LAKE VICTORIA BASIN COMMISSION

GUIDELINES FOR THE RAPID ECONOMIC VALUATION OF BIODIVERSITY AND ECOSYSTEM SERVICES

USAID
FROM THE AMERICAN PEOPLE

SEPTEMBER 2014

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The guidelines were prepared by Tetra Tech and Land Trees and Sustainability Africa (LTSA). Tetra Tech and LTSA thanks all those who participated in preparation of this training guidelines. Special thanks goes to Lucy Emerton, the consultant who developed and wrote the guidelines. The aim of the guidelines is to provide training on biodiversity and ecosystem valuation and supporting the development of Conservation Investment Plans (CIPs) for biologically significant areas in Lake Victoria Basin.

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LIST OF ACRONYMS

BSA	Biologically Significant Area
CIP	Conservation Investment Plan
EAC	East African Community
MEA	Millennium Ecosystem Assessment
NGOs	Non-Governmental Organisation
NPV	Net Present Value
PIN	Project Identification Note
PRA	Participatory Rural Appraisal
PRE-PARED	Planning for Resilience in East Africa Through Policy, Adaptation, Research, and Economic Development
RRA	Rapid Rural Appraisal
TEEB	The Economics of Ecosystems and Biodiversity
TEV	Total Economic Value
WTA	Willingness to Accept
WTP	Willingness to Pay

1 INTRODUCTION AND OBJECTIVES

These guidelines contribute towards the USAID-funded Planning for Resilience in East Africa Through Policy, Adaptation, Research, and Economic Development (PREPARED) project. Their objective is ***to elaborate a step-wise approach for the rapid economic valuation of biodiversity and ecosystem services in biologically sensitive areas (BSAs) of East Africa, to be used to help justify the Conservation Investment Plans (CIPs) being developed under the PREPARED project.***

Under the PREPARED project, CIPs are being prepared for selected BSAs in the Lake Victoria Basin. Targeted at potential donors and investors, CIPs present key conservation activities as a set of bankable investment packages, aiming to mobilise new funding flows and fill critical financing gaps. Information about the economic value of biodiversity and ecosystem services at each site – and hence the economic return on investing in conservation – provides a key part of the business case and economic justification for the CIP.

The guidelines also address important issues relating to biodiversity and ecosystem valuation information, capacity and approaches. Little or no information is available on the economic value of biodiversity and ecosystem services – in the BSAs, or in East Africa more generally. The technical capacity of most conservation planners and managers in the region to undertake biodiversity and ecosystem valuation also remains undeveloped. At the same time, many of the methods that are commonly used to value biodiversity and ecosystem services are overly complex in terms of their data and analytical requirements and are primarily geared towards an academic audience, rather than being targeted at supporting real-world conservation planning processes. There is clearly a need to strengthen national and regional technical capacity for valuation in East African Community (EAC) countries, to build approaches and methods that can be applied in situations where time, resources and expertise are scarce, and to generate practical and policy-relevant information to feed into and strengthen conservation planning.

The current document aims to help to overcome these constraints.

The guidelines feed into two other project activities. First, as already explained above, they are intended to be used to generate information to be included in the CIPs. It should be noted that a set of guidelines have also been produced under the PREPARED project to guide the development of CIPs, which should be used in conjunction with the current document. Second, they are expected to serve as the basic manual for a training course on the economic valuation of biodiversity and ecosystems which will be held by the PREPARED project. This training course aims to equip CIP development team members and other EAC Partner State experts with an awareness and understanding of the general principles and applications of biodiversity and ecosystem valuation for conservation planning.

To these ends, the guidelines first of all describe the basic **conceptual framework** that underpins economic valuation, and explains the terminology and approaches which are subsequently used in the guidelines. After giving an **overview of steps** in the rapid valuation of biodiversity and ecosystem services, the guidelines go on to provide guidance on the various **tools, techniques and templates** that can be used at different stages of a rapid valuation exercise: when setting its scope and focus, estimating values, investigating costs and benefits, and communicating findings. The report has an annex that presents a reference list of selected **toolkits and manuals** on biodiversity and ecosystem valuation, encompassing a variety of different themes and habitat types.

The primary audience for the guidelines is the CIP development team members who will be carrying out rapid valuation exercises in BSAs, and any other consultants or technical specialists who might be hired to assist them. It is also hoped that the guidelines will serve as a resource that can be more widely used by project partner institutions and experts in the region to undertake rapid biodiversity and ecosystem valuation exercises and to generate information for conservation planning.

It should be noted from the start that the scope of the guidelines is fairly narrowly circumscribed. The guidelines are limited to the topic of how to ascribe a monetary value to biodiversity and ecosystem services. They are primarily concerned with **making the economic or business case for biodiversity, by articulating the economic benefits associated with conservation and/or the economic costs associated with ecosystem degradation and biodiversity loss.**

The guidelines do not extend to **the identification and design of economic policy instruments for conservation,** as would usually be the case in the economic assessment of ecosystems and biodiversity. Most importantly this includes assessing needs, niches and opportunities to capture or redistribute economic costs and benefits as economic incentives and financing mechanisms for conservation. As such the guidelines should be understood to deal only with the first stages of an economic valuation process, and to relate mainly to the use of valuation to generate information for awareness and advocacy purposes.

2 CONCEPTUAL FRAMEWORK: ECOSYSTEM SERVICES, HUMAN WELLBEING AND ECONOMIC VALUE

The basic aim of valuation is to facilitate more equitable, sustainable, inclusive and better-informed decision-making. It provides a way of articulating in monetary terms the economic importance of biodiversity and ecosystem services for human wellbeing. This chapter describes the conceptual frameworks that can be used to understand and trace these linkages, and which underpin ecosystem valuation. It explains key terminology and approaches which are subsequently used in the guidelines.

WHY UNDERVALUATION IS A PROBLEM

Undervaluation of biodiversity and ecosystem services continues to pose a serious problem for both conservation and development planning. Land, resource and investment decisions have traditionally been based on a very narrow view of environmental values: primarily the commercial earnings associated with the extractive utilisation of natural resources and conversion of wild habitats to "productive" uses. These sources of income however represent only a small proportion of the total value of natural ecosystems, which generate economic benefits far in excess of just physical products or marketed commodities. Confining concepts of economic value to these benefits alone constitutes a huge underestimation – both of the economic worth and opportunities that are associated with the natural environment, and of the diversity of stakeholders that depend on environmental goods and services that stand to be affected by changes in their status.

Undervaluation has a number of implications for what is considered the "best" or "most profitable" development choices. Most cost-benefit analyses, investment appraisals and other economic calculations that are used to inform decision-making remain fundamentally incomplete — and thus misleading in their conclusions as to the relative costs, benefits and returns to alternative uses of land, resources and investment funds. It is hardly surprising that, as a result, decision-makers have perceived there to be few economic benefits associated with the conservation of natural ecosystems, and few economic costs attached to their degradation and loss.

At the policy level, too, undervaluation has often served to hasten processes of environmental degradation and loss — for example through subsidies to industry and intensive agriculture, tax breaks and fiscal inducements to "reclaim" natural habitats, and low or non-existent environmental penalties and fines. Perhaps most serious are the effects on the markets, prices and incentives that producers and consumers face, and which shape their economic opportunities and decisions. It frequently remains more profitable (or less costly) for people to engage in economic activities that degrade biodiversity and ecosystems — even if the costs and losses that arise for other groups, or to the economy as a whole, outweigh the immediate gains to the landholder, resource user or investor that is causing the damage.

Another serious consequence of undervaluation is manifested in the shortage of financing and investment funds. Conservation tends to be given an extremely low budgetary priority as compared to those sectors which are considered to be more "productive", or to make a greater contribution to development and economic goals. It is also difficult to mobilise private capital and investments. Many of the incentives afforded to other sectors of the economy have typically not been not extended to 'ecosystem-friendly' products, technologies and activities. At the same time, markets and prices simply do not exist for many ecosystem services, meaning that it is impossible for land managers and investors to fully capture the considerable economic opportunities and potentials that their conservation offers.

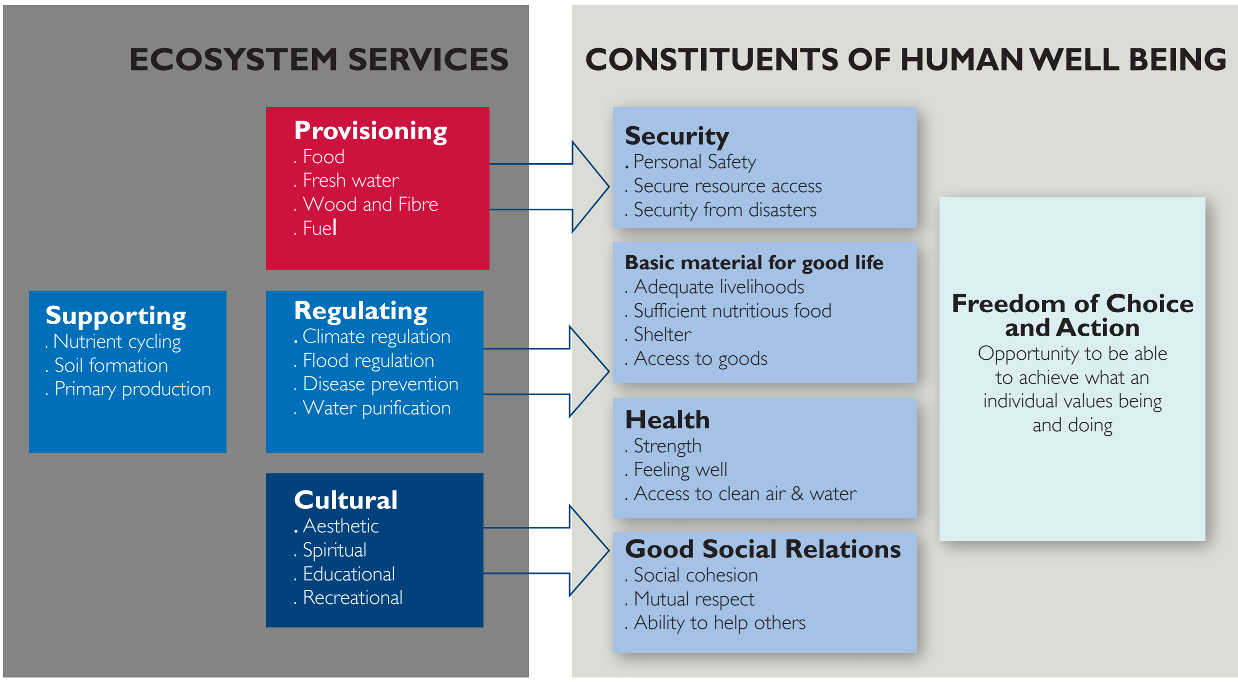
If it is assumed that biodiversity and ecosystems have no value, then such policies, decisions and market signals are perfectly rational from both a financial and an economic point of view. Should there be seen to be few benefits associated with the conservation of biodiversity and low or zero costs attached to its degradation and loss, then there would be no advantage to be gained from considering ecosystem values in either public or private decision-making. The reality is however not that biodiversity and ecosystems have no economic value, but rather that this value is poorly understood, rarely articulated, and as a result is frequently omitted from decision-making. Decisions have tended to be made on the basis of only partial information, thereby favouring short-term (and often unsustainable) development imperatives or leading to conservation and development choices that fail to optimise economic benefits. At the worst, a substantial misallocation of resources has occurred and gone unrecognised, and immense economic costs have been incurred.

Economic valuation can provide a powerful tool for placing biodiversity (and the actions and actors that secure its conservation) on the agenda of planners and decision-makers. Its basic aim is to determine people's preferences: how much better or worse off they would consider themselves to be as a result of changes in the supply of ecosystem services. By expressing these preferences, and relating them to measures of human well-being, valuation aims to make the natural environment directly comparable with other sectors of the economy when investments are appraised, activities planned, policies formulated, budgets allocated, or investment, land and resource use decisions are made. Although calculating the economic value of ecosystems does not necessarily favour their conservation and sustainable use, and economic criteria are only one set of factors among many in decision-making, it at least permits them to be considered as economically productive systems, alongside other possible uses of land, resources and funds.

CATEGORISING ECOSYSTEM SERVICES AND ECONOMIC VALUES

The last decade has seen a shift in the way that the natural environment is conceptualised. In particular, the publication of the Millennium Ecosystem Assessment (MEA) in 2005 has spurred a much greater awareness of the links between ecosystem services and human wellbeing.

