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GROUNDWATER HYDROGEOCHEMISTRY OF THE SHALLOW AQUIFER IN LOWER KELANTAN BASIN

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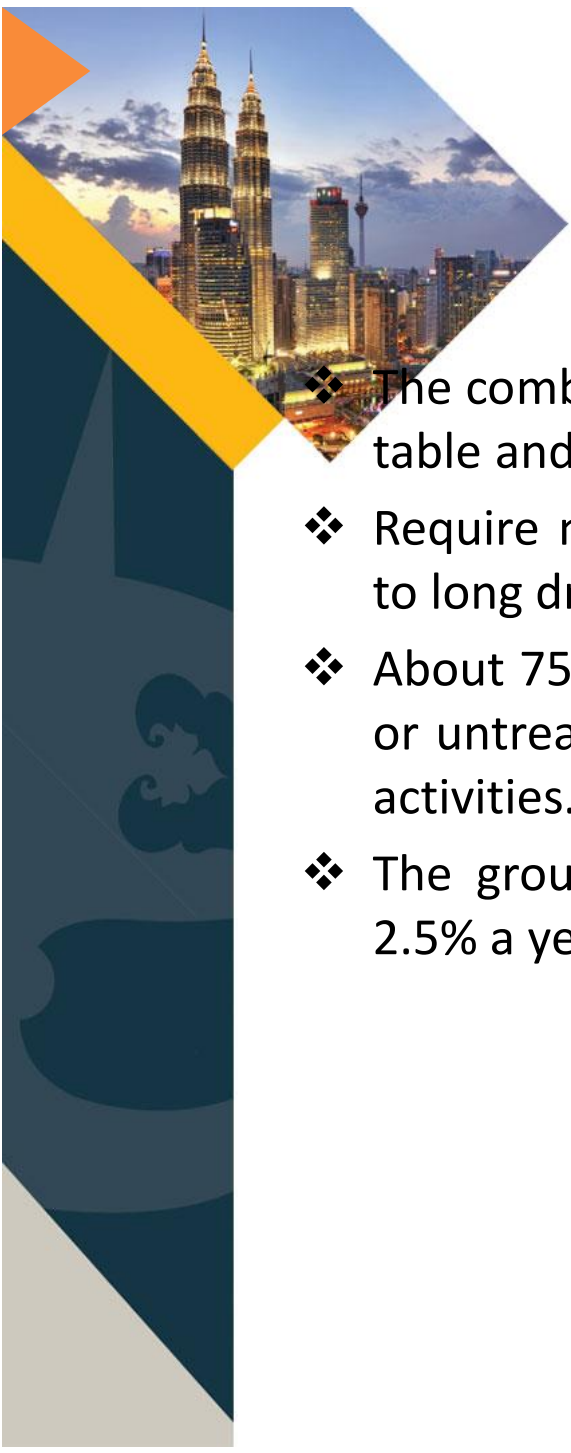
4:30 p.m. – 6:00 p.m.



Content

- ❖ Introduction
- ❖ Problem Statement
- ❖ Objective
- ❖ Research Methodology
- ❖ Result & Discussion





Introduction

- ❖ The combination of fertile, low-lying topography with shallow water table and widespread of aquifer with plentiful and easily accessible
- ❖ Require minimal treatment, low capital cost and less effected due to long drought.
- ❖ About 75% of the populations - rely on groundwater (either treated or untreated) for domestic water supply, agricultural and industrial activities.
- ❖ The groundwater consumption approximately 160 MLD- increase 2.5% a year. Allowable abstraction is 148 MLD





- ❖ However-coastal aquifer is complex and fragile, easily be distorted by poor management and anthropogenic activities
- ❖ Overexploitation-increase in contaminant migration
- ❖ There are increasing concern on the quantity and quality of groundwater resources.
- ❖ has not been investigated in depth on a basin-wide scale and poorly understood.





Objective

- ❖ To **assess the groundwater hydrogeochemistry** in shallow aquifer (provide information that may be used for the utilisation of groundwater resources in a sustainable manner and can also help in the planning of water resources in the future)





Study area

- ❖ lies between $5^{\circ} 53' \text{ N}$ and $6^{\circ} 14' \text{ N}$ and $102^{\circ} 7' \text{ E}$ and $102^{\circ} 28' \text{ E}$, 675 km^2
- ❖ located in the most north eastern part of Peninsular Malaysia (Kota Bharu and Bachok)
- ❖ bounded by the South China Sea and Golok River basin
- ❖ characterised by low lying coastal plain in the east and river plain in the west with surface elevations range a few meters
- ❖ composed of marine Quaternary alluvium and fluvial origin deposits
- ❖ Thicknesses – few m near the foothills, $>200 \text{ m}$ near the coastal
- ❖ underlain by granitic bedrock



