Hard Methods for Soft Policies

Environmental and Social Cost-Benefit Analysis

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Summary:

The quest for sustainability has put the conventional Cost-Benefit Analysis (CBA) technique under fierce attack. Much of the critique is, however, misplaced or based on misunderstandings. Alternative methodologies for project appraisal are often insufficient for making the unavoidable hard choices on resource use and distribution. The paper further argues that it is impossible to formulate any unified and operational definition of sustainability applicable to project appraisal. As an alternative strategy, two basic concerns in the sustainability debate, environmental and distributional, are identified. The paper explores how these can be integrated into the consistent framework which CBA provides. This expansion of the conventional analysis, which is labeled Environmental and Social CBA (ESCBA), particularly focuses on environmental valuation, distributional weights, and discounting.

Sammendrag:

Interessen for bærekraftig utvikling har ført til kritikk av tradisjonell nytte-kostnadsanalyse (NKA). Mye av denne kritikken er imidlertid ubegrunnet eller basert på misforståelser. Alternative metoder for prosjektvurdering vil ofte være utilstrekkelige for å foreta vanskelige valg knyttet til ressursbruk og fordeling. Notatet argumenterer videre for at det er umulig å formulere meningsfulle og operasjonaliserbare kriterier for bærekraftighet i prosjekt-vurderinger. Som en alternativ strategi identifiseres først to mål som står sentralt i bærekraftighetsdebatten; miljø- og fordelingshensyn. Dernest drøftes hvordan disse kan integreres i NKA. Denne utvidelsen av tradisjonell NKA fokuserer spesielt på miljøverdsetting, fordelingsvekter og diskontering.

Indexing terms:

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1 Introduction[1]

Cost-Benefit Analysis (CBA) is facing strong criticism among environmentally concerned scholars (e.g., Booth, 1994; Drepper and Månsson, 1993; Hanley, 1992; van Pelt, 1993; Schulze, 1994). We argue that a large share of the criticism of CBA is either misplaced or based on misunderstandings about the method. Furthermore, we show that through the application of a pragmatic approach, already available methods can be used to incorporate the main sustainability concerns into the existing CBA techniques.

While recognizing the many difficulties involved in applying CBA to project appraisal, and that other competing methods are available, we use CBA as our point of departure for several reasons. Generally, CBA provides a consistent methodology for project appraisal. In doing so, however, it raises certain problems which other methods also face even if only implicitly. Typically, other "softer" methods do not have much to offer when it comes to the hard choices: should, for instance, some environmental resources be sacrificed in order to increase the welfare of the poor living in a village? Whereas we do *not* believe that CBA, or even the expanded CBA we advocate, can provide precise answers to such questions, its merits lies in two areas. First, the trade-offs and hard choices involved are made explicit and confronted directly, and not assumed away implicitly. We believe that better choices can be reached only if the available alternatives are clearly stated and their consequences made as transparent as possible. Second, it provides a coherent framework within which the various arguments relating to the costs and benefits involved in such a trade-off can be assessed. Although we may not be able to quantify and value all effects, CBA will provide useful information on the relative merits of different projects given what information is available.

A common argument against CBA relates to its apparent conflict with the notion of sustainability. In section two, we discuss the two main definitions of sustainable development commonly found in the environmental economics literature, that is, the "non-declining welfare" and the "constant natural capital" approaches. In our view, neither of these approaches offers definitions or criteria that are very useful guides for project selection. We therefore identify two main concerns in the sustainability debate that can form reasonable bases for formulating such criteria. These are a concern for human welfare of the poor in both the present and future generations (distributional concern), and a concern that environmental degradation now may seriously hamper overall human welfare (environmental concern).

[1] This paper was prepared for the 25th Anniversary Conference on *Development Projects: Issues for the 1990s;* Development and Project Planning Centre, University of Bradford, UK, 6 - 8 April 1995. We would like to thank our colleagues Odd-Helge Fjeldstad, who worked with us on the report which this article is based on, Richard Moorsom, Arne Wiig, and M. Asaduzzaman for constructive comments to draft versions of this paper. The usual disclaimer applies. Funding for the project has been provided by the Norwegian Research Council.

