International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 12 Issue 6 ǁ June 2024 ǁ PP. 43-50

Qualitative Analysis of Ground Water Quality through Index Method Using Spatial Distribution Technique at Dr. B. R. Ambedkar Konaseema District

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Abstract
The current investigation aims to determine the Water Quality Index (WQI) of Dr. B.R Ambedkar Konaseema District to assess water quality for public consumption, recreation, and other uses. Samples were collected from different locations within the Dr. B. R. Ambedkar Konaseema District. The Water Quality Index was calculated based on 11 physical -Bio-chemical parameters: pH, Chloride, Total Dissolved Solids, Total Hardness, Fluoride, Nitrate as Nitrogen, Sulphate, Sodium, Potassium, Calcium, and Magnesium. The primary aim of the WQI is to transform intricate water quality data into easily understandable information for the public. This is typically done using software like ArcGIS for specialized distribution. The analysis also involves comparing water quality standards set by the CPCB. It is recommended that all necessary precautions be taken.

Keywords*: Ground water, physical and chemical parameters, Water quality index (WQI), Spatial Distribution.*

Date of Submission: 27-05-2024 Date of acceptance: 08-06-2024

I. INTRODUCTION

Groundwater is often used by people for drinking, farming, and industrial uses. It is essential that we have a full

Understanding of the geochemical procedures that govern the organic configuration of groundwater. It is helpful to understand the hydro chemical schemes in many parts of the world. However, the quality of the ground water is declining due to heavy exploitation of ground water for domestic usage even though the water through surface source is available in abundant quantity. Surface and ground water are traditionally treated like independent units in water resource management strategies. But everyone cannot understand all the scientific or chemical terms in the reports, so water quality index solves this problem by giving a single value to describe the quality of the ground water. By water quality index anyone can understand the overall water quality by just a single value and its varying range. So that they can proceed for further testing and all if the quality is not good. This gives every individual a better understanding as it is very simple to understand a range than a table of chemical parameters.

The WQI converts water eminence factor phases interested in a numerical mark using logical tools, illuminating the typical condition of water physiques. Based on physical, chemical, and biological factors, WQI may be evaluated. The purpose of the idea of water quality is to listed water according to the degree of concentration.

Study area of this work Dr. B. R. Ambedkar Konaseema district is situated in the delta of the Godavari River. The land in this region is considered highly fertile, and its economy is primarily based on agriculture, especially with a focus on rice and coconut cultivation. Mangrove forests are present in the northeast of the district. Apart from the Ramachandrapuram revenue division, the district lies between the two branches of the Godavari River. The Godavari divides into two components, namely Gautami and Vasishta, forming an island which is called Konaseema.[1] This district is surrounded to the north by East Godavari district, south by the Bay of Bengal, east by Kakinada district and west by West Godavari district.[1] Konaseema district is a proposed district in the Indian state of Andhra Pradesh. With Amalapuram as its administrative headquarters, it was proposed on 26 January 2022 to become one of the resultant twenty-six districts of the state once a final notification is issued by the government of Andhra Pradesh. The district would be formed from Amalapuram and Ramachandrapuram revenue divisions from East Godavari district.The Godavari delta is surrounded by the tributaries of Vruddha Godavari, Vasishta Godavari, Gautami and Nilarevu. [3] After crossing the city of Rajahmundry, the Godavari River bifurcates into two distributaries, the Vruddha Gautami (Gautami Godavari) and the Vasishta Godavari, which then further splits into the Gautami and the Nilarevu. Similarly, the Vasishta splits into two branches, the Vasishta and the Vainateya. These branches form delta 170 km (105 mi) long along the coast of the Bay of Bengal. This delta makes up the Konaseema region. Amalapuram is the largest town in Konaseema, followed by Razole, Ravulapalem, Kothapeta, and Mummidivaram.[3] The study has been carried out at 33 locations in Dr.B.R.Ambedkar Konaseema District. The samples were collected from various parts of the district covering all sides of the district. The locations are Ainavilli, Krapa, Alamuru, Choppella, Allavaram, Amalapuram, Ambajipeta, Pulletikurru, Athreyapuram, Ryali, Kesinakurrupalem, T.Kothapalli, Kotipalli, Pekeru, Teki, Vedurumudi, Katrenikona, Pallamkurru, Lakkavaram, Malikipuram, Mamidikuduru, Mandapeta, Mummidivaram, Lankala Gannavaram, Ramachandrapuram, Venkatayyapalem, Gopalapuram 1, Gopalapuram 2, Ravulapalem, Katrenipadu, Razole, Antharvedi, Uppalaguptam.

