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GEOCHEMICAL ASSESSMENT OF GROUND WATER AROUND PEDDAPURAMDIVISION EASTGODAVARI DISTRICT, ANDHRA PRADESH, INDIA

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ABSTRACT
Ground water is the only reliable water resource for domestic, Agriculture and industrial uses in the arid is Gandepalli Mandal. Rapidly depleting ground water aquifers as a consequence of high population growth and rapid industrialization are threatening the quality of water resources in Gandepalli Mandal. The present study of groundwater is to determining the quality for Gandepalli Mandal of East Godavari district,Andhra Pradesh India, and the quality of water to assess the groundwater system to ensure long term sustainability of the resources. A total of 18 groundwater sample parameters were collected from ten bore wells for two different seasons. Pre-monsoon and post monsoon and analyzed for major cations and anions. Also the variationsin the quality levels of groundwater were compared over the years of 2019 and 2020.statistical analysis including spear man correlation coefficients and factor analysis display good correlation between phsic- chemical, parameters (EC,TDS AND TH) $Ca^{2+,}$ Na^{2+}, Mg2+,Potassium(K+),chloride(Cl-),PH, Fluorides, COD and BOD Turbidity. Finally we are collecting and Analyzing the data of all groundwater sample parameters for Drinking, Irrigation, and Industrial purposes.We conclude that the water quality of samples from various places is determined and comparing to the standards of Bureau of Indian standards (BIS) and World Health Organization (WHO). Finally weconcluded that most of the area has poor quality which is never to industrial area.

Keywords: BIS, WHO, Irrigation, water supply

1. INTRODUCTION:
Quality of water has widely been used to evaluate the groundwater quality for drinking purposes in various regions of the world. Man needs water for domestic purposes such as cooking, washing, cleaning, utensils, gardening, clothes and above all for drinking. He also needs it for commercial, industrial and recreational purposes. It may be noted that 90% of world population is without safe drinking water and that water borne diseases kill nearly30,000 people every day. It is difficult, time consuming and costly to have complete purification of water. The impurities in water are to be removed to such an extent that so that it is not harmful to public health. The concentrations of different substances are expressed in mg/l or ppm.

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1.1 GROUNDWATER INTODUCTION:

In many developing countries like Bangladesh, India, China etc., are very large no of people depend on groundwater for their daily needs particularly drinking purpose. ince most groundwater is colourless, odourless and without specific taste, we are typically mostconcerned with its chemical and biological qualities. In specifically, arid and semi-arid regions of India where erotic rainfall, high evaporation and over-Exploration typically caused in decline of the ground water levels. The common groundwater contaminates to kill the bacteria from groundwater using through chemicals like Fluoride, Nitrate, Arsenic and other trace metals. Globally, irrigated farming is the largest abstractor and chief user of groundwater assets near about 65% of the agricultural land is irrigated by groundwater.

2. LITERATURE REVIEW:

C. R. Ramakrishnaiah, C. Sadashivaiah, And G. Ranganna [1] carried out Assessment of Water Quality Index for the Groundwater in TumkurTaluk, Karnataka State, India .The present work is aimed at assessing the water quality index (WQI) for the groundwater of Tumkur taluk. This has been determined by collecting groundwater samples and subjecting the samples to a comprehensive physicochemical analysis. For calculating the WQI, the following 12 parameters have been considered: pH, total hardness, calcium, magnesium, bicarbonate, chloride, nitrate, sulphate, total dissolved solids, iron, manganese and fluorides ranges. The results of analyses have been used to suggest models for predicting water quality.

Assessment of Groundwater Quality Index in and Around Sholinganallur Area, Tamil Nadu. The present study aims in determining the groundwater quality in and around Sholinganallur area, Kancheepuram District. Sholinganallur is a suburban town of Chennai city situated on the southern IT corridor of Chennai in the Indian state of Tamil Nadu. The increase in growth of Sholinganallur's economy, population density and infrastructure developments aggravated the stress on water and land related issues. The areal extent of a study area is 46.25 km2 from Navalur to Karapakkam. The Water Quality Index explains overall quality at certain location and time, based on several physic-chemical parameters. It provides an excellent representation of overall quality of water for various purposes in the arena of water management. Water samples were collected from ten sampling points and tested for several physic- chemical parameters like pH, Total Dissolved Solids (TDS), Hardness, Alkalinity, Sulphates, Nitrates, Chloride and Fluoride. Further the study uses Arc GIS for mapping the water quality to identify the spatial variation in groundwater quality.

