Science, trans-science and policy: How to build a dredged material decision framework

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Introduction: In general, the field of contaminated sediment assessment can be divided into two categories, largely defined by the purpose for which they are being examined. The first, assessment for construction or navigational dredging, is carried out to address the risks of dredging, disposal, beneficial uses and/or treatment options. The second type of sediment assessment, for hotspot or environmental cleanup, is generally triggered when a spill, survey, toxic effect or historical record flags a site as potentially posing a risk to human health, fisheries or the environment. Site conditions are important in determining which remediation techniques (and combinations thereof) are appropriate. Assessment of such sediments can focus on absolute and relative risk, as well as risks of in-place vs. removal options. Frameworks for the assessment and management of these two categories are often treated as parallel frameworks with differing management objectives, but dredged material disposal and environmental quality assessments are carried out at fundamentally different levels of a decision tree. For dredged material (DM) disposal (the topic of this paper), a management decision has been made (removal for non-remedial purposes) and the risks of that process (as well as disposal options) are being examined. Because the cheapest and simplest disposal option is generally unconfined open water disposal, an important question being asked in an assessment for DM disposal is if there is any evidence that this disposal will pose risks to human health and the environment. In general, if the answer to this question is no, then such disposal is permitted. Ultimately, then, the first question asked in a DM assessment is a precautionary one - where there is NO evidence of risk of a proposed action (ocean disposal). Contaminated sediment management, on the other hand, examines line of evidence to determine whether there is enough evidence to trigger (rather than prevent) remedial action. Thus, although similar assessment and decision tools may be used in both applications, how they can and should be used for these two applications differs greatly.

Discussion: Whilst most, but not all, DM and other sediment management decision frameworks are risk-based and built upon our scientific understanding of ecological risks of various processes, they are tools for implementing policy. Many aspects of these frameworks, such as how lines of evidence (LOEs) will be combined, and what decisions they lead to, are quite clearly policy decisions. What is less clear is that even more seemingly scientific aspects, such as the development of toxic risk standards and the selection of bioassays is permeated with policy choices. Wagner [1] has stated that "…contemporary science can provide only partial answers to pressing environmental problems, (but that) this limitation is esoteric and often escapes the lay observer". Thus, the development of standards and tools, intentionally or inadvertently fall victim to a "science charade" in which "the capabilities of science susceptible to …overstatement", and the role of science, trans-science (questions which can be asked of science and yet which cannot be answered by science, and are thus addressed by policy) and policy can be unclear [1]. Although this mix may be appropriately applied as tools and frameworks are being developed for a specific application, when the lines between the science and policy choices are blurred, we lose our ability to be adaptive, and this poses risks as tools are applied to different management decisions, regulatory frameworks and policy priorities.

As various countries are developing and refining their DM decision frameworks in light of changing policy and emerging science, there is a need to critically assess the science AND policy embedded in various choices, including chemical action levels, how various chemical data are combined, the selection of biotests, how tests and decisions are combined and/or tiered, and how emerging chemicals and changing reference conditions will be addressed. Whilst thee are no inherently right or wrong answers to these questions, it is important to be clear about how these choices affect our ability to implement desired policy in a scientifically defensible way. The implications of such choices in a dredged material disposal framework are much different than they would be in, for example, a basin-scale sediment risk assessment or a remedial study. Various approaches to these questions and their implications for DM (and sustainable) management will be discussed, in light of a number of policy reviews from many parts of the world.

References: [1] Wagner WE. 1995. The Science Charade in Toxic Risk Regulation. Columbia Law Review 95(7):1613-1723.