

Source of nitrate in shallow groundwater in the Shakujii river catchment, central Tokyo, Japan

Takashi Nakamura^{1*}, Takeshi Hayashi², Masaya Yasuhara³, Kei Nishida¹

¹ICRE, University of Yamanashi, ²Akita University, ³Geological survey of Japan, AIST

Water chemistry of shallow groundwater in the Shakujii river catchment in the downtown Tokyo is discussed with special reference to its nitrate and chloride concentrations. The catchment is divided into the highly urbanized lower reaches (Toshima, Kita and Itabashi Wards) and the upper reaches which have been urbanized to a lesser extent (Nerima Ward, and Nishi-Tokyo and Kodaira Cities). In 2012 shallow groundwater samples were collected from 24 wells of less than 10m deep. Groundwater aquifer is in the Kanto loam layer and/or underlying stream terrace gravels.

The nitrate-nitrogen concentration had wide ranges (from 0.1 to 13.6mg/l). The total coliform was detected from all shallow groundwater samples. Vice versa the *Escherichia coli* was not detected. The nitrate nitrogen isotope ranges from 5.6 to 11.7 permil, which overlaps fertilized soil and wastewater nitrogen. Moreover, End-member mixing analysis using hydrogen and oxygen isotope values revealed spatial distribution in the contribution ratios of the local precipitation and domestic water (sewage and tap).

The concentration of nitrate nitrogen and total coliform was increasing along with contribution ratios of precipitation in shallow groundwater, except some samples that has high nitrogen isotope and chloride concentration. This trend suggests that the nitrate source in this area is not only from sewage leakage. It also needs to consider the loading of the nitrogen fertilizer to shallow groundwater by the precipitation infiltration.

Keywords: Tokyo, Urban, Shallow groundwater, Nitrate nitrogen and oxygen isotopes