Transfer of heavy metals between the regulated and inactive riverbed of the Przemsza River (southern Poland)

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Despite recent efforts in improving rivers water quality in Poland, the Przemsza River draining the most industrialized part of the country still receives large amounts of industrial and domestic effluents. River-borne contaminants easy penetrate alluvial sandy bottom leading to contamination of groundwater in a river valley, which is additionally dissected with remnants of the pre-regulation channel of this river. Researches aimed to evaluate the flux of dissolved trace metals and major ions with groundwaters in relation to the distance from the channel, in the channelized river reach with the inactive Przemsza channel, filled with sediments.

After careful cartographic and field studies six piezometers have been installed in cross-section over the interdyke zone in increasing distance from the channel.

Groundwaters as well as river waters were sampled six times at variable water stages for the period of one year. Samples were filtered before an analysis through 0.45 µm filters and concentrations of Cl-, NO^{3-}, $SO4^{2-}$, PO_4^{3-}, CO_3^{2-},and Ca, Mg, Na, K were determined within 48 h using Ion Chromatography (DIONEX 1000). Water samples for metals analysis were immediately filtered and acidified to pH below 2.0. Concentrations of Cd, Fe, Mn, Pb, Zn were measured with an Inductively Coupled Plasma-Mass Spectrometer (ICP-MS, Perkin Elmer ELAN 6100).

Waters from the river is permanently alkaline (about 7.5) whereas groundwaters are weakly acidified or acidified (from 4.1 to 6.6). Also conductance of the river waters (about 1800 µS cm-1) is several times higher than in groundwaters just as concentrations of SO_4^{2-}, Cl-, NO^{3-} and Ca, Mg, Na, K. Surprisingly the highest concentrations [mg l-1] of Cd (0.03), Pb (0.17) and Zn (4.90) there are in groundwaters especialy in the levee zone. In contrary content of Fe and Mn rises rapidly outside the levee in the paleochannel with high average water table level.

The investigations indicate that in losing river reaches and at high stages when water is lost to the floodpalain the relatively narrow riparian strip exhibit the large capacity to attenuate contaminant fluxes from the river whereas remnants of the channel favour transfer of contaminats to more distant parts of the floodplain.

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