ARL ACADEMY FOR TERRITORIAL DEVELOPMENT IN THE LEIBNIZ ASSOCIATION

Karsten Grunewald, Olaf Bastian

Ecosystem services

URN: 0156-559915461

This is a translation of the following entry:

Grunewald, Karsten; Bastian, Olaf (2018): Ökosystemdienstleistungen. In: ARL – Akademie für Raumforschung und Landesplanung (Hrsg.): Handwörterbuch der Stadt- und Raumentwicklung. Hannover, 1677-1683.

The original version can be accessed here:
urn:nbn:de:0156-55991546

Typesetting and layout: ProLinguo GmbH
Translation and proofreading: ProLinguo GmbH

Recommended citation:
Grunewald, Karsten; Bastian, Olaf (2018): Ecosystem services.
https://nbn-resolving.org/urn:nbn:de:0156-559915461.

Leibniz Association

Karsten Grunewald, Olaf Bastian

Ecosystem services

Contents

1 Meaning of the term
2 The concept and a brief historical overview
3 Spatial contexts
References

Ecosystem services has become established as a concept encompassing the services nature provides for the benefit of humans. On the basis of this concept, ecological services (cost-free benefits from nature) should be better integrated in decision-making processes to ensure sustainable land use.

1 Meaning of the term

Nature offers benefits, both direct and indirect, to human well-being; these benefits can be thought of in a metaphorical sense as *ecosystem services* that nature provides for humans (▷ *Services*; Grunewald/Bastian 2015). Ecosystem services are basically defined by society's perception of ecological and biophysical processes and functions. This anthropocentric (though not exclusively economic) focus distinguishes them from landscape functions, which should be understood as neutral in terms of value.

In an economic sense, natural resources, biodiversity, and ecosystems are natural capital (cf. ifuplan/UFZ/BfN 2012) and their services can be thought of as a dividend paid out to society, including future generations if the natural capital stock is preserved. However, we are often oblivious to the fundamental importance of nature and the resources and services it provides for us, or we believe it to be an inexhaustible source of our prosperity.

The purpose of the concept of ecosystem services is to better integrate ecological services (cost-free benefits from nature) in decision-making processes and ensure sustainable land use to counteract the overexploitation and degradation of our natural environment. The attraction of this integrated concept lies in its inter- and transdisciplinary character and its combination of ecological and socioeconomic approaches.

Ecosystem services are often classified, in accordance with the three categories of ▷ *Sustainability*, as provisioning services (e.g. providing wood or crops), regulating services (e.g. regulating the climate by storing carbon dioxide in moorland and forests), or (socio-)cultural services (such as the educational and recreational benefits afforded by the landscape). Certain ecosystem processes such as soil formation or the water cycle contribute to the provision of ecosystem services, but to some extent are also regarded as separate services and are thus designated basic or supporting services (MEA 2005). ▷ *Biodiversity* – the diversity of species, ecosystems, or habitats, and genetic variation – is an important foundation of ecosystem services.

These services have vital impacts on human welfare, such as the secure supply of food and clean water or protection against natural hazards, i.e. the goods and services provided by ecosystems have economic, material, health, and psychological benefits. However, some natural events can have negative consequences (which are called disservices) for us, e.g. floods, avalanches, or pest infestations.

By drawing attention to the diverse values and services of ecosystems and treating nature as a productive force, the notion of ecosystem services is gaining in relevance for the economy, policymaking, and the general public. Economists have been working for years on methods for the economic valuation of ecosystems and their changes. Resource economics has most notably established the concepts of externalities and total economic value. The economic valuation of ecosystem services, including existence value, option value, and bequest value, provides a conceptual framework for the comprehensive assessment of the effects of changes in land use and ecosystems on societal welfare. However, achieving completeness in the sense of arriving at a total economic value of the environment is scarcely feasible.

The importance of ecosystem services for humankind has been beyond question at least since the appearance of the seminal paper by Costanza, d'Arge, de Groot et al. (1997), in which they calculated the value of global ecosystem services. For example, the global value of agricultural products that can only ripen after pollination by insects was US$ 153 billion per year at that time. The value of such fruits, vegetables, and oil plants in Germany is some EUR 2.5 billion (ifuplan/UFZ/BfN 2012). However, the methodological questions around measuring and quantifying the value of ecosystem services and the problems of assessing their significance to society remain a major challenge.

