

Corporate Ecosystem Valuation

Additional Notes A

Selected Ecosystem Valuation Concepts and Issues

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Introduction

This interim paper on selected ecosystem valuation concepts and issues complements the World Business Council for Sustainable Development Guide to Corporate Ecosystem Valuation (CEV). The paper provides a basic overview for corporate managers on:

- Ecosystem Services and Total Economic Valuation;
- Other related CEV concepts and issues; and
- Business approaches that CEV can be linked to.

When attempting to undertake a CEV study, it is important to have a basic awareness of these concepts and issues. Further background information can be found in the references provided in the WBCSD's Guide to Corporate Ecosystem Valuation's Resource section (see Box 10). This paper is considered an information document and might be revised in the future.

Ecosystem Services and total economic value

1. Introduction

The two main underlying concepts involved in CEV are ecosystem services and Total Economic Value (TEV). The former came to prominence following the Millennium Assessment in 2000, while the concept of TEV was established prior to 1990. As outlined below, the two concepts are closely related, with TEV in effect providing a suitable framework for valuing ecosystem services.

2. Ecosystem Services

Ecosystem Services¹ are 'the benefits people obtain from ecosystems'. The benefits can be broken down into four categories that include:

- **Provisioning services.** The benefits that ecosystems provide in the form of 'products' or 'goods' that are consumed by humans or used in the production of other goods. They include things such as timber, water, fish and genetic resources.
- **Regulating services.** The benefits obtained from an ecosystem's control of natural processes such as climate, disease, erosion, water quality and flows, and pollination, as well as protection from natural hazards such as storm and wave damage. "Regulating" in this context is a natural phenomenon and is not to be confused with government policies or regulations. They are ecosystem 'functions' and 'regulatory processes' that includes vegetation storing carbon, wetlands slowing down water flows and cleansing water, and coral reefs and mangroves protecting coastal infrastructure from erosion and storm damage.
- **Cultural services.** The non-material benefits people obtain from ecosystems such as recreation, spiritual values, and aesthetic enjoyment.
- **Supporting services.** The natural processes such as nutrient cycling and primary production that maintain the other services.

The value of supporting services is captured within the value of the above three services and so should NOT be valued separately.

3. Total Economic Value

A well recognized framework for putting money values on ecosystem services is that of 'Total Economic Value'². As illustrated in Figure 1, this categorizes the different 'ecosystem services' into the following types of economic value:

- **Direct use values:** These include raw materials and physical products that are used directly for production, consumption and sale such as those providing energy, shelter, food, agricultural production, water supply, transport and recreational facilities. These values effectively include all 'provisioning services' and some 'cultural services' involving direct use of resources, such as recreation.
- **Indirect use values:** These include the ecological functions that maintain and protect natural and human systems through services such as maintenance of water quality and flow, flood control and storm protection, and micro-climate stabilization, and the production and consumption activities they support. These values are equivalent to 'regulating services'.
- **Option values:** This is the 'premium' placed on maintaining a pool of habitats, 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. This type of value potentially applies to each of the three main services (provisioning, regulating and cultural).
- **Non-use values:** This is the value of ecosystems regardless of their current or future use, for cultural, spiritual, aesthetic, heritage and biodiversity reasons. They represent a complex, contentious and potentially highly significant type of value. They are real in that people do pay large sums of money to charities to protect whales and rainforests even though they will never use or see them in the wild themselves. Motives behind the values relate to individuals deriving value just from knowing that things exist (existence value), knowing that others will benefit (altruistic value) and knowing that future generations will benefit (bequest value).

Non-use values can be highly significant, particularly for maintaining unique and important ecosystems where large populations may be willing to pay to protect them. They can only be ascertained using stated preference questionnaires or benefits transfer from a previous stated preference study (see Additional Notes B). Non-use values are a component of 'cultural services'.

Figure 1 shows the relationship between ecosystem services and total economic value, as well as links to human wellbeing.

