CHAPTER 21

Incorporating Costs and Benefits of Biodiversity Conservation into Economic and Policy Decision-Making Processes

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INTRODUCTION

Biodiversity conservation is a resource allocation problem. That is to say, the preservation of biodiversity is part of the general problem of allocating the economy's resources between competing ends like the protection of genetic resources, habitats, species and ecosystems versus agriculture and industrial development. Biodiversity policies are a set of operational objectives and measures in conservation by which the overall efficiency objectives can be attained.The aim is to remove inefficiencies in the provision of biodiversity benefits to society sustainably.

Most public activities not directly concerned with biodiversity have considerable effects and important consequences, positive or negative on the resilience of different ecosystems. The examples include irrigation schemes, hydro-electric power stations, dams and many productive activities. On the other hand, where biodiversity is taken into consideration, like in the gazetting of protected areas in Africa, it has always involved the exclusion of indigenous people and the prohibition of resource use (Pimbert and Pretty, 1994). This has been on the presumption that as little influence as possible is desirable for conservation. This led to eviction and the imposition of state controls which is a significant burden on the affected communities because of their dependency on protected areas for their livelihood and welfare. In some cases, some communities were forced to undergo not only economic hardships, but also difficult social and cultural adjustment processes (Gihmire, 1994). For example, Turnbull (1972) states that the IK ethnic group, expelled from Kidepo National Park in north-eastern Uganda, experienced almost total social collapse.

Many designated protected areas are suffering from encroachment and conflict, (Wells, 1992). Where there are fewer economic alternatives, the local communities may have no choice, but continue to use resources illegally once those outside the protected areas have been depleted. Increased economic insecurity also generates extreme antipathy and conflict towards official conservation measures. Open protest and rallies against protected areas, attacks on park guards, poisoning of animals and deliberate destruction of forests have become a common experience in developing

countries (Pimbert and Pretty, 1994. Talbot and Olinso, 1990; Gadgil and Guha, 1992; Steinberg, 1993).

Pressure on any remaining resources outside the protected area is a direct result of exclusion. Parks therefore become "islands" in a sea of incompatible land usage (Bwindi Impenetrable Forest National Park (BINP), Mt. Rwenzori and Elgon National Parks are examples). This can be detrimental to biodiversity conservation in the long-term, since surrounding degraded habitats can limit gene flow, alter nutrient flow and water cycles and produce regional and global climate change that may ultimately lead to the disappearance of these "islands" parks, (McNeely, 1994).

Brandon, (1995) has stated that it is neither politically feasible nor ethically justifiable to exclude people with limited resources from protected areas without providing them with alternative means of livelihood. Otherwise, attempts to conserve biodiversity to the exclusion of the local community are expensive and unsuccessful and will continue to fail (Baranga, 1994; Wells and Brandon, 1992). Therefore the restoration of the balance between nature and people should be taken into account as the starting point of future conservation efforts. To achieve this, cost benefit analysis (CBA) as a tool for decision-making is essential in biodiversity conservation and policy formulation. The requirements for CBA are such that the costs and benefits of each action have to be evaluated, assessed, and accounted for, bearing in mind the various stakeholders, including women. Women in Africa are important in food production, natural resource management and economic systems, and are therefore a major stakeholder whose efforts and knowledge in biodiversity conservation are not appreciated. The reason is partly because, their contribution may not always be obvious and yet they do play a critical role in their respective communities.

This presentation gives the justification for CBA, the steps to follow in cost benefit analysis of programmes, policies and projects and the boundaries of economic appraisal. Fundamental issues that constrain cost benefit analysis and how they should be handled at policy level are discussed at length. These include discounting; irreversibility; future generations; sustainability; risk; and uncertainty.

Justification for CBA of Biodiversity

Cost benefit analysis has a utilitarian foundation. The 19th century British Philosopher, Jeremy Bentham, summarised the criterion for judging rightness of an action as "the greatest good of the greatest number". In the context of biodiversity, a fundamental objection to utilitarianism is its anthropocentrism that people, and only people count. Thus, the fate of every species, habitats and ecosystems depends

exclusively on its contribution to the well-being of people. In this case, the costs and benefits in economic terms are defined according to the satisfaction of wants or preferences. A benefit is supposed to increase human well-being and a cost reduces it. CBA functions on the basis that a "better" allocation of resources is one that meets people's preferences (wants). While some people object morally to this anthropocentrism, a conservation programme in which benefits to humans exceed the total cost to humans is more likely to succeed than one that does not pass a cost benefit test. A second fundamental objection is that the quantification and valuation required for cost benefit analysis cannot be done.

