An Inquiry into Ethical Foundations of Cost Benefit Analysis

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ABSTRACT

Cost benefit analysis is one of the main tools in decision making in the natural resource sector. The conclusion of a development project through the EIA procedure is usually derived from the cost benefit analysis. To what extent ethical concerns have been integrated into this tool is therefore worth investigating. The objective of the paper is to review the theoretical and practical context of CBA in handling ethical issues (mainly intergenerational, intragenerational and interspecies equity) and to propose adjustments towards a more 'ethical CBA'. The decisions from CBA are inherently biased towards present generation and the wealthy. The former is due to the positive discount rates used in the CBA and the latter is arising from the economic values and the hypothetical nature of compensation of CBA. Concerns towards non human species are dominated by preferences of the wealthy present human beings. The history of economic development of the world is therefore the history of this injustice which is reflected in the widening income gaps among present and the burgeoning environmental costs left to the future. World has paid only a very scant attention to the tools available to correct such intra and intergeneration inequities of CBA. The paper concludes emphasizing the immediate need to use appropriate adjustments to make the preferences of the present non-wealthy, unborn human beings and both present and future non-human beings be more explicitly reflected in the cost benefit analysis.

KEYWORDS: *Cost benefit analysis, Discounting, Equity, Ethics*

Introduction

There are several decision tools for assessing viability of projects, programs and policies. Cost-benefit analysis is by far the most widely-practiced technique of project appraisal and evaluation. The main rationale for conducting cost-benefit analysis is to subject project choice to a consistent set of general objectives of national policy (UNIDO, 1972). In the early stages of CBA, it only included direct

project costs and benefits. As national policy objectives in the developing countries tried to include equitable income distribution, project appraisals have been expanded to reflect these new objectives (Little and Mirrlees, 1974; Squire and Tak, 1975). The technique of CBA was further extended by inclusion of environmental considerations (Dixon and Hufschmidt, 1986; Dixon *et al.*, 1986). When contrasting the traditional approach which considers only the direct project costs and benefits, the extended approach includes the external and environmental improvement and protection benefits as well as the costs of environmental damages and control measures (Dixon and Hufschmidt, 1986).

The problems of relying on CBA to guide environmental policy is widely discussed (Hanley and Shogren, 2005). Although CBA could easily deliver a judgment on efficiency of the project, ethical aspects, mainly equity aspects are hardly ever considered, except where a social cost benefit approach is adopted. Acceptance of current distribution of income and exclusion of all other values than utilitarian values are other issues which are often highlighted. CBA deals with expressions of money values, which depends on individual's ability to pay which is a function of income and wealth.

The decisions from CBA are inherently biased towards present generation and the wealthy. The former is due to the positive discount rates used in the CBA and the latter is arising from the economic values used and the hypothetical nature of compensation of CBA. Concerns towards non human species are dominated by preferences of the wealthy present human beings estimated through environmental valuation methods. The history of economic development of the world is therefore the history of this injustice which is reflected in the widening income gaps among present and the burgeoning environmental costs left to the future. World has paid only a very scant attention to the tools available to correct such intra and intergeneration inequities of CBA.

Cost benefit analysis is one of the main tools in decision making in the natural resource sector in Sri Lanka. The conclusion of a development project through the EIA procedure is usually derived from the cost benefit analysis. According to National Environmental Act of Sri Lanka, Environmental Impact Assessments (EIA) is a mandatory requirement for deriving the concluding comment of the development projects. EIA incorporates environmental values into the decision making through an extended cost benefit analysis (ECBA). To what extent ethical concerns have been integrated into this tool is therefore worth investigating. The objective of the paper is to review the theoretical and practical context of CBA in handling ethical issues (mainly intergenerational, intragenerational and interspecies equity) and to propose adjustments towards a more 'ethical CBA'.

The paper is organized as follows. The next section provides a detailed description of the theory of cost benefit analysis followed by description on main ethical streams relevant for the discussion. This is followed by an account on how CBA fails to address intra generational, intergenerational and interspecies equity concerns. The next section describes various frameworks available for handling

such inequity issues with examples of applications. The final section provides concluding remarks.

Cost-Benefit Analysis (CBA)

Historically, CBA was first developed to evaluate water resources investments in the United States. The general objective of benefit-cost analysis in this application was to provide a useful picture of the costs and gains from making investments in water development. CBA is the most common method of project analysis (Winpenny, 1991). Currently CBA is used to assess efficiency of projects, programs and policies worldwide. CBA has a very wide range of applications from natural resources (water, energy, forests, and fishery) to interventions on environmental damages such as climate change.

