



Methodological and Ideological Options

A Bottom-up Approach to Environmental Cost-Benefit Analysis

Johannes Friedrich Carolus^{a,*}, Nick Hanley^b, Søren Bøye Olsen^a, Søren Marcus Pedersen^a^a Department of Food and Resource Economics, University of Copenhagen, Denmark^b Institute of Biodiversity, Animal Health & Comparative Medicine, University of Glasgow, United Kingdom

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ABSTRACT

Cost-Benefit Analysis is a method to assess the effects of policies and projects on social welfare. CBAs are usually applied in a top-down approach, in the sense that a decision-making body first decides on which policies or projects are to be considered, and then applies a set of uniform criteria to identifying and valuing relevant cost and benefit flows. This paper investigates the possible advantages, prerequisites and limitations of applying CBA in what may be considered an alternative, “bottom-up” manner. Instead of starting out with a pre-defined policy option, the suggested approach begins with the underlying environmental problem, and then assesses costs and benefits of strategies and solutions as identified by local and directly affected stakeholders. For empirical case studies concerning two river catchments in Sweden and Latvia, the bottom-up CBA approach utilises local knowledge, assesses plans which are not only developed for local conditions but are also likely to be more acceptable to local society, and sheds additional light on possible distributional effects. By not only benefitting from, but also supporting participatory environmental planning, bottom-up CBA is in line with the growing trend of embedding stakeholder participation within environmental policy and decision-making.

1. Introduction

By accounting for market and non-market costs and benefits, Cost-Benefit Analysis (CBA) is a method to assess the effects of policies and projects on social welfare. In CBA, all costs and benefits are monetised and translated into a single number, the net present value (NPV). This index is usually interpreted in a straightforward manner: a positive NPV means that the social benefits outweigh the social costs of the assessed policy or project. Implementation of the policy or project is thus justified as it represents an efficient reallocation of resources that increases social welfare. Moreover, NPVs can be used to consistently rank a set of mutually-exclusive alternatives. Together with its theoretical foundation in welfare economics through the Kaldor-Hicks compensation test, these features make CBA a highly demanded and widely applied approach to policy and project evaluation world-wide (Hanley & Barbier, 2009). CBA outcomes are used in the policy development process and as a driver of regulatory decision-making, although rarely as the single decision criterion (Atkinson et al., 2018).

Usually, a CBA is applied as top-down approach, meaning a central decision-making body (such as a Finance ministry) issues guidance on which policies or projects are assessed, and on how the costs and benefits to society are to be identified and then measured. In this paper, we contribute to the literature by suggesting a bottom-up CBA approach as an alternative. A bottom-up CBA, we argue, allows a more informed

development of regulatory policies. Instead of starting with a policy or project option, this approach begins with an environmental problem, and then assesses costs and benefits of strategies identified by “local” stakeholders in pursuit of addressing this problem. While a top-down CBA can be used to assess the trade-offs of an already-defined set of projects or policies, the bottom-up approach takes advantage of additional case-specific knowledge, and assesses strategies which might be more likely to be accepted by the local society, and are better adapted to local conditions. For instance, drawing on local insights can provide information that is otherwise not available to decision-making bodies, and may improve the integration of wider societal goals into policy decisions (Pellizzoni, 2003; Perni & Martínez-Paz, 2013; Wright & Fritsch, 2011). Current studies also find that participation fosters trust, and increases understanding and acceptance in the project and decision progress amongst the stakeholders (Fischer et al., 2014). This can be due to the enhanced transparency when developing a decision-support tool for environmental management (Oliver et al., 2017), or when incorporating stakeholder interests into water management plans (Kochskämper et al., 2016). Moreover, bottom-up CBA facilitates disclosure and discussion of distributional concerns to be considered in policy development. Distributional concerns are not the primary focus of top-down CBA (Hahn & Tetlock, 2008), yet are seen by some as an essential factor to enhance social acceptance of policy decisions (Hall et al., 2013). By not only benefitting from, but also encouraging and

* Corresponding author at: Department of Food and Resource Economics, University of Copenhagen, Rolighedsvej 25, 1958 Frederiksberg C, Denmark.
E-mail address: jfc@ifro.ku.dk (J.F. Carolus).

supporting stakeholder engagement, bottom-up CBA is in line with the growing trend of embedding stakeholder participation into environmental policy and decision-making (Koontz & Newig, 2014; Pascoe & Dichmont, 2017), for instance in the context of water management (Michels, 2016).

Setting the system boundaries is a decisive step of every CBA and of crucial importance for the results and recommendations that are obtained (e.g. Pearce et al., 2006). System boundaries establish the terms of reference, referring to both the scope of the object of assessment (the project), and the population whose well-being should be considered. Typically, the latter consists of a national population. In the bottom-up approach, the focus is on selecting those stakeholders whose strategies and preferences in terms of an environmental problem are to be analysed. In doing so, a balance of arguments is needed to enable practical feasibility for the bottom-up approach. First, it needs to be ensured that the boundaries are set in a way that a changing environmental condition primarily affects the welfare of the population within the spatial system, while possible impacts outside the system are secondary at the most and therefore, in this context, deemed negligible. Second, the boundaries need to allow the inclusion of all groups with areas of responsibility directly connected to the environmental problem, which therefore embody these key agents who should be involved in addressing the problem. While consideration of different groups ensures the capturing of diverse interests and solution options, the inclusion of directly affected agents ensures that those who are most affected by a project get to participate in its appraisal and in implementing solutions, creating a sense of ownership to solutions which is likely to increase the chances of successful problem solving.

