



## **Investigation of groundwater quality at Tindivanam Town, Villupuram District.**

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### **ABSTRACT:**

The study area Tindivanam has chosen to assess the groundwater quality. There are 20 groundwater samples were collected and analyzed for various physical and chemical parameters of groundwater such as TDS, pH, EC, Ca, Mg, Na, K, Cl, NO<sup>3</sup>, HCO<sub>3</sub>, SO<sub>4</sub>, F. The groundwater samples are compared with the WHO standards. The quality of ground water in the study area is fresh to Brackish, slightly basic in nature, Salinity nature.

**Key words:** TDS, WHO, Ca, Mg, Tindivanam town, etc.

### **Introduction:**

Water is one of the most fundamental natural resources for eco sustainability and it is possible to turn into crucial in short supply in the coming decades due to rising demand, rapid growth of urban populations, increase of agriculture and industrial activities especially in semi-arid regions (Hajalilou, and Khaleghi, 2009). Groundwater plays an essential role in providing a major drinking water sources in arid and semi-arid areas worldwide. About 2.5 billion people worldwide fulfill their drinking needs using groundwater as the only source (UNESCO 2012; Aasif et al. 2023). In India, groundwater suites the drinking and domestic requirements of nearly 90% of the rural and 30% of the urban population (Bhunia 2020). There has been a tremendous increase in the demand for groundwater due to increase in population, advanced irrigation practices and industrial usages (Ramamoorthy and Rammohan, 2015). Due to shortage of surface water, demand for groundwater resource has increased in many folds in recent times for drinking, irrigation, and industrial purposes in the world. It is estimated that approximately one third of the world's population use groundwater for drinking (Nickson et al., 2005). Due to overexploitation of groundwater for domestic, irrigation and industrial purposes for the past few years the groundwater level has depleted forcefully it will adverse affect of groundwater quality and quantity. Groundwater quality mainly depends on numerous factors like lithology, rock water interaction, soil characteristics, sub-surface environment, manmade activity, climatical condition etc (Hem, 1989; Freeze and Cherry, 1979; Amadi et al. 1989; Appelo and Postma, 2005; Gholam and Azam, 2012; Ramamoorthy and Rammohan, 2014). The significance of water quality in human health has recently attracted a great deal of interest (Ramamoorthy et al 2020). Once the groundwater is contaminated, it is not easy to restore by stopping the pollutants from the supply. This contamination is primarily caused by the discharge of untreated industrial effluents, agricultural septic tanks, domestic wastewater, and other sources (Siddiqui et al. 2015), causing waterborne diseases such as hepatitis, jaundice, typhoid, dysentery, and diarrhoea (Ayush Verma et al. 2023). With the increase of groundwater contamination, it is necessary to analyze groundwater chemical characteristics and evaluate groundwater quality for water supply purpose (Ali et al. 2024).

### **Study Area:**

The study area Tindivanam town (Fig.1) falls in Villupuram district. The district is bounded on the South and West by Chennai and on the North West by Pondicherry on the South Trichi district and on the east by Kancheepuram district.