Sri Lankan application of CBA has been few isolated attempts at water and energy sectors until the enactment of National Environmental Act in 1980 which made EIA procedure compulsory for the development projects and BCA has become an important component of the EIA report.

CBA has its basis on Paretian welfare economics (neo-classical economics). Welfare economics is the analysis of the optimal behavior of individual consumers at the level of society as a whole. Just as, at the level of the individual, there is a need for a subjective ranking of bundles of goods dependent on the consumer's taste, at the level of a society there is a need for a ranking of economic states, and this will usually rely on subjective or normative criteria: judgments of taste about how society should look. Welfare economics is based on the view that an economic system should be efficient in satisfying human wants. Its basic tenet is that welfare cannot be at a maximum if it is possible to make any individual better off without making another worse off. This is called Paretian optimality and it operates under a set of restrictive assumptions such as perfect information, absence of externalities etc.

A similar rule is the Paretian improvement. A Paretian improvement is said to occur when as a result of a change in the use of resources some individuals are made better off without anyone being made worse off. Any change that brings a Paretian improvement is regarded as socially desirable. In practice however this is not easy to achieve. The potential Paretian improvement (Kaldor-Hicks compensation approach) was suggested as a means of dealing with this problem. According to this criteria, a change is considered to be socially beneficial if the gainers could secure sufficient benefits, so that they could compensate the losers and still have some net gain left over. If the compensation is exact, the gainers have net benefit, while losers are indifferent. This actual compensation need not to be paid to the losers. If compensation is paid then this criterion reduces to the Paretian criterion. The criterion of potential Pareto improvement is the underlying basis of cost benefit analysis (Hufschmidt *et al.*, 1983; Randall, 1981; Pearce and Turner 1990).

The basic methodology of CBA involves identification and measurement of environmental effects and translating them into monetary terms for inclusion in the formal project analysis. When CBA is used for social choices, benefits and costs should be evaluated in a social context and take account of any externalities arising from adoption of the particular action. There are three main decision rules used in CBA; Net Present Value (NPV), Benefit-Cost Ratio (BCR) and the Internal Rate of Return (IRR) criterion.

CBA and Ethical Concerns

Ethics is about deciding what is good or right. There are both western traditions and eastern traditions of ethics. Western philosophers such as Descartes, Locke, Berkeley, Hume and Kant have laid the foundation of ethical principles. The neoclassical economic approach and CBA has its philosophical basis on utilitarianism (developed by Bentham, Mill and others) while there may be individuals and societies who may operate on the basis of a deontological or rights-based approach to decision-making (Kneese and Schulze, 1985).

In classical utilitarianism, individual or collective actions are supposed to maximize the good of the whole society. Neoclassical utilitarianism requires that the individual maximize only his own utility and under certain very restrictive conditions, this results in a welfare maximum for the whole economic system. However, the egalitarian view holds that the well-being of a society is measured by the well-being of the worst off person in that society. This criterion would, if fully adopted, lead to a totally equal distribution of utility (Rawls, 1971). An elitist criterion is the exact opposite of the egalitarian criterion. The well-being of society is measured by the well-being of the best off individual. Every act is "right" if it improves the welfare of the best off and "wrong" if it decreases the welfare of the best off (Nietzsche, 1886 cited in Kneese and Schulze, 1985).

Environmental ethics concerns about two main types of values: (1) instrumental, and (2) non-instrumental. Instrumental values are the values derived from environment being an instrument for human beings in terms of various goods or services provided. Natural environment is non-instrumentally valuable when it is valuable in its own right independently of any benefits it confers on human beings. If the focus is on the instrumental values, environmental destruction raises ethical concerns since it threatens instrumental values received by both present and future human beings. The moral concern here is human beings; the natural environment is of indirect moral concern because it is instrumental to human well-being (Booth, 1994).

If the natural environment is also seen as non-instrumentally valuable, then it is directly an object of moral concern. To claim that the environment is non-instrumentally valuable, is to claim that it is valuable for itself independently of any instrumental values it provides to human beings. This implies that the moral concern extends beyond human society to the world of plants, animals, biotic

communities, ecosystems, and even geological structures. Human individuals in this situation would be willing not only to defend the existence and well-being of one another, but nonhuman natural entities as well, and to defend them for their own sake, not for the instrumental value they deliver (Booth, 1994).

Ethical Failures of Cost Benefit Analysis

CBA is failing to address intragenerational and intergenerational equity when it is analyzed from utilitarian point of view. From non instrumental value point of view, CBA fails to handle interspecies equity in a fir way. The following section describes these in turn.

