

Table 6: Suitability of groundwater for irrigation based on SAR

SAR	Water Class	% of wells	No. of wells
0-10	Excellent	100%	10
10-18	Good	Nil	Nil
18-26	Fair	Nil	Nil
>26	Poor	Nil	Nil

Table 7: Suitability of ground water for irrigation based on percentage sodium

%Na	Water Class	% of wells	No. of wells
<20	Excellent	20%	2
20-40	Good	70%	7
40-60	Permissible	10%	1
60-80	Doubtful	Nil	Nil
>80	Unsuitable	Nil	Nil

Sodium Hazard

Large amounts of sodium is of special concern as excess sodium in irrigation waters produces the undesirable effects of changing soil properties and reducing soil permeability leading to sodium hazard [18]. Hence, the assessment of sodium concentration is necessary while considering the suitability for irrigation. %Na was calculated by using the following formula:

$$\text{Na\%} = \frac{\text{Na} \times 100}{\text{Na} + \text{Ca} + \text{Mg} + \text{K}}$$

where the quantities of all cations are expressed in milliequivalents per liter.

The classification of groundwater was grouped according to percentage of sodium as Excellent (<20%), Good (20-40%), Permissible (40- 60%), Doubtful (60-80%) and Unsuitable (>80%). Out of 10 water samples collected in the study area based on percentage of sodium, 20% of the samples have excellent irrigation water, 70% of the samples have good irrigation water and remaining 10% of the samples have permissible irrigation water quality (Table 7).

6. Conclusions

The results of this study shows that all the water samples have alkaline (>7) character and all the samples fall under fresh water category. The concentrations of major ions in groundwater are within the permissible limit for domestic purpose except for a few locations. TDS values range from 502 to 992 mg/l with an average of 714mg/l. The total hardness exceeded the maximum permissible limit at five sampling points out of ten in the study region. Also, all the ground water samples found under very hard category. Calcium exceeded at one location and Magnesium at two locations. In case of bicarbonates (HCO₃⁻), it also exceeded at two locations with a maximum of 874 mg/l at location no.2.As far as EC concentration is concerned, all the samples were representing the permissible category. Presence of Coliforms and *E.coli* makes the water unfit for drinking at all the locations. On the basis of percent sodium and sodium absorption ratio, all the samples were found suitable for irrigation purpose. Hence, the present study concludes that the collected water samples were not suitable for drinking purposes, but can be used for irrigation purpose.

References

- [1] K.Ramesh, L.Elango, "Groundwater quality and its suitability for domestic and agricultural use in Tondiar river basin, Tamil Nadu, India," Environmental Monitoring Assessment, pp.1-13, 2011.
- [2] B.Nisi ,A.Buccianti , O.Vaselli , G.Perini , F.Tassi, A.Minissale, "Hydrogeochemistry and strontium isotopes in the Arno River Basin (Tuscany, Italy): constraints on natural controls by statistical modeling,"Journal of Hydrology,360,pp.166–183, 2008.
- [3] N.Rajmohan, A.Al-Futaisi, S.Al-Touqi, "Geochemical process regulating groundwater quality in a coastal region with complex contamination sources: Barka, Sultanate of Oman,"Environmental Earth Sciences, 59, pp.385-398,2009.
- [4] M.V.Prasanna, S.Chidambaram, T.V.Gireesh,T.V.Jabir Ali, "A study on hydrochemical characteristics of surface and sub-surface water in and around Perumal Lake, Cuddalore district, Tamil Nadu, South India,"Environmental Earth Sciences, 63(1), pp.31-47,2010.
- [5] S.K.Tyagi, P.S.Datta, N.K.Pruthi, "Hydrochemical appraisal of groundwater and its suitability in the intensive agricultural area of Muzaffarnagar district, Uttar Pradesh, India,"Environmental Geology, 56, pp.901–912,2009.
- [6] R.Nagarajan, N.Rajmohan, N.Mahendran, S.Senthilkumar, "Evaluation of groundwater quality and its suitability for drinking and agricultural use in Thanjavur city, Tamil Nadu, India,"Environmental Monitoring and Assessment, 171, (1-4), pp.289-308,2010.
- [7] N. Ghazadeh, A.Mogaddam, "Investigation of hydrochemical characteristics of groundwater in the Harzandat aquifer Northwest of Iran, Environmental Monitoring and Assessment,"176(1-4),pp.183-195,2011.
- [8] D.Alexakis, "Assessment of water quality in the Messolonghi-Etoliko and Neochorio region (West Greece) using hydrochemical and statistical analysis methods,"Environmental Monitoring and Assessment, 182(1-4), pp.397-413, 2011.
- [9] Z.Ahmad, A.Qadir, "Source evaluation of physic chemically contaminated groundwater of Dera Ismail Khan area, Pakistan,"Environmental Monitoring and Assessment,175(1–4), pp.9–21, 2011.
- [10] APHA AWWA, Standard methods for the examination of water and waste water, American Public Health Association, 21st Edition, Washington, DC, 2005.
- [11] Indian Standard 10500:2012, Drinking Water Specification.
- [12] World Health Organization (WHO):, Guidelines for Drinking Water Quality,2012.
- [13] D.F.G. Rani, S.Geetha, J.Ebanazar, "The drinking water quality characteristics of five rural places in and around Thittagudi, Tamil Nadu, India,"Pollution Research,22(1), pp.111-115, 2003.
- [14] R.Padmanaban, M.Dharmendirakumar, P.B.Sakthivel, N.S.Elangovan, "Ground Water Quality of Madurai District in Tamil Nadu, India - A Case

- Study,"International Journal of Engineering Research and Development, 6(10), pp.50-53, 2013.
- [15] A.K.Singh, G.C.Mondal, S.Kumar, T.B.Singh, B.K.Teary, A.Sinha, "Major ion chemistry, weathering processes and water quality assessment in upper catchment of Damodar River basin,India,"Environmental Geology, 54, pp.745-758, 2008.
- [16] K.Srinivasamoorthy, C.Nanthakumar, M.Vasanthavigar, K.Vijayaraghava, R.Rajivgandhi, S.Chidambaram, P.Anandhan,R.Manivannan, Vasudevan, "Groundwater quality assessmentfrom a hard rock terrain, Salem district of Tamil Nadu, India.,"ArabianJournal of Geosciences, 4 (1-2), pp.91-1022009.
- [17] K.Srinivasamoorthy, K.Vijayaraghavan, M.Vasanthavigar, V.S.Sarma,R.Rajivgandhi, S.Chidambaram, P.Anandhan, R.Manivannan,"Assessment of groundwater vulnerability in Metturregion, Tamil Nadu, India using drastic and GIS techniques,"ArabianJournal of Geosciences,4, pp.1215-1228, 2011.
- [18] J.Mithra, R.Bhaskaran, S.Kumar"Assessment of Ground Water Quality in Thanajvur town and Adjacent areas, Thanjavur District, Tamilnadu, India (Post-monsoon Season),"International Journal of Engineering Research and Application, 2 (6), pp.1237-1243, 2012.