Srinivas J, Purushotham A.V, and Murali Krishna K.V.S.G[3]carried out Determination of Water Quality Index in Industrial areas of Kakinada, Andhra Pradesh. The present study intended to calculate Water Quality Index (WQI) of industrial areas of well water samples in Kakinada, Andhra Pradesh, India were monitored. The quality of bore waters was assessed by comparing with existing standards for important parameters. Water Quality Index calculated from thirteen parameters of physic-chemical parameters such as pH, D.O., E.C., T.D.S., alkalinity,

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turbidity, Ca (calcium) and Mg (magnesium) hardness, total hardness, NO3(nitrate), F (fluoride), Fe+3 (iron) and Cl^- (chloride),C.O.D have been tested and suggested to take all the necessary precautions before the waters are sent into public distribution system. It is concluded that WQI can be used as a tool in comparing the water quality of different source.

DevendraDohare, Shriram Deshpande,andAtulKotiya[4]carried out Analysis of Ground Water Quality Parameters: A Review . Due to human and industrial activities the ground water is contaminated. This is the serious problem now a day. Thus the analysis of the water quality is very important to preserve and prefect the natural eco system. The present work is aimed at assessing the water quality index (WQI) for the ground water of Indore City and its industrial area .The ground water samples of all the selected stations from the wards were collected for a physiochemical analysis. For calculating present water quality status by statistical evaluation and water quality index, following 27 parameters have been considered Viz. pH, colour, total dissolved solids. electrical conductivity, total alkalinity, total hardness, calcium, chromium, zinc, manganese, nickel. The obtained results are compared with Indian Standard Drinking Water specification IS: 10500-2012. The study of physic-chemical and biological characteristics of this ground water sample suggests that the evaluation of water quality parameters as well as water quality management practices should be carried out periodically to protect the water resources.

SurekhaGangavarapu, UdayaBhaskar Pinnamaneni and Padma Kumari K [5]carried out GroundwaterQuality Mapping Of East Godavari District, Andhra Pradesh, India , Using Remote Sensing And Geostatistics . Quality of drinking water supplies has always been a vital concern. An alarming growth rate in the density of the population, urbanization, industrialization and agricultural activities skyrocket the usageand demand for water to such an extent that even the Groundwater quality is being degraded. According to WHO, about 80% of all the diseases in human beings are water borne. Hence 348 samples from the open wells and dug wells distributed all over the district were collected, analyzed and calculated for the quality index. GIS a powerful computational tool not only facilitates data capture but also facilitates spatial map integrations. In this research ground water quality analysis was carried out for 58 mandals of the District, the analysed results were used to calculate the Water Quality Index (WQI) to find the suitability of water for portability and agriculture, and using ARC GIS 10.2 VERSION water quality mapping was done. Groundwater samples analysed show quality expedience in terms of Electrical conductivity, Total Hardness, Chlorides, and TDS.

Manjesh Kumar and Ramesh Kumar[6]carried out experimental work on Physic-Chemical Properties of Ground Water of U.P., (India). The study deals with evaluation of granite mines situated in Jhansi (Goramachia) for their status about physicochemical contamination of ground water. Six different sites are selected for sample testing collected from mines and urban area. Three samples have been taken at various distances on the site. This location is 10Km above from

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Jhansi city. The physic-chemical parameters such as pH, D.O., E.C., T.D.S., alkalinity, turbidity, Ca (calcium) and Mg (magnesium) hardness, total hardness, NO3(nitrate), F (fluoride), Fe+3 (iron) and Cl- (chloride) have been tested. It has been found that parameters are not in limit when compared with W.H.O. standards.

3. METHODOLOGY:

A Total of 18 Ground water samples were collected, Analyzed and evaluated for Drinking water quality parameters over in 36 km area towards west from district Head quarters in high quality of polythene bottles of one litre capacity from bore wells and hand pumps that were extensively used for both domestic and irrigation purpose, sample bottles were thoroughly rinsed with the water to be sampled and then packed under airtight condition to discard the chances of Entrapment of any air bubble. Each sample was tested for water quality parameters within 27 hrs of duration.

Sample Collection and Preservation

Ground water samples from10 villages of Gandepalli Mandal are collected from bore wells. Manual sampling with plastic container in compliance with established standard norms was adopted. Labels were used to prevent sample misidentification. Sample preservation was done in tune with ground water guidelines with minimum possible time lapse between collection and analysis. Each sample was tested for water quality parameters within 27 hours of duration.

Details of Sampling Locations

Sampling stations are situated in Gandepalli .The details are followed below.

