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.

1. Arsenic is a metalloid. Heavy metal(oid)s should be replaced instead of heavy metals.
2. The choice of stations needs more clarification. On what basis did the author select the locations? Did the authors use any standard methods for sample collection? If so, please state the standards.
3. Which digestion method and measuring instrument were used to determine the total concentration of HMs?
4. Authors should measure the properties of soil samples.
5. Quality control (QC) and quality assurance (QA) are very important in geochemical analyses. Please include the results in the manuscript.
6. Muller's index is called the Geo-accumulation index (I_{geo}) rather than PGI. Also, B_n denotes the geochemical background concentration, not the maximum permissible concentration of the element.
7. Buat Menard and Chesselet developed the Enrichment factor (EF), so please use EF instead of HMEI. Moreover, EF = $(C_x/C_{Fe})_{sample}$ / $(C_x/C_{Fe})_{background}$. Where $(C_x/C_{Fe})_{sample}$ denotes the metal value of the examined sample and (C_x/C_{Fe})background denotes the metal value of the background.
8. Please write the Potential ecological risk index (PERI) instead of ERI.
9. To evaluate the biological effect of metals, the adverse effect index (AEI), toxic units (TUs), and toxic risk index (TRI) can be included.
10. "The total element concentration in the region is in the order of Ca > K > Fe > Ti > Mn > Zn > Cu > V > Cr > Pb > Ni > As > Co > Cd > Mo": Comparing different metals' concentrations is not correct because the concentration ratios of elements in the earth's crust are different. So you can't compare the mean content of elements. All of the elements should be presented in uniform cases.
11. Please provide the reference for the classification of coefficients of variation. For example, it is mentioned that the coefficients of variation of Ti, Mn, Cr, Cd, V, As, Mo, and Co (38.3% - 59.3%) were moderate to low. Moreover, this contradicts the results of PCA.
12. Please compare the concentration of metals in the area with the earth's crust, soil quality guidelines, and other soils around the globe.
13. "Mn is the most abundant pollutant in the topsoil of Debrecen": In most cases, Mn has the highest concentration after Fe / Al. Al and Fe are the most common elements found in high quantities in most soils because they are prevalent in the upper and lower earth's crust. Mn is the third element in relatively high concentrations, and it is an important micronutrient needed for both plants and humans. https://doi.org/10.1016/j.marpolbul.2023.115565

14. The results of spatial distribution should be discussed in parallel with the sources of pollution. Authors need to discuss more thoroughly the spatial distribution of HMs in the soil.
15. How can the Pearson correlation coefficients show diffusion, adsorption, and absorption processes?
16. "High positive correlations were observed between As and Pd (0.66)": Please correct the typo.
17. Please explain why Ni is negatively correlated with some other metals.
18. "… Factor 1 is the major contributor to pollution, mainly As, Pb, and Zn, due to mining and industrial activities.": Please mention those industries in the area that emit these metals.
19. The description of the PCA section is general; specific information from this area must be provided to support each sentence and confirm the accuracy of the claims.
20. In the ERI results, the authors can add “Among the elements considered, Cd had a low concentration with a notable contribution. Cd has the maximum T_r (30) which is related to its high half-life time of about 25–30 years.” https://doi.org/10.1016/j.marpolbul.2023.114836
21. Table 2 can be given as a figure. The heatmaps in the articles I have suggested as examples above may be a good choice.