The Rise and Rise of Ecosystem Services: Is “value” the best bridging concept between society and the natural world?

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Abstract

Economics – specifically, monetary valuation – has been given a pivotal role in ecosystem conservation. This is a retrogressive step, undoing important sustainability principles and practices that should have been embedded in environmental policy and management action. The concept of ecosystem services is a useful framework for understanding the dependency of human society on its natural environment, but it needs to be part of a larger solution that recognizes the complexity of the socio-ecological system, and the issues of equity and justice that pertain to sustainable responses to global environmental change. There have been a few recent critical analyses of the ecosystem services concept and its global application that address these issues. This paper summarizes the perspectives and arguments made in those articles, and argues for more reflexive policy and research.

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1. Introduction

In recent years, economics has been given a pivotal role in the global discourse of ecosystem conservation. In the last two or three decades, monetary valuation of those ecosystem functions that benefit human society, and the creation of international markets and finance mechanisms for these “ecosystem services”, have become key elements of environmental policy and management at the global scale. The concept of ecosystem services, initially a formulation devised by concerned ecologists as a means of highlighting the growing problems of human-environment interactions, has evolved into

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powerful global geopolitical structures. Table 1 outlines a timeline for this process. In framing ecosystems in terms of their benefits to human society, many regard the ecosystem services concept as a significant – maybe essential – shift towards better management of our environmental “life support systems”. In other words, people will care more about nature if they are aware of what nature does for people, and will be moved to protect nature in order to preserve the benefits they derive from those natural processes and functions.

However, the ways in which this very rational and well-intentioned idea is being implemented have prompted a few recent calls [1, 2, 3] for a deeper consideration of issues such as the nature of the dialogues about society’s sustainability objectives, the development and application of appropriate scientific and economic theory for the socio-ecological system, and the provision of robust ecological and economic evidence for policy and management. This paper briefly reviews the countervailing arguments.

Table 1. A timeline of the development of the Ecosystem Services concept

<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
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<tr>
<td>1980s</td>
<td>Ecologists draw attention to the unsubstitutable nature of living resources, unlike other economic resources, as an argument against unsustainable over-consumption and over-use of ecosystems [4]</td>
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<td>Early 1990s</td>
<td>The concept of “natural capital” emerges [5,6], followed by a focus on “global account” valuation and quantification [7, 8]</td>
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<td>Late 1990s</td>
<td>Calls for the “integration of ecology” as a complex dynamic system into natural resource management [9] paralleled with the growth of environmental economics as a recognized field, developing methods for marginal valuation of ecosystem functions and services for inclusion in cost-benefit analysis [10]</td>
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<td>Early 2000s</td>
<td>The commissioning and publication of the Millennium Ecosystem Assessment [11] showed a global picture of environmental degradation and biodiversity loss, with risks of serious impacts to society (but these consequences of environmental damage were not framed in economic terms)</td>
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<td>Late 2000s</td>
<td>Potsdam Initiative of the G8+5 nations [12] commits partners to creation of financial mechanisms for ecosystem services markets, and initiates major study, ‘The Economics of Ecosystems and Biodiversity’ [13, 14], linked to UN Environment Programme’s Green Economy Initiative.</td>
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Figure 1. (a) Numbers of publications returned from ISI database searches for “ecosystem services” plus other keywords (* indicates a search query wildcard for any other characters); (b) recent exponential growth in articles on ecosystem services, including the emergence of the issue of payment for ecosystem services.
2. Emerging issues

2.1. Perceptions of Ecosystem Services are divergent in science and policy

The multidisciplinary community engaging in ecosystem services as a research and policy concept may inadvertently be talking and working at cross-purposes. Much of the academic discourse and literature about ecosystem services is still disconcertingly ambiguous about the essential economic and political focus of the concept – but the policy literature certainly is not. Economists have had some academic debate about the semantics of ecosystem services, discussed in Cornell [1], but in the wider community, the term is deployed in various ways, ranging from the highly technical and categoric through to a rough synonym for biodiversity or nature. When most environmental scientists use the term, they are often actually referring to the functions and processes of ecosystems, or “what nature does”, framed in a broad perspective of nature conservation and environmental protection, and usually emphasising the need for a holistic understanding of human-environment interactions. When economists and people in the policy domain talk of ecosystem services, they are usually referring to “what nature does for us”; the starting point is a profoundly anthropocentric and utilitarian perspective. Policy concern lies with the institutions and instruments for managing and maintaining these services, not necessarily with notions of nature or ecosystems.