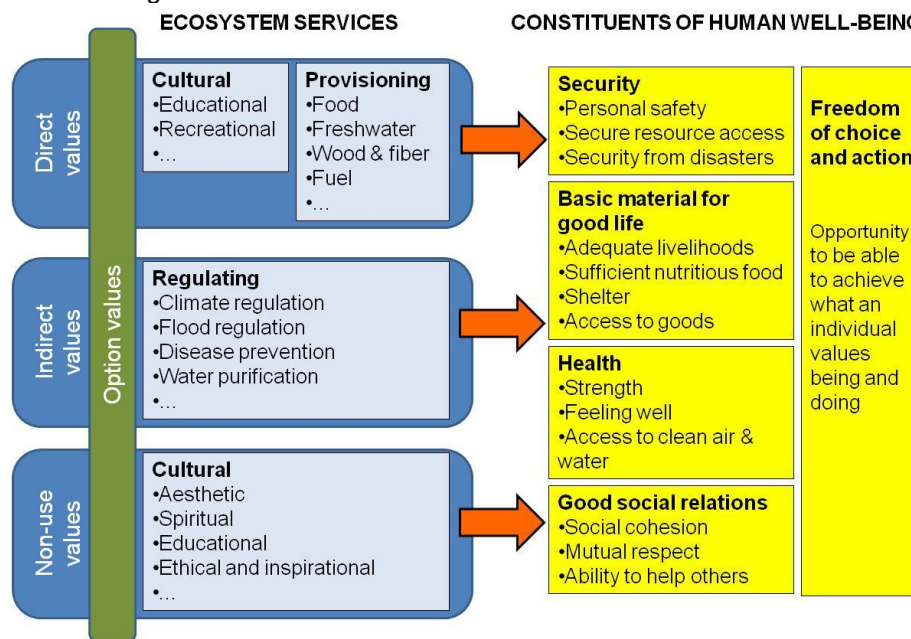


Figure 1: Linkages between ecosystem services, TEV and human wellbeing
 Source: Adapted from WBCSD's Corporate Ecosystem Valuation Scoping Study (2009)

Other concepts and issues

The following represents a selection of related concepts and issues that require some consideration when undertaking CEV studies.

Cumulative effects. If a large amount of a natural habitat is available, there may be greater societal benefits from developing and thereby sacrificing part of it. Such actions will lead to a 'marginal' loss of the ecosystem service values provided by the habitat. The marginal loss of the habitat may be bearable. However, if a number of such decisions are made independently of each other, the resource and its values may soon be lost. It might be that the combined value of the losses may be greater than the assumed one off individual losses. In particular this can happen when so much of the resource is lost that its services are no longer sustainable, or because of a loss of connectivity between different parts of the resource.

Discounting. This is a procedure used when comparing costs or benefits that occur at different magnitudes at different dates in the future (see Time-periods). The procedure converts future costs or benefits to present values so that they can be compared on an equal basis, taking into account time preferences and the opportunity cost of capital. It is an important and contentious topic, as discounting future impacts gives them a lower value than if they were to occur today. Box 1 gives some guidance on selecting a suitable discount rate.

Box 1: Selecting a suitable discount rate

A suitable discount rate needs to be adopted when considering different values over time. Depending on the nature of the assessment, this could be either a 'commercial' or 'social' discount rate, for a financial or economic/societal analysis respectively.

A **commercial rate** would typically be the company's standard discount rate used in Discounted Cash Flow analysis, and be based on the company's weighted average capital costs (WACC). Alternatively, a company's Internal Rate of Return (IRR) hurdle for investments could be used (see definition at end of the Box). If a special lower IRR exists for prestige or sustainability projects, then this should be used. Any of these would be appropriate if examining the financial viability of setting up visitor facilities and an entrance fee for a reservoir or forest landholding.

A **social rate** is appropriate if a company wants to assess the overall economic welfare impacts a business has on society. In theory, if an economic cost-benefit analysis was being undertaken, all the financial costs and benefits linked to the company aspect should be adjusted to become 'economic' values. For example, this would include using a 'shadow' labor wage to reflect the opportunity cost of labor, and include the omission of any 'transfer payments' such as taxes and subsidies. In practice, depending on the intended application, and if clear caveats are provided, it may be acceptable to leave the existing financial values as they are, add the environmental values and use a societal discount rate.

There is however, considerable discussion as to the preferred social discount rate to use. These guidelines recommend either i) adopting the approach that the UK government is currently taking by using a declining rate of discount, or ii) using several discount rates to test the sensitivity of the outcome.

The UK government currently uses 3.5% for first 30 years, 3% for years 31 to 75, 2.5% for 76 to 125, 2% for 126 to 200, 1.5% for 201 to 300 and 1% for over 300 years. Potential discount rates to use to test the sensitivity of the outcome include say 0%, 1%, 2.5% and 5%.

An alternative approach that avoids the need to select a discount rate is to determine the 'Internal Rate of Return' of the company aspect itself. This is the discount rate that yields a net present value of 0, which can then be compared to other discount rates or IRRs.

