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Commentary

Do we need ecosystem accounts?

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ABSTRACT

The internationally adopted System of Environmental-Economic Accounting measures the interaction between the economy and the natural environment. Its central framework accounts for the depletion of natural resources, but omits environmental degradation, notably from pollution. A recent "companion volume" on "experimental ecosystem accounting" addresses ecosystem degradation, but excludes the depletion of natural assets. Its physical accounts, notably on land cover and use, could support the management and conservation of ecosystems. Policies of sustainable economic performance and growth require, however, integrative information on both depletion and degradation at national and sectoral levels. Integrated environmental and economic accounts can provide this information without the detour of ecosystem accounting.

1. Introduction

Environmental impacts of economic activity threaten the sustainability of economic growth and development. Sustainable development is a popular but opaque concern: it appeals to everyone, but it is far from clear what it entails. The need for a more factual assessment brought about new data and accounting systems, notably the international System for integrated Environmental and Economic Accounting (SEEA) (United Nations, 1993).

A special edition of this journal (Ecological Economics 61/4, 2007) reviewed a revised version of the SEEA. Several authors (Boyd, 2007; Heal, 2007; Walker and Pearson, 2007; Weber, 2007) called for better reflecting ecosystems and their benefits for human well-being in the greened national accounts. Their pleas can be seen as a response to the Millennium Ecosystem Assessment (2005), which sought "to assess the consequences of ecosystem change for human well-being" (p. v). Incorporating the 'services' of ecosystems in the national accounts might also help bridge the gap between scientific information about nature and measures of socioeconomic activity.

These expectations were not met when the Statistical Commission of the United Nations approved a "central framework" of the System of Environmental-Economic Accounting (SEEA/CF) (European Commission et al., 2012). Its focus on marketed natural resources facilitates measurement and valuation, but it skirts environmental degradation, especially from the emission of pollutants and wastes.[1] The SEEA/CF treats difficult-to-measure degradation as a change in ecosystem conditions and loss of ecosystem services, which should be addressed in experimental accounts rather than the main body of the accounts (ibid., Preface, para. 14).

A "companion volume" to the SEEA/CF on "Experimental Ecosystem Accounts" (EEA) (European Commission et al., 2013) attempts to meet possible critique of omitting environmental degradation from the SEEA. The objective is to complement the SEEA/CF by presenting ecosystem-related non-market activities and impacts in an accounting framework [1.4][2]. The EEA report also claims that it "goes beyond other approaches to ecosystem analysis and assessment through the explicit linking of ecosystems to economic and other human activity" [1.2].

Unresolved challenges of establishing compatible accounts at ecosystem levels might disappoint expectations again. This commentary provides a critical review of the use and usefulness of physical and monetary ecosystem accounts in general and the EEA report in particular.

2. Physical Ecosystem Accounts: Counting or Accounting?

Should biophysical data of ecosystems be presented in comprehensive accounts of ecosystem assets and services or in statistical

Abbreviations: EEA, Experimental Ecosystem Accounts; FDES, Framework for the Development of Environment Statistics; SEEA, System for integrated Environmental-Economic Accounting; SEEA/CF, System of Environmental-Economic Accounting/Central Framework; SNA, System of National Accounts

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[1] See Bartelmus (2014) for a critical review of progress made by the SEEA revision.

[2] References in square brackets refer to paragraphs, tables, figures or footnotes of the EEA report.

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tabulations of ecosystem characteristics? This question is not just a matter of terminology since the national accounts apply a systemic approach with strict accounting conventions and rules that require aggregation of the underlying statistics. Environmental statistics and indicators can be presented, on the other hand, without or with limited aggregation in relatively loose frameworks.

The world-wide adopted System of National Accounts, the SNA (European Commission et al., 2009, para. 1.1) defines national accounting as "a condensed way [to present] a great mass of detailed information". This is done in a system of accounts and balances that are

- *comprehensive* in the coverage of all activities of all accounting units (economic agents of households, enterprises and non-profit institutions)
- *consistent* in applying the same accounting rules to the transactions of all economic agents, and
- *integrated* by recording all consequences of a transaction in all accounts and balance sheets.

Applying these criteria to the physical ecosystem accounts will reveal their true nature as either integrated accounts or as loosely organized statistics and indicators. It will also indicate to what extent biophysical ecosystem data can be meaningfully linked to measures of economic activity.

2.1. Comprehensiveness

The SEEA/CF and the EEA extend the asset and production boundaries of the national accounts.[3] The physical assets of the SEEA/CF comprise all biophysical assets that may provide "benefits to humanity" (European Commission, Food and Agriculture Organization et al., 2012, para. 5.14). Benefits to humanity appear to be broader than economic benefits: contrary to the SNA, the SEEA/CF includes in the monetary accounts environmental assets, even if they do not yield an economic benefit. However, the SEEA/CF returns to the SNA asset boundary in its monetary accounts by accepting the SNA's valuation principles (ibid.). Accounting for nature's provision of non-produced (resource) inputs to and residual outputs from the economy (wastes and emissions) by the physical accounts of the SEEA/CF can be seen as an extension of the SNA production boundary.

