International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 06 | June 2021 www.irjet.net p-ISSN: 2395-0072

ANALYSING CHEMICAL PARAMETERS OF GROUNDWATER IN JUNGLE KAUDIA BLOCK OF GORAKHPUR DISTRICT WITH THE HELP OF GIS

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ABSTRACT- The streams and the water repositories should be the existence line of any human progress . The ground water is most prime water which has multipurpose utilizations going from toasting modern and agrarian employments. The quality prerequisite fluctuates particularly concerning the particular employments. For example drinking water more likely than not determined quality, which isn't at all fundamental for mechanical employments. Despite the fact that ground water seems, by all accounts, to be less inclined to poison blending yet there are various possible wellspring of ground water contamination. The disturbing expansion in the degree of contamination of water is a genuine danger. This should be taken up with most extreme need The principle objective of the current investigation has been to contemplate the variety of ground water quality in Jungle Kaudia block of Gorakhpur district area. By utilizing 19 samples of water from hand siphons all around conveyed within the study area were dissected for various parameters like ph, Electric conductivity(E.C), Total Dissolved Solid (TDS), Total hardness (TH) ,Fluoride(F), Nitrate (NO3), IRON(Fe), ARSENIC(As) .Global Positioning System (GPS) was utilized to record the example areas and the quality parameters were planned utilizing Geographical Information System (GIS).

Key Words: Inverse Distance Weighted (IDW), Water Quality Index (WQI), spatial distribution maps

1.INTRODUCTION

Water assumes an essential part in the advancement of any area. Accordingly, the accessibility of surface and ground water oversees the way toward arranging and advancement. The surface water assets are deficient to satisfy the water interest. Usefulness through groundwater is very high when contrasted with surface water, yet groundwater assets have not yet been as expected created through investigation. Keeping this in see, the current investigation endeavors to choose reasonable areas for groundwater regions utilizing a coordinated methodology of and GIS.

1.1 OBJECTIVES

- The principle objective of the current investigation are
- To contemplate the variety of ground water quality in Jungle Kaudia block of Gorakhpur district area.
- To determine Water Quality Index of the sample locations.
- To prepare the spatial distribution map of the various parameters
- To show the variation of the parameters within the study area with the help of bar chart.

2.DESCRIPTION OF STUDY AREA

Jungle Kaudia is a Block in Gorakhpur District of Uttar Pradesh State, India. Jungle Kaudia Block Head Quarters is Jangle Kaudia town. It belongs to Gorakhpur Division. It is in the 86 m elevation(altitude).

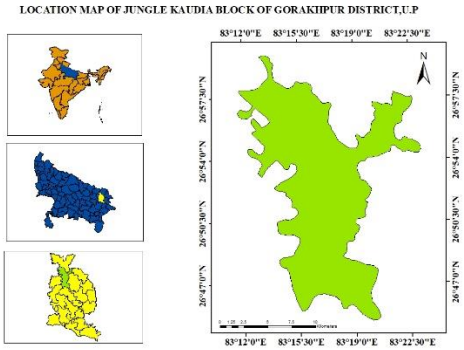

Figure 1 LOCATION MAP OF STUDY AREA

3.MATERIALS

3.1 Data Used

- Layout map of Jungle Kaudia block
- Ground water quality parameters
- Survey of India toposheet.: 63N/1, 63N/5 ,63N/6

3.2 Instruments

- Global Positioning System
- Water quality field kit
- Digital pH-meter
- Digital conductivity meter
- UV-Visible Spectrophotometer

3.3 Software

- ArcGIS 10.3.1
- Microsoft package

4. METHODOLOGY

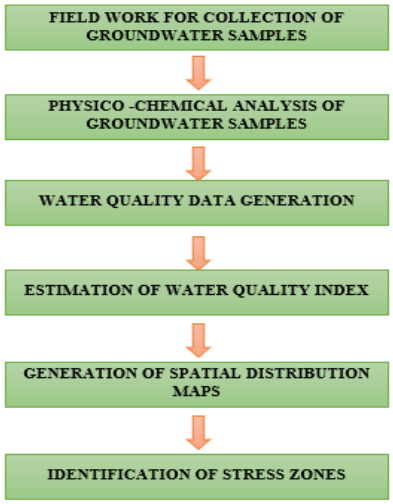

Figure2 FLOW CHART OF METHODOLOGY

Total 19 well distributed groundwater samples were collected in the study area. These samples were analysed in the laboratory using the standard procedure for the test of water and wastewater American Public Health Association (APHA 1995).Global Positioning system (GPS) was used to locate the groundwater samples. Spatial distribution maps of the various parameters were plotted in accordance of BIS (IS 10500:2012) by using Inverse Distance Weighted (IDW) method using ARC GIS software. The quality of the groundwater is determined by computing the water quality index for the sampling locations.

