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## Evaluation of ground water quality and it's suitability for drinking

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### Abstract

Water Excellence File of Phreatic water dependent upon the nine examples gathered from Gautam Buddha Nagar locale close by Yamuna stream. 9 Physical -synthetic boundaries viz Calcium, Mg, Cl, Sulfate, Total solidity, F, NO<sub>3</sub>, entire liquefy solids, acidity have broken down and explored that ninety percent of water tests were found to be worthy of drinking and just ten percent of water tests come within the ambit of respectably helpless class. The water standard list goes to 64.65 from 16.49.. Thus it becomes necessary to treat the water before utilize . Furthermore that region is needed to be shield from tainting. After going through this whole purification process the water can be fit to be used for any purpose be it drinking ,cooking ,agriculture etc

Watchwords- Water Standard list, , purification, adulterant , total

### Introduction

If Human existence has to make a due on this blue planet then the utmost thing it is going to require for the survival is water .This is what makes the earth most special planet of the solar family Water has uses in each and every department be it Farming, homegrown purposes ,force or industry it is used in each and every aspect of life That is the reason everyone ought to have some fundamental information on standard & amount of water assets so that it can be used appropriately and formative exercises has brought about more utilizations of vadose water than the exterior water assets ,which led to the lack of phreatic water .Because of that the phreatic water standard is decaying gradually owing to removal of huge modern sewage and excavating or unearthing exercises as revealed by various analysis in different pieces of India . Subsequently, groundwater quality checking has gotten basic for keeping up its dependability for sometime later .

Water standard file is solitary basic, successful, & justifiable method of assessing standards of water for its propriety considering various perspectives. It is an exertion of creating water standards lists of phreatic water in a few pieces of Gautam Buddha Nagar locale.. As indicated by numerous analysts who examined this territory recommended that the water which is found beneath the surface of some pieces of this territory isn't consumable and is primary reasons for the medical issues because of synthetical & bacterial contaminate.

### **Literaturereview**

- In 2015, Raj Aniket, who has collected the specimens of water to test the quality of groundwater on different chemical variables in the Moradabad region, Uttar Pradesh, India. In the instant study, twenty eight specimens of ground water accumulated from the hand pumps operated by hands at various locals in Moradabad district. Inspection, numerous synthetic and biotic parameters have been used & the indicator that checks the water quality discloses that the quality of water in Moradabad region is extremely poor and not fit to be drink & this water needs continuous monitoring & protection from contamination.
- In 2016, Jitendra Bohare, et al, Read, To calculate the quality of water in the city of Bhopal city we used water quality index and statistical tests. 27 variables were contemplated such as –total dissolved solids, total hardness, colors, EC, total alkalinity, Ca, potential of hydrogen (ph) and then outcomes obtained were compared to Indian standards (BIS - 2012). They recommended that monitoring of water levels should be done on regular intervals.
- In 2017 Dr. M. Sangwan, examined the water specimens on physical –chemical parameters. The outcomes were acquired and the same were compared with the standards of World health organizations. The outcomes showed that the parameters to be below the allowed limits.
- In 2018, Dr Manjit Bhide, examined, analysed the water specimens at various locations in Ahmednagar (MH, India). Different conditions have been compared in this examination and water contained in a well as well. Various parameters were used in this process. The results acquired showed that the water is not drinkable.
- In 2019, MM Kalelkar, Read, Evaluation of ground water quality and its suitability for drinking. After reading he concluded that when outcomes are not available within the permitted limitation then this kind of drinkable water requires easy and simple treatment prior to use.

