

# Marching forward or flying blind? Ensuring that sediment management strategies and frameworks meet our objectives

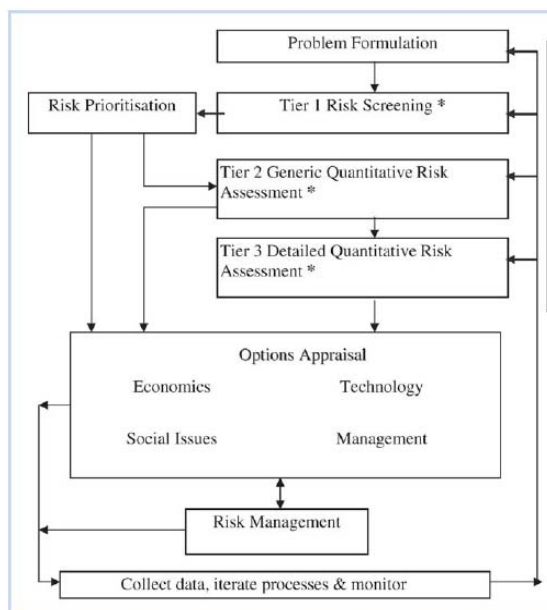
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**Introduction:** Contaminated sediment management is complex and multivariate, requiring a careful balance of science, politics and economics. As is true for most such complex issues, there is not a single correct way to address a problem, but rather the approach should be driven by the ecological, political and economic goals of all interested parties. However, because the choices made have far-reaching implications, it is useful for countries, regions or communities to develop standard, transparent approaches for sediment assessment and management that will meet agreed-upon goals<sup>1</sup> while still allowing for adaptive management. In general, risk evaluation employs a tiered framework and underpins much of legislative decision making (Figure 1). A well-designed, tiered framework is explicit about how regulatory policy, scientific method, and mathematical models will be combined.<sup>2</sup>



**Fig. 1:** The risk assessment framework (from [3]).

**Methods:** Following on from a series of reviews of the state of practice in sediment assessment and management,<sup>1-7</sup> past and current initiatives to develop sediment strategies and frameworks are examined. In this examination, focus is placed on determining how well policy objectives are delivered in frameworks, and what the intended and unintended consequences of various framework and policy choices on overall

protection of ecosystem health are. Examples of such choices, and their likely consequences, are presented.

**Discussion:** How sediment quality criteria, bioassays and other tools are applied within a decision framework has implications on whether one can properly allocate resources as a function of risk. Background considerations and how they are balanced against other issues such as regional risk can affect not only risk assessments but also options appraisals. Emerging tools such as Comparative Risk Assessment, Net Environmental Benefit Analysis and Decision Support Systems have the potential to help ensure that complex objectives are balanced in a rational and transparent manner, but it is necessary to ensure that benefits, risks and objectives are clearly linked to societal goals. Without careful and explicit problem formulation, assessments can be ill-designed to inform goal-focused decisions. Process-level information is required, based upon explicit links between what one hopes to achieve (the Assessment or Protection goal, often defined by legislation) and what one measures (the Measurement endpoint).<sup>3</sup> But, as policy objectives have shifted from sectoral (e.g., contaminant-based) to more holistic (e.g., ecosystem-based) goals, standard approaches must be examined to ensure they are still fit for purpose.<sup>4</sup> European scientists and policy makers must work together to ensure that sediment management objectives are driven by regional risk reduction with an aim towards basin-scale good ecological status, rather than by simple chemical thresholds that may result in moving risks from one area or set of receptors to another. This will require a focused effort to ensure that decision frameworks are underlain by models and measures that clearly and explicitly link sound science to well-conceived, Europe-specific policy and objectives.<sup>7</sup>

**References:** [1] Apitz and Power (2002) *J. Soils Sediments* **2**: 61-66; [2] Apitz *et al* (2005) *Int. Env. Asses. Manag* **1**:2-8; [3] Wharfe *et al* (2007) *Int. Env. Asses. Manag.* **3**:268-274; [4] Apitz (2007). In: Linkov I, editor. *Environmental Security in Ports and Harbors*. Dordrecht: Springer, 147-173; [5] National Research Council (1997) *Contaminated Sediments in Ports and Waterways: Cleanup Strategies and Technologies*, National Academy Press, Washington, D.C., 295 pp; [6] Apitz *et al* (2005) *Int. Env. Asses. Manag* **1** (online-only):e1-e14; [7] Förstner and Apitz (2007) *J. Soils Sediments*, <http://dx.doi.org/10.1065/jss2007.10.256>.