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Managed Aquifer Recharge (MAR) perspectives in the Friuli Venezia Giulia Region of Italy in the context of climate change trends

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The Friuli Venezia Giulia (FVG) region in northeastern Italy has experienced an imbalance in the hydrogeological system over the years, resulting in the lowering of groundwater levels. Reduced and erratic precipitation patterns, rising temperatures, and increased abstraction have all contributed to the decline in piezometric levels in the Friuli Plain's phreatic aquifers. These changes in the hydrogeological system have resulted in a decrease in direct infiltration and an increase in the surface run-off and evapotranspiration rate, thus affecting both the surface and groundwater resources in the region. The groundwater of the region is also polluted by nitrate content, whose concentrations in some parts of the region exceed the threshold value (50 mg/l as per Italian legislation) for potable use. To address declining water resources and improve underground storage of high-quality surface waters, three recharge sites (Carpeneto, Mereto di Tomba, and Sammardenchia), in the upper Friuli plain have been suggested for MAR practice. MAR potential in this pre-Alpine region is characterized by the availability of high-quality surface waters (primarily from rivers), a highly permeable thick aquifer system, and numerous existing structures such as pits and large-diameter wells. The present study aims to investigate the effect of MAR on groundwater levels and quality through an infiltration pond at Sammardenchia site. Modflow is applied to simulate the aquifer's response to natural and artificial recharge through MAR by means of water from the nearby Ledra channel. The initial results show a positive effect of MAR on the groundwater levels at the local scale. The study further aims to simulate the solute transport and water quality changes resulting from the recharge operation, with the ultimate goal of predicting future hydrogeological variations in the aquifer system.