### **Study area**

Gautam Buddha nagar is the newly found city in the state of Uttar Pradesh. It is situated at the longitude of 77.50 40 degree East and latitude of 28.47 44 degree north in the geographical map of India. It includes one hundred and twenty four towns. Population of this city is around 107,676 (upto march). The Gautam Buddha Nagar holds 40000 hectares of the land when it comes to area and bound by NH -24 on the inside of North –West. This city comes within the purview of NCR (National Capital Region). Gautam Buddha Nagar has a large chain of educational institutions which cover 1970.03 hectares of its total area and remaining area has been occupied for business and residential purpose. These days four hundred sixty kilometer length of waste water organizations, five hundred kilometer length of sewage & almost five hundred kilometer length of water furnishing lines spread around there.

### **Sampling and Analysis**

An absolute digit of nine examples out of 10 unique areas of Gautam Buddha nagar (district) were gathered to perform the examination. Fig 2 indicates towards the referenced areas. The examples have been gathered through various sources, for example, Borwells, General Hand siphons, Government Hand siphons and saved as per the strategies endorsed in USA Public Health Association manual (1999). In the current examination water standards list were resolved and the outcomes were contrasted and the qualities endorsed in different water standard principles like World Health Organization, Indian Standard (2012), Bureau of Indian Standards. Every one of the compound fixations are communicated in milligrams /l.

### **METHODOLOGY**

Water Standard list is distinct fundamental instruments of evaluation of the surface i.e. phreatic water contamination, which can be utilized proficiently in enhancing the quality of water projects. Records of water quality provide data on rankings from 0-100. 9 boundaries were carried out to plan the list of water quality.

In instant investigation, the file of water quality determined in 3 stages. Every one of the 9 boundaries in the initial step (Ca, Mg, Cl, Sulfate, T H, F-, NaNO<sub>3</sub>, TD S, Alkali) were relegated a W (wi) as indicated by its general significance on the general nature of water that scale from one to five it has demonstrated in figure 1. The greatest load of 5 have been doled out directed towards boundary that impact all the additional altogether the quality of water and least W of one is chosen directed towards most un-prevalent quality of water .

In subsequent advance, relative strength (WI) is determined amid the accompanying condition

$$W I = w / \sum 1 \text{ to } n [w]$$

Wherever , Wi and wi are the relative weight and weight of every boundary individually and n is the quantity of boundaries .

In the 3rd stair , scale of quality rating (qi) for every boundaries were registered by partitioning its level fixation endorsed by the rules of B.I.S.

$$q_i = (c_i/s_i) * 100$$

where qi is the scale of quality rating , then centralization of every synthetically boundaries is ci in one and all water test in milligram /L, si is the I.S. water boundaries in mg/l recommended through the rules of B.I.S. in figure (5). To

figure the list of water quality, the Sli is 1<sup>st</sup> decided for one and all synthetically boundaries that was determined through the following equation.

$$S_{li} = w_i * q_i \quad WQI = \sum$$

Wherever , the second list of ithparameters is Sli, the rating of every grouping of ithparameters is qi, and the quantity of boundaries is n. Determined list of water quality have been ordered into 5 gatherings brilliant water to water n unsatisfactory to drink of reach water quality record for drinkable design is specified in the figure [2].

### Experimental Section

Allocating of W (wi) to the chosen parameters of water e.g., power of hydrogen ,TDS, TH, HCO<sub>3</sub>, Cl, SO<sub>4</sub>, NO<sub>3</sub>, ..... ) in step with their relative significance withinside the ordinary high-satisfactory of drinkable water for ingesting motives (weight can be to five from one).

Second step – Computation of a relative weight (Wi) of the chemical parameter the usage of the subsequent calculation .

$$W_i = w_i / \sum w_i \quad (i = 1 \text{ to } n)$$

Wherever , Wi is the relative weight, wi is the burden of every variables and 'n' is the variety of variables .Third step - Assigning of a high-satisfactory score scale (qi) for every parameter, as specified under

$$q_i = (C_i / S_i ) \times 100$$

wherever , qi is the high-satisfactory score, Ci is the awareness of every chemical variables in every water pattern in milligram/L, and Si is the manual line value/appropriate restrict as given in Indian ingesting water standard (BIS).

