

# Ground water Evaluation of Chinnar watershed (Koneri sub - watershed) Perambalur Dt With Arc GIS Platform

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*Abstract*— Thirty groundwater samples have been collected from Chinnar watershed (Koneri sub-water shed), a purely hard rock terrain in south India for hydro chemical investigations to understand the chemical quality of groundwater for drinking and irrigation purposes .the quality of groundwater has been assessed by using SAR, RSC, Piper and USSL diagrams. Spatial analyst on extended module of ArcGIS 9.3 was used to find out the spatial behavior of the groundwater parameters.

Key Words – Chinnar water shed groundwater quality, sodium adsorption, residual sodium carbonate, and spatial distribution

#### I. INTRODUCTION

Water quality analysis is one of the most important aspects in groundwater studies. The hydro chemical study reveals quality of water that is suitable for drinking, agriculture and industrial purposes. Further, it is possible to understand the change in quality due to rock water interaction or any type of anthropogenic influence. Groundwater often consists of seven major chemical elements-  $Ca^{+2}$ ,  $Mg^{+2}$ ,  $Cl^{-1}$ ,  $HCO_3^{-1}$ ,  $Na^{+1}$ ,  $K^{+1}$ , and  $SO_4^{-2}$ . The chemical parameters of groundwater play a significant role in classifying and assessing water quality. Considering the individual and paired ionic concentration, certain indices are proposed to find out the alkali hazards. Residual sodium carbonate (RSC) can be used as a criterion for finding the suitability of irrigation waters. It was observed that the criteria used in the classification of waters for a particular purpose considering the individual concentration may not find its suitability for other purposes and better results can be obtained only by considering the combined chemistry of all the ions rather

Chemical classification also throws light on the concentration of various predominant cations, anions and their interrelationships.

than individual or paired ionic characters.

A number of techniques and methods have been developed to interpret the chemical data. Presentation of chemical analysis in graphical form makes understanding of complex groundwater system simpler and quicker. The objective of the present work is to discuss the major ion chemistry of groundwater of Perambalur district. In this case the methods proposed by Piper, Wilcox, and USSL (US Salinity Laboratory) classification have been used to study critically the hydro-chemical characteristics of groundwater.

### II. STUDY AREA

Chinnar watershed is located in the Perambalur district in Tamilnadu state between 11° 10'00" to 11° 25' 00" North latitude and 78° 40' 00" to 79° 00' 00" East longitude (Fig3) and covers an area of 415 sq.km.



Fig 1. Study area with sample location.



# III. METHODOLOGY

In the present study, water samples were collected from thirty bore wells during pre-monsoon season of the year 2013. samples from the selected sites were collected in a good quality polyethylene bottle of one-litre capacity during period and analyzed on the same day. The samples after collection were immediately kept in dark boxes and analyzed in laboratory for various parameters at earliest. For the present analyses the average concentration of major cations, anions, PH and EC were estimated. This data formed the basis for estimating the other derived parameters such as total hardness, SAR and RSC etc.

IV. RESULT AND DISCUSSION

IONS	Min	Maximum
+1 Na	35	245
K <sup>+</sup>	11	91
Ca <sup>+2</sup>	33	239
Mg <sup>+2</sup>	11	115
Cl <sup>-1</sup>	20	586
so4 <sup>-2</sup>	16	230
CO3 <sup>-2</sup>	0	0
HCO <sub>3</sub> <sup>-1</sup>	210	545
TOTAL HARDNESS	199	955

Table 1: Maximum and minimum concentration of major ions in groundwater



Fig 2. Premonsoon groundwater samples plotted in piper-Trilinear

Hardness	Water class	Sample
0-75	Soft	Nil
75-150	Moderate to hard	Nil
150-300	Hard	One sample
>300	Very hard	Twenty nine samples

 Table 2: Classification of water based on hardness by Sawyer and

 McCarthy.

Sodium	Water class	samples
<20	Excellent	Nil
20 - 40	Good	One sample
40-60	Permissible	Nineteen samples
60 - 80	Doubtful	Ten samples
>80	Unsuitable	Nil

Table 3: Sodium percent water class



RSC (epm)	Remarks on quality	Samples
< 1.25	Good	Nil
1.25 – 2.5	Doubtful	Eighteen samples
>2.5	Unsuitable	Twelve samples

 Table 4: Groundwater quality based on RSC (Residual sodium carbonate).

Sodium hazard class	SAR equivalents per mole	Remark on quality	Samples
S1	10	Excellent	Two samples
S2	10 -18	Good	Thirteen samples
\$3	18 - 26	Doubtful	Fifteen samples
S4 & S5	>26	Unsuitable	Nil

Table 5: Sodium hazard classes based on USSL classification

Salinity Hazard class	EC in micro moles	Remarks on quality	Samples
C1	100 - 250	Excellent	Nil
C2	250 - 750	Good	One sample
C3	750 – 2250	Doubtful	twenty three samples
C4 & C5	>2250	Unsuitable	Six samples

### Table 6. Salinity hazard class















## V. CONCLUSION

Water qualities for drinking in this study area are 60 percentages suitable and remaining 40 percentages of samples are having higher electrical conductivity as per WHO standards. The total hardness of the study area comes under 3.33 percent hard and 96.67 percent is very hard categories. For irrigation purposes the sodium of 33.33 percentages doubtful, RSC 60 percentage doubtful and 40 percentage unsuitable. The SAR showed 50 percentages doubtful. The spatial analysis of the sample's PH, TDS, TH and EC were drawn by ArcGIS 9.3

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