Table: 1- Details of Sample Sources

Sample No	Sample station	Bore well numbering	Type of Source
1	Gandepalli	BW1	Bore well
2	Mallepalli	BW2	Open well
3	N.T.Rajapuram	BW3	Open well
4	P.Nayakampalli	BW4	Bore well
5	Singarampalem	BW5	Open well
6	Surampalem	BW6	Open well
7	Talluru	BW7	Bore well
8	Uppalapadu	BW8	Open well
9	Yerrampalem	BW9	Open well
10	Yellamilli	BW10	Borewell

Table:2-METHODS OF ANALYSIS:

S.No	Parameter	Method	Range	Instrument / Equipment
1.	pH	Electrometric	6.5-8.5	pH Meter
2.	Turbidity	Electrometric	<1NTU	Turbidity meter
3.	Alkalinity to phenolphthaleinas (caco3)	Titration with H_2SO_4	200	LaMotte Alkalinity TestingKit
4.	Alkalinity to methyl orange as (CaCO3)	Titration with H_2SO_4	200	LaMotte Alkalinity TestingKit
5.	Salinity	Electrometric	100PPT	Salinity meter

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6.	Total Hardness	Titration with EDTA	200	LaMotte Hardness Testing Kit
7.	E-Conductivity	Electrometric	83-210	Conductivity meter
8.	Total Dissolved Solids	Electrometric	91-750	TDS Meter
9.	Nitrate (NO3)	Spectrophotometric	<25-50	LaMotte Nitrate Testing Kit
10.	Calcium (Ca+)	Titration with EDTA	10-500	LaMotte Hardness TestingKit
11.	Magnesium(Mg +)	Titration with EDTA	<5-22.2	LaMotte Hardness
12.	Iron	Titration	<0.005-8.5	LaMotte Iron Testing Kit
13.	Fluoride (F)	Spectrophotometric	<1-3.8	LaMotteFluoride
14.	Sulphates (SO4)	-	<10-750	-
15.	Residual Chlorine (CL)	Titrometric	<10-230	Octa-slid scale
16.	COD	Titrometric	<50-80	Spectrophotometer

Table:3-Details of Solution and Reagents used in Analysis:

S.No	Parameter Studied	Required Solution
1	Dissolved Oxygen	1. 0.025 M Hypo solution 2. Alkali- iodide- azide reagent 3. MnSO4 solution 4. Starch Indicator
2	COD	1 0.025 M Hypo solution 2 Alkali- iodide- azide reagent 3 MnSO4 solution 4 Starch Indicator 5 HgSO4
3	Alkalinity	1. 0.1 N Standard sulphuric acid 2. methyl orange indicator 3. 0.5 N Sodium carbonate solution
4	Hardness	1.0.01M standard EDTA solution 2.Ammomium chloride and ammoniumhydroxide buffer solution 3. E.B.T. indicator
5	Nitrate	1.Standard Potassium Nitrate solutions 2.1.0N HCL solution
6	Phosphate	1. Standard KH2PO4 solutions 2. Potassium antimony titrate + ammonium molybdate + ascorbic acid combined reagent
7	Calcium	1.0.01M standard EDTA solution 2. NaOH buffer solution 3.E.B.T. solution
8	Chloride	1.0.141 M standard Silver Nitrate solution 2.Standard NaCl solution 3.K2CrO4 solution

4. RESULTS AND DISCUSSION:

Results:

The chapter deals with the water quality status.

S.No	Borewell Names	Water Quality Index	Water Quality Status
1	Surampalem	58.53	Poor water quality
2	Yerrampalem	32.61	Good water quality

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3	P.Nayakampalem	68.335	Poor water quality
4	Gandepalli	37.304	Good water quality
5	Mallepalli	19.576	Excellent water quality
6	Uppalapadu	42.728	Good water quality
7	Talluru	25.113	Excellent water quality
8	Yellamilli	41.278	Good water quality
9	N.T.Rajapuram	31.289	Good water quality
10	Singrampalem	5.6911	Excellent water quality

The above table shows that water quality status of 10 areas. Here Surampalem, P.Nayakampalem water belongs to Poorquality, Mallepalli, Singarampalem, Talluru water belongs to Excellent quality and Yerrampalem, ,Gandepalli, Uppalapadu, Yellamilli, N.T.Rajapuram , belongs to good water quality.

If the water quality has 0-25 then that water quality has Excellent, and the water quality has 26-50 is Good water quality, water quality has 51-75 the water quality is poor, and the water quality has 76-100 is very poor water quality and greater than 100 is unsuitablefor drinking.

