The impact of human activities in soils and sediments on urban and peri-urban areas

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In this current research we would like to detect the amount of the differences between the natural, the suburb and the urban areas. The aim of the investigation was to determine the impact of human activities on urban and peri-urban soils of Sopron. 72 urban soil samples were collected on 6 sub-catchments for analysing the background pollution of Rák Creek in Sopron. After the analysis of chemical and physical properties of urban soil samples, two element fractions – the total (HNO_3+H_2O_2-extractable) and the available (NH4-acetate+EDTA-extractable – were used for element determination. Toxic elements were measured by ICP-OES in the urban soils and the sediments as well. in case of sediment samples (from thalweg and dead region). That were collected from the bank of the Rák creek at 6 sampling points to calculate enrichment factors to assess the possible harmful effects of toxic metals. The field and laboratory data were processed using a GIS softver (DigiTerraMap). Six elements were selected for analyses (Co, Cd, Ni, Cu, Zn, Pb), which are prominent in urban soils. Statistical analysis was carried out with Microsoft Office Excel 2003, STATISTICA 11 and R Studio. C2 program was used for the distribution of toxic elements.

Based on results (e.g. pH, etc.), there were definite differences between natural (HAZ, BAN), semi-natural (HAJ-NAL) and urbanized (FASOR, GYORI, TESCO) areas and significant differences in toxic element distribution as well. The toxic elements of sediment showed the following tendency: Pb > Zn > Cu > Ni = Co. The Co and the Ni values were lower than the natural background limits. The Cutotal exceeded the first interventional pollution limit (> 75 mg.kg-1) and the available Zn and Pb were higher than the suggested interventional pollution limits (Znavailable >40 mg.kg-1; Pbavailable >25 mg.kg-1) at GYORI sub-catchment. The EF values were generally higher in dead region than in thalweg except of GYORI point. Lead had the highest EF values between the five metals investigated and it is followed by Zn strongly. The EFPb > 5, which indicates the moderate degree of Pb contamination inside the town. Co, Cu and Ni exhibited the lowest in our EF values.

Summarized, the largest heavy metal values were in sampling point GYORI. The EF values for Pb and Zn increased towards city. The accumulation of Pb was confirmed by moderate enrichment of sediment samples, which are originated from the busiest transport hub of Sopron.

The difference between natural and urban areas seemed definite based on our results. Even though the flow characteristic of the dead region and thalweg of the natural part of the stream was different, the heavy metals accumulated in the dead region mainly in the urbanized area.