

Turner, R. Kerry

Working Paper

Limits to CBA in UK and European environmental policy: Retrospects & future prospects

CSERGE Working Paper EDM, No. 06-17

Provided in Cooperation with:

The Centre for Social and Economic Research on the Global Environment (CSERGE), University of East Anglia

Suggested Citation: Turner, R. Kerry (2006) : Limits to CBA in UK and European environmental policy: Retrospects & future prospects, CSERGE Working Paper EDM, No. 06-17, University of East Anglia, The Centre for Social and Economic Research on the Global Environment (CSERGE), Norwich

This Version is available at:

<https://hdl.handle.net/10419/80253>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

**LIMITS TO CBA IN UK AND
EUROPEAN ENVIRONMENTAL POLICY:
RETROSPECTS & FUTURE PROSPECTS**

by

R.K. Turner

CSERGE Working Paper EDM 06-17

**Limits to CBA in UK and European Environmental Policy:
Retrospects & Future Prospects**

by

R.K. Turner

**Centre for Social and Economic Research on the Global Environment (CSERGE),
School of Environmental Sciences, University of East Anglia,
Norwich, NR4 7TJ, United Kingdom**

Author contact details:

Kerry Turner

Tel: ++44 (0) 1603 592551

Fax: ++44 (0) 1603 593739

Email: r.k.turner@uea.ac.uk

Acknowledgements

The support of the Economic and Social Research Council (ESRC) is gratefully acknowledged. This work was part of the interdisciplinary research programme of the ESRC Research Centre for Social and Economic Research on the Global Environment (CSERGE).

ISSN 0967-8875

Abstract

This paper reviews the contemporary debate and the now long standing role of CBA in UK and European environmental policy appraisal and looks forward to possible future applications. The position taken is that despite its limitations CBA still has an important part to play in environmental policy appraisal. However, with the increasingly 'contested' nature of environmental and related public policies and outcomes, its role will become less prescriptive and its findings more constrained by social justice and ethical imperatives. Future CBA is more likely to continue to flourish as a component in a wider policy analysis and decision support system. Whatever decision support system is eventually adopted, its value will be judged on how well it aids real policymakers operating iteratively in the non-linear real world political economy.

Keywords: cost-benefit analysis, environmental policy, valuation

1. INTRODUCTION: A BRIEF HISTORY OF CBA DEPLOYMENT

Following its formal introduction into public water project planning in the USA in the 1930s and somewhat later in the UK and Europe, cost benefit analysis (CBA) was subsequently applied to an ever wider spectrum of projects, policies, programmes and courses of action (Hanley & Spash, 1994; Pearce 1998; Hanley 2000). But as CBA applications became more extensive so did criticism of their reliability and validity. Together with the rise of environmentalism, the late 1970s and early 1980s marked a particular phase of CBA debate and controversy with a list of single concepts and wider issues attracting particular attention: discounting, measures of economic and social welfare, distribution and equity, use and non-use values in nature etc (Tribe et al, 1976; Ackerman et al 1974; Self 1975; Pearce, 1979; Pearce & Nash, 1981). Looking back today (2006) at this dialogue it seems that a set of fundamental questions remain almost as controversially unresolved as they were then. This paper reviews the contemporary debate and the role of CBA in environmental policy appraisal and looks forward to possible future applications. It will be argued that despite its limitations CBA still has an important part to play in environmental policy assessment, but that given the increasingly 'contested' nature of environmental and related public policies its prescriptive importance will decline as moral/ethical constraints, among others, become more politically binding. Future CBA will be a component in a wider policy analysis and decision support system in which a range of separate but comparative analyses are displayed and presented to policy makers. This multi-criteria assessment (MCA) is best deployed in a disaggregated form in order to avoid a lack of transparency and hidden assumptions which are ever present dangers in MCA's which adopt scaling and weighting procedures which culminate in aggregate index number scores. Whatever decision support system is eventually adopted, its value will be judged on how well it aids real policymakers operating iteratively in the non-linear real world political economy. The contemporary debate over CBA fundamentals, sustainability constraints and ecosystem goods and services valuation will be reviewed in later sections of this paper, but first it is useful to look a little more closely at the earlier debate because it can be viewed as initiating an ongoing discussion over the two basic roles that CBA can play in the policy process.

Simplifying matters, CBA can be utilised as a method for identifying a "decision rule" for choosing a preferred alternative, or as a component of a comprehensive policy analysis with an heuristic purpose. In the former role, economic CBA has been directly deployed in order to indicate which option is welfare maximising according to an individualistic social welfare function and hence prescribing that option choice.¹ The options assessed must have well defined outputs that are quantifiable and reducible to a single money metric, as costs or benefits. It is also possible to perceive of CBA in terms of an 'indirect deployment', with the analysis reflecting rational choice theory outcomes and offering a 'sounding board' against which other forms of appraisal and outcomes can be compared. CBA is based on a utilitarian (economic efficiency) social welfare function approach but as there are no meta ethical rules for selecting social welfare functions then a 'sounding board' comparative evaluation against alternative social welfare functions might be beneficial. The choice will then turn on criteria such as 'ethical reasonableness' and 'consensus achievement' potential etc.

In the latter heuristic role, the art of policy analysis is a "set of procedures for inventing, exploring and comparing the alternatives available for achieving certain social ends - and for inventing, exploring and comparing the alternative ends themselves - in a world limited in knowledge, in resources and in rationality" (Rowan, 1976 p137). So the late 1970s/early 1980s exchanges of views set up the foundations for the continuing debate in academic and policy making circles about the realities of environmental policy formation and implementation and the most appropriate enabling decision support system and methods and techniques. Is environmental policy better enabled via CBA which requires the aggregation of individual choices made independently in a market context; or via a multi-criteria assessment (MCA) process (which could include or not a form of economic CBA as

one component) that is adapted to real political economy in which plural and contested interests and values have somehow to be reconciled and consensus achieved? Or, can a hybrid policy appraisal method encompassing elements of CBA and MCA as separate but complementary assessment arrays do the best job? Or, is the technical – rational model of appraisal so unreliable that politicians should find alternative ways of legitimising policy decisions through citizens juries and other inclusionary procedures (Owens et al, 2004).

Formal CBA techniques have been required to support environmental regulation in the USA since the early 1970s. Within its federal politico-economic arrangements, environmental assessment and CBA were formalised into the legislative process beginning with the National Environmental Policy Act of 1969 and subsequent actions such as, among others, Presidential Executive Order 12291 (1981) and the Oil Pollution Act (1989) (Froehlich et al 1991; Arrow et al 1998). Environmental, health and safety legislation assessments and the public trust doctrine now have established status in the USA political economy. It has also been the case that CBA techniques have been refined as they became increasingly used in appraising projects in developing countries where economic and social conditions seemed to require extensive shadow pricing and equity weighting. (Little and Mirrlees, 1968; Marglin, Sen and Dasgupta, 1972; Squire and Van der Tak, 1975).