The challenge then is, how can these concerns be incorporated into a consistent framework for project assessment? A two-track strategy to improve the conventional methods of project evaluation is put forward: first, a proper valuation of the environmental effects of the projects, and second, a framework that gives higher value to benefits to the poor than to the rich, either now or in the future. Fortunately, most tools for such an approach are readily available in the economic literature, as shown in section three. We label this approach the *Environmental and Social Cost-Benefit Analysis (ESCBA)*. It is only in the special cases where the critical functions of the environment will be adversely affected by the project that the imposition of sustainability constraints is required as an addition to ESCBA.

The article is based on a study on how to integrate the sustainability concern in project appraisal of development projects (Angelsen *et al.*, 1994). Thus, our references and examples relate mainly to Third World settings. This has some implications for the discussion; for example, valuation based on contingent valuation (CV) of recreational services provided by the environment - an issue receiving considerable attention in the valuation literature - is of much less importance in Less Developed Countries (LDCs) than environmental changes that affect production directly. Indeed, there seems to be an inverse relationship between applicability in LDCs and the level of theoretical attention given to the various methods. Much of our optimism with regards to the possibilities for a successful application of CBA is because the simplest methods would frequently be the most useful.

The fact that we relate our discussion to poor countries also implies that more hard choices have to be made: Conflicts between increasing the material standard of living and environmental preservation are much more pressing than in the rich parts of the world where the material sacrifices necessary are often marginal compared to those involved in LDCs. One may in fact argue that applying CBA is more relevant and easier to defend for LDCs. Booth (1994, p. 251), who is in general critical to CBA, suggests a moral standard which "implies that human beings take priority when the income they require to live decently is threatened, but that ecosystems have priority over income above this level".

2 The problem of defining sustainability

> *It is very hard to be against sustainability. In fact, the less you know about it, the better it sounds. ... sustainability is an essentially vague concept, and it would be wrong to think of it as being precise, or even capable of being made precise* (Robert Solow, 1993, pp. 179-180, Nobel Laureate in Economics).

The concept of sustainable development was moved to the top of the international political agenda by the World Commission on Environment and Development (WCED, 1987). It captures the widespread concern for the negative impacts of environmental degradation on human welfare and its development into the future.

The popularity of the "sustainable development" idea should be understood in several ways. There is no doubt that it expresses a genuine concern with respect to the environment and the welfare of future generations. At the same time, the concept is sufficiently wide and vague to act as an umbrella for a large number of movements with contradictory goals (Ruttan, 1994). It has acted as a mediating term between environmentalists and developers, who each have a stake in both "sustainable" and "development". For analytical purposes, however, we will argue that the term is of limited use, and a workable definition is yet to be formulated.

There are a number of concerns driving those marching under the sustainability banner: the present generation's poor, the well-being of future generations, the environment in itself (in particular, biodiversity), cultural diversity, etc. It is, however, possible to categorize the concerns that seems to permeate them all into two broad groups;

1. The concern for human welfare both present and future. This is known as the *instrumental view.*
2. The concern for the persistence of all components of the biosphere, even those with no apparent benefits to humanity. This is the *deep ecological view.*[2]

Even though the ecological view has few followers in its pure version, it has had far-reaching implications for environmental economists in their effort to incorporate environmental values in the neoclassical paradigm. The concept of *existence value* has been introduced to capture the non-use values people assign to environmental resources. Thus, when it comes to the measurement of people's preferences (that is, environmental valuation), the distinction between the instrumental and the deep ecology view is not as sharp as it appears: whether people assign values to environmental goods because of their "use" or "existence" value is of minor theoretical importance, and should both be included in a CBA.

It should also be noted that an instrumental view does *not* imply that terms like "rights of nature" or "rights of future generations" are meaningless. The essential point is that such rights (viewed as restrictions on current human activities) are granted by *human beings in the present generation.* Rather than viewing this as a very anthropocentric view, we take this to be the logical consequence of the simple fact that nature or future generations cannot participate in the current decision-making process. Again, this problem would not be confined to CBA, as any criteria chosen and decision made would reflect our, that is, human beings of the present generation's preferences.

