

A numerical modelling of seawater intrusion into an oceanic island aquifer, Sipadan Island, Malaysia.

ABSTRACT

The primary source of water on many small islands is the fragile freshwater lens that floats on saline water in its shallow aquifer. The management of such a limited groundwater resource on these islands is seriously constrained by the occurrence of seawater intrusion. Sipadan Island, the renowned and only oceanic island in Malaysia, had experienced in the over-extraction of its groundwater for more than ten years to cater for freshwater demand associated with tourism activities. This paper discusses the output of modelling of seawater intrusion into the island's aquifer using SEAWAT-2000. The findings indicated that the island's coastal aquifer has been encroached by seawater. The infiltration of isochlor (chloride concentration) of 2.5 and 45% of seawater and freshwater mixing ratios has moved 63.4 m and 12.7 m inland from the coastline, respectively. The upcoming event at the pumping well, as simulated by the three-dimensional model, showed that 14.5% of seawater-freshwater mixing ratio took place below the bottom of each well. Intensive and unregulated exploitation of groundwater from such an unconfined aquifer of the island by pumping wells contributed to the upcoming. In order to protect the fresh groundwater resources in the study area from seawater intrusion, adjustment of groundwater pumping rate is needed. This study showed that the model is useful in demonstrating the mechanism and movement of freshwater-seawater interface in the island, and thus provide a powerful management tool for such an aquifer.

Keyword: Groundwater; Numerical modelling; Oceanic island; Seawater intrusion.