

# Geochemical characterization of coastal sea, river and stream sediments in peninsula Istria, Croatia

**Vlado Valkovic<sup>1</sup>, Jasmina Obhodas<sup>2</sup>, Ante Kutle<sup>3</sup>**

<sup>1</sup>Kvinticka 62, Zagreb, Croatia

Phone: +385-(1)-468-0101

<sup>2</sup>Institute Ruder Boskovic, Zagreb, Croatia

E-mail: valkovic@irb.hr

<sup>3</sup>NGO "Lijepa nasa", Zagreb, Croatia

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Samples of coastal sea, river and stream sediments in peninsula Istria, northern Adriatic Sea, Croatia have been collected and analysed for 17 elements: Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Br, Rb, Sr, Y, Zr, Pb and U using EDXRF as an analytical tool. Samples have been taken from uninhabited bays, marinas and ports, rivers and streams floors and banks. Special attention was paid to bays on the mouths of rivers and streams.

Enrichment factors showed that there were no significant contributions to the concentration of heavy metals from anthropogenic sources except for bays with marinas and ports. These were identified as «hot spots» for elements Cu, Zn, As and Pb used, alone or in compounds, as biocide in antifouling paints. Maps of concentration distribution for these elements in surface sediments show increased values near the boat service areas in the villages or marinas. Core profiles for these elements were used to evaluate the environmental impact of newly constructed marinas. In each marina two samples are taken and analyzed, one from the marina service area (antifouling paint removal and treatment) and the other from a dock/pier farther away. From the distance of these two sampling points and the age of the marina, the contamination speed (coefficient) could be calculated. Special attention has to be focused on copper (biocide) and note that its concentration in some marinas is very high resulting in a very rapid propagation of the contamination all over the entire marina area. Source partitions indicate also the influence of other sources located in near by villages. The critical factor in these considerations was shown to be water exchange with the open sea.

Concentrations of all 17 elements measured in samples from rivers and streams drainage areas showed little variation among samples and they were similar to those from corresponding bay. The results of principle component analysis and discriminant function analysis confirmed the hypothesis that river and stream drainage areas represent main source of material for bays sediments. It was found that the influence of the nearby industrial disposal sites have negligible role on the concentration of heavy metals in bays sediments.

National Park Brijuni, an archipelago of 14 islands is located near western coast of peninsula. Some 45 samples of sediments were collected near all of islands of Brijuni archipelago most of them around the Veliki and the Mali Brijun islands. In addition, 5 sediment cores were taken on selected locations. The surface sediments in the National Park Brijuni are mainly of the Class 1 except 5 samples (out of 35 investigated locations) where the sediment is Class 2. This is good quality sediment which is cleaner further away from the coast. It is interesting to mention that the concentrations of some elements in the sediment cores are increasing with the depth.