ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT'18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

Analysis of Water Quality Parameter of Kachna Area, Raipur, Chhattisgarh

[1] Archana Thakur, [2]Chirag Atha
[1][2]MBA(PCM) student

***Abstract*— Water is essential natural resources for all activities of human being. The study was carried out evaluate the current status of contamination in ground water collected from various different water bodies of Kachna area of Raipur district center of Chhattisgarh state. The study was carried out by collecting groundwater and municipal water samples during December 2015 – Feb 2016. The result was compared with various parameters in drinking water as per bureau of Indian Standard (BIS) specification for portable water (BIS 10500-1991) and World Health Organization (WHO).**

The water quality parameters such as , electrical conductivity(EC),total dissolved solid(TDS), alkalinity, pH, total alkalinity(TA), total hardness(TH) calcium hardness and magnesium hardness were analyzed. It was found that underground water was contaminated at few sampling site and few sampling shows the physiochemical parameter below the water quality standard and is not favorable for drinking purpose.

The solution for the same problems are herewith mentioned in this research report.

I. INTRODUCTION

Natural resources are the important wealth of our country, water is one of them. Water is extremely essential for survival of all living organisms. The quality of water is of vital concern for mankind since it is directly linked with human health, protection of the environment and sustainable development. The modern civilization, industrialization, urbanization and increase in population have led to fast degradation of our ground water quality. Ground water is the major source of drinking water in both urban and rural areas. The domestic sewage and industrial waste are the leading causes of ground water pollution [1, 2].
The significance of environmental water quality monitoring has been increasingly recognized over the last few decades. Presently, drinking water quality has become a serious issue of concern for human, mainly in developed and developing countries worldwide [3].

1.1 Drinking Water Quality Standards

Drinking water quality standards describes the quality parameters set for drinking water. Despite the truism that every human on this planet needs drinking water to survive and that water may contain many harmful constituents, there are no universally recognized and accepted international standards for drinking water. Even where standards do exist, and are applied, the permitted concentration of individual constituents may vary by as much as ten times from one set of standards to another.

Many developed countries specify standards to be applied in their own country. In Europe, this includes the European Drinking Water Directive and, in the USA, the United States Environmental Protection Agency (EPA) establishes standards as required by the Safe Drinking Water Act [4]. For countries without a legislative or administrative framework for such standards, the water quality standards do exist, most are expressed as guidelines or targets rather than requirements, and very few water standards have any legal basis or, are subject to enforcement. Two exceptions are the European Drinking Water Directive and the Safe Drinking Water Act in the USA, which require legal compliance with specific standards.

1.2 Indian Standard for Drinking Water as per BIS (IS 10500-1991)

This is a presentation which gives details of the permissible and desirable limits of various parameters in drinking water as per the BIS standard specifications for potable water.

Arghyam has compiled a brief presentation which gives details of the permissible and desirable limits of various

ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT – 18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

parameters in drinking water as per Bureau of Indian Standards (BIS) standard specifications for potable water (BIS-10500-1991). The BIS drinking water specification (IS 10500:1991) was drawn up in 1983 and its most recent revision dates back to July 2010 (Amendment No. 3).

The standard was adopted by the Bureau of Indian Standards with the following objectives -

- ✓ To assess the quality of water resources, and
- ✓ To check the effectiveness of water treatment and supply by the concerned authorities.

They apply to drinking water supplied by different Authorities/ Agencies/ Departments of State Governments and Central Government, wherever applicable in the country. They also apply to water supplied by Non-Government or Private Agencies for human consumption in any place of the country.
The various parameters covered include color, odor, pH, total dissolved solids, hardness, alkalinity, elemental compounds such as iron, manganese, sulphate, nitrate, chloride, fluoride, arsenic, chromium, copper, cyanide, lead, mercury, zinc and coliform bacteria.
The standard categorizes various characteristics as essential or desirable. It mentions the desirable limit and indicates its background so that the implementing authorities may exercise their discretion, keeping in view the health of the people, adequacy of treatment etc. All essential characteristics should be examined in routine. Besides, all desirable characteristics should be examined either when a doubt arises or the potability of water from a new source is to be established.

The standard has categorically made relaxation in the specification when no alternate resources are available and therefore, to enable the Water Supply Agencies to exercise their discretion a maximum permissible limit has also been given to certain parameters.
In formulation of the standard for drinking water BIS has taken into consideration the following publications:
International Standards for Drinking Water issued by World Health Organization, 1984.
Manual of Standards of Quality for Drinking Water Supplies. Indian Council of Medical Research 1971.
Manual on Water Supply and Treatment (third revision) CPHEEO, Ministry of Urban Development, 1989.

