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Analysing The Ground Water Quality of Udaipur

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***A*bstract**: Ground water is the most important resource for life. In this paper, we have analysed the ground water quality for different locations in Udaipur by calculating the Water quality Index. WQI Can give us an idea about quality of drinking water. Udaipur is city surrounded by hills and lakes. Fresh water and ground water is in abundance in and around Udaipur. Water quality is better in Udaipur in comparison to other places in Rajasthan. The water Quality index incorporates important chemical parameters and combines them in one number which tells us about the quality of water in the area. The water quality parameters are considered with their degree of importance and weightage is given to each parameter for calculating Water quality Index.

***K*eywords**: Water Quality, Ground Water, Water quality Index.

I. INTRODUCTION

Water is an essential and most valuable natural resource on our planet earth, 70% of earth's surface is covered with water but only a small amount i.e. only 1% is suitable for human utilisation. It covers about 3 quarters of our planet earth and 70% of the world population living in rural areas are living in harsh conditions of not having clean water[1]

We cannot survive without water and we need it without any contamination i.e. free from harmful chemicals, pathogens and impurities [2] otherwise we won't be able to live for longer duration. Frequent illness would be a regular phenomenon.

The most common risk related to drinking water is pollution by sewage and industrial waste, faecal matter, fertilisers, household waste, hospital waste etc. Water pollution poses a major threat to our country's economic development, social development and health of human beings.[3] Fresh air and clean water are the most essential things for human beings. The % of water in the human body is around 60-65%. [4]

Various factors such as population, urbanisation, industrial waste going in the rivers have polluted the ground water due to which many water borne diseases have increased. Groundwater is still considered as one of the main source to get clean drinking water. It is also used for irrigation. But due to factors such as poor sanitation, dumping of chemicals in rivers, ineffective irrigational practices, the ground water quality has deteriorated over the years. [5] In order to solve this problem a quality standard needs to be developed in order to check for pollutants in water. Proper methods should be adopted to clean ground water so that it can be safe for drinking.

II. METHODOLOGY

The Water Quality Index (WQI) was first introduced by Horton in 1965[6] as a method of assessing the quality of water resources. Horton's WQI uses a weighted scoring system to evaluate various physical, chemical, and biological parameters of water, such as pH, dissolved oxygen, turbidity, and faecal coliform count. The scores for each parameter are then combined to obtain a single numerical value that represents the overall quality of water.

Horton's WQI has been widely used by water resource management agencies and researchers around the world to evaluate the quality of water resources, identify sources of pollution, and prioritize management actions. The index has undergone several revisions and modifications over the years to reflect new scientific understanding and changing environmental concerns.

Today, the WQI remains an important tool for water resource management and research, and there are many variations of the index that have been developed to suit specific local or regional conditions. The WQI is an important tool for decision-making and public education about the quality of water resources and the need to protect and conserve them.

The area for study is Udaipur and water parameter data for 8 locations in Udaipur was considered for this study. Water quality Index was calculated by calculating the respective weight of each parameter.

$$WQI = \sum W_i Q_i / \sum W_i$$

Q_i is quality of subindex

$Q_i = [(V_i - V_{id}) / (S_i - V_{id})] * 100$

V_i = Value of parameter

V_{id} = Ideal value of parameter

S_i = Standard value as per water standards

W_i = Weight of parameter

K = constant

$W_i = K / S_i$

$K = 1 / [1/S_1 + 1/S_2 + 1/S_3 + \dots + 1/S_n]$

WQI Level	Status
0-25	Excellent Water Quality
26-50	Good Water Quality
51-75	Poor Water Quality
76-100	Very poor Water Quality
>100	Unsuitable for drinking

Table I

III. EXPERIMENTAL RESULTS

The experimental data in this paper for various locations of Udaipur is taken from Central water Board and these stations are being monitored by Government for Water quality management and control.

Water quality parameters like pH, Nitrate, TDS, Coliform, Fluoride, conductivity etc are shown in table II for eight locations in Udaipur.

