

## **THEORETICAL ISSUES AND OPERATIONAL CHALLENGES IN ECOSYSTEM SERVICES VALUATION**

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This paper identifies key challenges for current efforts to incorporate the value of ecosystem services in economic decision making. The paper is structured in two main parts. Part one addresses the operational challenges of 1) double counting, 2) non-linear dynamics, and 3) ecological interactions. First, double counting problems emerge from the presence of synergies and trade-offs in ecosystem services delivery. It is argued that substantial problems result from the attempt of extrapolating accounting models designed for economic goods to complex interrelated systems of ecosystem functions. We stress the limits that ecosystem services accounting models are meeting in their quest to develop ‘well defined units’ derives from artificially treating as discrete items what in reality are overlapping ecological processes (in Georgescu-Roegen’s jargon of treating as ‘aripmomorphic’ what is ‘dialectic’ in nature). It is argued that ecosystem service research, and related design of payment schemes, should shift its current focus from single ecosystem services to ecosystem service bundles produced by service providing units with ecologically consistent boundaries. Second, ecosystem services valuation needs to take into account non-linear dynamics and thresholds. It is argued that conventional economic valuation based on marginal analysis are inadequate when ecosystems are close to thresholds and small changes may lead to sudden loss of ecosystem services. Furthermore, it is argued that in such situations information provided by monetary valuation can be misleading by sending the wrong signals. It is suggested that in such situations information guiding ecosystem service management should move from monetary values to early warning signals based on biophysical indicators. The third operational challenge relates with how to deal with “invisible” components in ecosystem services valuation. It is noted that none of the value components included in the Total Economic Value approach attempts to capture the components emerging from the interaction of the elements in ecological systems. It is argued that the value of these elements, i.e., value of maintaining ecosystem functioning over time, should be acknowledged as an explicit part of the ecosystem’s economic value. Related to this issue, it is argued that growing focus on final benefits from ecosystems open up the risk of masking the role of the core ecological processes and ecosystem functions underlying their production.

Part two of the paper focuses on theoretical controversies. Three issues are raised 1) value incommensurability, 2) commodification, and 3) social construction of value. The notion of value incommensurability, that is, the idea that the distinct value dimensions involved in ecosystem valuation may not be reduced to a single measurement unit, e.g. money, energy, land, or labor. The concept of environmental externality, and by extension, the idea that failure to preserve ecosystem services can be tackled through their pricing and incorporation to markets, is discussed critically in the light of this theoretical stand. It is argued that, whereas money has become the hegemonic valuation language, decision making in ecosystem services management entails dealing with conflicting and often irreducible values. Closely related to this issue, the second theoretical controversy relates to the phenomenon of commodification. The emphasis is put in the loss of information that results from masking diverse ecological processes behind the homogeneity of monetary figures. It is argued that if the perception of ecological elements and processes as exchange values becomes normalized, ecosystem functions lacking direct economic value may tend to become invisible in decision

making. Finally, third theoretical issue addresses the social construction of value. It is highlighted that valuation methods are value articulating institutions. As such, rather than neutral measurement tools, valuation methods are embedded in particular ideological structures that shape the way people perceive and codify ecosystem values, and can thus act as vehicles that articulate particular notions of ownership, rationalities, and ways to relate with the environment that are specific to particular societies.

The last section of the paper discusses implications of the above identified issues for ecosystems services science and related design of environmental policy instruments.