Data in brief 28 (2020) 104872

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Data on application of water quality index method for appraisal of water quality in around cement industrial corridor, Yerraguntla Mandal, Y.S.R District, A.P South India

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ARTICLE INFO

Article history:
Received 5 November 2019
Accepted 18 November 2019
Available online 23 November 2019

Keywords:
Water quality index
Drinking water
Cement industry
Groundwater

ABSTRACT

The present paper aims at determining the status and trends of groundwater quality by applying water quality index method from 22 villages around Cement industries, Yerraguntla Mandal, Y.S.R District, A. P South India. Water Quality Index (WQI) was calculated from fourteen physicochemical parameters like pH, EC, TDS, Total hardness, Total alkalinity, Sodium, potassium, Calcium, Magnesium, chloride, Bromide, nitrate, sulphate and fluoride. The computed WQI values range from 123 to 1121 and water quality varies from poor water to water unsuitable for drinking. Most of the groundwater from this place is not suitable for drinking.

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https://doi.org/10.1016/j.dib.2019.104872

Subject area	Hydro Chemistry
More specific subject area	Water Quality
Type of data	Tables and figures
How data was acquired	40 Ground Water Samples were collected in different Bore wells at; Yerraguntla Mandal, Y.S.R District, A. P and analyzed for pH, Electrical; Conductivity, Total dissolved solids, Total Hardness, Total alkalinity; Calcium, Magnesium, Potassium, Sodium, Chloride, Bromide, Sulphate; and Fluoride. WQI was calculated using relative weight method WHO; Water quality Standards.
Data format	Raw and analyzed
Experimental Factors	Samples of ground water were collected in 2 L bottles and stored in dark room under specified conditions.
Experimental features.	To analyze the concentration levels of various physico chemical Parameters using standard methods.
Data source Location	Yerraguntla Mandal, Y.S.R Kadapa District
Data accessibility	Data is included in this Article

Value of the data

- The data presented is used to calculate water quality index which helps in assessment of groundwater around mining areas, as the water contaminated with mine wastes are used by local community for drinking purpose can cause serious health impacts in this area, quality assessment of groundwater helps in taking necessary steps to avoid using contaminated water.
- Increased knowledge of water quality enables in understanding hydrochemcial systems, this data will guide in effective planning and mitigation measures in limestone mining areas and aids in sustainable development of groundwater.
- Limited published studies on water quality around Yerraguntla limestone mining area, the data will be useful in taking suitable measures for the Government and other policy makers in supplying safe drinking water to the local people in this area.

1. Data

1.1. Study area

Yerraguntla, Kadapa is located between North Latitudes 14°35′ 17.2″-N 14°° 44′ 38.4″ and East Longitudes 78°27′38.4″ - 78°34′39.3″ (Fig. 1) and it forms part of the Lower Cuddapah super group comprising Papaghni and Chitravati groups. These are mainly argillaceous with subordinate calcareous sediments.

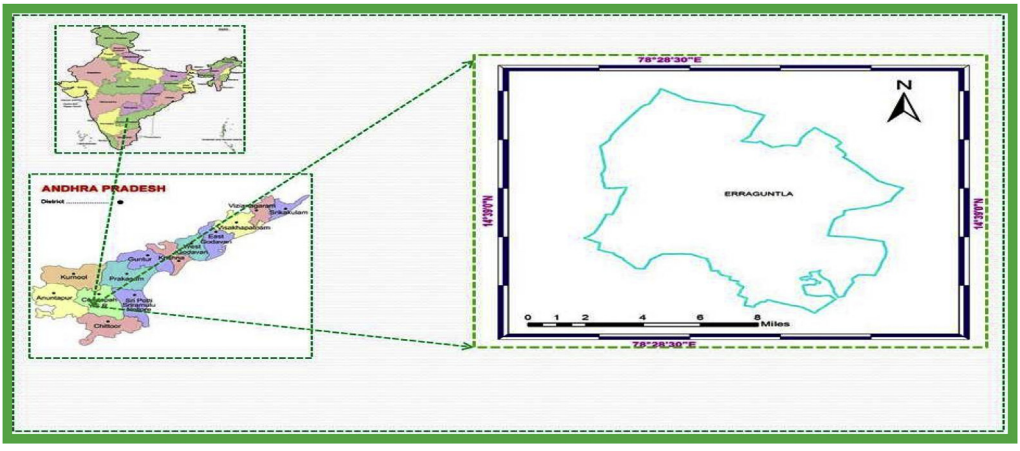

Fig. 1. Study area map.

