International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

Experimental Investigation on Ground Water in Nagthan Village

Md. Saifaadil Attar[1], Fahad Quadri[2]
[1]assistant Professor Dept Of Civil Engg. Siet Vijaypur, Affiliated To Vtu Belgavi, Karnataka India
[2]student Department Of Civil Engg. Siet Vijaypur Affiliated To Vtu Belgavi, Karnataka India

Abstract - The water and environment has become an emotive issue with the people and policy makers. The chief causes for the pollution of water and environment are anthropogenic activities of human beings. The primary objective is to study the groundwater quality parameters around Nagathan village. Water is a polar inorganic compound and it is a transparent, tasteless, odourless, and nearly colourless with a hint of blue chemical substance, which is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. Water is vital for all known forms of life, even though it provides no calories or organic nutrients. The project work is aimed at assessing the water quality index (WQI) for the ground water of Nagathan village.The groundwater samples from 35 places were collecting and subjected for a chemical analysis. For calculating the WQI, the following 3 parameters have been considered viz., pH, total hardness and alkalinity. The results analyzed (by WQI method) have been used to suggest models for predicting water quality. The analysis reveals that the groundwater quality status of the study area. IS (10500-2012). Hence a study has to be carried out for the quality of the available groundwater around the Nagathan village.

INTRODUCTION.

1.1 General

Water is the most precious gift of nature, the most crucial for sustaining life and is required in almost all the activities of man - for drinking and municipal use, for irrigation, to meet the growing food needs for industries, power generation, navigation and recreation. Moreover, the rainfall is mostly confined to the monsoon season and is unevenly distributed both in space and time even during the monsoon season. As a result, the country is affected by frequent droughts. Nearly one third of the country is drought prone. In the very near future, water will be a scarce resource and therefore, needs to be harnessed in the most scientific and efficient manner. The surface water is subjected to various threats like discharge of effluents from different industries in the vicinity, encroachment of surface water sources like pond, river, stream etc. Groundwater is the major source of drinking water in both urban and rural India. The demand for water has increased over the years and this has led to water scarcity in many parts of the world. Exploitation of groundwater reservoir as a viable source of drinking water and for domestic use (or even for small scale industries) is safer and economical than surface water, as groundwater is not only found almost everywhere but also generally uncontaminated. As a result groundwater investigation has assumed top priority in recent years. Groundwater is often thought of as an underground river or lake. Groundwater is usually held in nonporous soils or rock materials. The area where water fills these spaces is called the saturated zone; the top of this zone is called the water table. The water table may be shallow (only a foot below the ground surface) or it may be deep (hundreds of feet down) and may rise or fall depending on many factors. Heavy rains or melting snow may cause the water table to rise while an extended period of drought may cause the water table to fall Groundwater is stored in, and moves slowly through, layers ofsoils.

LITERATURE REVIEW.

1. **Farah Deeba et.al(2019),** The results indicate that pH, color and odor were all within limits of WHO that is pH ranges 6.5–8.5, colorless and odorless, respectively. The high values of suspended solids were observed in the Sindh-1 and Dharki samples. The ionic concentration analysis showed that high bicarbonate (HCO3 -) which leads too headache and muscle pain, ions are present in the samples of Sahiwal and Dharki.
2. **Amrita Kasana(2017)**,The state of Haryana has witnessed a spectacular increase in agricultural production in the last few decades, and is largely dependent on Groundwater mining for irrigation has become a reality in the state over the years as the number of tube wells has increased from 0.02 million in 1966 to 0.73 million in 2012, showing alarming signs of over exploitation. The impact of increased groundwater irrigation on groundwater levels has not been studied both spatially and temporally, which has lead to Contaminated drinking water and having toxin, cancer and other diseases.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

