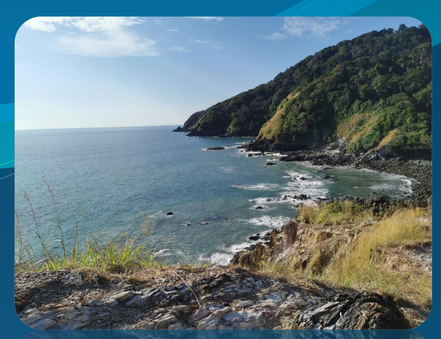
Aquifer Investigations and Assessment in Island areas, Koh Lanta, Krabi Province, Southern Thailand

Jaratmanee Sitthi[1-]; Chutima Nudam[2-]

[1] Bureau of groundwater region 6 Trang, Department of Groundwater Resources , Ministry of Natural Resources and Environment, Trang 92000, Thailand



Abstract

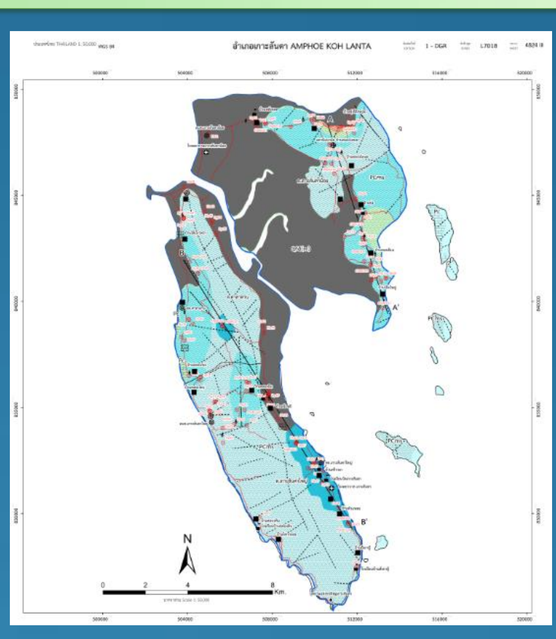
Koh Lanta is a large island about 190 square kilometers. It is part of Koh Lanta District. Krabi Province. Consists of Koh Lanta Noi and Koh Lanta Yai with a total population of 18,400 people. The number of tourists is about 1 million per year and the rate of tourism on the island is expected to increase. As a result, the demand for water increases in various activities. Most of the island's topography is steep hills in the middle of the island and gradually decreases to a flat plain to the beach. The rain falls will flow fast into the sea. As a result, there is very little water left in the river or shallow groundwater. Therefore, there is always a water shortage on the island area. In addition, there was a problem with the intrusion of salt water into freshwater sources. Therefore, it is necessary to explore the potential of groundwater both in terms of quantity and quality.

In this study, the medthodlogy are desk study available data, hydrogeological analyzed, existing wells inventories and analyze the quality of groundwater, surface geophysical investigation by specific electrical resistivity medthod, Drilling for investigation and borehole logging. Identifying aquifer depth for aquifer packer test considering borehole logging data, design groundwater according to standard DGR. Quality analysis and Map Improvement groundwater to be more modernes.

A survey of the status of 83 existing groundwater wells found that the average depth was 80 meters and the amount of groundwater was in the range of 2-5 cubic meters per hour. In the dry season, water was insufficient for consumption. The hydrogeology is mostly composed of sedimentary rock and semi-metamorphic sedimentary rocks such as shale, siltstone, sandstone, limestone, and semi-metamorphic shale. The surface geological investigation was completed by 367 points of one-dimensional vertical electrical resistivity sounding (VES) and 12 lines of two-dimensional electrical resistivity. The data analysis provided extensive information for identifying well location and interpreting groundwater potential, resulting in the successful development of 15 well and 7 observation wells to monitor the level and quality of groundwater. From data processing groundwater development It was found that aquifer are sandstone, shale and limestone, in which groundwater is found in the fracture layer, joints between rock layers, caves, holes. The average depth of the groundwater well is 150 meters. The groundwater potential is in the range of 2-18 cubic meters per hour. The groundwater level is 0.8-10 meters. The maximum pumping capacity of groundwater is 50 cubic meters per hour. The groundwater quality from the analysis of the groundwater wells drilled in the project found that most of them were used for consumption according to the standards groundwater that can be used for consumption with total dissolved solid (TDS) 70-400 milligrams per liter and the iron and manganese content exceeded the edible standard in some areas. In addition, following the results of pumping test volume groundwater continuously for 75 hours, it was found that there was no saltwater insertion into the groundwater layer. In the future, Department of Groundwater Resources and local government organizations can bring groundwater potential information to support planning in decision for groundwater resource management which can be further developed for the construction of the groundwater system.

Introduction

Island area in the southern part of Thailand Both the Gulf of Thailand and Andaman coast. There are more than 750 islands with outstanding potential to become an international tourism destination. As a result, the demand for water will increase in various activities. Koh Lanta area has not yet been a detailed study of the groundwater potential and its maximum potential and the impact of drilling and pumping groundwater . It is necessary to study of groundwater potential. In order to manage water resources. The main purpose of this project is Aquifer Investigations and Assessment in Island areas and study the suitability of groundwater development a as well as proposing a model for water management and groundwater resource development .