Figure 1: Ecosystem services and human wellbeing



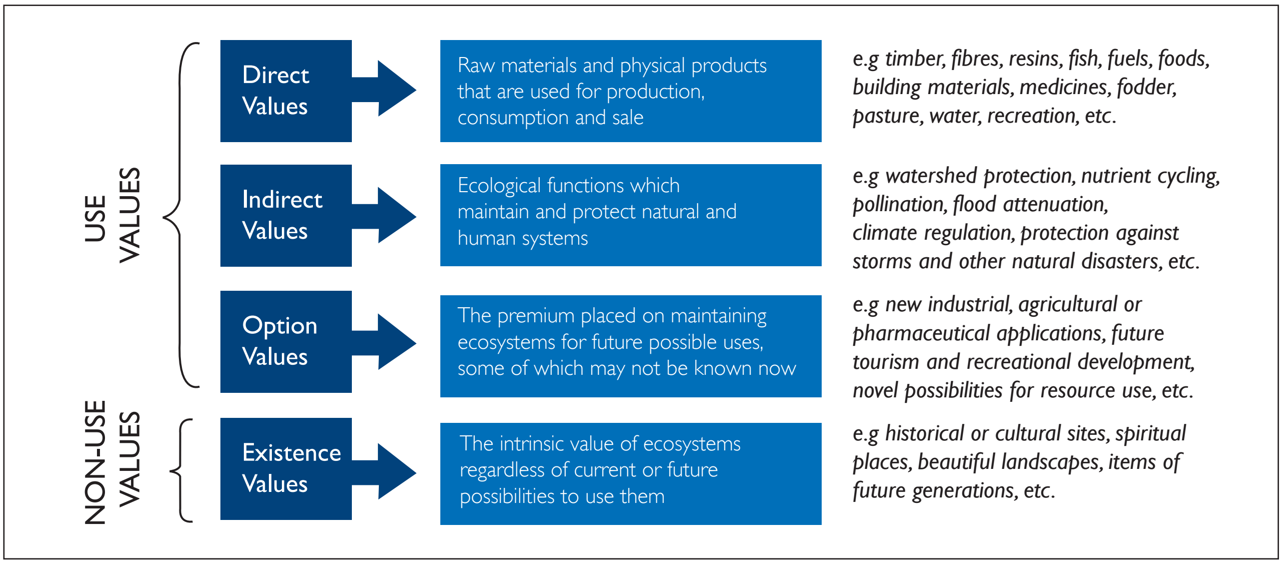
Source: adapted from Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington DC

The MEA defines ecosystem services as "the benefits people obtain from ecosystems[1]". It groups them into four basic categories: provisioning, regulating, cultural and supporting services. Together these generate not just products and raw materials, but also the primary productivity and vital life support services that are critical to human wellbeing and to the functioning of the economy (Figure 1). It is now commonplace for conservation planners and policy-makers to conceptualise ecosystem services in these terms. Understanding these linkages is also an important first step in biodiversity and ecosystem valuation.

The way in which biodiversity and ecosystem values are understood has also undergone a broadening in perspective. Over the last two decades, Total Economic Value (TEV) has become the most commonly-used framework for identifying and categorising environmental values. The major innovation of TEV is that it extends beyond the marketed and priced commodities to which economists have conventionally limited their analysis, and considers the full amount of economically important goods and services associated with ecosystems (Figure 2). Importantly, it takes account of the non-market values that have traditionally been omitted from economic and financial decision-making. Looking at the TEV of ecosystems involves considering their complete range of characteristics as integrated systems – resource stocks, flows of services, and the attributes of the ecosystem as a whole, including:

- **Direct values:** the raw materials and physical products that are used directly for production, consumption and sale such as those providing income, energy, shelter, foods, medicines and recreational facilities.
- **Indirect values:** the ecological functions that maintain and protect natural and human systems such as regulation of water quality and flow, flood control, micro-climate stabilisation and carbon sequestration.
- **Option values:** the premium placed on maintaining a pool of species and genetic resources for future possible uses, some of which may not be known now, such as leisure, commercial, industrial, agricultural and pharmaceutical applications and water-based developments.
- **Existence values:** the intrinsic value of ecosystems and their component parts, regardless of their current or future use possibilities, such as cultural, aesthetic, heritage and bequest significance.

Figure 2: Total economic value of ecosystem services



Source: adapted from Emerton, L., and Bos, E. (2004) VALUE: Counting Ecosystems as Water Infrastructure. IUCN — The World Conservation Union, Gland.

1 Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington DC.

Each of the categories of TEV correspond to a different component of the MEA framework: direct values to provisioning services, indirect values to supporting and regulating services, existence values to cultural services, and option values potentially cross-cutting all four categories of ecosystem service.

THE BIGGER PICTURE: IDENTIFYING, ESTIMATING AND CAPTURING BIODIVERSITY AND ECOSYSTEM VALUES

Ecosystem valuation is not an end in itself, but rather a means to an end: better-informed, more inclusive, equitable and sustainable conservation and development decisions. One important application of ecosystem valuation is to present a justification, or "make the case" for, biodiversity conservation – this is the focus of these guidelines. By demonstrating the values (and, by implication, the stakeholder groups and sectors) that have traditionally been marginalised in decision-making, it aims to present a fuller and more accurate picture of the economic consequences of making particular choices about how to use lands, resources and investment funds. The intention is to articulate the high economic returns and value-added that can be gained from conserving biodiversity and, conversely, the economic costs, losses and damages that will arise if biodiversity is degraded and lost. This is, in effect, what the PREPARED project seeks to do as part of the CIP development process.

Even though it lies beyond the scope of the current guidelines, it is however important to recognise that valuation would not usually stop at coming up with monetary estimates of how much biodiversity and ecosystems are worth. Most economic assessment processes would go on to look at how information about the nature and distribution of these benefits and costs can be used to guide development conservation solutions in the real world.

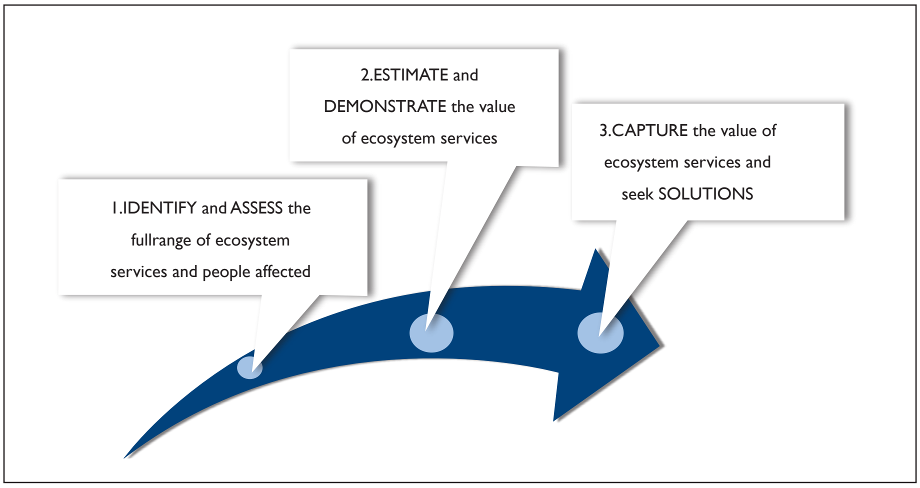
The point is that, however great the value of biodiversity is demonstrated to be on paper, this means little in practice unless it translates into tangible changes in the markets, prices and profits prices that drive people's economic decisions. Along similar lines, as much as conservation and development decision-makers may be convinced that it is in the public interest to conserve biodiversity, this will have little impact unless the people who depend and impact on biodiversity also perceive there to be concrete gains from doing so. In the absence of sufficient, targeted incentives and finance, conservation interventions are unlikely to be viable, acceptable, effective or sustainable over the long-term.

The key challenge becomes one of moving beyond merely estimating the value of biodiversity and ecosystem services, and identifying where there are needs and niches to capture these values as concrete incentives and finance for conservation. The aim is to help to change the economic conditions and circumstances that cause people to convert or degrade biodiversity and ecosystems in the course of their economic activities, and instead set in place the economic opportunities and rewards which will stimulate the investments which are required to encourage, enable and motivate conservation.

The global initiative The Economics of Ecosystems and Biodiversity (TEEB) provides a particularly appealing, and simple, framework for linking economic valuation to the identification of policy instruments to strengthen the conservation and sustainable use of natural resources in the real world2. TEEB is a global programme of work which arose from the 2007 meeting of G8+5 environment ministers in Potsdam, Germany. The meeting agreed to "initiate the process of analysing the global economic benefit of biological diversity, the costs of the loss of biodiversity and the failure to take protective measures versus the costs of effective conservation". The resulting initiative aims to help decision-makers recognise, demonstrate and capture the values of ecosystems and biodiversity. Over the last five years or so, the TEEB framework has become an increasingly popular way of approaching the economics of ecosystems and biodiversity, and of using valuation to identify policy instruments for conservation.

2 TEEB (2008) The Economics of Ecosystems and Biodiversity: An interim report. European Communities, Brussels; TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB. United Nations Environment Programme (UNEP), Geneva.

Figure 3: Three-tiered approach to identifying, estimating and capturing ecosystem service values



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TEEB proposes a three-tiered approach to the economic assessment of biodiversity and ecosystem services (Figure 3):

- First of all, it is necessary to **identify and assess** the full range of ecosystem services affected and the implications for different groups in society. This requires considering the full range of stakeholders and economic processes influencing and/or benefiting from the affected ecosystem services and biodiversity;
- Second, the value of ecosystem services should be **estimated and demonstrated,** using appropriate methods. This involves both looking at the present situation and analysing the linkages over scale and time that affect when and where the costs and benefits of particular uses of biodiversity and ecosystems are realised, to help frame the distributive impacts of decisions; and
- Last, but not least, comes the step of **capturing the value of ecosystem services and seeking solutions:** to overcome their undervaluation using economically-informed policy instruments.

As mentioned above, in the introduction, these relate only to the first two steps in the TEEB process. They do not address how to identify needs and opportunities to capture the value of ecosystem services or design policy instruments that can be used to support biodiversity conservation.

3 OVERVIEW OF THE PROCESS: STEPS IN THE RAPID VALUATION OF BIODIVERSITY AND ECOSYSTEM SERVICES

This chapter summarises the ten step approach to the rapid valuation of biodiversity and ecosystem services. This starts with scoping and designing the study, works through collecting and analysing the valuation data, and culminates in communicating the findings to the intended target audience.