For calculating the Water Quality Index , for every chemical parameter ,the sub index (SI) is 1<sup>st</sup> decided as specified under

$$S_{li} = W_i \times q_i$$

$$WQI = \sum S_i \cdot W_i \cdot q_i$$

Wherever,  $S_i$  is the sub index of  $i$ th parameter;  $W_i$  is relative weight of  $i$ th parameter;  $q_i$  is the score primarily construct totally on awareness of  $i$ th parameter and 'n' is the variety of chemical parameters.

The water can be categorized into 5 sorts primarily based totally on computed WQI as given below:

WQI variety and water type:

WQI variety and water type:

< 50 > 300

Chemical parameter's relative weight

Chemical parameters	I.S.	Weight	Relative weight
Potential of hydrogen	6.8-8.5	4	.09756
Total hardness(TH)	300-600	2	.04878
Calcium	75-200	2	.04878
Magnesium	30-100	2	.02439
Bicarbonate	244-732	3	.07317
Chloride	250-1000	3	.07317
Total dissolved solids	500-2000	4	0.09756
Fluoride	1-1.5	4	.09756
Manganese	0.1-0.3	4	.09756
Nitrate	45-100	5	.12195
Iron	0.3-1.0	4	.09756
Sulphate	200-400	4	.09756
		$\sum w_i = 41$	$\sum w_i = 1.000$

Water Standards Categorization Based Construct on Water Quality Index Merit

Water Index Quality Merit	Water quality	Water specimens percentage (before - downpour)
Less than 50	Outstanding	00
50 to 100	fine water quality	1.5
100 to 200	Bad water quality	63.5
200to 300	Extremely bad water quality	22
More than 300	Water not fit to be jused	13

### Analysis and results

The aftereffects of physico-synthetic boundaries and Water quality index of nine water tests are specified in the figure (4). The

Ca focus went in the middle of 11-88 milligram/L contrasted with satisfactory restriction of 75 mg/l. The Mg focus shifted in the middle of 6-37 milligram /L contrasted with satisfactory restriction of 30 milligram/L. The Cl- focus changed in the middle of 16-170 mg/l contrasted with satisfactory restriction of 250 milligram/L. The Sulfate fixation differed in the middle of 2-15 mg/l contrasted with satisfactory constraint of 200 milligram. The entire Firmness focus shifted between 52-295 mg/l contrasted with satisfactory constraint of 200mg/l. The Fluoride fixation was discovered consistent all through which is 0.10 mg/l contrasted with adequate constraint of 1.0 milligram /L. The NO3 fixation shifted in the middle of 1-9 milligram/L contrasted with satisfactory restriction of 45milligram/L. The Total dissolved solids fixation changed in the middle of 351-701 milligram/L contrasted with satisfactory constraint of 500 milligram /L. The Alkalinity focus shifted between 30-230 mg/l contrasted with adequate constraint of 200 milligram/L. Different worthy restrictions of quality of ground water boundaries are appeared in the figure (5)

It has been analyzed amid outcomes that ,the base and greatest estimation of Water Quality Index is discovered to be 16.49 and

64.65 as portrayed in the figure 3 that comes within the class of great water and helpless water. It has inferred that dominant part of water found beneath the crust tests ninety percent comes under the outstanding standardsy and remaining ten percent comes under the quality of low class.

Water Quality Index of nine diverse boundaries of water quality have been surveyed and it was discovered that ninety percent of water inheres in tests lies in great standards and just ten percent comes within the category of extremely low quality , that demonstrates that the phreatic water is appropriate to utilize directly and needs smaller treatment and remaining ten percent of water can only be utilized for drinking purpose when it has gone through the treatment process. The normal observing of water found underneath the crust of the earth is fundamental in the locale to preserve the water in near future and likely disease because of increasing industrialisation and rural implementation.

