Assessment of nitrate-N contamination in the Chunnakam aquifer system, Jaffna peninsula, Sri Lanka

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Abstract

Jaffna peninsula in Sri Lanka is an area of intensive agriculture using extensive organic and inorganic nitrogenous compounds and hence, this study was focused on assessing vulnerability of karstic aquifer system with specific focus on nitrate contamination, and compare loads of nitrate from agriculture. The total number of the wells sampled in the Chunnakam aquifer is 44. The coverage of wells with measurements of nitrate and nitrite concentrations in the database covering the study period from January, 2011 to August, 2011. The intrinsic vulnerability of the area is estimated by the DRASTIC model and the modified DRASTIC method was used to determine the nitrate-specific vulnerability of the aquifers. Average concentrations of nitrate-N and nitrite-N during the study period were 4.869 and 0.014 mg/L respectively. The average number of wells exceeding permissible level of NO_3-N is approximately 6-12, which means that about 14-28% out of the 44 wells. Modified DRASTIC (DI) index value computed as explained above increased from DI=177 to a range of 182 to 197. In spite of the increase, the Modified DI values show that the aquifer vulnerability specific to nitrate contamination remains in "high" category. Although nitrogen loading at the domestic sources and irrigation is of the same order of magnitude, the loading from fertilizer input is much larger which is about 15 times higher. This finding suggests that the fertilizer input in agricultural areas constitute a significant contribution to the nitrogen content in the groundwater and soils in agricultural areas of Jaffna.

Keywords

Nitrate, DRASTIC, Agricultural pollution, Nitrogen fertilizer

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