# Spatial relationships between groundwater quality and land-use characteristics, Seoul metropolitan ty, Korea

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The degradation of groundwater quality is an important environmental problem encountered in rapidly growing urban area such as Seoul, because human activities emit a myriad of pollutants to the surface or subsurface. Rapid changes of surface and subsurface environment, which are caused by industrializing activities (factories), building construction, road pavement, construction of underground facilities such as subway and water supply networks, etc., may perturb the hydraulic conditions and therefore the groundwater quality. Therefore, the urban groundwater quality is closely related to the land-use characteristics. In sight of regional scale, vertical groundwater flow just below the contaminated site could concentrate the pollutant on the deeper part of the aquifer, even though horizontal flow could remove the pollutant by changing quantities and qualities of recharge water in the shallower part of the aquifer. Then it is possible to estimate the influence of land-use on the groundwater quality in regional scale. Many researches on the urban groundwater have been undertaken to examine the relationships among the specific land-use patterns, the corresponding pollutant emission and the resulting groundwater quality. However, such study has not been done in Korea.

We are conducting a hydrogeochemical study on the urban groundwater in Seoul, in order to describe the interaction between land-use and groundwater quality and to help the determination of the recharge area of each contaminated well. For these purposes, three-year monitoring is progressing since 1999 to identify the spatial and temporal change of regional groundwater quality. The regional land use was divided into five major categories (green zone, housing, agricultural, traffic, and industrialized), based on the data from Seoul Statistical Yearbook and Annual Report of Traffic Volume in Seoul.

The average TDS concentration is the lowest in the green zone (164.5 mg/l) and generally increases in the following order: the housing area (384.3 mg/l), the agricultural area (386.3 mg/l), the traffic area (453.2 mg/l), and then the industrialized area (525.8 mg/l). In the August, the TDS concentration in the agricultural area (369.1 mg/l) becomes lower than that in the housing area (387.4 mg/l), in accordance with the reduction of nitrate concentration. In case of minor elements, we cannot find any distinct spatial variation of average concentrations, although heavy metal concentrations (Cu, Fe, Mn, Ni, Se, Zn) tend to be increased in the industrialized area. However, we consider that more detailed examination of water quality variation in terms of local land use characteristics (based on the quantitative calculation of areal percentage of each land use within 500 m around a well by using the large scale maps) will be necessary to understand the spatial distribution of solute concentrations. We are performing the local-scale survey to deduce a correlation matrix between the hydrochemical data and local areal percentage of each land use.

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