International Journal of Advance Research in Science and Engineering
Volume No 06, Special Issue No. (02), September 2017, ICITTESE-17
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

# A Review paper on ground water quality analysis and its health impact in iron ore area of Chhattisgarh

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**ABSTRACT**

*According to analysis about 75 – 80% human requirements are fulfilled by groundwater. Further groundwater accounts for more than 95% of all liquid fresh water available on the earth at any given movement. Due to the indiscriminate use of surface water as most of these are direct recipient of sewage, industrial effluent, etc. Water is one of the most basic necessities for life. Water pollution is subjects of great concern in the said areas due to presence of iron ore belt the ground waters around Chhattisgarh region where the iron ore mines are present. The water quality parameters viz. pH, Electrical Conductivity(EC), Sodium, Potassium, Calcium, Fluoride, Sulphate ,Total hardness, Iron, Total dissolved salt, Chemical Oxygen Demand, Biological Oxygen Demand, Dissolved oxygen are tested and statistically shown by WQI Index which shows the quality of water is suitable for drinking purpose or not.*

***Keywords: Groundwater, Water Analysis, Water Quality Parameters, WQI Index***

## I. INTRODUCTION

Water plays vital role in existence of all living beings and is essential for all activities of human beings. Water sources are available for drinking and other domestic purposes must be pure and free from all types of contamination. Contamination of water is a major problem in all areas of India. Although three fourth part of the world is surrounded by water, millions of people are facing problems due to water pollution. The State covers a geographical area of 1, 37,360 sq. km. Nearly 65.90 % of the total area is covered by tribals and hence it is said as tribal dominated State. The ground water regime is monitored through a network of observation dug wells and piezometers. Iron ore deposits in Chhattisgarh are widespread and have been a backbone to industrial development in the state. In Chhattisgarh iron ore deposits are found in Bailadila,Bacheli and Kirandul (Dantewada), Dallirajhra (Durg) and Kawardha. The environmental impact of large scale mining activities in Bailadila and Dalli-rajhara includes soil erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater and surface water by chemicals from mining processes. The monitoring database on water levels and chemical parameters helps to simulate models of forecasting, planning and management of ground water resources.

## II. OVERVIEW OF THE FIELD

Iron ore is an important mineral in Chhattisgarh. The production of iron ore is 5.50 million tones per year. Due to massive extraction of iron ore, it pollutes air, water and soil. When iron in solution reaches the water table it pollutes the ground water,while dissolved iron in surface water reacts with soil to cause soil erosion and effect

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

the soil profile and sometimes minor particles of iron spread with air cause air pollution. The major sources of heavy metals in ground water include rock minerals, discharge of sewage and other waste effluents on land and runoff water. The water used for drinking purpose should be free from any toxic elements, living and nonliving organism and excessive amount of minerals that may be hazardous to health.

Iron refineries can cause the drinking water supply to be hazardous. Sometimes, the mining may be deep enough to hinder with the water table. Mining activities have damaged the region, especiallyKirandul and Bacheli in Bailadila and Dallirajhra in Chhattisgarh.

In Bailadila the Shankhini and Dankini rivers are the most polluted rivers in India. Shankhini is the main river in Bailadila, most of the people about 100 villages are dependent on this source but due to excess mining the color of river water is converted into red water, apart from this most of the drinking water wells are reaching to dry.

## III. METHODOLOGY & FINDINGS

### Parameters Testing

The monitoring of quality of groundwater is important tomaintain the human health. The pH values in the ground water at all the cities of Chhattisgarh are mostly confined within the range 7.25 to 8.28. The pH values for most of the samples are well within the limits prescribed by BIS (1991) and WHO (1996) for various uses of water including drinking and other domestic supplies.[10]

The measurement of electrical conductivity is directly related to the concentration of ionized substance in water and may also be related to problems of excessive hardness and/or other mineral contamination. The conductivity values in the ground water samples varied widely from 385 to 2470.

Ten parameters, i.e., pH, EC, DO, hardness, alkalinity, Mg2+, Ca2+, Cl-, NO3- and SO4 2- were selected for evaluation of WQI using the standard values recommended by BIS and WHO. The weighed arithmetic method was used for calculation of the WQI of the groundwater with the help of the following expression.[5]

WQI ¼ RqnWn=RWn

Where

Qn = 100 x [Vn-Vo] / [Sn-Vo]

Where, qn = Quality rating for the nth water quality parameter.

Vn = Estimated value of the nth parameter at a given sampling site.

Sn = Standard permissible value of the nth parameter.

Vo = Ideal value of nth parameter in a pure water.

W.Q.I has been calculated by using the standards of drinking water quality recommended by BIS (1993) and ICMR (1975).

