

# Qualitative Analysis of Groundwater for Zone1 of Visakhapatnam using RS and GIS

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**Abstract:-** Groundwater is one of the important water sources accounting over 80% of public water supplies in rural and urban areas. Groundwater is cheaper and less vulnerable to pollution than surface water. Improper disposal of wastes on land results in ground water contamination. Household chemicals, garbage landfills, industrial wastes, excessive usage of fertilizers and pesticides, leaking of underground oil storage tanks and pipelines, sewage sludge and septic systems are the major sources that causes contamination. In this connection, Remote Sensing and Geographic Information System(GIS) has become one of the leading tools in the field of hydrogeological science, which helps to assess, monitor and conserve the groundwater resources. The present study aimed at the generation of groundwater potential map through ground water quality assessment, of zone1 of Visakhapatnam, Andhra Pradesh, India. The study deals with the ground water quality, sources of ground water contamination and its variation. In this study the database is created which consists of satellite images and different maps using Survey of India Topographic sheets no. 65o5 and 65o6 on 1: 50,000 scale, with the help of ERDAS, QGIS2.18.14 and ARCGIS. Water quality index is calculated using weighted arithmetic sum method which renders the ground water pollution in the study area.

**Keywords:-** Ground Water, Remote Sensing & GIS, Water Quality Index.

## I. INTRODUCTION

Ground water is often abundant, which is highly useful and one of the major sources of domestic and industrial usage. Ground water also has ecological importance.

Pollutants in ground water are less identified than in surface waters. Improper disposal of wastes on land leads to ground water contamination. Wastes which are generated from residential, industrial, commercial and institutional areas are the major sources that causes pollution.

As the pollutant content in ground water is increasing day by day there should be a continuous monitoring of ground water quality which can be easily done using RS & GIS techniques. Hence, by employing RS&GIS as an efficient tool ground water potential mapping can be done to identify the source of the pollution.

## II. STUDY AREA:

The study area lies to the north east of Andhra Pradesh which covers an area of 115.1sqkm. It is covered by the SOI topographic sheets no.65o5,65o6 bounded between the 17°45' to 17°52' north latitudes and 83°13' to 83°26' east longitudes on 1: 50,000 scale. It is surrounded by kailasa hills on the south, kambalakonda hills on the west and Bay of Bengal on the east. The area exhibits an average rainfall of about 100.8cm and an average temperature of 27.8<sup>o</sup>c. The location of study area is shown in fig.1

## III. METHODOLOGY:

SOI topo sheets and satellite images are obtained from Survey of India and Google Earth respectively which are geo-referenced using QGIS. Water sampling locations are identified. The land use/cover map is generated and statistics are obtained for the study area to depict the influences on the ground water. With the help of latitude and longitude values, samples are collected in the areas which are identified for the study. Physico-chemical characteristics are identified by performing tests such as pH, Total Dissolved Solids (TDS), Dissolved oxygen (DO), Electrical Conductivity, Chlorides are performed and their results are tabulated in Table 1. The samples those are exceeding the IS standards are identified as harmful and non-potable for consumption. Maps are generated individually for all the parameters. The detailed methodology is shown in fig.2

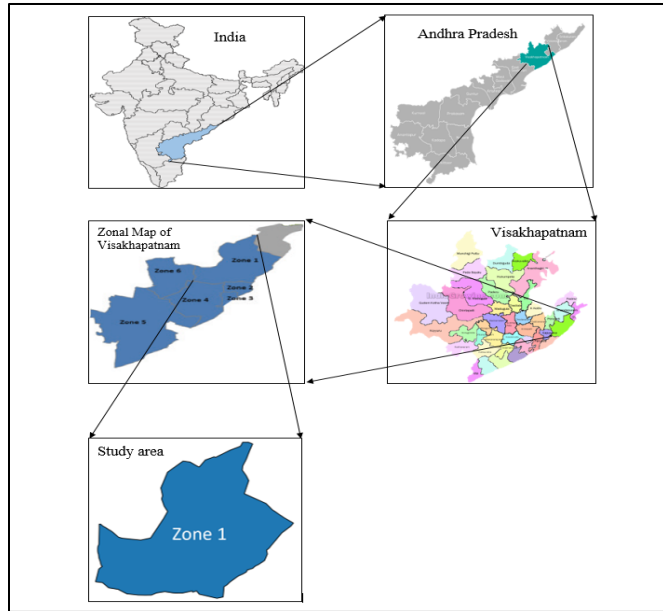


Fig.1:- location of study area

#### IV. RESULTS & DISCUSSIONS

About 72 samples were collected within the study area for every 1km buffer. Drinking water quality standards as per **IS 10500-1991** are taken into consideration. The samples were examined in the laboratory and the results obtained are as follows:

- 1) **pH** of water should be within **6.5-8.5**. If the pH value exceeds the specified limit, it leads to kidney diseases, memory problems and high blood pressure. The results are shown in the fig.3
- 2) **TDS** in water should not exceed **1000mg/lit**, if so it causes formation of scales, staining and affects taste. The results are shown in fig. 4
- 3) **CHLORIDES** in water should not exceed **250mg/lit**, if so it causes cancer, develops tumors in kidneys and intestine, irritation and skin burns, destroys tissues and cells within the body, increases the rate of asthma, leads to heart strokes and attacks. The results are shown in fig.5
- 4) **ELECTRICAL CONDUCTIVITY** in water should not exceed **1500 µs/cm**, if so it increases salinity in water. The results are shown in fig.6
- 5) **DISSOLVED OXYGEN** in water should lie within the range **4 - 7 ppm**. If doesn't lies between the limit it causes corrosion. The results are shown in fig.7.

