**ECOSER mapping tool: from ecosystem functions to socio-ecological vulnerability**

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**Abstract**

The emergence of GIS-based tools has offered a powerful means to undertake ecosystem services mapping. Yet few existing procedures have been capable to connect all ES cascade’s components (functions, services, benefits, values) and none has considered the spatial representation of socio-ecological vulnerability (SEV) under different scenarios. We describe a new version of ECOSER, a GIS modeling framework for the quantification and mapping of an “extended” ES cascade from functions to vulnerability. To achieve this, ECOSER integrates three complementary conceptual frameworks: a) the socio-ecological system, b) the ES cascade (module 1), and c) vulnerability (module 2). Module 1 comprises the quantification, integration, and mapping of ecosystem and landscape attributes to ES benefits and values, along three main steps: a) combination of ecosystem and landscape attributes within proxys of ecosystem or landscape functions using ecological production functions; b) combination of ecosystem functions for the calculation of ecosystem or landscape services using a integration matrix (since one ES can result from variable contributions of one or more ecosystem functions); and c) assessment of benefits from their respective services after modeling their spatial propagation and capture by direct and indirect enjoyers. When ecosystem functions are not easy to envisage, as is usually the case for cultural services, ES flows can be directly derived from ecosystem and landscape attributes through “cultural” production functions. Module 2 is linked to module 1 by the expected marginal changes in ecosystem benefits according to a chosen scenario of LUCC (benefit susceptibility), and leads to SEV through the difference between benefit susceptibility and the capacities of the socio-ecological system to resist, cope with or adapt to those changes, all this affected by the probability of LUCC occurrence (exposure). Ecosystem services and SEV maps are the main outputs from the two modules of the tool, but complementary outcomes can also be obtained from them, like benefits, susceptibility, and capacities maps. As a result of the collaborative effort of two Ibero-American research networks (VESPLAN-CYTED and BEST-P- IAI), ECOSER reflects a common vision that developing countries are characterized by highly dynamic landscapes where land use changes usually reinforce social inequities between winners and losers, which calls for novel planning tools.