Economic impact. This is a measure of the economic activity generated through the use of an ecosystem service. Economic impact tends to be something that governments and businesses are accustomed to measuring – it would include, for example, the contribution to GDP or total jobs

created by an activity. **Direct economic impacts** include the capital investment, gross revenues, and jobs created through use of an ecosystem service – for instance, the annual jobs and revenues associated with dive tourism at a given site. **Indirect economic impacts** include the flow-on effects on the wider economy from, for example, tourist expenditures on other items (eg food and accommodation) and through purchases from upstream domestic suppliers and employee expenditures. Economic impacts are seen as being extremely important for dealing with poverty alleviation, and an important aspect that companies can assist with (see the WBCSD’s Measuring Impact Framework, 2008).

Economic value. This is a measure of how much something such as an ecosystem service improves the wellbeing of an individual or of society when aggregated. The difference between the maximum amount that someone is willing to pay for something and the cost of providing that something is what economists call “value.” Economic values include the profit generated by producing something (producer surplus = revenues less costs to produce it) plus the additional amount someone would have paid (i.e. consumer surplus = willingness to pay less price paid). Many of the services provided by ecosystems are not captured in existing markets and hence are considered only in an assessment of economic value and not economic impact.

Environmental thresholds. This describes a situation when a natural resource system exhibits rapid change or even a sudden collapse when a threshold is reached. Beyond this threshold, an irreversible change to the ecosystem may occur, resulting in permanent loss of services provided by that ecosystem. Examples include water quality in lakes impacted on by nutrient inputs and marine fisheries suffering from over-fishing.

Intrinsic values. Ecosystem valuation will never be able to put a monetary value on the non-anthropocentric component of ‘intrinsic values’, which relate to the ‘right’ for plants and animals to exist. It is important that intrinsic values are acknowledged as another element of the environment that cannot be ‘valued’ monetarily.

Time-periods. It is always necessary to identify an appropriate time-scale for the CEV analysis over which the flow of costs and benefits are considered. This may for example relate to the expected life of the product, project or asset, or perhaps be more arbitrarily set at a reasonable duration between say 25 to 100 years. The time period should enable important longer term implications to be accounted for, but also bear in mind that going too far into the future leads to i) considerable uncertainties and ii) future money flows potentially becoming significantly reduced as a result of ‘discounting’ (see Discounting).

Uncertainty. Considerable uncertainty exists surrounding both the functioning and valuation of ecosystems. There is a potential lack of understanding about certain aspects, for example, what services are provided by different ecosystems, how these may change over time and how changes to ecosystems may affect the quantity and quality of the services they provide. It is prudent to undertake a sensitivity analysis that identifies areas of uncertainty and tests how sensitive the ecosystem valuation outcomes are to changes in values or assumptions used.

Ecosystem valuation links to business decision-making

CEV can potentially support and feed into most ‘analytical approaches’ used within a business to assist decision-making and reporting³. It is important to define at the outset which analytical approach, if any, the valuation will be part of, or be used to inform. This will influence the objective and nature of the CEV adopted. However, the CEV could equally be a stand-alone assessment. A number of these analytical approaches are briefly described below and in **Table 1**.

There are numerous money-based analytical approaches for corporate decision-making. Accounting processes range from **financial and management accounting**, which assess costs and benefits that have a direct financial implication for a company’s bottom line for external and internal uses respectively, to **full (environmental) cost accounting**, which recognizes all costs and benefits associated with an activity, including economic, environmental, health and social costs. **Economic cost-benefit analysis** is a monetary approach that compares all costs and benefits relating to a project or policy, including environmental externalities, from the perspective of the nation. **Economic**

impact assessments, often conducted as part of compulsory Environmental and Social Impact Assessments (ESIA), evaluate the impacts of a project on the local economy, including knock-on effects, jobs created, and distributional impacts. **Natural resource damage assessments** focus specifically on the costs and compensation for environmental damages. **Share price valuation** use techniques such as discounted cash flows and ‘real options’ to estimate values for company shares.

In addition, numerous non-monetary decision-making approaches are also adopted. Increasingly, the outputs of CEVs are being linked to these approaches too. Examples include **company reporting**, which provides annual financial and sustainability updates to shareholders, as well as **ESIAs** and **Strategic Impact Assessments (SIAs)**, which provide systematic approaches for evaluating and minimizing the potential environmental and social impacts of developments, programs, and policies. **Environmental Management Systems** are internal frameworks designed to manage a company’s environmental impacts. There are also a number of approaches for evaluating the longer-term social and environmental risks and impacts of company products or operations, including **risk assessment** and **life-cycle assessment**. Finally there are decision-making tools for assessing trade-offs, such as **multi-criteria analysis**, which compares alternative options using a quantitative scoring and weighting system, **cost-effectiveness analysis**, an approach that compares the outcomes and costs of several alternatives, and the **Ecosystem Services Review**, which focuses on developing corporate strategies around the risks and opportunities associated with company impacts and reliance upon ecosystem services.