In the UK, together with Western Europe, environmental policy assessment through CBA was slower to develop and more piecemeal in its application (Pearce 1998; Hanley 2001). The centralised sectoral and ministerial political system in the UK probably accounts for some of the different characteristics of the project and policy appraisal approach, together with the degree to which ‘contested’ issues within the wider society became more overt; or ethical value judgement became more apparent eg. as in Health Policy. Individual government ministries/departments such as those concerned with transport policy and flooding and coastal protection and defence policy have a long track record in project-based CBA going back to the 1960s/70s. The then Ministry of Agriculture Fisheries and Food (MAFF) which also had responsibility for aspects of flooding and sea defence policy rank ordered projects using a CBA methodology which was continually updated and made more extensive in its impacts converge over time. Guidance evolved from depth-damage property calculations to human health and environmental “intangibles” valuation (Penning-Rowsell & Chatterton, 1997; Parker et al 1987; Penning-Rowsell et al 1992; Penning-Rowsell et al 2005) The first crude application, in 1986, of a prototype environmental contingent valuation study within a public sector project (a sea defence project), for example, was funded within this context (Turner, Bateman & Brooke, 1992). Critics of land drainage and flood protection appraisals conducted during the 1970s and 80s correctly highlighted the importance of the political and institutional framework and warned that this could easily lead to ‘regulatory or institutional capture’ of CBA (Bowers, 1988). The department for transport has taken the appraisal process from projects to policy furthest in terms of a formal multi-criteria procedure as transport issues have become increasingly politically sensitive (DFT, 2004).

Other areas of government have been more resistant to the advances of CBA and related techniques and it was not until 1990 following the publication of the Pearce Report (Pearce et al 1989) and a Government white paper ‘This Common Inheritance’ (HMSO, 1990) that implementation became in principle more extensive. But a key point to note was that following 1990 and official 1991 guidelines (DOE, 1991) both project appraisal via CBA and wider policy appraisal were twin-tracked. This juxtaposition of approaches has been a continuing source of confusion and debate within government circles, confusion which the plurality of relevant academic argumentation has only served to magnify. The European Commission up until the early 1990s did not appear to use CBA or related methods in its formulation of new directives (eg Bathing Water Directive, 1976; Packaging & Packaging Waste Directive, 1994 & the Drinking Water Directive, 1978). More recently a more explicit recognition of the costs and benefits involved in a policy change is evident within EU policy development (Pearce, 1998). However, the difficulties currently being posed in the UK and

elsewhere as governments seek to operationalise the new EU Water Framework Directive, mirror the long run underlying confusion over project and policy appraisal rationales and methodologies. While the Directive mandates the achievement of 'good ecological status' in Europe's water bodies by a set target date it is less clear on what level of implementation cost is acceptable or practicable. So-called 'disproportionate costs' need not be incurred but little guidance is provided on how 'disproportionality' is to be reliably and uniformly calculated across Member countries. DEFRA is currently (2006) formulating a decision support framework and process to assess water quality improvement and other measures. The resulting appraisal system will mirror the disaggregated MCA adopted by the Department for Transport.

Back in the 1970s, two key features of good policy analysis were identified:

- The exploration, reformulation and invention of objectives – recognising the multiplicity of the objectives that are held and the hierarchies of objectives that may exist as well as the fact that what is immediately observed is an intermediate objective; and
- The sensitive use of criteria of choice with due caution, giving weight to qualitative as well as quantitative factions (Rowan, 1976)

These core features are intimately connected to the ways in which preferences for options or policies are formed and to the role of performance indicators in the prevailing institutional structures. In the late 1980s, the Brundtland Commission put forward environmental policy integration (EPI) as a means of promoting sustainable development (WCED, 1987) EPI would place the environment at the heart of policy making in all other sectors such as transport, energy, overseas aid, or agricultural policy etc. The UK government has, 1990-2004, sought to use ex ante environmental policy appraisal (EPA) as a means of institutionalising EPI in policy making. Ex ante appraisal is also at the core of the UK's Regulatory Impact Assessment (RIA) (1997) and the EU's Impact Assessment (IA) regime (2003). RIA replaced EPA in the UK in 2004 but analysts seem sure that these various initiatives were not very well implemented and were not as extensively implemented as they should have been (Russel & Jordan, 2006) A number of EPA's appeared to be little more than after-the-event justifications that 'green proofed' pre-determined policies. Meanwhile project-based CBA continues to be applied piecemeal in different areas of government and in principle following HM Treasury guidance (HMT, 2003).²

A number of reasons appear to explain the lack of take-up within the policy process of formal appraisal methods and techniques. Pearce (1998) claims that in general civil servants are unwilling or unable to quantify environmental costs and benefits despite official guidance weighted in favour of such quantification. Russel & Jordan (2006) confirm that UK civil servants in some Ministries continue to exhibit such traits along with a low awareness and lack of expertise, a lack of high-level leadership and a lack of resources, especially if EPA was not deemed to be core departmental work (see also Hanley, 2001; Helm, 1998). Particular problems seem to be associated with the way in which the EU impacts on UK environmental policy making. According to Jordan (2002) around 80% of UK environmental legislation originates with the EU but only 26% of EPAs published between 1997-2004 concerned EU proposals (Russel & Jordan, 2006). Pearce argued that until the 2004 introduction of the Impact Assessment regime, the European Commission did not routinely appraise its proposals and the UK government then had to assess policy it had already agreed to and which it would be embarrassing to subsequently discover did not pass a cost-benefit test (Pearce, 2004).

So given this at best 'patchy' take up of CBA by policy makers and the debate about its efficacy in academic and policy circles, is CBA 'fit for purpose'? We examine some relevant argumentation in the next section.

2. IS CBA 'FIT FOR PURPOSE'?

If society is simply the sum of isolated individuals, their wants/needs are, if not infinite, many and diverse, and if resources are scarce (relative or absolute) then CBA and its economic efficiency based social welfare function is relevant to and useful for public policy choice making. Further, given that all policy choices are made by humans some conception of "preferences" and their human motivation lie behind any environmental policy. But many would contend that collective society is more than the aggregation of individuals and that other social welfare functions have validity. They would also dispute the economic (new welfare economics) explanation of how preferences are determined and would not agree that self-interestness is the only 'rational' motivation, rather than 'other regarding' preferences towards humans and entities in nature. Randall, (2002) has argued that CBA should be accorded "substantial influence" within a domain where preference satisfaction carries a good deal of weight, but also that the domain is bounded by rights-based arguments and possible moral imperatives.

These differing theoretical and applied viewpoints do not, however, necessarily mean that all forms of technical-rational models of resource allocation appraisal should be abandoned. The observations of analysts like Rowan (1976) and Brooks (1976) in the late 1970s, that those responsible for policy choices often do not have a clear concept of what needs to be done, are not in possession of the relevant facts, do not know the alternatives available and do not know the consequences of choosing particular courses of action, have been repeated over 20 years or more later by Pearce (1998), Hanley (2001), Helm (1998) and Russel & Jordan (2006). While there is a very strong case for arguing that technical analysts need to develop a far better understanding of the pressures on and motivations of actual decision makers; and that we currently lack an adequate theory of environmental policy, it is equally true that policy practitioners need to acquire a far better understanding of technical appraisal methods. Environmental problems are often too complex to be solved/mitigated by technical analysis alone, but taking decisions without any formal decision support system would not seem sensible either. In the next section we examine the key areas of contention in the CBA and policy analysis debate.

