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# Opinion brief

## Ecosystem services: can the concept help policy and management?

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### Main message

When used carefully, well-framed and well-documented, the ecosystem services perspective can be highly useful in a comparison of alternative policy measures or land development plans (as an EIA), for damage assessment, or for identifying options to generate revenues for biodiversity conservation.

### Why this text?

Since I got closely involved in the teaching of Earth Sciences and Economics at VU University in Amsterdam in 2010, I have been using the concept of ecosystem services, mainly as an orderly way of framing and thinking. Whereas it intuitively suited my own way of thinking, I experienced that it generates strong opposition and can be met with disdain (for not being a formal science). Also, it sometimes has been embraced naively as the 'new kid on the block' that would succeed where previous attempts to a more integrated environmental policy had disappointed. I start from this personal perspective, because I feel the urge to clarify the limitations and possibilities in the use of ecosystem services as a frame. Ideally, I write for an audience of both fellow natural scientists as well as policy makers and their counterparts in the institutions that plan and manage the landscapes we live in.

Box 1. Three definitions of the ecosystem services concept

MEA (2003): Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits.

Boyd & Banzhaf (2007): Final ecosystem services are components of nature, directly enjoyed, consumed, or used to yield human well-being.

Diaz et al. (2015, IPBES): Nature's benefits to people are all the benefits (and detriments or losses) that humanity obtains from nature. By definition, all nature's benefits have human value, which can range from spiritual inspiration to market value. Nature provides some benefits to people directly without the intervention of society (e.g., oxygen). Most benefits, however, depend on the joint contribution of nature and anthropogenic assets, e.g., fish need to be caught to act as food.

### Some background on the concept 'ecosystem services'

From the early dawn of the Neolithic, we humans have been using, exploiting and increasingly changing the landscapes we live in (e.g. Figure 1). We take for granted that we can breathe the air around us, or enjoy the view of a scenic landscape and we generally do not pay for it: a free service

of ecosystem earth to us humans. For many other uses, however, society has developed markets where a good or service is obtained after a monetary transaction and therefore is no longer consumed 'for free'. And we produce, trade and consume in increasingly complex patterns that span the world. However, not all the different ways we benefit from nature have been cemented in markets, and access to those that are is not always free to all. Where I wrote nature, one can read landscape or ecosystem, as these are partly overlapping terms, with loose definitions and no distinct geographic bounds. Overexploitation and repeated 'tragedies of the commons' led to the notion that it would be useful to get some sort of price for the value of these services that are not straightforwardly monetized in markets (Westman, 1977). Around the millennium, this awareness brought a large group of scientists together to write the Millennium Ecosystem Assessment (2005), which developed and applied a generic framework to quantify ecosystem services including a definition that would also be practicable in policy development and planning decisions. Their definition (box 1) emphasizes the anthropocentric perspective: this is about human well-being. Boyd & Banzhaf (2007) propose a more precise focus on only those 'final' services that are directly of benefit to humans. All supporting, and many regulating services should then be seen as 'intermediate', since they contribute to our well-being via another truly final service.

Figure 1. The Atna river in Central Eastern Norway. At this point it is not affected by regulation. It flows freely, carrying large volumes of sediment as well as woody debris. It serves as a wildlife corridor, has place for low intensity sheep grazing, is a source of gravel and sand, as well as drinking water for cattle and residents, and it likely reduces the magnitude and risk of downstream flooding. In addition, the scenic landscape attracts tourists from Norway and abroad. All in all, an impressive list of ecosystem services.

So far, the debate is far from settled. The different positions are usefully mapped by Schröter et al. (2014): there are opposing fronts on the acceptability and degree of anthropocentricity, on whether it emphasizes the exploitation of nature and thus is in conflict with conservation objectives, or whether commodification of the intrinsic value of nature is principally wrong. The most striking is the polarizing claim of IPBES to replace previous understandings in a superior way (e.g. Diaz et al., 2015, see box 1), which led the editor in chief of the journal Ecosystem Services write an editorial entitled 'Five reasons why the Science publication ''Assessing nature's contributions to people" (Diaz et al. 2018) would not have been accepted in Ecosystem Services'. My conclusion is that there is no consensus to be expected and that this depends on worldview and purpose of the user.

