

Nitrate contamination in groundwater at developing Asian-Mega cities estimated by d¹⁵N and d¹⁸O in nitrate

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Nitrate contamination in groundwater is severe problem in the subsurface environments at developing mega cities, as well as other chemical and metal contamination. Spatial and temporal shift of nitrate concentrations, the source of nitrate pollutions and the potential of NO₃⁻ reduction in the subsurface environments were investigated using d¹⁵N and d¹⁸O signatures in nitrate at targeted Asian cities, Manila, Jakarta, Bangkok and Taipei.

Nitrate was dominant components of dissolved inorganic nitrogen (DIN) throughout the inland of Jakarta, while ammonium was dominant at the other areas, especially around the coastal areas. In addition to the population and land use, hydrogeological characteristics may be also important factors to control the extent of nitrate contamination on the systems.

Heavier d¹⁵N values in shallow groundwater on average than those in deep ones (deeper than 100 m) at all areas indicated that the contribution of sewage to nitrate contamination is increasing in developing cities partly due to leaking of wastewater from sewage pipes. Furthermore, relatively lighter d¹⁵N values observed in Bangkok than the other cities may be related to the higher coverage of sewage plant system. On the other hand, the potential of nitrate reduction due to denitrification was suggested at Manila and Jakarta areas from unidirectional shift of d¹⁵N and d¹⁸O values in groundwater nitrate.