

# Soil geochemical mapping and characterization of Ararat region, Armenia

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Current state of soil geochemical mapping of Armenia territory includes step by step soil surveys of the country's regions. Regional scale soil surveys following a uniform grid (1 sample per 25 km<sup>2</sup>) started since 2019 and 3 out of 10 regions (excluding capital city of Yerevan) were studied covering 29.2 % of the country. In this study the result of Ararat soil geochemical survey is presented. In 2020, 84 soil samples were collected and contents of Cr, V, Ti, As, Zn, Cu, Co, Fe, Mn, Ba, Pb, Ca, K and Mo were determined by the XRF spectroscopy [1]. The application of compositional data analysis and geospatial mapping allowed us to reveal three spatially distinct subsamples. The first one was spatially located in the south-eastern, north-eastern and north-western part of the region which was characterized by the dominance of naturally occurring elements: Fe, Co, Ti, Mn, V, Ba, Pb and Zn. The second subsample was spatially located in the urbanized and industrialized parts of the region having developed road networks and known sources of pollution. This subsample distribution spatially correlates with the areas where Cu, As and Cr high contents (> 75 %) were identified. The latter suggested predominant anthropogenic origin of the studied elements in the second subsample. The third one was spatially located in the southern and central parts of the region. Here Ca high contents were identified suggesting that in the third subsample geological base and exploitation of quarries conditioning the spatial pattern of the studied elements. Excesses vs MAC's stated in Armenia observed for As (in 98 % of samples) and Cr (in 70 % of samples). However, the health risk assessment showed that children non-carcinogenic and lifetime carcinogenic risks [2] were above the allowable level in 3 and 2 sampling sites, respectively.

## Acknowledgment

Supported by the MESCS Science Committee of RA: grant №1-12/20TB.

## References

[1] US EPA. (2007). Field portable x-ray fluorescence spectrometry for the determination of elemental concentrations in soil and sediment. *Method 6200*.

[2] RAIS. (2021). Risk Exposure Models for Chemicals User's Guide. *The Risk Assessment Information System*. [https://rais.ornl.gov/tools/rais\\_chemical\\_risk\\_guide.html](https://rais.ornl.gov/tools/rais_chemical_risk_guide.html).

Accessed 1 January 2020