Moving to the attempts at operationalizing the concept of sustainable development, a useful framework or typology is provided by, among others, Pearce *et al.* (1990). They consider development to be a vector of *several desirable social objectives.* Possible elements in the vector are increases in real income per capita,

[2] See for example Redclift (1987) and Booth (1994) for comparisons of these views.

improvements in health and nutritional status, a "fairer" distribution of income, and increases in basic freedoms. Development is said to occur if this vector increases, and we have sustainable development if this pattern stretches over a long period of time.

This approach is in line with most definitions of sustainable development suggested in the economic literature, which can be summarized in the phrase "non-declining welfare over time". An early statement of this principle is Tietenberg (1984, p. 33): "The sustainability criterion suggests that, at a minimum, future generations should be left no worse off than current generations." However, definitions along this line - or any others, for that matter - do not address the more difficult issues of;

- Which elements should be included in the "development vector"?
- What weight should be given to each element?
- To what extent can a decline in one element be compensated for by an increase in others (substitution)? Must all components in the vector increase in order to have sustainable development?

It is exactly this kind of questions that welfare economics and its applied branch, CBA, attempts to deal with. Thus, the non-declining welfare approach to sustainability leads us directly into the core of CBA.

One noteworthy attempt towards operationalization of the concept is the *constant natural capital approach*. There are at least three different views on the relevance of the constant natural capital approach to sustainable development: first, some authors use this concept as the definition of sustainable development (Pearce *et al.*, 1990). Second, others view it as a precondition and/or an essential step towards the operationalization of the non-declining welfare approach. Third, there is the view that constant natural capital is not a necessary nor sufficient condition for sustainable development. Some followers of this view would argue that the focus should be on the *total* capital stock: human, physical reproducible, technological, and natural (Mähler, 1990).

The interpretation of the concept of constant natural capital stock in the literature usually takes the "stock - flow" and the "economic value - physical quantity" axis. The instrumental view and CBA are generally more concerned with the flows (which, of course, are closely related to the size of stocks), and more so with the value than the quantity of flows. This diverges from the more common interpretation of constant natural capital as constant physical stocks. At a glance, one would expect the latter to be easier to operationalize, but it faces problems and involves trade-offs which are difficult to resolve. Maintaining the physical quantity of (each kind of) natural capital stock *could* be interpreted as:

1. Always use renewable resources according to the following rule: $h \leq g$, where h is the harvest rate of the resource and g its regenerative rate. Here,

the maximum sustainable yield (MSY) is frequently proposed as the main guide for the sustainable exploitation of the resource.

2. Always keep waste flows to the environment (*w*) at or below the assimilative capacity of the environment (*a*), that is, according to the rule: $w \leq a$.
3. Never exploit non-renewable resources.

Some caveats to the rules above are necessary. The third rule is both unrealistic and impractical to abide by. The main solution to this problem seems to be that insofar as nonrenewable resources must be exploited, we must ensure that their reduced stock is compensated for by investments in renewable resources. The Hartwick (1977) rule tells us that under certain assumptions the consumption level may be sustained if the economic rent from the extraction of non-renewable resources is invested. Thus, this rule allows for substitutability between renewable and non-renewable resources.

Secondly, the regenerative capacity of natural resources is not static. Renewable resources can also be managed so as to improve their sustained yield.[3] The meaning of MSY is also somewhat unclear when, for example, several ecologically dependent species are harvested, or more generally because environmental functions are interrelated. Then some weighted sum must be used, and the outcome depends crucially on the weighting system applied (Clark, 1990). Moreover, the MSY approach overlooks the costs of extraction and discounting. Cost considerations can in fact lead to higher stocks than would be predicted by a simple MSY rule. This is particularly so in the realistic case where harvest costs increase with declining stocks.

Thirdly, the waste assimilative capacity of the environment can be improved, for instance, river flows can be augmented to enhance their assimilative function. To further complicate matters, the idea of assimilative capacity in itself is not definite, as many ecological equilibria are possible.