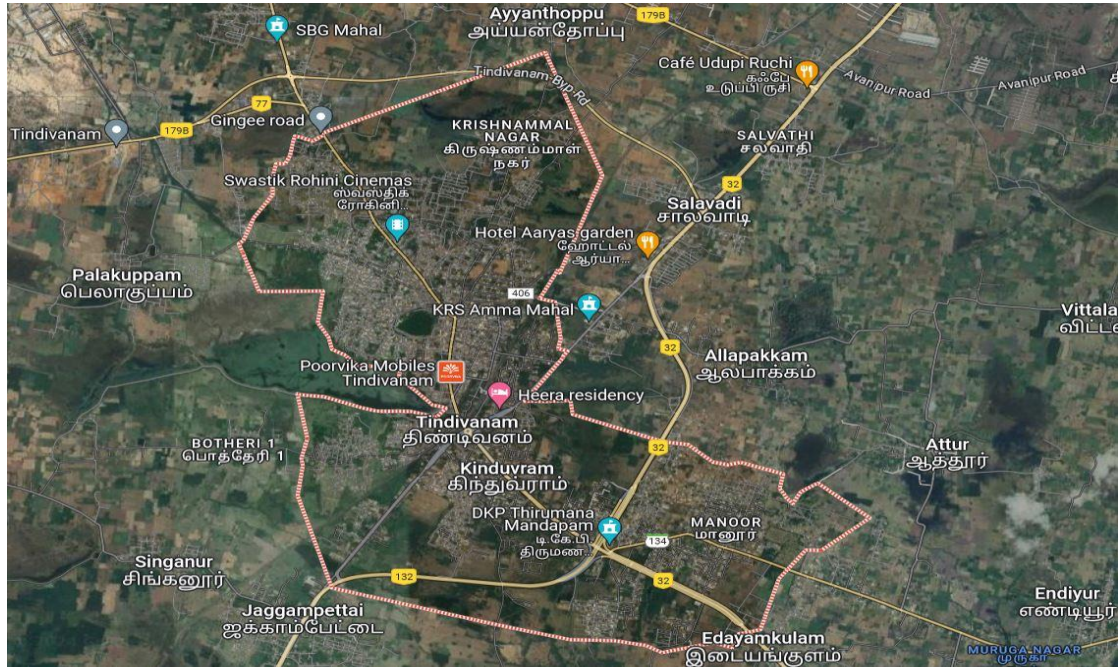


Fig:1 Study area Tindivanam Town

## Materials and methods:

A 20 ground water samples (Fig 2) were taken from Open well and Bore well in and around Tindivanam Town for identifying quality of groundwater. Water samples were gathered and placed in sterile polythene bottles. They were then completely cleaned using diluted nitric acid, rinsed with distilled water, and then rinsed once more with representative water samples. The field measurements included total dissolved solids (TDS), electrical conductivity (EC), pH and other physical characteristics of the water sources.

## Results & Discussion

### Water quality

The value of physical parameters (pH, EC and TDS) of the groundwater samples collected from Tindivanam town varies from 6.75 to 7.90, 678 to 2480  $\mu\text{s/cm}$  and 480 to 1760 mg/l, with mean values of 7.33, 1537 mg/l and 1091 mg/l respectively. The concentrations (mg/l) of major cations ( $\text{Ca}^2$ ,  $\text{Mg}^2$ , Na and K), major anions ( $\text{HCO}_3^-$ ,  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$ ), and Organic matter ( $\text{NO}_3$ ) are in the range of (57 to 96, 50 to 75, 78 to 142 and 60 to 98), (196 to 305, 111 to 171 and 44 to 68), and (0.5 to 0.76).