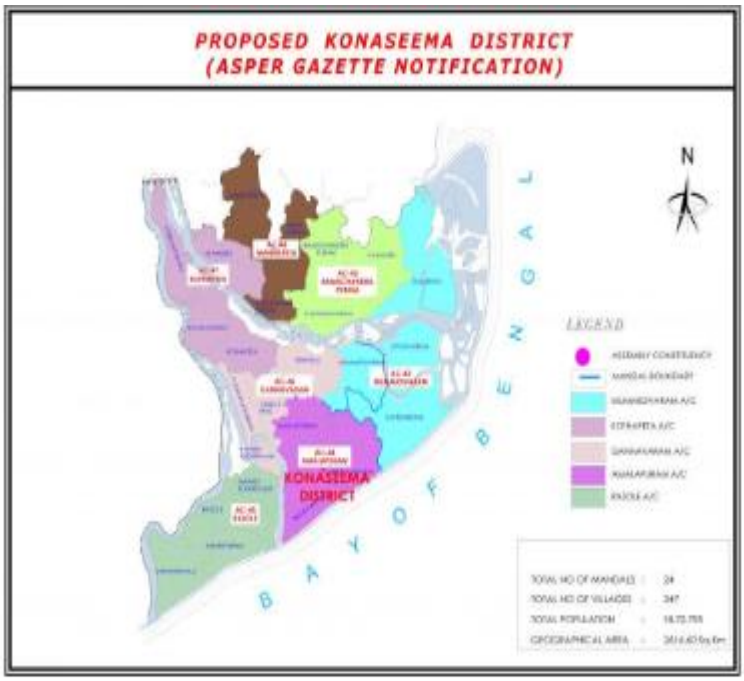

Fig 1 Map of Dr.B.R.Konaseema District

1.1 Spatial Distribution through ArcGIS

Spatial analysis is the process by which we turn raw data into useful information. Here we collect the samples of parameters from different places and calculate their values. we calculate spatial distribution of parameters using IDW (inverse distance weightage) method in given area. The spatial auto-correction is the underlying assumption of inverse distance weightage. IDW interpretation exactly assumes that things that are close to one and another are more alike that are farther apart. To predict a value for any unmeasured location. IDW uses the measured values surrounding the prediction location.

1.2 Objectives Of Study

1. This investigation will be used for infrastructure planning and development.
2. This investigation determines water supply sustainability.
3. It helps with community health improvement.
4. This analysis can be used for sustainable agriculture and land use practices.
5. It helps in addressing emerging contaminants.
6. It helps with groundwater monitoring assessment.

1.3 Scope Of The Study

1. It is applicable to ground water only.
2. The study area is limited to Dr.B.R.Ambedkar konaseema district.
3. The study is limited to physical and chemical parameters of ground water.
4. The study is carried out for only piezometric wells.
5. The study is applicable for pre monsoon data.

II. DATA AND METHODOLOGY

The study of ground water has been carried out in 33 locations of Konaseema district. The samples were collected from various parts of the district during May of 2023. The samples range from S1-S33. Water Samples were collected during pre-monsoon to determine the Water Quality Index (WQI) of a coastal water body in Dr. B.R Ambedkar Konaseema District. There are mainly 11 parameters were tested in this study, they are separated by the category of physical and chemical parameters. For each parameter a specific test and procedure is to be conducted. The following are the parameters that we used to calculate the water quality index of Dr.B.R.Ambedkar Konaseema district. pH, Total Dissolved Solids, Total Hardness, Fluoride, Nitrate, Sulphate, Sodium, Potassium, Calcium, Magnesium, Chloride. The data is collected from Ground Water And Water Audit Department, Dowlaiswaram, Rajamahendravaram, Andhra Pradesh.