Other factors that make the stipulation of conditions for sustainable development very difficult are the effects of population increases and of technological progress. The latter improves efficiency in the use of natural resources, and increases the scope of substituting man-made capital for natural capital. Indeed, at the core of the debate between the "growth disciples" and the "limits-to-growth prophets" is their different views on the future role of technological progress. We do not pursue the controversy here for the reason given by Buchholz (1990, p. 58): "Long term forecasts regarding economic resources and technology require divine gifts, not degrees in economics."

Population growth, on the other hand, may make the constant natural capital rule insufficient, as constant natural capital *per capita* may be a necessary requirement

[3] See Hannesson (1993) for a discussion of this point with regards to fisheries management.

for non-decreasing welfare per capita. Other problems arise from risk, uncertainty, and irreversibility.[4]

Thus, we can conclude that neither the "non-declining welfare" nor the "constant natural capital" approaches provide readily applicable definitions of (or conditions for) sustainable development, and we subscribe to the view of Solow in the opening quote. Whereas these concepts are *potentially* useful for guiding macro level policies, they are even more difficult to translate into meaningful sustainability criteria at the project level. Any attempt to define a sustainability criteria at the micro level would lead us into situations where applying the criteria would be too rigid. Moreover, any sustainability criteria that may be designed would in many situations not guide us on how to spend available resources efficiently nor which project(s) to select. This is the background for the provocative statement by two of the founders of Social CBA, Little and Mirrlees (1991, p. 365): "Whether a project is sustainable has nothing to do with whether it is desirable."

It is hard to imagine any decision rule that does not involve some balancing of costs and benefits. Given this, our approach is to carefully look at the underlying concern for sustainability, and see how these can be integrated in a consistent framework for project appraisal, that is CBA. We interpret the quest for sustainable development to arise from two basic concerns:

1. A concern that current environmental degradation may seriously reduce human welfare, and the fact that present policies and practices do not take sufficient account of this effect (an *environmental* concern).
2. A concern for human welfare of the poor in both the present and future generations (a *distributional* concern)

In a broad sense, this interpretation is not new; for example, Veeman (1989) interprets sustainable development to consist of three critical sub-components: growth, distribution and environment. Policies and project appraisal practices have, conventionally, emphasized the growth component, often implicitly. The redirection suggested by the sustainability debate is to put more emphasis on distributional and environmental effects.

Generally the economic literature on sustainability tends to limit the distributional concern to *inter*generational justice. In line with the WCED (1987), we argue for the inclusion of also *intra*generational justice, i.e., the distribution *within* the present generation, in the concept for two reasons. First, our concern for the future is based on the real possibility that future generations may not enjoy the same level of welfare as the present generation. If this is so, then there should be no reason why the present generation's poor should be excluded from the same consideration. "There is something inconsistent about people who profess to be terribly concerned

[4] Due to space constraints, this paper does not address the problem of risk in project assessment. See Angelsen *et al.* (1994) for a discussion. Lind (1982) gives a comprehensive treatment of these issues based on neoclassical economic theory.

about the welfare of future generations but do not seem to be terribly concerned about the welfare of poor people today" (Solow, 1993, p. 185).

Second, most environmental problems in the Less Developed Countries (LDCs) are caused or escalated by poverty, and the unequal intragenerational distribution of resources both nationally and globally. Thus, in order to solve the intergenerational problem we must also address the present skewed intragenerational distribution.

3 Including environmental and distributional effects in CBA

The main issue in this section, deriving from the above discussion, is how to incorporate the environmental and distributional concerns in the CBA methodology. CBA is a conceptual framework for the evaluation of the social desirability of a project. The CBA procedure attempts to quantify and value different types of costs and benefits, occurring at different points in time, into one common unit, that is, the net present value (NPV). Bojö *et al.* (1990, pp. 57-58) summarizes the general understanding of the content of CBA:

> *A coherent method to organize information about social advantages (benefits) and disadvantages (costs) in terms of a common monetary unit. Benefits and costs are primarily valued on the basis of individuals willingness to pay for goods and services, marketed or not, as viewed through a social welfare ordering representing the preferences of the relevant decision-maker. The flow of monetary units over time are brought together to a net present value. Unvalued effects (intangibles) are described quantitatively or qualitatively and put against valued items.*

As there exist a large number of excellent texts on CBA both in general and as applied to developing countries, we shall not go into further details on the underlying principles of CBA.[5] One clarification may, nevertheless, be in order. Many people react against the idea of reducing the value of (the services from) the environment into monetary terms, or assume that economic criteria in themselves are biased against the environment and future generations. "A large body of people are nervous about what they think economists are up to" (Winpenny, 1991b, p. 381). Much of this fear is based on the lack of distinction between two separate issues: the present economic policies and the interests of the economic power-holders in many countries, on the one hand, and the principles of economic theory, on the other.