3. **Razim Ganesh (2018),** The extraction of groundwater in Kathmandu Valley is increasing day by day due to increase in population. The present study aims to prepare water table map and groundwater quality Surface maps are prepared for water quality parameters (pH, turbidity, conductivity, TDS, total hardness, iron, ammonia, nitrate, chloride, alkalinity and E-coli) in From the water quality mapping of the Bhaktapur Municipalityp from unconfined aquifer of Bhaktapur Municipality. It is noted that it contains chloride, ammonia and nitrate in majority of wells, which can lead to cyanosis, shortness of breath and vomiting.
4. **A. Lumb,(2006),** The groundwater quality characteristics of cluster results also revealed that the groundwater quality in the study area depends on geological locations. Most of the samples in Cluster I are located in An Giang province and some in Dong Thap province. Cluster includes 15 samples (AG1-4, AG6-13, DT2, DT8, DT9), which was highly polluted with coliforms. Groundwater samples in this cluster also showed slight total hardness contami- nation.
5. **Kumar (2023),** Ground water contamination is one of the most popular domain of research in India. While researcher reviewed that uranium and arsenic content is present in the ground water of malwa district of punjab, which leads to brain effects, nausea, vomiting and diarrhea. The authors also reported that over exploitation of ground water along with anthropogenic was found in ground water, which leads to cancer, chronic disease and early fatal death.
6. **Verma and sinha (2023),** The investigation was held, where the health risk assessment was conducted due to consumption of elevated levels of arsenic through monte carlo simulations. The authors observed that a high risk of cancer is predominant in the eastern bank of the river ganga than in the western part.

Sampling.

The samples will be collected from the Nagthan village in vijayapura city. The grab samples will be collected covering the entire village. after a gap of every 7 days. One litre of water sample will be collected from each sampling point and immediately transported to the laboratory for analysis the water samples of Nagthan village.

Correlation and Regression analysis.

Co-variation of two independent magnitudes is known as correlation. If two variables x and y are related in such a way that increase or decrease in one of them corresponds to increase or decrease in the other, we say that the variables are positively correlated. Also if increase or decrease in one of them corresponds to decrease or increase in the other, the variables are said to be negatively correlated. The numerical measure of correlation between two variables x and y is known as coefficient of correlation. Regression is an estimation of one independent variable in terms of the other. If x and y are correlated, the best fitting straight line in the leastsquare sense gives reasonably a good relation between x and y.

A water quality index provides a single number (like a grade) that expresses overall water quality at a certain location and time based on several water quality parameters. The objective of an index is to turn complex water quality data into information that is understandable and useable by the public.

According to the concept of indices to represent gradation in water quality was first proposed by Horton(1965). The water quality index has been calculated by standards of drinking water quality recommended by the World Health Organization (WHO). Bureau of Indian Standards (BIS) and Indian council for medical research (ICMR). The weighted arithmetic index method has been used for calculation of WQI of groundwater of Bijapur City. Further quality rating or sub index (Qn) is calculated by the following expression.

$$Qn=100(Vn-Vin)/(Sn-Vin)\ldots\ldots(1)$$

Where

Qn= Quality rating for the n^{th} water quality parameter

Vn= Estimated value of the n^{th} parameter at a given sampling pointSn= Standard

permissible value of n^{th} parameter

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

Vin=Ideal value of n^{th} parameter in pure water.(i.e.,0 for all other parameters except theparameter pH and dissolved oxygen 7.0 and 14.6 mg/L respectively).

The overall water quality index was calculated by aggregating the quality rating withthe unit weight.

Source IS;10500-2012

Table-1: Characteristics of groundwater Parameters

PARAMETER	METHOD/INSTRUMENT
pH	pH meter
Total Hardness	EDTA Titrametric method
Calcium	EDTA Titrametric method
Magnesium	EDTA Titrametric method
Chloride	Titrametric method
Alkalinity	Titrametric method
Acidity	Titrametric method
Colour,Taste,Odour	Physical observation

Table-2: Analytical method

RESULTS AND DISCUSSION

1] pH value

Desirable limit:6.5-8.5 Permissible limit:

No relaxation

Nagthan bore 1	**7**
Nagthan bore 2	**7**
Nagthan bore 3	**7**

All the values of P^H are in desirable limits.