Figure 2 GROUNDWATER SAMPLES LOCATION MAP

Table 1 BIS (IS 10500:2012) STANDARDS FOR DRINKING WATER

S.NO.	PARAMETERS	ACCEPTABLE LIMIT (mg/L)	MAX ALLOWABLE LIMIT (mg/L)
1.	pH	6.5-8.5	No relaxation
2.	Electrical Conductivity (µS/cm)	Not Specified	----------
3.	Total Dissolved Solid	500	2000
4.	Total Hardness (as $CaCO_3$)	300	600

5.	Iron	0.3	No relaxation
6.	Arsenic	0.01	0.05
7.	Fluoride	1	1.5
8.	Nitrate	45	No relaxation

4.1 WATER QUALITY INDEX

Water quality index is probably the best procedure for giving water quality information to concerned inhabitants and technique makers. Three steps are followed to figure WQI. In the underlying advance, a weight (wi) was designated to all of the parameters subject to their overall importance in overall nature of drinking water (Table 2). The parameter nitrate was assigned the most outrageous heap of 5 due to its critical importance in the assessment of water quality

In the second step the relative weight (Wi) is determined from the condition as follows:

$Wi = wi/\Sigma wi$

Where, Wi is relative weight, wi is every parameter's weight and n is number of parameters

Table 2 likewise gives determined relative weight (Wi) values for every parameter.

In third step, quality rating scale (qi) for every parameter is relegated by separating its focus by its individual standard in water test as per the rules set down in the BIS and the and the outcome increased by 100:

$qi = (Ci/Si) \times 100$

Where, qi is the quality ranking,
Ci denotes the concentration of respective water quality parameter of each water sample in mg/l, and Si denotes Indian drinking water level in mg/l for the parameters in accordance to the BIS 10500 :2012 guidelines.
The SI is calculated for the computation of WQI for the water quality parameters, according to the equation

$$SI_i = W_i q_i$$

$$WQI = \sum SIi$$

where, SIi is the subindex of the ith parameter,qi= concentration-based rating of ith parameter

Table 2 RELATIVE WEIGHTS OF WATER QUALITY PARAMETER USED IN COMPUTATION OF WQI

WATER QUALITY PARAMETERS	BIS std (Si)	WEIGHT (wi)	RELATIVE WEIGHT (Wi=(wi/Σwi)
pH	8.5	4	0.14815
TOTAL DISSOLVED SOLIDS	500	4	0.14815
TOTAL HARDNESS	300	2	0.07407
FLUORIDE	1	4	0.14815
NITRATE	45	5	0.18519
IRON	0.3	4	0.14815
ARSENIC	0.01	4	0.14815

The calculated WQI values are categorized into five categories, "excellent water" into "water unsuitable for drinking."

Table 3 CATEGORY OF WATER AS PER WQI VALUE

WQI VALUE	WATER QUALITY
< 50	excellent
50 - 100	good water
100 - 200	poor water
200 - 300	very poor water
> 300	unsuitable for drinking

5. RESULT AND DISCUSSION

Table 4 GEOCHEMICAL ANALYSED DATASET OF GROUNDWATER SAMPLES

Sr No.	SAMPLE LOCATION	pH	E.C.	TDS	T.H	F	NO3	Fe	As
			µs/cm	mg/l	mg/l	mg/l	mg/l	mg/l	(ppb)
1	Bistauli	7.4	372	223	134	1.68	0.5	0.4	2.1
2	Harpur	7.5	380	228	141	1.25	0.3	0.9	0.36
3	Gooram	7.8	463	278	255	1.19	0.4	0.1	0.75
4	Ban	7.2	688	413	198	1.45	1.2	0.5	0.42
5	Karanhari	6.9	755	453	104	1.96	0	0.4	0.18
6	Ranadeeh	8.2	673	404	214	2.94	0.5	0.6	0
7	Ramwapur	7.2	468	281	127	1.2	0.6	0.1	0
8	Rampur	6.5	552	331	251	0.83	0.4	0.2	10.8
9	Jangal Kauria	7.3	330	198	201	1.65	0.2	0.3	0.45
10	Tal Koila	7.4	371	223	174	1.38	0.8	0.1	0.62
11	Meerpur	7.2	362	217	164	0.95	0.1	0.5	0.8
12	Partappur	7.4	325	195	171	1.35	0.2	0.3	0.35
13	Kalani urf Barhni	7.4	679	407	90	1.47	0.3	0	1.6
14	Ahirauli	7.1	573	344	97	1.35	0	0.4	0.2
15	Ghunghunkotha	7.3	499	299	87	0.95	0.2	0.1	0
16	Laxmipur	7.4	393	235	110	1.12	0.2	0.1	0

