Influence of covariates upon heavy metal distribution in Sydney, Australia

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As urbanisation and population density increases, areas once used for industry are being repurposed and redeveloped into housing for the growing population. Soil naturally contains background levels of heavy metal concentrations, dependent upon the parent material from which the soil was formed. However, in urban areas with a history of, or currently containing Industrial activity, these background concentrations can be elevated to potentially harmful levels. For the benefit of urban planning and human health, it is therefore essential to observe where contamination lies and to gain a mechanistic understanding of the drivers of soil contamination in urban areas. Mapping soil contamination in a city is relatively simple; however it is harder to identify key drivers of heavy metal distribution, such as proximity to roads.

To address this, the current study obtained samples from around Sydney and interpolated the data, taking into account certain covariates. These covariates were obtained from a number of Australian government agencies and included distance to roads, digital elevation and its derivations (i.e. slope, aspect, curvature, MRVBF, MRRTF), population density data, land use, regolith geomorphology and soil landscapes. The heavy metal data were obtained from a number of sources and then harmonised to gain an overall understanding of contaminant distribution in Sydney. Soil samples were taken from up to a depth of 10cm, sieved, digested in acid and analysed using atomic absorption spectroscopy.

Heavy metal concentrations were interpolated using covariates as predictors within the linear mixed model with the aim to determine the most likely drivers of contaminant concentration in Sydney. Interim results indicate that the main covariates influencing heavy metal distribution include distance to roads, land use, population density, slope and the soil landscape. Results obtained will enhance understanding into the drivers of urban soil contamination and in turn assist with urban planning and risk assessment.