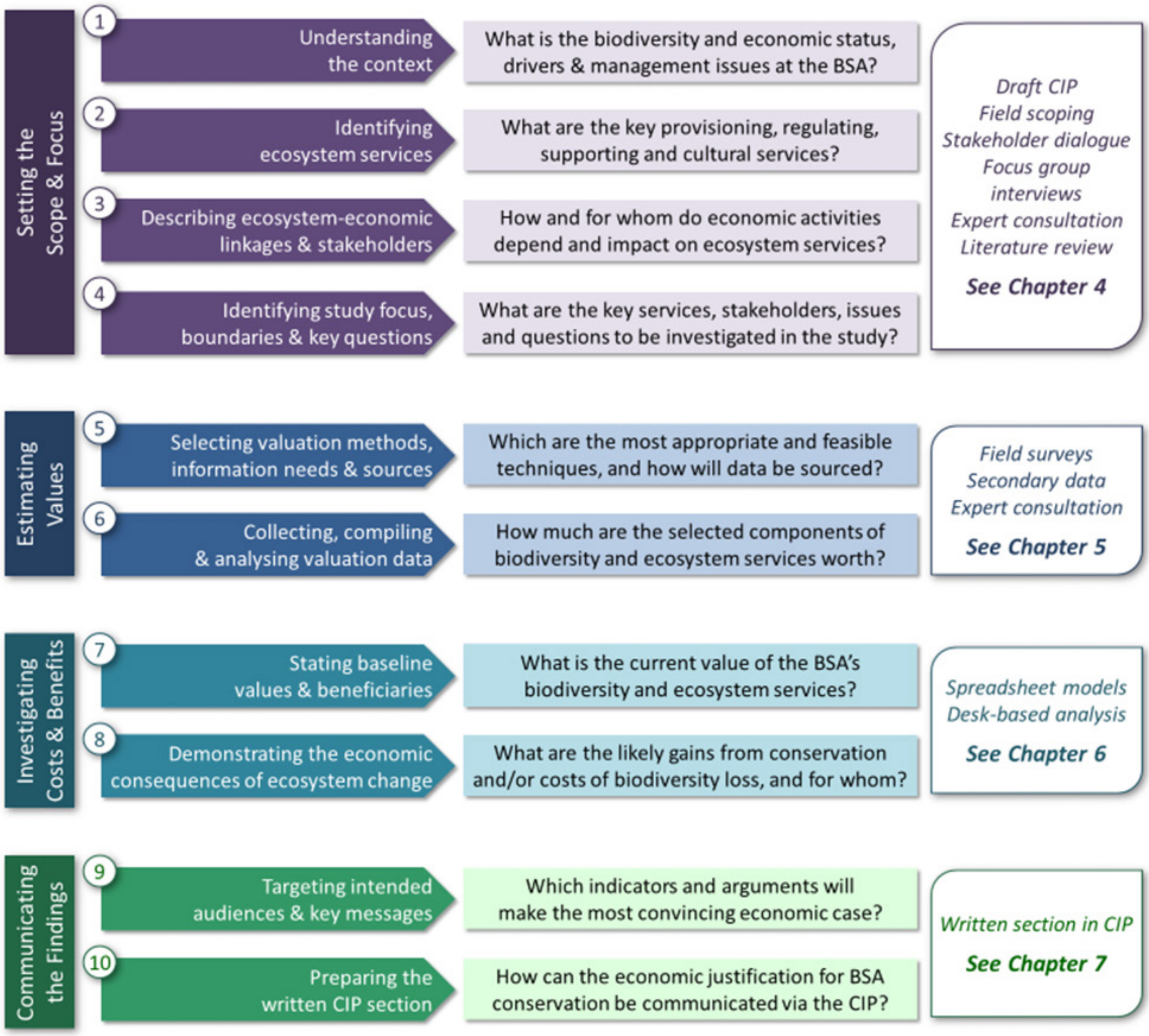


Figure 4: Steps in the rapid valuation of biodiversity and ecosystem services

Step 1: Understanding the context

First of all, it is necessary to set the scene for the valuation exercise: to understand the different forces and factors that influence the status of biodiversity in the BSA, and which have prompted the development of the conservation interventions that are laid out in the CIP. This helps to clarify the background conditions and management issues against which the valuation exercise is taking place, and in response to which the CIP needs to be justified. This step asks: ***what is the biodiversity and economic status, drivers & management issues at the BSA?***

Step 2: Identifying ecosystem services

A second step is to identify the ecosystem services that are being provided by the BSA. It is these services that will be the subject of the valuation exercise. This step asks: ***what are the key provisioning, regulating, supporting and cultural services?*** It should result in a clear list of ecosystem services, categorised according to habitat type.

Step 3: Describing ecosystem-economic linkages & stakeholders

The primary goal of valuation is to articulate the economic significance of ecosystem services. It is, therefore, of critical importance to be able to understand how different sectors and stakeholders depend on the BSA for their economic wellbeing and survival. This step builds on the list of ecosystem services compiled in Step 2, and asks: ***how and for whom do economic activities depend and impact on ecosystem services?***

Step 4: Identifying study focus, boundaries & key questions

The first three steps of the rapid valuation process build up an understanding of the biophysical, socioeconomic and management context to the BSA, identify the ecosystem services it generates, and trace through key economic links and stakeholders. Step 4 now draws together this information to specify exactly what the valuation study will focus on (and what it cannot value, or must exclude). At this point it is also useful to carry out some preliminary thinking about who the study should ultimately seek to influence, and what kind of messages it should convey. This step asks: ***what are the key services, stakeholders, issues and questions to be investigated in the study?***

Step 5: Selecting valuation methods, information needs & data sources

Steps 1-4 together yield a shortlist of the ecosystem services, sectors and stakeholders to be included in the valuation study. It is now necessary to select the methods that will be used to value each of these benefits and beneficiaries. This step asks: ***which are the most appropriate and feasible techniques, and how will data be sourced?*** It should result in a final list of ecosystem services that will be valued, indicate which valuation method(s) will be applied to each, and formulate a detailed plan for data collection which lists all the information requirements and specifies where and how they will be sourced.

Step 6: Collecting, compiling & analysing valuation data

Step 6 involves implementing the data collection plan and applying the selected valuation techniques, in order to come up with estimates of the value of biodiversity and ecosystem services at the BSA. It asks: ***how much are the selected components of biodiversity and ecosystem services worth?***

Step 7: Stating baseline values & beneficiaries

Having collected, compiled and analysed the valuation data, it is now possible to work out the baseline value of biodiversity and ecosystem services in the BSA under present circumstances. This step asks: ***what is the current value of the BSA's biodiversity and ecosystem services?***

Step 8: Demonstrating the economic consequences of ecosystem change

The baseline values calculated under step 7 are not, alone, sufficient to provide a convincing justification for the CIP. Coming up with a snapshot estimate of the economic value of a BSA has little meaning unless it is presented in conjunction with other figures. It is the economic gains and/or costs avoided from conservation that are of interest. The ultimate concern is to show the incremental or marginal increase in economic value that will result from the implementation of the CIP as compared to the current situation (or the decrease in economic value that will result should it not be implemented). This step asks: ***what are the likely gains from conservation and/or costs of biodiversity loss, and for whom?***

Step 9: Targeting intended audiences & key messages

Building on the preliminary thinking carried out in step 4, detailed consideration now needs to be given to presenting the findings of the valuation study. The main concern is to make sure that the evidence offered will be interesting, persuasive and credible to the individuals and groups that have the most power to influence conservation funding and affect the status of biodiversity in the BSA. This step asks: ***which economic indicators and arguments will make the most convincing economic case for the CIP actions?***

Step 10: Preparing the written CIP section

A final step is to prepare the section in the CIP on the economic justification for conservation interventions. This step asks: ***how can the economic justification for BSA conservation be communicated via the CIP?***

4 SETTING THE SCOPE AND FOCUS: IDENTIFYING ECOSYSTEM-ECONOMIC LINKAGES AND STAKEHOLDERS (STEPS 1-4)

This chapter provides further guidance on the tools, techniques and key questions that might assist in collecting and analysing the information required to set the scope and focus of the valuation.

Steps 1-4 of the rapid valuation process aim to answer four basic questions:

- What is the biodiversity and economic status, drivers & management issues at the BSA?
- What are the key provisioning, regulating, supporting and cultural services?
- How and for whom do economic activities depend and impact on ecosystem services? and
- What are the key services, stakeholders, issues and questions to be investigated in the study?

A variety of tools, techniques and information sources can be used to answer these questions. The first point of reference should be the planning or strategic documents that the CIP is based on (the aim of the CIP is not to develop a new plan, strategy or set of activities for conservation in the BSA in question, but merely to organise, articulate and develop pre-existing conservation strategies and plans into a set of bankable and marketable investment packages). In most cases this will the management plan that has been developed for the BSA, or the Project Identification Note (PIN) that had been proposed under the PREPARED project. This should have already compiled and documented existing knowledge on biological, ecological, socio-economic and institutional conditions and trends. The valuation team should acquaint themselves thoroughly with this document. The information in the management plan, PIN or other strategic planning document can be supplemented via a review of documents, records and statistics produced by other agencies and organisations working in and around the BSA.

In situations where time, money and staff capacity are extremely limited, or if there is an urgent need to complete the valuation exercise in a very short time period, steps 1-4 may be carried out purely as a desk exercise, using only secondary sources. In most cases it should however be possible (and will always be desirable) to conduct a brief field scoping exercise. Unless the BSA is a very large, complex system, two to three days would usually be sufficient to accomplish this scoping. This should allow for a dialogue to be initiated with key stakeholders and experts in the BSA, if necessary supplemented with consultation at the central or capital city level. As well as answering the four questions listed above, face-to-face interactions provide an important opportunity to inform stakeholders about the valuation exercise, and seek their inputs and buy-in to the process.

One of the most effective (and potentially inclusive) ways to gather information is by means of roundtables or focus group discussion. The aim is to bring together key stakeholders and experts to identify, discuss and report on the provisioning, regulating, supporting and cultural services associated with the BSA, and their link to the economy. Although the most appropriate participants will of course depend on the specific circumstances of the BSA, as a general rule of thumb the consultations should at a minimum include the BSA authorities (if the BSA is a formally designated area), other local authorities, line agencies and non-governmental organisations that are working in the area, members of the communities that live in and around the BSA and utilise its land and resources, and representatives of private businesses or industries that have major dependencies or impacts on ecosystem services. These interactions may take place during a single session or via a series of meetings, depending on the number of stakeholders to be involved, their physical location, and the relationships and freedom of expression that exist between them.

A simple template can be used to guide these discussions and record information (Figure 5). For each of the main habitat types in the BSA, a list of ecosystem services can be compiled. While this may not be exhaustive, it should cover those services that stakeholders consider to be significant in biophysical and socioeconomic terms. The **key** beneficiaries or users of each service should then be specified, and details provided of exactly how economic benefits (or costs and damages avoided) are manifested and received.

Figure 5: Template for tracing through ecosystem services, key beneficiaries and economic linkages

Main Habitats	Ecosystem services	Key benaficiaries/users	Economic Linkages
Montane forest	**Provisioning Services**		
	Firewood	Forest -adjacent community Traders	Provides fule source; saves cash purchases on alternative energy sources Generates cash income and employment
	Dry season grazing	Pastoralists in lowland areas	Sustains livestock production; saves cash purchases on alternative feed and water; saves time on accessing more distatnt pastures; safeguards human and animal nutrition, health and life
	Bioprospecting	Pharmaceutical companies	Provides raw materials for pharmaceutical products; generates cash income
	Regulating & Supporting Services		
	Erosion control	Hydropower facility	Prolongs lifespan of dam; decreases outages; maintains power generation; reduces maintanance, repairs and breakdown costs
	Protection agaisnt floods	Downstream urban dwellers	Avoids damages to property, intrastructure and other assets; safeguards human life and health; reduces expenditures on disaster response
	Cultural Services		
	Nature-based tourism	Recreational visitors Tourism industry	Provides recreation, enjoyment and leisure facility Generates cash income and employment
	Cultural and spiritual sites	Forest-adjacent comunity	Provides place for ceremonies; plays a key role in local tradition & heritage

It is important to remember that it will rarely (if ever) be necessary, or practical, for the rapid valuation exercise to consider each and every value, stakeholder or habitat type associated with a given BSA. After reviewing the status, drivers and management issues at the BSA and "longlisting" its ecosystem services, beneficiaries and economic linkages, it is necessary to prioritise and narrow the study focus and boundaries into a relevant and manageable exercise. This involves deciding who and what will be included in the study, and at what level of detail. For example:

- Will the valuation study look at the costs of biodiversity loss or the benefits of ecosystem conservation, or both?
- Will it consider biodiversity benefits and/or costs overall, for a particular site, habitat type or ecosystem service, to a specified sector or group, or as a result of a distinct threat?
- What is the spatial cut-off point beyond which ecosystem values and beneficiaries will not be considered?

Step 4 should result in a "shortlist" of ecosystem services to be valued, and sectors and stakeholder groups to be included in the study, and a list of specific questions to be answered by it.

Even at this early stage of the valuation process, it is useful to give some thought to the question of who the study ultimately seeks to influence, and what kinds of messages it should seek to convey. It may be relevant to initiate a discussion with stakeholders to help identify the individuals and groups that have the most power to influence biodiversity conservation status and funding in the BSA, and the evidence that is needed to convince them to support the CIP. An understanding of the study's target audience and communication needs should shape its design and focus, and guide the questions it seeks to answer.

5 ESTIMATING VALUES: A TOOLBOX OF METHODS FOR VALUING BIODIVERSITY AND ECOSYSTEM SERVICES (STEPS 5-6)

A variety of methods can be used to value biodiversity and ecosystem services. This chapter provides further guidance on the most commonly-used valuation techniques. It lays out the data and analytical needs for each, summarises their applicability, main strengths and weaknesses, and presents examples of their practical application in EAC countries.