In this paper a bottom-up CBA approach is proposed, and then illustrated using two case studies (the Helge and Berze river catchments, located in Sweden and Latvia respectively). Local stakeholders suggested strategies to solve issues related to the supply of ecosystem services, which are commonly defined as the benefits people obtain from ecosystems (Millennium Ecosystem Assessment, 2005). Assessing effects in terms of their change in supply is widely applied in environmental planning and policy-making (Dick et al., 2018), and offers a holistic framework which has the potential to shift the awareness towards considering multiple services in decision-making (Posner et al., 2016; Stosch et al., 2017). Even though the ecosystem service approach itself is perceived as useful by the majority of stakeholders when managing water resources (Grizzetti et al., 2016b), preferences in terms of which services should be prioritised naturally differ across stakeholder groups and interests (Butler et al., 2013; Micha et al., 2018). While CBA in general is an ideal tool to reveal how different priorities and trade-offs influence the societal welfare, the bottom-up CBA also sheds light on which ecosystem services are seen as important and are thus prioritised by stakeholders in the local context.

After providing a background on CBA in Section 2, the potential role of bottom-up CBA in environmental planning, and the associated conditions to ensure its validity and practicability are outlined in Section 3. In Section 4 we empirically investigate the application of bottom-up CBA based on the two case studies, followed by the discussion of the results in Section 5. In Section 6, the circumstances under which bottom-up or top-down CBA approaches should be preferred are discussed, whilst conclusions follow in Section 7.

2. CBA and the Policy Process

In the history of CBA, opinions are divided over whether the outcome of the CBA is the decision or just an input to decision making. There has also been much discussion over whether it is the preferences of individuals (consumer sovereignty) or decision-making agents (political sovereignty) which should be relevant for decision making (cf. Banzhaf, 2009). CBAs are usually conducted in what we refer to here as a top-down approach. This means that a central decision-making body decides on the set of policies or projects to be assessed, which costs and

benefits to society are to be considered, and these impacts should be valued. For instance Arrow et al. (1996) stress that “values [...] assigned to program effects [...] should be those of affected individuals” (p. 222), yet argue that, in order to compare the evaluated regulatory decisions across multiple areas of government (e.g. health, transport, energy), there is a need of overall consistency in terms of which impacts to include and what prices to use to value them, which implies a top-down approach. This means that, even though it ensures a degree of participation due to the assumption of consumer sovereignty, a conventional CBA does not usually allow those parties impacted by the project to have much influence over the process (Pearce et al., 2006).

The influence of CBA in real-world decision-making is somewhat limited, yet is the method increasingly used as a tool to inform public policy decisions (Hahn & Tetlock, 2008; Hockley, 2014; Pearce et al., 2006). Hahn and Tetlock (2008) identify an important contribution of CBA in the process of policy development by preventing the adoption of “economically unsound regulations” (p.79) and by eliminating “obviously bad proposals” (Hockley, 2014, p. 285). Atkinson et al. (2018) have also emphasised the role of CBA within regulatory decision-making.

Besides of its straightforward interpretation and the possibility of including impacts that might otherwise be ignored (Sunstein, 2000), ex-ante CBAs come not only with a high data demand, relying on predictions of future variables and estimations of monetary values of non-market goods, but also with the equally challenging problem of quantifying the physical effects of a project. Bertram et al. (2014), amongst others, argue that closing all existing data gaps needed for a comprehensive CBA is not achievable, and that relying on current data does not resolve underlying uncertainties. Due to practical and methodological challenges of environmental valuation, Klauer et al. (2016) consider a full-scale CBA to be warranted only in a sub-set of cases. Finally, it has been observed that a “lack of participation can easily engender opposition to a project or policy, making it difficult to implement and costly to reverse”, while greater “[p]articipation may ... produce better policy and project design” (Pearce et al., 2006, p. 285). However, top-down CBA does not do much to encourage such participation. An alternative way would be the use of a bottom-up CBA approach. By extending the conception of consumer sovereignty, it is possible to take on board not only the preferences or choice of affected individuals regarding the valuation of impacts, but also regarding their preferences in terms of strategies of how these impacts can be best managed.

3. An Alternative: “Bottom-Up CBA”

Instead of starting with a policy decision, a bottom-up approach analyses the “multitude of actors who interact at the operational (local) level on a particular problem or issue” and focuses on the “strategies pursued by various actors in pursuit of their objectives” (Sabatier, 1986, p. 22). Such problems or issues therefore serve as the starting point of a bottom-up approach, and thus determine the relevant actors. Being commonly accepted as one component in environmental planning (Human & Davies, 2010; Koontz & Newig, 2014), the benefits of including local stakeholders in policy planning processes go beyond its democratic value and the possibilities of describing societal values in an improved way (Beierle & Konisky, 2001; Fischer et al., 2014). There is evidence that bottom-up approaches may result in advantages in terms of information and implementation. These merits can for instance emerge due to the increased transparency of such a participatory process (Oliver et al., 2017), or due to harnessing local knowledge, information that may otherwise not be available to decision-makers (Perni & Martínez-Paz, 2013), which in turn enhances innovation, effectiveness, acceptance or trustworthiness amongst stakeholders (Beierle & Konisky, 2001; Graversgaard et al., 2017; Ostrom, 2010). Participatory planning is also in line with political guidelines such as the Water Framework Directive or Principle 11 of the Convention on Biological Diversity (Convention on Biological Diversity, 1993; European Commission, 2003).

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