2 The concept and a brief historical overview

The idea underlying the concept of ecosystem services – that people depend on nature and benefit from it in numerous ways – is very old. With empirical observations initially and subsequently with an increasingly systematic approach, humankind has recognised the benefits and potential as well as the risks and hazards of exploiting natural resources. The approach was formalised in scientific terms in an ecosystem services concept in the late 1970s, particularly as a result of studies in Germany, the Netherlands, and the United States. The guiding principle of this research was that the intensified exploitation of renewable natural resources often has such a detrimental impact that we can no longer view them in a relatively carefree manner as services provided free of charge but must see them instead as a form of natural wealth with limited regenerative capacity. This insight led to a systematic assessment of nature's productive capacity from different perspectives, with the aim of working towards and implementing a sustainable and optimised use of ecosystem services.

The exploitation or commodification of ecosystem services is most apparent in the type and intensity of land use and affects the structures and processes of the ecosystems, which in turn affects their potential productive capacity. The causes, effects, and consequences of these complex interactions need to be highlighted and managed in a suitable manner.

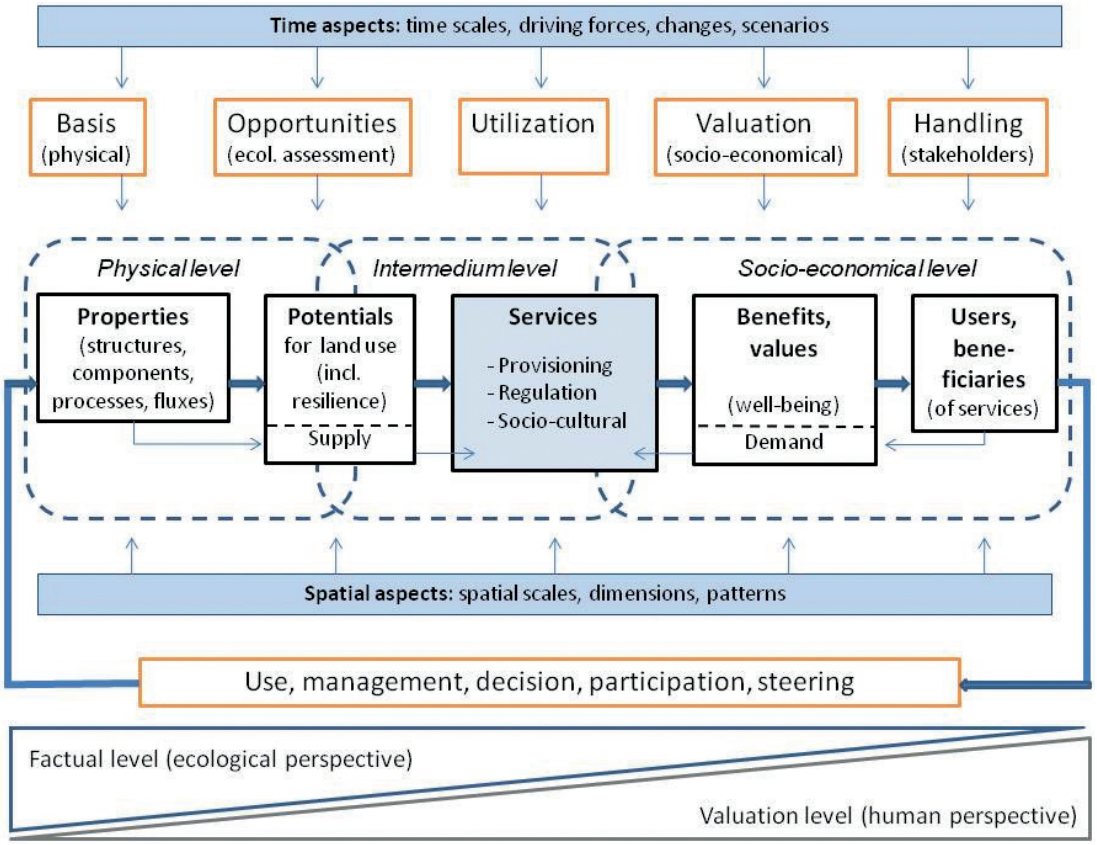
The ecosystem services concept is not primarily about foregoing the exploitation of ecosystems but about pricing in (internalising) the associated side effects and follow-on costs as well as the resulting consequences for the future exploitation and protection of ecosystems. This includes:

- providing incentives that encourage users to preserve the natural foundations of life for the long term;
- removing market distortions that have harmful effects on biodiversity and ecosystem services.

