

Heavy metals accumulation areas in the Venice Lagoon sediments

Margherita Botter¹, Daniele Cassin, Stefano Guerzoni, Roberto Zonta

¹Institute of Marine Sciences, National Research Council,
Castello 2737/F, 30122 Venice, Italy

Phone: +39-041-2407925
m.botter@ve.ismar.cnr.it

Introduction: The lagoon of Venice is a coastal shallow water basin with a surface area of 550 km² and an average depth of about 1 m. Contaminants of different origin are transferred to the lagoon and dispersed in the water body by mixing processes and tidal circulation. The QSEV project [1] was addressed to investigate the sediment quality in the shallow water areas of the lagoon (from -40 to -150 cm on the m.s.l.) Fifty centimeters-long sediment cores were collected, in 2008, in 380 sampling sites, and analyzed with the depth for the content of different chemical species, including heavy metals and arsenic. The impact of the human activities affects the sediment to a different extent, in response to local water renewal and position with respect to the main pollution sources. The latter are the drainage basin (1850 km², 12 main freshwater tributaries), the industrial zone of Porto Marghera, and the inhabited islands (including Venice). Unexpected situations of sediment contamination were also observed in some areas. The more interesting accumulation areas were subjected to a further core sampling in 2009, in order to obtain more detailed information about the pollution extent and temporal evolution. Four noteworthy examples are described in the following.

Methods: Core collection, treatment and analysis are described elsewhere (Cassin D. et al., this Conference).

Results and Discussion: Maxima heavy metal concentrations found in the four areas (Fig 1), at different depth layers, are reported in Tab 1.

The Osellino River drains a 50 km² sub-basin of the catchment, and its pollutant load is characterized by the contribution from the runoff of the urban centre of Mestre. Sediment cores collected near its main mouth in the lagoon (Fig 1 - a) evidence a shallow water accumulation area, about 2 km² wide, with high metal contents particularly in the sub-surface sediment layers.

Similar heavy metal concentration values are found in the shallow water area (about 1 km² width) close to the northern sector of Porto Marghera (Fig 1 - b). This is a partly confined area of the lagoon, where freshwater inputs from the mainland are not present. Metal accumulation which mainly occurs in the sub-surface sediment layers may be ascribed to both the sedimentation of polluted particles coming from nearby lagoon sectors, and the runoff from the industrial zone.

Concerning sediments to the East of the Trezze island (Fig 1 - c), originally part of the Venice defending system of fortified islands, high metal concentrations (particularly Hg and Pb) are found in the deeper layer (30-50 cm) of a very restricted area. This indicates a situation of localized pollution referable to a release of many years ago, or an unauthorised discharging of contaminated material.

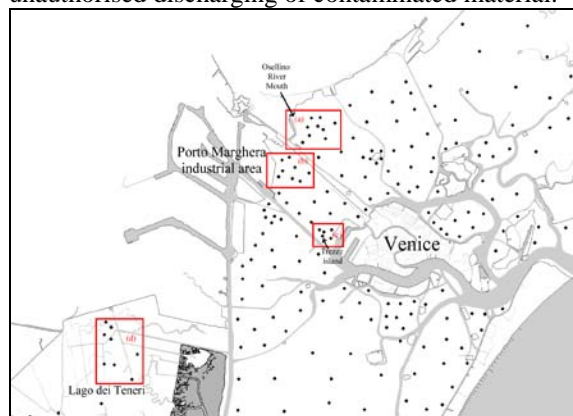


Fig 1: Location of the metals accumulation areas: Osellino mouth (a), Porto Marghera (b), Trezze island (c), and Lago dei Teneri (d).

Area	depth (cm)	As	Cd	Cu	Hg	Pb	Zn
(a)	5-30	35,2	15,0	185	2,3	80	2536
(b)	5-20	34,2	19,8	110	1,8	59	2114
(c)	30-50	24,6	11,3	156	3,9	128	1337
(d)	20-50	43,6	9,9	93	2,9	63	1130

Tab 1: Maximum heavy metals value in the sediment of the four accumulation areas, with indication of the concerned depth layers.

The “Lago dei Teneri” (Fig 1 - d) is a confined area located in the central basin of the lagoon, and close to the mainland. The high metal accumulation signal found at the deeper layers (20-50 cm), particularly in sites close to the land border, is probably the consequence of uncontrolled discharges of industrial waste and/or the effect of the runoff of landfill disposal sites.

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References: [1] Cassin D. et al. (2010) *Proc.39th Congress C.I.E.S.M., Venice, Italy, 10-14 May 2010.*