Table 1: Summary of business analytical approaches

| | Analytical approach | Description |
|---------------------|--|---|
| Monetary approaches | Financial accounting | Financial analysis for external stakeholder purposes, in particular shareholders. It focuses on costs and benefits with direct financial implications to a company’s bottom line. It includes inputs to the ‘profit and loss account’ and ‘balance sheet’ of a company or business unit. |
| | Management accounting | Financial analysis for internal company purposes, that focuses on costs and benefits with direct financial implication relating to a product line, activity or asset investment. It includes, for example: pricing decisions, budgeting, capital investment decisions, discounted cash flows, net present values, internal rates of return, return on investments, payback periods etc. |
| | Full (environmental) cost accounting | An accounting approach that recognizes all costs and benefits associated with an activity, including economic, environmental, health and social costs. The assessment sometimes only includes internal costs and benefits, but it can also include externality costs and benefits too (either monetized or non-monetized). |
| | Economic cost-benefit analysis | An analysis that compares all costs and benefits relating to a project or policy that includes impacts to societal welfare and other stakeholders (i.e. ‘externalities’). These have typically been conducted for government or donor bank purposes to analyze net benefits to a nation using benefit:cost ratios, net present values and internal rates of return. However, the private sector is increasingly using this approach, especially if heavily regulated or with public responsibilities. |
| | Economic (socio-economic) impact assessments | A distribution assessment that evaluates the affects of a project in terms of money injected into a local economy, its knock-on-effects, jobs generated, and winners and losers etc. It is often required as part of an ESIA, and is particularly important when justifying contentious developments that boost local economies (e.g. nuclear power stations). |
| | Natural resource damage assessments | An approach involving various techniques to calculate environmental damages, remediation requirements and compensation relating to environmental liability and pollution incidents. |
| | Share price valuation | Valuation of a company through use of discounted cash flows and real options. |

| | Analytical approach | Description |
|--|---|---|
| Sustainability non-monetary approaches | Company reporting | Annual reporting of environmental, social and financial information (the triple bottom line/sustainability reporting) for external use, and in particular shareholder information. |
| | Environmental management systems | A structured framework for managing an organization's significant environmental impacts. It includes an assessment of a company's activities, products, processes and services that might affect the environment, and an environmental improvement program. |
| | Environmental and Social Impact Assessment (ESIA) | Systematic approach to evaluate and minimize potential environmental and social impacts associated with developments. For development projects seeking investments from Equator Principle banks, environmental costs and benefits of alternative options should be considered, and the aim should be for 'no net loss' of biodiversity and ecosystem services. <i>Note: Equator Principle banks are banks that have signed up to the Equator Principles which means that all development projects over \$10 million need to conform to the IFC and World Bank environmental and social performance standards.</i> |
| | Strategic Environmental Assessment | A system of incorporating environmental considerations into policies, plans and programs. It works at more of a strategic level than an ESIA, typically considering entire programs or policies. It can therefore look for synergies between projects and potentially address cumulative effects of projects. |
| | Ecosystem Services Review | An analysis to develop corporate strategies to maximize opportunities and minimize risks associated with ecosystem services based on a qualitative analysis. |
| | Multi-criteria analysis | A set of parameters are identified and compared quantitatively against a similar set for a number of alternative options using a system of scoring and weighting to derive a single number outcome. |
| | Sustainability appraisals | An assessment of a proposed development or operation that considers how governance, environmental, social and economic impacts meets stakeholder and government policy expectations. |
| | Risk Assessment | A risk assessment considers the risk to all ecosystems, including humans, exposed or impacted via a given media. It typically considers a source-pathway-receptor mode. |
| | Life Cycle Analysis | Life Cycle Assessment is a structured management tool for quantifying emissions, resources consumed, and environmental and health impacts associated with products over its full life cycle. |
| | Cost-effectiveness analysis | An analysis that compares the outcome (effectiveness) and costs of alternatives. In situations where the outcomes are all the same (i.e. they have the same goals), the 'least cost approach' is selected. |

References

¹ Millennium Ecosystem Assessment (2005). Ecosystems and human wellbeing. Biodiversity Synthesis. Washington DC: Island Press.

² Pearce, D.W., Markandya, A. and Barbier, E. (1989). Blueprint for a green economy. Earthscan, London.

³ Pearce D, Atkinson G and Mourato, S. (2006). Cost Benefit Analysis and the Environment: Recent developments, Chapter 18. OECD

Further references that may be of use include:

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