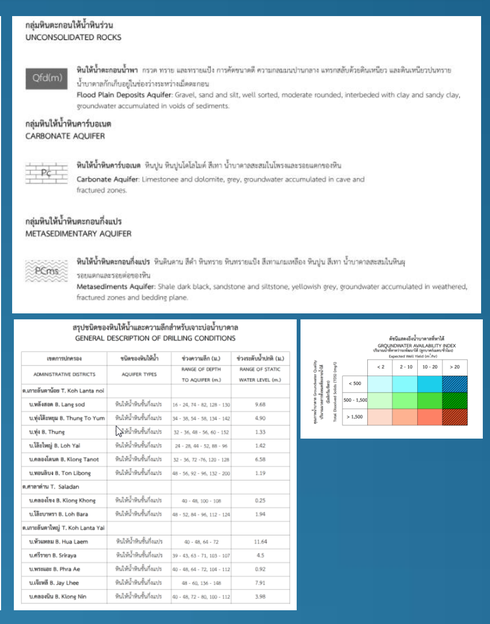


Figure 1 : Groundwater map of Koh Lanta)

Methodology

1. Desk study available data, hydrogeological analyzed, existing wells inventories and analyze the quality of groundwater

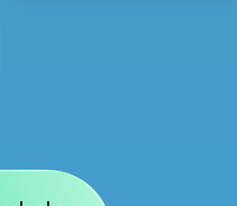
2. A total of 109 water samples from groundwater and surface water were collected for Ec, TDS, pH and temperature to determine trends in groundwater quality changes.

3. Exploring Geophysics with Specific Electrical Resistivity Method to estimate the depth of hard rock and located drilling point for groundwater well.

4. Drilling for investigation and groundwater well development, Borehole Geological logging to provide guideline for groundwater well and identify aquifers, water quality and quantity.

5. Pumping test andcalculating the hydraulic properties oHydraulic Properties of Aquifers, including Transmissivity (T), Hydraulic Conductivity(K) and Storativity (S) including finding the maximum water pumping volume that will prevent sea water from rising up.

6. Collect water samples from wells that have been drilled and developed groundwater. The samples have been analyzed for major cations (Na, K, Mg and Ca), major anions (Cl, SO4, HCO3 andCO3) and physical parameters such as TDS, TH, Ec and pH



7. Improve the groundwater map scale 1:100,000 in the study area.

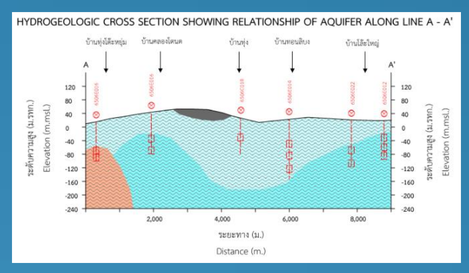


Figure 2 : Hydrogeological cross-section (line A-A')

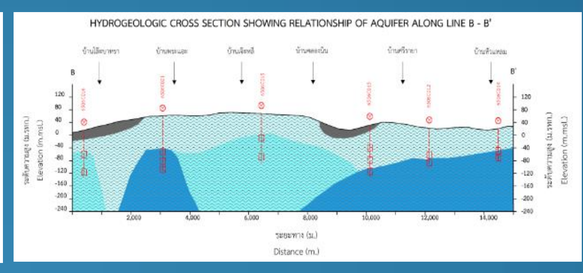


Figure 3 : Hydrogeological cross-section (line B-AB')

Figure 5 : Chloride content map, Iron content map, Hardness content map and Dissolved solids map

Overall Results

From data processing groundwater development It was found that aquifer are sandstone, shale and limestone, in which groundwater is found in the fracture layer, joints between rock layers, caves, holes. The average depth of the groundwater well is 150 meters. The groundwater The groundwater potential is in the range of 2-18 cubic meters per hour. The groundwater level is 0.8-10 meters. The maximum pumping capacity of groundwater is 50 cubic meters per hour. The groundwater quality from the analysis of the groundwater wells drilled in the project found that most of them were used for consumption according to the standards groundwater that can be used for consumption with total dissolved solid (TDS) 70-400 milligrams per liter and the iron and manganese content exceeded the edible standard in some areas.

Conclusion

The sources of groundwater are divided consolidated rock. Aquifer are sandstone, shale and limestone, that groundwater potentials are 2-18 m3/hr. and water quality with total dissolved solid (TDS) 70-400 mg/l. The maximum pumping capacity of groundwater is 50 cubic meters per hour. Following the results of pumping test volume groundwater continuously for 75 hours, it was found that there was no saltwater insertion into the groundwater layer. In the future, Department of Groundwater Resources and local government organizations can bring groundwater potential information to support planning in decision for groundwater resource management which can be further developed for the construction of the groundwater system.

Reference

1) Department of groundwater resourrces. (2008), Standards and manuals for groundwater well drilling , investigations and and development,. Volumes 1-10,

2) Todd, D.K. (1980). Groundwater Hydrology. (2nd ed.). John Wiley. New York.