# What Can Ecosystem Services Do For You? From Assessments to Decisions

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Introduction and Background: The Ecosystem Service Paradigm (EsSP) is increasingly a component or even an underlying principle of environmental policy, legislation and management internationally. The EsSP can be used to define links between human activities and ecosystems, and ecosystems and the services that in turn support and sustain those and other activities; this information can then be used to evaluate, justify or optimize decisions. However, how EsS within various practical applications and frameworks are applied, defined, quantified, modelled, valued and communicated ranges widely, potentially hindering their roles as integrative tools. Instead, a review of cross-sectoral literature revealed a cacophony of language, tools and assumptions, with few explicit links between the scientists and engineers who are carrying out technical assessments and the economists and lawyers who are driving policy. For this paradigm to be useful for the cross-disciplinary integration which is necessary for the integrated management of sediments at the watershed scale to sustain river basin objectives, it is important that practitioners in different fields are clear about what is meant and assumed when terms are used, and within what context assessments are being carried out.
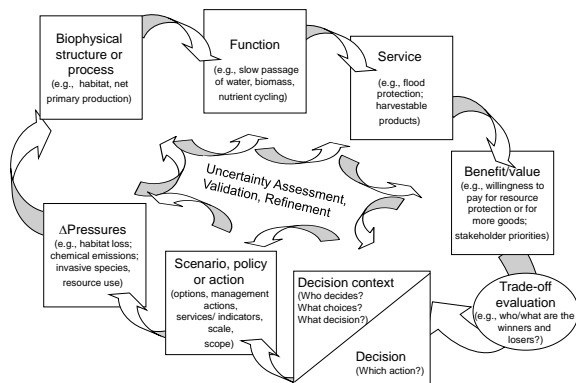
Fig. 1: The logic underlying the Ecosystem Services Paradigm (EsSP)—the decision cascade. From [1].

Results and Discussion: The logic behind practical applications of the EsSP can be explained by the EsS Decision Cascade, a three-part, iterative conceptual framework (Figure 1 and Table 1). Within the decision cascade, Ecosystem Service Decision Analysis (EsSD) defines the proposed policies or actions (scenarios), and the changes/pressures under consideration in different scenarios. Within the context laid out by EsSD, Ecosystem Service Assessment (EsSA) will then evaluate how such changes affect biophysical structure, and thus ecosystem function and services; Ecosystem Service Valuation (EsSV) then takes the results from these analyses and generates valuations (which can, but do not need to be, monetary) to inform decisions; linking back to EsSD.

Tab. 1: Categories of analysis required in applications of the EsSP, their purpose, and From [1].

EsS-based evaluations can expand the current risk-focused thinking behind ecological risk assessment (ERA) to consider trade-offs between a range of desirable and undesirable responses of a variety of ecosystem endpoints; understanding of such trade-offs is essential to inform decisions about more sustainable remediation, regulation and management of landscapes and resources. This paper describes "taxonomies" of various aspects of EsSP applications, based upon their decision context, perspective and assessment approach. Actions and policies available to "consumers" of EsSA are discussed. Then, with a focus on coastal and river basin management issues, a range of current and emerging regulatory and management applications to which the EsSP can be applied in light of this taxonomy are described.

References: [1]. Apitz (2013) *Integ Environ Assess Manage* **9:**214-230.