

Title: Groundwater level prediction for excessive agricultural irrigation to achieve SDGs: Vulnerability assessment using field-based empirical method

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Abstract: Excessive over-drafting and unsystematic management of groundwater brings different geo-environmental problems; thus precise prediction of groundwater (GW) status in large scale becomes prime concern for efficient GW management. This present study primarily focused on estimating the current groundwater status of agro-rich Murshidabad district using a GIS-based empirical approach including trend analysis of groundwater depth (2001–2021) by using Modified Mann Kendall test (MMKT) and Sen's slope estimator; the most prominent water level fluctuation (WLF) method employed in the estimation of groundwater recharge scenario of the last three decades. The groundwater recharge potential zone (GWRPZ) also delineated through widely used logistic regression (LR) method. The current research depicts that eight CD Blocks and twenty-five CD Blocks out of twenty-six CD Blocks are facing notable declining trend in groundwater depth in pre-monsoon and post-monsoon period accordingly, with a 95% confidence level; the lowering down of groundwater recharge (GWR) also alarming, the recharge amount in 2001, 2011 and 2021 was 210958.70 ham, 240168.80 ham and 201921.90 ham respectively due to variability in rainfall; the predicted GWRPZ shows that 674 (12.6%) Km² and 1392 Km² (26.02%) come under very high and high recharge zone which is predominantly found in the eastern and south-eastern part of this study region, validated through most reliable method Receiver Operating Characteristics (ROC) and Area Under Curve (AUC) with 0.954 value. Unsystematic over-drafting of groundwater and intense cropping intensity are severely responsible for this alarming condition. Thus, sustainable groundwater management is essential to fulfil SDG-6 by ensuring SDG-2 and policymakers and planners will be benefited from this study in formulating the proper mitigation measures for this agronomic Murshidabad district.

Keywords: Groundwater (GW), Groundwater management, Groundwater recharge, GIS-based empirical approach, Water level fluctuation (WLF), Logistic regression (LR), Groundwater recharge potential zone (GWRPZ).

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