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Groundwater suitability assessment before and after flash flood in the arid region, Western Saudi Arabia

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The study was carried out to understand the influences of flash flood on groundwater suitability in the arid region, Wadi Baysh Basin, Western Saudi Arabia. Groundwater samples were collected from 82 wells and 100 wells, before and after flash flood (FF), respectively and measured EC, pH, major ions and nutrients. Groundwater in the study area is alkaline in nature ($\text{pH} > 7$) and the average EC value is $2556 \mu\text{S}/\text{cm}$ and $2265 \mu\text{S}/\text{cm}$ before and after FF, respectively. After FF, the average concentrations of TDS, Mg, Na, Cl, NO_3 and EC in the groundwater are decreased in the study area whereas K and SO_4 are increased. Groundwater suitability assessment for drinking and domestic uses indicate that 46% and 49% of wells, before and after FF, respectively are suitable for drinking based on TDS. According WHO drinking water standards, most of the samples exceeded highest desirable limit, especially pH, TDS and TH; however, around 60% of groundwater samples are within the maximum allowable limit. Further, water quality and its suitability for drinking are improved after flash flood recharge especially in the case of TDS, Ca, Na, Cl, HCO_3 and NO_3 . Drinking water suitability maps illustrate that wells in the upstream region come under mostly suitable category except TDS and TH. In the downstream, unsuitable zones became moderately suitable zones after FF except Cl and SO_4 . Hence, suitability maps suggest that the water quality in the downstream is improved by FF recharge compared to upstream. Irrigational suitability of the groundwater is evaluated using various parameters. Salinity classification indicates that the groundwater samples in the study area fall permissible (C3, 61%) and unsuitable (C4 and C5, 33%) classes. According to Kelly's ratio, 61% and 69% of wells, before and after FF, respectively are suitable for irrigation. Kelly's ratio, Mg hazard and Na percentage reveal that the water quality is improved by dilution after FF. USSL classification illustrates that majority of the water samples are plotted on C3S1 (BFF: 50%, AFF: 56%), C4S2 (BFF: 21%, AFF: 19%) and C3S2 classes irrespective of FF. Irrigational suitability maps depict that wells in the upstream region are suitable for irrigation whereas wells located near to the coast are unsuitable for irrigation. Parameters namely TDS, Mg hazard, Kelly's ratio and Na percentage justify that the water quality is improved after FF by dilution, especially in the downstream region.

Biography

Jalal M Basahi has obtained his PhD for Texas A&M, Texas, USA in 1998. His specialty is irrigation engineering. He has conducted several research projects that were supported from the university as well as KACST and was promoted as Professor in 2007.

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