The cascade system described by Haines-Young and Potschin (2009) is often used as means of examining paths from ecosystems to human well-being, and the EPPS (*ecosystem properties, potentials, and services*) assessment framework was developed from this system (cf. Fig. 1). On the left side, ecosystems with their structures and processes form the basis for society's existence and thus establish the conditions for the services exploited by humans. Depending on their properties, ecosystems have the ability (potential or capacity) to provide (supply) certain services for human society, regardless of whether society has a demand for or avails itself of them. Various conditions (such as ▷ *Resilience / robustness*) must be taken into account. Humans benefit from ecosystems through the connecting link of ecosystem services. In this sense, they are beneficiaries

of ecosystem services, but there can also be losers. Accordingly, the two categories at the right in the EPPS diagram represent a distinctly anthropogenic perspective and are assigned to the socioeconomic level.

Figure 1: EPPS assessment framework for analysing ecosystem services



Source: Grunewald/Bastian 2015: 37

At the latest, the concept of ecosystem services came to international attention with the Millennium Ecosystem Assessment (MEA 2005) drawn up under the coordination of the United Nations Environment Programme (UNEP). Its aim was to show how changes to Earth's ecosystems are affecting human well-being and to provide science-based ideas for the protection and sustainable use of those ecosystems.

Building on this, the international TEEB (The Economics of Ecosystems and Biodiversity, www.teebweb.org) study attempted more forcefully to stress the worldwide economic benefits of nature and to highlight the growing costs of lost biodiversity and ecosystem services. Numerous national TEEB studies have since been commissioned or completed, including one in Germany (Natural Capital Germany – TEEB DE: ifuplan/UFZ/BfN 2012). The 10th Conference of the Parties to the Convention on Biological Diversity in Nagoya, Japan (COP 10 in 2010) resolved to take effective measures by 2020 to stop the loss of biodiversity and ensure the further availability of

important ecosystem services. By 2050, biodiversity is to be assessed, protected, restored, and used with care, while ecosystem services are to be preserved for the benefit of humanity. The European biodiversity strategy (EU 2011) aims to map and assess the ecosystem services in the EU and draw up an economic assessment of them for integration in national reporting systems by 2020 (Grunewald/Walz/Herold et al. 2015). The Ecosystem Services Partnership (ESP), a global network of organisations and individuals aiming to improve communication, coordination, and cooperation relating to ecosystem services, was founded in 2008. Also worthy of mention is the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), a UN organisation providing science-based advice to policymakers on the preservation and sustainable use of biodiversity and ecosystem services, which was founded in 2012.

The number of relevant professional publications has soared in recent years; this includes the first comprehensive German-language book (Grunewald/Bastian 2023).

3 Spatial contexts

Ecosystem services are affected by a variety of relationships involving space, time, and scale (▷ *Spatio-temporal structures*). This is true not only for the ecological aspects but also for socioeconomic and cultural aspects, both in terms of the measures associated with their analysis and evaluation and in terms of supply and demand perspectives. Ecological structures and processes and ecosystem services act or manifest themselves in different dimensions at local, regional, and global scales in very different ways. One result of this is that recording and evaluating ecosystem services requires different methodologies in different areas. Large-scale surveys are suitable for gaining awareness about problems but are not very useful for analysing specific situations at a local level.

Areas that generate ecosystem services – called service providing areas (SPA) – are often physically separated from those that benefit from the services – service benefiting areas (SBA). If the SPAs and SBAs are not adjacent, intermediate zones called service connecting areas (SCA) must be present to connect them (Syrbe/Walz 2012). For example, ▷ *Flood protection* in mountainous regions is provided by protective forests from which the population in settlements in the middle and lower sections of rivers benefits. Between these regions are areas such as flood zones that modify the flood wave.

The social (spaces as they are perceived or where certain activities take place) and physical (regulated areas, locations, positional relationships, distances, spatial boundaries) notions of space can be linked using the ecosystem services concept.

