

Re-use of sediments for the Venice Lagoon salt-marsh restoration

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Lagoons represent transitional areas between the land and the sea. Exposed to an intense environmental gradient, lagoons provide a particularly rich and diversified ecosystem maintained by the presence of marshes, along with the associated mudflats and channels, increases its complexity. These marshes should be considered as morphological elements of fundamental importance. First, the marsh areas play an important ecological role as areas of reproduction and shelter for many species such as birds, fish and shellfish. Further, the marshes act as areas of high productivity, able to deliver organic substances and nutrients to close by habitats. This expedites the functions of growth as well as the filtering of pollutants from rivers and other sources. In the last two centuries, the current evolutionary tendency of the lagoon towards erosion is clearly evident, with result in the loss of sediments from the lagoon into the Adriatic Sea and the progressive disappearance of salt marshes. Figure 1 shows the comparison between the first lagoon bathymetry (1810) and the current lagoon bathymetry.

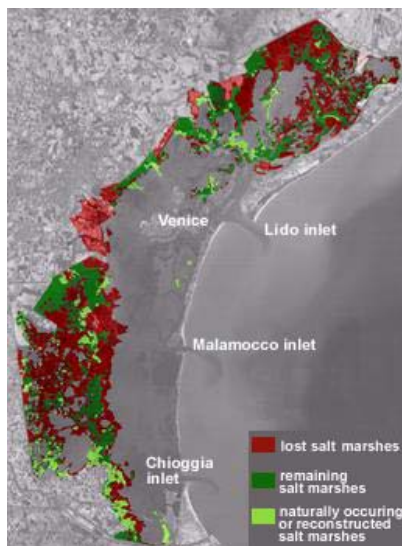


Fig. 1: The image shows the transformation which the salt marsh areas have undergone (from www.salve.it). In red lost salt marshes.

Marsh lands work against the erosive processes of natural (waves and currents) or of human origin (fishing and traffic).

Therefore, the protection of marsh habitats is instrumental for the lagoon ecosystem as a whole. During the last twenty years, the Consorzio Venezia Nuova, on behalf of the Venice Water Authority (Magistrato alle Acque), has conducted numerous studies regarding the hydro-morphological processes in the lagoon and the characteristics of sediments from dredging activities, the latter being used for the construction of marsh lands. Several works have been carried out for the recovery of the lagoon morphology with the general objective to slow down the tendency of losing its proper hydro-morphological structure. If this structure is lost, the lagoon could lose the natural characteristics which distinguish it from a coastal environment (flat and uniform), and the typical lagoon biodiversity would suffer.

With the re-use of dredging sediments of appropriate quality, some 90 marsh structures have been rebuilt. These structures have been located and shaped to improve the local hydro-morphological conditions such as channelling and the capture of sediments. Care has also been taken to protect precious environments from wave motion, stop the exploitation of territory, and to limit the flattening of the lagoon.

The artificial morphological structures have been monitored in order to verify their functionality within the lagoon context. Necessary measures were defined to accelerate and/or improve the naturalizing process such as the recharge of sediments, the dredging of *chiari* and *ghebi*, and the transplantation of halophyte vegetation.

Altogether in the last 20 years, a total of about 800 hectares of morphological structures have been constructed. This value is comparable to the natural marsh lands lost in the same period of time as a result of erosion. For these interventions, about 9 million cubic meters of sediment have been used from the maintenance dredging of the navigation channels, and more recently from the development of the Chioggia Port and the excavations for the construction of the mobile barriers.

References: [1] Magistrato alle Acque di Venezia (2000) Revisione del piano generale degli interventi secondo piu' avanzati e integrati obiettivi di recupero morfologico.; [2] Cecconi G. (2000) Restoring salt marshes in the Venice lagoon. Proceedings IFREMER, Brest 8-9 November 2000.