3. CONTESTED ELEMENTS IN THE PUBLIC PROJECT/POLICY APPRAISAL PROCESS

3.1 Theoretical welfare economics foundations of CBA

A large body of theoretical work since the 1950s has shown that the concept of a Potential Pareto Improvement (PPI) determined by the Kaldor-Hicks compensation test, is not an entirely reliable basis for evaluating environmental policies (e.g. Scitovsky, 1941; Sen, 1970; Boadway, 1974; Bromley, 1990; Chipman & Moore, 1978). The Kaldor-Hicks approach states that a policy is to be judged socially beneficial if the gainers secure enough benefits to as to be able to compensate any losers and still have some net gain left over. Such a policy is justified (on efficiency grounds) even if no actual compensation is paid. But a number of theoretical difficulties (the Scitovsky, Boadway paradoxes etc) ensure that PPIs cannot be consistently identified by comparing individual welfare changes (Pearce & Nash, 1981).³ Gowdy (2004) concludes that there is no theoretically justifiable way to make welfare judgements without interpersonal comparisons of utility and this is forbidden by the assumptions of neoclassical welfare economics. If compensation is not actually paid it is

necessary to know if the gainers really could compensate the losers i.e. the relative size of the gains and losses must be known, which means comparing utilities across different individuals. A way out is to argue that compensation should be actual but this introduces distributional issues which the Kaldor-Hicks approach seeks to avoid. We deal further with 'environmental compensation' in a later section covering sustainability constraints on CBA. But next we look at distribution and equity concerns directly.

3.2 Distributional concern

If CBA (broadly interpreted) is to continue to play a role in the policy process then the neglect of distributional or equity concerns needs to be rectified. A two stage approach needs to be adopted in which the spread of costs and benefits across different affected individuals and groups in society needs to be accounted for and then weighting could be applied. Project appraisals funded by development agencies have often included distributionally weighted costs and benefits calculations but this practice has not been commonplace in other public sector applications in the donor countries themselves. As a minimum, the way in which the CBA 'accounts' are set out and formatted needs to be changed in order to incorporate and highlight financial transfers and the distributional impact of the costs and benefits across stakeholders. (Krutilla, 2005) has set out a tableau format which disaggregates the benefits and costs of a project or policy among stakeholders and encompasses and records all inter-stakeholder financial transfers. It also serves to highlight key issues such as the level of aggregation adopted and the project/policy accounting boundary. Both the Department of Transport appraisal system and the likely future DEFRA Coastal and Flood management and Water Framework assessment procedures will include such transfers information.

Adoption of a distributional accounts format may be sufficient as a heuristic aid to policy formulation and implementation but more quantification might deliver further insights. Kristrom (2005) has suggested a "hierarchy of options approach" in which explicit distributional weighting is applied to the array of costs and benefits e.g. based on a rule that requires higher weights on all costs and benefits occurring to socially disadvantaged or below average income groups. Project/policy weighted net benefits can be re-calculated in order to test for "tipping points" (implicit distributional weighting) between project rejection or go-ahead. Alternatively, explicit distribution weights can be introduced to reflect the degree of inequality aversion present in society, by examining past public policy decisions, or the prevailing marginal rates of income tax. Stated preference methods, such as choice modelling, designed to elicit preferences for environmental goods/services might be used to evaluate trade-offs between efficiency and equity as well as implicit equity weights (Atkinson et al, 2000). Critics of this type of revisionism would stress that finding a consensus basis for equity weight formulation and quantification has so far proved elusive.

Environmental change impacts such as climate change and biodiversity loss often carry with them long term consequences and so policy responses need to be flexible and adapted to long time horizons and future 'surprises'. The standard CBA practice of positive, fixed and short term (<25 years) discounting does not sit easily with these contexts but is critical in determining whether a project/policy passes a CBA test (Olson & Bailey, 1981; Broome, 1992; Lind, 1982). What is indisputable is that discounting at a constant positive social rate of discount is problematic (increasingly so the higher the rate) over a time horizon of 100 years or more. The effect is to make even large costs/benefits incurred in the distant future seem inconsequential and this intuitively feels wrong (Weitzman, 1998). Groom et al (2005) comment that contemporary decisions taken on the basis of standard CBA appear to tyrannise future generations and in some cases impose future risk because future costs carry no weight (due to positive discounting) e.g. nuclear decommissioning, or when current inaction inhibited by cost considerations, neglects low weighted future benefits e.g. climate change.

While zero discounting may be a threat to the least well-off in today's society, and a single invariant low rate of discount could allow a greater volume of projects to pass the CBA test and therefore strain resource capacities, some modification to the standard procedure is overdue. There is now a growing consensus on the adoption of a time declining discount rate (DDR) procedure over at least a 100 year time horizon. Official guidance on UK public sector project/policy appraisal now advocates such an approach (HMT, 2003) and it also perhaps fits more easily with the strategic policy goal of more sustainable management of natural capital.

A range of reasons have been put forward in support of DDR. For Weitzman (1989) uncertainty about future interest rates and for Gollier (2002) uncertainty about the macro-economic state of the economy point towards DDR. Some empirical evidence exists for 'hyperbolic discounting' that shows that individuals value the medium and distant futures on an equivalent basis i.e. the discount rate falls the longer the time horizon (Fredrick et al, 2002). Part of the explanation put forward is that individuals live in relative and not absolute time and therefore revise and re-evaluate plans continually as time passes; or as time passes individuals pass through different stages of life and change as people (Henderson & Bateman, 1995; Heal, 1998). Nevertheless, should social discounting as practised by government mimic the 'time inconsistency' behaviour of individuals exhibiting hyperbolic discounting? While policy inconsistency at a given period of time is an institutional failure that should be corrected, policy switching over longer periods of time are surely inevitable and 'correct' if uncertainties and surprises are unavoidable.

For some the case for DDR is, however, still not proven beyond doubt (Groom et al, 2005). But given the underlying message in this paper, that whatever decision support system is eventually adopted it must be suitable for utilisation by real policymakers operating iteratively in the non-linear real world political economy, then DDR has more advantages than limitations. Along similar lines, critics of CBA have questioned the way in which standard CBA values the losses and gains connected to projects/policies. Knetch (2005) claims that individuals discount future losses at a lower rate than the value of future gains and that therefore rates reflecting observed individual preferences would give more weight to future environmental losses, justify greater current sacrifices to deal with them and support policies that reduce the risk of future losses. We return to the issue of valuing 'large' environmental losses and compensation in the next section. The rational consumer choice model of human behaviour, typically assumed in CBA, is at odds with actual human behaviour as witnessed by behavioural and experimental economists and other social scientists (Gowdy, 2004).

