

Ecosystems services — accounting for what matters

Ecosystems and their services underpin our economic activities, quality of life and social cohesion, but environment, economy and society are unequal partners — for while there are environments without economies and societies, there are no economies and societies without environment. Many of the goods and services provided by ecosystems in our conventional market economy do not have an explicit value — yet if the resilience of our ecosystems continues to diminish, these goods and services will become infinitely value and eventually unattainable. There would be huge consequences for employment, health and the basics of life, stretching far beyond today's resource conflicts (e.g. fish for food or feed; crops for food or fuels; water for people or crops).

Politically acceptable means of paying for our social and ecological securities represent a huge challenge that needs to be supported by innovative approaches and key forms of data and information. These include:

- economy-environment accounting techniques to analyse the relationship between the activities of economic sectors and their impacts on the quantity/quality of ecosystems' goods and services;
- accounts of inclusive ecosystem benefits and full costs of ecosystem maintenance for informing decisions and trade-offs in macroeconomic policies, local management and market-based actions;
- measurements of societal cohesion and hence welfare that go 'beyond GDP' — based on a framework of socially cohesive economic entities known as 'socio-ecological systems'.

The trade-offs inherent in policy decisions around very complex interactions mean that we have to improve substantially the knowledge base regarding ecosystem functioning and services — our natural capital — including how these services contribute to our overall well-being. The 2007 G8+5 Potsdam Initiative (The economics of ecosystems and biodiversity) to which the EEA work presented here contributes, is already addressing the

problem by showing that the accounting principles, already used by governments, business and ourselves in every-day life can be used to calculate the physical flows of ecosystem services, their economic value, how these are distributed and hence impact on different parts of society. However, in our current paradigm, the idea of accounting for the actual services that ecosystems provide is largely ignored.

Many dimensions to consider

Today we often hear that our ecosystems around the world are increasingly threatened by ongoing pressures — climate change, demographics, over-use of resources, invasive alien species — all of which potentially undermine their long-term resilience. An explicit illustration is how Europe has moved from equilibrium between its ecological footprint and its biological capacity forty years ago to today

where we need more than twice Europe's biological capacity to maintain its production and consumption patterns. One can argue about the robustness of the footprint's calculation but there can be little argument about the trend: Europeans' use of natural capital has outgrown Europe's resource base and now absorbs increasingly the environmental space of the rest of the world.

At the beginning of the last century, about 50 % of our natural capital came from renewable resources and about 50 % from non-renewables. At the beginning of this century, the contribution of renewables had dropped to 25 %, with 75 % coming from the finite stocks of non-renewable resources.

In this context, the numerous and acute issues arising from the race to produce biofuels provides a clear example where complex situations with an incomplete accounting of what is at stake can result in misguided policy decisions. Clearly, a further expansion of first-generation biofuels risks not achieving the required global greenhouse gas emission reductions and can lead to further adverse effects on biodiversity, water and soil. Similarly, concerns are emerging regarding the possible contribution of second generation biofuels, where access to a continued volume of feedstock to ensure the economic viability of a specific biofuel may simply not be physically or biologically possible.

These pressures are already having a visible effect on prices and supplies of commodities such as food and land. In April 2008, several governments took drastic

action to control food inflation, India and Saudi Arabia among those scrapping import duties and restricting exports. Rising prices have also provoked riots in several countries: in 2007, tens of thousands of people marched through the streets of Mexico City, demonstrating against a 400 % increase in the cost of corn meal used to make tortillas — blamed on increased demand for biofuels in USA. Shortages in other commodities such as water are also widespread. In May 2008, the city of Barcelona began importing water from elsewhere in Spain at an estimated cost of some EUR 22 million per month, as long-term drought conditions persist.

Analysts can point to many examples where overharvesting of resources or changed land-use patterns have triggered undesired social and economic changes. Europe itself is prone to intensive urban sprawl at the expense of productive arable land, high-value nature pastures and mixed farmland — more than 80 % of the total uptake by the 6 % net increase of urban areas over the past decade.

Need for an accounting approach

The problem is not simply about a series of negative impacts, but more about underlying systemic errors in societal design that contribute to continuing negative trends.

One key problem lies in the area of market values. The risk of continuing in an undervalued market, where many ecosystem services are often not priced, is to risk depriving us in the future of what ecosystems provide in terms of supplies of food, water and fibre, metals and minerals,

and other services, such as nutrient and water recycling, soil formation and retention, pollination of plants, climate regulation, pest and pollution control.

Putting some kind of monetary price on ecosystems in order to create the warning signals of loss is needed. But this is not the whole point. We also need to regain a sense of humility when facing the reality of the natural world. As indigenous peoples have come to understand, in the end it is nature that we must respect for the simple reason that nature has limits and rules of its own.

We now have an opportunity to put in place a well-structured framework for strategic policy-making that is large enough in time and space and developed with scientific consensus and citizens' input. Such a framework is not an alternative to existing data, knowledge, management systems, laws, methodologies and tools. Rather, it creates comprehension and a stronger basis from which to promote environmental objectives and policies to counterparts in economics, trade and other domains — and to present the counterparts with both evidence and argumentation that will resonate with their own interests.

Ecosystem accounts are such a tool that can promote a functioning 'ecosystem approach' to both policy-making and its implementation. What was missing, *inter alia*, from the Millennium Ecosystem Assessment in terms of its ability to speak authoritatively to governments about resilience was a quantitative framework bridging the global assessment to

the country level where policies are decided and to the local level where action is often taken. Having quantitative information on the drivers, pressures, state and impacts, makes it easier to devise adequate responses.