17	Karhiya	6.9	455	273	190	1.21	0	0.1	0.41
18	Jungle Ramgarha	7.2	380	228	150	0.91	0.1	0.2	0
19	Jamuar	7.1	468	281	210	1.32	0.4	0	0

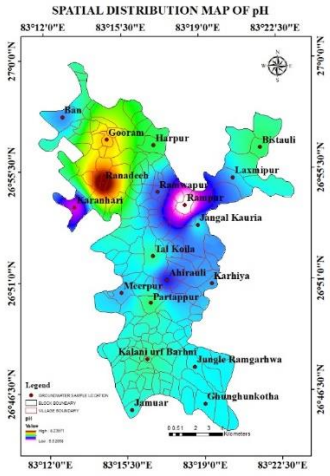

Figure 3 SPATIAL DISTRIBUTION MAP OF pH

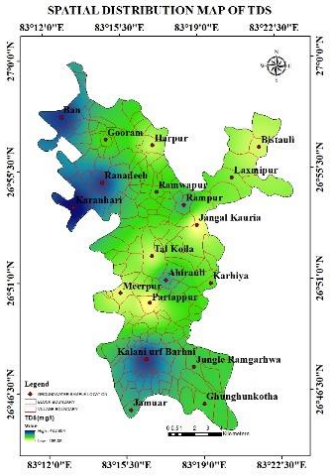

Figure 4 SPATIAL DISTRIBUTION MAP OF TDS

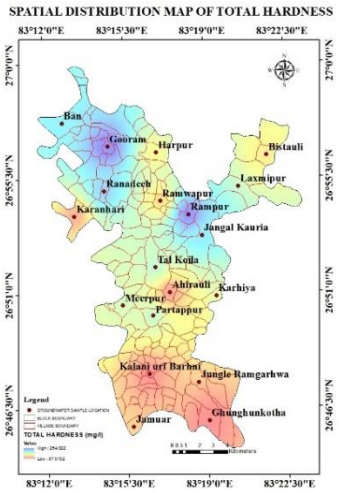

Figure 5 SPATIAL DISTRIBUTION MAP OF TH

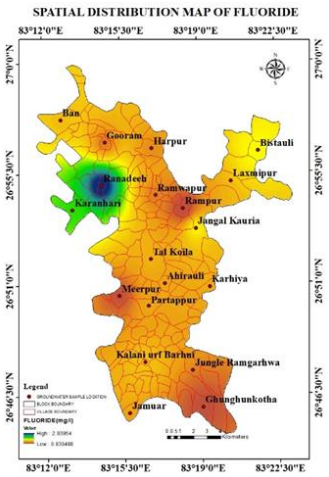

Figure 6 SPATIAL DISTRIBUTION MAP OF FLUORIDE

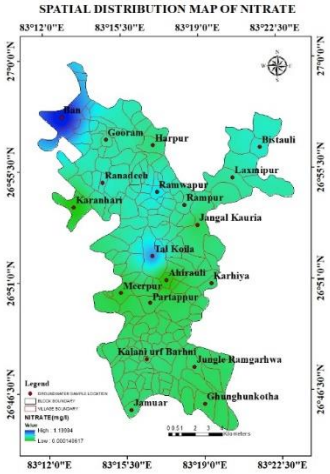

Figure 6 SPATIAL DISTRIBUTION MAP OF NITRATE

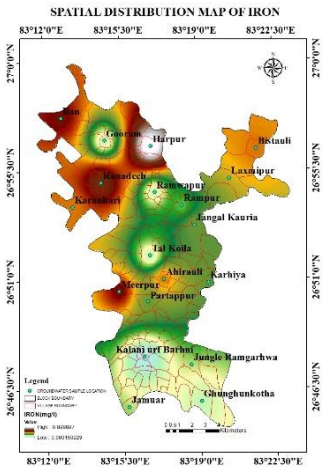

Figure 8 SPATIAL DISTRIBUTION MAP OF IRON

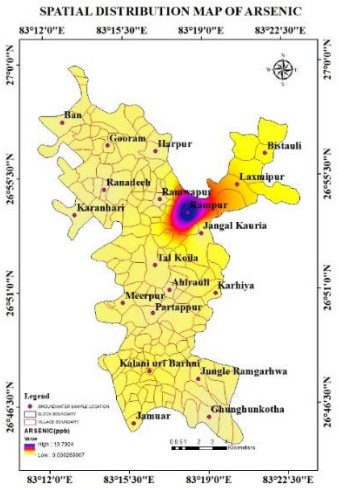

Figure 7 SPATIAL DISTRIBUTION MAP OF ARSENIC

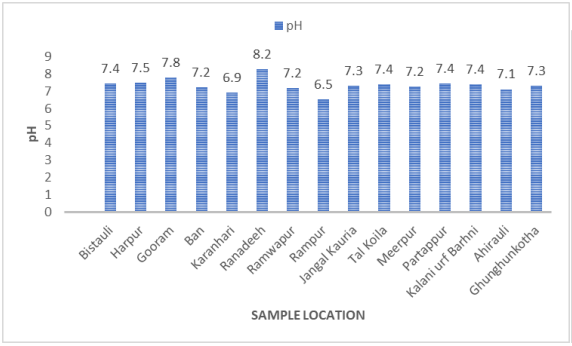

CHART 1 pH VARIATION

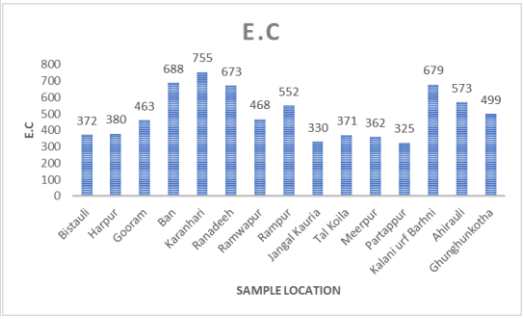

CHART 2 EC VARIATION

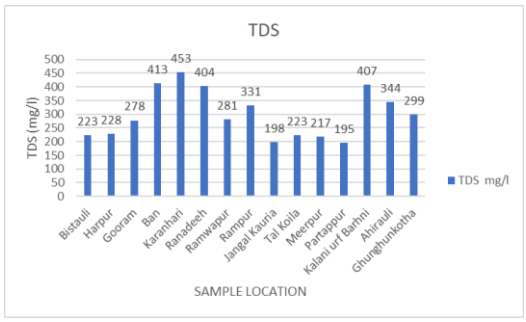

CHART 2 TDS VARIATION

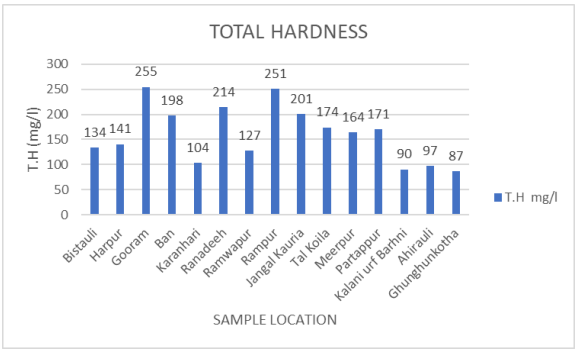