Table 1: WATER QUALITY LEVEL II LAB, GROUND WATER AND WATER AUDIT DEPARTMENT, DOWLAISWARAM, RAJAMAHENDRAVARAM.

ANALYTICAL REPORT OF WATER SAMPLES RECEIVED FROM THE DISTRICT GROUND WATER OFFICER, GROUND WATER AND WATER AUDIT DEPARTMENT, AMALAPURAM, COLLECTED FROM PIEZOMETERS IN KONASEEMA DISTRICT DURING PRE-MONSOON 2023												
S.No	**Village**	**P^H**	**Tds**	**Cl**	**F**	**NO_3**	**SO_4**	**Na**	**K**	**Ca**	**Mg**	**T.H.**
				ppm								
1	Ainavilli	7.48	1677.4	640	0.46	2.2	175	305	20	72	112	640
2	Krapa	7.76	693.12	160	1.24	2	47.6	163	18	32	19	160
3	Alamuru	7.58	483.2	80	0.39	3	43.6	42.6	3.4	72	24	280
4	Choppella	8.19	295.68	40	0.37	1.3	44.6	43.6	9.5	24	15	120
5	Allavaram	7.63	816.64	100	0.4	1	101	137	140	40	15	160
6	Amalapuram	8.07	152.96	30	0.42	1.7	24	15.4	5.5	24	4.9	80
7	Ambajipeta	7.70	528.64	160	0.35	10	46	94	42	24	24	160
8	Pulletikurru	8.12	545.92	60	1.82	0.7	64	111	18	32	24	180
9	Athreyapuram	7.73	343.68	80	0.41	0.2	70	29.6	21	48	15	180
10	Ryali	8.67	211.2	10	0.45	0.2	28	42.7	7.3	8	9.7	60
11	Kesinakurru palem	8.20	1386.9	420	0.83	1.2	49.4	353	42	32	39	240

12	T.kothapalli	8.46	12800	5800	1	7.6	317	3978	164	320	292	2000
13	Kotipalli	8.61	421.76	80	0.63	3.4	99.8	98	26	8	15	80
14	Pekeru	7.5	3714.6	1650	0.83	0.2	148	1142	34	168	44	600
15	Teki	8.91	2281	620	0.25	1	73	585	215	16	4.9	60
16	Vedurumudi	8.26	771.2	60	1.82	0.7	71.4	184	27	24	24	160
17	Katrenikona	8.51	13225	7600	1.32	8.3	213	4125	65	160	126	920
18	Pallamkurru	8.39	5942.4	2000	1.03	5.5	912	1945	35	200	24	600
19	Lakkavaram	8.03	380.8	50	0.64	0.3	33.2	25	5.8	32	39	240
20	Malkipuram	7.95	7027.2	2900	0.96	2.3	99.2	1954	96	240	49	800
21	Mamidikuduru	8.37	7955.2	3600	1.57	9.8	51.2	2542	93	160	44	580
22	Mandapet	7.55	399.36	50	0.59	7.8	61.4	50.2	14	40	24	200
23	Mummidivaram	8.16	1481.6	480	0.4	3.5	32.4	395	14	24	58	300
24	Lankala Gannavarm	8.25	154.88	30	0.41	1	17	19.9	5.3	16	4.9	60
25	Ramachandrapuram	8.16	250.88	30	0.1	2.7	49.6	47.2	12	16	9.7	80
26	Venkatayapalem	7.47	1198.1	270	0.19	1.3	134	205	41	40	83	440
27	Gopalpuram 1	8.49	2542.1	620	0.76	13	31.2	789	19	32	44	260
28	Gopalpuram 2	7.63	1041.3	180	0.1	2.1	89.4	233	26	24	49	260
29	Ravulapalem	7.72	1930.9	530	0.05	5.2	54.2	381	7	40	136	660
30	Katrenipadu	8.12	1033	240	0.45	1.9	71.4	180	28	64	53	380
31	Razole	7.7	410.24	50	0.08	2	50.4	32.8	7	64	19	240
32	Antharvedhi	8.41	5921.3	2700	0.14	10	214	1082	160	80	442	2020
33	Uppalaguptam	8.17	10202	5000	0.55	2	371	2135	25	320	632	3400