The EEA introduce further stocks and flows from an ecosystem perspective, including

- *ecosystem assets* that go beyond particular natural resource stocks of the SEEA/CF by combining interacting biophysical stocks in spatially delimited ecosystems [2.130]
- a broader set of *ecosystem services*, defined as "the contributions of ecosystems to benefits used in economic and other human activity" [2.23], and
- the *impacts* on the environment from economic and other human activities [1.13].

The EEA define ecosystem assets, and actually ecosystems themselves, as "spatial areas containing a combination of biotic and abiotic components and other characteristics that function together" [2.31]. Ecosystem assets include, but do not separately identify and measure, the "individual" natural assets (of timber, fish, minerals etc.) accounted for in the SEEA/CF. They reflect a synthetic view of ecosystems defined by their extent (in units of surface area), condition (by quality indicators) and significance (as a basket of expected ecosystem services) [2.31].

Ecosystem services include the provision of natural resources, the regulation of natural events and impacts, cultural services (for the recreational, cultural and spiritual enjoyment of nature) and support of internal ecosystem processes, as specified by the Millennium Ecosystem Assessment (2005). Provisioning services refer to the use of natural resources, accounted for 'individually' by the SNA and the SEEA/CF. Regulating and cultural services are the result of interacting stocks and processes within an ecosystem — the main reason for including them in the EEA. The SNA does not account for these services because they are not brought about by a "consensual transaction" between economic agents (European Commission, Food and Agriculture Organization et al., 2009, para. 3.92). Such "externalities", i.e. unintended side effects of economic activities, could be handled by satellite accounts.[4]

The physical accounts of the SEEA/CF stop short of assessing environmental externalities by measuring "pressures" only on the environment. The pressures include natural resource use and depletion and the emission of waste and pollutants (European Commission, Food and Agriculture Organization et al., 2012, para. 2.159). The EEA go further. They account for environmental external effects as *impacts* of environmental pressures that generate ecosystem degradation. They seek to measure the degradation with the help of a large variety of indicators of ecosystem condition and services. "Declines in ecosystem condition and/or declines in expected ecosystem service flows … due to economic and other human activity" is their definition of ecosystem degradation [4.31].[5]

Lack of agreement on how to apportion the declines in ecosystem conditions and services to individual resource stocks and stock changes is probably the main reason for shifting environmental degradation as ecosystem degradation from the SEEA/CF to the EEA (European Commission, Food and Agriculture Organization et al., 2012, para 5.91, 5.92). The SEEA/CF's concentration on individual assets prevents thus the comprehensive accounting for depletion and degradation. On the other hand, the EEA would like to include in principle natural resource depletion in "a broader concept of ecosystem degradation" [2.133]. To this end they assume that "in many cases depletion of resources … should correlate strongly with measures of ecosystem degradation" [4.34]. The assumption that high correlation makes ecosystem degradation an indicator of both depletion and degradation is questionable, notably in the case of ecosystem conversion to other uses [4.13–4.37] and the provision of minerals and energy that are not the result of a short-term ecosystem process [2.128]. Like the SEEA/CF the EEA fail therefore to link and combine depletion and degradation in a common concept of physical impact and environmental cost (see Section 3.2).

The objective of expanding the SNA boundaries is opaque. At first sight, the intention seems to include 'non-economic' environmental concerns in the SEEA/CF and EEA — beyond the "economic activities recognized in the SNA" (European Commission, Food and Agriculture Organization et al., 2009, para. 3.19). Nowhere can we find, however, a clear definition of what is non-economic. The SNA defines economic benefits as utility obtained from using the remuneration for supplying labor and capital to production (ibid.). But there are many non-remunerated benefits that are scarce and contribute to economic welfare; they are not generated by economic production as defined by the SNA, but seem to be covered in the EEA definition of ecosystem services as "contributions of ecosystems to benefits used in economic and other human activity" [2.23].

[3] Assets in the SNA are "economic assets", for which ownership rights can be established and from which economic benefits of current and future income can be derived (European Commission, Food and Agriculture Organization, et al., 2009, para. 2.34, 3.31). The SNA production boundary refers to transactions between economic agents; these transactions exclude therefore nature's provision of non-produced natural resources and its absorption of residuals (ibid., para. 6.24).

[4] The 1992 Rio Earth Summit called for establishing systems for integrated environmental and economic accounting in satellite accounts (United Nations, 1994, para. 8.41). The SNA suggests that its satellites should present conceptual and methodological variations in which "normal constraints and conventions of the SNA are relaxed" (European Commission, Food and Agriculture Organization, et al., 2009, para. 3.95, 29.31).

[5] Ecosystem degradation is measured 'net', allowing for offsetting natural regeneration and human enhancement of ecosystems [4.42].