

## **Degradation of subsurface environment due to human activities and climate variability in Asian cities**

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**Abstract** Degradation of subsurface environments has been studied in Tokyo, Osaka, Seoul, Bangkok, Manila, Taipei and Jakarta. The groundwater temperature observed in the study cities show the magnitude of timing of surface warming due to global warming and heat island effects. Recent new techniques using remote gravity measurement and isotope data enable us to evaluate the regional scale of groundwater issues. Groundwater contaminations and accumulated materials in the subsurface environment depend on the development stage of the cities. The material transports by groundwater have been evaluated. Stable isotopes data of the groundwater and soil water can tell us the origin of the contamination and processes.

**Key words** urbanization; groundwater; heat island; Asia; land subsidence; groundwater contamination