Discussion:-

- The **pH** values for all the samples were almost uniform at all times except for an occasional variation in one or two cases. This may be attributed to the carbonate-bicarbonate buffer abundantly found in the soil. pH of all the samples was found to be within the BIS range of 6.5 to 8.5. Samples were mostly alkaline. The pH was very rarely found to be around 7.0. The pH limit for drinking water is 6.5 to 8.5. Majority of the samples most of the time showed less than 7.5 pH.

- **Electrical Conductivity(EC)**of water is determined by the concentration of ions present in it. The more the concentration of ions in the sample the more is its conductivity. Some samples had greater than1000µS conductance although 1000 µS

is the permissible value recommended by Bureau of Indian Standards. Higher EC is the reason behind the problem of scale formation in the study area.

- **Hardness** in water is mainly caused by Ca and Mg although Fe and Mg also contribute to actual hardness. Total hardness (carbonate and noncarbonated) is expressed as mg/l of CaCO3 It is a measure of the capacity of water to precipitate soap. Hardness in water results in excessive consumption of soap and wastage offuel. Total hardness of all the samples was found to be higher during monsoon when compared to other times. Average total hardness of most of the samples in the study area was found to be higher than 300mg/l indicating that the water is very hard water.

- **Alkalinity** is the capacity of water to neutralize acid. It is a measure of bicarbonates, carbonates and hydroxides present in water. Alkalinity was found to be maximum in winter season and

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minimum in summer season. Total alkalinity of all the samples was found to be higher than permissible value suggested by BIS..sometimes alkalinity have touches the excessive limit if Higher alkaline waters are usually unpalatable and cause bitter taste.

- **Calcium** is abundant in groundwater because of the presence of its minerals in the earth crust. Magnesium is relatively less abundant in groundwater but is extensively found in sea water. Both Ca and Mg cause hardness to water. Average calcium and magnesium concentrations in most cases are found to be higher than the permissible limit both by BIS (Ca-75 & Mg-30) standards.
- **Total alkalinity**(TA)/Total hardness (TH) ratio was always found to be > 1. Since groundwater is rich in bicarbonates and sea water is very rich in chlorides and sulphates of calcium and magnesium (that impart hardness to water) an excess of TA over TH ruled out contamination from sea water intrusion.

5. CONCLUSION:

- Water quality is dependent on the type of pollutants and the nature of mineral found at particular zone of bore well.
- Monitoring of the water quality of ground water is done by collecting water samples by analysing the physic-chemical characteristics of water samples at different areas of Gandepalli Mandal by using Horton water quality index formula.
- Result of water quality assessment showed that most of the areas having good quality of water and only one area i.e. Surampalem is poor in quality which is very nearer to industrial area while compared to other villages
- Groundwater is the primary source of water for drinking and domestic purposes in the hard rock terrain of Gandepalli region in India. Therefore, to understand the quality of groundwater in the study region, 18 groundwater samples were collected, analyzed and evaluated for drinking water quality parameters.

- The study region groundwater is neutral to slightly alkaline nature. Na+, and Cl- are the most dominant cation and anions, respectively. Compared with the World Health Organization (WHO) drinking water quality guidelines, Ca2+, Na+, and K+ ions concentrations are under the maximum permissible limits in the groundwater of the study region. Furthermore, excessive concentrations of TDS, TH, Cl-, Mg2+, and EC are found at a few groundwater sampling locations in the study region.
- The results also show NO3+concentration in the groundwater of the study region is 8.8 times larger than its recommended limit of 50 mg/ L, and higher concentration is noticed in the southern and north-eastern part of the study region. The results demonstrate that high fluoride concentration in groundwater is found in the eastern part of the study region, where its content reached up to 7.1 mg/L, which is the highly unacceptable range for drinking uses. Based on GWQI, the groundwater of the study region generally excellent to poor water quality for drinking purposes.
- The groundwater chemistry of the

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study region was largely influenced by the rock-water interaction or rock weathering dominance, and further evaporation dominance. Ca2+-Mg2 +-Cl-,Ca2+-Na+- HCO3 - , Ca2+-HCO3 - , Na+-HCO3- and Na+- Cl-water types were observed in the groundwater of the study region. Mainly, dominant of Na+-HCO3-water type may be responsible for the enrichment of fluoride concentration in the groundwater of the study region.

- Finally, we are study the groundwater region of particular area and collected and Analysed the data of given area is the quality of water is some places has poor, Excellent, Good quality of water is there near by the villages of the Gandepalli mandal.

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