3.3 Valuing environmental gains and losses via individual and/or collective preferences

Over the years work done by behavioural and experimental scientist have shown that individuals' preferences do not always conform with the standard assumptions of CBA theory. The theory assumes that each individual has consistent preferences over all combinations of private and public goods, that these preferences are reasonably stable across time and that they are independent of the contexts in which, and the mechanisms through which, they are revealed. Analysts working with so-called stated preferences techniques (contingent valuation surveys and choice experiments) in environmental and other contexts have found responses that contravene these assumptions (so-called "anomalies"). Psychologists have found explanations for these behavioural responses which to the standard economist seem 'non-rational'. Other critics of standard economics argue that it is the new welfare economic theory itself which is problematic because it denies the existence of 'endogenous preferences' i.e. preferences that change depending on personal experiences, social contacts and context, historical/cultural background, and the type of decision making process.

So there is now an on-going debate about how robust and/or extensive such behaviour and underlying psychology is, whether behaviour in real markets is or is not influenced in similar ways and whether some “anomalies” are merely the result of poor survey instrument design/application (Sugden, 2005a). Intertwined with this technical debate is a dispute over more ethical matters concerning the ‘proper’ extent of markets (‘commodification’) and related behaviour into environmental domains. In addition, whether ‘isolated’ individual preferences are the correct ethical basis for guiding social decision rules, rather than collectively influenced “citizen” preferences or more paternalistic collective preferences imposed by the ‘executive’ to meet the ‘needs’ of a civilised society. This last position is more than a mechanism to provide the ‘basics’ of livelihoods and can encompass ideas such as JS Mill’s “higher values” criterion. Thus, in reaching environmental decisions one should consider the degree to which the decisions reached, and the process of reaching them, strengthen adherence to “higher values” (consciousness expanding) relative to lower values (Rowan, 1976).

To navigate a route through this complex and diverse set of arguments about human preferences and motivations specifically in relation to environmental policy a few simplifying assumptions will be introduced. In the first instance, we will assume that there is a legitimate and meaningful role for market transactions and related human behaviour in the environmental domain and that therefore CBA is not ruled absolutely out of scope (Aldred, 2002). For a critique of this assumption, see O’Neil (1997). Second, we assume that a typology of environmental values based on ‘use’ and ‘non-use/existence’ value concepts, more or less captures human-related instrumental and intrinsic environmental values (Turner, 1999); and that comparability and monetary incommensurability problems are not totally intractable (Aldred, 2002), at least as far as ‘use’ and some ‘non-use’ values are concerned. Thirdly, that since public (environmental) goods often do not have market price tags and society requires that their provision should be decided by collective decisions, it is legitimate to take into account individual preferences, values or attitudes and guard against the dominance of special interest groups and/or special pleading (Sugden, 2005a) The aggregation of individual preferences represents the collective choice outcome and the individual preferences themselves are given and context independent.

Given these assumptions a pragmatic way forward is to accept that behavioural anomalies (i.e. preferences that fail to satisfy standard economic coherence conditions) exist but that their prevalence can be reduced to such an extent that stated preference studies/data and CBA more generally can play a useful role in the project/policy appraisal process. Other economic valuation methods such as revealed preference methods (travel costs, hedonic pricing) are also still available and relevant for ‘pricing’ a wide range of environmental goods/services. So comparisons of value findings derived from similar methods across different environmental goods/services and rough ‘ball park’ comparisons across method outcomes can provide some meaningful indication of economic value (short of absolute money values).

3.4 Anomalies, scope and coping strategies

Some experimental economists have been testing the proposition that anomalies can be reduced. They operate on the premise that individuals have “underlying” preferences which are economically rational and that such preferences can be illuminated either by better survey/choice experiment designs, or via suitable environments e.g. repeated markets (Hanley & Shogren, 2005; List, 2005). According to List (2005) three types of mechanisms might lead to the diminution of anomalies. They are “institutional learning” i.e. a market discipline hypothesis which promotes individual behaviour which is responsive to costly errors; “value learning” i.e. consumption experience might change or refine and individuals’ perception of their own preferences; and the assimilation of simple rules to aid choice making. This sort of experimentation could be used to develop value elicitation methods

which give repeated market-type feedback (Hanley & Shogren, 2005).⁴ Or it may be possible to discern some patterns of deviation between stated and underlying preferences for private goods, which could then be extrapolated to cover public environmental goods. Critics will be quick to point out, however, that since public environmental goods typically do not have private individual and tradable rights associated with them, repeated market-type data is of dubious relevance. Nevertheless, there are environmental markets (e.g. water pollution rights, carbon permits) now in existence in which economic agents are engaged in transactions.

Other analysts see the anomalies evidence as support for alternative (to the economic rational choice, expected utility theory) held preference theories. Stated preference studies using contingent valuation survey techniques have revealed the existence of “protest bids”, i.e. extreme bids of zero or infinity, as some respondents refuse to make trade-offs between an environmental goods/service and money (Stevens et al, 1991; Spash & Hanley, 1995; Rekola, 2003). These findings have been taken to indicate that in certain contexts individuals exhibit lexicographic preferences. Tversky & Kahneman (1991) have provided another theory called the ‘reference-dependent’ preference or ‘endowment’ effect approach. This does seem to provide a plausible explanation for another anomaly i.e. the willingness to accept (WTA) versus willing to pay (WTP) disparity. Using this approach in CBA, Knetch (2005) argues that WTA loss is two to four times more than otherwise commensurate gain WTP. Defining the appropriate reference state is an empirical matter of which state is likely to best describe people’s views about environmental changes (usually it is WTP for gains and WTA for losses).

The debate about how best to value and discount environmental gains and losses we have briefly reviewed above is clearly connected to the related question of the appropriate ‘scope’ of CBA. Issues of incomparability and/or incommensurability now loom large (Alder & Posner, 2001). Incommensurate things cannot be precisely measured along some common cardinal scale of units of value, and incomparable things have no positive value relation between them thus precluding their ranking on even an ordinal scale. Rough comparability is a necessary but not sufficient condition for monetary commensurability within CBA. Standard CBA works with a cardinal interpretation of the net benefit measure. If compensation is however actual and not hypothetical then ordinal valuation data can be used to indicate the sign of the net benefit measure (but not its magnitude). It has also been argued that money (CBA’s required metric) is not a neutral scale of valuation with no value per se, nor is it universally substitutable (Aldred, 2002).⁵ Combining the notions of WTA as the appropriate measure of environmental losses and the constraint of ‘large’ environmental losses being incommensurate with money, then the precise form of compensation available and acceptable to an individual becomes important. This line of argument is not implying that at some point money has zero marginal value to the individual, not that environmental loss necessarily has infinite value (although for some ‘life-support’ environmental services this may be the case).

So faced with a ‘large’ environmental loss context relative to the status quo, and displaying lexicographic preferences, or influenced by a reference dependent effect, an individual may not be compensatable by a sum of money. However, the same individual might accept the loss if a ‘like for like’ or ‘in-kind’ compensation were offered e.g. wetland loss in one location compensated for by equivalent wetland restoration/creation nearby. Equally, the compensation might be in the form of some other social capital asset such as a new local hospital or other community facility. We return to this issue in the next section on CBA, ‘shadow projects’ and sustainability constraints.