It is therefore, necessary that biodiversity conservation and planning goals are in harmony with society's economic objectives. CBA as a tool in decision-making can be useful in the following policy areas:

a. appraisal of projects or policies for biodiversity conservation;

b. appraisal of and design of projects whose primary objectives are not for biodiversity, but which nevertheless may have significant impacts;

c. it is necessary in framing biodiversity policies or legislation with the objective of directing limited resources into conservation;

d. provides a useful framework for consideration of the issues involved and therefore helps in resolving conflicts in decision-making. This reduces the dimension of the problem;

e. ensures that the rational design of development projects is the rule rather than the exception. In other words, incorporating the effects of a project on biodiversity into the CBA at the very beginning is likely to harmonise the economic and biodiversity goals in addition to maximising social benefits.

f. it creates an awareness of the causes of biodiversity loss and their inclusion into the CBA. This enables decision-makers to identify a socially superior project design which increases the well-being of society.

Steps in the application of CBA in decision-making

It is possible to identify numerous policy alternatives. The difficulty that arises thereafter is the need to keep the decision problems ??? manageable and yet at the same time be able to formulate them so that relevant options are chosen. In CBA, the formulation of decision alternatives are an important phase which may become

intertwined with the evaluation process itself. The CBA has to bring about an allocation of resources that will reflect and balance all of the different objectives of a project. The following have to be considered when CBA is used in decision-making and setting of policies:

a. Setting of clear CBA objectives

Once the use of CBA has been decided on, the objectives have to be clearly defined. This is important in the formulation of and choice between options.

b. Considerations of options

The purpose is to have clearly defined alternative options. A range of technically, managerially and politically feasible options is compared with the "with and without" scenarios rather than the "before and after" situation. This permits the choice of a socially optimal biodiversity conservation project.

c. Specification of effects of each option

The impacts arising from each option have to be identified and specified systematically. The specification of impacts on biodiversity from a project is a problem area in CBA. These impacts can be captured through Environmental Impact Assessment (EIA), which should not only capture the biodiversity indicators but also social and physical indicators. Quantitative estimate of the effects of these changes on receptors like humans, animals, wildlife, vegetation, etc., and the impact on human welfare should also be specified. Some impacts on biodiversity are easy to predict. For example, resource requirements for each option could be estimated from technical specifications in terms of land, labour, capital and equipment for each year of project duration.

d. Evaluation of effects of each option

The evaluation process involves quantification. Quantification forces policy-makers to be explicit about the nature and magnitude of benefits and costs associated with alternative polices. It also creates pressure towards and provides resources for systematic data collection. Even if it fails to improve decision-making in the short-run, it increases the knowledge base upon which future policy decisions depend.

For projects whose primary objectives are not impacting on biodiversity, valuation procedures of standard inputs and outputs of the project are straight forward because market prices are used. However, where inputs and outputs do not reflect

true scarcity of resources, shadow pricing or accounting prices are used in the valuation procedure. Shadow pricing is the process of deriving prices for a good or service when there is no monetised market or when the market fails to price goods based on their true value. The following three relationships between market and shadow prices are possible:

(i) the market price exists and reflects willingness to pay (WTP), in which case market prices and shadow prices are the same;

(ii) market prices exist, but due to market imperfections or distortions, they do not reflect willingness to pay and therefore shadow pricing is necessary;

(iii) no market prices exist, but market prices for similar goods and services might help in determining shadow prices.

