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Spatial Assessment of Trace Metals in Groundwater around Udupi Thermal Plant, India

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Udupi Power Corporation Limited (UPCL) is a coal based thermal power station in Karnataka, India, established in 2008. The fly-ash which is produced in the process of burning coal to produce power contains trace metals which are toxic in nature. A study was carried out to assess the concentration of zinc (Zn), cadmium (Cd), lead (Pb), copper (Cu), nickel (Ni) and cobalt (Co) in groundwater around the thermal power plant within a radius of 10 kms. Groundwater from open wells at an interval of 1 km was collected from a total of 30 sampling stations along the north, east and south of UPCL. The water samples were tested onsite for pH, electrical conductivity (EC) and total dissolved solids (TDS). Trace metal concentration was estimated using anodic stripping voltammetry.

Parameters
Min.
Max.
Mean
Std. Deviation
pH
4.85
6.49
5.6787
0.43582
TDS (mg/L)
12.84
427.00
55.537
73.42232
EC (μ S/cm)
29.8
232.0
97.353
49.8504
Zinc (mg/L)
65.39
285.76
167.22
57.66555
Cadmium (mg/L)
0.504

1.891
0.985
0.205513
Lead (mg/L)
4.612
17.365
7.744
2.044088
Copper (mg/L)
13.239
40.896
25.761
5.304148
Nickel (mg/L)
13.276
46.706
19.240
7.161938
Cobalt (mg/L)
1.127
3.687
2.016
0.629981

According to Indian Standards (IS) 10500:2004 for drinking water, the desirable limit for pH is 6.5-8.5. The maximum and mean level of TDS obtained is within the drinking standards (500 mg/l). EC is in direct proportion to the total dissolved solids. The order of concentration of trace metals is Zn > Cu > Ni > Pb > Co > Cd. The values are well within the desirable limits. Table 1 gives the statistical values of the samples. The study concludes that the effect on ground water is within the permissible limits. However, there are chances of future contamination as trace metals do not decompose rapidly and are bio accumulative in nature.

Table 1: Physico-chemical parameters and trace metal concentrations in the ground water of 30 stations around UPCL

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