

Heavy metals contamination, distribution, sources apportion and Ecological risk assessment in the sediments of Dir-Kohistan, Khyber Pakhtunkhwa, Pakistan

Shafiullah^{1*}, Seema Anjum Khattak¹, Mohammad Tahir Shah¹, and Liaqat Ali¹

¹National Centre of Excellence in Geology, UoP, Pakistan

*Email: shafi4pk100@yahoo.com

The sediments samples collected from different tributaries and River Punjkora of Dir-Kohistan and were analyzed for major and minor elements. The elemental concentration in the prepared sediment samples were measured by using atomic absorption spectrometry. The arithmetic means values for metals were found as 29460 mg/Kg, 26384 mg/Kg, 23473 mg/Kg, 15193 mg/Kg, 132868 mg/Kg, and 2369 mg/Kg, respectively for major elements Na, K, Ca, Mg, Fe and Mn. Similarly, an average concentration of minor elements was found as 158 mg/Kg, 48 mg/Kg, 100 mg/Kg, 22 mg/Kg, 87 mg/Kg, 69 mg/Kg, 25 mg/Kg and 294 mg/Kg, for Cu, Ni, Zn, Cd, Co, Ag, Cr and Pb, respectively. The distribution patter of major elements in sediments samples were found as Fe > Na >K > Ca > Mg> Mn while in minor elements arranged as Pb > Cu > Zn > Co > Ag > Ni > Cr > Cd. The potential ecologic risk assessment in term of contamination factor (CF), degree of contamination (Cd), pollution load index (PLI), geo-accumulation index (Igeo) and enrichment factor (EF) were also calculated. The CF data indicated very high contamination for Cd and Ag while low contamination factor for Ca, Ni, Zn and Cr. The degree of contamination in sediments samples were majorly contributed by Ag, Cd and Pb. Similarly, the PLI data indicated moderate category of pollution. The Igeo calculation data showed strong to very strongly pollution for Cd, very strongly pollution for Ag while rest of the elements indicated unpolluted to moderately polluted category of geo-accumulation index. More over EF assessment confirmed no enrichment for Ca, Mg, Mn, Cu, Ni, Zn, Co and Cr, minor enrichment for Pb; moderately sever enrichment for Cd and extremely severe enrichment for Ag. Enrichment factor analysis of ecological risk assessment further confirmed anthropogenic source of pollution for Ag and Cd while rest of the elements experienced geogenic sources of pollution in the study area.