Br/Cl ratio characteristics of groundwater in coastal areas in Indonesia

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The urban development in Indonesia’ s coastal areas has led to an increase of groundwater demand, which then has resulted in groundwater salinization. In this study, we analyze bromide and Br/Cl ratio characteristics, as index of groundwater salinization, in three cities of Indonesian coastal areas, namely: Indramayu, Mataram, and Semarang. Each research site is at different stage of urbanization. Indramayu is in very early stage of urbanization, followed by Mataram as a developing tourism area, and the last one Semarang as a heavy urbanization city. The results show that concentrations of bromide in groundwater are ranged from 0.05 to 38 mg/L in Indramayu, 0.01 to 0.8 mg/L in Mataram, and 0.02 to 8.0 mg/L in Semarang. Furthermore, the occurrence of Br is described in terms of the Br/Cl weight ratio, which allows for small changes in bromide concentrations to be assessed in terms of salinity. Median values of Br/Cl weight ratio in the groundwater of Indramayu, Mataram, and Semarang were approximately 0.0035, 0.0027, and 0.0025, respectively, while the ratio in seawater is generally around 0.0035. The relationship between Br/Cl weight ratio and chloride concentration indicate the groundwater in Indramayu is undergoing salinization due to seawater intrusion compared to the other two areas, meanwhile the groundwater in Semarang is experiencing chloride contamination due to anthropogenic activities based on the study by Andreasen and Fleck (1997).

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