	Flow Dynamics and Management Options in a Stressed Carbonate Aquifer System, The Western Aquifer Basin, Palestine
	Prepared By: Muath Jamil Abusaada
	Supervisor: Prof. Dr. Martin Sauter: Prof. Dr. Thomas Ptak
	University: Göttingen
	email: Muathas@gmail.com

Abstract:

Sustainable management of trans-boundary groundwater aquifers is usually difficult due to the complexity of natural and man-made systems. Therefore, sustainable management of trans-boundary water resources is urgently needed. The Western Aquifer Basin (WAB), in the West Bank and Israel, was depicted as a case study. The aquifer inflow is dominated by the rainfall over the replenishment areas with an estimated annual average 373 Million m3 /yr during the period 1951-2006. The analysis of the recharge-rainfall relation confirmed that the annual recharge volumes are directly correlated to the monthly rainfall, where the highest recharge to rainfall ratio occurred whenever the majority of the annual rainfall comes during November, December, January and February. Accordingly, an empirical equation was developed which relates the annual recharge with monthly amounts of rainfall over the replenishment areas of the aquifer. The annual recharge values were then spatially and monthly distributed based on the distribution of rainfall, land use, aquifer geometry and outcropping formations. The WAB, an area extending over 6250 km2 , was simulated by a three-layer model using MODFLOW-2000. The model was calibrated during the period 1951-2000 and validated during 2000-2007 in monthly time steps. As a result, the model provides significant information about the aquifer's physical properties, flow dynamics, and aquifer water balance. The water balance shows that an average of 62% of the natural recharge directly replenishes the upper sub-aquifer and 11% of the total aquifer outflow flows from the lower towards the upper sub-aquifer. This transient flow model of the WAB was extended in time, to 2034/2035, in order to evaluate the impact of a combination of different rainfall and pumping scenarios. The results showed a comparison between different scenarios in both water levels and springs' discharges under different climate and pumping conditions. Accordingly two pumping scenarios were recommended to maintain the water level and the springs' ability to continue discharging. These scenarios are (1) pumping 85% of the historical aquifer yield under the no change in rainfall scenario (i.e. 310 Mm3 /yr) and (2) 85% of the 7 year moving average of the aquifer recharge (254 Mm3 /yr) under the possible reduction in rainfall as expected by regional climate model.