Managed Aquifer Recharge (MAR) in Baluchistan, Pakistan, Present Situation and Future Prospects

Sikandar Hayat1,2, Hana Ben Mahrez1,2, Zsóka Szabó1,2, Ádám Tóth1,2, and Judit Mádl-Szőnyi1,2

1ELTE Eötvös Loránd University, Faculty of Science, Department of Geology, Hungary
2József and Erzsébet Tóth Endowed Hydrogeology Chair

Groundwater is depleting across the globe. According to NASA, 33% of the world’s major basins are overexploited. This water shortage could be alleviated by using Managed aquifer recharge (MAR) techniques. MAR is defined by Gale, 2005 as “Intentional storage and treatment of water in aquifers”. The three most common methods of MAR are a) direct infiltration into the aquifer through wells, b) interception in the river bed, c) indirect infiltration from the land surface (Dillon et al., 2009a). Baluchistan, the largest province of Pakistan by area (44% of the total area of Pakistan) has hyper-arid to dry climate and is comprised of 18 river basins, 11 of which are suffering from groundwater depletion (2-3 m cumulative decline in watertable). To solve the issue, 300 delay action dams were constructed but due to high-intensity rainfalls, steep slopes, and lack of vegetative cover, the sediment erosion rate was very high which converted the delay action dams into evaporation ponds and this scheme failed. After the failure of delay action dams, the leaky dam technique along with effective watershed management was applied, this enhanced the percolation and reduced the sedimentation in the reservoir (Asharaf and Sheikh 2017). Leaky dams reduce the energy of flood, initiate the sedimentation of suspended load and release the water downstream through leakage to infiltrate in the riverbed (Gale, 2005). The integrated approach of watershed management, leaky dams, ditches, and furrows positively affected the watertable in the area (Asharaf and Sheikh, 2017). The goals of this research are to revise the development of MAR in Baluchistan (Pakistan), to display a MAR suitability map using INOWAS platform and update of MAR sites in Baluchistan at Global MAR portal. To delineate potential MAR sites, thematic layers such as slope, rainfall, drainage, land cover, and soil characteristics are integrated using GIS multi-criteria decision analysis (based on weighted linear combination method) (Senanayake et al, 2016). MAR suitability maps are used as a preliminary step to field investigation to decide whether an area is suitable for a particular MAR type and hold the potential to be integrated into sustainable groundwater management plans. This study helps design a suitable groundwater management plan for Baluchistan.

Acknowledgement:

“This work is part of a project that has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 810980.”
References