The TDS values are found in between 210-17240 mg/l this might be due to the natural and percolation of industrial, Sewage & MSW dump site wastewater in to the ground water table.**Chloride**: The concentration of chloride varies from 16 to 270 mg/L. More than 90% of the samples are within the desirable limit of 250 mg/L. **Nitrate**: Nitrate content in drinking water is considered important for its adverse health effects. The occurrence of high levels of nitrate in ground water is a prominent problem in many parts of the country. The nitrate content in the monitored cities varied from 0.10 to 0.98 mg/L.**Heavy Metals** The contamination of ground water by heavy metals has received great significance during recent years due to their toxicity and accumulative

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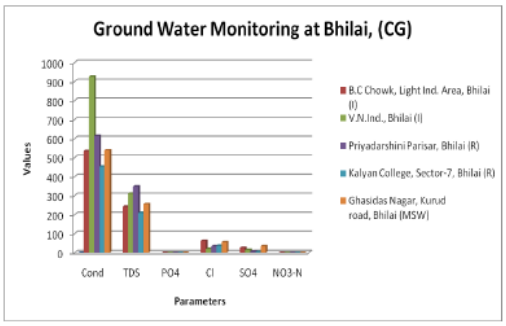
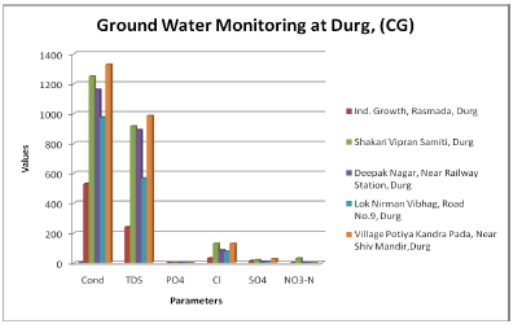
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

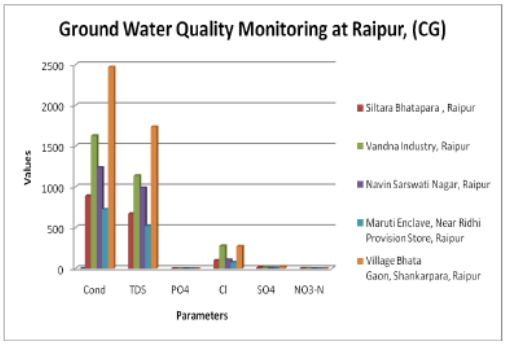
behaviour. **Iron** The concentration of iron in the ground water of the metropolitan city of Delhi ranges from 1.142 to 70.53mg/L. The Bureau of Indian Standards has recommended 0.3mg/L as the desirable limit and 1mg/L as the maximum permissible limit for iron in drinking water (BIS, 1991). High concentrations of iron generally cause inky flavour, bitter and astringent taste to water.

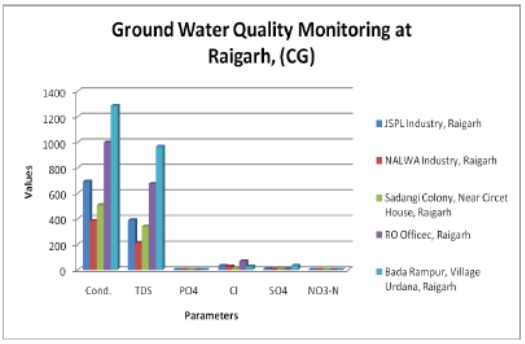
**Over all graphic representation of Ground water Quality Monitoring Status in Chhattisgarh**

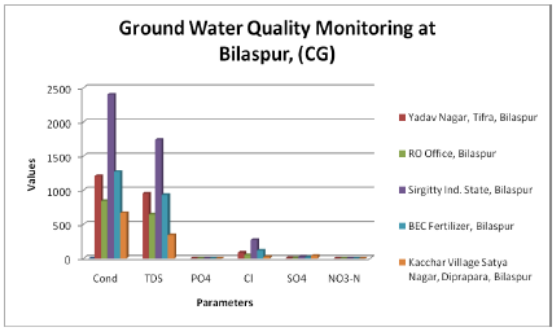
Almost all the parameters for most of the samples were reported with lower than the permissible limits of WHO standard. The level of these low concentrations of these ions does not have any considered impact for this water to use for drinking and cooking purposes. All the site of study area were found iron content is higher than the specified limit of WHO standard Dalli Rajhara includes, contamination of soil, groundwater and surface water by chemicals from mining processes Samples were collected in sterilized screw-capped polyethylene bottles of one litre capacity. The water sample was divided in two portions. The 1st portion was used for measurement of the physico-chemical parameters. The 2nd portion was acidified with few drops of ultra-pure nitric acid(E. Merck) for analysis of the metals. Samples collected from study sites were properly labelled and a record was prepared .Borosilicate glassware, distilled water and good quality reagents were used throughout the testing.



IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

## IV. IMPACTS OF IRON ORE IN GROUND WATER

The environmental impact of large scale mining activities in Bailadila and Dalli-rajhara includes soil erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater and surface water by chemicals from mining processes.

The overall discussion, observation and study conclude that iron ore is such create bad effect of environment in mine site, like Soil erosion, Land degradation, Water pollution Air pollution and Soil pollution High concentrations of iron generally cause inky flavour, bitter and astringent taste to water. It can also discolour clothes, plumbing fixtures and cause scaling which encrusts pipe The increasing concentration of heavy metal has been correlated with the mining practices and growing population There is potential for massive contamination of the area surrounding mines due to the various chemicals used in the mining process as well as the potentially damaging compounds and metals removed from the ground with the ore... Dalli Rajhara includes, contamination of soil, groundwater and surface water by chemicals from mining processes It's not only effects the environment but also affect the human beings. The pollute water and pollute air which cause some disease in human beings.

## V. CONCLUSION

The increasing concentration of heavy metal has been correlated with the mining practices and growing population. Due to large scale mining activities in Dalli-Rajhara the groundwater is contaminated by chemicals from mining processes All the site of study area were found iron content is higher than the specified limit of WHO. the ground water is found to be contaminated and prolonged exposure may lead to health related problems among the local people residing in and around. Water pollution Air pollution and Soil pollution. It's not only effects the environment but also affect the human beings. The pollute water and pollute air which cause some disease in human beings.

## VI. ACKNOWLEDGEMENT

I am Thankful to Dr. Manoj Kumar Ghosh , Department of Chemistry Parthivi college of Engineering and Management for his guidance and Support in making this Paper.

## REFERENCES

[1.] APHA.1989.Standard methods for the examination of water and wastewater (18th edn).American public Health association Washington, D.C.

[2.] APHA. 1995. Standard Methods for the Examination of Water and Waste Water. APHA inc 16th edt Washington

[3.] Abulude et al.2007 EJEAFChe 6(8). [2297-2303]

[4.] B.B.Dhar., R.S.Singh and Tiwary.B.K, 1995.First world mining Environment Congress, NewDelhi.pp 675-686.

[5.] B. Das, "Environmental impact due to iron ore mining in Chhattisgarh," vol. 6, no. 1, pp. 27–29, 2014.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

[6.] Bank World, "Deep Wells and Prudence: Towards Pragmatic Action for Addressing Groundwater Overexploitation in India,"p. 120, 2010.

[7.] Bhagirathi Behera, Mira Das, Ajaya Chanda Assessment of ground water quality in and around Bacheli and Kirandula area, Dantewada district, Chhattisgarh, India INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCES Volume 3, No 6, 2013 ISSN 0976 – 4402

[8.] CPCB. 1994. Standard for liquid effluents, gaseous emission, automobiles exhaust, noise and ambient air quality. June 1995. Pollution Control Board law series, pcl4/95-96.

[9.] EPA. 1973. Water Quality Criteria. National academy of sciences, Washington., D.C.

[10.] ISI-1991. Indian Standard Norms for Drinking Water. No. 10500, pp 2-8.

[11.] Jain C.K., Ram D. and Bhatia, K., Evaluation of ground water quality in district Hardwar, Indian J.Environ. Prot., 16(10), 730-737 (1996)

[12.] Knickerbocker, C., Nordstrom and Southam, 2000. The role of "blebbing" in overcoming the hydrophobic barrier during bio-oxidation of elemental sulfur by Thiobacillus thiooxidans. Chem. Geol Journal, 169, p. 425.

[13.] Kumarswamy N, 1999.Journal of pollution Research. 10(1), 13-20

[14.] Mishra P.C., Fundamentals of Air and water pollution,Ashis publishing House, 115-121 (1996

[15.] Natural Waters, New York7 Wiley, 1981, pp. 780.

[16.] NMDC limited, works in Chhattisgarh.

[17.] P. S. V. Shankar, H. Kulkarni, and S. Krishnan, "India'sGroundwater Challenge and the Way Forward," Econ. Polit. Wkly., vol. xlvi, no. 2, pp. 37–45, 2011

[18.] State of Environment Report Odisha, Government of Odisha, Bhubaneswar, p. 132.

[19.] Somasekhar R.K., Studies on quality of water suppliedby municipality of Kakinada and ground waters of Kakinada Town, Indian J. Environ. Protection, 14(3),167-169 (1994)

[20.] W. Stumm, J. Morgan, Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in

**[21.]** WHO, (1984). Guidelines for Drinking Water Quality. In: Health Criteria and Other Supporting Information, second ed., vol. 2. World Health Organization, Geneva.