

Effect of urbanization on the groundwater discharge into Jakarta Bay

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Abstract At Jakarta city in Indonesia, an increase of chemical fertilizer input in suburban areas and over-abstraction of groundwater at unregistered wells have caused many groundwater-related problems such as NO₃⁻ contamination in the shallow aquifer and seawater intrusion in coastal areas. Because groundwater is an essential carrier of land-derived nutrients into adjacent aquatic ecosystems, as well as river water, it is important to understand the effect of urbanization on the submarine groundwater discharges into coastal areas. In this study, we carried out continuous ²²²Rn and SGD measurements at a fixed location and along the coast of Jakarta Bay in March, 2008. Rn concentrations in groundwater in coastal areas were mostly similar to those in the lower reaches of a nearby river, suggesting that Rn may not be an effective tool as an indicator of groundwater discharge in coastal waters off Jakarta city. However, ²²²Rn activities were low along the reclaimed land areas (i.e. 0.8–3.0 dpm/L) around the centre of the city, while the values increased up to 6.0 dpm/L along the coast line with natural mangrove vegetation in western suburban areas. ²²²Rn and conductivity signatures suggested that an increase of Rn around suburban areas can be caused by river water (likely groundwater fed) rather than direct discharge of groundwater. The estimated minor contribution of groundwater to the terrestrial water flux into the ocean corresponds to the observed decline of hydraulic potential caused by urbanization in the Jakarta city area.

Key words SGD (Submarine Groundwater Discharge); Jakarta; ²²²Rn; urbanization