Such a quantitative framework now seems feasible, for example, through the work underway at the EEA and in countries like India on ecosystem accounting, and within the G8+5 Potsdam Initiative on valuation of the cost of inaction for biodiversity, regarded as a counterpart to Lord Stern's analysis for climate change.

Policy-makers need such a quantitative framework and results in order to move beyond case studies, allow scaling of the findings up from the local to the global levels, and link findings to policy actions. The ultimate purpose of the ecosystem accounting being implemented by the EEA is to measure the gap between the reality of ecosystem integrity and the objectives stated in national laws, European regulations and directives and international conventions (e.g. CBD, UNCCC), and then to calculate the additional maintenance and restoration costs of meeting these objectives.

These costs should be calculated both for national ecosystems for domestic consumption and for ecosystem input to imported products. For both countries and companies, such calculations lead to measuring a full cost of commodities which includes, in addition to market prices, the cost of their footprint on the ecosystems. This is what going beyond GDP begins to look like.

How can accounts for ecosystems and their services work?

Ecosystem accounts are used to describe the way ecological systems change over time in terms of their structure and capacity to provide benefits to people. They quantify ecosystem assets: stocks and resilience, flows and services, benefits and maintenance costs. As a part of the System of Economic-Environmental Accounts, a satellite framework of the UN System of National Accounts, they are closely aligned to recognised classifications and accounting rules. They are also deeply rooted in geographical information systems enhancing the biophysical linkages between landscapes, land uses and ecosystem service benefits at the global, regional, national and local scales, where trade-offs are faced and decisions taken.

Using the coastal wetlands of the Mediterranean as a test case, EEA shows how we can use remotely sensed data to define and map socio-ecological systems with field data to build up a set of accounts. A range of biophysical measures are used for the accounts that allow the impacts of change on biodiversity and ecosystem services to be assessed and the costs of biodiversity loss and ecosystem service degradation examined.

Coastal wetlands are particularly sensitive to human impacts and thus offer a direct case to test the use of accounting methods. At global scales, wetlands are amongst the most threatened ecosystems as a result of drainage, land reclamation, land conversion, pollution, and overexploitation, and those found in the Mediterranean

are no exception. It has been estimated that more than half of all Mediterranean wetlands have been lost.

Although hard to quantify, it has recently been suggested that a 'conservative' estimate of the global value of the general services associated with wetlands is around USD 3.4 billion per year.

Such estimates are not likely to be of direct use in macro economics decision-making. However, it gives the magnitude of the benefits which could be lost if no reinvestment into ecosystems is made for keeping their potential for delivering services. It can then be important information in negotiations on nature protection, in particular, when the costs look beyond the conservation of emblematical sites.

The first elements of service valuation of the Mediterranean wetlands study suggest that large conservation costs can be viable when the full value of services including regulation of water, soil erosion, pests and pandemics control (e.g. flu transported by migratory birds out of their degraded routes) are taken into account.

An important feature of the accounts presented in the wetlands study lies in the new spatial modelling techniques for mapping both biodiversity potential and the pressures upon it. Ecological potential, which describes the capacity of systems to sustain biodiversity and provide ecosystem services, has been captured by using methods that combine information on areas of high nature value

and the fragmentation of such areas by roads and other infrastructure. Pressures upon ecological systems have been characterised through measures which take into account internal pressures as well as those from the neighbourhood of the ecosystems. Using these different types of measures, novel types of accounts have been created that show the spatial relationships between areas of high ecological potential and the pressures upon them, and how both appear to be changing over time. In the study, socio-ecological systems dominated by wetlands were identified in the Mediterranean for 31 administrative regions; all showed a loss of ecological potential. The largest change was recorded for Andalucía.

From promising prospects to broader application

Ecosystem accounts provide an open framework in which the different approaches (schools) of ecosystem assessment (physical, monetary, multi-criteria) and valuation (services value and value of maintenance costs) can cooperate within a common project. In this vein, making ecosystem accounts part of the UN SEEA based upon the UN System of National Accounts (SNA) would give ecosystem

accounts an additional chance of reaching key policy-makers.

These accounts should be implemented at all scales with the support of Earth observation programmes (GEO, GMES), and statistical networks (e.g. Eurostat, UNCEEA, UNSD). Local-scale accounts can be established by a range of public actors and by companies for calculating complete ecosystem costs and benefits.

The multi-functionality of ecosystems represents in this objective a major issue. In many cases, ecosystem degradation results from the preference given to one or a very limited number of services, ignoring other services such as ancillary products, recreational services or regulating services (e.g. carbon storage and sequestration).

Conversely, ecosystem services can be measured and valued one by one, according to uses and users. Generally, significant results are obtained when focusing on important services. Focusing on broad services with a well identified use, these accounts bring efficient numbers into economic calculation and policy debate.

Finally, a holistic approach of ecosystem services, present and future should be favoured; it can be done on the basis of the maintenance of the ecosystems delivering them. The value obtained is not that of the ecosystem services but instead, that of a minimum reinvestment in nature needed to guarantee sustainable ecosystem services delivery. Additional maintenance costs of ecosystem potentials can be computed in reference to stated official policy targets.

The calculation of the value of biodiversity and the costs that result from its loss is a complicated problem. We need both robust data and tools to help people use these estimates in their decision-making. Focusing on the key elements above would in turn represent a formidable progress.

References

The 2007 G8 + 5 Potsdam Initiative (The economics of ecosystems and biodiversity): http://ec.europa.eu/environment/nature/biodiversity/economics/index_en.htm.

The full report of this study will be published by the EEA later in 2008.

European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Fax: +45 33 36 71 99

Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