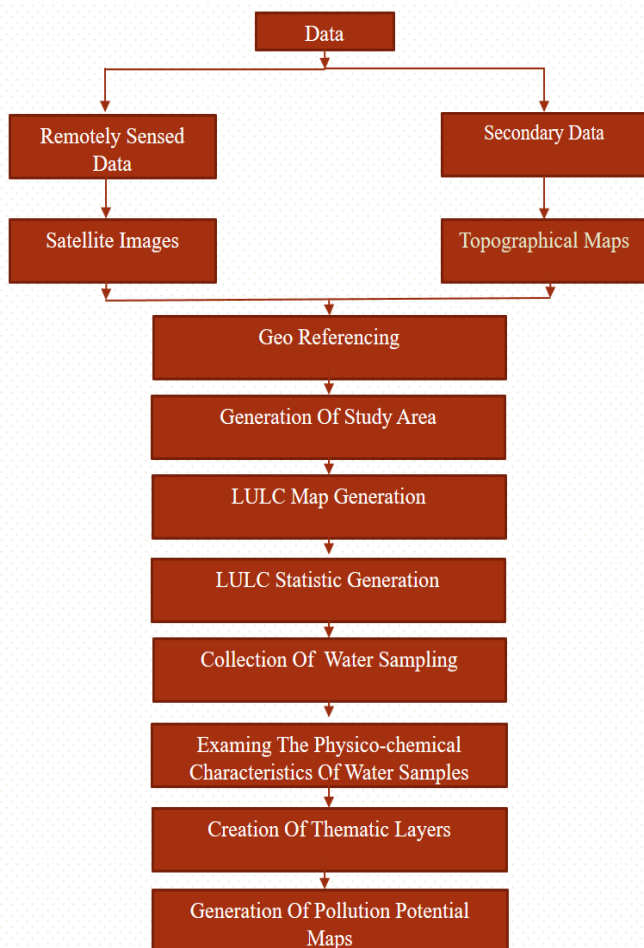


Fig. 2:- showing the methodology of the study

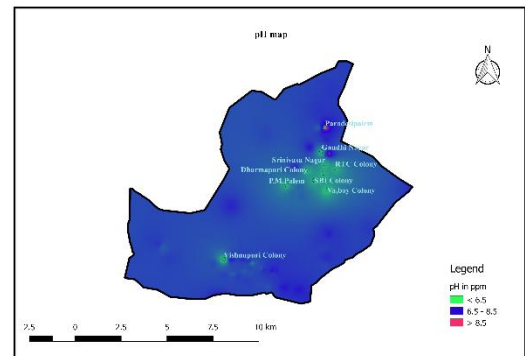


Fig. 3:- showing the pH content in the study area

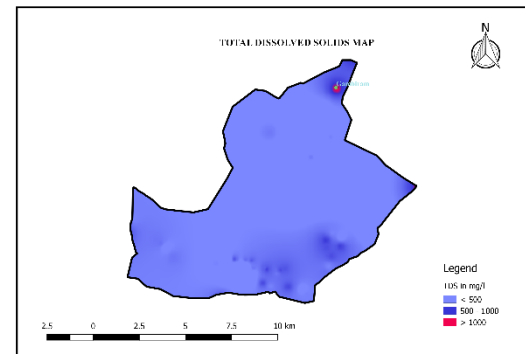


Fig. 4:- showing the TDS content in the study area

Sl.no	Locations	Chlorides	TDS	Conductivity	pH	DO
1	Arilova Sector-III, IV,V	98	239.5	525.2	7.31	5.3
2	Ramakrishnapuram	118	584	1002.3	7.48	5.21
3	Pineapple Colony	285	415	430.8	6.85	4.74
4	Adavivaram	242	512.8	863	7.25	4.76
5	Deenadayalapuram	126	425	892	7.42	4.72
6	BC Colony	132	541	984	6.53	5.21
7	Arilova Sector-I,II,III	98	239.5	525.2	7.31	5.3
8	Peddagadili	298	254	490.9	7.49	4.97
9	Thotagaruvu	217	426	843	7.12	5.48
10	vishnupuram colony	288	220	430	4.25	4.74
11	muddasarlova	298	517.8	987.2	7.25	4.76
12	sambhavanipalem	260.18	482	960	7.92	6.82
13	Adarshanagar	228	789.5	1731	8.01	6.29
14	Veterinary Colony	287	625.6	1321	8.24	6.32
15	Indiranagar	321	742.9	1398	7.6	6.51
16	Vivekananda Nagar	246	563	1162	7.42	6.17
17	Ravindranagar	198	721	1598	7.8	6.51
18	Hanumanthawaka	228	523.6	1148	7.09	6.6
19	SC Colony	245	512	1130	8.02	6.03
20	durga nagar	305	745	1589	8.12	5.23
21	Marikavalasa	182.3	470	943	7.1	6.2
22	Boravanipalem	140.2	428	856	7.62	4.68
23	Kommadi	195	560	1013	7.3	4.33
24	Bakkannapalem	256.24	476	952	7.85	6.76
25	Swatantra Nagar	206.24	476	958	9.2	4.68
26	P.M.Palem	116.25	196	392	5.18	7.4
27	gambiram	340	1146	1708	7.6	4.6
29	vambay colony	113.25	182	365	5	7.1
30	Paradesipalem	200	490	980	9.6	4.8
31	gandhi nagar	194.4	556	1113	7.34	4.82
32	kommadi village	152.6	344	690	8.17	6.04
33	Yendada	356	987	1725	7.6	4.2
34	Sagarnagar	212	507	755	7.32	4.1
35	Visalakshinagar	202	800.5	1740	8.22	6.78
36	Rushikonda	344	1142	1703	7.56	3.9

