Integration index-overlay method and numerical simulation to quantify pumping-induced variations of groundwater vulnerability

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Abstract

Groundwater vulnerability assessment plays a vital role in the utilization and protection of groundwater resources, it may also be used to identify areas where special attention, or protection efforts are warranted. This study is to present a concept that integrates an index-overlay method with a calibrated physical-based numerical model to quantify variations of groundwater vulnerability influenced by changes of hydrogeological conditions. In this study aquifer system located in Mekong Delta in the south of Vietnam was used to illustrate the proposed concept. The selected index-overlay methods were the DRASTIC and the widely used MODFLOW in combination with PEST model was used to be the physical-based numerical flow model for illustration purpose. The results showed that over 62% areas had the low potential to contamination. The rest of study area had 29.1% of moderate vulnerability and 8.1% of high vulnerability. In future works, collecting data of nitrate distribution is necessary in order to verify the DRASTIC map, whereby making accurately the classification of groundwater vulnerability. Furthermore, several predefined-pumping strategies are applied to the numerical model to assess the changes of groundwater vulnerability.