The evaluation of use values of biodiversity such as ecotourism or new prescription of drugs may be inferred from spending patterns. For example, how much do people spend to travel to Uganda to see the Mt. Gorilla in its native habitat? How much does society spend on preventive health care? However, measuring potential use value is difficult because it requires predictions about which species will be useful and how highly that use will be valued. Whereas the determination of use values is difficult, measuring non-use values associated with biodiversity poses even greater challenges. These values include the satisfaction derived from the fact that the Mt. Gorilla is saved from extinction or the sense of knowing that Bwindi Impenetrable Forest exists. Non-use values are not manifested even indirectly in peoples lives.

e. Elimination of less desirable options

This phase in CBA depends on the nature of the project, the number of technically feasible options for each component of the project and how well the objectives of the project are defined.

First, if the objective of each option is well-defined and the available technology limits the options to one or two other than that of no option, then the analysis takes on a relatively sophisticated level and decisions may be reached quickly.

Second, when dealing with projects whose objectives are rather broader and perhaps less amendable to precise definition or contain a number of components that are independent of the rest of the project, then a detailed examination is impossible.

Finally, the number of options can gradually be reduced by increasing further analysis. The collection of more information through research may lead to the emergency of main options. CBA in such situations is regarded as a closed loop from which a final decision will eventually be made.

f. Decision made

Through consultation with the decision-makers, options or alternatives that closely attain the stated conservation objectives of biodiversity are chosen. However, some areas will remain that cannot be captured in the CBA for either ethical or technical reasons. One of the principal uses of the CBA tool is to weigh the benefits against costs of an action. For example, a close analysis of the costs and benefits of Uganda's protected area could be demonstrated by deriving the sum of all benefits less the sum of all costs (Howard, 1995), which can be summarised as:

NBPAs =GBDUM +GBDU/NM + GBM + GBO -CM -CLO

Where

NBpm = Net benefit to society of maintaining Uganda's protected areas
GBDU1/M = Gross benefits derived from direct use of marketed products
GBDUINM = Gross benefits derived from direct use of non-marketed products
G13ju= Gross benefits derived from indirect uses
G13Nu= Gross benefits derived from non-use (option and existence) values
CM = Costs of Management
CLO= Costs of protection, in terms of lost opportunities for alternative development

BOUNDARIES OF ECONOMIC APPRAISAL

The problem arises from the differences in the way costs and benefits are valued by individuals, private firms and society as a whole. For example, in the forest sector, benefits from the sale of timber, fuelwood or other marketable products accrue to private owners or individuals. These are the only incentives for private investment. Benefits such as watershed protection are critical for enhancing social welfare, but there are no incentives for including these considerations in private decision-making. Furthermore, whereas the private owners are concerned with costs that affect their profit, the public on the other hand considers costs of downstream siltation, loss of biodiversity, habitats, ecosystems and soil fertility. Society and individuals therefore view costs and benefits in completely opposite terms. This may explain why Wells (1992), basing his analysis from an economic perspective argued that the underlying causes of blodiversity loss are due to the imbalance in

costs and benefits of biodiversity conservation at the global, national and local levels. This argument is showed by McNeely (1994); Durbin (1994); Steinberg (1993); and Gihmire (1994) among others. How the imbalance arises is shown in Table 1 below.

Table 1

The Benefits and Costs of Protected Areas at Three Spatial Scales

	Significant costs	**Significant benefits**
Local	Opportunity costs e.g. loss of access	• Consumptive benefits e.g. resource collection
	Indirect costs e.g. crop damage	• Recreation/Tourism • Future values
National	Opportunity costs e.g. opportunity foregone to use land for other purposes	• Recreation/Tourism • Watershed values • Future values
Global	Minimal costs	• Biological diversity • Non-consumptive benefits e.g. existence of wildlife • Ecological processes e.g. the protection of international river basins, climate modification; • Education and Research • Future values

(Source: Wells (1992, p 241)

Table 1 above shows that, whereas most of the benefits from conserving biodiversity are global, most costs are borne nationally and locally. At the national level, the costs named are those related to the management operations, and the opportunity costs if there is a land shortage (referring to the foregone opportunities to develop the area for alternative purposes such as agriculture or hydro-power). At the local level, the costs include loss of access to forest resources, and opportunity costs associated with foregoing the opportunity to use the land for agriculture or timber harvesting. This is more felt in areas with high population density and land insecurity as is the case in Mt.Elgon and Rwenzori national parks, Kibale and

Bwindi Impenetrable National Parks in Uganda where consumptive benefits from grazing, hunting and collection of products are prohibited in all parks.

