

Heavy metal contamination of surface water at Jajmau (Kanpur) and Unnao industrial areas of the Ganga Plain, Uttar Pradesh, India

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The concentrations of heavy metals (Ba, Cr, Cu, Ni, Sr, and Zn) were studied in surface water at Jajmau (Kanpur) and Unnao industrial areas (80°15' – 80°34' E longitude and 26°24' – 26°35' N latitude), of Uttar Pradesh, India to find out the extent of chemical pollution in surface water due to industrial waste. Jajmau and Unnao are prominent centers for leather processing clusters of tannery industries (about 450) along the banks of river Ganga, besides other industries. Geologically the study area is beset with alluvium of Quaternary age consisting of older alluvium of middle to upper Pleistocene and newer alluvium of Holocene.

Sixty-three water samples were collected from Jajmau and Unnao industrial areas and were analyzed for trace metals by using ICP-MS (Model-ELAN DRC II, Perkin-Elmer Sciex Instrument, USA). The data reveals that the surface water in the area is significantly contaminated with heavy metals such as Ba varies from 57.9 to 197.2 $\mu\text{g/L}$ (average of 112.9 $\mu\text{g/L}$), Cr varies from 9.3 to 541.2 $\mu\text{g/L}$ (average of 125.7 $\mu\text{g/L}$), Cu varies from 6.6 to 52.9 $\mu\text{g/L}$ (average of 28.7 $\mu\text{g/L}$), Ni varies from 9.0 to 47.8 $\mu\text{g/L}$ (average of 22.5 $\mu\text{g/L}$), Sr varies from 128.2 to 728.0 $\mu\text{g/L}$ (average of 339.3 $\mu\text{g/L}$) and Zn varies from 36.3 to 2105.1 $\mu\text{g/L}$ (average of 359.1 $\mu\text{g/L}$). Indiscriminate dumping of hazardous waste and letting out of the industrial effluents in the study area could be the main cause of the water contamination spreading by rainwater and wind. The concentration levels of these metals are much above the permissible limits in surface water and are responsible for health hazards especially for the people working in the tannery industries. It was observed that the people in the area are seriously affected and suffering from occupational diseases such as asthma, chromium ulcers and skin diseases. Distribution and correlation of heavy metals in water and their effect on human health along with possible remedial measures are discussed.

Geophysical and hydrochemical investigations of groundwater in a hard rock terrain, India: Implications for evaluation, quality and vulnerability risk mapping

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Groundwater quality in Mettur region, India gets inferior due to infiltration of effluents from anthropogenic activities. To understand the process controlling the groundwater chemistry and vulnerability risk mapping groundwater samples collected, an attempt has been made by collection of water samples and Vertical Electrode Sounding.

The water types represent Na-Mg-HCO₃ and Na-Cl-HCO₃. Positive high correlation between Na and Cl suggest intermixing. DRASTIC demarcated three vulnerable zones. High vulnerable zone extend due SW direction, moderate vulnerability along northern and NW part and low/no risk along NE parts. The Pore water Specific conductance (SC) calculated and correlated with observed SC [1]. The SC of the pore water noted higher than native water in high vulnerable zones and vice versa. Groundwater chemistry is dominated by silicate weathering, ion exchange process and human influences [2]. The TDS, Cl and 18O proved good correlation with vulnerable zones demarcated.

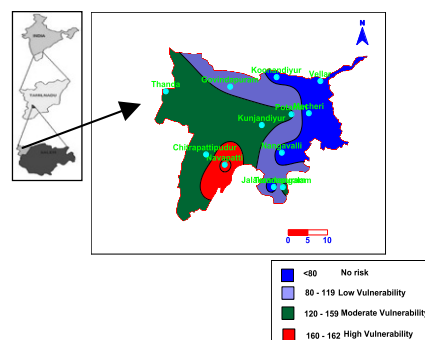


Figure 1. Groundwater Vulnerability map of the study area

- [1] Archie (1942) TAIMMPE, **146**, 54–62.
[2] Srinivasamoorthy *et al.* (2008) JESS, **117(1)** 1- 10.