Sugden (2005b) has proposed a CBA method which he claims circumvents the preference anomalies problem. He treats CBA as an exercise in market simulation, based on the measurement of surplus (to be maximised) which is a property of transactions in which

goods are transferred between individuals. The main problem that anomalies pose for CBA is then the context-dependence of preferences, which means that the surplus for the goods at issue vary according to the hypothetical payment mechanisms used to make measurements. The way to cope with anomalies is to chose between payment mechanism using a criterion that mandates use of the closest market analogue (payment mechanisms in competitive markets).

Following the Sugden line, the practice of CBA becomes a process through which public goods and private goods supplied collectively are analysed in terms of the differential benefits occurring to separate individuals. Either real world situations, or constructed hypothetical scenarios, are then investigated in order to see how individuals chose whether or not to incur private costs to gain private benefits. But environmental public goods that attract 'existence values' are not suited to this consumer frame of reference and are deemed out of scope for CBA. Survey methods which use citizen frames to elicit existence values (Blamey, 1995) or more deliberative forms of evaluation are not invalid but are different types of policy-relevant information (Wilson & Howarth, 2002; MacMillan et al, 2003). A number of environmental goods such as landscape and amenity features have long run reference dependency characteristics, associated with cultural, symbolic and historically significant values. There is an ongoing debate about the role of values derived from citizen/deliberate processes in CBA and further research is needed.⁶

One other line of argument therefore which has direct relevant to CBA and preference based valuation is based on the proposed existence of a range of endogenous preferences which are dependent on an individual's personal history, collective interaction with others (citizens) and social context (i.e. not necessarily given, stable and context independent). Individuals may act to affect the welfare of others, they may make different decisions as citizens (rather than consumers) in isolation or in a collective social context, and the process by which decisions are made (e.g. is it fair?) may be influential (Sagoff, 1988; Gintis, 1998; Gowdy, 2004). In short, preferences are socially conditioned (Brekke & Howarth, 2000) or conditioned by cultural transmission in line with prevailing norms and patterns (Henrich, 2004). The clear distinction between consumer and citizen put forward by Sagoff (1988) seems to push the case based on intuition and constructed examples too far. Public budgets are always limited and social opportunity costs relating to allocation decisions are always present. The citizens' deliberation process must surely include economic considerations alongside others as individuals seek to play a multidimensional role. Endogenous preference theories and claims in favour of endowment effects and 'other-regarding' preferences do, however, seem to fit more comfortably into the prevailing environmental policy agenda and its sustainable development goal. Rights based (deontological) propositions covering the rights and interests of "possible" future people (or generations) and other sentient non-human species also play a part in sustainability dialogues. Some empirical studies have indicated that rights based values are held by some individuals (Stevens et al, 1991). The use of rights based "trump cards" may not, however, be a particularly practicable tactic in any real world conservation versus development problem. In the next section we look at the connections between CBA and its alternatives and sustainability constraints.

3.5 CBA and sustainability constraints

As the process of environmental change across local to regional and up to the global scale has intensified and increased in pace, so the risks posed to the integrity and resilience of ecosystems have increased in parallel. Unanticipated irreversible damage to "critical natural capital" is a risk that not only impacts on environmental systems but also on their provision of livelihood support (especially for the poorest people on the planet). In the past, nature conservation and protected area policy has been justified by a combination of scientific and ethical 'intrinsic value' arguments. But in contemporary conditions where natural resources are under severe development pressures the traditional arguments in support of ecosystem

conservation may not be sufficient to win political arguments. Rather, we require the additional support of what has been called the 'ecosystem services' methodology. This is based on 'instrumental' values in nature (expressed in monetary terms and fitted into the CBA format) to support the case for more protected areas or better management and sustainable use of ecosystems under threat of conversion or degradation from economic development (Costanza et al, 1997; Daily, 1997; Bockstael et al, 2000; Balmford et al, 2002).

The individual ecosystem goods/service valuation approach which fits most easily into the CBA approach can however mislead policymakers. The total system value is greater than the sum of its parts and threshold effects may lead to non-linear damage impacts (Pearce, 1976; Perrings & Pearce, 1994). There is a clear connection between non-convexities, positive feedback effects, dynamic externalities, ecosystem resilience and sustainable livelihood provision, especially for the poorest in society. There is now a greater acceptance among environmental economists that while the word 'convexity' is ubiquitous in economics, it is absent from ecology (Dasgupta & Maler, 2003). A significant effort is now being put into the economics of non-convex ecosystems and the links to the plight of the poorest people in this context.

There is a 'primary', 'glue' or 'infrastructure' value in nature which is a condition for the existence of other values (Green et al, 1994; Turner et al, 2003). This is not an argument for rejecting economic values for environmental goods/services as such, but rather one for constraining values to reflect precaution (and links to the 'endowment' effect). There is a line of reasoning that can link ecosystem diversity and resilience maintenance together with support for the precautionary principle and strong sustainability. The precautionary principle itself is shrouded in ambiguity (Turner & Hartzell, 2004; Ekel, 2004) and CBA can provide useful filter for it if a 'safe minimum standards' (SMS) interpretation covering species, habitats and ecosystems is accepted (Ready & Bishop, 1991; Crowards, 1998). Under the SMS there is a presumption in favour of not harming the environment unless the opportunity costs of that action are, in some sense, very high. What is not acceptably high is of course not a straightforward issue.

Sustainability limits may also be encompassed by thinking about project management on a portfolio basis (Barbier, Markandya & Pearce, 1990). This resulted in the idea of a 'shadow' or 'compensating' project in contexts in which some projects cause environmental damage. These projects are "covered off" by projects that result in environmental improvements. It was noted in the previous section that the precise form of 'acceptable' compensation will vary from context to context and is an under-researched area. Roach and Wade (2006) have examined the use of so-called habitat equivalency analysis which estimates ecological service loss and then scales restorative ecological compensation to offset the environmental damage impact.

4. CONCLUDING COMMENTS

This review paper began by highlighting the two basic rules for CBA, as a "decision rule" method or a "heuristic aid" operating as one component of policy analysis. At various points, issues have been raised which point to a mismatch between CBA (rule variant) as a process of aggregating independent individual choices in a market context and the real world policy process. In the real world it is claimed that the policy challenge is about reconciling contested value realms and achieving consensus and that policy evolves in a recursive and iterative manner (Rhodes, 1997; Sabatier, 1998). Bromley (2004) has argued that pragmatism, an important branch of philosophy, offers a theory of human action that is more relevant than rational choice theory to the understanding and improvement of environmental policy. In the pragmatism account, individuals and groups work out (from initially contesting positions) what is best by working out what is possible, including both means and ends.

Choice involves picking through thoughts and thoughts are not given but created from impressions and imaginings. The identification of the “correct” decision is something that occurs after a consensus has been achieved and the best course of action agreed. The cause of the correct decision is not some a priori “rational/correct” decision rule and protocol but the intensive search process itself, given the prevailing context and circumstances.

The endogenous preferences literature indicates that the process of decision making is important to people and that it can act to shape preferences. Recent work in deliberative decision making aims to give voice to the range of contesting values and moral frameworks (O’Connor, 2002). The deliberative processes can be applied to environmental valuation situations e.g. those involving existence value issues, or to decide on specific policies or management regimes. But these processes themselves are not free of theoretical and practical challenges (Suskind & McKearnan et al, 1999).

