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Geochemistry of Pulicat Lake, East coast of India and its environs

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Pulicat Lake is the second largest lake in India, located 60km north of Chennai. The lake receives fresh water from the Kalangi and Arani rivers, and connected with the Bay of Bengal for its saline water input. To evaluate the extent of degradation, 24 water and sediment samples (12 each during premonsoon – June 2003 and postmonsoon – February 2004) were analyzed for physicochemical parameters major and trace elements (As, Cd and Hg). The analytical results reveal significant variations in parameters between the two seasons. Trace metals were found to be adsorbed onto clay particles due to their high surface to volume ratio and surface charges. Mercury, arsenic and cadmium, exist in fresh water as dissolved species and as adsorbed ions on to particulates. Upon estuarine mixing condition, Fe, Mn, organic matter and associated trace metals are flocculated forming aggregates, primarily by the complexation of divalent cations and subsequent coagulation due to Vander Wall's forces. The salinity variations regulate the sediment associated cadmium concentrations due to their complexation with chloride ions. Burning of coal in the nearby Ennore Thermal Power Plant has significantly contributed mercury, arsenic and cadmium to the sediments of Pulicat Lake, Clay, organic carbon, Fe, Mn, Hg As and Cd concentrations in the sediments were observed to be more during post monsoon, due to the riverine input and heavy rainfall. In channel part mercury was found more due to the sea water coming through narrow mouth. Heavy metal pollution and rapid siltation, seasonal closure of the lake mouth affected entire ecosystem and environ.

Keywords : Soil, Sediment, Surface water, Groundwater, Physicochemical parameters, Toxic trace metals, Pulicate Lake