INTEGRATED URBAN GEOCHEMICAL STUDY IN AJKA, HUNGARY

ZACHÁRY, D.[1]*, VÖLGYESI, P.[1], JORDÁN, Gy.[2] & SZABÓ, Cs.[1]
[1] Lithosphere Fluid Research Lab, Department of Petrology and Geochemistry, Eötvös Loránd University, Pázmány Péter sétány 1/C, H-1117, Budapest, Hungary
[2] Environmental Geology Department, Geological Institute of Hungary, Stefánia út 14, H-1143, Budapest, Hungary
* E-mail: zachary.dora@gmail.com

Urban environment may concentrate contaminants in large quantities deriving from industry, traffic, fertilizers, tailings and wastes. In Hungary, during the 20th century, industrial activity (e.g., mining, alumina industry, coal fired power plants) produced huge amount of by-products and pollutants. Both of these contaminants can be enriched in toxic metals and radioactive isotopes as a result of the treatment technology. Consequences could be toxic element and radionuclide enrichment in urban public and private areas such as soil of playgrounds and parks or dust in dwellings. In addition, technological by-products (particularly coal slag) were often used in construction technologies as building and insulation materials on their own or as additives to building materials.

The major objective of this research was to study and map the spatial distribution of toxic element (As, Hg, Pb, Cu, Zn, Cd, Ni) contamination of urban soil and airborne attic dust and to measure the radionuclide (^{226}Ra, ^{232}Th and ^{40}K) concentrations of urban soil and coal slag samples.

In order to figure out a link between contamination sources and the receiving urban areas, 46 soil samples were collected at 44 locations, 30 attic dust samples at 27 houses and 6 coal slag samples at 6 houses from the old-established industrial city, Ajka in western Hungary. Ajka has multiple contamination sources of glass industry, as well as heavy alumina industry and coal-based power plants supplied by the nearby bauxite and coal mines, respectively. The project area covers an 8x8 grid of 1 x 1 km cells with a total area of 64 km^2. The soil samples have been collected at a depth of 0–10 cm at public areas (mostly playgrounds and parks). Attic dust was sampled in houses with attics kept undisturbed for at least 30–40 years in order to represent long-term industrial pollution. The gamma dose rate was measured on the sampling sites with FH 40G L10 detector at the surface and at 1m height. The laboratory analyses include grain size distribution and ICP-OES measurements for soil and attic dust samples, whereas HPGe gamma-spectroscopy was used for soil and coal slag samples.

Results show spatial correlation of environmental contamination and the contamination sources. The applied integrated urban geochemical method is efficient to study the impact of contamination and it may help with revealing the possibly associated human health risk in an industrial area.