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.

According to the dataset provided, I do not agree that Cd, Mo, and Cu are the main toxic pollutants in Debrecen topsoils, but Cd-As-Pb. But refer to details.

Remark to page 3/16: "The soil surface depth ranges between 2-3 meters" - but 0-20 cm were sampled. Does this mean a sequence of historic horizons dating back to the Middle Ages?

The "pollutant accumulation index" has been termed by G. Müller as "geo-accumulation index." The formula is correct, but "B" means the geochemical background, and not the maximum permissible concentration. Further on, the authors are not aware that they had determined total element contents, where many soil data refer to aqua regia extracts. This causes differences for Cr (up to 3-fold) and Ni. Presumably, the maximum permissible concentrations in soils given by Hungarian legislation refer to aqua regia. Values of 75 mg/kg for Cr and 40 mg/kg for Ni are below mean crust values, and this would be nonsense.

The **pollution index** refers to the tolerable levels and would be calculated for this case = {[As]/15 + [Cd]/1 + [Co]/30 + [Cr]/75 + [Cu]/75 + [Ni]/40 + [Pb]/100 + [Zn]/200}, if metal concentrations had been taken from **aqua regia**!

The **contamination index** refers to the background values and would be calculated for Hungary = {[As]/7,3 + [Cd]/0,29 + [Cr]/25,4 + [Cu]/15,3 + [Ni]/17,7 + [Pb]/18,4 + [Zn]/54,3}/7, if metal concentrations had been taken from **aqua regia!**

The authors might try to calculate these indices without Cr and Ni from the existing dataset.

Table 1: Why do the authors assume that there are negative concentrations? Some data distributions are non-Gaussian, thus a mean and a standard deviation are nonsense. A Gaussian distribution should be calculated around the median. From this, no concentration is negative, and the positive outliers are found clearly. In the case of contaminants, there are just positive outliers here, but a Gaussian distribution using all data implies that there are equal numbers of positive and negative outliers! A lower limit and an upper limit are given, which is complete nonsense at all. The upper limit is smaller than the median for Ca, Fe, K, Mn, Ti, and the lower limit is larger than the median for Cu, Pb, and Zn? The range of outliers should be given instead!

Table 1: Delete unnecessary commas for Ca, Fe, K, Mn, Ti; maybe give percent. How precise can you measure?

Chapter 3.2: In order to evaluate enrichments, you have to refer to mean crust values, or at least local background. Get some idea about geochemistry! Mn is not the most abundant pollutant; it is just half of the mean crust value of 950 mg/kg

(Mason, Moore 1985) or 800 mg/kg from other sources. It is a usual level for chernozem soils. I know the Debrecen area, but I cannot remember mining activities there.

The enrichment versus mean crust values follows the order Cd > As > Pb, Zn and Mo are about at mean crust, and the concentrations decrease Cr > Cu > Mn > Co > Ni.

Chapter 3.3: “Positive correlations between As and **Pb** …” not Pd.

The factors found by principal component analysis are plausible, but the interpretation is odd. Factor 1 means industry, traffic, and roofs. Factor 2 is more plausible to derive from mineral fertilizers used in urban parks. Factor 5, containing mainly Cu, is more plausible to derive from Cu-containing pesticides. Ca is not toxic to the water system - lime precipitation can clog it, but that is not a toxicity.

Last but not least, it is not understandable why the authors did not quote authors from Hungary and adjacent countries, where much had been issued during the last 50 years. Instead, they referred to the last “copy and paste” activities from Asia and Africa.