CBA Fails to Address Intragenerational Equity

Intragenerational inequity of CBA is resulting from two aspects; the decisions from CBA are inherently biased towards wealthy and the CBA worsens the existing income distribution of the country. The following section elaborates these issues.

Decisions of CBA are Biased Towards Wealthy

Economic values which form the basis of CBA are usually based on a comparison of "willingness-to-pay" rather than of actual welfare gains or losses of different people. Willingness-to-pay depends on expectations concerning what it is appropriate to purchase and for what price. For example, the amount of money one would be willing to pay to avoid any unwanted change, also depends on wealth. Since preferences in cost-benefit analysis are weighted with money, and the poor have less of it, their preferences count for less (Hausman and McPherson, 2008).

This could be illustrated with an example where a community consisting of rich and poor groups and a community forest is shared by both groups; for poor it is a source of income and for the rich, it being a recreational area. A decision has to be made on a proposal to convert the forest totally to a recreational park. The rich group collectively would be willing to pay Rs. 1,000,000 to see this change happening while the poor are only willing to pay Rs. 20,000 to avoid it. The decision of a CBA would be biased towards the wealthy because willingness to pay is based on the income and CBA assigns unjustifiably large decision weight to high-income persons.

Decisions of CBA Worsens Existing Income Distribution

CBA supports policies and projects that make some people worse off. A project which yields high net benefits may result in benefits borne by one group of society and costs borne by another. The compensation proposed in the CBA need not be an actual transfer of money from gainers to losers, but a hypothetical one. This is based on the assumption that society is the sum of the individuals composing it. However, it seems unreasonable to say a society is better off if some portion of the society

(losers) still actually lost. If each policy or project implemented in a country had different winners and losers, in the long run everyone would be both winners and losers and the unfairness of individual projects may be cancelled out. However, the widening income disparities in the world suggests otherwise. Little (1957) has proposed in this regard that potential Paretian improvement should only be regarded as a social gain if it does not worsen the distribution of income.

CBA may approve a change which seriously worsens the distribution of income. For example, often land has been acquired for national parks without adequate compensation for traditional users who are poor. Costs of energy projects are also unequally born by minorities, low income groups or unknown future generations (Farrow, 1998, Zerbe *et al.*, 2005) and wealthier groups usually suffer little loss (Torras, 1999). For example, Mahaweli Development Program of Sri Lanka required inundation of considerable agricultural land (5400 ha) and displacement of 14000 rural families. It would be the wealthy urban groups that are benefited mostly since they are grid connected. Low income groups are affected in several ways; Loss of traditional land in the affected areas and loss of opportunity to develop off grid power since limited funds being devoted to the large grid connected projects in preference to off grid projects (Gunawardena, 2010).

Under the present EIA of Sri Lanka, if there are significant disproportionate environmental impacts on low-income groups they need to be identified and evaluated. However, identifying disproportionate impacts to low-income groups does not necessarily preclude an agency from going ahead with the development of the project. Hence, concerns of distributional issues are rarely incorporated into projects.

CBA Fails to Address Intergenerational Equity

The decisions from CBA are inherently biased towards present generation which has lead to burgeoning environmental costs left to the future. CBA needs to express all costs and benefits in a single term and express them in present value terms. A discount rate is used to calculate the present value. The higher the discount rate used the lower will be the level of present value of benefits (Table 1). Therefore the decision on the discount rate could have a significant impact on the level of realized benefits and also costs. There are two main reasons for positive discount rates; social time preference rate and social opportunity cost.

Future generations will be affected by discount rates determined by market mechanisms based on current generation preferences and/or capital productivity. The higher discount rates will discriminate against future generations. This could occur in three situations. First, with higher discount rates, projects with social costs that occur in the future and net social benefits that occur in the near term will be favoured by the cost-benefit rule. Consequently, a disproportionate share of the costs of the project will be borne by future generations. Secondly, projects with high social benefits that occur in the future are not likely to pass the cost-benefit rule if

discount rates are high. Therefore, future generations are deprived of higher share of project benefits. Thirdly, with a higher discount rate, the overall investment level will be lower depending on the availability of capital and therefore the capital stock inherited by future generation will also be lower (Pearce *et al.*, 1989; Pearce and Turner, 1990).

Table 1: Present value (PV) of Rs. 100 billion with different discounting periods and rates

Discounting Period (Yrs)	PV @ 2% Discount Rate	PV @ 10% Discount Rate	PV @ 12% Discount Rate
50	37,152,788,213	851,855,128	346,018,139
100	13,803,296,720	7,256,572	1,197,286
150	5,128,309,597	61,815	4,143
200	1,905,310,003	527	14.3
250	707,875,790	4.5	0.05

CBA fails to Address Interspecies Equity

Development projects often involve aspects which have implications on non human species. These include the destruction of ecosystems, loss of species, and the creation of pollutants which damage ecosystems functions or cause genetic mutations. Economic values for such CBA are dominated by preferences of the wealthy present human beings. Non human species have no role to play in the decision making process.

