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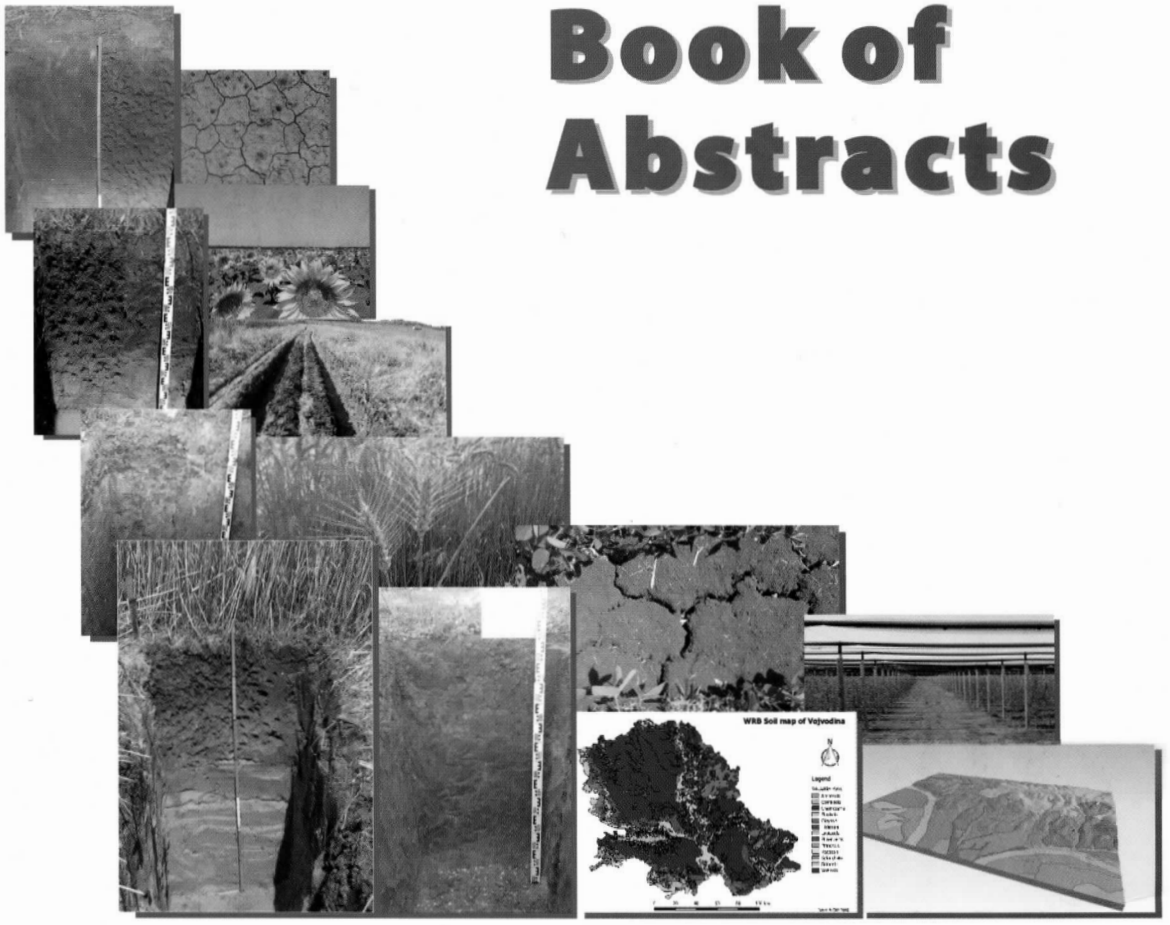
Book of Abstracts



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EVALUATING THE POTENTIAL FOR SOIL POLLUTION FROM TRACE METALS IN THE VICINITY OF INDUSTRIAL FACILITIES IN BELGRADE

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INTRODUCTION AND OBJECTIVES: On the territory of the City of Belgrade, due to a strong demographic development, industrial activity is continually increasing. Large industrial complexes (coal mines and thermal power plants, oil refineries, chemical plants, etc.) as well as industrial and municipal landfills, represent potential sources of soil contamination by heavy metals, which, because of their toxicity and poor biodegradability could bring about the degradation and pollution of soil, with long-term negative impact on the environment and quality of life of city dwellers, as well as those living in peripheral suburban areas. At the same time, intensive agricultural production of the food that enters the Belgrade market takes place on two-thirds of the city's territory. This suggests that the health and welfare of Belgrade's citizens could be under potential threat, directly through inhalation of and contact with soil contaminated by heavy metals, and indirectly through the contamination of water and food, a reduction in the quantity and quality of farm products and a decrease in the agricultural use value of the land. It is therefore necessary to identify and quantify the presence of heavy metals in the soil. The aim of the research providing the results presented in this paper was to determine the heavy metal contents in the soil of selected localities on the territory of the City of Begrade, and by calculating different factors of contamination, to determine the contamination levels of the studied soil and assess the anthropogenic impact on its quality.
MATERIALS AND METHODS: The study was conducted on the territory of Belgrade at selected localities in the municipalities of Lazerevac (1. Crljeni), Obrenovac (2. Urovci), Grocka (3. Vinča) and Palilula (4. Padinska Skela), that are in immediate proximity to different sources of contamination (the open-pit mines and thermal power plant "Kolubara", the ash dump and thermal power plant "Nikola Tesla-A", the municipal landfill "Vinča" and oil refinery "NIS Petrol Pančevo"). As the control, a locality in the municipality of Surčin (5. Jakovo) was chosen. After drying and sieving (2-mm mesh), the basic physicochemical characteristics of homogenized soil samples (from depths 0-20 cm collected from 5 points at each locality) were determined according to the standard analytical procedure. The results are interpreted in accordance with the relevant national regulations. Total soil As, Cd, Cr, Cu, Hg, Ni, Pb and Zn (M±SD, mg/kg) contents were determined using inductively coupled plasma spectrometry (ICP-OES, Spectro Genesis) after breaking down the samples by wet digestion (USEPA 1996). The soil contamination status was estimated by calculating the pollution index (PI) and the Nemerow pollution index (PI_N). The impact of human activities on the accumulation of heavy metals in the soil surface layer was estimated based on the enrichment factor (EF), and the environmental risk of their presence in the soil on the basis of the environmental risk factor (Ei).
RESULTS AND CONCLUSIONS: The contents of the studied chemical elements at all the selected localities on the territory of Belgrade were below the maximum allowable concentrations (MACs) and remedial values ("Official Gazette RS", br. 23/94; "Official Gazette RS", br. 88/2010), while the contents of Cd at all localities, Cu at localities 1 and 5, and Ni at localities 1, 2 and 5, were higher than the borderline values ("Official Gazette RS", br. 88/2010). According to the pollution index (PI), the soil at all localities was moderately contaminated with Cd and slightly-to-moderately contaminated with Cu and Ni at localities 1, 2 and 5. Based on the enrichment factor (EF), it was established that Cd contamination at localities 1, 2 and 3 was of anthropogenic origin. The slight Cu and Ni contamination established by the PI was most probably geological in origin considering the low category of the EF index. Because of the high toxicity coefficient, the environmental risk factor (Ei) for Cd was significant at localities 1, 2 and 4, and moderate at localities 3 and 5. The results indicate that proximity to thermal power plants, ash dumps and oil refineries contributes most to the Cd contamination of the surrounding soil, and that future studies should focus on the potential risks to crop cultivation in the immediate environments of industrial plants.

KEY WORDS: soil contamination, heavy metals, degradation, PI, EF, Ei.