EUROPEAN COMMISSION
Directorate General for International Cooperation and Development

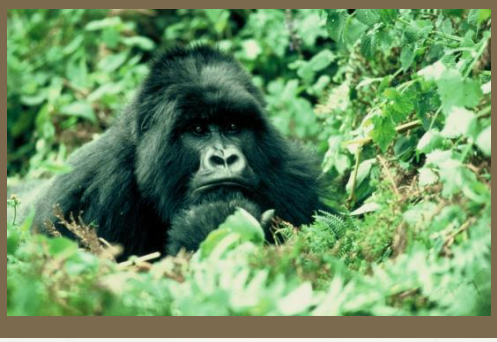
DCI/ENV/2015/365-966

EU Technical Assistance Facility for the Biodiversity for Life (B4Life) Initiative

The Economics of Ecosystems and Biodiversity (TEEB)

Briefing note

June 2016



In collaboration with

and

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TEEB rationale and objectives

With some exceptions, **biodiversity and ecosystem services do not have a market value** – so they tend to be ignored in the calculation of the costs and benefits of economic development, and are poorly captured (if at all) in policy- and decision-making frameworks and processes. This results in inappropriate regulation, suboptimal allocation of resources and depletion of the natural capital on which humanity's current and future prosperity and wellbeing depend.

In response to this pressing issue, The Economics of Ecosystems and Biodiversity (TEEB) was launched in 2007, with the support of the European Union and others, as a global initiative focused on "making nature's values visible". Its principal objective is to promote a better understanding of the **economic values associated with biodiversity and ecosystem services** and thereby support their mainstreaming into decision making at all levels. It aims to achieve this by following a structured approach to valuation that helps policy and decision makers:

- Recognize the wide range of benefits provided by ecosystems and biodiversity.
- Demonstrate their values in economic terms.
- Use tools for capturing those values in decision making processes.

Linkages between biodiversity, ecosystem services and development

Biodiversity and ecosystems generate multiple services that support life and provide a foundation for economic development and human wellbeing. These include:

- **Provisioning services**, i.e. the provision of food, water, raw materials, as well genetic, medicinal and ornamental resources.
- **Regulating services**, which underpin provisioning services or directly contribute to human wellbeing and security, such as air quality and local climate regulation, global climate regulation (through carbon sequestration), the moderation of extreme events (e.g. flood and landslide prevention), water flow regulation, water purification, erosion prevention, soil fertility maintenance and nutrient cycling, pollination, disease vector and pest control.
- **Habitat services**, providing food, water and shelter for a multitude of plant and animal species and contributing to the maintenance of genetic diversity.
- **Cultural services**, supporting recreation, tourism, spiritual experience and the enjoyment of natural beauty, and providing inspiration for culture, art and design.

In turn, human activities and especially economic development have a significant impact on biodiversity and ecosystems – more often than not taking the form of degradation and loss. Monitoring the benefits and values we derive from biodiversity and ecosystems can promote **improved governance of natural resources** and influence decision making with a view to addressing the direct and indirect drivers of change in biodiversity and ecosystems.

Ecosystem and biodiversity valuation methods and challenges

TEEB's approach to the valuation of biodiversity and ecosystem services rests on **bringing together ecological and economic aspects**, quantifying and mapping the economic consequences of policy changes on the state of ecosystems and biodiversity, the resulting changes in the provision of ecosystem services, and their impacts on human welfare. The approach takes account of the costs, as well as the benefits, of reducing or preventing biodiversity loss and protecting ecosystems: where trade-offs exist between conservation and development, "opportunity costs", i.e. the costs of foregone economic development, must be estimated and included in the calculation of net benefits.

The economic valuation of environmental services is not an exact science. Specific valuation methods have been developed to try and capture the multiple elements that contribute to the economic value of an environmental asset. Valuation is made complex, among other factors, by the **context, space and time specificity** of ecological functioning and economic values, and by the fact that different stakeholders attach different values to ecosystem services. Even applying best practices, **challenges and limitations** are experienced. Our ability to meaningfully attribute monetary values sharply decreases as we move from economic benefits (generally measurable) to socio-cultural benefits (only partly measurable) to ecological benefits (hardly measurable in money terms). There are also scientific uncertainties, measurement difficulties and "philosophical" disagreements between economists over the definition of sustainability, all of which influence the obtained values.