The use of monetary units as the unit of measurement (numéraire) does *not* imply any bias towards goods sold in a market, or a view that "money is all that counts". In principle, any numéraire could have been used, but a monetary measure is conveniently chosen as it is commonly used as a measure of value. Hence, we

[5] The methodology on Social CBA (SCBA) for developing countries was developed by Dasgupta, Marglin and Sen (1972), Little and Mirrlees (1969 and 1974), and Squire and van der Tak (1975). Ray (1984) gives a very good overview of the theoretical foundations of SCBA. Noteworthy presentations of the method also include ODA (1988) and Brent (1990).

disagree with the statement by van Pelt (1993, p. 29) that "CBA's monetary numéraire is likely to be the major obstacle to the incorporation of environmental effects in efficiency measurement under broad welfare concepts." Everything which is valued by people should, *in principle*, be included in a CBA.

Some costs and benefits are obviously more difficult to quantify, but this does not imply that they are less valuable. We have no problem realizing that *in practice* measurable costs and benefits have usually been given more attention. Besides the practical explanation regarding data availability, this also reflects an important aspect of the political economy of environmental degradation: measurable benefits of resource degradation will often be appropriated by the few (and powerful), whereas the more diffuse costs are shared by the many. While this practice does not derive any support from economic theory, it may be supported by powerful interest groups in society. It is not well founded, but well funded.

To facilitate the further discussion, we briefly outline in Table 1 below the main steps used to assess the environmental impacts of a project, using the CBA technique.[6] All the listed steps are important in the ESCBA we advocate; however, the processes in steps 4 and 5 assume greater emphasis here. Steps 2 to 4 capture our first main point that environmental effects of projects be properly identified, quantified, and valued, while step 5 accommodates the concern for inter- and intragenerational equity - our second main point.

1. Defining the alternatives (or projects)
2. Identification of the major environmental effects (costs and benefits)
3. Quantification in physical terms of the environmental effects
4. Valuation of the environmental effects
5. Weighing of the costs and benefits
    a. Between different income groups (intratemporal): distributional weights
    b. In time (intertemporal): discounting
6. Sensitivity and risk analysis
7. Modifications of the project(s) and policy recommendations

Table 1. The main steps of ESCBA.

The identification of major environmental effects (step 2) is not unique to ESCBA, but necessary for most methods. The identification of major environmental effects is not an area where economists have their comparative advantage. Their contribution here may be in the selection of which effects need to be studied further, based on preliminary estimates on their relative importance to welfare. This selection, known as "scoping" (Bisset, 1987, p. 5) will always be necessary due to resource and time constraints.

[6] Table 1 draws partly on Bojö *et al.* (1990).

The quantification in physical terms of the environmental effects (step 3) raises more difficult problems than the identification. A useful tool in the quantification process is the development of an *effect matrix*. The most well-known effect matrix is the Leopold *et al.* (1971) matrix, which is a horizontal list of development activities and a vertical list of environmental parameters. The effect matrix would often need to have several dimensions: It may be essential to differentiate between different effects in *time,* in *space*, and between different income *groups*.

Steps 2 and 3 listed in Table 1 are often referred to as Environmental Impact Assessment (EIA), though the definition of EIA varies in the literature. Some use it to cover most methodologies applicable to the analysis of environmental consequences, including CBA and economic modelling (Biswas and Geping, 1987). Others would include in EIA measures for reducing or eliminating any negative environmental impacts, the implementation of these and the monitoring of the project (Therivel *et al.,* 1992, p. 13). For the purposes of this paper we will narrow the definition of EIA to cover the identification and physical quantification of the environmental consequences of projects, while CBA covers the social valuation of these effects. This corresponds to the actual focus in the literature on EIA and CBA. The EIA term is mainly used by engineers and natural scientists, whereas economists use CBA. It also reflects an appropriate division of labour between the disciplines. The above definitions imply that EIA and CBA are not alternative but rather complementary methods: EIA should be considered as a part of the overall ESCBA process. Following Cooper (1981), we consider EIA to be a *specification technique* of environmental consequences, whereas the bulk of CBA is concerned with *valuation techniques*.