STN Code	Name of Monitoring Location	Temp	pH	Conductivity	Nitrate	Faecal Coliform	Total Coliform	TDS	Fluoride
2019	Near Uit Bridge, Udaipur	25.5	7.1	1225	2.15	7	14	882	0.8
2020	New Fatehpura, 200 Ft.From Panchwati Nallah, Udaipur	25.5	7.1	1773.5	2.52	5	9	1213.5	0.75
2021	Near Arvind General Store, Aloo Factory, Kacchi Basti, Sardarpura, Udaipur	25	7.05	1756	2.65	4	8	1216.5	0.7
2022	Near Rana Pratap Nagar, Railway Station, Udaipur	26	7.2	1775	1.8	2.5	3.5	1233.5	0.9
2023	Hotel Orient Place, Subhas Nagar, Udaipur	26	7	1260.5	1.68	5.5	12.5	889.5	0.75
4796	Open Well Of Saras Dairy, Vilas, Nh-08, Udaipur	25.5	6.9	1283	1.43	3.5	9	876.5	0.75
4797	Borewell Near Main Gate,City Palace, Near Sheetla Mata Temple, Udaipur	26	7.45	957.5	1.3	2.5	3.5	671.5	0.5
4798	Borewell Of Bsnl Office,Sector-03, Hiran Marg, Udaipur	25.5	7.4	2550	1.99	11.5	21	1717	0.95

Table II

Parameters	Standard (Sn)	1/Sn	∑(1/Sn)	K=1/∑(1/Sn)	Wi=K/Sn	Ideal Value (Vid)	Mean Conc. Value (Vn)	R=Vn/Sn	Qn= R*100	Wn*Qn
pH	8.5	0.118	1.006	0.994	0.117	7	7.45	0.30	30.00	3.51
Conductivity	1500	0.001	1.006	0.994	0.001	0	957.5	0.64	63.83	0.04
Nitrate	50	0.020	1.006	0.994	0.020	0	1.3	0.03	2.60	0.05
Faceal Coliform	10	0.100	1.006	0.994	0.099	0	2.5	0.25	25.00	2.49
Total Coliform	10	0.100	1.006	0.994	0.099	0	3.5	0.35	35.00	3.48
TDS	1000	0.001	1.006	0.994	0.001	0	671.5	0.67	67.15	0.07
Fluoride	1.5	0.667	1.006	0.994	0.663	0	0.5	0.33	33.33	22.09
		1.00598039			1					31.7236199
									WQI	31.72
									∑(Wn*Qn)/∑(Wn)	

Table III

Sample calculation for Station Code 4797 Borewell near Main Gate City Palace are as mentioned in Table III. We have done calculations of WQI in similar way for all the other locations mentioned which are summarised in Table IV.. After all the calculations WQI[7] is Calculated for station code 4797 location as per steps explained below.

1. S_n is standard value for each parameter
2. Now for calculating weight we do inverse of Sn which is 1/Sn
3. Now in third step we calculate sum of (1/Sn) = (0.118+0.001+0.020+0.1+0.1+0.001+0.667) = 1.006
4. K is constant which is 1/1.006 = 0.994
5. Weight of each Parameter $W_i = K / S_n$
6. Now for pH ideal value should be 7 but for all others it must be zero
   $Q_i = [(V_i - v_{id})/(S_i - V_{id})]*100$
7. $WQI = W_i Q_i / W_i =$ (3.51+0.04+0.05+2.49+3.48+0.07+22.09)/(0.117+0.001+0.02+0.099+0.099+0.001+0.663) = 31.72

WQI = 31.72 for station Code 4797 is Good water Quality.

