Urban geochemistry of the city of Aschersleben, Saxony-Anhalt, Germany

MANFRED BIRKE*, UWE RAUCH AND BEATE KEILERT

Federal Institute for Geosciences and Natural Resources, Branch Office Berlin, Wilhelmstrasse 25-30, 13593 Berlin, Germany
(*correspondece: manfred.birke@bgr.de)

A third of the population of Germany lives in cities with a population greater than 100,000. Anthropogenic activities are the determining ecological factor in cities and industrial regions. The main objectives were to identify the spatial distribution and the main sources of potentially toxic elements in topsoil by conducting univariate and multivariate statistical methods assisted with GIS tools.

A total of 381 air-dried soil samples (0-10 cm, < 2 mm fraction) were analysed for TOC, TC, pH_{H2O}, pH_{CaCl2}, and electrical conductivity of the eluate (IR-spectroscopy, potentiometry, conductometry). All topsoils were analysed for ten organic compounds and compound groups (adsorbable organic halogen compounds, extractable organic halogen compounds, mineral oil hydrocarbons, phenol index, highly volatile halogenated hydrocarbons, benzene, toluene, ethylbenzene and xylene, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, polychlorinated dibenzodioxins and polychlorinated dibenzofurans), and for 53 trace and major elements and lead isotopic compositions in the aqua regia extraction by ICP-MS and ICP-AES. The total concentrations of 45 elements were analysed by WD-XRF, ICP-AES and AAS.

In the area around Aschersleben, local anomalies of PTEs occur near metal processing, and construction materials industries, and in the vicinity of landfills and old contamination sites. The regional or local geochemistry of an urban area can be evaluated only by comparison with the surrounding non-industrial area. Both single and multi-element maps were used to interpret the geochemical data. Study of regional variations and anthropogenic contaminations of topsoil by metals and organic compounds is very important for environmental planning and monitoring in urban areas. A geochemical survey of the urban environment provides a reliable database for setting concentration limits for urban and other soils. Sustainable urban development requires combined management and monitoring of urban conditions of soils and chemical fluxes. Geostatistics and multivariate statistical methods provide a comprehensive understanding of the spatial distribution of urban pollution and alteration of soils.