Assessing the impact of fluvial dynamics on floodplain soil contamination and microbiota in the transboundary Drava River Floodplain

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Floodplains have received significant attention recently because they are densely populated areas, covered by fertile agricultural lands and act as diverse riverine habitats. At the same time, these important areas are sensitive receptors of PTE (Potentially Toxic Elements) contamination originating from upstream mining and industrial areas endangering food safety and the ecosystems. The large Drava River catchment has been impacted by industrial activities since historic times. Previous studies have shown that the alluvial sediments record the contamination from upstream mines and smelters (e.g. Bleiberg-Kreuth in Austria, Cave del Predil in Italy and Mežica in Slovenia).

Floodplain topsoil (depth: 0-10cm) and subsoil (depth: 50-60cm) samples in the actively flooded alluvial plains and river terraces were collected along 10 cross-sections all along the Hungarian-Croatian border river Drava. In order to study the impact of contamination on soil microbiota, the samples were analysed with ICP-MS for chemical composition, FDA (Fluorescein Diacetate) tests were made for the bulk microbial activity assessment, β-glucosidase content was measured for the rate of catabolic activities, furthermore Docosahexaenoic acid (DHA) content for describing the anabolic processes, and phosphatase enzyme for assessing the mobility of phosphorus. Total cell number was counted on Tryptone Glucose Yeast Extract and the number of fungi on Rose Bengal Agar with Chloramphenicol.

Data was modelled with data analysis methods including descriptive statistics, regression models and homogeneity tests, complemented by spatial visualisation with GIS based softwares. Results show that there is a significant difference between alluvial plain and river terrace sediment contamination, while soil depth (topsoil vs subsoil) seems to be an important factor for soil microbiological parameters.