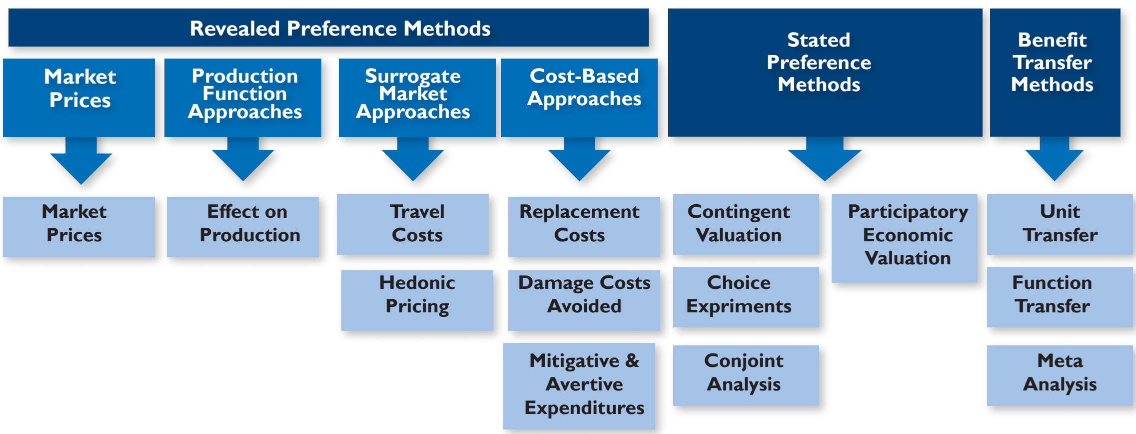
PLANNING TO COLLECT VALUATION DATA

The question of how to place a monetary value on biodiversity and ecosystem services has long posed something of a challenge to economists. The easiest and most straightforward way to value goods and services, and the method used conventionally, is to look at their market price: what they cost to buy or are worth to sell. However, as biodiversity and ecosystem services very often have no market price (or are subject to market prices which are highly distorted as regards their real value), these techniques obviously only have very limited application. For this reason, other valuation techniques must be found.

A suite of methods have been developed over recent decades which are used to estimate ecosystem values that cannot be calculated accurately via the use of market prices. Annex I provides a list of selected references on these techniques, covering a variety of habitats, services and management contexts. These are now commonly-accepted and widely-used in most countries of the world, and include (Figure 6):

- **Production function approaches:** attempt to relate changes in the output of a marketed good or service to a measurable change in the quality of quantity of ecosystem services by establishing a biophysical or dose-response relationship between ecosystem quality, ecosystem services, and related production;
- **Surrogate market approaches:** look at the ways in which the value of ecosystem services are reflected indirectly in people's expenditures, or in the prices of other market goods and services;
- **Cost-based approaches:** look at the market trade-offs or costs avoided of maintaining ecosystems for their goods and services;
- **Stated preference approaches:** ask consumers to state their preferences, either as direct cash bids or through some kind of indirect "game" or proxy; and
- **Benefit-transfer approaches:** involve the use of value estimates from studies which have been carried out elsewhere to the service or site that is of current interest.

Figure 6: Commonly-used methods for the valuation of biodiversity and ecosystem services



Source: adapted from Emerton, L., and Bos, E. (2004) VALUE: Counting Ecosystems as Water Infrastructure. IUCN — The World Conservation Union, Gland.

There is no hard and fast rule as to which valuation technique should be applied to a given ecosystem service. Each method has its own strengths and weaknesses, and may be more or less suitable in a particular context or situation. The time, cost and data that are available to the valuation study also typically exert a strong influence on which valuation techniques are selected for use. Depending on the methods chosen, the study will typically utilise a number of different information collection approaches and sources, such as:

- Literature review: including a review of similar valuation studies carried out in other areas or countries, as well as of documents and reports that contain information on the BSA such as project reports, government statistics and records, scientific articles and publications;
- Expert consultation: including with technical experts (such as sociologists, biologists, ecologists, hydrologists and civil engineers) as well as with the various stakeholders who are involved in managing and using the BSA (such as government officials, Non Governmental Organisation (NGOs), community leaders, local households, and resource user groups);
- 'Traditional' socio-economic information gathering techniques: such as questionnaires, interviews and statistical analysis; and
- Participatory techniques: such as focus group interviews, Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) techniques.

Before commencing on the collection, compilation and analysis of valuation data, it is important to have decided exactly which methods will be used to value each ecosystem service, worked out what the information needs are, and identified how and where data can be sourced. Constructing a simple table or matrix can help to structure this data collection plan (Figure 7).

Figure 7: Template for identifying ecosystem valuation techniques, data needs and information sources

Ecosystem services	Valuation techniques	Data needs	Sources of information
Firewood: forest-adjacent community	Market prices	% of households collecting firewood; amount harvested; price; collection costs	Focus group discussions with forest-adjacent communities
Firewood: traders	Market prices	Number of traders; amount sold; price; costs of collection, transport and processing	Focus group discussions with traders, market surveys
Dry season grazing	Replacement costs	Number of animals grazed; months of year grazed; labour & other costs of forest grazing; contribution of forest fodder & pasture to annual requirements; purchase, transport, labour & other costs of equivalent purchased feed	Focus group discussions with herders; consultation with Ministry of Livestock
Bioprospecting	Insufficient information on activity to enable valuation		
Erosion control	Mitigative & avertive expenditures	Difference in silt and sediment loads with &without forest; silt trapping and removal requirements with & without forest; silt trapping and removal costs with & without forest	Hydropower company; consultation with University hydrologist; literature review
Protection against floods	Damage costs avoided	Flood risk area and population; value of main assets and infrastructure at risk; flooding magnitude, impacts and return periods with and without forest	Not available for BSA: use benefit transfer from other studies
Nature-based tourism: recreational visitors	Contingent valuation Travel costs	Number and profile of different categories of visitors; travel costs and expenditures; total visitor willingness to pay	Not available for BSA: use benefit transfer from other studies
Nature-based tourism: tourism industry	Market prices	Number and profile of different categories of visitors; visitor sales; costs of operating visitor facilities and businesses	National Park records; interviews with hoteliers & tour companies
Cultural and spiritual sites	Inappropriate/ impossible to value in monetary terms		

MARKET PRICES

The market price approach simply values ecosystem services according to how much they can be bought or sold for.

Using market prices to value local wetland and woodland use in Mtanza Msona Village, Tanzania

Market price techniques were used to value the contribution of wetlands and woodlands to community livelihoods in Mtanza Msona Village, Rufiji District. The valuation study focused on eight categories of wetland product or harvesting activity: fishing; woodfuel and timber; grasses, reeds and palms; medicinal and aromatic plants; wild food plants; hunting; wild honey; and clay. Household questionnaires and focus group interviews were used to establish quantities and levels of resource use, and prices were obtained from market surveys. The local value of woodland and wetland resources was calculated to be equivalent to just over $107 per capita, or 37% of Gross Domestic Product (GDP). The importance of wild resources was found to grow as household poverty increased: they were worth almost eight times as much as all other sources of farm and off-farm production for the poorest households in the village. The value of plant-based medicines was almost 15 times as high as purchased drugs and 'modern' treatment, and the wide range of wild foods harvested was worth more than 14 times as much as households' annual expenditures on food from the market.

From: Kasthala et al 2008

Summary of data collection & analysis requirements

There are four main steps involved in collecting and analysing the data required to apply market price techniques:

1. Find out the quantity of the good used, produced or exchanged;
2. Collect data on its market price;
3. Multiply price by quantity to determine its gross value; and
4. Deduct any costs incurred in collecting, producing or trading the product in order to determine its net value.

Such data are generally quite easy to collect and analyse. Price information, including historical trends, can usually be obtained from a wide variety of sources such as government statistics, income and expenditure surveys, or market research studies. In many cases it will be necessary to supplement these secondary sources with original data, for example through performing market checks or conducting some form of socio-economic survey. When applying this technique it is important to ensure that the data collected covers an adequate period of time and sample of consumers and/or producers. Factors to bear in mind include the possibility that prices, consumption and production may vary between seasons, for different socio-economic groups, at different stages of the marketing or value-added chain, and in different locations.

Applicability, main strengths & weaknesses

In theory, market price techniques can be applied to any product that is freely bought and sold. They are particularly useful for valuing provisioning services and the recreational use of ecosystems.

The greatest advantage of the market price technique is that it is relatively easy to use, as it relies on observing actual market behaviour. Few assumptions, little detailed modelling, and only simple statistical analysis are required to apply it. Their main weakness is that it is often difficult to collect information about levels of ecosystem use (especially when harvests are occasional, unlicensed, or take place only at the subsistence level). In addition, in reality, very few ecosystem services have market prices which accurately reflect their real social and economic value.

CHANGE IN PRODUCTION TECHNIQUES

Even when ecosystem goods and services do not themselves have a market price, other marketed products often rely on them as basic inputs. For example, downstream hydropower and irrigation depend on upper catchment protection services, fisheries on upstream nursery and breeding habitat, crop production on insect pollination services, and many sources of industrial production utilise natural products as raw materials. In such cases it is possible to assess the value of ecosystem goods and services by looking at their contribution to these other sources of production, and to assess the effects of a change in the quality or quantity of ecosystem goods and services on these broader outputs and profits.

Using change in production to value bee pollination services in Central Uganda

Effect on production techniques were used to value the contribution of bee pollination services to coffee production in the Lake Victoria Arc zone in central Uganda. On-farm pollination experiments were conducted in small-scale coffee fields to determine the monetary value attributable to pollination services in and to identify the degree of influence of various socio-ecological drivers. Three measures of pollination service delivery were calculated: the proportion potential yield of coffee, the proportion bee contribution to fruit set, and the proportion pollination limitation. Data on landscape variables were collected within around each selected coffee field, and farmers were provided with forms to record coffee yields. Farmers were also interviewed using a semi-structured questionnaire. The study found that of a total production of 0.4 million tons of coffee beans with an approximate economic value of US$214 million, more than 70% is attributable to bee pollination services.

From: Munyuli, B. (2014) Social and Ecological Drivers of the Economic Value of Pollination Services Delivered to Coffee in Central Uganda. Journal of Ecosystems vol. 2014.

Summary of data collection & analysis requirements

There are four main steps involved in collecting and analysing the data required to apply change in production techniques:

1. Determine the contribution of ecosystem services to the related source of production;
2. Specify the relationship between changes in the quality or quantity of a particular ecosystem good or service and output;
3. Relate a specified change in the provision of the ecosystem good or service to a physical change in the output or availability of the related product; and
4. Estimate the market value of the change in production.

It is usually relatively easy to collect and analyse the market information that is required to value changes in production of ecosystem-dependent products (see above, market price techniques). The most difficult aspect of this method is determining and quantifying biophysical relationships, and establishing causality: for example relating catchment deforestation to a particular rate of soil erosion, consequent siltation of a hydropower dam and reduced power outputs, or assessing the impacts of a loss of wetland habitat and water purification services on local fisheries production. To be able to specify these kinds of relationships with confidence usually involves detailed, and often complex data. This may require consultation with other experts, and may necessitate situation-specific laboratory or field research, controlled experiments, detailed modelling and statistical regression.

Applicability, main strengths & weaknesses

Change in production techniques are most commonly used to assess the value of ecosystem services which form an input or raw material into, or otherwise enable and support, other production processes.

The main weakness of change in production techniques relates to the difficulties in accurately predicting biophysical or dose-response relationships between changes in ecosystem health or status to changes in other production processes. Such relationships are often unclear, unproven, or hard to demonstrate in quantified terms. Simplifying assumptions are often needed. An additional concern is attribution, and the large number of possible influences on product markets and prices. For example, in some cases changes in the provision of an ecosystem good or service may lead not just to a change in related production, but also to a change in the price of its inputs or outputs. That product may become scarcer, or more costly to produce. In other cases consumers and producers may switch to other products or technologies in response to ecosystem change or to a scarcity of ecosystem goods and services. Furthermore, general trends and exogenous factors unrelated to ecosystem goods and services may influence the market price of related production and consumption items. They must be isolated and eliminated from analysis.

TRAVEL COST TECHNIQUES

Ecosystems often hold a high value as recreational resources or leisure destinations. Even when there is no direct charge made to enjoy these benefits, people still spend time and money to visit ecosystems. These travel costs can be taken as an expression of the recreational value of ecosystems.

Using travel costs to value recreation and tourism at Lake Nakuru National Park, Kenya

Lake Nakuru National Park is an important international tourist destination. Although fees are charged to enter the park, these underestimate the total value that tourists place on the wetland and its component species, especially flamingos. A travel cost survey of visitors elicited information about length of stay, travel costs, place of origin and visitation rates, distinguishing between resident and non-resident tourists. The results of these surveys demonstrated that the annual recreational value of wildlife viewing in Lake Nakuru National Park was between US$ 7.5-15 million, of which over a third was accounted for by flamingos.

From: Navrud, S. and E.D. Mungatana (1994) Environmental valuation in developing countries: The recreational value of wildlife viewing. Ecological Economics 11(2): 135-151.

