

Mechanisms of Arsenic Pollution of Groundwater in Sedimentary Aquifers: An Example from the Ganges-Meghna-Brahmaputra Deltaic Plain of Bangladesh

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In the deltaic plain of the Ganges Meghna-Brahmaputra rivers, arsenic pollutes groundwater because FeOOH is microbially reduced and releases its sorbed load of arsenic to groundwater. The most intense reduction, and so severest pollution, is driven by microbial degradation of buried peat deposits, which generates concentrations of dissolved iron of up to 80 mg l⁻¹, methane, and methanogenic-CO₂, seen as low pH (> 6.3), high pCO_2 (> 10^{-0.7} atm), and high SiO₂ (<84 mg l⁻¹) from its weathering effect. Concentrations of ammonium up to

10 mg l⁻¹ are sourced both by latrines and microbial fermentation of buried peat. Concentrations of phosphorus are up to 5 mg l⁻¹ derive from reductive dissolution of FeOOH and fermentation of buried peat. Neither pyrite oxidation nor competitive exchange with fertilizer-phosphate contribute much to arsenic pollution. Inorganic arsenic may be lost from solution via bio-transformation into forms that are analytically inaccessible to hydride-generation, loss on sampling (volatile arsines), or sorption to organic matter in the aquifer.