III. RESULTS

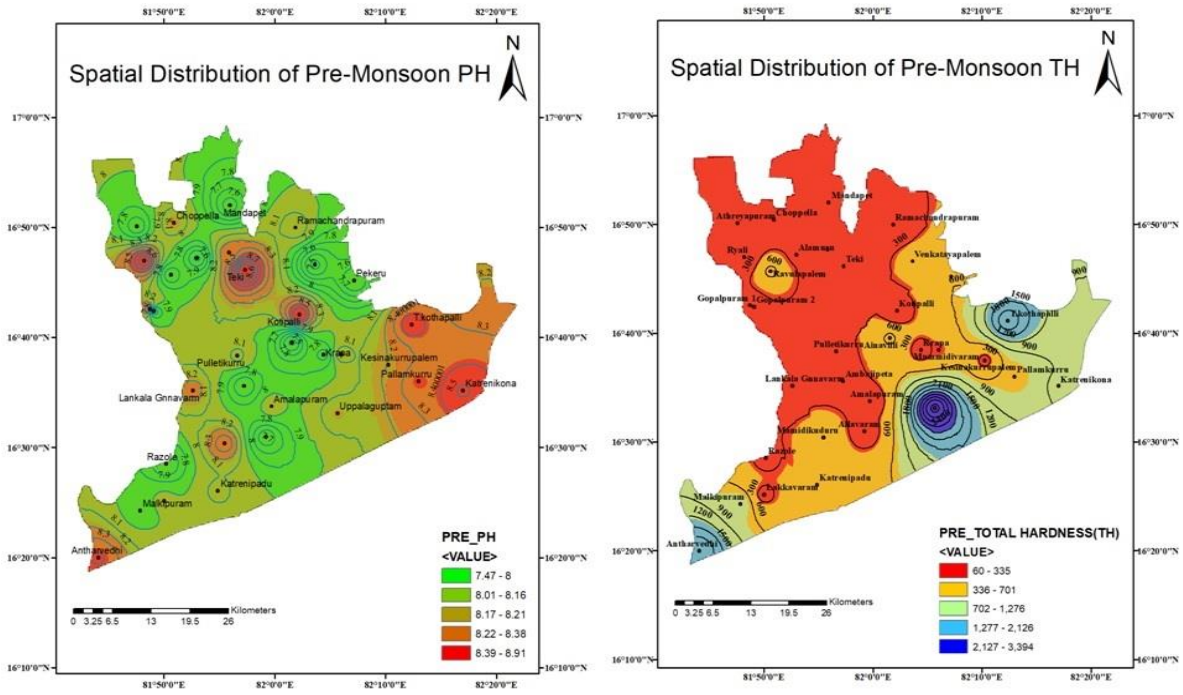

Figure 2 Spatial distribution of pH and Total hardness

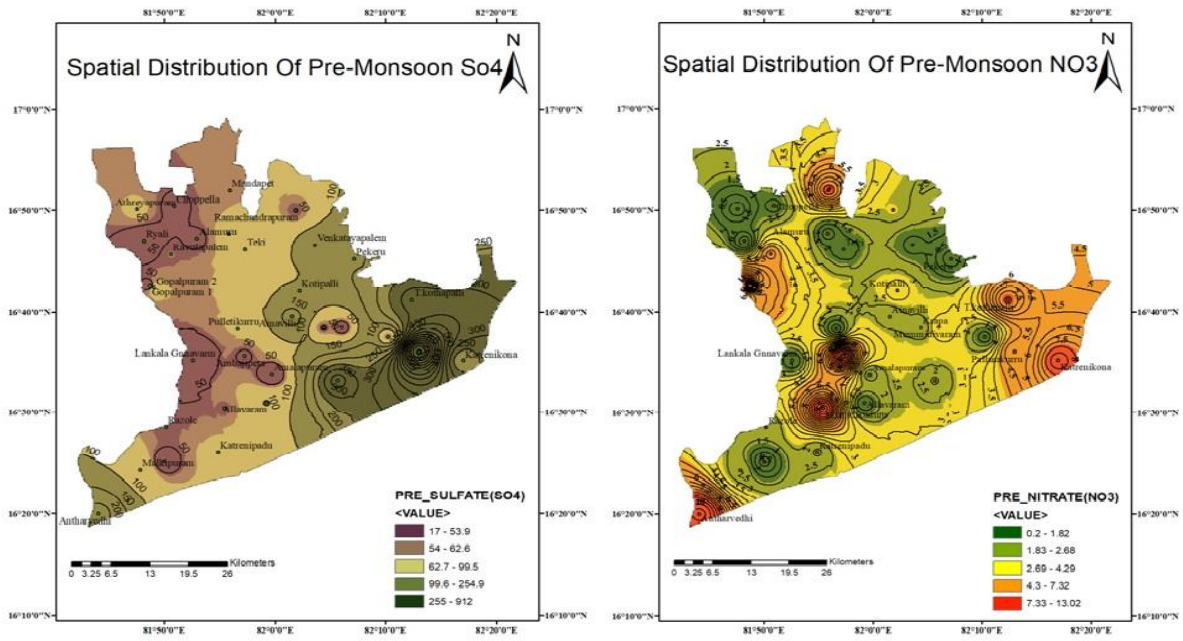

Figure 3 Spatial distribution of Sulfate (SO_4) and total Nitrate(NH_3)

