

The sediment management issue in the Venice lagoon: lessons learned and future perspectives

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Introduction: The Venice lagoon (Italy), an ecosystem of great ecological and cultural value, faces many interrelated problems, ranging from loss of biodiversity and habitat destruction to extensive and varied exploitation of its ecosystem services. A successful ecosystem-based management strategy requires a good scientific understanding of the behaviour of ecosystems dynamics, and its responses to perturbations, which should then inform integrated management and policy.

In spite of the cross-disciplinary complexity of the systemic risk issues involved in sustainable management of ecosystems, there is a wide consensus that research is underutilized in policy-making due to increased specialization and a lack of links between disciplines and sectors, and between research and policy. There are also little understanding of the mechanisms by which scientific information is incorporated in environmental policy making, and few effective communication tools to effectively link complex research to clear-cut policy decisions.

Sediment balance and contamination are among the major issues to be addressed if the Venice Lagoon ecosystem is to be sustainably managed.

Methods: The Magistrato alle Acque di Venezia, through its concessionary Consorzio Venezia Nuova, has undertaken various scientific programs to establish a framework for sustainable assessment and management of sediment in the Venice Lagoon.

Sediment quality was assessed since mid -90s through extensive chemical monitoring and finally in the recent years through the implementation of a multidisciplinary program integrating in a weight of evidence approach the results of different lines of evidence to link contaminant exposure levels to observed effects, in a Ecological Risk Assessment framework. The results obtained were used to design and implement a pilot-scale study aimed at understanding the positive and negative effects of translocation of sediments, even with very low levels of contamination, the most difficult to assess.

Results: The above projects, together with several other monitoring projects in the same timeframe, produced a large amount of useful information on the

processes that affect the lagoon ecosystem and its responses to management strategies, as well as specific data on the quality of lagoon sediments. The overall results highlighted the absence of ecological risk in most of the lagoon areas, where low to medium levels of contamination were observed. In fact, no significant differences in terms of biological responses were highlighted among low and medium contaminated sediments. When sediments with low level of contamination are translocated the only deleterious impact was associated with the fact that dredged, subsurface, fine sediments rich in organic matter tend to contain high concentrations of ammonia and sulphides, that can be temporarily and locally released after translocation.

Discussion: The standard and innovative assessment measures, and the methods developed to integrate and interpret experimental results may be used to help inform adaptive, sustainable, ecosystem-based sediment management decisions.

As science transitions into the public policy sphere, there is a need for a framework in which scientific knowledge that derives from multiple disciplines and sectors can be evaluated, synthesized, and aggregated. In constructing such a framework, there are a number of questions that arise: 1) How can we maximize the integration of scientific knowledge into policy-making while maintaining the integrity and credibility of scientific knowledge gathering? 2) How can we achieve transparency and accountability in how scientists from diverse disciplines across the academic, governmental, and industrial sectors aggregate their opinions?

The challenge of enhancing the connectivity between science and sediment management in the Venice Lagoon is exemplified by two different examples: 1) the attempt to review the current sediment management criteria; 2) the application of scientifically sound management in reclamation projects.

Some aspects of these two topics, still under discussion, and possible solutions, will be examined.