Assessment and Mapping of Groundwater Potential Zone using GIS- and Remote Sensing-Based Multiple Regression Analysis in Chiangmai-Lampun Sub-Basin, Thailand

Sasin Jirasirirak[1]; Pakkasem Thongchai [2]; Aksara Putthividhya[1]; and Somkiat Prajamwong[3]

[1] Water Resources Engineering Department, Faculty of Engineering, Chulalongkorn University, Bangkok, THAILAND.
[2] Faculty of Architecture, Chulalongkorn University, Bangkok, THAILAND.
[3] Office of the Prime Minister, Bangkok, THAILAND.

Corresponding Author(s): dr.aksara.putthividhya@gmail.com

The objective of this study is to exploit the potential application of multiple regression analysis for assessing groundwater potential mapping at Chiangmai-Lampun sub-basin, Thailand using remote sensing and geographic information system (GIS) technique. For this purpose, seven groundwater occurrences and movement controlling factors, including lithology, slope, and land use and land coverage (LULC), rainfall, lineaments, soil, and drainage density were mapped based on assimilated remote sensing and localized geospatial data sets. Multiple regression models have been tested with independent controlling variable data sets for the best match by minimizing errors. Groundwater potentials of 3 aquifer layers in the sub-basin are qualitatively classified into very high, high, medium-high, medium, and low zones. The cross-validation of the resultant model was carefully carried out using spring, hand-dug, deep well yield data, and vertical electrical sounding (VES) carried out at different points to locate water-bearing formations/fracture zones. The highest groundwater exploitation potential is located in the central-southern part of the basin where mainly sand and gravel deposits are discovered in the area of maximum down-faulting. High groundwater potential zones up to 20 m^3/hr are localized particularly near the location where Ping river and Mae Kuang river are merged. Average groundwater potential zone of 4-10 m^3/hr is characterized all over the study area. Overexploitation in deeper parts with lower permeability zones of the aquifer system is also identified based on the continuously lowering of water table to provide information to regional and local planners on the availability and natural protection of groundwater resources in the study area.

Keywords: Groundwater Potential, Multiple Regression, Groundwater Mapping, Remote Sensing.