In spite of these issues, economic valuation is becoming **increasingly reliable**, and usefully supports the integration of at least some ecosystem service values in economic decision-making frameworks and processes. The challenges and limitations briefly described above should be acknowledged when presenting the results of economic valuation, but can be addressed by **combining economic valuation with other qualitative and quantitative information**. While cost-benefit analysis works only with monetary values, other decision support frameworks such as participatory appraisal and multi-criteria analysis support the joint consideration of monetised and non-monetary values and criteria.

Benefits of biodiversity and ecosystem conservation and sustainable use

Biodiversity and ecosystem protection, conservation and sustainable use involve a wide range of benefits that frequently exceed the direct and short-term financial and economic benefits derived from ecologically destructive human activities. The box below provides a few illustrations of the benefits associated with the protection and sustainable use of biodiversity and ecosystem services– or the costs generated by their unsustainable use – in a variety of ecological and geographical contexts.

- In **Ethiopia**, the overall net present value (over 20 years) of coffee **agroforestry systems** is estimated at US$ 2 750–29 300/ha compared with only US$ 900–3 000/ha for maize systems. Economic analysis has shown that conversion of coffee agroforestry systems to maize cultivation would not only reduce the value of the crop production, but also entail significant losses in regulating services. Conversely, increasing forest cover to 30% in such ecosystems would not much affect crop production, but would increase carbon stocks and water yields and reduce soil erosion and runoff.
- **Maldives** has the seventh largest **coral reefs** in the world. Coastal and marine biodiversity underpin the two largest sectors in the economy: fisheries and tourism, which account respectively for approx. 8.5% and 67% of gross domestic product. The tourism sector employs 64 000 people or 58% of the workforce. In addition to their direct support for economic activity, coral reefs provide services such as shoreline protection, storm protection and sand formation. The cost of artificial replacement of coral reefs for these purposes was estimated at EUR 1.5–2 billion.
- **Globally**, a World Bank study has estimated the lost economic benefits resulting from the over-exploitation of marine **fisheries** at US$ 50 billion annually. In other words, more sustainable management (allowing fish stocks to recover) combined with the downsizing of fishing fleets would make the global marine fishing industry more profitable by US$ 50 billion every year – while also entailing ecological and social benefits not captured by these estimates. The establishment of more **marine protected areas** (MPAs) is one of the options for allowing fisheries to recover. The costs of running a significantly larger network of MPAs could easily be covered by the phasing out of harmful subsidies to industrial fisheries.
- In Aceh province in **Indonesia**, a study of the economic value of the Leuser **forest ecosystem** compared the benefits from 11 different ecosystem services over a period of 30 years under three scenarios: "deforestation" (a continuation of the current trend); "selective use" (involving a substantial reduction in primary forest logging and compulsory reforestation); and "conservation" (involving a total ban on logging). Conservation and selective use were found to provide the highest benefits (respectively US$ 9.1 and 9.5 billion), against less than US$ 7 billion for the continued deforestation scenario. Local communities gain most from the conservation scenario, with benefits estimated at US$ 5.32 billion.
- By the early 1990s, Hiware Bazaar in the state of Maharashtra, **India**, was affected by severe environmental

degradation, and over 90% of families were below the poverty line. Under the impulse of a new mayor, the municipality adopted an **integrated watershed management** approach with water conservation and ecological regeneration at its core. By 2006, irrigated land had increased from 20 to 260 hectares. The number of wells more than doubled. Grass production went up from 100 tonnes in 2000 to 6 000 tonnes in 2004, supporting a large increase in livestock units and milk production. The number of families living below the poverty line has sharply decreased, and the per capita income of the village is now one of the highest in rural areas nationwide.

- In **Uganda**, the Nakivubo Swamp between Kampala and Lake Victoria provides water purification services to the city of Kampala, treating and purifying domestic and industrial wastes and effluents. An economic valuation study concluded that the wastewater purification and nutrient retention ecosystem services provided by the **wetlands** were worth between US$ 1 million and 1.75 million per year. Another study showed that a sewage treatment plant providing the same service would cost over US$ 2 million in maintenance each year. In comparison, the estimated cost of managing the wetland to simultaneously optimize its waste treatment potential and maintain its ecological integrity is only US$ 235 000 per year.

