Title: Spatial distribution of heavy metal in sands and sediments of Parki Beach, Chattogram, Bangladesh.

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Abstract: To assess the sources, levels, spatial distributions and exposure to human health, the concentration of heavy metals Pb, Cu, Mn, Zn, and Fe in the sand/sediment of the Parki Beach area of Anowara, Chattogram, Bangladesh are determined using Atomic Absorption Spectroscopy (AAS) for the first time. A total of 40 surface and subsurface sand and sediment samples were collected from 20 different sampling points along the 15 km long Parki Beach area, Bangladesh. Average concentrations of Pb, Cu, Mn, Zn and Fe in surface samples are 14.60, 10.10, 283, 407 and 25,256 mg/kg respectively and 9.95, 4.20, 193, 156.6 and 24,404 mg/kg for sub-surface samples, respectively, which shows that the values are higher in surface samples than those in sub-surface samples. According to the Consensus-Based Sediment Quality Guidelines (CBSQG), the northern part of the beach becomes moderately polluted by Mn and Fe, and a smaller area of the southern part is highly polluted by Zn. The average Contamination Factor (CF) of Zn was greater than 1($CF > 1$), while the CF of other metals was less than 1($CF < 1$). CF of Zn in some sampling points was exceptionally high. Geo-accumulation Index (I_{geo}) also shows that Zn slightly pollutes some sampling points. The enrichment Factor (EF) of Fe and Mn in samples in the northern part of the study area is quite high and the study reveals that high values of Fe and Mn are mainly derived from geogenic sources. Ecological risk factor (Er) indicates low ecological risk for all sampling points. The Pollution Load Index (PLI) was measured at all sampling stations, and the results showed that the overall level of heavy metal pollution is low. The health quotient (HQ), health index (HI), total health index (THI) and incremental life time cancer risk (ILCR values suggest that adults are safe from any health risk while children may experience non carcinogenic health risk due to the combined effect of the metals. Reduction of heavy metal in the beach is possible with the adaptation of multiple strategies. This data can be used by policymakers to develop strategies to reduce the potential impacts of soil contamination on the environment and public health.

Keyword: Environmental Pollution, Heavy Metals, Enrichment Factor (EF), Geo-Accumulation Index (Igeo), Pollution Load Index (PLI).

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