The Central Water Commission has recently come up with a document to present the tolerance limits for inland surface waters for the various classes of water use. As per ISI-IS: 2296-1982, the tolerance limits of parameters are specified as per classified use of water depending on various uses of water. The following classifications have been adopted in India

Class A: Drinking water source without conventional treatment but after disinfection

Class B: Outdoor bathing

Class C: Drinking water source with conventional treatment followed by disinfection.
Class D: Fish culture and wild life propagation

Class E: Irrigation, industrial cooling or controlled waste disposal
Table 1.1
The test characteristics for drinking water as per IS - 10500:1991 (amended).

S. No.	Characteristic/Parameter	BIS	WHO
1	Temperature (^{o}C)	28-30	28-30
2	pH	6.5-8.5	7.0-8.5
3	Electrical conductivity (S/cm)	1500	1500
4	Total dissolved solid (ppm)	500	500
5	Total alkalinity (ppm)	200	200
6	Total hardness (ppm)	300	300
7	Calcium hardness (ppm)	200	200
8	Mg hardness (ppm)	200	200

ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT – 18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

BIS- Beaurau of Indian Standards.

WHO- World Health Organization.

Table 1.2

Different analytical water quality parameters used for testing of quality of water and
their source of occurrence and potential health effects with USEPA guidelines.

S. No.	Parameter	Source of occurrence	Potential health effect
1	pH	pH is changed due to different dissolved gases and solids.	Affects mucous membrane; bitter taste; corrosion
2	Electrical conductivity (EC)	Due to different dissolved solids.	Conductivity due to ionizable ions. High conductivity increases corrosive nature of water.
3	Total dissolved solid (TDS)	Presence all dissolved salts	Undesirable taste; gastro-intestinal irritation; corrosion or incrustation
4	Total alkalinity (TA)	Due to dissolved gases (CO_2)	Embrittlement of boiler steel. Boiled rice turns yellowish
5	Total hardness (TH)	Presence of calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions in a water supply. It is expressed. Hardness minerals exist to some degree in every water supply.	Poor lathering with soap; deterioration of the quality of clothes; scale forming
6	Calcium hardness (CaH)	Precipitate soaps, anionic	Interference in dyeing, textile,
7	Mg hardness (MgH)	surfactants, anionic emulsifiers,	paper industry etc.

The above facts motivated to undertake the present study is to analyse the water quality parameters of ground water collected from various different location of kachna area, Raipur Chhattisgarh state. The ground water quality parameters such as pH, Electrical conductivity (EC), Total dissolved solid (TDS), Total alkalinity (TA),Total hardness(TH), Calcium hardness and Magnesium hardness are analysed in accordance to standard analytical method.

2. Literature Review

A literature review surveys scholarly articles, books, dissertations, conference proceedings and other resources which are relevant to a particular issue, area of research, or theory and provides context for a dissertation by identifying past research.

Analysis of Water Quality in Different Location of BALCO Industrial Area of Korba, Chhatisttgarh, India, Chirag Pandey and Ram Prakash Rajwade, International Journal of Research in Engineering, science and Technologies (2015)
Water is essential natural resources for all activities of human beings. The presents study was carried out to evaluate the current status of contamination in surface and ground water samples collected from different location of BALCO industrial area korba on the month of April 2015. The water quality parameters such as pH, Electrical conductivity (EC), Total dissolved solid (TDS), Total alkalinity (TA) and Total hardness (TH) of water samples are determined by standard method. Iron in water samples was determined by 1, 10 phenanthroline method using colorimeter at 510nm. The study reveals that Iron concentration is in the range of 0.02 to 0.59mg/L.

The physico-chemical characteristics of surface and ground water of Balco Industrial area of Korba city Chirag Pandey and Ram Prakash Rajwade, Journal of Civil Engineering and Environmental Technologies pp 23-24 (2015)

An investigation was carried out to examine the physical and chemical properties of surface and ground water quality of BALCO industrial area in Korba City. Ten different locations were selected for the study and water sample were collected in 2litres capacity of

polyethylene bottles (Jan 2015) from various sampling point viz. Budhawaribasti, ITI chowk, Irrigation colony, Parasabhata, Duggupara, Bhdrapara, Mungda, Sitamani, Risda, and Daihanpara. The parameters studied were pH, Total Alkalinity, Total Hardness, Total Acidity, Calcium and Magnesium Hardness, Total Dissolved solids and Conductivity. Result lies between viz. pH 5.55-8.46, TDS 100-390ppm, total hardness 82-238ppm, total alkalinity 20-130ppm, total acidity 10-80ppm.

