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BUILDING AN INTEGRATED ENVIRONMENTAL MONITORING SYSTEM FOR HEAVY METALS IN ROMANIAN SOILS: MOLDOVA REGION CASE STUDY

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Abstract

The objective of our study was to demonstrate the necessity of an integrated environmental monitoring system relative to heavy metal concentration in soil in Romania. The reports published between 2006 and 2011 by the National Agency for Environmental Protection (ANPM) in Moldova Region counties (Suceava, Botosani, Neamt, Iasi, Bacau, Vaslui, Vrancea and Galati) were used to synthesize the necessary information for this study. The concentration levels corresponding to the top soil layer for some heavy metals, such as Pb, Cd, Zn, Cu, Ni, Cr, Mn and Co, for 22 cities were analysed using descriptive statistics methods and Principal Component Analysis in order to determine the tendency of the time evolution, possible relations and correlations among heavy metal concentrations, their sources and possible health risks. The main sources of pollution of soil with heavy metals are considered the industrial activities and traffic, excepting towns of Suceava and Dorohoi, where the main sources are the urban waste deposits and the water treatment plants. Exceeding of the thresholds in locations distant to any direct source of pollution were highlighted in 7 towns. A model with 3 PCs describes almost 89% of the calibrated data variation. The variation of heavy metals concentration for all samples along categorial variables was explored. The results of the principal component analysis show that only "county" categorial variable has a distinct influence on the heavy metal concentration variation according to PCA analysis. The analysis shows the necessity to build an integrated environmental monitoring system for heavy metals in soil, at least for Moldova Region. In order to have data for an extended study it is necessary to make analysis on regular basis, for an increased number of fixed locations, and for the same metals. Such data bases will allow more complex statistical analysis, with the possibility to use the results for decision-making processes.

Key words: descriptive statistics, heavy metal, monitoring, Principal Component Analysis, soil

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