

Ecological and human health risk assessment of heavy metal contamination in surface soil of Yadadri-Bhuvanagiri District, Telangana state, India.

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Soil is the foundation of basic ecosystem function *that has experienced some degree of physical, biological, and chemical weathering*. Soil contamination often cannot be visually perceived or directly assessed, and making it a hidden menace with serious consequences. This study was conducted to know the heavy metal contamination and its ecological, and human health risk assessment for adults and children through various pathways. For this study, a total of 44 soil samples were collected and analyzed for various heavy metal content using the XRF technique. The concentrations of As, Co, Cr, Cu, Ni, Pb, Sr, and Zn ranged from 3.4-19.6 mg/kg, 0.3-89.6 mg/kg, 8.7-543.4 mg/kg, 7.7-96.6 mg/kg, 5.4-168 mg/kg, 4-66 mg/kg, 134.6-437.9 mg/kg, and 1-478.3 mg/kg respectively. The higher concentration of heavy metal is found to be in the northwestern part of the study area. The Geo-accumulation index (I_{geo}) indicates the soil is moderately contaminated. The EF mean values for As in most of the samples is >2 indicating minimal enrichment or involvement of some anthropogenic activities in the area. The principal component analysis also showed the origin of contaminants in the soil was due to anthropogenic activities like the use of pesticides, and fertilizers. The non-carcinogenic risk due to soil for children and adults via ingestion, dermal, and inhalation pathways in almost all the samples is found to be less than the permissible limit of 1 ($HI < 1$) indicating no noteworthy chronic risk of metals in the study area. The total carcinogenic risk (TCR) showed 90.91 and 4.45 percent of samples exceeding the limit for children and adults respectively. It is also clear that ingestion is one of the major pathways for exposure. Especially in children the carcinogenic risk was very high and is likely to cause cancer in the future if the exposure continues for a longer period. Some heavy metals like Cr and As showed very high values via ingestion pathway that may cause carcinogenic risk to the people of the study area. The Ni and Cr via dermal pathway also showed some carcinogenic risk which should also be taken seriously.