However, humans could express their values (under the non use value category of the total economic value) towards non human species through stated preference approaches and such values may have their bases in instrumental or non instrumental contexts. An individual, who really cares about the non human species, may be unwilling to trade-off increases/decreases in biodiversity against losses / gains in income. These individuals will then be likely to refuse to participate in the willingness-to-pay or accept procedure. This rejection could show up in non-response, zero bids, or outliers, and the data would erroneously be regarded as respondents placing no value on the public good in the first two cases or acting irrationally in the third case (Spash and Hanley, 1995).

Approaches and Techniques Available for Handling Equity Issues

There is widespread negligence of equity issues in the CBA and only a very scant attention has been paid to the tools available to correct such intra and intergeneration inequities of CBA. The following section elaborates on these approaches under each inequity category.

Corrections for Intragenerational Inequity

Intra-generational equity could be achieved by various mechanisms. Table 2 elaborates on examples of such applications in renewable energy sector.

Table 2: Mechanisms to address intragenerational equity concerns in power projects

Study	Mechanisms
Reddy *et al.* (2006)	Enhancement of social, natural capital with off grid small hydels
Trussart *et al.* (2002)	Social and environmental mitigation measures - shadow projects and compensation funds
Biswas *et al.* (2001)	Improving productivity (savings in firewood collection time), mobility, security and health (lesser indoor pollution) of women with provision of biogas/hydropower to rural areas
Farrow (1998)	Actual compensation to identified groups

Source: Gunawardena (2010)

Application of Distributional Weights in CBA

Distributional weights are important in achieving intra-generational equity. However, use of distributional weights is one of the most controversial aspects of CBA. Weights can be attached either to the income changes (benefits or costs) of the groups affected by the project (Stewart, 1978) or to the good that is being provided (Brent, 1996). In the latter, distributional weights become a part of the determination of shadow prices.

In an example of application of distribution weights in a power project in Sri Lanka, costs incurred by different groups changed significantly. Cost of local low income people increased to 85% while that of remote high income groups becomes very small. Different scenarios of electricity consumption are tested in order to identify the most just system. The maximum social benefits are obtained when all the electricity benefits are diverted to the lowest income groups. Maintaining the present electricity distribution and consumption pattern means any additional supply provided to the grid would be consumed by the urban high income groups. This would not however yield an economically efficient outcome when distributional weights are applied. In order to be viable, the project need diversion of at least 9.3% of its electricity generated for the low income households in the country (Gunawardena, 2010).

Corrections for Intergenerational Inequity

Adjustments Using Krutilla-Fisher Algorithm

Krutilla and Fisher (1975) suggests to retain the conventional discount rate but increasing the value of the environmental good with time by adding a growth rate for the price of the environmental good (relative to the general price level) and by reducing the value of development benefits with a negative growth rate (double discounting). The rationale for this is that as natural resources become scarcer in time, they become increasingly more expensive (Hanley and Craig, 1991).

Use of Intergenerational CBA

Intergenerational CBA incorporates future generations explicitly in the analysis (Kula, 1988) and this idea was extended to apply an intergenerational weight, which takes into account that individuals do not value equally present and future (Nijkamp and Rouwendal, 1988; Bellinger, 1991). 'Multigenerational Net Present Value' concept (Padilla, 2001 cited in Saez and Requena, 2007) enables to translate the individual level of "altruism" into social intergenerational weighing. There are further developments of the idea, for example, Sumaila and Walters (2005), incorporate future generations into the discount rates by means of an "Intergenerational Discount Factor" (Saez and Requena, 2007).

Adjustments to Discount Rates

There are various approaches to discounting; the prescriptive approach derives discount rates from fundamental ethical views, even if the resulting rates do not match market rates (Baum, 2009). CBA usually uses a single discount rate for all classes of project. The choice of which discount rate to use is an ethical choice.

Dual Discounting

Recent literature on CBA of climate change recommends a 'dual-rate discounting' where goods consumption is discounted with a consumption discount rate and environmental consumption is discounted with an environmental discount rate. It is expected that this would justify substantial emission reductions, as the environmental discount rate might be lower than the consumption discount rate, or that both discount rates might decline over time (Kögel, 2009).

