

## **Suggestions of source groundwater management strategies based on the water quality grade in Jeju island**

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Groundwater is a major source of water for public supply in Jeju Island of South Korea whose volcanic aquifer is vulnerable to the inflow of surface contaminants because of its good permeability. Recently several studies have shown that groundwater in Jeju Island is threatened by anthropogenic factors such as over-fertilization, inappropriate management of livestock wastes, and sewage discharge increased due to land use changes. Therefore, it is urgent to precisely diagnose the quality status of source groundwater for sustainable water supply in Jeju Island. Therefore, this study was conducted (1) to understand the overall status (including trend) of source groundwater quality, (2) to determine the main source(s) of groundwater quality degradation, and (3) to suggest an appropriate groundwater management scheme including land use controls. For these purposes, we examined the hydrochemical characteristics of groundwater samples that were collected by two campaigns (dry and wet seasons) in 2021, and compared the current concentration with the NO<sub>3</sub>-N concentrations in 2002-2020 for trend analysis. In addition, the N-O isotopes of nitrate were analyzed for source identification. Principal component analysis (PCA) and redundancy analysis (RDA) were conducted to assess the major hydrochemical processes in groundwater and the correlations between land use and water quality, respectively. The study results showed that agricultural activities and domestic sewage have the significant influence on groundwater quality in Jeju island. In order to propose a sustainable water resources management plan, the water quality grade of each groundwater source was evaluated in 5 levels using the NO<sub>3</sub>-N concentration, its coefficient of variation, and its trend of change. Appropriate water quality management plans were proposed for each grade including wellhead protection areas. The suggestion of groundwater management strategies based on the water quality grade will help sustainable water management not only in Jeju Island but also in other areas where the water sources are threatened by anthropogenic components. <Acknowledgement> This study was supported by the research fund from the Jeju Special Self-Governing Province Water supply and Sewage treatment Headquarters Waterwork Management Division.