Assessment of Groundwater Quality by Factor Analysis in Urban and Industrial Areas of Ghaziabad, India

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Due to accelerated growth of anthropogenic activities, Groundwater quality is the one of the emerging environmental concern in urban India. Unscientific Disposal of Municipal and Domestic wastes, industrial effluents have been predominantly responsible for deterioration of Groundwater Quality in Ghaziabad. About 120 groundwater samples were collected in Ghaziabad Urban area and four major Industrial areas surrounding by urban area on either side of the Hindon River for the year 2008 in both pre & postmonsoons and analyzed for pH, EC, Cl, SO_4, HCO_3, CO_3, Na, K, Ca, Mg, Cr(IV) and Total Cr. The geology of the study area was composed of moderately thick quaternary unconsolidated alluvial formations.

To handle large quantity of datasets and to identify the dominant mechanisms and factors controlling the chemistry of Groundwater, Factor analysis can be used as an effective method (Dalton and Upchurch, 1978; Grande et al., 1996). Factor analysis by principle components extraction method with varimax rotation was applied for the assessment of groundwater quality in Ghaziabad urban and Industrial areas. In Premonsoon accounting a 74% variance with five factors and variables EC, Cl, Na, Mg, SO_4 and Ca have positive loading on factor1, TCr and Cr(IV) have positive loading on factor 2, CO_3, HCO_3, NO_3 have loadings on factors 3, 4, 5 respectively. With increased variance, postmonsoon accounts 83% variance and six factors. TCr and Cr(IV); SO_4, Ca and EC; NO_3 and K; CO_3 and pH; Na and Cl; HCO_3 have loadings on factors 1, 2, 3, 4, 5, 6 respectively. This may be due to the discharge of effluents and its interaction with the groundwater and the contamination of anthropogenic origin was derived from human and industrial activities. Factor analysis provides greater precision in identifying contaminant components and interpretation of their origins.

Keywords: Groundwater Quality, Factor analysis, Ghaziabad, Urban and Industrial pollution

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