Summary of data collection & analysis requirements

There are six main steps involved in collecting and analysing the data required to apply travel cost techniques:

1. Ascertain the total area from which recreational visitors come to visit an ecosystem, and divide this into zones within which travel costs are approximately equal;
2. Within each zone, sample visitors to collect information about the costs incurred in visiting the ecosystem, motives for the trip, frequency of visits, site attributes and socio-economic variables (such as the visitor's place of origin, income, age, education and so on);
3. Obtain the visitation rates for each zone, and use this information to estimate the total number of visitor days per head of the local population;
4. Estimate travel costs, including both direct expenses (such as fuel and fares, food, equipment, accommodation) and time spent on the trip;
5. Carry out a statistical regression to test the relationship between visitation rates and other explanatory factors such as travel cost and socio-economic variables; and
6. Construct a demand curve relating number of visits to travel cost, model visitation rates at different prices, and calculate visitor consumer surplus.

Travel cost techniques depend on a relatively large data set. Quite complex statistical analysis and modelling are required in order to construct visitor demand curves. Basic data are usually collected via visitor interviews and questionnaires, which make special efforts to cover different seasons or times of the year, and to ensure that various types of visitors from different locations are represented.

Applicability, main strengths & weaknesses

The travel cost method is mainly used to calculate the value of nature-based tourism and recreation. In a small number of cases it has been applied to the consumptive use of ecosystem goods, looking at the time and other costs that are involved in harvesting resources.

The main weakness of this method is its dependence on large and detailed data sets, and relatively complex analytical techniques. Travel cost surveys are typically expensive and time consuming to carry out. An additional source of confusion is that several factors make it difficult to isolate the value of a particular ecosystem in relation to travel costs, and these must be taken into account in order to avoid over-estimating ecosystem values. Visitors frequently have several motives or destinations on a single trip, some of which are unrelated to the ecosystem being studied. They also usually enjoy multiple aspects and attributes of a single ecosystem. In some cases travel, not the destination ***per se***, may be an end in itself.

HEDONIC PRICING TECHNIQUES

Even if they do not have a market price themselves, the presence, absence or quality of ecosystem services influences people's perceptions of the value of other products or activities, and their willingness to pay (or be paid) for them. Hedonic pricing techniques look at the difference in prices that can be ascribed to environmental quality or the provision of particular ecosystem services.

Using hedonic pricing to value open water wetlands in Cape Town, South Africa

Hedonic price methods were used to assess the value of Zandvlei, an open water wetland near Cape Town surrounded by four residential areas. Two methods were used. One was based on interviewing estate agents to determine their expert opinion of the determinants of home prices, especially the influence of access to the Zandvlei. The second tracked property sales over a four-year period, looking at both the asking price and final selling price, as well as the time take to sell the property. Property characteristics were noted, including the nature of the development, size, state of repair, facilities and any special features. Proximity to and view of the lake was included as an independent variable, measured using municipal maps. Regression analysis was carried out, looking at house characteristics and proximity to open space. The results of the statistical analysis compared well with those of the estate agent interviews. The former technique yielded total property price premiums associated with the Zandvlei of R77 million for all houses, while that latter yielded an estimate of R87 million.

From: Turpie, J., Joubert, A., van Zyl, H., Harding, B. and Leiman, A. (2001) Valuation of Open Space in the Cape Metropolitan Area. Report to the City of Cape Town; Van Zyl, H. and Leiman, A. (2002) Hedonic approaches to estimating the impacts of open spaces : a case study in the Cape. South African Journal of Economic and Management Sciences 5(2): 379-394.

Summary of data collection & analysis requirements

There are five main steps involved in collecting and analysing the data required to apply hedonic pricing techniques:

1. Decide on the indicator to be used to measure the quality or quantity of an ecosystem good or service associated with a particular job or property;
2. Specify the functional relationship between wages or property prices and all of the relevant attributes that are associated with them, including ecosystem services;
3. Collect data on wages or property prices in different situations and areas which have varying quality and quantity of ecosystem services;
4. Use multiple regression analysis to obtain a correlation between wages or property prices and the ecosystem good or service; and
5. Derive a demand curve for the ecosystem good or service.

Hedonic pricing techniques require the collection of a large amount of data, which must be subject to detailed and complex analysis. Data are usually gathered through market observation, questionnaires and interviews, which aim to represent a wide variety of situations and time periods.

Applicability, main strengths & weaknesses

Although hedonic pricing techniques can, in theory, be applied to any good or service, they are most commonly used within the context of wage and property markets.

In practice, there remain very few examples of the application of hedonic pricing techniques to ecosystem goods and services in the tropical world. One reason for this, and a weakness in this technique, is the very large data sets and detailed information that must be collected, covering all of the principal features affecting prices. It is often difficult to isolate specific ecosystem effects from other determinants of wages and property prices. Another potential problem arises from the fact that this technique relies on the underlying assumption that wages and property prices are sensitive to the quality and supply of ecosystem goods and services. In many cases (and especially in developing countries) markets for property and employment are not perfectly competitive, and ecosystem quality is not a defining characteristic of where people buy property or engage in employment, or of how much they are willing to pay or be paid.

REPLACEMENT COST TECHNIQUES

It is sometimes possible to replace or replicate a particular ecosystem good or service with alternative products or infrastructure. For example, constructed reservoirs can replace natural lakes, sewage treatment plants can replace wetland wastewater treatment services, and many natural products have artificial alternatives. The cost of replacing an ecosystem good or service with such an alternative or substitute can be taken as an indicator of its value in terms of expenditures saved.

Using replacement costs to value the water services of Tanzania's catchment forests

The value of Tanzania's catchment forests in securing drinking water supplies was estimated by looking at the replacement of natural flows by the sinking of boreholes. A crude replacement cost estimate was also used in order to estimate the cost of stabilising water flows in the absence of catchment forest reserves. These calculations were based on the construction of dams, for the creation of reservoirs, and control gates at various points along the catchment basins. The total amount of water for domestic and livestock use by people surrounding the forest reserves in Morogoro, Tanga, Kilimanjaro and Arusha which may disappear was earlier estimated at 4.934 million m3, which would require 1,609 boreholes to be constructed to serve the population around the reserves at a net present value of USD 32.18 million. Replacement cost of constructing dams and control gates for the Pangani and Wami-Ruvu Basins was estimated to have a net present value of USD 54.1 million.

From: Sjaastad, E., Chamshama, S., Magnussen, K., Monela, G., Ngaga, Y and Vedeld, P. (2003) Resource economic analysis of catchment forest reserves in Tanzania. Report to Ministry of Natural Resources and Tourism. Forestry and Beekeeping. Division. Dar es Salaam, Tanzania.

Summary of data collection & analysis requirements

There are three main steps involved in collecting and analysing the data required to apply replacement cost techniques:

1. Ascertain the benefits that are associated with a given ecosystem good or service, how it is used and by whom, and the magnitude and extent of these benefits;
2. Identify the most likely alternative source of product, infrastructure or technology that would provide an equivalent level of benefits to an equivalent population; and
3. Calculate the costs of introducing and distributing, or installing and running, the replacement to the ecosystem good or service.

Data collection is relatively straightforward, and usually relies on secondary information about the benefits associated with a particular ecosystem good or service and alternatives that are available to replace it. In most cases this can be ascertained through expert consultation and professional estimates, supplemented with direct observation.

Applicability, main strengths & weaknesses

Replacement cost techniques can be used to value most ecosystem services that have the potential be at least partially substituted by other products or by technologies. They are particularly useful for valuing regulating services and the protective functions of natural ecosystems.

Replacement cost techniques have the great advantage that they are simple to apply and analyse. They are particularly useful where only limited time or financial resources are available for a valuation study, or where it is not possible to carry out detailed surveys and fieldwork. The main weakness of this technique is that it is often difficult either to identify all the goods and services provided by an ecosystem or find perfect replacements or substitutes for ecosystem goods and services that would provide an equivalent level of benefits to the same population. In some cases this results in ecosystem under-valuation, as artificial alternatives generate a lower quantity or quality of goods and services. Yet this technique may also lead to the over-valuation of ecosystem benefits, as in some instances the replacement product, infrastructure or technology may be associated with secondary benefits or additional positive impacts. The reality of the replacement cost technique is also sometimes questionable: we may question whether, in the absence of a well-functioning ecosystem, such expenditures would actually be made or considered worthwhile.

MITIGATIVE OR AVERTIVE EXPENDITURES TECHNIQUES

When an economically valuable ecosystem good or service is lost, or there is a decline in its quantity or quality, this almost always has negative effects. It may become necessary to take steps to mitigate or avert these negative effects so as to avoid economic losses. For example, the loss of upstream catchment protection can make it necessary to desilt reservoirs and dams, the loss of wetland treatment services may require upgrading water purification facilities, and the loss of ecosystem flood control may require the construction of flood control barriers. These mitigative or avertive expenditures can be taken as indicators of the value of maintaining ecosystem goods and services in terms of costs avoided.

Using mitigative expenditures to value wastewater treatment services in Nakivubo Swamp, Uganda

Mitigative expenditures techniques were used to value the wastewater treatment services provided by Nakivubo Swamp, Uganda. Covering an area of some 5.5 km^2 and a catchment of over 40 km^2, the wetland runs from the central industrial district of Kampala, Uganda's capital city, passing through dense residential settlements before entering Lake Victoria at Murchison Bay. The study looked at two cost components that would arise in the absence of the water purification functions currently provided by the wetland: connecting Nakivubo channel to an upgraded sewage treatment plant which could cope with additional wastewater loads, and constructing elevated pit latrines to process sewage from nearby slum settlements. The study found that the infrastructure required to achieve a similar level of water quality to that assured by the wetland would incur costs of up to $2 million a year in terms of extending sewerage and treatment facilities.

From: Emerton, L., Iyango, L., Luwum, P., and A. Malinga, 1999, The Economic Value of Nakivubo Urban Wetland, Uganda, IUCN - The World Conservation Union, Eastern Africa Regional Office, Nairobi.

Summary of data collection & analysis requirements

There are four main steps involved in collecting and analysing the data required to apply mitigative or avertive expenditure techniques:

1. Identify the negative effects or hazards that would arise from the loss of a particular ecosystem good or service;
2. Locate the area and population which would be affected by the loss of the ecosystem good and service, and determine a cut-off point beyond which the effect will not be analysed;
3. Obtain information on people's responses, and measures taken to mitigate or avert the negative effects of the loss of the ecosystem good or service; and
4. Cost the mitigative or avertive expenditures.

Data collection and analysis is relatively straightforward, and usually relies on a combination of interviews, surveys, direct observation and expert consultation.

Applicability, main strengths & weaknesses

Mitigative and avertive expenditure techniques can be used in most cases where the effects of the loss of ecosystem goods and services can be clearly offset, averted or mitigated by undertaking particular investments or market actions. They are particularly useful for valuing regulating services and the protective functions of natural ecosystems.

In common with other cost-based valuation methods, a major strength is their ease of implementation and analysis, and their relatively small data requirements. As is the case with the replacement cost technique, the mitigative or avertive measures that are employed in response to the loss of ecosystem goods and services do not always provide an equivalent level of benefits. In some cases it is also questionable whether in fact such expenditures would be made or would be seen as being worth making. An additional important factor to bear in mind when applying this technique is that people's perceptions of what would be the effects of ecosystem loss, and what would be required to mitigate or avert these effects, may not always match those of "expert" opinion.

DAMAGE COSTS AVOIDED TECHNIQUES

Ecosystem services frequently protect other economically valuable assets. For example, the loss of catchment protection services may result in increased downstream siltation and flooding, which leads to the destruction of infrastructure, settlements and agriculture. Such costs and losses can be taken to represent the economic value of ecosystems in terms of expenditures avoided.

Using damage costs avoided to value mangrove storm protection in Kenya

The damage costs avoided approach was used to calculate the value of Gazi Bay's mangroves in protecting against the effects of storms and tidal surges. This looked at the potential damages that extreme weather events would cause to coastal housing and infrastructure in areas with intact mangroves as compared to those with degraded mangroves. Assumptions were made (based on the literature) about the extent to which mangroves slow the effects of waves and tidal surges, in order to calculate the damages avoided that could be ascribed to the presence of natural vegetation. These data were combined with figures on the likelihood and magnitude of extreme weather events and the average costs of rebuilding property that would be destroyed, to come up with an estimate for mangrove shoreline protection of US$ 91.7/ha/year.

From: Hoberg, J. (2011) Economic Analysis of Mangrove Forests: A case study in Gazi Bay, Kenya. United Nations Environment Programme (UNEP), Nairobi.

