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Geochemical study of urban soils in public areas of an industrialized town (Ajka, western Hungary)

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Soil is one of the most essential parts of urban ecosystem contributing to the biogeochemical cycles along the rock-soil-plant-animal and human pathway. Soil plays a fundamental role in plant nutrient uptake and groundwater filtration, too. Urban soils differ from non-urban soils in many aspects, including their origin, and they may also concentrate contaminants in large quantities due to intensive human activities. The pollution sources are industry, traffic, fertilizer, tailing and waste. In addition to the increasing rate of urban areas, urban soils are under growing interest and their pollution have received significant attention in the past few decades.
This work focuses on the toxic element (As, Hg, Pb, Cu, Zn, Cd, Ni) content of soils and their spatial distribution in order to find a link between contamination sources and the receiving urban soils at sensitive receptor locations such as children's playgrounds and parks. Ajka town is located in western Hungary. It has an old-established industrial history with multiple contamination sources of heavy alumina industry and coal-based power plants supplied by the nearby bauxite and coal mines. At 44 locations 46 soil samples have been collected at a depth of 0-10 cm along a 1x1 km grid. The whole grid covers an area of 48 km2. In each grid cell a sampling site was selected at public areas. Sample preparation included drying at 40 Cº, thorough homogenization and sieving to 2 mm fine earth before chemical analysis. Grain size distribution and soil pH were also determined. Samples were analyzed with ICP-OES and SEM methods. The As, Hg, Pb, Cu, Zn, Cd and Ni concentrations range from 2.07 ppm to 9.48 ppm, 0.02 ppm to 2.84 ppm, 5.08 ppm to 35.74 ppm, 2.55 ppm to 47.78 ppm, 17.00 ppm to 91.00 ppm, 0.07 ppm to 0.61 ppm and 5.57 ppm to 32.09 ppm, respectively. The results revealed the contaminated areas associated with past industrial sites. This study also identified locations with considerable contamination at sensitive receptors in urban public areas, thus supporting contamination risk assessment for environmental decisions.