"EXPERIMENTAL INVESTIGATION ON GROUND WATER IN VIJAYAPUR CITY"

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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 Vijayapura city. 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 Vijayapura city. 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 analysed (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 Vijayapura city.

INTRODUCTION.

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 of soils.

Sand and rocks called aquifers. The nature of groundwater flow depends on the size of the pores in the rock or within the soil particles and how well the spaces are interconnected. Aquifers typically consist of gravels, porous sedimentary rocks and fractured crystalline rocks. Water in aquifers at times reaches the surface of the earth naturally through springs. Groundwater can also be extracted from a well manually or can be brought to the surface by a pump. Some wells, called artesian wells, do not need a pump because of natural pressures that force the water up and out of the well. "EXPERIMENTAL INVESTIGATION ON GROUND WATER IN VIJAYAPURA CITY."

2.1 LITERATURE REVIEW.

1. Vijaya Lalitha et. al(2016),The concentrations of physical, chemical and biological parameters in groundwater samples were compared with the Bureau of Indian Standards (BIS) and World Health Organization (WHO)Water samples are collected from bore wells of sample stations and are analysed for concentrations. The conclusion of the analysis is that the groundwater in some places of study area is good for drinking and many areas have poor water quality. However the quality can be improved after undergoing the treatment processes**.**

2. Akshay Kotian et. al(2018),Water is an essential natural resource for sustaining life and environment, but over the last few decades the water quality is deteriorating due to it's over exploitation. Water quality is essential parameter to be studied when the overall focus is sustainable development keeping mankind at focal point. In the present study ground water quality analysis has been done in pre-monsoon period for 106 water samples collected at various locations of Udupi district considering industrial areas and sea shores. The analysis was done for the parameters such as pH, chlorides, calcium, magnesium, nitrates, sulphates, fluorides, iron, potassium, sodium, Total Dissolved solids, Bicarbonates, Turbidity, Conductivity, Total Hardness etc. The Bureau of Indian Standards for drinking water 10,500: 2012 has been used for assesment.

3. Tjasa Kanduc et.al(2014),The geochemical and isotopic composition of surface waters and groundwater in the Velenje Basin, Slovenia, was investigated seasonally to determine the relationship between major aquifers and surface waters. Groundwater in the Triassic aquifer is dominated by HCO_3^-, Ca^{2+}, Mg^{2+} and $\delta^{13}C_{DIC}$ indicating degradation of soil organic matter and dissolution of carbonate minerals similar to surface waters. In addition, groundwater in the Triassic aquifer has $\delta^{18}O$ and δD values that plot near surface waters on the local and global meteoric water lines, and detectable tritium, likely reflecting recent (>50 years) recharge. These waters have likely been influenced by sulfate reduction and microbial methanogenesis associated with coal seams and dissolution of feldspars and Mg-rich clay minerals.

G.R. Lashkaripour(2003),The Korin basin is located in Sistan and Baluchestan Province in the southeast of Iran. Rapid agricultural development in this basin has caused increase on demand for water supply. The basin is characterized by an arid climate with an average annual rainfall of 84 mm. The main reason for this decline in the groundwater table is that wells pumping from groundwater resource

has exceeded natural recharge in the recent years. The need for this research is studying groundwater conditions for protecting groundwater supplies as a unique source of water for this area. A resistivity survey was carried out in order to study groundwater conditions in the shallow Korin aquifer such as depth, thickness and location of the aquifer and the type of water. Also zones with high yield potential have been determined based on the resistivity information. The resistivity Schlumberger sounding m was carried with half-spacing in the range of 200m to 400m.

5. Mohamed Yousif et.al(2018), The current research provides an integrated remote sensing data, microfacies analysis, field studies and geochemical approach to investigate the groundwater resources in West El Minia area. Three aquifers were investigated; Oligocene sandstone, Middle Eocene limestone and Nubian sandstone aquifer. New data about two aquifers (Nubian sandstone and Oligocene) are presented in the current study extracted from well logging interpretation and wells rock samples. The groundwater of the Oligocene sandstone and Middle Eocene limestone aquifers are recorded under unconfined conditions, while the Nubian sandstone is recorded as confined aquifer. The total thicknesses of the three aquifers were identified through interpretation of the well logging data (180 m for Oligocene aquifer, 445 m for the Middle Eocene aquifer, and 145 m for Nubian sandstone aquifer). The present study discusses the groundwater levels, the geological controls and groundwater chemistry of the recorded aquifers. The low salinity values (560–916 mg/l) and water table map as well as the obtained stable isotopes data reveal that the Middle Eocene aquifer is recharged from the Nile River where it has isotopic signature of the modern Nile water with slightly contribution of paleo-water of the Nubian sandstone.

