

HISTORICAL PERSPECTIVE ON THE HAZARDS OF ENVIRONMENTAL HEAVY METALS CONTAMINATION OF SEDIMENTS OF THE Odra RIVER VALLEY (POLAND/GERMANY)

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Introduction

The occurrence of heavy metals (Cu, Pb, Zn) has been determined in floodplain sediment samples collected along eight transects between the 551th and 609th km of the Middle Odra River, at present the border river between Poland and Germany. The river system of the Odra River is contaminated with heavy metals from mining and smelting industry (Boszke et al., 2004; Głosińska et al., 2005; Helios-Rybicka et al., 2005; Ibragimow et al., 2013a, b). Furthermore, many significant historical events have taken place around the Odra River Valley in the last centuries (Ibragimow et al., 2015, Podruczny et al., 2014). These had a direct impact on the landscape and environment surrounding the river. Therefore this study was aimed:

- 1) to determine the concentrations of the total and available fractions of the heavy metals Cu, Pb, and Zn, with particular emphasis on lead concentrations;
- 2) to identify the areas with the highest concentrations of metals in the floodplain sediments;
- 3) to correlate the areas with the highest concentrations with the most historically significant areas in the Odra River Valley.

Methods

The total concentrations of the heavy metals were obtained after HNO₃ microwave digestion. Available fractions were determined by single extraction procedures using soft extractants: 0.01 M CaCl₂, 0.05 M EDTA and 0.1 M HCl. Also physico-chemical parameters including grain size fraction analysis, Eh, pH, organic matter and calcium carbonate contents were determined. Spatial analysis was carried out based on historical maps of Brandenburg from the 19th century and laser scanning data of the present-day.

Results and conclusions

Maximum total concentrations found were 312 mg·kg⁻¹ for Cu, 426 mg·kg⁻¹ for Pb and 1463 mg·kg⁻¹ for Zn. The available concentrations of those metals were up to about (% of total content) 80 for Cu, 60 for Pb and 60 for Zn. Chemical and spatial analyses revealed that collected floodplain samples were characterized by high concentrations of the metals which varied in terms of physico-chemical parameters, total contents and available fractions. There is a connection between the areas with the highest contamination of the heavy metals and the most historically significant areas. The results of this study

suggest that historic contamination can be still represent a potential risk to the environment in the Odra River Valley.

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