

Geostatistical Simulation of Carcinogenic Industrial Effluent on the Irrigated Soil and Groundwater, District Sheikhpura, Pakistan

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Abstract : The water resources are depleting due to an intrusion of industrial pollution. There are clusters of industries including leather tanning, textiles, batteries, and chemical causing contamination. These industries use bulk quantity of water and discharge it with toxic effluents. The penetration of heavy metals through irrigation from industrial effluent has toxic effect on soil and groundwater. There was strong positive significant correlation between all the heavy metals in three media of industrial effluent, soil and groundwater ($P < 0.001$). The metal to the metal association was supported by dendrograms using cluster analysis. The geospatial variability was assessed by using geographically weighted regression (GWR) and pollution model to identify the simulation of carcinogenic elements in soil and groundwater. The principal component analysis identified the metals source, 48.8% variation in factor 1 have significant loading for sodium (Na), calcium (Ca), magnesium (Mg), iron (Fe), chromium (Cr), nickel (Ni), lead (Pb) and zinc (Zn) of tannery effluent-based process. In soil and groundwater, the metals have significant loading in factor 1 representing more than half of the total variation with 51.3 % and 53.6 % respectively which showed that pollutants in soil and water were driven by industrial effluent. The cumulative eigen values for the three media were also found to be greater than 1 representing significant clustering of related heavy metals. The results showed that heavy metals from industrial processes are seeping up toxic trace metals in the soil and groundwater. The poisonous pollutants from heavy metals turned the fresh resources of groundwater into unusable water. The availability of fresh water for irrigation and domestic use is being alarming.

Keywords : groundwater, geostatistical, heavy metals, industrial effluent

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