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Spatial Variability of Soil Pollution and Health Risks Due to Long-Term Wastewater Irrigation in Egypt

Authors : Mohamed Eladham Fadl M. E. Fadl

Abstract : In Egypt, wastewater has been used for irrigation in areas with fresh water scarcity. However, continuous applications may cause potential risks. Thus, the current study aims at screening the impacts of long-term wastewater irrigation on soil pollution and human health due to the exposure of heavy metals. Soils of nine sites in Al-Qalyubiyah Governorate, Egypt were sampled and analyzed for different properties. Wastewater resulted in a build-up of metals in soils. The pollution index (PI) showed the order of Cd > Pb > Ni > Zn. The integrated pollution index of Nemerow's (IPIN) exceeded the safe limit of 0.7. The enrichment factor (EF) surpassed 1.0 value proving anthropogenic effects. The geo-accumulation index (Igeo) indicated that Pb, Ni, and Zn-induced none to moderate pollution, while high threats were associated with Cd. The calculated hazard index proved a potential health risk for humans, particularly children. It is recommended to perform a treatment to the wastewater used in irrigation to avoid such threats.

Keywords : pollution, health risks, heavy metals, effluent, irrigation, GIS techniques
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