As a signal of this divergence in the understanding and use of the ecosystem services concept, the majority of academic publications on ecosystem services make no mention of economics or economic values (fig. 1; based on a search of the ISI Web of Knowledge database). This quick search of the academic literature also shows that the idea of payments for ecosystem services is clearly still very novel, only emerging in the scholarly literature once it has become prominent in the policy agenda. This indicates that many scientists are keeping their ecosystem studies somehow detached from the wider social, economic and political context. The newly formed Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES, www.ipbes.net) has the explicit remit of providing the scientific evidence base for the evolving global governance regime for ecosystem services, but even its website and meeting documents scarcely mention economics.

In contrast, economic dimensions are a fundamental element of the “Ecosystem Approach”, as defined by the Convention on Biological Diversity (CBD) in 2000 [15]. Principle 4 (out of 12 Ecosystem Approach Principles endorsed by the CBD) states:

“Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

(a) Reduce those market distortions that adversely affect biological diversity;
(b) Align incentives to promote biodiversity conservation and sustainable use;
(c) Internalize costs and benefits in the given ecosystem to the extent feasible.”

The UN Environment Programme (UNEP) [16] is explicit about the importance of valuation of ecosystem services, in financial terms and at the national scale:

“Valued ecosystems incorporated into national planning processes: UNEP will continue to develop innovative tools that help countries place a financial value on their ecosystem services and tackle their degradation.” (p. 4)

This Ecosystem Approach is currently being embedded in global and national environmental policies [16, 17], actively driven by the world’s most developed countries and the most rapidly growing economies – the G8 + 5 nations, who are signatories to the Potsdam Initiative [12]. The Green Economy Initiative, proposed and endorsed by these nations and led by UNEP, is gathering information and setting the foundations for the required policy reforms and the development of international infrastructure for a reconfigured economy that is predicated upon these financial values. The vision outlined in the UNEP
Green Economy documents for the post-carbon world is of a globalised, information-intensive, high-trade volume, and high-tech economy (structurally rather like our contemporary one, in fact), in which ecosystem services are bought and sold, instead of old-style manufactured products (although there will still be plenty of manufacturing required, to meet demand for the new low-carbon transport, housing, energy generating systems, and technologies that needs to replace what we currently have). The documents are emphatic about the pro-poor benefits of monetary valuation and payment schemes, but appear to be primarily oriented towards the maintenance of the wealthy world’s economic stability; the UNEP Green Economy Report is not yet published, but its preview [18] has a “trickle-down economics” tone:

“Such reconfiguration leads to a higher share of green sectors contributing to GDP, greener jobs, lower energy and resource-intensive production, lower waste and pollution, and significantly lower greenhouse gas emissions. It can also assist in the reduction of persistent poverty through targeted wealth transfers, new employment, as well as improvements in access and the flow of ecosystem goods and services to the bottom of the economic pyramid.” (p. 3)

In Norgaard’s words [2], the ties of the ecosystem services concept “to the problems of continued global economic growth have largely been broken.” Norgaard reminds us that distributional issues and environmental justice are at the core of sustainability, and argues that there is a need to “become more adept with a priori ethical reasoning, as well as move towards new individual virtue ethics”. Cornell [1] also argues that there is a need for greater literacy in research ethics, along with a stronger critical (and self-critical) focus on “meta-debates” about the nature of the science-policy interface in the area of ecosystem services, where scientific knowledge is applied – and could potentially be misapplied. Spash and Vatn [3] write, “Some ecologists have jumped on the monetary valuation band wagon without recognising the limited scope of and validity attributable to the economic value estimates they then transfer regardless of content or meaning”, arguing that academics working on ecosystem services have a responsibility to address the fundamentally interdisciplinary issues comprehensively, through dialogue and methodological pluralism and experimentation.

2.2. Policy is starkly under-evidenced

The three critique articles [1, 2 and 3] all highlight the limitations of evidence for the ecosystem approach, emphasising different dimensions of the problem.

