

(ID 271)

**Chemical Index for Assessment of Groundwater Palatability: A Case Study from Vavuniya**

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**Abstract**

Vavuniya, located in the northern province of Sri Lanka, primarily relies on groundwater as its main drinking water source. However, the area witnessed rapid population growth during and after the civil war, driven by extensive development projects like resettlement programs. Consequently, heightened water demand strains groundwater resources, compromising quality due to overexploitation. This study aimed to evaluate the fluctuation patterns in groundwater quality within Vavuniya (coordinates) and develop a comprehensive water quality index, namely the O-index. This index was built upon chemical speciation analysis, allowing an assessment of water palatability. Sixty groundwater samples were collected from 42 dug wells and eighteen tube wells. Sodium (Na), potassium (K), calcium (Ca), and magnesium (Mg) were measured in total, whereas anion species were also measured. These samples were then analysed for  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{SO}_4^{2-}$ , and  $\text{SiO}_2$  for the index. Questionnaire data was also collected from consumers of the sampled water sources to assess their perceptions of the water's taste. According to the O-index, palatable water is ranked above 2.0. Calcium, potassium, and silica were positively correlated with palatable water, while sulphate and magnesium were negatively correlated. The O-index data was refined based on the chemical speciation of the sampled water quality. Tube-well water samples had a slightly higher mean O-index value ( $1.57 \pm 0.68$ ) than well-water samples ( $1.35 \pm 0.55$ ), indicating better taste. However, tube-well water samples also showed greater variability with higher standard deviations. Tube-well or dug-well water samples did not obtain a mean value of more than 2 for palatability, which is required to be considered palatable. However, a slightly higher percentage of tube well water samples (25%) complied with the standard than dug well water samples (6.24%). After obtaining the results, water was classified as palatable or non-palatable. This classification appears rational, as the findings align with everyday experiences. Overall, tube well water quality seems slightly superior based on median values, but both water sources are susceptible to contamination and should be tested regularly. The research contributes to understanding the palatability of groundwater and its relevance for human consumption.

**Keywords:** Groundwater palatability, Human consumption, O-index, Spatial distribution