Review of: "Probabilistic Assessment of the Heavy Metal Pollution in Debrecen's Topsoil"

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Potential competing interests: No potential competing interests to declare.

The authors have given a well-written manuscript on the probabilistic assessment of heavy metal pollution in Debrecen's topsoil. However, there are issues that need to be addressed.

- The background information provided is relevant and sets a suitable context for the study. It includes a discussion of the sources of heavy metals and their implications. Yet, the introduction could benefit from more specific examples of heavy metal pollution impacts in urban areas, particularly in Debrecen, to highlight the study's local significance.
- While the introduction hints at a gap in the existing literature—specifically, the need for a probabilistic assessment of heavy metal pollution—a more explicit statement of the research gap and how this study aims to fill it would make the objectives clearer.
- The soil sampling process is outlined, including the use of soil augers and shovels and the criteria for sample collection (0 to 20 cm depth). While this provides a basic understanding, additional specifics on sampling strategy (e.g., random, systematic, stratified) would enhance reproducibility and clarity regarding potential sampling bias.
- A brief mention of air drying and sieving procedures is included, but details on the particle size retained for analysis are lacking.
- The application of sequential Gaussian simulation and the use of ArcGIS Pro for spatial analysis are mentioned. However, the explanation lacks depth regarding the specific steps taken and the parameters set for the Gaussian simulation.
- Multivariate methods used in Statgraphics Centurion 18 software are listed without detailing the specific analyses conducted (PCA, cluster analysis).
- In the results and discussion, a deeper engagement with previous studies could reveal how the current research advances, contradicts, or complements established knowledge.
- The discussion did not fully explore the environmental implications of heavy metal pollution, such as impacts on soil health, plant life, and broader ecosystem services.