Summary of data collection & analysis requirements

There are four main steps involved in collecting and analysing the data required to apply damage cost avoided techniques:

1. Identify the protective services of the ecosystem, in terms of the degree of protection afforded and the on- and offsite damages that would occur as a result of loss of this protection;
2. For the specific change in ecosystem service provision that is being considered, locate the infrastructure, output or human population that would be affected by this damage, and determine a cut-off point beyond which effects will not be analysed;
3. Obtain information on the likelihood and frequency of damaging events occurring under different scenarios of ecosystem loss, the spread of their impacts and the magnitude of damage caused; and
4. Cost these damages and ascribe the contribution of the ecosystem service towards minimising or avoiding them.

Data collection is for the most part straightforward, usually relying on a combination of analysis of historical records, direct observation, interviews, and professional estimates. Predicting and quantifying the likelihood and impacts of damage events under different ecosystem scenarios is however usually a more complex exercise, and may require detailed data and modelling.

Applicability, main strengths & weaknesses

Damage cost techniques can be used in cases where the effects of the loss of ecosystem services incurs clear economic damages and losses. They are particularly useful for valuing regulating services and the protective functions of natural ecosystems.

There is often confusion between the application of damage costs avoided and production function approaches to valuation. Here it is important to underline that whereas this technique deals with damage avoided such as from pollution and natural hazards (which are typically external effects), change in production techniques usually relate to changes in some input such as water (typically internalised). A potential weakness is that in most cases estimates of damages avoided remain hypothetical. They are based on predicting what might occur under a situation where ecosystem services decline or are lost. Even when valuation is based on real data from situations where such events and damages have occurred, it is often difficult to relate these damages to changes in ecosystem status, or to be sure that identical impacts would occur if particular ecosystem services declined.

CONTINGENT VALUATION TECHNIQUES

Absence of prices or markets for ecosystem goods and services, of close replacements or substitutes, or of links to other production or consumption processes, does not mean that they have no value to people. Contingent valuation techniques infer the value that people place on ecosystem goods and services by asking them directly what is their willingness to pay (WTP) for them or their willingness to accept (WTA) compensation for their loss, under the hypothetical situation that they could be available for purchase. Contingent valuation methods might for example ask how much people would be willing to see their water bills increase in order to uphold quality standards, what they would pay as a voluntary fee to manage an upstream catchment in order to maintain water supplies, how much they would contribute to a fund for the conservation of a beautiful landscape or rare species, or the extent to which they would be willing to share in the costs of maintaining important ecosystem water services.

Using contingent valuation to value Mountain Gorilla protected forests in Rwanda, Uganda and the Democratic Republic of Congo

Contingent valuation methods were used to assess the tourist and recreational value of Mountain Gorillas in Bwindi Impenetrable Forest National Park (BINP) in Uganda, Parc National de Volcans (PNV) in Rwanda, the Mikeno section of Parc de Virunga Sud (PNVi-Sud) in Democratic Republic of Congo; and Mgahinga Gorilla National Park (MGNP) in Uganda. Contingent valuation was used to ascertain stakeholders' WTP to prevent deterioration of forest cover and reductions in mountain gorilla populations. Contingent valuation surveys were carried out for local villagers, international tourists, and for the residents of nearby urban centres. WTP was determined using a double-bounded dichotomous choice bid method, with an open-ended follow-up question: respondents were given a scenario and asked if they were willing to pay a certain predetermined amount (bid). Depending on the response, bids were either doubled or halved, and the question repeated. Respondents who answered no to both bids were then asked to nominate their bid i.e., an open-ended amount. Local residents were asked what amount of annual compensation they would be WTA in order to offset the costs of the forests' existence. The starting point for bids was set at the equivalent monetary equivalent of 2.5 bags of millet, a common cash crop. For both WTP and WTA, characteristics such as household income, formal education level, household size, and land ownership status were also surveyed, since these factors can be expected to affect WTP and WTA bids. More than half of local residents were found to be willing to pay for forest protection, on average just under USD 5 per household. The local opportunity costs of conservation indicated an annual amount of USD 13.4 million. The international non-use value of mountain gorilla habitat was estimated at US$196 million.

From: Hatfield, R. (2005) Economic Value of the Bwindi and Virunga Gorilla Mountain Forests. AWF Working Paper Series, African Wildlife Foundation, Nairobi; Hatfield, R. and Malleret-King, M. (2007) The economic value of the Mountain Gorilla protected forests (the Virungas and Bwindi Impenetrable National Park). International Gorilla Conservation Programme (IGCP), Nairobi.

Summary of data collection & analysis requirements

There are five main steps involved in collecting and analysing the data required to apply contingent valuation techniques:

1. Ask respondents their WTP or WTA for a particular ecosystem good or service;
2. Draw up a frequency distribution relating the size of different WTP/WTA statements to the number of people making them;
3. Cross-tabulate WTP/WTA responses with respondents' socio-economic characteristics and other relevant factors;
4. Use multivariate statistical techniques to correlate responses with respondent's socio-economic attributes; and
5. Gross up sample results to obtain the value likely to be placed on the ecosystem good or service by the whole population, or the entire group of users.

Most contingent valuation studies are conducted via interviews or postal surveys with individuals, but sometimes interviews are conducted with groups. A variety of methods are used in order to elicit people's statement or bids of their WTP/WTA for particular ecosystem goods or services in relation to specified changes in their quantity or quality. The two main variants of contingent valuation are:

- Dichotomous choice surveys, which present an upper and lower estimate between which respondents have to choose; and
- Open-ended surveys, which let respondents determine their own bids.

More sophisticated techniques are also sometimes used, such as engaging in trade-off games or using take-it-or-leave it experiments. The Delphi technique uses expert opinion rather than approaching consumers directly.

Applicability, main strengths & weaknesses

Contingent valuation techniques are particularly useful for valuing ecosystem services that have no market price, close substitutes or clear effects on other production processes. They have a potentially wide application, but are most often used to elicit information about non-use values, cultural services, and consumer surplus over and above what might actually be paid for a good or a service. They are often applied to the option and existence values associated with tourism and recreation, and with perceptions of the intrinsic values associated with particular habitats or species. Contingent valuation techniques are also often applied to value people's perceptions of the loss in value associated with biodiversity loss and ecosystem degradation.

A major strength is that, because they do not rely on actual markets or observed behaviour, they can in theory be applied to any situation, good or service. They remain one of the only methods that can be applied to option and existence values, and are widely used to determine the value of ecosystem services. Contingent valuation techniques are often used in combination with other valuation methods, in order to supplement or cross-check their results. One of the biggest disadvantages of contingent valuation is the large and costly surveys, complex data sets, and sophisticated statistical analysis and modelling techniques that it requires. Another constraint arises from the fact that they rely on a hypothetical scenario which may not reflect reality or be convincing to respondents.

Contingent valuation techniques require people to state their preferences for ecosystem goods and services. They are therefore susceptible to various sources of bias, which may influence their results. The most common forms of bias are strategic, design, instrument and starting point bias:

- Strategic bias occurs when respondents believe that they can influence a real course of events by how they answer WTP/WTA questions. Respondents may for instance think that a survey's hypothetical scenario of the imposition of a water charge or ecosystem fee is actually in preparation;
- Design bias relates to the way in which information is put across in the survey instrument. For example, a survey may provide inadequate information about the hypothetical scenario, or respondents are misled by its description;
- Instrument bias arises when respondents react strongly against the proposed payment methods. Respondents may for instance resent new taxes or increased bills; and
- Starting point bias occurs when the starting point for eliciting bids skews the possible range of answers, because it is too high, too low, or varies significantly from respondents' WTP/WTA.

With careful survey design, most of these sources of bias can however be reduced or eliminated.

CONJOINT ANALYSIS TECHNIQUES

Conjoint analysis was originally developed in the fields of marketing and psychology, in order to measure individuals' preferences for different characteristics or attributes of a multi-choice attribute problem. In contrast to contingent valuation, conjoint analysis does not explicitly require individuals to state their willingness to pay for environmental quality. Rather, conjoint asks individuals to consider status quo and alternative states of the world. It describes a specific hypothetical scenario and various environmental goods and services between which they have to make a choice. The method elicits information from the respondent on preferences between various alternatives of environmental goods and services, at different price or cost to the individual.

Using conjoint analysis to value water quality in South Africa

The conjoint analysis sought to ascertain the tourism value of rivers in the Crocodile Catchment in terms of revenues to Kruger National Park, South Africa. A combination of a representative range of relevant river attributes (the number of crocodiles and hippos, number of waterbird species, diversity of the riverscape, and density of riparian trees) were presented, and four levels were defined for each depending on ecological catchment management practices. Two contingent valuation-style questions provided values for the 'ideal' and 'worst' scenarios relative to the status quo: (1) If all of the rivers in the Kruger National Park dried up completely, so that there were no crocodiles, hippos or waterbirds present, there were no riverine trees, but everything else in the park were the same, would you spend less time in the Park? Please estimate how much; (2) Consider the fact that the rivers in the Park are used upstream, and are presently not in their original state. If, hypothetically, the rivers were to be restored to their original state - that is, they contained high numbers of crocodiles, hippos, waterbirds, etc, diverse habitats, including lots of riverine trees, do you think that you would spend more time in the Park? The study estimated that the current value of Kruger National Park tourism is about $17 million in terms of on-site expenditure, $33 million in terms of economic impact, and $125 million in terms of consumers' surplus. It was found that about 30% of tourism business would be lost if rivers were totally degraded.

From: Turpie, J.K. and A. Joubert, 2001, Estimating potential impacts of a change in river quality on the tourism value of Kruger National Park: An application of travel cost, contingent and conjoint valuation methods. Water SA 27(3): 387-398.

Summary of data collection & analysis requirements

There are two main steps involved in collecting and analysing the data required to apply conjoint valuation techniques:

1. Describe specific future scenario, involving choices between ecosystem services; and
2. Ask respondents for information about their preferences between various choices, at different prices and costs to them.

Data collection usually relies on some form of face-to-face interviews, focus groups and discussions. In order to generate statistically valid results which can be extrapolated to a larger population, they require that a sufficient number of respondents are involved which also span a representative range of demographic categories or socio-economic groups.

Applicability, main strengths & weaknesses

Like contingent valuation, conjoint analysis techniques have a potentially wide application but are most often used to elicit information about non-use values and cultural services, or to look at people's preferences for multiple ecosystem services and attributes.

Their main weakness or difficulty in application is that they rely on extremely complex survey and data analysis techniques, and typically require high budgets and specialised expertise to carry out.

Choice experiments techniques

Choice experiments techniques present a series of alternative resource or ecosystem use options, each of which are defined by various attributes including price. Choice of the preferred option from each set of options indicates the value placed on ecosystem attributes. As is the case for contingent valuation, data collection and analysis for choice experiments is relatively complex. Usually conducted by means of questionnaires and interviews, choice experiments ask respondents to evaluate a series of "sets", each containing different bundles of ecosystem goods and services. Usually, each alternative is defined by a number of attributes. For example, for a specific ecosystem this might include attributes such as species mix, ecosystem status, landscape, size of area, price or cost. These attributes are varied across the different alternatives, and respondents are asked to choose their most preferred alternative. Aggregate choice frequencies are modelled to infer the relative impact of each attribute on choice, and the marginal value of each attribute for a given option is calculated using statistical methods.

Using choice experiments to value catchment trees in the Kilombero Valley, Tanzania

Choice modelling was used to examine the values attached by communities in and around Kilombero Valley to the conservation of catchment trees. Household willingness to pay for wetlands attributes were determined through a choice experiment investigating the following three biodiversity attributes of Kilombero Valley: tree cover in the catchment areas; area under grazing; and area of undisturbed flood plains, together with a price attribute which was proposed as the percent increase in the water dues. Results show that although conservation preference is generally positive among both rural and urban communities for the trees, it is markedly lower among rural communities.

From: Mombo, F., Lusambo, L., Speelman, S., Buysse, J., Munishi, P. and can Huylenbroeck, G. (2014) Scope for introducing payments for ecosystem services as a strategy to reduce deforestation in the Kilombero wetlands catchment area. Forest Policy and Economics 38: 81-89.

Summary of data collection & analysis requirements

There are three main steps involved in collecting and analysing the data required to apply choice experiment techniques:

1. Present series of alternative ecosystem use options, each defined by different characteristics (e.g. species mix, ecosystem status, landscape, size of area) including price or cost;
2. Ask respondent to evaluate these "sets", and to choose their most preferred alternative;
3. Model aggregate choice frequencies to infer impact of each attribute or choice, and their values.

