factors where they are expected to occur in the future. It is argued that for this reason, intrinsically and practically, CBA is not a good tool for making environmental decisions. In addition to this, the time and resource-intensive nature of valuing benefits is identified as a reason not to include CBA as a method of providing additional information for a decision, where it is not the tool for decision-making.

In CBA an option is appraised relative to the base state of the world in which that option would exist. The problem this poses for low-carbon is that a future low-carbon infrastructure is yet to be defined. There are also considerable uncertainties about carbon regulation and technological and lifestyle changes, as well as the impacts of climate change in the future. Consequently, decisions are being appraised above a base case that is in flux. Policy options are disaggregated and assessed as though they are a stand-alone project, with the overall cost being aggregated in the end, therefore making any single proposal in a low-carbon future difficult to justify. CBA is designed to

deal with marginal decisions over a base case; therefore the non-marginal infrastructure must be decided prior to CBA being performed on the marginal decisions within that infrastructure. If the infrastructure is not achieved in reality, then the CBA is compromised as the decision becomes non-marginal.

CONCLUSIONS

CBA can be an effective method of appraisal for policy and project decisions; however it is not necessarily an appropriate method for low-carbon policy. Where it could be appropriate, consistency across government departments in their models used, factors considered and valuation of those factors is required. This has not been found to be the case, however, methods are still in the development stage where low-carbon is concerned and therefore improvements may follow.

The main concerns surrounding the use of CBA are:

- Measurement of benefits in terms of the time and resource-intensive nature of valuation as well as the methods of valuation used
- Valuation of carbon emissions due to the high level of uncertainties involved
- The failure to define a 'marginal' policy
- The high level of uncertainty in the impacts of climate change and the probability of catastrophic scenarios
- Whether it is appropriate to attribute monetary values to factors such as human life, health and the environment and the method by which values are attached
- Whether equity is fully accounted for
- Whether energy security is fully accounted for
- The disaggregation of future options combined with aggregated cost calculations
- The discounting of future costs and benefits

Ultimately, the high level of uncertainty in the future impacts of climate change, combined with controversial methods of valuation and discounting, make the argument for CBA in low-carbon policy difficult to justify. Furthermore, the requirement for change is becoming increasingly urgent, with large-scale decisions and low-carbon infrastructure a requirement for the future in order to meet targets and achieve security of energy supply. A policy appraisal method such as CBA, which is rooted in certainty, combined with discounting of future factors, will undervalue policy decisions that contribute to this requirement, favouring incremental policy moves over bold, large scale decisions for a low-carbon future. One question this raises for further research is whether new appraisal methodologies are required, including the possibility that CBA be further supplemented by other approaches. This research certainly found evidence that CBA currently co-exists with a range of other appraisal techniques, including policy impact assessment.

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[1] Jacobs. N (Dec 2011); "Hope at last at the Durban conference on climate change"; guardian.co.uk ; available from http://www.guardian.co.uk/commentisfree/2011/dec/11/durban-conference-climate-change [accessed 19th Dec 2011]

[2] Heinzerling. L, Ackerman. F (2002); "Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection"; Georgetown Environmental Law and Policy Institute, Georgetown University Law Centre; available from http://ase.tufts.edu/gdae/publications/c-b%20pamphlet%20final.pdf [accessed 25th Jan 2012]; Georgetown University

[3] HM Treasury, Department of Energy and Climate Change (Oct 2011); "Valuation of energy use and greenhouse gas emissions for appraisal and evaluation"; available from http://www.decc.gov.uk/assets/decc/statistics/analysis_group/122-valuationenergyuseggemissions.pdf [accessed 21st Dec 2011]

[4] HM Treasury (2003, updated July 2011); "The Green Book Appraisal and Evaluation in Central Government"; available from http://www.hm-treasury.gov.uk/d/green_book_complete.pdf [accessed 16th Dec 2011]

[5] Roemer. J.E (Dec 2008); "The ethics of distribution in a warming planet"; in Cowles Foundation Discussion Papers 1693, Cowles Foundation for Research in Economics, Yale University; available from http://pantheon.yale.edu/~jer39/Ethics.warmingPlanet%20copy.pdf [accessed 26th Jan 2012]

[6] Tol. R.S.J (2003); "Is the Uncertainty About Climate Change Too Large for Expected Cost-Benefit Analysis?"; in Climatic Change 2003, volume 56, pages 265 - 289; available from http://www.fnu.zmaw.de/fileadmin/fnu-files/models-data/fund/ccuncertain.pdf [accessed 15th Dec 2011]