The relevancy of Wells, (1992) economic approach to the understanding of the imbalance of costs and benefits is that it helps at the time of appraisal of biodiversity conservation projects or new policies the identification and distribution of costs and benefits. This enhances improvement in decision-making by exposing real costs and benefits for certain courses of action previously carried out in a false belief that biodiversity is not important or the environment is "free". During the appraisal of projects, the following should be taken into account:

a. who are the gainers and losers from an action, policy or project?
b. are the various socio-economic groups clearly understood and defined?
c. what market distortions might bias the decision-making process? If any distortions occur at all they should be highlighted and where possible corrections are made accordingly;
d. what conditions encourage sustainable use of biodiversity that have to be promoted?

The growing concept of sustainability implies that the utilitarian cost-benefit analysis paradigm commonly used in conventional economic analysis has to be modified. The modification has to allow the integration of concepts like discounting, sustainability irreversibility effects, risk and uncertainty and future generations so that decision-makers make well-informed decisions.

Discounting

The project costs and benefits are normally spread over time. This is achieved by applying discounting to adjust all transactions to the present, so that they are comparable (Price, 1989). Economists use discounting to allocate resources to activities with the highest returns. Discounting:

a. is away of comparing projects with different time-scales;
b. is a way of taking into account time preferences of governments/ society and individuals, and;
c. discriminates projects according to their profitability.

In discounting, a discount rate is used to represent the implied time preference held by an individual or by society as a whole. The discount rate to use for a particular analysis is a very controversial issue. Private firms have a higher discount rate than society as a whole. The reason is attributed to the need to avoid the risk of waiting

to receive benefits. Society may be willing to spread out benefits over time, in spite of the assumption that doing so entails greater risks. Society in this case may be in a better position to pool risks from a large number of independent projects. To add to the complication, poor rural communities and mostly women have often a very high discount rate. The immediate pressures from hunger and poverty force people, particularly women to forgo possible benefits from a forest in order to provide goods they need for immediate survival such as food, fuelwood and fodder (Panayotou, and Aston, 1992). For policy purposes, these projects whose benefits will not be realised until the distant future, and which would be heavily discounted, can be dealt with by considering the following:

a. attempting to quantify and value biodiversity resources as much as possible;

b. highlighting important biodiversity values (not quantified) left out in the discounting process;

c. establishing a sustainability criterion to enhance the decision-making process. This overcomes the problem of choosing which discount rate to use because economists have had a long running debate over whether discount rates should be lowered and if so, how large should the reduction be (Grainger, 1993).

Sustainability criterion

The concept of sustaianability criterion applies to the use of critical and renewable natural capital. Biodiversity is a component of critical capital, which are resources essential to life and cannot be substituted, or replaced by manmade capital. Therefore it could be exploited to extinction. On the other hand, natural capital (renewable resources) which includes forests, soil fertility etc. are resources which can be partially replenished or substituted by manmade capital. Any decisions made should be for sustainable-use management like ecotourism and multiple use. Where communities, most especially women, have been the beneficiaries of the resources, shadow projects could be put in place. Shadow projects are a special case of replacement costs in which the expected damage from an activity is offset by inclusion of a project that would replace the lost benefits. For example, the establishment of ethno-botanic gardens in on-farms so that the desirable resources once accessed in the forests or wetlands is available to the affected communities. During project design, compensatory projects like village women co-operatives for arts and crafts promotion and ectourism are built in. Where certain projects displace local communities like the case of Kibale national park, actual compensation could be made to the losers by the gainers by resettling them somewhere else.

Irreversible effects

The outcome of undertaking an action without knowing for certain what will happen may create irreversible consequences (Pearce and Turner, 1994). For example, the elimination of species, habitats and ecosystems leads to biodiversity loss. Once extinct, we cannot recreate them and neither can we be certain of what happens if continued loss of biodiversity occurs. This is particularly felt if the loss sets in chain cumulative processes or permanently alters the state of nature. Under such circumstances, irreversible decisions carry a cost, which increases over time. A project with major irreversible processes requires serious thought as to whether or not to proceed at all. The way out is to measure the cost of not proceeding in terms of the benefits that would be foregone (opportunity cost), by abstaining from the proposed developments (MUIENR, 1994).