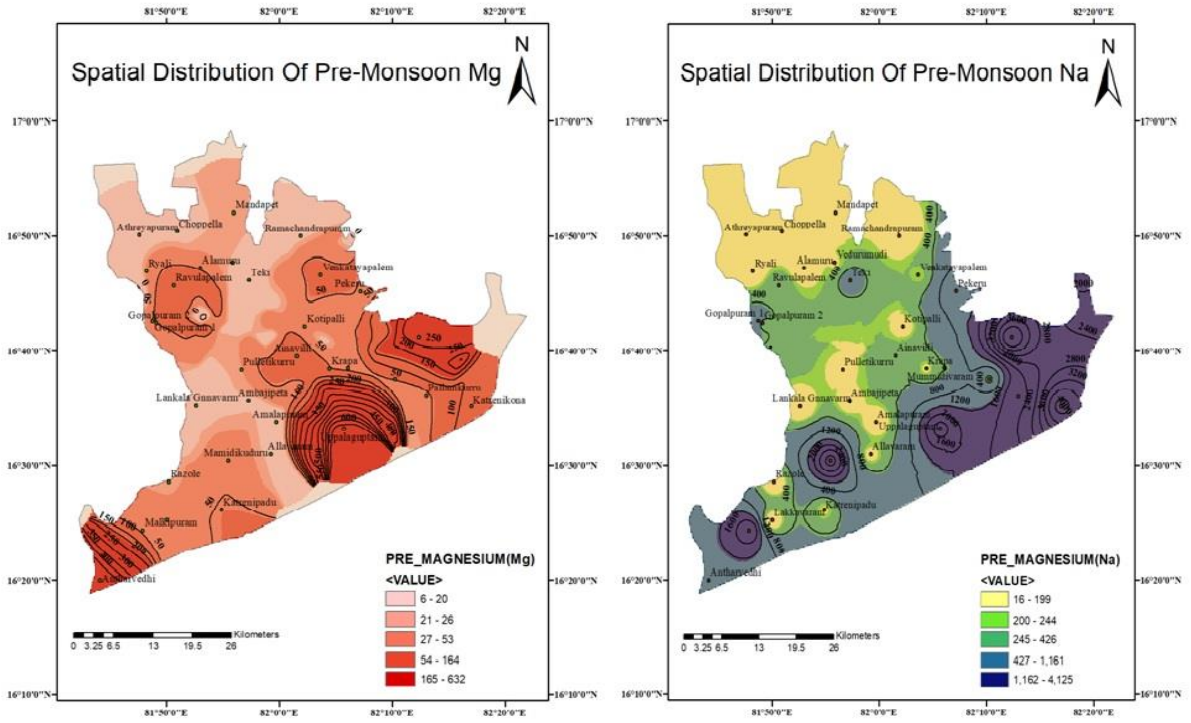

Figure 4 Spatial distribution of Magnesium (Mg) and Sodium(N)