Cornell [1] points out that demand for economic valuations of ecosystem services now seriously outstrips supply. Before the publication of the Millennium Ecosystem Assessment (MA) [10], peer-reviewed publications of valuation studies were a fairly constant proportion of the non-valuation studies of ecosystem services, such as ecological research, and social or policy analysis. Since then, although policy has shifted towards a notional reliance on financial valuation and both kinds of literature are rising rapidly, many times more articles are published that talk about ecosystem services than actually assess and value them (fig. 1 and [1]). International databases of environmental valuations and research exist (www.evri.ca, fsd.nl/naturevaluation), but they are hardly representative of all ecosystems; the values lodged in them are derived by a mix of methods, not all of which are robust; and they are under-utilised by both scientists and policy people. Even in comparatively information-rich countries, economic valuations are rare, and far from systematic. As an example, the draft key messages of the UK National Ecosystem Assessment (NEA) [19], commissioned as part of the UK’s embedding of the Ecosystem Approach and due to be completed in 2011, only include three (as yet unattributed) monetary value estimates: one for pollinator services, and two assessments of the use and recreational values of woodlands. Perhaps partly in recognition of this paucity of information, the UK NEA will also evaluate
the human benefits arising from ecosystems in terms of “health value” and “shared” or “social value” (which the report terms “non-economic”).

Spash and Vatn [3], like Cornell [1], propose that the solution to the shortage of economic valuation is not simply to increase the number of monetary valuations, nor to transfer environmental values from one context to another, but to explore alternative means of making choices. They provide a thoughtful critical analysis of the theoretical and methodological shortcomings of environmental value transfer, where monetary value estimates such as those in the EVRI online database are taken to hold for other times, places, and even ecosystems. They note that even in site-specific studies, “values are found which represent social and moral commitments of a non-consequentialist and non-utilitarian kind, and the context within which values arise is highly relevant to their expression”, and argue that this presents major operational and ethical challenges as environmental valuation is extended to global ecosystem services. Institutions are needed “which are capable of supporting people in expressing their values in ways they find to be sound” [3]. Fully in line with long-standing sustainability principles, quantified economic values can be an important part of decision-making, as long as other classes of value are also given consideration, and the process involves participation of those who are affected by the decision.

Norgaard [2] reminds us that there is also a parallel shortage of social and ecological research that fits the ecosystem services framework. By focusing so tightly on the link between economics and ecology, the ecosystem services concept can only utilise a small part of the available knowledge. Understanding “what nature does for us” is only a small subset of the available understanding of both nature’s and society’s structures and processes. Norgaard also emphasises the parallels in the need for sustaining the richness of understanding in both ecology and economics, where context matters fundamentally; the translation of knowledge about one ecosystem to another is as problematic as the transfer of environmental values from one primary study to another case.

2.3. Total value ≠ economic value

The statement that monetised economic values are not equal to the total environmental value should not need further justification, but for completeness, Turner [20], Gren et al. [21] and Costanza et al. [8] give both formal and empirical economic explanations why monetary values are only partial estimates of total value.

Norgaard [2] and Cornell [1] both emphasise the fact that ecosystems are complex (adaptive) systems, and that a sustained flow of ecosystem services depend on a well-functioning whole system. The ecosystem services concept, as it is being played out in the policy domain, reduces the complexity into a conceptualisation of stocks and flows of services. This is a much simpler, and perhaps politically tractable, representation of human-environmental interactions, but also a very partial one.

Norgaard [2] alerts us to the problems of thinking of ecosystem services in a piecemeal way in the emerging economic analysis of ecosystem services. Most of the literature uses partial-equilibrium analysis, where “what-if” questions about a change are asked within a ceteris paribus (all other things being equal) assumption, where a “project-scale” perturbation is taken not to have an effect on the economy as a whole. He argues this assumption should not be made. Given “humanity's shriveled ecological options and gross social injustices” [2, p. 1224], the present and future values of ecosystem services will be fundamentally mischaracterised in this approach (see also [22]); since the social and economic institutions that constitute the “all other things” are not adequate to the task of achieving sustainability now, projects structured around ecosystem services (and here I mean the money values) are not capable of making the necessary market adjustments towards the required system efficiency.
Do we really want to relinquish society’s experience in sustainability research and policy of more integrative or plural assessments of ecosystem value? All three critical articles interpret the development of the ecosystem services concept as a narrowing of focus onto problematically-derived economic values, and call for collective attention and debate about such values, as well as more appropriate and effective institutions for the management of ecosystem services:

“Fully thinking through ecosystem service projects from multiple perspectives means society must establish standing institutional mechanisms for bringing out, sorting through, and using complex, contradictory insights in environmental management.” [2, p. 1220]

“Existing value transfer practice reveals the need for a more inclusive approach if environmental values are to be addressed. We argue that there are robust alternative means for including multiple environmental values in decision processes, these cannot be dismissed out of hand, and analysts should be expanding their understanding of the available approaches which include attitude and norm measures, multi-criteria analysis and participatory deliberative institutions.” [3, p. 379]

3. Risks and consequences of the concept of ecosystem services

The first area of risk comes from applying part-values to the whole: by looking just at “what nature does for us” rather than “what nature does”, by applying fixed and unwieldy ecosystem service categories to the interlinked and dynamic phenomena of the human-environment system, and by restricting ourselves to quantification in monetary terms. All of this errs towards undervaluing the natural world on which we depend (yet it is the fear of “double-counting” that appears as a theme in most Ecosystem Approach documents – [19, 23-24]). As a synthesis of the three critical articles, the applicable scope of economic (monetary) valuation meets its limits:

- Where there is insufficient fundamental process understanding or environmental data to support an informed valuation (= most cases);
- Where values determined in one context are applied to another (i.e., benefits transfer), with insufficient validity testing (= most cases);
- Where “individual” services are considered in isolation: the functions and processes of a well-functioning ecosystem cannot be disassembled;
- Where there is already scarcity, or a serious risk of non-linearity in ecosystem response (= many cases): environmental economics works for marginal changes, not for “once-and-for-all” circumstances;
- In the future: values determined in the past are unlikely to be stable (but this has barely been tested for environmental benefits); and while some features of ecosystems might be predictable with process models, economic (equilibrium) models are not intended to predict benefits.

A second issue that the three articles touch on is that scholars working in this area – in both science and economics – seem inadequately equipped for working at this interface with policy, particularly with regard to the global geopolitical dimensions. The end-goal of most people involved is clear, and unarguably a good one: this effort to link ecology and economics is an effort to shape a sustainable trajectory for our world. However, there is a lot in the ecosystem service perspective that is not lined up with sustainability.

- There is a risk of naïve faith in science and also in markets, made worse by the tendency for experts in one to be ignorant of the other, and for both to be opaque and not fully accountable to wider society. For sustainability, good governance is essential, along with sound science and a consideration of the social and environmental costs and benefits.
- In the simplified ecosystem services world, the dynamics of nature’s stocks and flows may well be tractable, manageable and predictable – but the real world is complex, and downplaying or
disregarding that complexity in decision-making brings risks of unwanted surprises. For sustainability, conceptualisations of human-environment interactions are needed that can capture and accommodate the complexity.

- The ecosystem services perspective has focused on “optimising the economy”, fixing the market failures that lead to unsustainability. Our understanding of ecosystems and our analysis of our socio-environmental history now bring more fundamental questions about the validity of the economy we have. What is needed is a focus on reconfiguring human-environment interaction for sustainability in the context of anthropogenic global change: transformation, rather than optimisation, of the economy.
- History shows us that an over-reliance on monetised costs and benefits can result in serious social and environmental inequity [25-27]. One major area where the ecosystem services perspective is being applied is in international payment schemes, where typically a “made-in-the-West” market determines prices and payment mechanisms for ecosystem services elsewhere in the world. A power asymmetry exists at the outset (in terms of who has the relevant knowledge of and access to science, economics, markets and political processes), so there is a risk that social and environmental justice and equity are not given the consideration they require.

4. Conclusions

The burgeoning field of ecosystem services is a signal that issues of sustainability are high in national and international policy agendas, demonstrating a widespread awareness of current environmental problems and of potential future environmental risks linked to current patterns of economic production and consumption. However, the intellectual and policy tools need to be properly fit for purpose, and concerns about the ecosystem services perspective need to be articulated and addressed. Environmental and socio-economic research and policy dialogues can and should be informed by decades of pro-sustainability experience in complex, contested environments, in which economic analysis and ecological knowledge have been integrated and deliberated upon in a broader societal context, following principles of good governance. There are increasing opportunities for the gritty but urgently-needed discussions about the purpose, scope, tacit assumptions, shortcomings and future challenges of the ecosystem services concept. If you see one, do join in!

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