The specification techniques would not vary too much between various methods for environmental assessment, and they form the basis for any valuation to be done. Schulze (1994, pp. 197-198) states that "undervaluation of poorly understood impacts" is one of three biases of CBA. This is certainly true, but the same could be said about any method. No method could have captured the damage on the ozone layer caused by CFC emissions before science discovered the effect!

The distinction between specification and valuation techniques also reveal the main flaw with several of the methods suggested as alternatives to CBA: they do not provide a consistent method or criteria for determining which projects are worthy of implementation. The same is true for Multi Criteria Analysis (MCA), which is more to be considered as an alternative to CBA. MCA does not provide a consistent procedure on how the different criteria should be weighted together in the overall analysis. *Most alternative methods are not wrong, per se, but simply insufficient.*

One possible escape route here is for the project analyst to leave the final weighting to the decision-maker or the decision-making process. Indeed, one may argue that this is always the case in practice - results of the EIA, (ES)CBA or MCA would be but one of several inputs into the decision process. However, the EIA or MCA procedures for project selection are likely to be less consistent than if performed using a systematic application of the CBA technique. The result could be less environmental protection, less poverty reduction and/or less overall economic growth, because the weights given to these goals are likely to vary considerably between projects. The ESCBA provides a consistent framework for valuing environmental effects, and balancing the growth, distributional and environmental objectives.

3.1 Valuation of environmental effects

The valuation of environmental effects involves putting prices or social values on physical environmental changes. The prices used in CBA are *shadow prices*, which can be defined as the social value of one unit of a good, or the marginal effect on social welfare of a unit change in the quantity of the good. "Economic benefits and costs of a project can be defined only by the effect of the project on some fundamental objectives of the economy" (Ray, 1984, p. 9). If the objective is to maximize total individual welfare in society, the classical utilitarian approach, then valuation should be based on individual preferences as expressed through their willingness to pay (WTP). As such, the phrase "environmental valuation" is very misleading (Pearce, 1993, p. 4): economists "only" try to measure preferences, and thereby reveal peoples' valuation of the environment.

Market prices are often the most useful *starting point* for estimating shadow prices. To estimate shadow prices from market prices at least three modifications need to be made. First, they have to be corrected for any market distortions, that is cases where market prices do not reflect marginal valuation and marginal costs.[7] Second, estimation of prices for non-market goods must be undertaken (see below). Third, market prices need to be adjusted to give different weights to costs and benefits occurring to different groups, which has both an intra- and intertemporal aspect. This is a way to build in explicit policy objectives in the appraisal. A comparison between the ESCBA we advocate and the Multi Criteria Analysis (MCA) advocated by van Pelt (1993), reveals that the differences *in part* are only semantic. "MCA is characterized by a weighting system involving relative priorities of policy-makers or any other group affected by projects" (p. 27). On the other hand, ESCBA uses weights that are determined partly by individual preferences (as approximated through adjusted market prices) and partly by the decision-makers' preferences and priorities.

The most common valuation methods are listed in Table 2, and grouped according to the extent by which existing markets and the prices found in these can be used as a points of departure for the valuation (Bojö *et al.,* 1990). Space does not permit any detailed discussion of the various valuation methods. Winpenny (1991a), gives a comprehensive and accessible overview of valuation methods for projects in LDCs.

[7] See any standard texts on CBA for a further discussion.

1. Valuation using conventional markets
* Effect on production (EOP)
* Human capital (HC)
* Preventive expenditure (avoid damage) (PE)
* Replacement costs (restore after damage) (RC)
2. Valuation using implicit markets
* Travel cost (TC)
* Hedonic prices (HP): property value (PV) & wage differentials (WD)
3. Valuation using artificial markets
* Contingent valuation (CV)

Table 2. Overview of different valuation methods.