Data collection usually relies on some form of face-to-face interviews, focus groups and discussions. In order to generate statistically valid results which can be extrapolated to a larger population, they require that a sufficient number of respondents are involved which also span a representative range of demographic categories or socio-economic groups.

Applicability, main strengths & weaknesses

Like contingent valuation and conjoint analysis, choice modelling techniques have a potentially wide application but are most often used to elicit information about non-use values and cultural services, or to look at people's preferences for multiple ecosystem services and attributes.

Their main weakness or difficulty in application is that they rely on extremely complex survey and data analysis techniques, and typically require high budgets and specialised expertise to carry out.

PARTICIPATORY ECONOMIC VALUATION TECHNIQUES

Participatory economic valuation has emerged largely as a response to the perceived gaps and weaknesses in "conventional" neoclassical ecosystem valuation methods. These have been criticised as being ill-equipped to deal with equity and livelihood issues, relying on an overly-narrow and culturally-specific market paradigm, and tending to overlook or underemphasise the interests and needs of more marginalised and vulnerable groups (such as indigenous peoples, women, the landless or ultra-poor). It should however be noted that participatory economic valuation is usually applied as a supplement or addition to (rather than a substitute for) more "conventional" ecosystem valuation methods.

There is no hard and fast definition of participatory economic valuation methods. Although there is considerable variation in the design and application of these methods, two common features can be identified: a concern with reflecting stakeholders' own perceptions, preferences and categories of value, and efforts to ensure that ecosystem service users and beneficiaries are directly involved in the valuation process.

Using participatory economic valuation to value subsistence use of forest resources in Kenya

The participatory economic valuation approach was used to calculate subsistence-level use of food, fuel, shelter, fodder and medicinal products in Oldonyo Orok forest, Kenya. Local Maasai community members selected the medium of valuation: a young castrated bullock. This was chosen because it represented a commodity which formed part of the local socio-economy, had wide local significance as an item of wealth and value, is a major medium for exchange, and could easily be translated into a monetary amount. Picture cards were prepared, depicting this value indicator and each forest activity/product that was carried out. The valuation process followed three steps. In order to get an idea of the relative importance of different products, a ranking exercise was first performed on the picture cards representing forest activities. Relative values were then established by distributing seeds and stones between the cards representing forest activities and the indicator of value. Lastly, respondents stated the purchase and sale price of the value indicator, which provided the means for forest products to be translated into cash amounts and calculated as average annual values. The study found that on average, subsistence forest use was worth over a third of the annual value of subsistence livestock production each for the 1,000 forest-adjacent dwellers in Oldony Orok.

From: Emerton, L. 1996. Valuing the Subsistence Use of Forest Products in Oldonyo Orok Forest, Kenya. Rural Development Forestry Network Paper 19e, Overseas Development Institute (ODI), London.

Summary of data collection & analysis requirements

Because there is no fixed approach or method for participatory economic valuation, it is not possible to specify the standard steps involved in collecting and analysing the data.

Applicability, main strengths & weaknesses

Participatory economic valuation methods are most commonly applied to provisioning services – especially subsistence-level or non-market uses of natural products by local communities. They are particularly useful in situations where money is not the most important medium of exchange or accurate indicator of value, and in relation to products which are not traded or for which the quantity of use is difficult to measure. Participatory economic valuation methods have also been applied to cultural services, and may (less commonly) be used to value supporting and regulating services.

Participatory economic valuation methods are usually relatively simple to apply. They are typically flexible, and do not require large amounts of complex data. One potential weakness is that, due to the specificity of the estimates yielded, values cannot always be scaled up or compared between sites. In addition, the emphasis on stakeholder participation means that these methods may be time-consuming to carry out.

BENEFIT TRANSFER TECHNIQUES

"Benefit-transfer" refers to the transferral of value estimates from studies which have been carried out in other sites.

Using benefit transfer to value ecosystem service values in Tabora Region, Tanzania

An assessment of ecosystem service values in Tabora Region was undertaken using benefit transfer techniques, in combination with household surveys on livelihoods and provisioning services. The benefit transfer portion of the analysis was based on a combination of secondary data from a wide range of sources within the Southern African region and further afield and a GIS land cover analysis. The assessment of land cover types and ecosystem characteristics used a GIS system to generate land cover data and this was cross-referenced with ecological studies and information from local informants to determine the ecosystem services characteristics of the different land cover areas. Because there was little or no existing data for the study area on ecosystem services values, data from studies of comparable areas were collated and used to generate valuation parameters that were then applied to the study area. This provided estimates of water regulation, biodiversity, tourism, cultural, aesthetic and carbon sequestration values. Combining this information with primary data on provisioning services suggests a total economic value of around USD 65 billion a year, plus a carbon stock worth USD 45 billion.

From: Majule, A., Yanda, P., Kangalawe, R. and R. Lokina. (2011) Economic Valuation Assessment of Land Resources, Ecosystems Services and Resource Degradation in Tanzania. Report prepared for The Global Mechanism by the Institute for Resource Assessment, University of Dar es Salaam..

Summary of data collection & analysis requirements

There are five main steps involved in collecting and analysing the data required to apply benefit transfer techniques:

1. Identify existing studies or values that can be used for the transfer;
2. Determine whether the existing values are transferable, based on criteria such as comparability of service, ecological and socioeconomic conditions;
3. Evaluate the quality of the primary studies to be transferred, and discard those which are of questionable methodological or technical quality;
4. Adjust the existing values to better reflect the values for the subject site under consideration. All values must be corrected for inflation (if they were generated in the past) to bring them to current price levels, as well as adjusted to account for differences in real prices and purchasing power between the country in which the estimate was generated and that in which it is being used.
5. Carry out some analysis of the degree of uncertainty regarding the transferred value.

There are three main types of benefit transfer:

- Unit value transfer in which the values being transferred from the study site are expressed as a monetary value per unit (usually per unit area or per beneficiary), combined with information on the quantity of units at the policy site, in order to estimate site values.
- Value function transfer uses a value function estimated for the study site, combined with information on the policy site characteristics, to calculate the unit value of an ecosystem service at the policy site. A value function is an equation that relates the value of an ecosystem service to the characteristics of the ecosystem and the beneficiaries of the ecosystem service.
- Meta-analytic function transfer uses a value function estimated from the results of many different primary studies representing multiple study sites, combined with information on the policy site characteristics, to calculate the unit value of an ecosystem service at the policy site. Since the value function is estimates from the results of multiple studies, it is able to reflect a much greater degree of variation in biophysical and socioeconomic characteristics.

Although benefit transfer techniques are almost always based on desk reviews of other valuation studies, it is worth remembering that they usually require some level of data on the study site: for example areas under different habitats, number of users of a particular service, and so on.

Applicability, main strengths & weaknesses

Benefit transfer techniques can and are applied to any type of ecosystem service. They are particularly widely used to value regulating and cultural services, in case where no site-specific data are available.

The key strength of the method is its flexibility, lower time requirement and lower cost when compared with primary valuation. However, this expedience comes at an obvious cost in terms of significantly decreased accuracy and validity, and high levels of uncertainty. The benefit transfer method is most reliable when the original site and the study site are very alike, when the environmental change being considered is very similar, and when the original valuation study was carefully conducted and used sound valuation techniques. Extreme caution must be applied when engaging in benefit transfer, due to the limitations of applying data about one site to another context which might have very different biological, ecological and socio-economic characteristics. It is always best to use a conservative approach, and make efforts to ensure that transferred values are as appropriate as possible to the situation in which they are being applied.

6 INVESTIGATING COSTS AND BENEFITS: WEIGHING UP THE ECONOMIC GAINS FROM BIODIVERSITY CONSERVATION AND THE COSTS OF ECOSYSTEM DEGRADATION (STEPS 7-8)

Steps 7 and 8 of the rapid valuation process involve making sense of the value estimates, and preparing the figures that will be used to convey the business case and justification for the CIP. This chapter provides further guidance on the kinds of tools and techniques that can be used to further analyse the information that has been generated on the gains and value-added from biodiversity conservation and/or the costs and losses associated with its degradation and loss.

INTERPRETING THE BASELINE

Calculating the baseline or current value of the BSA biodiversity and ecosystem services is relatively straightforward. It is a matter of collating and interpreting the results of the data collection and analysis that was carried out in step 6.

There are various ways of expressing baseline values. Providing a single, consolidated estimate of the total value of biodiversity and ecosystem services at the BSA, for the site as a whole and/or on a unit area basis, gives a broad-brush aggregated figure. It is also usual to indicate the value of each ecosystem service, and show how they contribute towards the total.

In addition, it may be instructive to disaggregate the baseline figures still further, and express the value of ecosystem services:

- For different groups (for example local households, the ultra-poor, women, downstream water users, urban dwellers, industrial users, public authorities);
- For different sectors (for example agriculture, fisheries, water, energy or tourism);
- At different levels of scale (for example the immediate locality, province, country, region, global community);
- In terms of specific cash or non-cash indicators (for example income, subsistence, employment, nutrition, energy, foreign exchange earnings or public revenues); and/or
- In relation to other indicators or as a share of total production, consumption or investment (for example share of household income, energy or nutritional intake, contribution to local or national GDP, as a component of government tax revenues, relative to expenditures on purchased alternatives, in comparison to other sources of output).

MODELLING THE ECONOMIC CONSEQUENCES OF ECOSYSTEM CHANGE

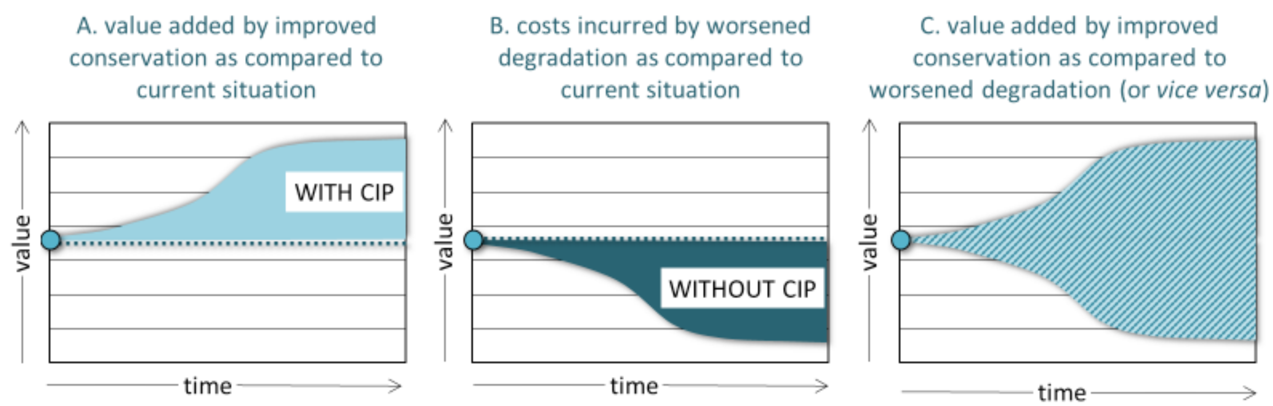
Coming up with a single, snapshot estimate of biodiversity and ecosystem values has little meaning in management and policy terms. It is marginal values – in other words the changes that result from a shift in ecosystem status and service provision– that are of interest.

Thus, it is not just a case of showing that "the BSA is worth ***x*** amount of money" (as in step 7). The analysis has to go beyond merely stating baseline values, and demonstrate how much additional value or avoided cost will result from biodiversity conservation (or, conversely, show the damages or losses that will arise due from continuing biodiversity degradation). It is concerned with ***incremental*** costs and benefits: what the CIP actions will add to or subtract from the economy. To do this, it is necessary to consider future scenarios in which the conservation status of the BSA will change.

The primary, and most basic, foundation for these scenarios should be the management plan, PIN or other strategic plan that has been prepared for the BSA, and which the CIP is communicating and marketing. This should contain measurable targets and outcomes for the conservation activities that are being proposed. These targets (e.g. restored habitat areas, tourist numbers, income or revenues generated, community benefits achieved) form the basis of modelling the benefits of conservation. It is important to note that these targets and indicators are not expected to be developed as part of the valuation exercise – they should already exist in the plan that is being assessed and turned into a CIP. If this information does not exist, it will be difficult (or likely impossible) to conduct a full valuation exercise that looks at the consequences of ecosystem change or the economic value-added by the CIP. It will be only possible to conduct a very rudimentary "snapshot" analysis of the value of biodiversity and ecosystem services in the BSA at the current time. While this can in no way be considered good practice in ecosystem valuation, it is sometimes the only valuation that it is possible to carry out. If this is the case, these limitations should be clearly stated, and it should be recognised that the valuation exercise will not measure the benefits (or costs avoided) from the CIP. It will only provide a broad indication of the overall value of biodiversity that is at stake, and will be in some way affected if the CIP is delivered.

