Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2020.25003

179 (2020) 252–262
March

Speciation of heavy metals in bottom sediments of a drinking water reservoir for Gdańsk, Poland – changes over the 14 years

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Received 6 May 2019; Accepted 2 October 2019

ABSTRACT

There was conducted a comparative study of the concentrations of heavy metals (Zn, Cu, Pb, and Cd) in the surface layer of sediments collected in two investigation periods: 1999–2000 and 2013. The results demonstrated that the degree of metals pollution decreased over time. The contamination factors (C_f) calculated for Zn, Cu, Pb, and Cd were respectively 3.63, 3.86, 3.23, and 3.25 in the first period of research and 1.35, 3.42, 1.98, and 1.43 in the second one. The metal speciation analysis indicated that Zn was mainly associated with the Fe–Mn oxides fraction and the residual fraction, and Cu – with the residual fraction and the organic fraction in both periods of investigation, while the percentage of geochemical fractions in binding of Pb and Cd changed in time. The share of fractions Fe–Mn oxides/carbonate increased in the case of Pb, and carbonate/exchangeable fractions in the case of Cd. The risk assessment code (RAC) decreased in the following order: Cd > Zn > Pb > Cu and was higher in 2013 - it achieved the very high-risk category in the case of Cd. Thus, despite the decrease of sediment pollution, RAC for Cd increased due to changed geochemical speciation.

Keywords: Heavy metals; Speciation analysis; Pollution chronology; Sediments; Risk assessment code

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