2] Total hardness Desirable

limit:200mg/ltr Permissible

limit:600mg/ltr

Nagthan bore 1	**450mg/ltr**
Nagthan bore 2	**420mg/ltr**
Nagthan bore 3	**480mg/ltr**

All the values of total hardness are in permissible limit.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

3] Calcium hardness Desirable limit:200mg/ltr Permissible limit:600mg/ltr

Nagthan bore 1	**47.33mg/ltr**
Nagthan bore 2	**41.83mg/ltr**
Nagthan bore 3	**43.16mg/ltr**

The values of calcium hardness in the areas of villages are in desirable limit.

4]Magnesium hardness Desirable limit:200mg/ltr Permissible limit:600mg/ltr.

Nagthan bore 1	**403mg/ltr**
Nagthan bore 2	**378mg/ltr**
Nagthan bore 3	**436mg/ltr**

The values of magnesium hardness in the areas of nagthan village are in the permissible limits.

5] Chloride content Desirable limits:250mg/ltr Permissible limits:1000mg/ltr

Nagthan bore 1	**200mg/ltr**
Nagthan bore 2	**196.3mg/ltr**
Nagthan bore 3	**189.7mg/ltr**

The values of chloride content in the areas of nagthan village are in the are within the desirable limit.

6] Alkalinity

Desirable limit:200mg/ltr Permissible limit:600mg/ltr

Nagthan bore 1	**353mg/ltr**
Nagthan bore 2	**326mg/ltr**
Nagthan bore 3	**323mg/ltr**

The values of alkalinity in the areas of nagthan village are within than the permissible limits.

7] Acidity

Derirable limit:200mg/ltr Permissible limit:600mg/ltr

Nagthan bore 1	**150mg/ltr**
Nagthan bore 2	**166.6mg/ltr**
Nagthan bore 3	**135.5mg/ltr**

All the values of acidity are within the Permissible limit.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

4.1 Water Quality Index

A water quality index provides a single number (like a grade) that expresses overall water quality at a certain location and time based on several water quality parameters. The objective of an index is to turn complex water quality data into information that is understandable and useable by the public.

According to the concept of indices to represent gradation in water quality was first proposed by Horton(1965). The water quality index has been calculated by standards of drinking water quality recommended by the World Health Organization (WHO). Bureau of Indian Standards (BIS) and Indian council for medical research (ICMR). The weighted arithmetic index method has been used for calculation of WQI of groundwater of Bijapur City. Further quality rating or sub index (Qn) is calculated by the following expression.

$$Qn=100(Vn-Vin)/(Sn-Vin)\ldots\ldots(1)$$

Where

Qn= Quality rating for the n^{th} water quality parameter

Vn= Estimated value of the n^{th} parameter at a given sampling point

Sn= Standard permissible value of n^{th} parameter

Vin=Ideal value of n^{th} parameter in pure water.(i.e.,0 for all other parameters except theparameter pH and dissolved oxygen 7.0 and 14.6 mg/L respectively).

The overall water quality index was calculated by aggregating the quality rating with the unitweight.

$$WQI=\Sigma QnWn/\Sigma Wn\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Table 1 shows the water quality index WQI and status of water quality. The comparison of estimated of water quality parameters with drinking water standards is shown in Table 2. The obtained values of water quality with regard to Physico-chemical parameters are shown in Table 3.

Table 1: Water Quality Index (W.Q.I.) and status of water quality (Chatterji andRaziuddin 2002)

Water Quality Index Level	Grade	Water Quality Status
0-25	A	Excellent water quality
26-50	B	Good water quality
51-75	C	Poor water quality
76-100	D	Very poor water quality
>100	E	Unsuitable for drinking

Table 2: Drinking Water standards recommending agencies and unit weight (All valuesexcept pH are in mg/L.)