Table 1:- showing the test results of various parameters

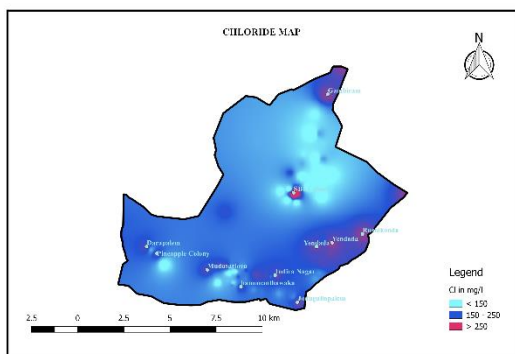


Fig. 5:- showing the chloride content in the study area

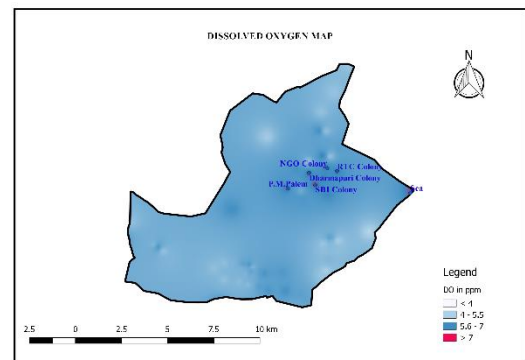


Fig. 6:- showing the DO content in the study area

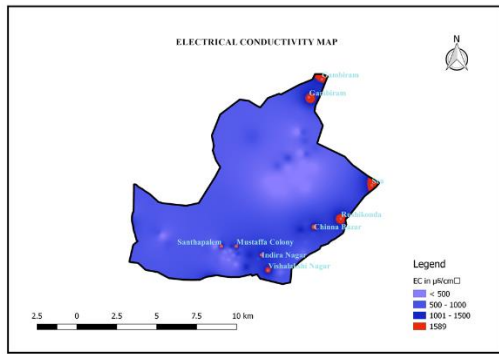


Fig 7:- showing the electrical conductivity content in the study area

## V. OBSERVATIONS & CONCLUSIONS

From the study it is found that:

- The areas of Paradesipalem, Gandhi Nagar, Srinivasa Nagar, RTC Colony, NGO Colony, SBI Colony, Vambay Colony, Dharmapuri Colony, PM Palem and Vishnupuri colony are exceeding the standards. High pH content of 9.6 is observed in Paradesipalem area and a low value of 4.25 is observed in areas of Vishnupuri colony.
- High TDS content of 1146 mg/lit is observed in areas of Gambiram.
- The areas of Gambiram, SBI Colony, Rushikonda, Yendada, Jodugullapalem, Indira Nagar, Hanumanthwaka, Mudasarlova, Pineapple Colony and Dharapalem are exceeding the Standards. High Chloride content of 356 mg/lit is observed in areas of Yendada.
- The areas of Gambiram, Rushikonda, Chinna Bazar, Vishalakshi Nagar, Indira Nagar, Mustafa Colony, Santha Palem are exceeding the limits. High Electrical Conductivity content of 1740  $\mu\text{c}/\text{cm}$  is observed in the areas of Vishalakshi Nagar.
- The areas of Dharamapuri Colony, NGO Colony, P.M.Palem, SBI Colony, RTC Colony are exceeding the Standards. High DO of 7.5 ppm is observed in the areas of Dharamapuri Colony and a low DO of 3.9 ppm is observed at Rushikonda.

From the above observations it can be concluded that the areas of Gambiram, Vishalakshi Nagar, SBI Colony and Rushikonda are highly susceptible to pollution. Hence, unfit for consumption.

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