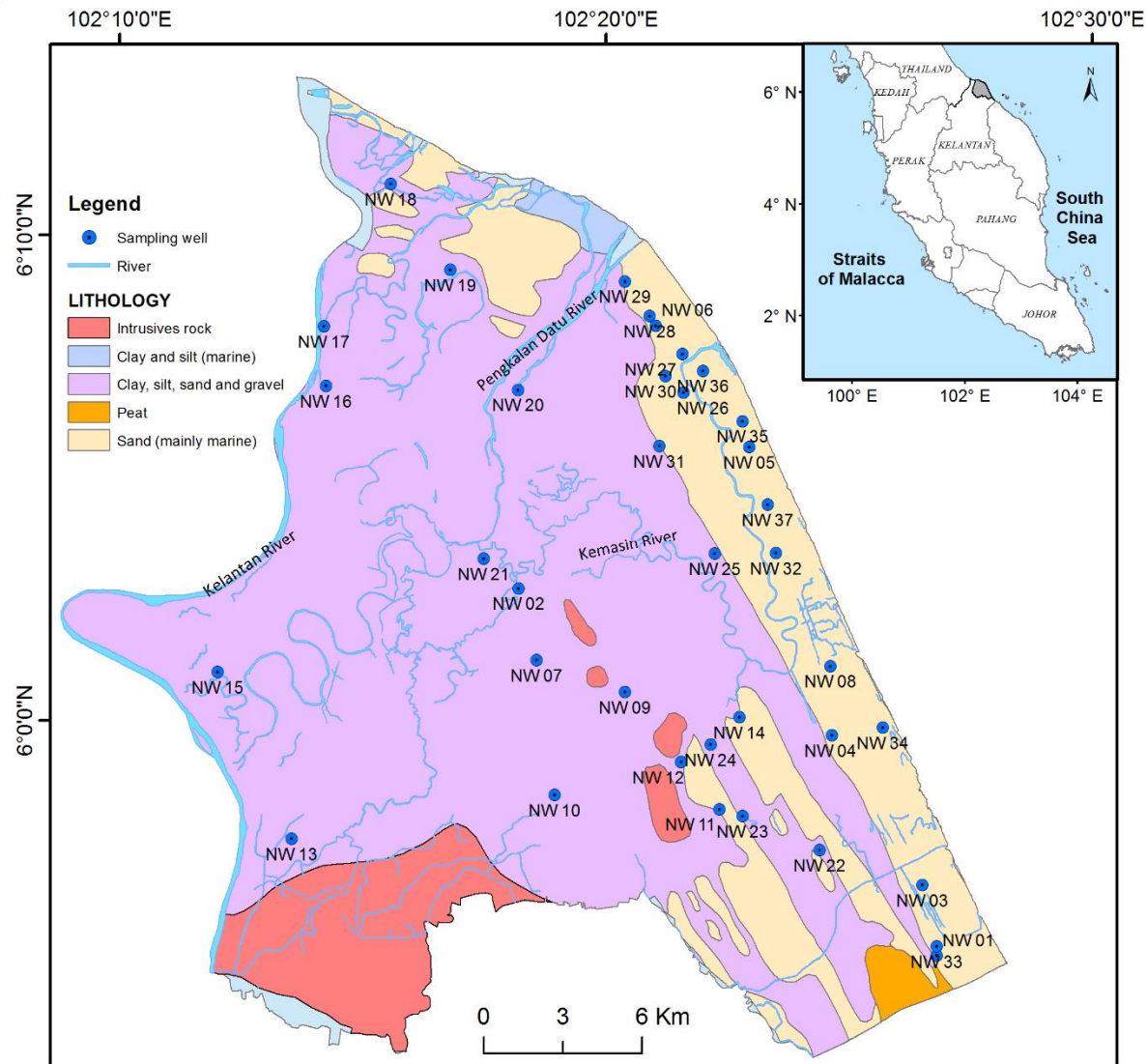


- ❖ drained by Pengkalan Datu, Kemasin and Semerak Rivers, flow northwest direction
- ❖ predominantly covered by agricultural followed by cleared land, built-up area, peat swamp and forest.
- ❖ The dominant agricultural land uses are paddy cultivation, mixed agricultural such as tobacco and vegetable, other crop (fruit), rubber and coconut.
- ❖ The average annual evapotranspiration and rainfall is about 1,510 mm 2,646 mm respectively (DID, 2011).





Study area





Methodology

- i. A total of 148 groundwater samples were collected from 37 wells (domestic and agricultural)
- ii. collected after emptied 3 times to remove the stagnant water.
- iii. pH, temperature, EC, and TDS; using the YSI multiparameter
- iv. filtered through 0.45 μm membrane filter and split into 2 polyethylene bottles 250 mL each (sampled water directly /acidified with nitric acid (HNO_3) to a $\text{pH}<2$ to minimise adsorption of metals to container walls and reduces biological activity.
- v. Stored $\sim 4^\circ\text{C}$.
- vi. All the groundwater collection method and the water sample analysis followed standard procedure [APHA, 2005].





- ❖ Ca, Mg, Na and K - flame atomic absorption spectroscopy (FAAS)
- ❖ Fe and Mn - inductively coupled plasma-mass spectrometer (ICP-MS).
- ❖ CO_3 , and HCO_3 ; acid titration method.
- ❖ Cl - AgNO_3 titration method;
- ❖ SO_4 measured by SulfaVer 4 method (HACH).
- ❖ All concentrations are expressed in mg/L, except pH and EC.
- ❖ Ionic balances calculated as $(\text{cations} - \text{anions})/(\text{cations} + \text{anions}) \times 100 \sim \pm 5 \%$