Parameters	Standards	Recommended Agency	Unit Weight
pH	6.5 - 8.5	ICMR / BIS	0.2190
Total Alkalinity	120	ICMR	0.0155
Total Hardness	300	ICMR / BIS	0.0062
T.D.S	500	ICMR / BIS	0.0037
Calcium	75	ICMR / BIS	0.025
Magnesium	30	ICMR / BIS	0.062
Chloride	250	ICMR	0.0074
Nitrate	45	ICMR / BIS	0.0413
Sulphate	150	ICMR / BIS	0.0124
Dissolved Oxygen	5.0	ICMR / BIS	0.723

Table 3: Water Quality Index of the groundwater of nagthan village.

Parameters	Observed Values	Standard Values (Sn)	Unit Weight (Wn)	Quality Rating (Qn)	WnQn
pH	7.00	6.5-8.5	0.219	15.38	3.36

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

TH	450.00	300	0.0062	150	0.93
Ca^{+2}	44.10	75	0.025	58.8	1.47
Mg^{+2}	405.67	30	0.061	1352.2	82.48
Cl^{-}	195.33	250	0.0074	78.132	0.578
Acidity	150.7	150	0.0364	100.46	3.657
Alkalinity	334	120	0.0155	278.33	4.314

$\Sigma Wn=0.4263 \quad \Sigma Qn=2,033.30 \quad \Sigma WnQn=96.789$

Water Quality Index
$WQI=\sum WnQn/\sum Wn=227.0$

CONCLUSION

- The Parameters total hardness, magnesium hardness, alkalinity are exceeding the desirable water quality standards (IS 10500-2009) hence required treatment like boilingor adding lime powder.
- As per WQI status of water quality the above water samples fall in grade "**C**" category hence it can be stated that the water quality belongs to poor quality.

Table 1: Water Quality Index (W.Q.I.) and status of water quality (Chatterji and Raziuddin 2002)

Water Quality Index Level	Grade	Water Quality Status
0-25	A	Excellent water quality
26-50	B	Good water quality
51-75	C	Poor water quality
76-100	D	Very poor water quality
>100	E	Unsuitable for drinking

Table 2: Drinking Water standards recommending agencies and unit weight (All values except pH are in mg/L.)

Parameters	Standards	Recomm-ended Agency	Unit Weight
pH	6.5 - 8.5	ICMR / BIS	0.2190
Total Alkalinity	120	ICMR	0.0155
Total Hardness	300	ICMR / BIS	0.0062
T.D.S	500	ICMR / BIS	0.0037
Calcium	75	ICMR / BIS	0.025

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 06 , June - 2026

REFERENCES

- Farah Deeba et.al(2019), Ground Water Quality of Selected Areas of Punjab international scientific organization
- Amrita Kasana(2017), Groundwater Irrigation Economy of Haryana N IRD and PR journal of rural development
- Razim Ganesh (2018), ASSESSMENT OF GROUNDWATER QUALITY AND WATER TABLE MAPPING OF BHAKTAPUR MUNICIPALITY JScE Vol. 5,

- Lumb,(2006), Water Quality Index Assessment under Climate Change
    - Journal of Water Resource and Protection

- Adimalla, N. (2019/2020): Widely cited papers on groundwater quality status and heavy metal contamination in hard rock terrains, often utilizing WQI models. [1, 2, 3]
- Sinha, D. K., et al. (2004): Frequently referenced for relative weight assignments (\(W_{i}\)) in computing the Weighted Arithmetic Water Quality Index.
- Ramakrishnaiah, C. R., et al. (2009): *Assessment of water quality index in the tumkur district of Karnataka, India*, a highly referenced regional case study utilizing standard BIS and WHO parameters for groundwater.