

# **Application of Analytic Hierarchy Process and Geographic Information System in Groundwater Potential Zones Assessment : A Case Study of the Hat Yai Basin, Songkhla Province**

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Hat Yai municipality is a densely populated and economically important urban area located in Hat Yai Basin, Songkhla province, southern Thailand. The continuous growth of industrial sector and other sectors in the past 50 years has resulted in increasing water demand for various types of usage. For this area, groundwater is an important source of water especially during the dry season. The objective of this study is to assess the potential of groundwater in this area and to create a groundwater potential map by using geographic information system (GIS) analysis based on the weighted factor index method with analytic hierarchy process (AHP) technique. The assessment parameters of descending importance such as geomorphology, rainfall data, lineament density, drainage density, slope, lithology, land use, and characteristics of soil, were compiled to analyze groundwater potential zones. Results from the AHP method suggest that the highest-weighted factor that affects the high groundwater potential is geomorphology and the lowest-weighted factor is the soil texture. Five types of groundwater potential zones can be identified i.e. very high, high, moderate, low, and very low. We further consider four criteria of classifying groundwater potentials: equal intervals, natural breaks, quantile, and geometric intervals. To verify the accuracy of the groundwater potential map assessment, we use these results to compare the groundwater volume from the groundwater well data, and find that the suitable classification method for Hat Yai basin was the equal intervals method. A large portion of the area has a high groundwater potential zone, representing an area of 1,176 km<sup>2</sup> (~44% of the area). The high groundwater potential zones are located in the area with high sedimentary terraces, sandy loam soil type, low lineament density, and low drainage density. The assessment parameters mentioned earlier will allow surface water to recharge into the subsurface, resulting in an increase in the volume of groundwater. This groundwater potential map can be used for planning for sustainable groundwater management in the future.

**Keywords:** Groundwater potential, Geographic Information System, Analytic Hierarchy Process