

GIS based Approach for Mapping the Groundwater Arsenic Vulnerable Zone of Nagaon District, Assam

Imdad H. Thakuria¹, B. K. Medhi¹, D. K. Bora¹,
H. Bhattacharyya² and R. Das³

^{1,2}Department of Soil Science, Assam Agricultural University, Jorhat – 785013

³Department of Crop Physiology, Assam Agricultural University, Jorhat - 785013

Abstract—A study for mapping of ground water arsenic was conducted in Nagaon District of Assam during 2014-15 and 2015-16 with an aim to identify the arsenic vulnerable risk zone using GIS. As many as 883 water samples from existing tube wells (shallow and deep), wells, ponds etc. using GPS were collected to cover the entire district (3993 sq.km). Data on total groundwater arsenic content collected from each sampling sites were fed into GIS environment to prepare a map for delineating arsenic contaminated risk zone of the district. Surface interpolation following Inverse Distance Weighted (IDW) method using Arc GIS 9.3 software was followed. Status map on groundwater arsenic, their distribution and demarcation of vulnerable zone along with statistical interpretation (Moran- I) by surface autocorrelation was prepared to address critical areas of high arsenic content for effective delivery of arsenic management strategy. Ground water arsenic ranged from 2.00 to 142.00 ppb (mean 47.08 ppb) with their standard deviation 24.96. It was observed that arsenic has become a major issue of health concern as 42% of the total geographical area of the district reported to exceed threshold limit of 50 ppb as set by Bureau of Indian Standard (BIS). More alarming was the case when 57% of the area had arsenic above the threshold value 10 ppb set by World Health Organization (WHO). The positive clustered pattern inferred from spatial autocorrelation suggested that higher values of arsenic were concentrated spatially indicating to focus on to those critical areas for suitable adoption management strategy. Moran's Index was found to be 0.0141 with significant Z-score (7.06 > 2.58) inferring that there was less than 1% likelihood that the clustered pattern became the result of random chance.

Keywords: (Arsenic, Geographical Information System, Groundwater, Map, Moran-I, Spatial autocorrelation)