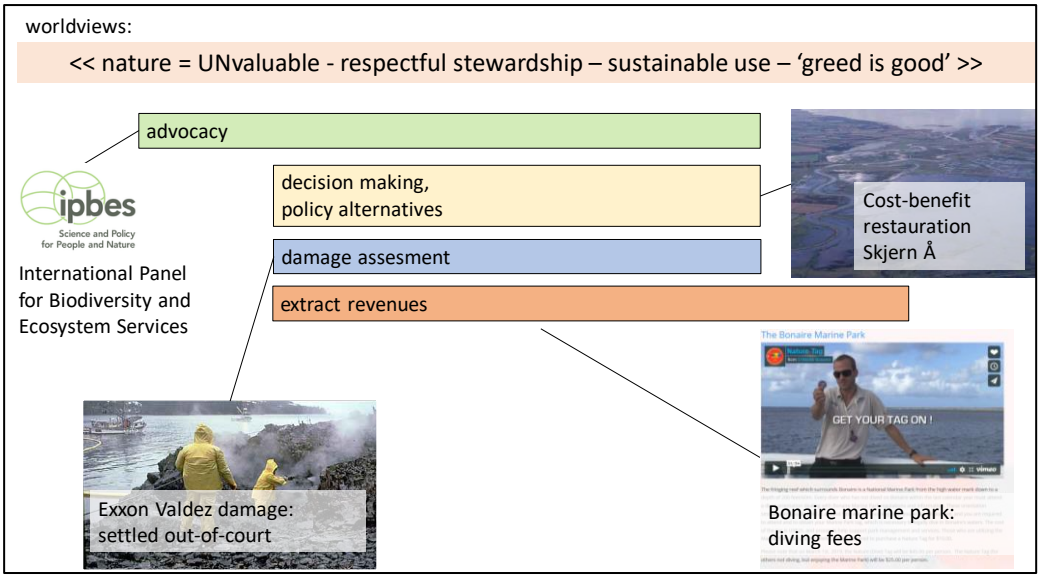


Figure 2. Different purposes of the ecosystem services perspective arranged along a gradient of world views (light yellow) from pure conservationism to short-term profit maximization. Four examples illustrate: The major effort of IPBES is likely somewhere between advocacy and policy development in its purpose. An extended Cost-Benefit Assessment of alternative restoration options of the Danish river Skjern Å is an example of informed decision making. The out-of-court settlement of the damage due to the grounding of the Exxon-Valdez on Alaskan shores is a case of monetary damage assessment and compensation for all the loss the ecosystem incurred. The collection of a diving or snorkeling tax at the airport of Bonaire allowing the tourist using the coastal waters is a clear case of commodification – with the purpose of funding conservation and longer-term sustainable tourism.

**Who uses it and what is it used for?**

The concept has likely found its most extensive use at this interface between institutional policy making, lobbying NGOs, consultancy, nature conservation and spatial planning, and scientists from various disciplines are engaged. This indeed involves different worldviews, and also different purposes and needs (Albert et al. 2014). Grossly simplified, our worldview may range from an 'ultra-green', 'anti-utilitarian' to one that sees nature as something to maximally exploit ('greed is good'), of course with different shades in-between (Hermelingmeier & Nicholas, 2017). At the same time our purpose may range from advocacy for the greater good of nature conservation, to the evaluation of alternatives in planning and decision making or to commodification (Figure 2). Applied ecological science projects often contribute to inform policy, and thus position themselves somewhere in the middle ground. As figure 2 illustrates, the concept is used for many purposes. These uses often but not always have three elements in common: (1) They are attempts to also include benefits that are not commodified in markets, or have otherwise powerful proponents in decision-making ('valuing the unvaluable'), so that a hopefully more complete, integrated overview is reached of all the consequences of different alternatives. (2) They contain a schematization of the ecosystem or landscape, with elements of the food web or geochemical budgets, or with categories of land cover. (3) They include a value estimate, which may or may not be in monetary terms, so that the value of different services can be added and compared. Monetary valuations often meet criticism (Schröter et al. (2014), both from environmental economists as the different methods in the toolkit are not properly anchored in welfare theory, or do not properly estimate value at the margin, but also from an anti-utilitarian perspective, as one 'should not put a price on mother nature'. Alternatives for this monetary valuation step are the use of weights as in multicriteria assessment, or high-low ranking scores, which can also be added. However, the use of a monetary estimate is tempting when advocacy is the purpose (headlines spell out the enormous value of this or that national park or ecosystem), but also useful, when comparing for example the value of

drinking water, or tourism revenues with agricultural land rent when all are normalized per unit area and year.

**Does it work? Possibilities and limitations**

Unfortunately, the realistic answer should be that this depends. Three of the four cases in Figure 1 (Amoco Cadiz, Skjern Å and Bonaire) suggest that it can really work, but these are hand-picked. In the UK, the Office for National Statistics (2019) compiles nationwide natural capital accounts since 2016 using the MEA typology and monetary value estimates, but report that the status of these indicators is 'experimental'. Scotland has included a similar approach but without the monetary valuation step as one of its 55 performance indicators (McKenna et al. 2019). A The approach we use in BIOWATER is an analytical framework that documents its choices in a traceable way based on empirical data and published literature, and then can be used to compare alternatives – in our case scenarios of changing land use cover and management intensity coupled to alternative lines along which society will develop its handling of a bio-economy. We present the approach in Vermaat et al. (2020). A careful development of such a framework should foster awareness of the limitations of the approach, but then it does offer a useful tool. Bart Immerzeel, a PhD in BIOWATER is further developing the framework to carefully and consistently separate and quantify how important intermediate services contribute to unequivocally final services. Such a careful mapping of how different services interact clearly offers a promising way forward to the use of the concept in comparing alternative scenarios or policy measures. It also allows the identification of winners and losers for different scenarios. This should take us some steps further than creating advocacy and awareness with scenic but qualitative imagery (e.g. Figure 1).

**Acknowledgment**

This note is presented as an opinion and that is on purpose, because it is a personal view. It has improved from critical feedback from Bart Immerzeel, Eva Skarbovik, Eija Pouta and Artti Juutinen, but the content is the responsibility of the author.

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