Assessment of Groundwater Quality for Drinking Purposes a Case Study of Sedarapet Village, Puducherry

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Abstract—A study was carried out to assess the suitability of ground water used for drinking utility. A total 15 groundwater samples were collected and analysed for various physico-chemical parameters and compared with the WHO standards of drinking water quality parameters with the following water quality parameters namely EC, TDS, Ca, Mg, Cl, Na, K, F, etc. The quality of ground water in the study area is fresh to brackish water. The analysis reveal that most of samples in the study area is highly contaminated due to the excessive concentrations of one or more water quality parameters such as Calcium, Magnesium, Total dissolved solids, and Fluorides, which have cause most of the water samples tested, non-potable.

Key words: Groundwater, Sedarapet, Drinking, WHO, EC, TDS

I. INTRODUCTION

Water is essential for sustenance of life. India, like any other developing country of the world, is facing increasing environmental problems. The vast population and ever increasing industrial activities in India, makes its water resources more vulnerable to water quality deterioration. The groundwater resources are at higher risk as its remediation is very difficult. The major anthropogenic activities for continuous groundwater quality deterioration are urbanization, industrialization, and agriculture run off. Also the problem of drinking water contamination, water conservation, and water quality management has assumed a very important role for sustainable development of countries, such as India (Prashant et al., 2010).

During the past two decades, the water level in several parts of India has been falling rapidly due to an increase in extraction (Gupta and Deshpande, 2004). The quality of water is vital owing to its suitability for various purposes since it is directly linked with human welfare. Groundwater quality variation is a function of physical and chemical patterns in an area influenced by geological and anthropogenic activities (Subramani et al., 2005).

The World Health Organization (WHO) has discriminated the major factor influencing the greater population is/as lack of access to clean drinking water (Nash and McCall, 1995). Poor quality of water adversely affects the human health, and plant growth (Hem, 1991, 1985; Karanth, 1997).

II. MATERIALS AND METHODS

A. Study Area

The study area of Sedarapet village formed part of Puducherry District of Puducherry, a separate union of unique geographical and geological disposition. The study area falls in survey of India Toposheet 57P/11 and 57P/16. Sedarapet village total area is 6.59 Km2 lies between N 12° 1’ 13.44” latitude and E 79° 47’ 0.6” longitudes and is bounded on the Villianur taluk and located in Puducherry district of Puducherry.

A total of fifteen samples, were taken for the analysis. The groundwater samples were taken from already running motor pumps or after operating the motor pumps for about ten minutes. Sampling, preservation and transportation of water samples were as per standard method (APHA, 1998).

B. Results and Discussion

1) Evaluation of Drinking Water Suitability

a) pH:

In the present study, the pH of the ground water ranging from 6.08 to 7.32. Most of the samples fall within the permissible limit as specified by WHO (1996). For most domestic and industrial uses, water having pH between 6 and 10 generally causes no problem.

b) Total Dissolved Solids (TDS)

To ascertain the suitability of groundwater for any purposes, it is essential to classify the ground water depending up on their hydro chemical properties based on their TDS values (Catroll 1962; Freeze and Cherry 1979).

The palatability of water with TDS level less than 600 mgl is generally considered to be good where as water with TDS greater than 1200 mgl becomes increasingly unpalatable (McKee, and Wolf, 1963).

Most of the groundwater samples are exceeding the maximum permissible limit for drinking as per the WHO international standard. Most of the samples in the study area shown above 1000 mg/l of TDS indicating high content of soluble salts in groundwater which partially used for drinking with risk.

c) Calcium/Magnesium

The concentration of Ca2+ varies from 26 to 84 mg/l and is due to rock weathering minerals like feldspars, pyroxene, and amphiboles. The concentration of Mg2+ in the groundwater is due to the exchange of minerals in soil and rock by water and ranges from 9.6 to 52.8 mg/l. weathering of silicate minerals might be the major cause for the high concentrations of major cations in the groundwater. (Rajmohan et.al. 2000)

d) Sodium (Na+)

The sodium concentration in ground water is varied between 36 to 179 mg/l with an average 120 mg/l in post-monsoon. The high variation of Na+ and Ca2+ in the groundwater is attributed to cation exchange among minerals as well as irrigation return-flow. The feldspars of igneous rock is the source of sodium when weathered.
e) **Potassium (K⁺)**

The concentration of potassium ranges from 0 to 4.4 mg/l with an average of 1.85 mg/l during the post monsoon it may be due to the agricultural activities and minerals like biotite and orthoclase. The potassium concentration in water is low because of the high degree of stability of potassium bearing minerals.

f) **Chloride (Cl⁻)**

Chloride content of study area ranges from 78 to 283 mg/l. Abundant chloride in groundwater may also indicate seepage from certain type of sewage facilities. Human wastes are generally high in chloride content and once these deposits are deposited in sewage lagoons chlorides often move into the groundwater system. Water that contains less than 150 mg/l chloride is satisfactory for most purposes. Abnormal concentrations of Chloride may result due to pollution by sewage wastes, salting for certain types of trees like coconuts and leaching of saline residues in the soil. 26.6% of sample exceeds the permissible limit.

g) **Fluoride**

The fluoride value ranges from an average of 1.39 to 1.6947 mg/l with an average of 1.59 mg/l. The high levels of fluoride, which accounts for the non-potability of ground water, may be due to both, the natural processes as well as the involvement of human element. Apart from the natural processes which cannot be controlled, considerable amount of fluorides may have been contributed to man made reasons (Ramasesha 2005), such as the use of fluoride salts in the large number of industries in the study area, which are using it in steel, aluminium, brick and tile industries. However, all samples show it does not within the permissible limit hence it is not suitable for drinking purpose. Fluorides in excess of 1.5 mg/l may lead to a crippling and painful disease called fluorosis, which may be in the form of dental fluorosis, skeletal fluorosis and nonskeletal fluorosis (Shankar et al., 2008).

### III. CONCLUSION

The analysis of groundwater samples from the study area has shown that most of the samples are contaminated and unfit for drinking use. The results clearly indicate that the groundwater is getting contaminated alarmingly due to rapid industrialization. To improve the quality of groundwater in the study area and protecting the people from the perils of groundwater contamination, Care needs to be taken to monitor the interaction between the groundwater and industrial effluents.

### REFERENCES