Randall (2002) has argued that CBA should be the decisive factor in a number of social policy making contexts, in particular where ethical/moral imperatives and social justice issues are not central concerns. The position put forward in this paper is somewhat different in that it is argued that there are many ‘contested’ environmental policy contexts and the number seems to be increasing as contemporary society changes. Given the preponderance of such contexts, CBA is best called upon to play a ‘partial’ role in assessments alongside other forms of analysis. The components of the policy analysis should remain as separate but ‘roughly comparable’ sets of findings.

Coastal zone policy in the UK and Europe, for example, is being re-orientated towards a more flexible and adaptable approach, while water catchment management is also being reformulated under the Water Framework Directive. In the UK coastal policy will encompass the new managed realignment (i.e. setting back of defences) thinking to erosion and inundation threats. The implementation of such an approach across extensive stretches of coastline will highlight a range of concerns, including the efficient use of scarce resources but also social justice, equity and compensation. Managed realignment policy needs to be appraised across a more extensive spatial and temporal scale than has been the case in the traditional scheme-by-scheme coastal management system. Whole estuaries or multiple coastal cells need to be treated as a single ‘project’ with a number of realignment sites. A sequential approach to the appraisal process would first identify all sites in which the opportunity costs of realignment did not involve complex social justice/ethical concerns eg. involving only the loss of ‘lower’ grade agricultural land. In these cases, an efficiency-based CBA could provide the decisive information (Andrews et al. 2006). In other cases where people, property, culture/historical assets and even currently designated nature conservation areas are part of the opportunity cost calculation, CBA will not be as decisive and will need supplementation. The implementation of the Water Framework Directive will require both economic cost-effectiveness and CBA (in, for example, the quantification of ‘disproportionate costs’ and derogation arguments). But because of the holistic nature of river basin planning involving multiple stakeholder interests, questions around only partially coordinated existing legislation, the planning control system and its future etc. etc., a multi-criteria decision support system will be needed.

On balance, it seems that the future for CBA as a policy relevant decision aid lies in the policy analysis frame. It is unlikely to become more relevant if it remains as a procedure for identifying which option is welfare-maximising according to a single social welfare function, and if it seeks to prescribe the option choice on claimed “rationality” grounds. As one complementary component of a wider, multi-criteria policy analysis decision support system there is still an important role for economic analysis. CBA accounts properly formatted to highlight distributional issues and incorporating DDR can provide useful information on environmental valuation and policy problems. The appropriate scope for CBA may have to be limited to use and option values in the environmental context, with existence value

questions left to other forms of analysis. CBA-type thinking is also relevant to questions of environmental compensation and environmental standards setting since public budgets are always constrained.

Notes

1. An individualistic or Bergson-Samuelson social welfare function in which each agent's utility depends only on his or her own consumption:

$$W = W (u_1 (X_1), \dots, u_n (X_n))$$

Or, with the possible inclusion of "paternalistic" altruism, where non-users care about the level of say environmental quality/service available to others but not the wellbeing of others.

Or, an unweighted-sum of utilities Benthamite function:

$$W = (u_1, \dots, u_n) = \sum_{i=1}^n u_i$$

See, Welch (1987) and Suzumura (1987).

2. The treasury "Green Book" was first published in 1991 with the aim of making the appraisal process throughout government more consistent and transparent.
3. Both the Scitovsky and Boadway paradox are linked to the fact that estimates of income compensated welfare gains (constant prices) are only partial equilibrium measures. The Scitovsky (1941) paradox refers to an inconsistency that arises when it is shown that if a movement from one point to another in utility space is Pareto improving according to the Kaldor-Hicks compensation criteria, it may also be shown that a movement back to the original point is also Pareto improving. Comparison between Pareto efficient allocations are not possible on the basis of the compensation principle (Varian, 1992). Scitovsky's own double criteria escape from the paradox violates the transitivity assumption (Suzumura, 1999). The Boadway (1974) paradox concerns the comparison of alternative projects or policies and the fact that the option with the largest net gain is not necessarily the 'superior' one in compensation terms.
4. A referee has argued that the key difference may be between individual rationality and collective rationality. Individuals can behave irrationally (eg. violate the anxious of preference) but markets punish them for this, such that collective behaviour is more likely to be rationed.
5. Aldred (2002) has put this argument in terms of an agent who is better off with a conserved woodland for a view but under threat of a new road which will cut through the woodland. The agent may not be compensatable via any sum of money, but might accept a new local hospital as compensation. He argues that in this context the measuring rod of hospitals is longer than the measuring rod of money.
6. There is a spectrum of environmental values in which the polar examples are fairly clear cut. On one end, there are individual values elicited from 'isolated' individuals assumed to possess held values and context independent preferences. At the other end, there are values derived from groups of individuals acting collectively to produce a 'committee' value. The latter are not suitable for inclusion in CBA, but in the middle are these 'individual' values formed/altered/held constant during a valuation workshop or some other group meeting that can be used in CBA? If they are suitable, how do we ensure representativeness?

References

- Ackerman, B et al (1974). *The Uncertain Search for Environmental Quality*. New York: the Free Press
- Alder, M.D. and Posner, E.A., (eds) (2001). *Cost-benefit Analysis: Economic, Philosophical and Legal Perspectives*. Chicago: University of Chicago Press Journals
- Aldred, J (2002) Cost-Benefit Analysis, Incommensurability and Rough Equality, *Environmental Values*, **11**: 27-46
- Andrews, J., Burgess, D., Cave, R., Coombes, E., Jickells, T., Parks, D and Turner, R.K., (2006) Biogeochemical value of managed realignment, Humber Estuary, UK; *Science of the Total Environment*, forthcoming.
- Arrow, K., Cropper, M., Eads, G., Hahn, Lave, L., Noll, R., Portney, P., Russell, M., Schmatensee, R., Smith, V.K., and Stavins, R. (1998) Is there a role for benefit-cost analysis in environmental health and safety regulations? *Environment and Development Economics*, **2**: 196-201
- Atkinson, G., Machado, F and Mourato, S. (2000) Balancing competing principles of environmental equity, *Environment and Planning A*, **32**: 1791-1806
- Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R., Jenkins, M., Jefferiss, P., Jessamy, V., Madden, J., Munro, K., Myers, N., Naeem, S., Paavola, J., Rayment, M., Rosendo, S., Roughgarden, J., Trumper, K., Turner, R.K., (2002) Economic reasons for conserving wild nature, *Science*, **297**: 950-953
- Barbier, E., Markandya, A and Pearce, D.W. (1990) Environmental sustainability and cost benefit analysis, *Environment and Planning A*, **22**: 1259-1266
- Blamey, R.K., (1995) *Citizens, consensus and contingent valuation*, PhD thesis, Canberra, Australian National University
- Boadway, R.W., (1974) The welfare foundations of cost-benefit analysis, *Economic Journal*, **84**: 926-939
- Bockstael, N., Freeman, A.M., Kopp, R., Porney, P., and Smith, V.K., (2000) *On valuing nature*, *Environmental science and technology*, **34**: 1384-1389
- Bowers, J (1988) Cost-benefit analysis in theory and practice: agricultural land drainage projects in Turner, R.K., (ed) *Sustainable environmental management: principles and practice*, London: Belhaven
- Brekke, K and Howarth, R., (2000) The social contingency of wants, *Land Economics*, **76**: 493-503
- Brookes, H (1976) Environmental decision making: analysis and values in Tribe, L, Schelling, C.S., and Voss, J (eds) *When values conflict: essays in environmental analysis, discourse and decision*, Massachusetts: Ballinger
- Bromley, D.W., (1990) The ideology of efficiency: searching for a theory of policy analysis, *Journal of Environmental Economics and Management*, **19**: 86-107
- Bromley, D.W., (2004) Reconsidering environmental policy: prescriptive consequentialism and volitional pragmatism, *Environmental Resource Economics*, **28**: 73-99
- Broome, J (1992) *Counting the cost of global warming*, Cambridge: White Horse Press
- Brouwer, R., N. Powe, R.K. Turner, I.J. Bateman and I. Langford (1999), 'Public Attitudes to Contingent Valuation and Public Consultation', *Environmental Values* **8**, 325-347
- Burgess, J., J. Clark and C.M Harrison (2000), 'Knowledges in Action: An Actor Network Analysis of a Wetland Agri-environment scheme', *Ecological Economics*, **35**, 119-132
- Chipman, J.S., Moore, J.C., (1978) The new welfare economics: 1939-1974, *International Economic Review*, **19**: 547-584
- Costanza, R., d'Arge, R., deGroot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R., Paruelo, J., Raskin, R., Sutton, P and Vander Belt, M (1997) The Value of the world's ecosystem services and natural capital. *Nature*, **387**: 253-260.
- Crowards, T.M., (1998) Safe minimum standards: costs and opportunities, *Ecological Economics*, **25**: 303-314

