Heavy metal contamination and distribution in watershed channels and Punjkora River, Lower Dir, Khyber Pakhtunkhwa, Pakistan

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Abstract

There are plenty of watershed channels in the Lower Dir, Khyber Pakhtunkhwa, Pakistan which are feeding the Panjkora River. The water of Panjkora River is used mainly for irrigation purposes and is also recharging the water table in the low lying areas. Therefore, the environmental impacts of these watershed channels in regard to heavy metals contamination have been investigated during this study. For this purpose, water samples were collected from watershed channels and Panjkora River. These samples were analyzed for the heavy metals such as Cu, Pb, Zn, Ni, Cr, Co, Cd, Fe and Mn using atomic absorption spectrometer. The data obtained during this study indicated that Ni, Cr, Co, Zn, Cu and Mn were found within the maximum permissible limits of Pak-EPA, WHO, and US EPA while Fe, Pb and Cd were found in contaminant level with their concentrations in the range of 0.112- 0.954 mg/L, 50.47- 213.6 µg/L, 0.146- 18.98 µg/L respectively in the water samples of watershed channels and 0.668-10.71 mg/L, 18.04-205.4 µg/L, 0.686-3.559 µg/L respectively in the waters samples of Panjkora River. These elevated values of Fe, Pb and Cd can be attributed to the weathering and erosion of rocks, extensive use of pesticides and fertilizers, urban and agricultural runoff and direct disposal of domestic sewerage system into the watershed channels and Punjkora River of the study area. The distribution pattern of heavy metals in watershed channels was found in the order of Fe > Pb > Cu > Mn >Zn >Cd > Co > Cr > Ni while in Punjkora River such distribution pattern was observed in the order of Fe > Pb > Cu > Mn > Zn > Co > Cr > Ni > Cd. The concentrations of Pb and Cd were found higher in watershed channels as compared to that of Panjkroa River. It is concluded that watershed channels are flowing through densely populated regions and hence carrying all sorts of pollutants which are deteriorating the water quality of Panjkora River. The pollution levels of both toxic elements such as Pb and Cd were also found higher than the health based standard values which suggest that health related hazards must be of special concern in the study area.