Quantifying Ecosystem Service Trade-offs at the Catchment Scale: From Landscape Management to Aquatic Protection

Sabine E . Apitz[1]

[1]SEA Environmental Decisions Ltd, 1 South Cottages, The Ford, Little Hadham, UK

Phone: +44-(0)-1279-771890

E-mail: drsea@cvrl.org

Introduction: With advances in our understanding of ecosystem services (EsS), recognition of the interconnectedness between ecology, environment, and human uses has prompted new considerations for evaluating and protecting ecosystems. This has led to the recognition that the soil-sediment continuum must be managed not only to maintain good ecological status at the field or river reach scale but also to sustain the viability and sustainability of landscape and aquatic EsS at the watershed scale [1,2].

Discussion: We manage landscapes and aquatic systems to optimize selected valued bundles of ecosystem services, but the dynamic nature of the soil-sediment continuum means that these systems are inter-related (Fig 1).

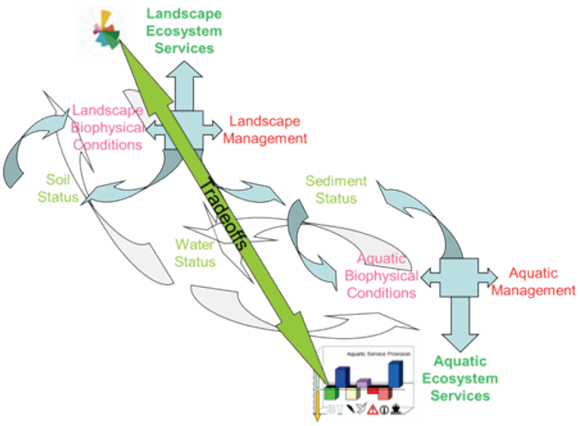

Fig. 1: Sediment and water provide connections between landscape and aquatic services.

Much of the work on sediment assessment and management stems from the ecological risk assessment (ERA) field. Although ERA is a powerful tool for sectoral, single-issue regulation and management, it tends to be uni-directional; focusing on the likelihood of negative impacts. EsS assessment may provide more meaningful insights on environmental impacts and social costs, as well as the net benefits and trade-offs likely derived from different management options. This results in an expansion of the current risk-focused thinking behind ERA to consider a range of desirable and undesirable responses by different ecosystem endpoints (service-providing units or SPUs); in this context, an EsS assessment may be better described as an Ecosystem Response Assessment (EcoResA) [3]. An understanding of the responses of a range of relevant SPUs to past or proposed changes to biophysical conditions (e.g., a change in landscape use, a remedial action, etc.) over time, if applied in a spatially explicit manner, can inform Ecosystem Regional Assessment (EcoRegA) [3]. Using such an approach, both desirable and undesirable impacts on SPUs can be quantified and valued.

However, evaluation of downstream effects of management actions alone should not inform a decision. As important as changes in the socio-economic and –ecological effects of sediments as a function of land- and water-scape management are the effects such management changes have on the bundle of services for which management was carried out in the first place. For instance, while buffer banks on the sides of fields can reduce sediment loss and thus protect downstream services, they can also, if designed correctly, serve as beetle banks, reduce nutrient and soil loss and chemical use, and thus, potentially increase agricultural yields in the short or long term. On the other hand, reduced boat activity to protect river banks may limit the transport carrying capacity of a waterway. When win-win opportunities are realized, the value of both target and downstream EsS are optimized, but in all cases, both changes in both target and downstream EsS as a function of a range of management actions must be evaluated, valued and compared.

Examples of landscape and aquatic management approaches and quantification of their impacts on the soil-sediment continuum, and on local and downstream EsS, will be discussed, with a view to building better valuation approaches.

References: [1] Apitz (2011) IEAM 7(4):691-693; [2] Apitz (2012) STOTEN 415:9-30; [3] Apitz (2013) IEAM 9(2):214-230