Since many ecosystem services depend on geographic context and landscape structure, i.e. the spatial (▷ *Space*) arrangement of ecosystems and landscape elements, the term ‘landscape services’ is coming into increasing use as it makes the relationship with planning (▷ *Landscape planning*) more explicit (Bastian/Grunewald/Syrbe et al. 2014).

Whether and how the concept of ecosystem services can be integrated into ecological ▷ *Spatial planning* in Germany is the subject of ongoing discussions. Its regular use in practice is still at an early stage. However, landscape planning appears in principle to be a suitable planning tool for integrating the ecosystem services approach.

Critical voices warn against encouraging the further commercialisation of nature under the guise of the 'green economy', reducing its role to that of a service provider, and negating any non-economic dimensions. The concept of ecosystem services highlights quite clearly how much humankind depends on nature. Since it gives greater consideration than previous approaches to aspects of demand (use, users, beneficiaries) and to people's wishes and needs, it opens up new opportunities for a greater appreciation of nature. But seeing it as the sole basis for decision-making would not be constructive as it is no substitute for public dialogue and the broad spectrum of eco-ethical arguments.

References

Bastian, O.; Grunewald, K.; Syrbe, R.-U.; Walz, U.; Wende, W. (2014): Landscape services: The concept and its practical relevance. In: Landscape Ecology 29 (9), 1463-1479. DOI: 10.1007/s10980-014-0064-5.

Costanza, R.; d'Arge, R.; de Groot, R.; Farber, S.; Grasso, M.; Hannon, B.; Limburg, K.; Naeem, S.; O'Neill, R. V.; Paruelo, J.; Raskin, R.-G.; Sutton, P.; van den Belt, M. (1997): The value of the world's ecosystem services and natural capital. In: Nature (387), 253-260.

EU – European Union (ed.) (2011): The EU biodiversity strategy to 2020. Luxembourg.

Grunewald, K.; Bastian, O. (eds.) (2015): Ecosystem Services – Concept, Methods and Case Studies. Berlin/Heidelberg.

Grunewald, K.; Bastian, O. (eds.) (2023): Ökosystemdienstleistungen – Konzept, Methoden, Bewertungs- und Steuerungsansätze. 2nd and much expanded edition. Heidelberg.

Grunewald, K.; Walz, U.; Herold, H.; Syrbe, R.-U. (2015): Ökosystemleistungen erfassen und bewerten: erste Vorschläge für die nationale Ebene in Deutschland. In: Naturschutz und Landschaftsplanung 47 (10), 305-310.

Haines-Young, R. H.; Potschin, M. B. (2009): Methodologies for defining and assessing ecosystem services. Final report. Nottingham. = CEM Report 14.

ifuplan – Institute for Environmental Planning and Spatial Development; UFZ – Helmholtz Centre for Environmental Research; BfN – Federal Agency for Nature Conservation (eds.) (2012): Der Wert der Natur für Wirtschaft und Gesellschaft – Eine Einführung. Munich.

MEA – Millennium Ecosystem Assessment (ed.) (2005): Ecosystems and human well-being. Synthesis. Washington, D.C.

Syrbe, R.-U.; Walz, U. (2012): Spatial relations and structural indicators for ecosystem services. In: Ecological Indicators (21), 80-88.

Additional literature

Burkhard, B.; Maes, J. (eds.) (2017): Mapping Ecosystem Services. Sofia.

Grunewald, K.; Bastian, O.; Louda, J.; Arcidiacono, A.; Brzoska, P.; Bue, M.; Cetin, NI.; Dworczyk, C.; Dubova, L.; Fitch, A.; Jones, L.; La Rosa, D.; Mascarenhas, A.; Ronchi, S.; Schlaepfer, MA.; Sikorska, D.; Tezer, A. (2021): Lessons learned from implementing the ecosystem services concept in urban planning. In: Ecosystem Services. 49, 101273. https://doi.org/10.1016/j.ecoser.2021.101273.

IPBES – Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (ed.) (2019): The global assessment report on biodiversity and ecosystem services. Bonn.

Potschin, M; Haines-Young, R.; Fish, R.; Turner, R.K. (eds.) (2016): Routledge Handbook of Ecosystem Services. London.

Last update of the references: November 2023