CHART 4 TOTAL HARDNESS VARIATION

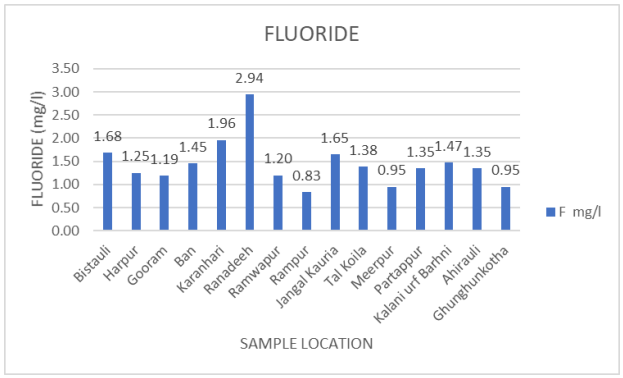

CHART 3 FLUORIDE VARIATION

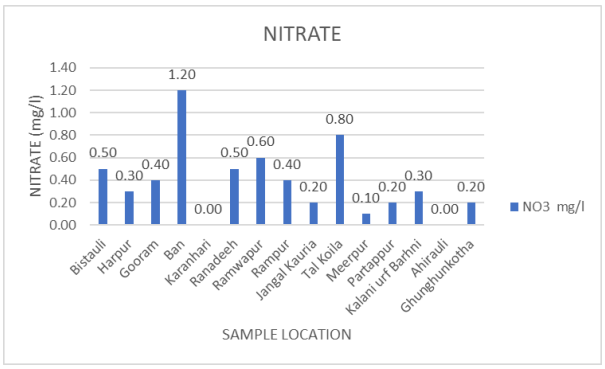

CHART 6 NITRATE VARIATION

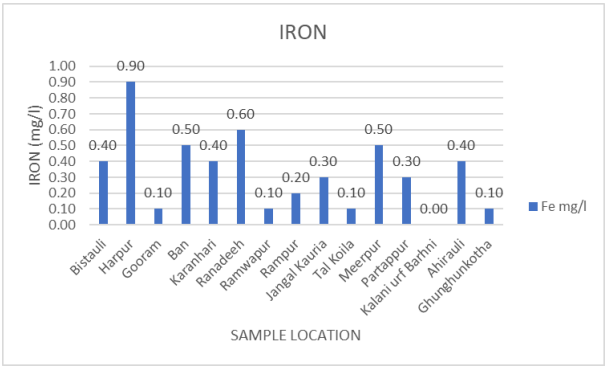

CHART 4 IRON VARIATION

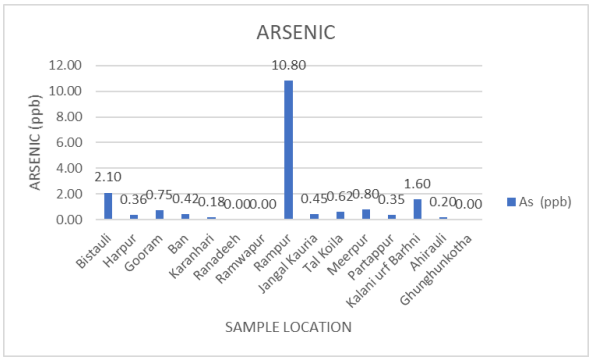

CHART 8 ARSENIC VARIATION

Table 5 WATER QUALITY INDEX

GROUNDWATER SAMPLE LOCATIONS	WATER QUALITY INDEX (WQI)	QUALITY OF WATER
BISTAULI	70.77	GOOD WATER
HARPUR	86.85	GOOD WATER
GOORAM	51.94	GOOD WATER
BAN	76.97	GOOD WATER
KARANHARI	77.08	GOOD WATER

RANADEEH	105.01	POOR WATER
RAMWAPUR	46.92	EXCELLENT
RAMPUR	65.79	GOOD WATER
JANGAL KAURIA	63.56	GOOD WATER
TAL KOILA	50.39	GOOD WATER
MEERPUR	63.09	GOOD WATER
PARTAPPUR	58.34	GOOD WATER
KALANI urf BARHNI	51.44	GOOD WATER
AHIRAULI	65.00	GOOD WATER
GHUNGHUNKOTHA	42.84	EXCELLENT
LAXMIPUR	53.77	GOOD WATER
KARHIYA	58.00	GOOD WATER
JUNGLE RAMGARHWA	56.22	GOOD WATER
JAMUAR	55.19	GOOD WATER

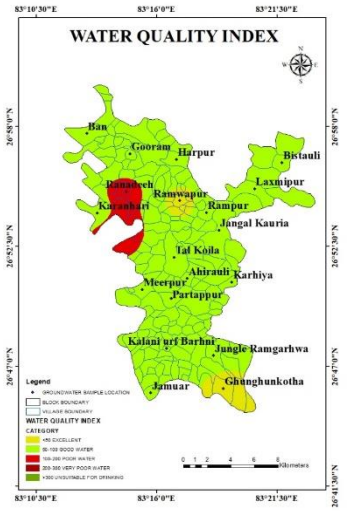

Figure 10 WATER QUALITY INDEX MAP

6. CONCLUSION

The current examination explores water quality parameters i.e pH, Electrical conductivity,Total disintegrated strong, Total hardness, Nitrate, Fluoride, Iron and Arsenic of Jngle Kaudia block of the district Gorakhpur in the state U.P to check the appropriateness for drinking. The parameters, for example, pH, Electrical conductivity, Total dissolved solids, Total hardness, Fluoride ,Nitrate and Arsenic are inside reasonable limits according to BIS (IS 10500: 2012) Standards for drinking water.In some part of Jungle Kaudia block, the amount of fluoride and iron surpassed as far as possible for

drinking reason. Consequently, the water isn't reasonable for drinking straightforwardly, as it might bring about awful wellbeing of individuals living there. In any case, with some reasonable treatments, it can be utilized for drinking purpose

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