

# Assessing copper and lead concentrations at abandoned mine areas using GIS-based hot spot analysis from portable XRF data

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## Abstract

To prevent soil contamination at abandoned mining area, understanding spatial variation of potentially toxic trace elements (PTEs) in soil is necessary to identify the proper measures. There have been many studies on exploring and mapping the spatial variation of PTEs using geostatistical methods. Although they are useful for predicting PTEs concentrations of abandoned mine areas where sampling is not conducted, these studies cannot give information as to whether samples are statistically significant. To overcome this limitation, this study used hot spot analysis which calculates z-scores based on the Getis-Ord  $G_i^*$  statistic identifying a statistically significant hot spot sample. Owing to the advantages of portable X-ray fluorescence (PXRF) analysis data with relatively cost and time effective, sufficient input data from the Busan abandoned mine was used for hot spot analysis in this study. PXRF data and the study area of Busan abandoned mine were classified as four categories according to the concentrations and z-scores: high value with high z-score, high value with low z-score, low value with high z-score, and low value with low z-score. It may be possible that the high value sample with low z-score or the low value sample with high z-score is the result of measurement error or accident. The results obtained in this case study can be beneficial to assess statistically significant soil contamination and to determine the area where additional survey is required.

**Keywords:** Hot spot analysis, Getis-Ord  $G_i^*$ , Portable X-ray fluorescence, Soil contamination