Summary of the case study on valuation of the forest ecosystem services

Title of the valuation study: **Spatial scales, stakeholders and the valuation of ecosystem services**
Author(s): Lars Heina, Kris van Koppen, Rudolf S. de Groot, Ekko C. van Ierland
Affiliation: Wageningen University
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Objectives of the study

The benefits provided by natural and semi-natural ecosystems are often underestimated in decision making. Ecosystem services are supplied at various spatial and temporal scales, which have a strong impact on the value different stakeholders attach to these services.

The paper analysed the spatial scales of ecosystem services in a case study based upon fieldwork in a wetland area of the Netherlands. Furthermore, it established an enhanced framework for the valuation of ecosystem services. Subsequently, the paper examined the ecological scales at which four ecosystem services were generated, and the institutional scales at which stakeholders benefited from these ecosystem services.

The results of these estimations can thus be used as a basis for establishing compensation payments to local stakeholders. Moreover, the outcomes can support decision making on ecosystem management by the selection of appropriate institutional scales and enhance the applicability of ecosystem services valuation. Hence, the method can be used to analyse potential conflicts resulting from different stakeholder scales in the management planning.

Scope of the study

The ecosystem services valuated in the study were provisioning services (fishing, reed cutting), habitat services (biodiversity) and cultural services (recreation). A local geographical scope was covered. The study area had a size of 5200 ha in the centre of a protected area in the Netherlands. “De Wieden” is a very extensive lowland peatland, which includes a large range of waterbodies of different sizes (4 big lakes, canals, and marshlands), reedlands, extensive agricultural land and forests. The area is protected under national laws, is included in the FFH directives, and was declared as a Ramsar site.

Valuation method(s) applied

Following **the framework** proposed by the authors, valuation of ecosystem services consisted of **four steps**: (i) specification of the boundaries of the ecosystem to be valued; (ii) assessment of the ecosystem services supplied by the system; (iii) valuation of the ecosystem services; and (iv) aggregation or comparison of the values of the services.

(i) A **spatial definition** was required to describe the ecosystem to be valued, which possibly covered several (sub-) ecosystems. In the case study, reed cutting was performed at 1400 ha employing 220 local people, professional fishing was done at 1600 ha employing 11 local people, recreation by tourists mainly happened at 9 small beaches around the lakes rendering a touristic sector possible.

(ii) First the ecosystem services needed to be assessed in bio-physical terms: For production services, this involved the **quantification of the flows of goods** being harvested in the ecosystem in a physical unit. For most regulation services, quantification required spatially explicit analysis of the bio-physical impact of the service on the surrounding the ecosystem. Assessment of cultural services required assessment of the

numbers of people benefitting from the service, and the type of interaction they were experiencing with the ecosystem involved.

(iii) The values that were attributed to ecosystem services depended upon the stakeholders benefiting from these services. The authors subdivided the stakeholders´ attributes to ecosystem services in four types (direct use values, indirect use values, option values, non-use values). The **marginal value** of private goods could be derived from **market prices**, whereas marginal values of public goods had to be established using **non-market valuation techniques**. These included stated preference approaches, related methods, and revealed preference approaches.

In the case study, for fishing, reed cutting and recreation, the **net value added** generated was used as indicator of its value. To assess the value for visitors the **consumer surplus** was used, calculated with the **zonal travel cost method**. The **demand function** for the site was constructed on the basis of the visit rate per zone and the travel costs from each zone (n=304). For the nature conservation service, **payments to the NGO** protecting and managing the site were used as an indication of the lower value of the willingness-to-pay of the Dutch public for this service.

(iv) Thus, the four value types were exclusive and may be added. The sum of the direct use, indirect use and option values equalled the **total use value of the system**. Moreover, the sum of the use value and the non-use value was **the total value of the ecosystem**. If non-monetary indicators were used for the non-use values, the values could be presented side-by-side or could be compared using **Multi Criteria Assessment** (MCA).

Ecosystem services are generated at all ecological scales and affect stakeholders of all institutional levels. To avoid possible **double counting** in the framework, contrary to the Millennium Ecosystem Assessment (2003), supporting services are not valuated. Assessment of scales and stakeholders enhanced the applicability of ecosystem services valuation and supported decision making. In the case study, four institutional scales were distinguished (municipal, provincial, national, and global).

Key results

- At the municipal scale, the most important stakeholder interests were related to recreation, reed cutting and fisheries. At the provincial scale, the main stakeholder interests were recreation and nature conservation. At the national level, nature conservation was by far the most important service. The value of the nature conservation service at the global scale is not known.

- Consideration of scales and stakeholders allows the identification of the appropriate institutional level for decision making. Hence decision making should take place at an institutional level high enough to ensure that all main benefits of the ecosystem are continuously supplied.

- The approximate, combined monetary value of the four selected ecosystem services provided by De Wieden was 4,500,000 €/year (830 €/ha/year) (Tab. 1).

Tab. 1: Economic value of the ecosystem services supplied by the study area

Ecosystem service	Economic value (euro/year)
Reed cutting	480,000
Fisheries	140,000
Recreation	1,680,000
Nature conservation	2,200,000
Total value of the selected services	4,500,000

- The implementation of management plans based on the stakeholders' interests at one institutional scale is bound to lead to sub-optimal ecosystem management from the perspective of stakeholders at other scales. 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.