

Numerical Investigation of the Groundwater Balance in the Mae Sai Aquifer, Northern Thailand

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Abstract:

Mae Sai is an important border district in the north of Thailand located in the area of the golden triangle delta. Nowadays, Mae Sai is the major trade hub among Burma and Thailand. Consequently, the economy of Mae Sai has a tendency to grow, with the consequence that more infra-structure for serving the future economic growth will be needed. Water resources, namely, groundwater is one of the commodities that need to be developed further to fuel the future economic growth in the area. Therefore, the Department of Groundwater Resources which is the key authorized department for groundwater resources management in Thailand is currently investigating the hydrogeology and groundwater resources of the aquifers in the Mae Sai aquifers system. Using first results of this field investigation, this article aims to numerically determine the groundwater balance in the Mae Sai aquifers. The Mae Sai aquifer is conceptualized as a multi-layer aquifer and groundwater flow is simulated by a fully 3D finite difference model. During the analysis the groundwater model is calibrated in both steady-state and transient mode in order to make sure that the model can correctly mimic the groundwater mechanisms in the Mae Sai aquifer system. After successful model calibration, the model is applied to numerically calculate the groundwater balance in the aquifer system. The numerical results show that (a) the top layer of the multi-aquifer system is the most productive aquifer with groundwater yields of about 186,000 cubic meter per day, whereas the 4th aquifer is the least productive, with a groundwater yield of only 14,000 cubic meter per day, (b) the rainfall recharge is the most influential inflow into the groundwater system, whereas the inflow from the bordering river (simulated through a general head boundary condition) plays only a small role, and (c) the most number of pumping wells are developed in the 3rd aquifer (2,400 cubic meter per day).

Keywords: Mae Sai aquifer; groundwater model, groundwater balance