Practical options for better stewardship of natural capital

The recognition of the values associated with biodiversity and ecosystem services must be followed by their integration in development planning. Practical options at the disposal of policy and decision makers at all levels include:

- **Planning and regulatory instruments:** these include not just environmental regulation and standards, but also ecosystem-sensitive spatial planning, strategic environmental assessment, the establishment and management of protected areas, and investment in the conservation or restoration of "ecological infrastructure", i.e. those natural assets that provide important services such as climate regulation, water purification, disaster prevention or erosion control in a more cost-effective manner than any man-made infrastructure.
- **Pricing and other market-based instruments**: these include the reform of environmentally harmful subsidies, the use of fees, charges and taxes to "correct" market prices so that they better reflect environmental values, commercial licences and tradable permits (e.g. fishing quotas), payment for ecosystem services (i.e. schemes by which those who use ecosystem services pay those who help sustain them, as illustrated below), and certification and labelling for accessing new "green markets".

In the watersheds of the **Northern Andean region**, forests (and thus water provisioning services) are threatened by conversion to crop and ranch land, while the demand for a regular supply of water by downstream users – including citizens, water utilities, hydropower companies, agricultural companies, and beer and water bottling companies – is increasing with population growth. To address these problems, a **payment for ecosystem services scheme** based on "water funds" has been developed and is now widely used in the region. Water funds are trust funds into which water users voluntarily put money. They then form a public-private partnership to make decisions on how to spend interest, and in some cases a portion of the endowment capital, to finance conservation activities in the watershed. These typically include the subsidizing of sustainable land management practices (such as re-vegetating the landscape or reducing land use intensity) implemented by upstream farmers and ranchers.

Bibliography

All TEEB publications are available (in draft or final form) from: http://www.teebweb.org/our-publications/. They include the following:

Russi D., ten Brink P., Farmer A., Badura T., Coates D., Förster J., Kumar R. and Davidson N. (2013) *The economics of ecosystems and biodiversity for water and wetlands*. IEEP, London and Brussels and Ramsar Secretariat, Gland. [Online]

TEEB (2008) *The economics of ecosystems and biodiversity: an interim report.* European Communities. [Online]

TEEB (2009) *The economics of ecosystems and biodiversity for national and international policy makers*. [Online draft version]. [Final version edited by Earthscan: TEEB (2011) *The economics of ecosystems and biodiversity in national and international policy making*. Patrick ten Brink (Ed.). Earthscan, London and Washington.]

TEEB (2010a) *The economics of ecosystems and biodiversity: ecological and economic foundations.* Pushpam Kumar (Ed.). Earthscan, London and Washington. [Online draft version also available]

TEEB (2010b) *The economics of ecosystems and biodiversity for local and regional policy makers*. [Online] [Final version edited by Earthscan: TEEB (2011) *The economics of ecosystems and biodiversity in local and regional policy and management*. Heidi Wittmer and Haripriya Gundimeda (Eds). Earthscan, London.]

TEEB (2010c) *TEEB for business*. [Online draft version]. [Final version edited by Earthscan: TEEB (2012) *The economics of ecosystems and biodiversity in business and enterprise*. Joshua Bishop (Ed.). Earthscan, London and New York.]

TEEB (2015a) *TEEB for agriculture and food: an interim report*. United Nations Environment Programme, Geneva, Switzerland.

TEEB (2015b) *Agroforestry: an attractive REDD+ policy option?* Executive summary. World Agroforestry Centre (ICRAF), UNEP World Conservation Monitoring Centre (UNEP-WCMC), and United Nations Environment Programme (UNEP).

The examples mentioned in boxes are derived from the above publications and also from TEEB case studies, available from http://www.teebweb.org/resources/case-studies/, and from a range of scientific publications reviewed and assessed by the TEEB team. Secondary references are mentioned in the longer "Synthesis note" prepared by the B4Life Facility.