

Development of river sediment monitoring in Croatia

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Establishment of regular river sediment monitoring, in addition to water monitoring, is very important. Unlike water, which represents the current state of a particular watercourse, sediment represents a sort of record of the state of pollution in the long run. Sediment monitoring is crucial to gain a real insight into the status of pollution of particular watercourses and to determine trends over a longer period of time.

First scientific investigations of river sediment geochemistry in Croatia started 1989 in the Krka River estuary [1], while first systematic research of a river basin in Croatia was performed 2005 in Kupa River drainage basin [2]. Up to now, several detailed studies of both toxic metals and organic pollutants have been conducted in this drainage basin and some other rivers, also Croatian scientists participated in river sediment research in other countries.

In 2008 Croatian water authorities (Hrvatske Vode) started preliminary sediment monitoring program, what was successfully conducted. In the first year of preliminary program only 14 stations existed, while in 2014 number of stations increased to 21. Number of monitored watercourses and of analysed parameters also increased. Current plan is to establish permanent monitoring network of river sediments throughout the state. The goal is to set up about 80 stations, which will cover all most important and most contaminated watercourses in all parts of the country [3]. Until the end of the year 2016, regular monitoring was conducted at 31 stations throughout the country.

Currently the second phase of sediment monitoring program is in progress. At the moment parameters being determined on particular stations are not uniform. From inorganic compounds it is aimed to determine Cd, Pb, Ni, Hg, Cu, Cr, Zn and As on all stations. The ratio of natural concentrations of those elements vs. anthropogenic influence is being evaluated on all stations. It was found that worse situation is with Ni, Hg and Cr, who have significant anthropogenic concentrations on several locations. With other studied elements situation is much better and anthropogenic influence is not so significant. Based on own research and experience and comparing them with existing sediment quality criteria worldwide, within the current phase of monitoring program it is aimed to propose threshold values for mentioned elements, what would be base for Croatian National legislative on sediment quality.

[1] Prohić, E. and Juračić, M. (1989): Heavy metals in sediments – Problems concerning determination of the anthropogenic influence. Study in the Krka River Estuary, Eastern Adriatic Coast, Yugoslavia. *Environmental Geology Water Science*, 13(2), 145-151.

[2] Frančišković-Bilinski, S. (2005): Geochemistry of stream sediments in Kupa River drainage basin [In Croatian] / Doctoral thesis. University of Zagreb, Croatia.

[3] Frančišković-Bilinski, S., Bilinski, H., Maldini, K. (2015): Establishing of monitoring of river sediments in Croatia. Contaminated sediments: Environmental Chemistry, Ecotoxicology and Engineering - Program and Abstract Book, Congressi Stefano Franscini, Ascona, Switzerland, 73-73.