Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.8731

Heavy Metal Contamination of Water Resources in Sukinda Mine Area, India

MR. BIBHABASU PRADHAN, MSC AND SANDIP KUMAR MOHAKUD

Indian Institute of Technology, Bhubaneswar

Presenting Author: bp23@iitbbs.ac.in

Leaching of heavy metals from working and abandoned mines may lead to contamination of the surface and groundwater resources in the surrounding areas. In view of this, a study has been conducted to evaluate the effect of mining activities on groundwater and surface water quality in the Sukinda valley area of Odisha, India. Further, it is also investigated, if the concentrations of various contaminants vary due to the seasonal changes from pre-monsoon to post-monsoon. The area is being extensively mined for chromite and iron ore. In total, thirty groundwater and twelve surface water samples were collected from the vicinity of the mining area during pre- and post-monsoon seasons. The collected water samples were analyzed for major ion and heavy metal concentrations. Groundwater and surface water in the area is characterized by Mg-HCO_3 facies during both seasons. The major ion concentrations in groundwater do not show significant seasonal variation; however, a seasonal change in the hydrochemistry of surface water has been observed. Chromium and iron are identified as the major contaminants in both groundwater and surface water. Total chromium concentrations were found to be above the WHO permissible limit of 0.05 mg/L in ~23% and ~20% of groundwater samples collected during pre- and post-monsoon seasons, respectively. In case of surface water, 25% of samples exceeded the WHO limit during both seasons. Further, more than 70% of groundwater and 40% of surface water samples have iron concentrations higher than the WHO permissible limit (0.3 mg/l) during both seasons. Plotting of hydrochemical data in Gibb's diagram shows their clustering in the rock dominance region. The spatial distribution of chromium and iron indicates leaching of these metals from the host rock. Seasonal variability in heavy metals are statistically visualized through Principal Component Analysis (PCA) and Hierarchical Clustering. Batch experiments performed at two different temperatures show a positive correlation between pH and chromium mobilization. Heavy Metal Pollution (HPI) Index calculations for the post-monsoon season shows higher contamination of the surface water. Extensive leaching of mine-waste by acidic rainwater has led to higher heavy metal content in the post-monsoon season.

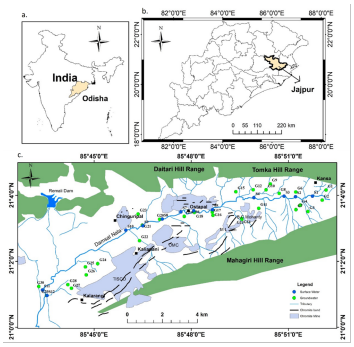

Figure 1: Location of the Study Area; (a) Map of India showing location of state of Odisha, (b) Map of Odisha showing location of Jajpur district, (c) Sample locations in Sukinda chromite mining area

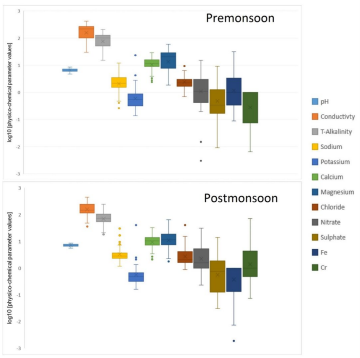

Fig. 2: Concentration of water quality parameters measured in collected water samples across both seasons.