- Daily, G.C., (1997) *Nature's Services*, Covelo, California: Island Press
- Dasgupta, P and Maler, K.G., (2003) The economics of non-convex ecosystems, *Environmental and Resource Economics*, **4**: 55-74
- Department for Transport (2004), Transport Analysis Guidance (www.webtag.org.uk), DFT, London
- DOE (1991) *Policy appraisal and the environment*, London: HMSO
- Ekeli, K (2004) Environmental risks, uncertainty and intergenerational ethics, *Environmental Values*, **13**: 421-448
- Frederick, S., Loewenstein, G., and O'Donoghue, T., (2002) Time discounting and time preference: a critical review, *Journal of Economic Literature*, **XL**: 351-401
- Froehlick, M., Hufford, D., Hammett, N., (1991) The United States in Barde, J.P., and Pearce, D (eds) *Valuing the Environment: six case studies*, London; Earthscan
- Gintis, H (1998) Beyond homo economics: evidence from experimental economics, *Ecological Economics*, **35**: 311-322
- Gowdy, J.M., (2004) The revolution in welfare economics and its implications for environmental valuation and policy, *Land Economics*, **80**: 239-257
- Gren, I.M., Folke, C., Turner, R.K., Bateman, I. (1994) Primary and secondary values of wetland ecosystems, *Environmental and Resource Economics*, **4**: 55-74
- Groom, B., Hepburn, C., Kondouri, P. and Pearce, D. (2005) Declining discount rates: the long and short of it, *Environmental and Resource Economics*, **32**: 445-493
- Gollier, C (2002) Discounting an uncertain future, *Journal of Public Economics*, **85**: 149-166
- Hanley, N. (2001) 'cost-benefit analysis and environmental policy making', *Environment and Planning C*, **19**, 103-118
- Hanley, N (2002) Cost-benefit analysis in Folmer, H., and Landis Gabel, H., (eds) *Principles of Environmental and Resource Economics*, Edward Elgar: Cheltenham
- Hanley, N and Spash, C., (1994) *Cost-benefit analysis and the environment*, Edward Elgar: Aldershot
- Hanley, N and Shogren, J.F., (2005) Is cost-benefit analysis anomaly proof? *Environmental and Resource Economics*, **32**: 13-34
- Heal, G (1998) *Valuing the future: economic theory and sustainability*. Columbia University Press: New York
- Henderson, N and Bateman, I., (1995) Empirical and public choice evidence for hyperbolic social discount rates and the implications for intergenerational discounting, *Environmental and Resource Economics*, **5**: 413-423
- Henrick, J (2004) Cultural group selection co-evolutionary processes and large-scale cooperation, *Journal of Economic Behaviour and Organisation*, **53**: 127-143
- HMT (2003) *Green Book: Appraisal and Evaluation in Central Government*. London: HMSO
- Jordan, A. (2002) *The Europeanisation of British Environmental Policy*. Basingstoke: Palgrave MacMillan.
- Knetch, K. (2005), 'Gains, Losses and the US-EPA Economic Analysis Guidelines: A Hazardous Product?', *Environmental and Resource Economics*. **32**, 91-112
- Kristrom, B (2005) Framework for Assessing the Distribution of Financial Effects of Environmental Policies, in Y.Serret and N. Johnstone (eds) *The Distributional Effects of Environmental Policy*. Cheltenham: Edward Elgar.
- Krutilla, K. (2005), 'Using the Kaldor-Hicks Tableau Format for Cost-Benefit analysis' *Public Policy Analysis and Management, Curriculum and Case Notes*, 864-875
- Lind, R. (1982), 'A Primer on the Major Issues Relating to the Discount Rate for Evaluating National energy Options', in R. Lind (ed.), *Discounting for Time and Risk in Energy Policy*, Washington: Resources for the Future.
- List, J.A.(2005), 'Scientific Numerology, Preference Anomalies, and Environmental Policy Making', *Environmental and Resource Economics*, **32**, 35-53
- Little, I.M.D, and Mirrless, J.A. (1968), *Manual of Industrial Project Analysis for Developing Countries*. Paris: OECD.

