Geophysical Research Abstracts
Vol. 18, EGU2016-10292, 2016
EGU General Assembly 2016

Groundwater recharge in a semi-arid environment under high climatic variability and over-pumping: Ajlun Highlands example, Jordan.

Marwan Raggad (1), Elias Salameh (1), Fabien Magri (2), Christian Siebert (2), Tino Roediger (2), and Peter Moller (3)

(1) University of Jordan, Amman, Jordan, (2) Helmholtz-Centre for Environmental Research – UFZ, Dept. Catchment Hydrology, Halle Germany, (3) GFZ German Research Centre for Geosciences, Potsdam, Germany

Jordan's ground water resources are being exploited up to 190% of the safe yield while rainfall rates are decreasing and highly variable, thereby affecting recharge volumes of the aquifers.
The Ajlun highlands, forming the northwestern edge of Jordan are characterized by annual rainfall rates exceeding 500 mm, the highest in the country, which leads to accordingly high replenishment of almost the entire groundwater system in northern Jordan. The high recharge and the NW-wards dipping strata lead to a groundwater flow towards the north and northwest, areas which host the vital aquifers of the region.
Limited and degraded groundwater recharge combined with growing over-pumping are the main issues that regard the northern groundwater basins, such as Wadi Arab, Yarmouk and the Jordan Valley side basins.
To evaluate the groundwater potential under high recharge variability, groundwater recharge was modeled and compared to different Global Circulation Models (GCMs).
Groundwater recharge was calculated based on climatic data covering the time period from 1965 to 2014. Recharge modeling was conducted by applying the J2000 water budget model. The simulation of hydrologic processes uses independent parameters that are calculated prior to simulate the recharge flow.
The simulations estimate recharge of 47.6 MCM, which is 12% less than the values given by the Jordanian authorities. The low calculated recharge is likely due to an overestimation of the evapotranspiration in areas with high topographic slopes.
To examine the variability of groundwater recharge under current climatic conditions, statistical downscaling of global circulation models was conducted for the time period 1965 – 2000. Data for the time period 2001 – 2014 was used for the model validation.

Results indicated a decline of 18.7% in precipitation by the year 2050 with an increase of 1.7 and 2.2 degrees in maximum and minimum temperatures respectively. Accordingly recharge for the year 2050 is 27% less than current recharge. Considering the recorded decline in groundwater levels by 1.3 m/year, continuous over pumping with decreasing recharge rates will cause by 2050 a reduction of the saturated aquifer thickness of 20 to 65%

Keywords: Ground water, Groundwater recharge, Climate variability, statistical downscaling, Jordan.