Geologically it consists of conglomerate, quartzite, quartzite with shale formation, dolomitic lime stones (Fig. 2). The total annual rainfall is 730.7 mm [12].

1.2. Data

Groundwater sample analysis data is shown in Table 1 and its statistical summary is shown in Table 2, Fig. 3. Relative weight of each parameter is shown in Table 3. Correlation matrix between the physicochemical parameters is shown in Table 4. WQI of ground water at each sampling point is shown in Table 5, Fig. 4. Table 6 deals with classification of drinking water quality. 35% of groundwater samples are unsuitable for drinking and another 35% of samples are very poor water and remaining 30% of samples are of poor category.

2. Experimental design, methods and materials

2.1. Materials and methods

Forty groundwater Samples from bore/hand pumps were collected in 2 L polythene water bottles from 22 different villages of Yerraguntla Mandal during September 2018 and necessary precautions were taken to avoid contamination [1]. Samples were analyzed as per standard procedures APHA [1]. Each of the groundwater samples was analyzed for 14 parameters pH and EC are determined by pH meter, conductivity meter, TDS are determined by indirect method Total Hardness, Ca^{2+}, Mg^{2+}, CO_3^{2-},HCO_3^{-} and Cl^{-} are determined by titrimetry, F^{-} is determined by using ion selective electrode (Orion 4 star ion meter, Model: pH/ISE). (Table 1). The analyzed data were compared to the WHO recommended standards [2] and water classification or drinking purpose has been made.

2.2. Analytical procedures

WQI was calculated using the World Health Organization standards [2] and Indian Standards [3] in the following steps. Water quality index method for groundwater quality assessment is widely used

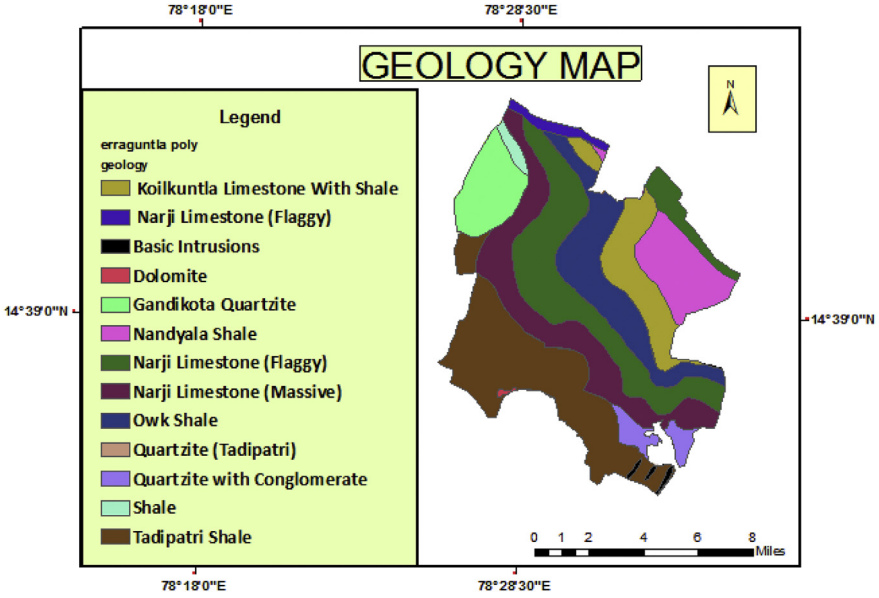

Fig. 2. Geology map of the yerraguntla Area.

Table 1
Data of the groundwater sample analysis.