- MacMillan, D., L. Philip, N. Hanley and B. Alvarez-Farizo (2003), 'Valuing non-market benefits of wild goose conservation: a comparison of interview and group-based approaches', *Ecological Economics*, **43**, 49-59
- Marglin, S., A. Sen and P. Dasgupta (1972) *Guidelines for Project Evaluation*. Vienna: United Nations
- Nyborg, K. (2000), 'Project Analysis as Input to Public Debate: Environmental Valuation Versus Physical Unit Indicators', *Ecological Economics*, **34**, 393-408
- O'Connor, M. (2002), 'Social Costs and Sustainability', in D. Bromley and J. Paavola (eds.) *Economics, Ethics and Environmental Policy*, Oxford: Blackwell.
- Olson, M. and M. Bailey (1981), 'Positive time preference', *Journal of Political Economy*, **89**, 7-25
- O'Neil, J. (1979), 'Managing Without Prices: The Monetary Valuation of Biodiversity', *Ambio*, **26**, 546-550
- Owens, S., T. Rayner and O. Binna (2004), 'New Agendas for Appraisal: Reflections on Theory Practice and Research', *Environmental and Planning A*, **36**, 1943-1959
- Parker, D.J., C.H. Green and P.M. Thompson (1987) *Urban Flood Protection Benefits: A Project Appraisal Guide*, Aldershot: Gower
- Pearce, D.W. (1976), 'The Limits of CBA as a Guide to Environmental Policy' *Kyklos*, **29**, fasc. 1
- Pearce, D.W. (ed.) (1979) 'Special Issue on Public Sector Decision Making', *Omega*, **7**, 379-479
- Pearce, D.W., (1998) 'Environmental Appraisal and Environment Policy in the European Union', *Environmental and Resource Economics*, **11**, 489-501
- Pearce, D.W., (2004), 'Does European Union Policy Pass a Cost Benefit Test?' *World Economics*, **5**, 115-137
- Pearce, D.W. and C.A. Nash (1981) *The Social Appraisal of Projects: A Text in Cost-Benefit Analysis*. Basingstoke: MacMillan
- Pearce, D.W., A. Markardya and E. Barbier (1989), *Blueprint for a Green Economy*. London: Earthscan
- Penning-Rowsell, E.C. and J.B. Chatterton (1977), *The Benefits of Flood Alleviation: Manual of Assessment Techniques*. Aldershot: Glower
- Penning-Rowell, E.C., C.H. Green, P. Thompson, A. Coker, S. Tunstall, C. Richards and D.J. Parker (1992). *The Economics of Coastal Management: A Manual of Benefit Assessment Techniques*. Aldershot: Glower
- Penning-Rowell, E.C., C. Johnson, S. Tunstall, S. Tapsell, J. Morris, J. Chatterton and C. Green (2005). *The Benefits of Flood and Coastal Risk Management: A Handbook of Assessment Techniques*, London: Middlesex University Press
- Perrings, C. and Pearce, D.W. (1994), 'Threshold Effects and Incentives for the Conservation of Biology', *Environmental and Resource Economics*, **4**, 13-28
- Randall, A. (2002). B-C considerations should be decisive when there is nothing more important at stake, in Bromley, D and Paavola, J. (eds.) *Economics, Ethics and Environmental Policy*, Oxford: Blackwell
- Rekola, M. (2003), 'Lexicographic Preferences in Contingent Valuation', *Land Economics* **79**, 277-91
- Roach, B. and W.W. Wade (2006), 'Policy Evaluation of Natural Resource Injuries, using habitat equivalency analysis', *Ecological Economics*, **58**, 421-433
- Rhodes, R.A.W. (1997) *Understanding Governance: Policy Networks, Governance, Reflexivity and Accountability*. Buckingham: Open University Press
- Rowan, H. (1976), 'Policy Analysis as Heuristic Aid: The Design of Means, Ends and Institutions, in L. Tribe (ed.) *When Values Conflict*, Cambridge Mass: Ballinger
- Russel, D. and A. Jordan (2006), 'Gearing-up Governance for Sustainable Development: Patterns of Policy Appraisal in UK Central Government', *CSEERGE Working Paper, EDM 06-02*, Norwich, University of East Anglia

- Sabatier, P.A. (1998), 'The Advocacy Coalition Framework: Revisions and Relevance for Europe', *Journal of Public Policy*, **83**, 201-220
- Sagoff, M. (1988) *The Economy of the Earth*. Cambridge: Cambridge University Press
- Sen, A.K. (1970). *Collective Choice and Social Welfare*. San Fransisco: Holden-Day
- Scitovsky, T. (1941), 'Note on Welfare Propositions in Economics', *Review of Economic Studies* **9**, 77-88
- Self, P. (1972). *Econocrats and the Policy Process*. London: MacMillan
- Spash, C. and N. Hanley (1995), 'Preferences, Information and Biodiversity Preservation', *Ecological Economics*, **12**, 191-208
- Stevens, T., R. Echeverria, R. Glass, T. Hager and T. Moore (1991), 'Measuring the Existence Value of Wildlife: What do CVM Estimates Show?' *Land Economics*, **67**, 390-400
- Squire, L. and H.G. Vander Tak (1975) *Economic Analysis of Projects*. Baltimore: John S. Hopkins
- Sugden, R. (2005a), 'Anomalies and Stated Preference Techniques: A Framework for a discussion of Coping Strategies', *Environmental and Resource Economics*, **32**, 1-12
- Sugden, R. (2005b), 'Coping with Preference Anomalies in Cost-Benefit Analysis: A Market Simulation Approach', *Environmental and Resource Economics*, **32**, 129-160
- Susskind, L. and S. McKearnan (eds.) (1999), *The Consensus Building Handbook*. A Thousand Oaks, CA: Sage Publications
- Suzumura, K.(1987) Social Welfare Function in J. Eatwell, M. Milgate and P. Newman (eds.) *The New Palgrave Dictionary*, **4**, 418-420, London: Macmillan
- Suzumura, K. (1999), 'Parentian Welfare Judgements and Bergsonian Social Choice', *Economic Journal*, **109**, 204-221
- Tribe, L., C.S. Schelling and J. Voss (eds.) (1976) *When Values Conflict: Essays on Environmental Analysis, Discourse and Decision*, Cambridge: Mass: Ballinger
- Turner, D. and L. Hartzell (2004), 'The Lack of Clarity in the Precautionary Principle', *Environmental Values*, **12**, 449-460
- Turner, R.K. (1999), The Place of Economic Values in Environmental Valuation in I.J Bateman and K.G. Willis (eds.) *Valuing Environmental Preferences*, Oxford: Oxford University Press
- Turner, R.K., I.J. Bateman and J.S. Brooke (1992), 'Valuing the Benefits of Coastal Defense: A Case Study of the Aldeburgh Sea Defense Scheme', in A. Coker and C. Richards (eds.), *Valuing the Environment: Economic Approaches to Environmental Evaluation*, London: Belhaven Press
- Turner, R.K., J. Paavola, P. Cooper, S. Farber, V. Jessamy and S. Georgiou (2003), 'Valuing Nature: Lessons Learned and Future Research Directions', *Ecological Economics*, **46**, 493-510
- Tversky, A. and D. Kahneman (1991), 'Loss Aversion in Riskless Choice: A Reference-Dependent Model', *Quarterly Journal of Economics*, **106**, 1039-1061
- van den Bergh, J.C.J.M. and J. Gowdy (2003), 'The Microfoundations of Macroeconomics: An Evolutionary Perspective', *Cambridge Journal of Economics*, **27**, 65-84
- Varian, H. (1992), *Microeconomic Analysis*, Norton, New York
- Welch, C. (1987) Utilitarianism in J. Eatwell, M. Milgate and P. Newman (eds.) *The New Palgrave Dictionary of Economics*, **4**, 770-775
- Weitzman, M. (1998), 'Why the Far Distant Future Should be Discounted at its Lowest Possible Rate', *Journal of Environmental Economics and Management*, **26**, 200-209
- World Commission on Environment and Development (WCED) (1987) *Our Common Future*. Oxford: Oxford University Press
- Wilson, M.A. and R.B. Howarth (2002), 'Discourse-Based Valuation of Ecosystems Services: Establishing Fair Outcomes through Group Deliberation', *Ecological Economics*, **41**, 431-443