Waste, Resource or Liability? Alternative Decision Criteria to Support More Sustainable Sediment Management

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Introduction: The selection of contaminated sediment management options, whether in support of remediation or dredging, is driven by a number of complex and potentially competing factors. There is an increasing use of comparative assessments or similar tools that consider all costs, risks (and, potentially, benefits) of treatment or disposal options, including those of removal, residuals (any remaining contamination), treatment, transport disposal and/or re-use. However, truly sustainable decisions must balance costs, risks and benefits at a range of spatial and temporal scales, considering drivers beyond the obvious regulatory, sectoral and site considerations.

A well-designed decision approach identifies the trade-offs among risks, costs, and benefits that must be made in choosing the best course of action among multiple management alternatives. Available tools that can be used include risk analysis, cost-benefit analysis, and decision analysis. Comparative assessment, however conducted, is an inherently subjective, value-laden process. Although this raises objections by some, due to its perceived "lack of scientific objectivity", it is important to remember that sediment management frameworks are not purely scientific tools, but rather, when properly designed, are tools for using science to inform decisions within a policy-based structure. Whatever tools are applied to make and communicate decisions, it is critical that decision criteria, and the parameters or indicators that are used to score or rank them have a number of characteristics. Criteria should be relevant to the actual decision process. For instance, detailed evaluations of risk pathways or waste streams are not relevant if mass removal or cost is the sole statutory decision driver. Scored parameters should be clearly linked to decision criteria, in scientific terms and in the minds of decision makers. Criteria should be exhaustive, allowing for the clear delineation between options, but not redundant, to avoid the risk of bias and "double-counting".

Discussion: Alongside the more "traditional" criteria such as cost, technological availability and maturity, short- and long-term human and ecological exposure, new criteria are emerging. Systems engineering and life cycle assessment tools allow for "sustainability" considerations such as resource use and re-use, carbon or land footprint. In Europe, the Environmental Liability Directive (ELD) poses new considerations for option selection. The processes of removing, transporting, treating and disposing of contaminated sediment have the potential to introduce new pathways of contaminant release, transport and exposure, all of which must be managed and can themselves result in new costs, risks and potential "contingent" liabilities. The ELD also requires for the first time remediation and/or compensation for damage to "natural resources and/or services", creating opportunities for service-based criteria; while the EU Soil Strategy supports integrated and landscape-scale considerations. The London Convention and the Waste Framework Directives demand more sustainable sediment management (including a prioritization of beneficial re-use), waste minimization and a consideration of the waste hierarchy, which can be used to classify and prioritize management strategies. Thus, management options can also be ranked and scored based upon the fate of sediment in terms of the waste hierarchy.

Contaminated sediment management scenario scoring and ranking case studies, using a Waste Hierarchy scoring scheme [1], liability considerations, ecosystem service and sustainability parameters, along with more "standard" decision criteria will be presented.

References: [1] Apitz (in press) Waste or Resource? Classifying and Scoring Dredged Material Management Strategies in Terms of the Waste Hierarchy, *Journal of Soils and Sediments.*