Step 8 of the rapid assessment process therefore needs to consider what the economic consequences of a change in the conservation status of the BSA will be. To do this, it is necessary to construct some kind of scenario model which projects how ecosystem values might change under "with CIP" and/or "without CIP" situations. This scenario is then compared either with the current situation (options A and B in Figure 8), or with its opposite (option C). Scenarios are usually modelled for a period of around 25 years into the future, and the discounted net present value (NPV) of each stream of future costs and benefits is compared.

Figure 8: Modelling changes in ecosystem values "with" and "without" CIP actions



In order to model these future scenarios, certain assumptions have to be made about how the status of biodiversity in the BSA will change as a result of the actions to be implemented in the CIP (or, conversely, how they will change if the actions in CIP are not implemented), and what impact this will have on ecosystem service values. Other changes, too, may need to be factored into the projections: for example broader alterations in land use and land cover, changes in population and demography, shifting patterns of resource use and ecosystem service dependencies, changing prices and market opportunities.

While it is important to emphasise that in a rapid valuation exercise the scenario models will inevitably be somewhat rough, "back of the envelope" projections, it is nevertheless important that they should have at least some basis in reality. Coming up with credible assumptions of change can however be quite difficult, especially if the CIP contains no quantified conservation targets or indicators.

It is therefore useful to allow for some kind of brief scenario-building exercise to be carried out with key stakeholders and experts. This would involve developing a vision of the future (with/without CIP), describing likely trends in key variables, and defining quantitative assumptions of change (Figure 9). This does not have to be a lengthy process – half a day or less would usually allow ample time, but should be seen as a key component of the rapid valuation exercise. As well as improving the quality and reality of the scenario and assumptions that are developed, it has the added advantage of being a good way of enhancing buy-in from key stakeholders. It can be held as a stand-alone meeting, rolled into the step 6 data collection process, or even combined with the scoping meetings that are held in steps 1-4 of the rapid valuation exercise.

The scenario-building exercise should also be informed by, and supplemented with, a review of the policies, strategies, plans and reviews that have been prepared by other agencies and sectors working in and around the BSA. These kinds of documents often contain quite detailed estimates of past and future trends in key variables: for example shifts in land use and land cover patterns, changes in agricultural production, energy and water demand, or industrial and infrastructural expansion. Informed opinions can also be sought from sectoral or thematic experts and used to fill in specific gaps in knowledge.

Figure 9: Template for recording BSA scenarios, assumptions of change, and trends in key variables

Description of the scenario	No PIN: continuing biodiversity loss and ecosystem degradation resulting from unsustainable forest utilisation, agricultural encroachment and low protected area management and funding

Variable	Assumption of change	Basis of assumption	Short-term trend	Medium-term trend	Long-term trend
Land use/cover	Continued decrease in forest area/ quality, initially worsening then levelling off. Conversion to smallholder mixed farming	Extrapolation of current trends into future (FAO and Forest Department records)	Forest cover ↓ 0.5% p.a.	Forest cover ↓ 0.75% p.a.	Forest cover ↓ 0.5% p.a.
Forest-adjacent & downstream populations	Increases steadily	2010 population census projections for 2015-40	Rural↑1.2% Urban↑2.0%	Rural↑0.8% Urban↑2.4%	Rural↑0.2% Urban↑2.8%
Firewood utilisation	Population increases but % participation decreases steadily as lifestyles change and switch to alternative fuel sources, and wood availability declines	Census projections; expert /stakeholder opinion	Population as above, participation declines to 50%	Population as above, participation declines to 25%	Population as above, participation declines to 10%
Grazing	Carrying capacity decreases as forest is degraded and area available for pasture declines	FAO and FD forest land use projections; expert consultation with Ministry of Livestock experts	Forest cover as above, carrying capacity↓, to 3.5 ha/TLU	Forest cover as above, carrying capacity↓, to 3 ha/TLU	Forest cover as above, carrying capacity↓, to 2.5 ha/TLU
Land erosion from forest area	Increases in line with average soil loss rates for converted and degraded forest land	Expert consultation with Soil & Water Conservation Branch, Ministry of Agriculture	Forest cover as above	Forest cover as above	Forest cover as above
Flood incidence and magnitude	Growing population, development of settlements and infrastructure, shorter return periods worsens impacts and damage costs	Census projections; Province urban masterplan, physical plan, roads department strategy; expert consultation with University basin modellers	Population as above, roads ↑10%, flood RP: 10y maj., 5y min	Population as above, roads ↑10%, flood RP: 5y maj., 3y min	Population as above, roads ↑10%, flood RP: 3y maj., 2y min
Visitor numbers and characteristics	Number of visitors, average expenditure and willingness to pay decreases as forest degraded	Expert consultation with tourism industry; review of visitor characteristics and expenditures in other areas	Numbers↓, 1% p.a., per capita spending ↓ 2.5%	Numbers↓, 1.5% p.a., per capita spending ↓ 5%	Numbers ↓, 0.5% p.a., per capita spending remains same

It is always important to be aware of the limitations of scenario modelling (and of biodiversity and ecosystem valuation more generally). It is very common for the biophysical and socioeconomic data that is available to the valuation study to contain major gaps, be of doubtful quality and accuracy, and show significant inconsistencies (and even contradictions) between different sources. This tends to especially be the case for information about the biophysical linkages and causal relationships between changes in habitat status and the provision of a given quantity or quality of ecosystem services. Extrapolating current ecosystem values into the future is both imprecise and risky, and involves many unknowns. It is, for example, unlikely that the scenario model will be able to adequately account for sustainability issues, non-linearities and threshold effects in ecosystem functioning.

As interesting (and hopefully useful) as the numbers generated by the rapid valuation exercise will be, it should be borne in mind that such figures will inevitably mask some important elements of ecosystem service values, and over-simplify the complex biophysical and socioeconomic dynamics and relationships at play. In all cases, the sources and assumptions that have been used to model the scenarios and come up with valuation estimates should be clearly enumerated. This means that, as new or improved data become available, the figures can be improved and updated.

7 COMMUNICATING THE FINDINGS: MAKING A CONVINCING ECONOMIC CASE FOR INVESTING IN CONSERVATION (STEPS 9-10)

The ultimate aim of valuing biodiversity and ecosystem services is to provide a justification for the CIP. Steps 9 and 10 involve communicating the economic case for investing in biodiversity conservation. This chapter provides further guidance on the kinds of tools, techniques and key questions that can be used to present information on biodiversity and ecosystem values, and convey the economic wisdom of implementing the CIP.

THINKING ABOUT THE AUDIENCE AND KEY MESSAGES

Before preparing the economic justification section in the CIP document, it is a good idea to think carefully about who this information is being targeted at, and what kind of evidence and arguments need to be presented in order to attract their attention and support. This revisits and builds on the preliminary scoping of target audiences and messages that was carried out as part of step 4 of the rapid valuation exercise. It involves identifying which individuals, groups and agencies have the most leverage to approve budgets or allocate investments funds to the activities presented in the CIP, as well as those that have the greatest power to influence conservation status and outcomes in the BSA.

The target audience of the CIP justification is likely to span several distinct groups: government decision-makers and budget-holders from both conservation and development sectors, local authorities, external donors and funders, and possibly even private investors and local land and resource users. The aim is to demonstrate that biodiversity conservation generally, and the actions outlined in the CIP specifically, makes clear economic sense from their perspective, and according to their different interests and mandates. For each target group, consideration should be given to identifying what the most strategic and convincing arguments will be, and which kinds of indicators and evidence will best make the case for the CIP (Figure 10).

Figure 10: Template for summarising target audiences, messages and evidence

Target audience	Main interest/mandate	Key economic messages/arguments	Indicators/evidence
Ministry of Finance	Managing national budget, allocating funds agencies, maximising public revenues, securing national development targets	Investing in the BSA (by increasing annual budget allocations) is a cost-effective way of achieving national development goals and fiscal improvement	Contribution of BSA to national GDP sectoral income, public revenues, employment and foreign exchange
Regional Development Authority	Managing local budget, allocating funds between agencies, maximising public revenues, securing local development targets	Investing in the BSA (by increasing annual budget allocations) is a cost-effective way of achieving regional development goals and fiscal improvement	Contribution of BSA to regional GDP and sectoral income, public revenues, employment
National Parks Authority	Ecosystem and biodiversity conservation, effective protected area management	Investing in the BSA (by increasing annual budget allocations and increasing revenue retention) will lead to gains in biodiversity conservation and protected area management effectiveness	Contribution of BSA to public revenues , potential new economic opportunities
International Conservation Donor	Conservation of biodiversity of global significance	Providing funding and other support to the BSA will improve the status of globally-significant biodiversity and ecosystem services	Value of BSA biodiversity and ecosystem services to global community
Development NGO	Poverty reduction, gender rights, reducing vulnerability	Providing funding and other support to the BSA will strengthen local livelihoods and secure access to basic needs, especially for women and the poor	Role of ecosystem services in livelihoods of poor and women, contribution to basic needs, disaster risk reduction, resilience
Downstream hydropower scheme	Sustained power generation, improved profits, reduced costs	Providing funding to the BSA will improve power generation. reduce operating costs, increase company profits, and prolong the lifespan of the facility	Value of ecosystem water services in terms of costs and damages avoided, sustained power generation and lifespan of facility

PRESENTING THE ECONOMIC JUSTIFICATION FOR THE CIP

The bottom line of the CIP section, and its overarching focus, is to present monetised estimates of the value-added and costs avoided from biodiversity conservation: in effect to show what are the economic returns from investing in the CIP. This would usually cover:

- What is the current value of the ecosystem services considered in the study for the BSA as a whole?
- What is the relative economic importance and value of different ecosystem services or habitat types?
- What is the economic importance of ecosystem services for different groups, sectors or levels of scale?
- What do ecosystem values contribute to key economic indicators such as sectoral output, GDP, foreign exchange, public revenues, employment, household cash income and livelihoods?
- How much are the gains, value-added and costs avoided from biodiversity being conserved (and/or the costs, losses and damages incurred from biodiversity continuing to be degraded)?
- How will implementing the CIP benefit key groups, sectors, levels of scale or indicators (and/or how will failing to implement the CIP incur costs to them)?

Exactly which messages and evidence are used in the CIP section will of course vary according to the specific circumstances of the BSA and scope of the interventions that are being proposed. The justification will also be tailored to the particular interests and agendas of the target audience. Certain general points and principles relating to the preparation and presentation of the evidence base on the gains and value-added from investing in the CIP can however be noted.

From the start, it is essential to remember that the written CIP section should be extremely clear in the messages it conveys and the reasoning it follows. If the justification for biodiversity conservation is in any way vague or ambiguous, then it is likely that the people reading it will also be confused – and may well remain unconvinced by the evidence and arguments that have been presented to them. Keep the language simple, the sentences short, and wherever possible avoid technical jargon. As a general principle, the judicious use of numbers, graphs and illustrations offers a far more convincing, and memorable, way of presenting arguments than lengthy and complicated writing.

One especially important point to bear in mind is the need to stay relevant. This means making sure that only the information which is necessary to provide a justification for the CIP is presented, as simply and succinctly as possible. There is often a temptation to mention every possible aspect of the economic value of biodiversity and ecosystem services. In most cases serves this only to confuse the issues, and may dilute the arguments that are being made. It is also not necessary to go into the minute details of how the figures have been calculated or what methodologies have been used. This information can be presented elsewhere, as part of a more in-depth technical report or annex.

A final point to raise is that a short section in the CIP document is unlikely to be sufficient to ensure either that the proposed interventions will be funded, or that decision-makers and budget-holders will become fully aware of, and convinced by, the high economic value of the BSA's biodiversity and ecosystem services. It is obvious that the decision to fund the CIP will also depend on many other considerations, arguments and processes. Many people are involved in shaping decision-making, and various channels and media should be used to disseminate the findings of the rapid valuation exercise. Making the valuation results convincing to these different groups requires that multiple ways of presenting information are deployed in addition to the CIP.

8 ANNEX I: SELECTED TOOLKITS AND MANUALS ON BIODIVERSITY AND ECOSYSTEM VALUATION

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