Weightage, Relative weight, Standard concentration on various parameters .(figure 1)

Parameters	Weightage (wi)	Relative weight (wi)	Standard concentration (mg/l) (si)
Calcium	3	0.75	75
Magnesium	3	0.75	30
Chloride	5	0.125	250
Sulphate	5	0.125	200
Total hardness	3	0.075	300
Fluoride	4	0.10	1
Nitrate	5	0.125	45
TDS	5	0.125	500
Alkalinity	3	0.075	200

Index rate. figure (2)

Parameters	Location	Index Rate	Type of water
A -1	GBU	30.7	Fine
A -2	Emilia	39.22	Fine
A -3	Village – Chipiyanabujurg	33.23	Fine
A -4	Kullipura	22.64	outstanding
A -5	Gangola	30.92	Fine
A -6	ETA-2	16.49	outstanding
A -7	SwarnNagri	29.13	fine
A -8	Salempurgujjar	19.54	Outstanding
A -9	Omicron	28.21	fine
A -10	Bulandkhera	64.65	Bad

A\* indicates specimens of various locale.

**figure-3: Range of WQI index for utilization purposes**

Range	category of water
0 to 25	Outstanding
26 to 50	Fine
51 to 75	Bad
76 to 100	Extremely bad
More than 100	Not fit to be used

Inspection outcomes of physio chemicals variables of various location . Figure –(40)

location	ca	mg	chl	sulphate	TH	fluroide	nitrate	TDS	Alk	
S1	24	20	27	10	144	0.10	4	396	150	
S2	37	16	42	06	142	0.10	02	388	120	
S3	32	26	25	12	188	0.10	06	353	140	
S4	20	09	42	05	88	0.10	06	351	60	
S5	32	18	32	08	158	0.10	04	389	140	
S6	<sup>11</sup>	06	16	02	52	0.10	02	357	30	
S7	27	17	30	05	140	0.10	06	385	120	
S8	11	06	40	03	54	0.10	01	359	80	
S9	29	19	23	02	154	0.10	04	380	130	

S10	88	37	170	15	295	0.10	09	701	230	
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Figure –(5) limitations on various parameters for ground water quality

Units	Acceptable limitations
Milligram /L	30
Milligram /L	250
Milligram /L	200
Milligram /L	200
Milligram /L	1
Milligram /L	45
Milligram /L	500
Milligram /L	200

### **Interpretation of the Findings**

After going through this whole process ,it was found that a certain percentage of water is polluted in the research area because disposal of polluted water and industrial waste from industries has made Yamuna a waste water reservoir .This place also has some water treatment plants but most of them are not working at all or overloaded due to dense population .That is why these plants are unable to fulfill the need of providing clean drinking water .This waste water includes many chemical substances .It has created an alarming situation for healthiness .These materials comprise of living synthetics and inanimate microelements i.e. cadmium sulfide , PB ,N .Thus it has become the need of hour to keep an eye on the standard of the water to prevent people from getting diseases due to consumption of polluted water .

### **Conclusion**

After completion of the research from this it is concluded that ninety percent of water specimens were discovered to be drink worthy and hygienic and remaining ten percent of water specimens were highly contaminated and not worthy to consume .The water standard marker scales from 16.49 to 64.65 that is why it is obligatory for the authorities to have the constant monitoring and treatment of the ground water to make it suitable for drinking and this treatment is also necessary to protect the area from contamination . There are some steps those can bring revolutionary changes in this direction such as installing of machinery which can collect the water of raindrops to reinstate the water level beneath the surface of the crust so as to achieve the clean and hygienic water and thus diluting the excessive gathering of chemical components ,liquefy sodium chloride and those water treatment plants should be repaired as soon as possible which are not working and more water treatment plants must be installed .Besides this Public awareness programs should be run to make people aware of water pollution .These necessary steps mentioned above can definitely improve the water quality index so that future generation would not have to go through this situation of having unhealthy water .This research can also play a pivotal role in future to enhance the quality of the water so that the goal of sustainable development and availability of clean drinking water ,both can be achieved simultaneously .

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