
Spatial Health Risk Assessment of Arsenic Exposure from Drinking Groundwater in Taiwan's Pingtung Plain

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Abstract

In Taiwan, the residents of the Pingtung Plain are unusual, in that only approximately 45.8% use tap water. In that area, a substantial amount of groundwater, which is relatively abundant and inexpensive, is used as a source of water to meet drinking. A long-term groundwater quality survey of the Pingtung Plain indicated that arsenic concentration at several wells exceeded the water quality standards of $10\mu\text{g/L}$ for drinking. In this study, we attempt to spatially assessing health risk associated with arsenic exposure through drinking groundwater in Pingtung Plain. Geostatistical Kriging is used to estimate spatial variability of arsenic concentrations in groundwater. The hazard quotient (HQ) and target risk (TR) established by the U.S. Environmental Protection Agency are adopted to evaluate the potential health risk based on the estimated arsenic concentration distributions. The estimated arsenic concentrations in groundwater reveal that arsenic concentrations ($> 50\mu\text{g/L}$) in groundwater are high in several townships. The results show that HQ exceeds 1 and TR is above the safe value of threshold value of 10^{-6} at these arsenic-affected townships. Residents of the townships with high arsenic-affected groundwater should use tap water as drinking water and use groundwater only for other purpose. The well water in other townships in the Pingtung Plain has no adverse effects on human health.

Keywords: Kriging, arsenic, hazard quotient, target risk

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