S.No	P^H	EC μs/cm	TDS mg/L	TH mg/L	Ca^{2+} mg/L	Mg^{2+} mg/L	TA mg/L	K^+ mg/L	Na^+ mg/L	Cl^- mg/L	Br^- mg/L	NO_3^- mg/L	So_4^{2-} mg/L	F^- mg/L
1	7.52	5620	2600	520	80	107	732	75	251	405	0.54	66	586	1.09
2	7.9	4270	2060	580	88	119	486	82	230	430	0.43	68	65	1.3
3	7.51	2700	1350	600	72	128	304	80	128	350	0.33	64	89	1.8
4	8.17	3030	1450	200	32	41	670	0.34	22	430	0.21	60	45	2.3
5	8.2	3380	1700	100	112	3	998	0.25	229	77	0.13	153	86	5.81
6	7.8	4880	2300	320	48	66	1340	0.34	245	70	0.58	130	60	2.82
7	7.2	6200	3130	640	48	144	961	4.53	285	68	0.65	288	216	2.72
8	7.69	7200	3480	920	64	208	606	4.01	235	700	2.06	26	514	1.78
9	7.2	5480	2640	760	96	161	450	4.5	65	720	1.9	25	240	1.94
10	7.9	2420	1160	720	64	159	657	5.53	77	92	0.64	247	189	1.26
11	7.8	1790	860	280	32	60	779	5.6	57	110	0.8	34	120	2.3
12	7.4	5970	2800	860	144	174	987	9.41	170	581	0.9	134	405	1
13	7.6	6170	2970	1000	88	222	756	10.24	140	520	1.2	35	430	1.2
14	7.3	9580	4580	1080	104	237	889	6.75	308	635	2.37	2.2	391	1.06
15	7.6	6820	3280	940	136	195	424	7.6	320	650	2.2	8.2	340	1.3
16	7.3	6280	3020	520	72	109	668	54	310	670	2.4	2.4	320	1.4
17	7.8	2470	1190	200	24	43	666	60	280	690	2.3	5.8	46	0.9
18	8.05	7200	3510	340	40	73	914	71	314	249	0.04	3.09	90	0.69
19	7.7	1380	660	180	48	32	351	65	320	230	1.2	7	70	0.73
20	7.8	4090	1900	320	40	68	608	70	230	260	0.8	8.2	230	1.57
21	7.9	3210	1610	320	24	72	559	56	350	180	0.23	9	220	1.6
22	7.4	6550	3060	300	64	57	865.2	5.80	347	300	0.34	10	295	1.6
23	7.6	3560	1720	460	56	98	548	8.6	430	150	0.42	10.2	120	0.99
24	7.6	2900	1400	360	104	62	463	1.69	60	95	0.15	16.6	131	1.11
25	7.6	3150	1520	280	48	56	560	2.4	68	130	0.23	12.4	110	0.9
26	7.67	2720	1310	200	64	33	572	6.8	65	120	0.45	8.4	120	1.31
27	7.3	4070	1970	340	88	61	633	6.19	175	116	0.69	9.2	143	1.53
28	8	1730	830	220	32	46	450	7.8	134	120	0.7	10.4	430	0.66
29	7.66	15800	7700	1600	344	305	608	85	546	479	0.89	28.1	516	0.99
30	7.1	12800	6070	960	200	185	767	90	560	340	1.2	34	450	0.49
31	8.12	2490	1070	240	64	43	352	3.86	66	664	2.95	103	416	3.17
32	8.17	2340	1130	200	48	37	487	2.88	88	1049	4.34	533	361	1.1
33	7.96	1910	920	220	64	38	303	8.3	89	1300	3.2	23	230	0.9
34	8.1	6620	3150	500	112	94	499	8.9	340	1200	0.11	36	240	0.78
35	8.03	9320	4550	640	120	126	597	2.59	433	1776	3.63	751	1280	1.08
36	7.79	6300	3060	380	136	59	694	10.9	258	737	2.11	101	1252	0.6
37	7.63	4010	1940	540	80	112	609	12.4	220	540	1.82	56	1100	1.7
38	7.37	5240	2520	480	24	111	695	16	210	560	1.76	54	1230	1.8
39	7.31	5440	2630	640	96	132	687	15.8	230	580	1.65	58	890	2.9
40	8.31	2280	1110	240	224	3.8	292	16.8	21	620	1.45	62	900	0.8

Table 2
Statistical parameters of Vemula region.

Parameter	Mean	Median	Maximum	Minimum	Standard Deviation
PH	7.7	7.68	8.31	7.1	0.314777496
EC	4984	4180	15800	1380	3012.272238
TDS	2398	2015	7700	660	1454.660922
TH	505	420	1600	100	317.6758548
Calcium	85.6	68	344	24	61.25391
Magnesium	102	83.59	305	2.916	68.62743
Potassium	24.6	8.45	90	0.257	30.2840884
Sodium	227.5	230	560	22.32	132.1742089
Chloride	475	430	1776	68.02	374.7269255
Bromide	1.25	0.845	4.34	0.04	1.063643954
Nitrate	82	34.21	751.15	2.29	146.6325879
Sulphate	374	240	1280.65	45.2	350.4179124
Total alkalinity	637	608.8	1340.4	292.4	218.3857411
Fluoride	1.52	1.28	5.81	0.49	0.962059623

*Note: All parameters are expressed in mg/L, except pH, EC in μs/cm.

