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Applying Isotope Techniques for Sustainable Development of Groundwater in the Upper Chao Phraya Basin (Bang Rakam area)

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The upper Chao Phraya Basin is the largest Cenozoic sedimentary basin that is located in the upper central part of Thailand. The basin is a high potential area for agricultural activities, such as growing rice, sugarcane and vegetables. In each year, the groundwater level has decreased continuously about 10-30 cm/year. Groundwater levels dropped from 5-10 m. to 10-25 m below ground surface at present. The water samples from groundwater, and surface water in Bang Rakam area were collected for analysis of stable isotopes (O-18 and H-2 in water), tritium (H-3) and Carbon-14 (C-14) as well as chemical composition such as major cation and anion as well. The most of groundwater samples, they have the water as of $\text{Na}^+ - \text{Ca}^{2+} - \text{HCO}_3^-$ type with indicating cationic exchange between Na and calcium along the flow path. The groundwater quality in this area is good quality below the maximum allowable limit of WHO (World Health Organization) for agriculture and consumer. The $\delta^{18}\text{O}$ and δD values of the rain water samples vary from 1.71 ‰ to -13.89 ‰ and 18.30 ‰ to -106.59 ‰ respectively. The origin of groundwater system in this area comes from local rainfall and surface water. The groundwater samples that depth less than 30 meters below the ground surface and away two kilometres from Yom river are effective on the river. The main flow direction of the groundwater system is movement from the south western of study area by means of tritium data. The average recharge rate of groundwater system were estimated by CMB (Chloride Mass Balance) using the average of chloride content in groundwater samples, the average of chloride content in rainfall sample during 2013 to 2014 as well as the effective of rainfall amount (mm/year). It is about 220 mm/year. The Chloride mass balance method shows that 10 % of the effective annual rainfall is recharge to the aquifer. Groundwater ages using tritium content can be separated into two groups. Group 1 (groundwater ages is less than 50 years ago) that groundwater samples are deep above 50 meters below the ground surface and Group 2 (groundwater age is more than 50 years ago) by the depth more than 50 meters below the ground surface.

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