STN Code	Name of Monitoring Location	WQI
2019	Near Uit Bridge, Udaipur	57.23
2020	New Fatehpura, 200 Ft.From Panchwati Nallah, Udaipur	48.13
2021	Near Arvind General Store, Aloo Factory, Kacchi Basti, Sardarpura, Udaipur	43.55
2022	Near Rana Pratap Nagar, Railway Station, Udaipur	47.56
2023	Hotel Orient Place, Subhas Nagar, Udaipur	51.24
4796	Open Well Of Saras Dairy, Vilas, Nh-08, Udaipur	44.98
4797	Borewell Near Main Gate, City Palace, Near Sheetla Mata Temple, Udaipur	31.72
4798	Borewell Of Bsnl Office, Sector-03, Hiran Marg, Udaipur	77.76

Table IV

WQI was calculated for each location as per the steps as explained above. For 5 locations water was found to be of good quality. In table IV WQI of each location is mentioned. As per the data only one location is very poor as per Water quality Index . Water at these locations can be treated by boiling, Reverse osmosis or water filter as the major cause of concern is coliform or TDS for high level of water quality index which is deteriorating the water quality.

WQI Level	Status	No. Of Stations	% of Stations
0-25	Excellent Water Quality	0	0%
26-50	Good Water Quality	5	62%
51-75	Poor Water Quality	2	25%
76-100	Very poor Water Quality	1	13%
>100	Unsuitable for drinking	0	0%

Table V

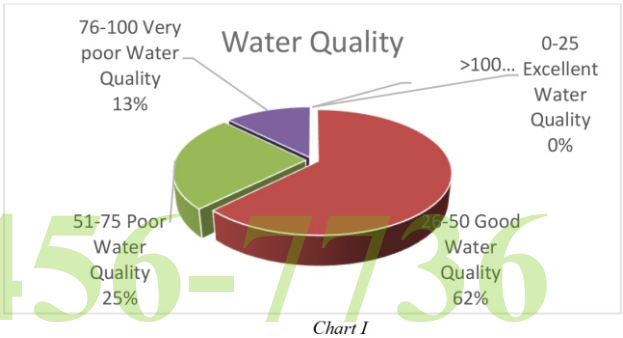

Chart I

As we see in chart 1 which is a pie chart, we can see that 62% of locations have good water quality and there are no locations which have unsuitable quality level of water or excellent level of water quality. Only two locations have poor water quality and one location has very poor quality as mentioned in Table V.

Udaipur is as such less polluted and quality of water is good overall.

IV. CONCLUSION

As per our analysis of water quality Index from various locations in Udaipur, we found that water quality in Udaipur is good and can be used for drinking purpose with minimum treatment. For the locations which have high quality Index Boiling of water can kill the pathogens and water can be made potable. The main reason for high WQI is pathogens(coliform), high conductivity and TDS. Ground water in Udaipur can be made usable by Reverse osmosis, filtration, distillation etc. Most important factor for managing Ground water quality is people awareness. Knowledge needs to be imparted with regards to waste disposal, rain water harvesting and recycling of waste water after treatment.

V. REFERENCES

[1] Tiwari TN, Mishra MA., 1985, A preliminary assignment of water quality index of major Indian rivers. Indian J Environ Proc, 5:276-279.

[2] Burrough PA, MCDonnell., 1998, Principles of Geographical Information Systems. Oxford University Press, Oxford, 333 pp.

[3] Milovanovic, M., 2007. Water quality assessment and determination of pollution sources along the Axios/ Vardar River, Southeastern Europe. Desalination, 213: 159-173.

[4] Shweta Tyagi, Bhavtosh Sharma, Prashant Singh and Rajendra Dobhal, Water Quality Assessment in Terms of Water Quality Index, American Journal of Water Resources, 2013 I (3), pg, 34-38.

[5] Cude, C.G., Oregon water quality index: a tool for evaluating water quality management effectiveness, J. American Water Resou. Assoc.(2001), 37(1). 125-137.

[6] Horton, R.K, An Index number for water quality. J Water Poll Cont. Fed. (1965) 37(3): 300-306

[7] S. Packialakshmi, Meheli Deb and Hrituparna Chakraborty. Assessment of Groundwater Quality Index in and Around Sholinganallur Area, Tamil Nadu Indian Journal of Science and Technology, Vol 8(36), DOI: 10.17485/ijst/2015/v8i36/87645, December 2015