Groundwater dynamics in the Betwa River catchment in Central India

Niranjan Naik, Zafar Beg, Amit Kumar, and Kumar Gaurav
Indian Institute of Science Education and Research Bhopal, Department of Earth and Environment Sciences, Bhopal, India (niranjannaik@iiserb.ac.in)

Groundwater is an important natural freshwater resource and plays a significant role in the socio-economic development of any country. The Betwa River basin in central India has experienced severe exploitation of groundwater resource in the past few decades. About 80% of groundwater in this region is extracted for the agriculture purpose. Also, the scarcity in rainfall throughout the year and seasonal flow in the Betwa River has increased the agricultural dependence on the groundwater. This has led the Betwa River basin into a major hot spot of groundwater depletion.

This study estimates the trend of groundwater level and storage change to assess the groundwater dynamics in the Betwa River basin. We used in-situ groundwater level data for a period between 1987-2018 to calculate the trend in groundwater level using the Seasonal and Trend decomposition using Loess (STL) method. Further, we performed the Ordinary Kriging to understand the spatial and temporal trends of groundwater during the pre-monsoon and post-monsoon. Eventually, we use the water table fluctuation (WTF) method to estimate groundwater storage in the study area. Our results suggest a decline in groundwater storage change as 701 and 626 MCM in the post and pre-monsoon period respectively from 2008-2018. During the same period, we observed that the Betwa basin has experienced about 3-5 m decline in the groundwater level.