Project Completion Report on

Integrated Approach Using RS and GIS Techniques for Mapping of Fluoride Menace in Ground Water in parts of Bankura District, West Bengal.

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Executive Summary:

Groundwater is an essential and vital component of any life support system. It is not only the basic need for human existence but also a vital input for all development activities. The present hydro-geochemical study was confined to the Gangajalghati, Chhatna and Bankura I and II Blocks of Bankura district.

In Gangajalghati, altogether 21 (Twenty one) samples were collected both in pre- and post-monsoon sessions. The Piper plot reveals the dominance of Ca^{2+}–Na^{+}–SO_4^{2-} , mixed Ca^{2+}– Mg^{2+}–Na^{+}–HCO_3^{-} types. From the plot in the U.S. Salinity diagram, the water of the areas are of low salinity and low sodium which is good for irrigation. The values of sodium adsorption ratio indicate that the groundwater of the area falls under the category of low sodium hazard. So, there was neither salinity nor toxicity problem of irrigation water, and hence the ground water can safely be used for long-term irrigation. Comparison of our analytical results with the WHO standards of drinking water, indicates that the present waters are also good for drinking purposes.

In Chhatna block also 21 (Twenty one) groundwater samples were collected and analyzed for various parameters. Based on the analytical results, groundwater in the area is generally fresh and hard to very hard. Assessment of water samples from various methods indicated that groundwater in this block is chemically suitable for drinking and agricultural uses.

Hydrochemical evaluation of groundwater has been conducted in Bankura I and II Blocks to analyse and determining groundwater quality in the area. Thirty six (36) groundwater samples were analyzed for their physical and chemical properties using standard laboratory methods. Concerned chemical parameters when plotted in the U.S. Salinity diagram indicate that waters are of low salinity and low sodium which is good for irrigation. The values of Sodium Adsorption Ratio indicate that the groundwater of the area falls under the category of low sodium hazard. Hence the waters of this block have neither salinity nor toxicity problem for using it in irrigation purposes. The chemical parameters when plotted in Piper's trilinear diagram are found to concentrate in the central and west central part of the diamond shaped field. Based on the analytical results, groundwater in the area is found to be generally fresh and hard to very hard. A comparative study of our analytical results with the WHO standards of drinking water, indicate that the present waters are also good for drinking purposes.

Fluoride contamination being a prominent and widespread problem in several parts of the world and as causes for this are mostly natural and unpreventable, educating the people and defluorinating the groundwater before consumption are essential for a healthy world. Fluoride in all three blocks are found to be within the permissible limits for human consumption as per the WHO and Bureau of Indian Standards.

Integration of remote sensing data and geographical information system (GIS) for exploration of groundwater resources has become a breakthrough in the field of groundwater research, which assists in assessing, monitoring and conserving groundwater resources. In the present study. In the present study, attempts to delineate groundwater potential zones of the three blocks, using the Remote Sensing – GIS software TNT Mips 2012. Three main features of the study area – hydrogeomorphology, slope and lineament length density, have been considered as three classified raster layers in the TNT Mips 2012 environment and the Multi Criteria Analysis (MCA) model (based on the principles of Weighted Index Overlay modelling technique) has been used to delineate the potential zone map. The above three layers have been prepared using Survey of India toposheets and IRS 1C LISS – III Satellite Imagery. When using the MCA model, each layers have been assigned a particular weight accordingly (taking into consideration the layer's potential with respect to groundwater recharge). Each individual layer has been divided into three categories defining their strength to allow infiltration of water to enhance scope of groundwater recharge. Each of these categories has been scored consecutively to define their individual adequacy. This methodology can also be applied effectively in areas with similar climate and geology like southern India, which suffers from acute shortage of water leading to severe suffering of farmers.