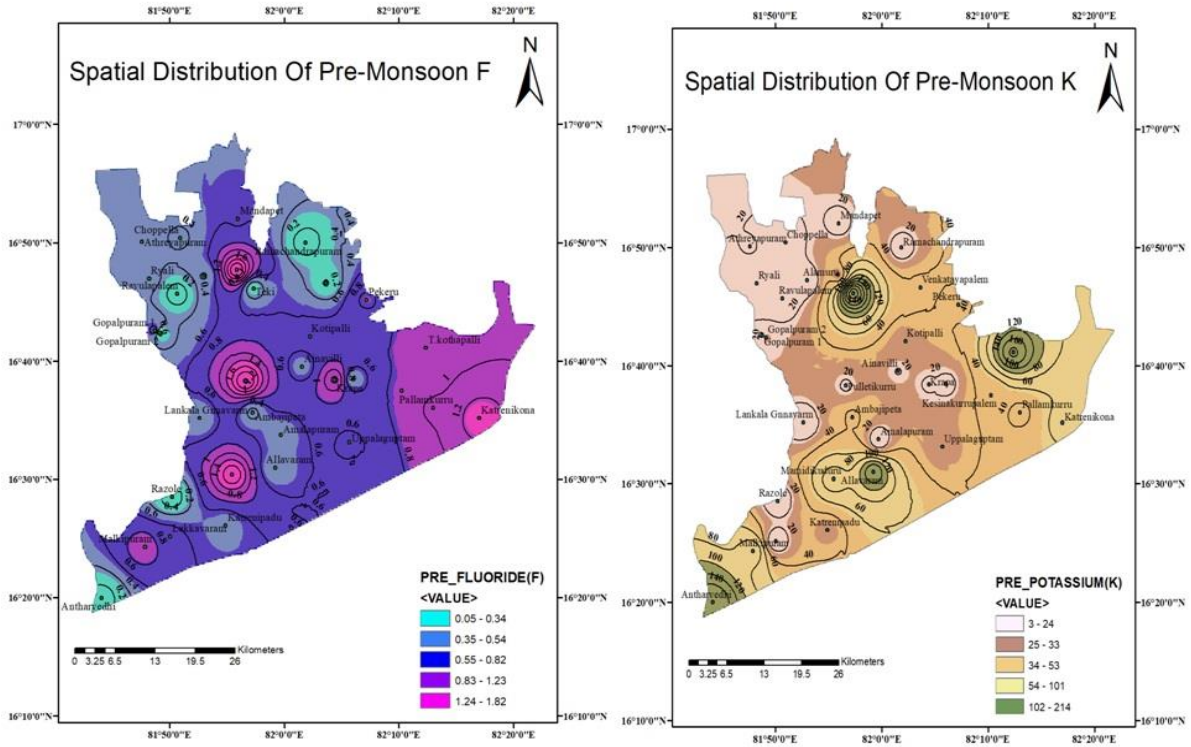

Figure 5 Spatial distribution of Fluoride (F) and Potassium (K)

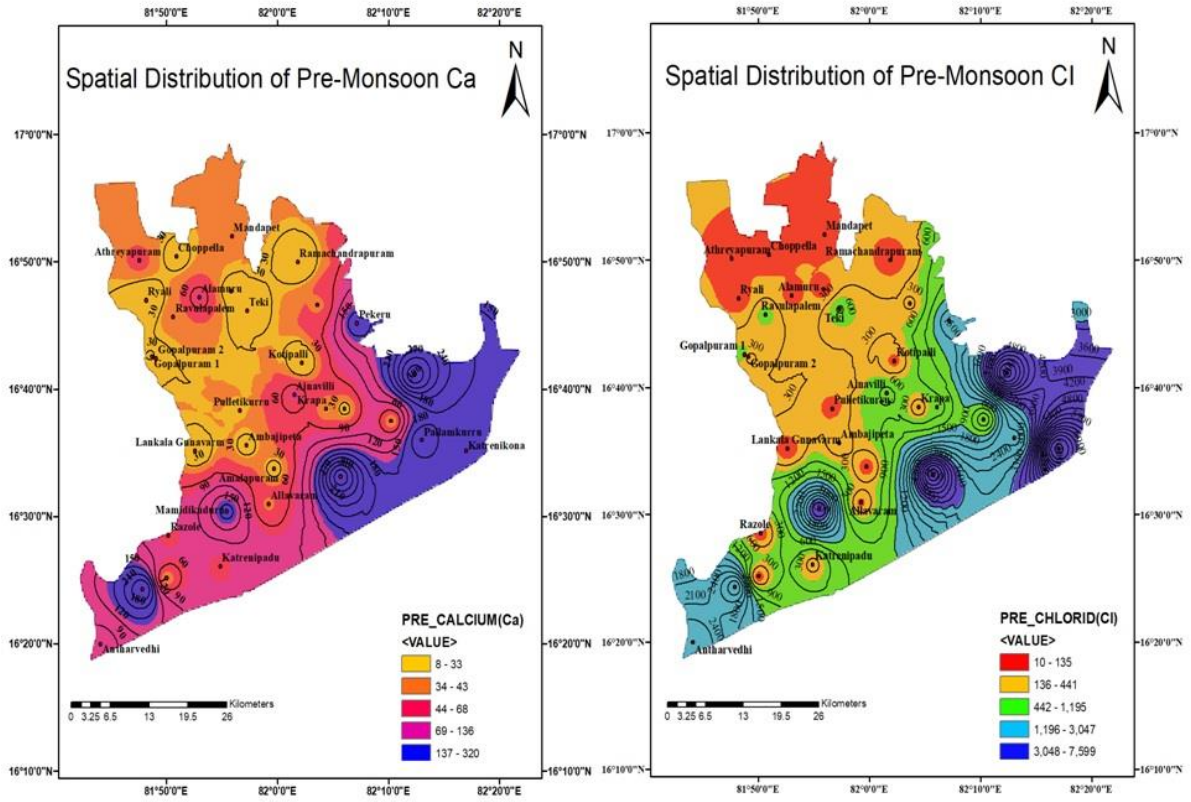

Figure 6 Spatial distribution of Calcium (Ca) and Chloride (Cl)

