Cleanup of Rivers and Harbors: The Uncertain Promise of Circular Economy

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Introduction: The logic of newly energized "circular economy" discourse is appealing. Maximizing reuse of inputs, minimizing impacts, and incorporating *ab initio* sustainability within product design and manufacture are worthwhile endeavors. But these principles' applicability to the cleanup of contaminated sediment is far from obvious. Cleanup responds primarily to legacy externalization of waste disposal costs and occasionally to management failures. Cleaning up contaminated rivers has proven to be an enormously expensive and time-consuming process, so much so that in many parts of the world the inventory of contaminated sediments is simply ignored. Project funding is often insufficient, and many countries lack the legal or regulatory framework to address contaminated sediment sites. Rhetorical arguments often suggest that the solution is as easy as "making the polluter pay." However, where applied, a singular focus on making historical polluters pay has had the counterintuitive effect of creating legal and technical complexities that ultimately impede progress toward the ultimate goal of implementing a long-term cleanup.

Methods: No materials were used in this work. Methods consisted of accumulated project experience and observation, literature research and review.

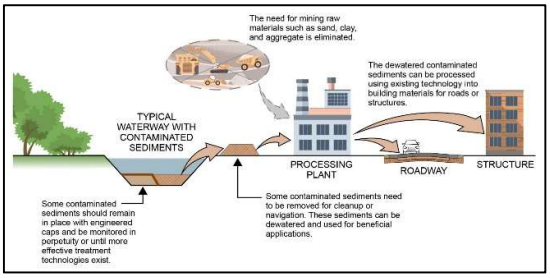

Fig. 1: Modeling beneficial use of contaminated sediments (Spadaro P, Rosenthal L, Fredenburg J 2020).

Results: Much of the difficulty in advancing the cause of contaminated sediment cleanup can be attributed to the high cost of cleanups and the difficulty in assigning financial responsibility for the cost. Simple schemes dependent on identifying polluters are fraught with underlying complexity. Converting contaminated sediment into safe reuse-products remains high-cost; more efficient conversion technologies are still in development. Sustainable markets for such reuse-products will remain elusive until those products can be made price-competitive with less "circular" alternatives. More elaborate approaches tied in with waterfront redevelopment show some promise but are yet to be applied routinely. New advances in the understanding of how sediments may, or may not, factor into circularity pose new challenges and opportunities, with the potential to complement new funding paradigms.

Discussion: The most promising possibilities for advancing circularity in contaminated sediment management lie in a kind of "punctuated circularity," the authors believe. These opportunities involve idiosyncratic beneficial use situations and will often rely upon deep project-based subsidy. However, these ideal scenarios will likely remain rare for the foreseeable future, without advancements in technology and regulatory approaches, as well as development of sustainable market demand for safe products made from contaminated sediments.