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ANALYSIS

Spatial scales, stakeholders and the valuation of ecosystem services

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Abstract

Since the late 1960s, the valuation of ecosystem services has received ample attention in scientific literature. However, to date, there has been relatively little elaboration of the various spatial and temporal scales at which ecosystem services are supplied. This paper analyzes the *spatial* scales of ecosystem services, and it examines how stakeholders at different spatial scales attach different values to ecosystem services. The paper first establishes an enhanced framework for the valuation of ecosystem services, with specific attention for stakeholders. The framework includes a procedure to assess the value of regulation services that avoids double counting of these services. Subsequently, the paper analyses the spatial scales of ecosystem services: the ecological scales at which ecosystem services are generated, and the institutional scales at which stakeholders benefit from ecosystem services. On the basis of the proposed valuation framework, we value four selected ecosystem services supplied by the De Wieden wetlands in The Netherlands, and we analyze how these services accrue to stakeholders at different institutional scales. These services are the provision of reed for cutting, the provision of fish, recreation, and nature conservation. In the De Wieden wetland, reed cutting and fisheries are only important at the municipal scale, recreation is most relevant at the municipal and provincial scale, and nature conservation is important in particular at the national and international level. Our analysis shows that stakeholders at different spatial scales can have very different interests in ecosystem services, and we argue that it is highly important to consider the scales of ecosystem services when valuation of services is applied to support the formulation or implementation of ecosystem management plans.

Keywords: Ecosystem services; Valuation; Spatial scales; Stakeholders; Wetlands

1. Introduction

Starting in the late 1960s, there has been a growing interest in the analysis and valuation of the multiple benefits provided by ecosystems. This interest was triggered by an increasing awareness that the benefits provided by natural and semi-natural ecosystems were

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often underestimated in decision making (Helliwell, 1969; Odum and Odum, 1972). Since then, economic valuation of ecosystems has received much attention in scientific literature. Methodologies for the valuation of ecosystem services have been developed by, among others, Dixon and Hufschmidt (1986), Pearce and Turner (1990), Freeman (1993), and Hanley and Spash (1993), whereas the value of the services of a particular ecosystem has been assessed by, for example, Ruitenbeek (1994), Kramer et al. (1995) and Van Beukering et al. (2003). In addition, several studies have provided frameworks for the valuation of ecosystem services (Costanza et al., 1997; Turner et al., 2000; De Groot et al., 2002; Millennium Ecosystem Assessment, 2003).

To date, relatively little elaboration of the scales of ecosystem services has taken place (Millennium Ecosystem Assessment, 2003; Turner et al., 2003). Ecosystem services are supplied at various spatial and temporal scales, which has a strong impact on the value different stakeholders attach to the services. Analyzing scales is important in order to reveal the interests of different stakeholders in ecosystem management. It can also be used as a basis for establishing compensation payments to local stakeholders that face opportunity costs of ecosystem conservation (Tacconi, 2000). In addition, it provides insight in the appropriate institutional scales for decision making on ecosystem management. This is highly relevant in the context of The Netherlands, where the national government is currently considering decentralization of the responsibilities for the management of nature reserves (VROM, 2004). Hence, there is a need to examine the various scales at which ecosystem services are generated and used, and, subsequently, how the supply of ecosystem services affects the interests of stakeholders at different scales (Tacconi, 2000; Turner et al., 2000, 2003; Millennium Ecosystem Assessment, 2003).

Therefore, in this paper, we analyze the *spatial* scales at which ecosystem services are supplied, and the implications of these scales for the values attached to ecosystem services by different stakeholders. For a discussion of the *temporal* scales, the reader is referred to, for example, Howarth and Norgaard (1993) and Hanley (1999). On the basis of existing literature, we first present a consistent framework for the valuation of ecosystem services, specifically considering the issue of double counting of services—one of the remaining issues in ecosystem valuation (De Groot et al., 2002; Millennium Ecosystem Assessment, 2003). The framework consists of four steps, and reflects current thinking on ecosystem services valuation. Subsequently, we assess the spatial scales at which ecosystem services are supplied. Based upon this assessment, we propose to extend the framework with a fifth step, dealing with scales and stakeholders, in order to enhance the applicability of ecosystem services valuation for decision making. To illustrate the expanded framework, as well as the relevance of spatial scales, a case study is presented. The case study includes a valuation of the ecosystem services supplied by the De Wieden wetland in The Netherlands, and an assessment of the scales at which these services are delivered. The De Wieden case study is based upon fieldwork, in which quantitative information on visitor numbers has been collected, and interviews with all major stakeholders of the area, conducted in the period January–September 2003.

The paper is organized as follows. In Section 2, a basic framework for the assessment of ecosystem services is established. In Section 3, the spatial scales of ecosystem services are analyzed and an extension of the framework is proposed. In Section 4, the framework is applied to the De Wieden wetland. This is followed by a discussion of the overall implications of spatial scales for ecosystem management in Section 5. Section 6 summarizes the main conclusions of the paper.

2. The ecosystem services valuation framework

Based upon a literature review, this section establishes a framework for the valuation of ecosystem services. The framework includes three types of services and four types of value, and is based upon Pearce and Turner (1990), Costanza et al. (1997), De Groot et al. (2002) and Millennium Ecosystem Assessment (2003). The framework is presented in Fig. 1. It is applicable to all ecosystems, but it will in general be more useful to apply it to natural or semi-natural (modified) ecosystems. This because of the specific attention paid to the goods and services provided by the regulation and cultural services, which