Water quality analysis of River Yamuna using water quality index in the national capital territory, India (2000–2009)
Deepshikha Sharma and ArunKansal

River Yamuna, in the national capital territory (NCT), commonly called Delhi (India), has been subjected to immense degradation and pollution due to the huge amount of domestic wastewater entering the river. Despite the persistent efforts in the form of the Yamuna Action Plan phase I and II (YAP) (since 1993 to date), the river quality in NCT has not improved. The restoration of river water quality has been a major challenge to the environmental managers. In the present paper, water quality index (WQI) was estimated for the River Yamuna within the NCT to study the aftereffects of the projects implemented during YAP I and II. The study was directed toward the use of WQI to describe the level of pollution in the river for a period of 10 years (2000–2009). The study also identifies the critical pollutants affecting the river water quality during its course through the city. The indices have been computed for pre-monsoon, monsoon and post-monsoon season at four locations, namely Palla, ODRB, Nizamuddin and Okhla in the river. It was found that the water quality ranged from good to marginal category at Palla and fell under poor category at all other locations. BOD, DO, total and fecal coliforms and free ammonia were found to be critical parameters for the stretch.

Analytical study and microorganisms present in rain water of different areas

Reddy, Kondal Y; Maddirala, Priyanka; Vamshigoud, Raghu; Reddy, SaireddyNarender; Krishna, Sai; et al. International Journal of Environmental Sciences2.1(2011): 194-200.

Rainwater serves as a source of many essential nutrients in terrestrial and aquatic ecosystems. Rainwater harvesting is the process of storing water in sub surface so that it can be used later.

Global Market for Water Treatment Products Janurary2005

The global demand for water treatment products should rise at 6.6 percent per year between 2002 and 2007 and reach almost $35 billion by the end of that period. China will record the highest rate of growth among major markets with a 17 percent annual rise through 2007. Gains in the developing world will reflect ongoing efforts to deliver safe drinking water to the more than one billion people who currently lack access.

Microbiological quality and metal levels in wells and boreholes water in some peri-urban communities in Kumasi, Ghana.

Obiri-Danso, K. S. and Adjei, B. and Stanley, K. and Jones, Keith (2009) Microbiological quality and metal levels in wells and boreholes water in some peri-urban communities in Kumasi, Ghana. African Journal of Environmental Science and Technology, 3 (3). pp. 59-66. ISSN 1996-0786
Many communities in Kumasi, Ghana, are increasingly dependent on boreholes and hand dug wells. The aim of this study was to examine the drinking water suitability of 6 wells and 3 boreholes in periurban communities in Kumasi, between December 2003 and January 2005. Total coliforms, faecal coliforms and enterococci were enumerated using the standard most probable number method and membrane filtration methods. The heavy metals in the water samples were determined using the atomic absorption spectrometry method. Overall, significantly higher bacterial counts were recorded during the wet (rainy) season compared to the dry (harmattan) season. Faecal coliforms counts (FCC) in 3 borehole samples ranged between 3 x 101 and 3.5 x 107 per 100 ml (geometric means 1.82, 1.75 and 2.8 x 104) while mean numbers of enterococci were 103-105 times

ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT – 18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

lower. The range and geometric means of FCC was similar in samples from wells but levels of enterococci were 8 times higher than in boreholes. Manganese and iron levels were well within the WHO standards for all 9 sites but lead levels except for one site (Boadi) were all higher than the WHO standard. A brief sanitation survey at each site suggested that wells and boreholes were frequently cited near latrines, refuse tips and other social amenities, and in the vicinity of domestic or grazing animals.

3.STUDY AREA

Water is essential natural resources for all activities of human beings. The study was carried out to evaluate the current status of contamination in ground water collected from various different location of kachnaarea , Raipur , Chhattisgarh on the month of December 2015. The water quality parameters such as pH, Electrical conductivity (EC), Total dissolved solid (TDS), Total alkalinity (TA) and Total hardness (TH), Calcium hardness and Magnesium hardness.

3.1 Study Area

The Kachana Area of Raipur district (21006|N 81002|E) is located in the centre of the Chhattisgarh state. The headquarters of Raipur, Chhattisgarh located on the Mumbai-Hawda line of south-eastern railways and the national highway (NH-6) is passing through the Raipur town..

