

Title: Quantitative analysis and modeling of groundwater flow using visual MODFLOW: a case from subtropical coal mine, northwest Bangladesh

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Abstract: Despite being a vital agricultural zone and livable land for millions of people, the northwest region of Bangladesh is facing a scarcity of groundwater, which has become a major environmental stress in recent years. To this end, the present study intends to evaluate the current groundwater condition and simulate it to predict groundwater flow in the Phulbari and Parbatipur upazilas in the Dinajpur district of subtropical coal mine, northwest Bangladesh, by applying the Visual MODFLOW model. Water table data was analyzed to assess the linear trends of groundwater levels. The exploration of coal mining influenced the groundwater resources in the study area, where the groundwater table declined at a rate of 0.142 m/year. During the last 35 years (1985–2020), the groundwater table decreased by 2.28 m at Parbatipur Upazila. In Phulbari Upazila, the water table has been declining at a rate of 0.201 m/year and has declined by 4.58 m over the last 35 years. The average recharge and discharge of 658,207.56 m³/day and 658,209.81 m³/day, respectively, indicate a deficit in recharge of 2.25 m³/day or 2250 L/day in the study area. The prediction results show that the shortage of groundwater will increase to 246,375,000 L annually by 2050. The progressive decline of the groundwater table is possibly due to a lack of replenishment, overexploitation of groundwater resources, and underground coal mining impacts. Overall, the study will help in policy planning for sustainable water resource management, waste supply, environmental protection and disaster preparedness.

Key words: Groundwater flow Visual MODFLOW Subtropical coal mine Northwest Bangladesh Hydrogeological modeling

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