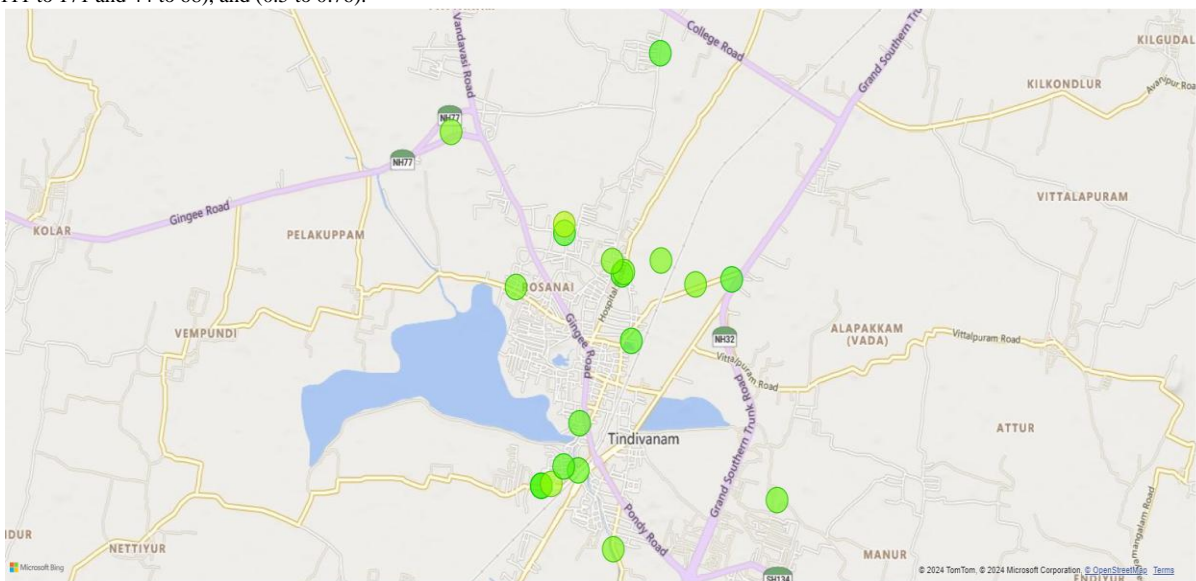


Fig 2. Location of groundwater samples

- **pH**  
In the study area the pH ranges from 6.75 to 7.90, the groundwater samples in the study are permissible limit as per WHO standards. In the study area, the pH values for the water samples range from 6.75 to 7.90, most of the samples are basic in nature.
- **Electrical Conductivity (EC)**  
The electrical conductivity is the range of the concentration in the water which is being measured by using the Electrical conductivity meter (digitalized) is being used for the analyzed. The EC for the samples ranges from 678  $\mu$  mhos / cm to 2480  $\mu$  mhos / cm.
- **Total dissolved solids (TDS)**  
The total dissolved solids in water are due to the presence of sodium, potassium, calcium, magnesium, manganese, carbonates, bicarbonates, chlorides, phosphate, organic matter, and other particles. The values of the total dissolved solids for all the groundwater samples vary between 480 and 1760 mg/l. Maximum TDS was observed in location Roshanai.
- **Calcium (Ca)**  
In the study area the Ca value ranges from 57 to 96 mg/l. Higher calcium value observed in Roshanai location. The concentrations of Ca in the groundwater was mostly derived from leaching of carbonate minerals such as Calcite and Dolomite (Magesh et al.2012). The higher Ca content can cause ailments in humans and it was also not useful for domestic uses as it causes scaling (Sarath Prasanth et al. 2012).
- **Magnesium (Mg)**  
The magnesium values are recorded between 50 and 75 mg/l for the groundwater samples. The highest value of magnesium is observed at station Roshanai and the lowest value 50 mg/l of magnesium is observed at station (Ayyanthoppu). On comparison with the WHO standard value of magnesium, in this study it is confirmed that the magnesium value for all the groundwater sample is within the maximum permissible limit (150 mg/l).
- **Sodium (Na)**  
The sodium concentration in ground water is varied between 78 to 142 mg/l in study area. The high variation of Na and Ca in the groundwater is attributed to cation exchange among minerals as well as irrigation return-flow.
- **Potassium (K)**  
The concentration of potassium ranges from 60 to 98 mg/l higher concentration of potassium it attributed to agricultural activities and minerals like biotite and orthoclase.
- **Chloride (Cl)**  
The Chloride (Cl) concentration of groundwater can be attributed naturally due to the presence of chlorides from rocks, evaporates and juvenile water or by the contamination of groundwater through industrial waste and domestic sewages (Saha et al., 2019). The concentration of Cl ranges from 111 to 171 mg/l.
- **Fluoride**  
The value of fluoride for the groundwater samples is recorded between 0.58 and 0.84 mg/l. The maximum allowed limit of fluoride according to WHO is 1.0 mg/l. The fluoride values for all the groundwater samples are within the permissible limit.
- **Nitrate (NO<sub>3</sub>)**  
The nitrate concentration ranges from 0.50 to 0.76 mg/l. The higher value of nitrate is the most common indication of agriculture impact on groundwater quality. Nitrate values for the village within the permissible limits according to the WHO standard (1984) for the irrigation water(50mg/l).
- **Sulphate(SO<sub>4</sub>)**  
The Sulphate concentration ranges from 44 to 68 mg/l. The higher concentration observed in the location Roshanai. The occurrence of SO<sub>4</sub> in groundwater can be resulted from the oxidation of sulfur from the surrounding igneous rocks in the region (Saha et al.2019). The lower concentration of Sulphate in groundwater was less affected by anthropogenic sources especially industries (Mostafa et al. 2017).

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## Conclusion

The present study of Tindivanam town has chosen in order to evaluate the suitability of groundwater for drinking purposes. The quality of ground water in the study area is fresh to Brackish, slightly basic in nature, Salinity nature. The present reveals that all the collected groundwater samples are fall in suitable for drinking purposes as per WHO standards.

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