METHODOLOGY.

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 least square sense gives reasonably a good relation between x and y.

Water Quality Index (WQI).

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 (Q_n) is calculated by the following expression.

$$Q_n = 100(V_n - V_{in})/(S_n - V_{in}) \ldots\ldots (1)$$

Where

Qn= Quality rating for the nth water quality parameter

Vn= Estimated value of the nth parameter at a given sampling point Sn= Standard permissible value of nth parameter

Vin=Ideal value of nth parameter in pure water. (i.e.,0 for all other parameters except the parameter 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 unit weight.

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

RESULTS AND DISCUSSION

1] pH value

Desirable limit:6.5-8.5

Permissible limit: No relaxation Mustafa Colony	**6.80**
Managuli base	6.50
Asar Galli	7.30
Chandpur Colony	6.60
Ram Nagar	6.70
Naubag	7.20

Magnesium hardness

Desirable limit:200mg/ltr

Permissible limit:600mg/ltr.

Mustafa Colony	**43.0mg/ltr**
Managuli base	**144.0mg/ltr**
Asar Galli	**25.40mg/ltr**
Chandpur Colony	**325.40mg/ltr**
Ram Nagar	**208.60mg/ltr**
Naubag	**336.00mg/ltr**

4] Chloride content

Desirable limits:250mg/ltr

Permissible limits:1000mg/ltr **Mustafa Colony**   **252.32mg/ltr**

Managuli base	**184.94mg/ltr**
Asar Galli	**109.97mg/ltr**
Chandpur Colony	**111.97mg/ltr**
Ram Nagar	**204.64mg/ltr**
Naubag	**411.27mg/ltr**

The values of chloride content in the areas of Managuli colony, asar galli, chandpur colony, ramnagar are below the permissible limit.

5] Total dissolved solids

Desirable limits:500mg/ltr

Permissible limits:1000mg/ltr **Mustafa Colony**	**157.00mg/ltr**
Managuli base	**83.80mg/ltr**
Asar Galli	**97.8mg/ltr**
Chandpur Colony	**112.4mg/ltr**
Ram Nagar	**15.00mg/ltr**
Naubag	**63.00mg/ltr**

6] Alkalinity

Desirable limit:200mg/ltr

Permissible limit:600mg/ltr **Mustafa Colony**	**182.00mg/ltr**
Managuli base	**244.00mg/ltr**
Asar Galli	**189.4mg/ltr**
Chandpur Colony	**182.0mg/ltr**
Ram Nagar	**230.0mg/ltr**
Naubag	**326.00mg/ltr**

7] Acidity

Desirable limit:200mg/ltr

Permissible limit:600mg/ltr	
Mustafa Colony	**52.6mg/ltr**
Managuli base	**42.6mg/ltr**
Asar Galli	**23.40mg/ltr**
Chandpur Colony	**30.60mg/ltr**
Ram Nagar	**51.40mg/ltr**
Naubag	**68.60mg/ltr**

CONCLUSION

- The Parameters total hardness, Calcium hardness, Chloride content are exceeding the desirable water quality standards (IS 10500-2009) hence required treatment like boiling or 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

REFERENCE.

1. **Vijaya Lalitha et.al(3),** A study on assessment of groundwater quality and its suitability for drinking in Shivajipalem area, Visakhapatnam, A.P.(2016).

2. **Akshay Kotian et.al(4),**Assessment of Ground Water Quality in Udupi District, Karnatak.(May2018).

3. **Tjasa Kanduc et.al(6),**A geochemical and stable isotope investigation of groundwater/surface-water interactions in the Velenje Basin, Slovenia.(January 2014).

4. **G.R. Lashkaripour,**An investigation of groundwater condition by geoelectrical resistivity method: A case study in Korin aquifer, southeast Iran. (2003).

5. **Mohamed Yousif et.al(3),**Utilizing the geological data and remote sensing applications for investigation of groundwater occurrences, West El Minia, Western Desert of Egypt. (7 June 2018).