

## Opinion

## Have Ecosystem Services Been Oversold?

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The concept of ecosystem services (ES) neatly encapsulates the ways in which human society depends upon the existence and functioning of nature, but also draws power by chiming with dominant neoliberal ideology. Scientific paradigms such as this have an inherent tendency to stop adherents from recognizing alternative approaches. It is high time to examine whether the concept is being oversold with potentially damaging consequences. Many authors have questioned the monetization of ES, but the origin of the problem lies deeper in anthropocentrism. By illustration with alternatives, I attempt to show how the ES paradigm has constrained thought, particularly towards the monetization and financialization of nature, even when many ecologists and others oppose this trend.

**From Metaphor to Tradable Commodity**

Since 2005, when **ecosystem services** (ES) were given prominence in the Millennium Ecosystem Assessment (MEA) [1], the concept has become the dominant paradigm framing research and policy making in biodiversity, ecology and conservation biology. At the same time, major nature conservation organizations have refocused their missions towards the needs of humans [2] and 'nature' has now been redefined as 'natural capital' [3]. Scientific concepts change over time, and it is instructive to look back at how 'ES' developed from Arthur Tansley's original idea of the 'ecosystem'. Tansley's 1935 paper [4] provided us with the abstract concept of nature that was necessary to start thinking about function (Table 1). Once **ecosystem functions** (see Glossary) were defined, they could become commodified, valued, and then monetized. The idea that nature has a **use value** has historical roots in philosophy and economics. Classical economists recognized nature as a source of use value, but attributed the **exchange value** belonging, for example, to a stand of trees as deriving from the ownership of the land on which the trees stood or to the labor involved in turning them into merchantable timber, not directly to the trees themselves [5]. In the same the vein, when the term ES was first employed for pedagogical purposes in the ecological literature of the 1980s, it was usually as a metaphor for the use value of nature. Valuing nature does not necessarily mean monetizing it, but it seems that the two are hard to separate. Attempts had already been made in previous decades to place a monetary value on 'nature's services' [6], for example to estimate the **external cost** of damage caused by pollution [7].

The transformation of ES into exchange values, which has now reached industrial proportions, continues to be motivated by the idea that nature will benefit if the external costs of actions that exploit or damage ecosystems are made explicit [8]. Nature will then (i) be preserved on account of its recognized true exchange value, (ii) gain if the higher price in the market caused by including external costs reduces demand for the damaging activity, and/or (iii) be compensated to restore damage. This is the logic variously behind the 'Payment for Ecosystem Services' program of the Global Environment Facility [9], carbon and emissions trading [10], and the REDD+ program (Reducing Emissions from Deforestation and Degradation) [11]. Once markets in a commodity

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Table 1. How the Development of the ES Paradigm Has Constrained Thinking About Nature and Some Alternatives to These Developments

Concept of nature (date of introduction)	Ontology	Transformation of the concept of nature	Constraint introduced by the transformation	Alternative
Ecosystems (1935)	Ecosystem functions including nutrient stocks and cycles, energy flow	Abstraction	Intrinsic value of biodiversity can become secondary to its generic roles in ecosystem function [18]. For example, plants are treated merely as 'biomass'	Explicit recognition and inclusion in ecological models and thinking of processes at the individual, population, and community levels [17]
Ecosystem services (1980s)	Provisioning, regulating, cultural and supporting services [1] (Table 1)	Commodification	A wholly-anthropocentric concept of nature [28]	Conservation for biodiversity's sake [2]
ES values (1990s)	Market prices, hedonic prices, travel costs, replacement costs, contingent valuation, discount rates [21]	Monetization	Reduces the intrinsic worth of nature to that which can be monetized [38]	Broader concepts of the value of nature [41,46]
ES markets (2000s)	Markets in wildlife, emissions trading, payment for ecosystem services, e.g., REDD+	Marketization	Conceptualization of environmental problems and their solution become focused on markets, even when such markets are artificial [11]	Recognize that ES markets are rarely if ever a solution to conservation problems. Protect nature from market forces, not expose it to them
ES-based financial instruments (2000s)	Carbon permits, biodiversity offsets, debt-for-nature swaps, green investment products	Financialization	Environmental objectives become secondary to financial ones [10]; control shifts from people to corporations [47]	Public investment in conservation under democratic rather than market control

exist, it is but a small and seemingly inevitable step to financialization (Table 1), in which derivatives of the underlying ES become tradable assets.

A milestone in the monetization of ES was reached in 1997 when Costanza *et al.* [12] published a dollar estimate of the value of the ES of the entire planet (Table 2). Clearly anticipating that the validity of the exercise would be challenged, the authors contended that 'although ecosystem valuation is certainly difficult and fraught with uncertainties, one choice we do not have is whether or not to do it'. This explicit statement illustrates how the 'monetized ecosystem services' (MES) paradigm seeks to define the legitimate boundaries of thought. Although Costanza *et al.* were heavily criticized and even derided [13], the paper went on to be cited more than 4000 times, the global estimate was updated, and the imperative to monetize was reiterated by Costanza *et al.* in 2014 [14].

### Alternatives

Contrary to the claim that there is no choice about how we define nature, there are clear alternatives to each one of the conceptual developments that has taken place – from Tansley's initial abstraction to the current trend of financialization (Table 1). Whether one believes that any of these conceptual developments is right or wrong, it is important to appreciate that all have involved choices that have, often invisibly, shaped our thinking about nature.

### Glossary

**Contingent valuation (CV):** a method used in economics to place a monetary value upon non-market goods and services by asking people the hypothetical question of how much they would be willing to pay for them.

**Devaluing by monetization:** reducing the intrinsic worth of nature by attaching a monetary value to it.

**Ecosystem function:** the ecological processes that take place in an ecosystem, including photosynthetic fixation of CO<sub>2</sub>, decomposition, nutrient uptake, and population processes at all trophic levels.

**Ecosystem services (ES):** the goods and services of use to humans that are directly attributable to the ecological functioning of ecosystems.

**Exchange value:** the price at which an item is bought and sold in the market.

**External cost:** the cost to the environment of damage or exploitation that is not reflected in the market price of the goods or services produced. For example, the price of aviation fuel does not reflect the environmental costs of burning it.

**Make-believe markets:** all markets are social constructs, but make-believe markets exist only in the mind of the researcher who invents them to fit reality to their model instead of fitting their model to reality. CV is a tool that depends on make-believe markets.

**Monetized ecosystem services**

**(MES):** ES on which a price has been fixed.

**Natural capital:** 'Earth's lands and waters and their biodiversity' [3].

**Neoliberalism:** a political and economic philosophy that seeks the de-regulation of markets and the privatization of all possible goods and services [45].

**Non-use value:** the value of an item attributed to its existence, not to its use. For example, the aesthetic pleasure given by wild birds (*cf.* Use value)

**Payment for ecosystem services (PES):** a policy instrument that seeks to influence the supply of ES by payments from the beneficiaries to those controlling the supply.

**Public goods:** goods that are free to all and that can be consumed without reducing their benefit to

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