As Winpenny (1991a,b) rightly observes, there seems to be a negative correlation between the usefulness of the methods applicable in LDCs and the space they receive in methodological writings. The simplest methods, i.e., the Effect on Production (EOP), the Replacement Costs (RC), and the Preventive Expenditure (PE), have proven to be the most useful. These methods are able to capture most of the costs affecting the local population associated with serious environmental problems, such as soil erosion and deforestation. On the other hand, the Contingent Valuation (CV), Hedonic Price (HP), Travel Cost (TC), and Human Capital (HC) methods, while receiving considerable attention in the literature, have more limited applicability in LDCs. The CV and TC methods have been developed primarily to deal with the valuation of non-market environmental goods in richer societies, for example, recreational services which generally are highly income-elastic.

We would therefore recommend that efforts be concentrated on a more systematic application of EOP, RC and PE methods in the evaluation of environmental effects of development projects. Experimental studies of the four other methods would definitely be of interest, and of potential value in the future. As for the EOP, HC, RC and PE methods, lack of data seems to be a problem resulting mainly from the side of the natural sciences.

The weighting of the various costs and benefits should ideally provide a conclusion on the desirability of the project. Lack of or uncertain data is always a problem, especially in LDCs. The guiding rule should be to quantify and value the effects whenever reliable estimates can be made. The meaning of "reliable" would, to some extent, be based on subjective judgements. One should avoid both "*number fetishism*" (variables are quantified in spite of very unreliable data) and "*number phobia*" (variables are not quantified because they are not commonly thought of in quantitative terms).

As mentioned elsewhere in this paper, decision-makers will in the end base their conclusion on both quantitative and qualitative assessments. Even though it is hard to avoid some qualitative judgements, CBA can in a number of cases filter out either the very good or the very bad alternatives. And it is exactly in these cases that the costs of a wrong decision are highest: either to implement a very bad project, or not to implement a very good one. For projects with a NPV around zero the costs in terms of reduced efficiency in the allocation of scarce resources is relatively small. CBA cannot provide precise answers, but can give a highly useful picture of the relative merits of the alternatives (Lind, 1982, p. 24).

3.2 Distributional weights

The conventional CBA gives equal weight to marginal income changes to all individuals, regardless of their initial income. It is based on the Pareto-criterion and the Kaldor-Hicks *potential compensation* principle. This is commonly considered a pure efficiency criterion, and the equity objective of society is ignored. One should, however, note that the term "efficiency" has acquired a rather misleading interpretation in the economic literature. The term itself generally refers to the extent to which certain means attain the stated ends. Using the term without specifying the ends is therefore meaningless. The way the term is commonly used in the economics literature implicitly assumes that growth in total income (GNP) is the only objective; other goals like distribution are ignored.

It is equally misleading when some, e.g., van Pelt *et al.* (1990) label the CBA without distribution weights Economic CBA (ECBA), as opposed to SCBA. There is nothing in welfare economics saying that income changes to all individuals should be given the same weight in a welfare assessment (project appraisal), though this has been the most common practice. The term *Social* CBA is therefore in many ways inappropriate. "In the folklore of project work, the term "social" symbolizes loose thinking, and the term "efficiency" is nothing short of being a rallying cry" (Ray, 1984, p. 11). Indeed, we may put ourselves in a glass-house by using the term ESCBA, as both environmental and social considerations should have been included in CBA in any case.

The reason why distributional effects are ignored may have several explanations, one being the assumption that the issue of distribution should be left to politicians after the economists have given their advice on how to maximize total income. "Income-distributional ... aspects of any project or program, ... are not part of that package of expertise that distinguishes the professional economist from the rest of humanity", argues Harberger (1971, p. 785), one of the most outspoken defenders of the conventional approach. It follows, in this line of argument, that there are efficient policy instruments available to achieve the desired distribution. "Let's first make the cake as big as possible, and then decide on how to share it" is a basic postulate.

We believe this position is wrong for two reasons. First, there is a relationship between the size of the cake and how we cut it, so the distributional aspect cannot