Applying a Zero Discount Rate

According to the proponents of this idea, the only valid discount rate is zero, since it is the only rate that is in accord with a fully intergenerational equity scenario (Sáez and Requena, 2007). For instance, Ciriacy-Wantrup (1942) has suggested applying a zero discount rate or even a negative rate for certain social purposes such as public health, defense, or education. Harrod (1948) argued that "a zero discount rate would

ensure intergenerational equity by preventing the present generations from ignoring the long-term environmental consequences.

Other Approaches

Sáeza and Requena (2007) introduce intergenerational equity in a Cost–Benefit Analysis, through two indicators of environmental profitability, Intergenerational Transfer Amount (ITA), which quantifies in monetary units what the current generation is willing to pass on future generations when an environmental restoration project is carried out, and the Critical Environmental Rate (CER), measures the implicit environmental profitability. The information provided by the environmental profitability indicators proposed renders more transparency to the quantification of the levels of intergenerational equity applied, thereby facilitating the difficult reconciliation of the CBA technique with the objective of sustainability.

Corrections for Interspecies Inequity

Natural Rights Argument

This suggests that wildlife has a right to exist independent of any value to humans including feelings of moral satisfaction (Nash, 1989). Then the levels of use and non-use values may be irrelevant for determining WTP for wildlife preservation. Rather, humans may be viewed as having a moral obligation to avoid violating the rights of others including non-human species (Opaluch and Grigalunas, 1992 cited in Diamond and Hausmann, 1993).

Strong Sustainability (Sustainability Constraint) Argument

The main argument here is that maintaining the level of natural capital constant (Pearce and Turner, 1990; Pearce *et al.*, 1990; Barbier *et al.*, 1990). This is in accordance with the strong or strict sustainability concept which makes sure that, no matter what the benefits and costs associated with the decision may be, the environmental capital stock must remain constant. For example, in order to justify a project, there are two requirements; the benefits should be greater than the costs and also any environmental damage caused by the project need to be compensated through restoration and rehabilitation.

This concept could be made operative at the regional level. The total sum of the environmental damage caused by a set of projects can be counteracted by separate "shadow" projects compensate for the reduction in natural capital stock. Shadow projects would not be required to be subjected to any efficiency criteria since their justification would lie in their compliance with strong sustainability.

Correction of Cultural Failures

There are cultural mechanisms that encourage conservation activities and cultural failures that lead to degradation of environment. Non recognition of such cultural values that encourage conservation and facilitation of cultural changes that are non conducive for holistic conservation are defined here as cultural failures. People's attitudes and preferences, are guided by their culture and thus the economic activity (Gunawardena, 1997). Culture and cultural diversity shapes the way in which society interacts with its environment (environmental behavior), and the way it uses biodiversity (Cochrane, 2006; Shiva, 1993; Matutinovic, 2001; Norgaard, 1994; Berkes and Folke, 1994; Levy-Leboyer *et al.*, 1996). Traditional cultures are often considered more sustainable than the modern Western cultures (Cochrane, 2006; Norgaard, 1994; Jenkins, 2000).

Pluralistic Approaches

According to Barbier *et al.* (1994), although modern scientific thinking has allowed highly specialized analytical techniques in each discipline, such specializations carry the danger of being reductionist and partial when faced with an extremely complex and multi-faceted scientific problem. Since it is the natural trend that each discipline tries to reduce a problem to a level it feels comfortable with. Alternatively, each discipline will only approach that part of the problem which it feels is most suitable for its specialized analytical approach.

Pluralism refers to the use of multiple viewpoints or intellectual approaches when a complex social problem is subjected to analysis. It is underutilized within economics and, of course, is a necessity when multi-disciplinary considerations are involved (Castle, 1993). It is essential to a full appreciation of sustainability issues. Pluralism becomes of particular importance under conditions of uncertainty.

Ethical CBA

Zerbe (2007) proposes ten Rules for CBA in a proposal for formulating an ethical CBA. He proposes among other things, concerns on legal rights, preference for expert opinion over uninformed preference and counting moral sentiments as preferences in ethical CBA. He also proposes that ethical sentiments are to be counted directly and not included in the discount rate.

Conclusions

Monetization permits the environment to enter the decision-making process thus providing a rational method for weighing up costs and benefits. However, CBA is burdened with several serious shortcomings that affect equity at different levels.
The CBA has its foundations on neoclassical utilitarianism. However, the real world applications of CBA have a bias towards an elitist approach and show a large

deviation from egalitarianism. It seems that economic techniques are unable to either capture non-instrumental value or to translate them into instrumental values. The intra and intergenerational inequities are being successfully handled by the recent developments in the field at least theoretically. However, interspecies equity has to be dealt with by more pluralistic approaches.

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