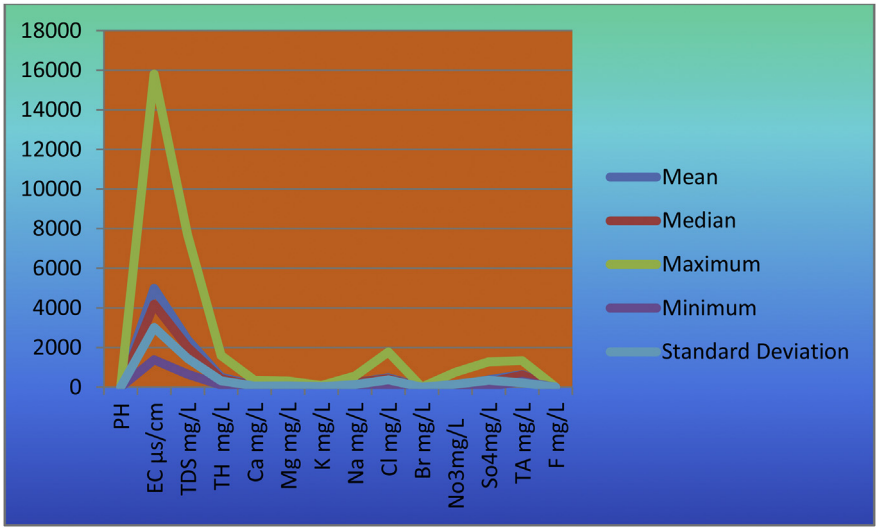

Fig. 3. Statistical parameters study area.

around the world for assessment & management of groundwater [4–7]. The WQI calculation was carried out using a weighted arithmetic index as shown below [8].

The WQI calculations include three successive steps [9–11] The first step is "assigning weight" each of the 14 parameters has been assigned a weight (wi) according to its relative importance in the overall quality of drinking water as shown in Table 2. The second step is the "relative weight calculation" calcul1ated by following equation

$$Wi = wi \Big/ \sum_{i=1}^{n} wi$$

The third step is "quality rating (qi)" calculated by following equation

Table 3
Relative Weight per parameter.

Parameter	Weight(wi)	Relative weight(Wi)	Si	Ci	Qi	SIi	WQI
PH	3	0.06122449	8	7.52	94	5.755102	303.91
EC	4	0.081632653	1500	5620	374.6667	30.58503	
TDS	2	0.040816327	600	2600	433.3333	17.68707	
TH	2	0.040816327	500	520	104	4.244898	
Calcium	3	0.06122449	75	80	106.6667	6.530612	
Magnesium	3	0.06122449	50	106.92	213.84	13.09224	
Potassium	3	0.06122449	12	75.004	625.0333	38.26735	
Sodium	3	0.06122449	200	251.108	125.554	7.68698	
Chloride	3	0.06122449	200	405.01	202.505	12.39827	
Bromide	4	0.081632653	0.5	0.54	108	8.816327	
Nitrate	5	0.102040816	10	66.4	664	67.7551	
Sulphate	5	0.102040816	250	586.21	234.484	23.92694	
Total alkalinity	4	0.081632653	100	732	732	59.7551	
Fluoride	5	0.102040816	1.5	1.09	72.66667	7.414966	
	49	1				303.916	

*Note: All parameters are expressed in mg/L, except pH, EC in μs/cm.

Table 4
Correlation matrix between the physicochemical parameters.