3.2 Water Sample Collection

The ground water were collected from ten bore wells from different parts of the kachna, Raipur chhattisgarh on the month of December 2015 are summarized in the Table 1. The ground water samples are stored in pre-cleaned and rinsed polythene bottles of three litre capacity.

Table 3.2

Sample collection summary

S. No.	Sample Identification No	Number of Samples	Water Source
1	Kachna- 1	3	Bore Well
2	Kachna- 2	3	Bore Well
3	Kachna- 3	3	Bore Well
4	Kachna- 4	3	Bore Well
5	Kachna -5	3	Bore Well
6	Kachna -6	3	Bore Well
7	Kachna -7	3	Bore Well
8	Kachna -8	3	Bore Well
9	Kachna -9	3	Bore Well
10	Kachna - 10	3	Bore Well

ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT – 18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

RESULTS

pH and Electrical conductivity of groundwater in Kachna area, Raipur

Sample No.	pH	Electrical conductivity (mhos/cm)
Kachna- 1	6.40	800
Kachna- 2	6.55	550
Kachna- 3	6.48	670
Kachna- 4	6.87	810
Kachna-5	6.65	450
Kachna-6	6.45	630
Kachna-7	6.89	720
Kachna-8	6.45	680
Kachna-9	6.40	560
Kachna-10	6.72	600

Total Dissolved Solid and Total Alkalinity of groundwater in Kachna area, Raipur

Sample No.	Total Dissolved Solid (ppm)	Total Alkalinity (ppm)
Kachna- 1	440	296
Kachna- 2	300	281
Kachna- 3	330	265
Kachna- 4	410	250
Kachna-5	300	234
Kachna-6	390	234
Kachna-7	420	296
Kachna-8	380	312
Kachna-9	440	265
Kachna-10	350	296

ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT – 18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

Total Hardness, Calcium and Magnesium Hardness of groundwater in Kachna area, Raipur

Sample No.	Total Hardness (ppm)	Calcium Hardness (ppm)	Magnesium Hardness (ppm)
Kachna- 1	440	180	260
Kachna- 2	440	180	260
Kachna- 3	420	180	240
Kachna- 4	400	180	220
Kachna-5	390	190	200
Kachna-6	390	180	210
Kachna-7	390	180	210
Kachna-8	390	180	210
Kachna-9	380	190	190
Kachna-10	390	190	200

Conclusion

The present study deals with the analysis of ground water samples collected from blocks of Kachna, Raipur , Chhattisgarh. The pH values are in range between 6.40 to 6.89, which are within the permissible limit prescribed by BIS [7] and WHO[6].
The electrical conductivity values of samples are in range between 450 to 810 mhos/cm. The result indicates that almost all the water samples are within the permissible limit of 1400 mhos/cm. The TDS of the water samples are varies from 300 to 440 ppm, which are within the permissible limit of 500ppm. The Total alkalinity of the samples is found to range from 234 to 312ppm. The results reveals that all the samples are not within the permissible limit of 200ppm by BIS and WHO. Total hardness of water samples is varying from 380 to 440 mg/L. The values of total hardness of all the samples are not within the permissible limit of 300ppm.

FUTURE SCOPE

According to the case studied for the water quality parameter of kachna area, Raipur, Chhattisgarh, Total alkalinity (TA) and Total hardness (TH) all the ground water samples are not within the permissible limit of 200ppm by BIS and WHO. The bore well attached to the study area should be filter based on activated alumina adsorption might be solution for filtering drinking water. In general this ground water may be boiling, cooled, filtered and used for drinking purpose

REFERENCES

1. Garg V.K., Chaudhary A. and Dahiya S.D., Indian J. Environ Prot. 1999: 19 (4): 267.

2. Gupta D.P., Sunita and Saharan J.P, http://www.sciencepub.com, 2009: 1(2).

3. Pradeep, V., Deepika, C., Gupta, U., and Hitesh, S., “Water Quality Analysis of an Organically Polluted Lake by Investigating Different Physical and Chemical Parameters”,International Journal of Research in Chemistry and Environment, August-2012, pp.105-111.

ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
.inSIGHT – 18, 4th National Level Construction Techies Conference
Advances in Infrastructure Development and Transportation Systems in Developing India.

4. European Drinking Water Directive Guidelines for Drinking-water Quality, Fourth Edition; World Health Organisation; 2011

5. United States Environmental Protection Agency (EPA). