

A conceptual model for enabling sustainable management of soil-sediment-water ecosystems in support of European policy

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Introduction: The health of soil-sediment-water ecosystems is under pressure from economic activities and a changing climate. This decreases health and hampers the service provision capacity of these ecosystems and thus impacts human well-being.

Protecting and where feasible restoring of ecosystem health has currently become the key European environmental policy objective and for this it is needed to take an entire system approach and engage stakeholders. ‘Entire’ means that soil, sediment and water are regarded as closely interlinked environmental matrices that need to be managed by taking a ‘river (or mountain) to sea’ perspective, crossing spatial, discipline, political and cultural boundaries.

Results: This paper presents a conceptual model (Fig. 1) – and its objects formulated in a common language (Table 1) – to support that purpose. Essentially, the conceptual model presents an approach for ecosystem-based management aimed to achieve healthy ecosystems, i.e. soil-sediment-water ecosystems that have the continued capacity to support ecosystem services to the benefit of their users.

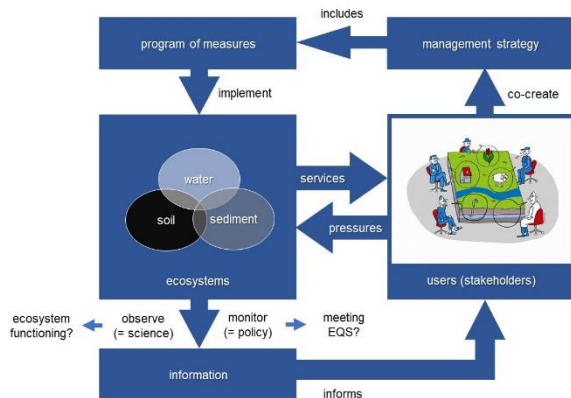


Fig. 1: Conceptual model

The model proposes a cyclic (iterative, learning-by-doing) approach and integrates soil-sediment-water, ecosystems, ecosystem services, users (stakeholders), pressures, information, management strategy and program of measures as building blocks.

Table 1: Common language

Object	Described in common language	Source
Ecosystem	A dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit	United Nations, 1992
Ecosystem services	Services provided and the benefits people derive from these services, both at the ecosystem and at the landscape scale, including public goods related to the wider ecosystem functioning and society well-being	Haines-Young and Potschin, 2018
Information	Organized, structured, interpreted, summarized data	Baskarada and Koronios, 2013
Management	The application of measures to achieve healthy ecosystems	This publication
Management Strategy	Sets out how users will work together to achieve healthy ecosystems	This publication
Measure	Action aimed to achieve healthy ecosystems	This publication
Pressures	The use of ecosystem services and the release of substances (emissions), physical and biological agents which impacts ecosystem health	Modified version EEA glossary*
Program of measures (PoM)	Set of actions aimed to achieve healthy ecosystems	This publication
Sediment	Suspended or deposited solids, of mineral as well as organic nature, acting as a main component of a matrix, which has been, or is susceptible to being transported by water	Brils, 2004
Soil	Upper layer of the earth in which plants grow	AGROVOC**
Users (stakeholders)	Those who are affected in their interest or concern by changes in soil-sediment-water management	This publication
Water	A colourless, transparent, odourless liquid that forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms	Lexico, Oxford English dictionary

Discussion: To successfully apply the model, it is above all needed to take an entrepreneurial approach, i.e. leave comfort zones, take an adventurous road, learn together to manage together, be adaptive and consider other than only command-and-control solutions. Furthermore, authorities should become facilitative leaders to engage users in co-creation of an ecosystem-based management strategy. Real live and place-based experimenting with multiple stakeholders, such as in the Living Labs and Lighthouses that are proposed in the EU soil mission, may provide an ideal instrument for such application, i.e. where the conceptual model can be used and support the achievement of European environmental policy objectives.

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References: [1] Brils & Maring (accepted) *AEHMS*