	P^H	EC μs/cm	TDS mg/L	TH mg/L	Ca^{2+} mg/L	Mg^{2+} mg/L	K^+ mg/L	Na^+ mg/L	Cl^-mg/L	Br^-mg/L	NO_3^-mg/L	SO_4^{2-} mg/L	TA mg/L	F^-mg/L
P^H	1													
EC μs/cm	−0.39127	1												
TDS mg/L	−0.38705	0.999341	1											
TH mg/L	−0.47645	0.802933	0.804505	1										
Ca^{2+} mg/L	−0.07992	0.672195	0.674024	0.626805	1									
Mg^{2+} mg/L	−0.51515	0.756221	0.757709	0.986119	0.489106	1								
K^+ mg/L	−0.13046	0.296898	0.295262	0.209841	0.215173	0.187612	1							
Na^+ mg/L	−0.22094	0.723417	0.725512	0.446068	0.469563	0.399937	0.476414	1						
Cl^-mg/L	0.218805	0.238149	0.236355	0.163815	0.200567	0.138453	−0.126	0.136275	1					
Br^-mg/L	0.068581	0.077777	0.075367	0.090106	0.05091	0.088018	−0.19317	−0.00583	0.747906	1				
NO_3^-mg/L	0.272861	0.074239	0.083098	−0.00698	0.021632	−0.01149	−0.25155	0.038429	0.483659	0.474554	1			
SO_4^{2-} mg/L	−0.05054	0.30967	0.310233	0.224698	0.313957	0.18286	−0.13248	0.222757	0.492627	0.466541	0.333836	1		
TA mg/L	−0.24024	0.320557	0.318417	0.118878	−0.07167	0.152869	−0.11448	0.207517	−0.30651	−0.26539	0.08316	−0.06074	1	
F^- mg/L	0.100667	−0.18285	−0.17674	−0.2051	−0.16442	−0.18534	−0.29252	−0.21773	−0.24465	−0.11973	0.095508	−0.13173	0.354216	1

Table 5
WQI of ground water at each point of sampling.

sample No	WQI	Water quality status	sample No	WQI	Water quality status	sample No	WQI	Water quality status
1	303.91	Water Un Suitable	2	259.7	Very Poor Water	4	193.12	Poor Water
5	338.63	For Drinking	3	223.34		11	173.93	
6	346.06		8	280.75		19	140.31	
7	510.92		9	229.89		20	197.44	
10	397.89		13	270.42		21	171.11	
12	380.08		15	243.15		23	153.05	
14	304.32		16	260.19		24	125.96	
29	418.27		17	202.72		25	126.48	
30	375.62		18	224.72		26	126.12	
32	749.6		22	208.86		27	159.3	
35	1121.34		31	284.4		28	123.86	
36	368.04		34	234.5		33	197.17	
38	305.7		37	288.37				
39	313.01		40	234.01				

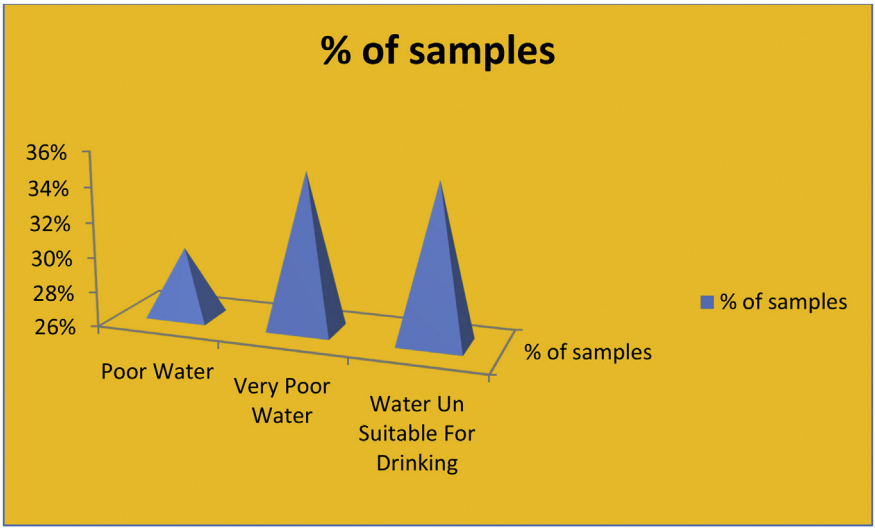

Fig. 4. Cone Chart of WQI at each sample location.

$$qi = \left(\frac{Ci}{Si}\right) \times 100$$

where Ci is the concentration of each parameter in each water sample, Si is the WHO standard value for each parameter. Finally, the Wi and qi are used to calculate the SIi for each parameters and then the WQI calculated from the following equation:

$$SIi = Wi \times qi$$

$$WQI = \sum_{i=1}^{n} SIi$$

where SIi is the sub index of each parameter.

Table 6
Drinking water quality classification.

Class	WQI	Water Quality Status	% of samples
I	<50	Excellent	Nil
II	51–100	Good	Nil
III	101–200	Poor Water	30%
IV	201–300	Very Poor Water	35%
V	>300	Water Un Suitable For Drinking	35%

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104872.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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