

Salinity study of coastal groundwater aquifers in north Kelantan, Malaysia

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The salinity of the ground water along the coastal aquifers of north Kelantan was investigated using both geophysical and hydrogeochemical methods. In the geophysical method, a geoelectrical sounding technique was employed using ABEM SAS 300C terrameter. A total of 53 sounding stations had been established and resistivity values of the ground water in different aquifers were determined. Salinity of the ground water was interpreted using a classification made by Flathe (1974). Based on this classification, ground water with resistivity values of less than 45 Ohm-m is considered as saline or brackish water and those of greater than 45 Ohm-m is fresh water. The results show that the ground water of the first top aquifer is fresh with resistivities ranging from 47 Ohm-m to 164 Ohm-m except in an area along the coast where the water is brackish. The ground water of the second aquifer generally has resistivity lower than 45 Ohm-m and has been classified as brackish water. Resistivity map of the second aquifer indicates that the brackish water covers an area of up to about 6 kilometres from the coastal line. Only few resistivity data were obtained for the third aquifer and values are generally low (i.e. ranging from 56 to 72 Ohm-m) indicating that the ground water is relatively fresh.

Salinity of the groundwater in all of the aquifers was also studied by analysing their chloride content. Ground water with chloride concentration of less than 250 mg/l is classified as fresh water and those having higher concentration of chloride is considered brackish or saline. Results of the water analysis show that the chloride concentration of the first aquifer is low and averages to only 15.8 mg/l. The fresh water/saline water interface in this aquifer is generally located directly in the coastal area, or very close to it. The concentration

of chloride in the second aquifer is high with values ranging from 500 to 3,600 mg/l and covers an area of up to about 6 kilometres from the coast. Beyond this area, the concentration of chloride appears to be low, with values ranging from 2 to 110 mg/l. Continuous monitoring of its chloride content (Haryono, 1997) indicates little changes with time inferring that the high salinity is not due to seasonal sea water intrusion. The analysis also reveals low concentration of sulphate which suggest that the groundwater of the second aquifer may represents fossilised sea water. The chloride content in the third aquifer is generally low with value ranging from 2 to 210 mg/l and thus the ground water in this aquifer is considered fresh and good for domestic use.
