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Managed Aquifer Recharge using treated waste water as adaptation to water scarcity in arid basins.

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This work studies the interaction between surface water composed of treated wastewater (TWW) discharge and groundwater. The work is focused on the Zarqa River in Jordan and the underlying limestone Aquifer.
We used the MODFLOW 2005 code to develop a groundwater model for the whole Zarqa River.
The main discharge is originated from AS SAMRA wast water treatment plant designed for a full capacity of 135 MCM/yr. The current discharge is 125 MCM/yr of secondary treated water added to less than7 MCM of base flow.
For climate change impact, SDSM (Statistical Downscaling Model) has been chosen to project the forecast data for a significant stations based on HADCM3 model under A2 and B2 scenarios.
The main objectives were to build on and upgrade previous existing simple model using high resolution groundwater and surface water level measurements. And to understand dynamics of recharge mound and groundwater levels under different stresses of increased TWW flows and climatic changes. In addition, the model investigates the potential of enhancing aquifer recharge through small dams construction.
Modeling outputs showed that the river is recharging the groundwater with 17% of its annual discharge. Development scenarios by increasing the discharge to the maximum capacity of the plant will enhance recharge to 21% due to increased river water head. It was also found that the best management scenario is a series of 4 Dams with 0.25 MCM each. Together the 4 dams will be able to substitute 40% of the over-pumping caused by agricultural activities in the area.
Construction of small dams found to have a very impact on enhancing MAR. The later resulted in enhancement of recharge up to 37% of the stored water. Climate change impact found to be very limited on the area as the area with a total impact of 3-5% reduction in recharge to the groundwater by 2050.

Key words: MAR, Treated waste water, Arid basin, Overpumping.