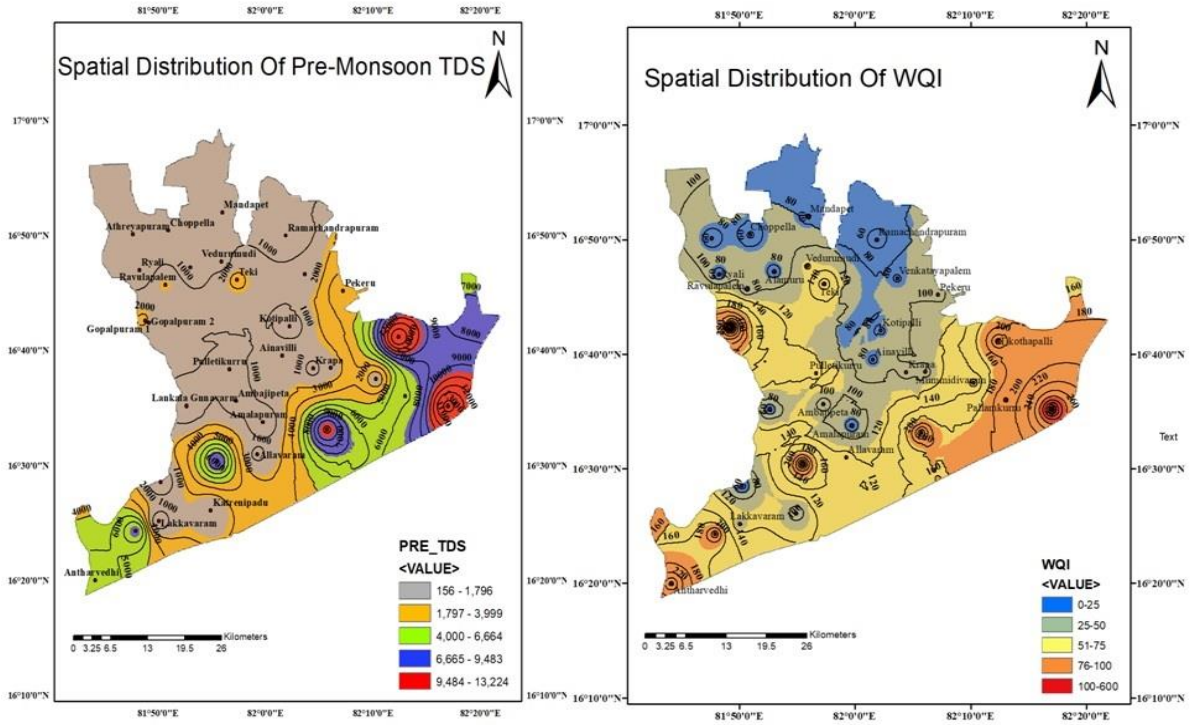

Figure 7 Spatial distribution of TDS and Water Quality Index

IV. CONCLUSIONS

This study demonstrated that the variation of water quality index with respect to seasons (i.e) pre monsoon for groundwater within the mandal areas of konaseema district results interpreted in terms of spatial distribution mapfor the year of MAY of 2023. The analysis of the results drawn at various parameters of the work entire area of konaseema district.

1. The water quality index and designed the spatial distribution maps by interpreting the data in ArcGIS software for the entire area of Dr. B. R. Ambedkarkonaseema District.
2. Mainly TDS content is very high compared to the standard values in 13 areas. Along with the TDS, some other parameters also exceed their standard values limits. Parameters like chlorine nitrate, sodium, sulphate are relatively high.
3. Katrenikona is having the higher values of TDS causes the water in that village is unfit for drinking purposes.
4. Higher values of Chlorine content in some particular villages are found in T.kothapalli.
5. Sodium content is also relatively higher than its limits in some villages of 25 katrenikona.
6. Therefore, the following are the above mentioned 13 areas along with their WQI values which are unsuitable for drinking water based on the standard WQI: Allavaram (136.3), Pulletikuru (124.5) , T.kothapalli (246.80) , Pekeru (186.76) , Vedurumudi (130.25) , Katrenikona (382.369) , Pallamkuru (206.50) , Malkipuram (235.553) , Mamidikuduru (308.884) ,Gopalapuram-1 (112.42),Gopalapuram-2 (519.20) , Antharvedi (256.48) , Uppalguptham (268.43).
7. WQI values shows that the water in areas like krapa, katrenikona, lakkavaram are comes under very poor category and unfit for drinking purposes.
8. Water Quality parameters like sulphate, calcium, magnesium, sodium, values in these villages are far more differ than the standard values for krapa.
9. As per the Water Quality Index, The values of WQI in Razole are in the permissible limits, which is shown in the table 39 Razole. The water quality in these two areas is suitable for drinking purposes according to the WQI.

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