

A preliminary study of redox conditions of groundwater in the coastal area of Indramayu, Indonesia

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The redox condition of groundwater is determined by the interaction between water, minerals, and organic matter. It plays an important role in preserving water quality and changes with environmental conditions. The redox condition varies with temperature in the subsurface due to the ground source heat pump system. Air conditioning due to the ground source heat pump system is reported as an effective energy saving technique even in tropical areas, where the difference between the subsurface and the atmospheric temperature is low. A rise in the use of air conditioning associated with ground source heat pump system is expected to elevate temperature in the subsurface. It is important to evaluate the redox condition with regards to the conservation of groundwater quality in tropical areas. This research evaluated the redox conditions of groundwater in the coastal area of Indramayu in Indonesia.

The Cl⁻/Br⁻ ratio of samples from the groundwater demonstrates rising salinity due to f seawater intrusion. The mixing ratio of seawater and groundwater was evaluated by setting the Cl⁻ concentration of seawater to 19500 ppm and that of the unaffected groundwater to 16 ppm, with a maximum mixing ratio of 62%. The SO₄²⁻ concentration of the groundwater affected by seawater was calculated and compared to the measured value. A measured SO₄²⁻ concentration lower than the calculated value was associated with sulfate reduction and vice versa. Sulfate showed weak correlations with the DOC, Fe and Mn concentrations of the groundwater. Sulfate reduction showed a strong correlation to the sampling depth, with no reduction at depths below 20 m. Further work is required to better understand the relationship between the measured and the calculated SO₄²⁻ concentrations, as well as the geology of the region.

Keywords: coastal area, groundwater, redox conditions, sulfate reduction