

Assessing Hydrogeological Characteristics in Mukdahan, Savannakhet Basin Thailand's Special Economic Zone

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Mukdahan is the catchment area of the Savannakhet Basin, which is part of the Khorat Plateau Basin, approximately 80,000 square kilometers (covers Savannakhet Province and Pakse City, Lao PDR). The height of the plain is approximately 100–250 meters above sea level. It is a raised plateau, sloping towards the east. This causes the entire river to flow, as well as the direction of groundwater flow from west to east into the Mekong River and into the Suvarnabhumi Basin. In 2015, the Thai government designated Mukdahan as a special economic zone to leverage ASEAN's economic potential and enhance safety in border regions. Given the pivotal role of water resources in driving economic development in border regions, effective water management is imperative. This research aims to investigate hydrogeology to support future water demands and groundwater reservations. Methodologies include data collection, field surveys, exploration drilling, groundwater potential assessment using mathematical modeling, hydrogeological mapping and provide groundwater management guideline for local authorities in this area.

The study area is composed of Khorat Group, semi-consolidated, and unconsolidated sediments. It shows anticline and syncline forms with two directions of fracture; NW-SW and NE-SW. Hydrogeology is composed of two groups of consolidated aquifers. First, Pha Wiha aquifer, Phu Phan aquifer and Khok Kruat aquifer are primarily composed of sandstone. Second, Phu Kradung aquifer and Sao Khua aquifer are primarily composed of shale and claystone. In the weather and fracture zone, groundwater accumulates with yield ranging from 2 to 5 cubic meters per hour. If groundwater is developed in firstly large fracture in sandstone, yield could increase up to 10–20 cubic meters per hour. Groundwater predominantly flows from west to east, eventually converging into the Mekong River which is recharge area from Mukdahan to Savannakhet Basin. While groundwater quality generally maintains a total dissolved solids (TDS) level below 500–1,500 milligram per liter, high iron (Fe), Sulfate and Chlorite levels exceed drinking water standards. According to the drilling report showed, salty brackish groundwater is approximately 50–70 meters depth at the edge of the Mekong River in Maha Sarakham aquifer (Thailand) or The Phon Hong Group (Laos). As a result, when Thailand plans to develop Special Economic Zone, industrial waste may have directly affect/impact the quantity and quality of groundwater in downstream communities, which should be studied in transboundary aquifer and with ongoing groundwater monitoring mandated by the Department of Groundwater Resources to ensure compliance with the Groundwater Act of 1977 and promote sustainable groundwater management practices.

Keywords: hydrogeological in Mukdahan; Savannakhet Basin; special economic zones