Risk and uncertainty

Risk and uncertainty are often used interchangeably. Risk is an event with a known probability, whereas uncertainty is an event with an unknown probability (Constanza, 1993; Affinadula and Sikoyo, 1996). The reality of life is that we do not know what the consequences of undertaking a particular project would have on biodiversity or other stakeholders like women, whose role in most African societies is not appreciated. The reasons for this include the lack of understanding of how ecological functions work and rnan-made substances interact with the environment. Individual behaviour often indicates an aversion to risk, while for governments or society, the cost of risk disappears because it is shared among many individuals. However, because of the public nature of the goods provided by the environment (biodiversity), the risks cannot be shared in the way that is possible in many projects. And government or society would prefer that private decisions made should display an aversion to risk. For policy reasons, it is necessary that the risk probability and severity of damage could be used to determine an expected value of potential costs, that would be used in CBA. The risk probability may be used to devise an insurance scheme to protect against the risk. The expected value of costs or insurance against an eventuality cannot be estimated because the increasing scale of human activity, complexity of environmental and ecological systems, and lack of knowledge of how these systems might be affected all emphasise the need to deal with uncertainty more explicitly. It requires a cautious approach. The way to incorporate uncertainty considerations in project level analysis would be to:

i. invest in collecting more information. This is not always possible or cost-effective in the course of the standard project life cycle;

ii. conduct sensitivity analysis (SA) to determine the variables that are most important to the success or failure of the project;

iii for variables that are likely to contribute to the success of a project, sensitivity analysis highlights the variables that require scrutiny, either in the course of seeking further information for the project or during project implementation.

The issue of risk and uncertainty play an important role in the valuation of biodiversity and policy formulation. Option value is the premium that consumers are willing to pay to avoid the risk of not having something available in the future. Quasi-option value on the other hand is the value of preserving options for future use in the expectation that knowledge will grow over time. For example, the indiscriminate destruction of forests leading to loss of biodiversity reduces the chances of gaining knowledge through the expansion of knowledge in the future.

Other important sources of uncertainty linked with environmental issues include uncertainty over land tenure, which leads to deforestation and unsustainable agricultural practices and uncertainty of resource rights. Policy-makers could institute land reforms that take into consideration the role of women in land ownership and resource management.

Future generations

The constant capital rule for sustainable economic development requires the adoption of an explicit equity (justice) and asset transfers across people and through time. The ethical argument is that future generations have a right to expect an inheritance (in the form of natural capital/human capital bequests) sufficient to allow them the capacity to generate for themselves a level of welfare no less than that enjoyed by the current generation (Pearce and Turner, 1994). This calls for an inter-generational social contract that guarantees the future the same "opportunities" that were open in the past (Page 1982).

The implication above is that today's generation has an obligation to future generation and that traditional forms of ethical reasoning and decision-making (cost-benefit analysis) must be broadened. The utilitarian cost-benefit paradigm therefore has first to be modified to allow for inter-generational equity, (Barbier, 1992). Therefore during appraisal, the impact a project will have on environmental assets, such as critical natural capital (biodiversity), which are substitutable and have to be conserved, may also be introduced as constraints on cost-benefit analysis. The functioning of the economic system before making a decision as to whether to invest in the project or not has to be looked into. There should be a moral

imperative to care for the next generation, even though it cannot readily be interpreted in terms of utilitarian gains and loses. The decision not to invest in certain projects that do not account for future generations due to environmental reasons might have to be borne by the current generation at a higher cost in order to maintain the environment.

CONCLUSION

Projects analysed using traditional cost-benefit analysis often seek to know the contribution that a particular project makes to a country's economy without considering the widespread long-term effects it may cause to biodiversity. Therefore, for the formulation and implementation of effective policies, it is necessary that biodiversity concerns are incorporated into the cost-benefit analysis framework. The objective would be to design incentives and measures that reduce or enhance negative or positive project impacts, respectively. The analysts and policy-makers have to ensure that fundamental issues such as discounting; sustainability; irreversability; risk and uncertainty; and future generations are introduced as constraints on cost-benefit analysis.

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