

HIGH RESOLUTION MAPPING OF METAL CONTAMINATION IN AN URBAN SPORTSGROUND (GALWAY, IRELAND) USING ORDINARY COKRIGING WITH MAGNETIC SUSCEPTIBILITY DATA

NESSA GOLDEN¹, CHAOSHENG ZHANG^{2*}, PAUL GIBSON³, LIAM MORRISON⁴

¹*Department of Geography, School of Geography and Archaeology, National University of Ireland, Galway, Ireland, Galway, n/a, Ireland*

²*GIS Centre, Ryan Institute and School of Geography and Archaeology, National University of Ireland, Galway, Ireland, Galway, n/a, Ireland*

³*Geophysics Unit, Department of Geography, National University of Ireland, Maynooth, Co. Kildare, n/a, Ireland*

⁴*Department of Earth and Ocean Sciences, School of Natural Sciences, National University of Ireland, Galway, Galway, n/a, Ireland*

Chaosheng.Zhang@nuigalway.ie

Lead contamination in soils poses a serious threat to human health and in particular, children playing on a lead polluted urban sportsground are potentially at risk to metal exposure. The production of maps for metal distribution in urban soils is important for both understanding the geochemical processes involved and the implementation of related environmental management policies. The aim of this study was to generate maps of metal (Cu, Pb and Zn) distribution at increased resolution in a contaminated urban sportsground (South Park, Galway) in Ireland. This study was carried out using the geostatistical technique of ordinary cokriging with magnetic susceptibility (MS) as a covariate. The MS was examined at a grid density of 10 × 10 m. Soil samples were collected at a lower density on a 20 × 20 m grid and the metal content was determined using a portable X-ray fluorescence (P-XRF) system. Strong positive correlations were found between MS and concentrations of Cu, Pb and Zn in the soil. The ordinary cokriging method allowed for the enhanced estimation of map values when the distribution of a secondary variable (MS) is sampled more intensely than the primary variable of interest (concentrations of Pb, Cu and Zn). Validation results demonstrated that the cokriging predictions facilitated the generation of more accurate prediction maps for metal concentration (Cu, Pb and Zn) using MS data, rather than maps produced using metal concentrations alone with ordinary kriging. Prediction maps of individual metal contaminants (Cu, Pb and Zn) were also produced for comparative purposes.

Keywords: metal contamination, magnetic susceptibility, geostatistics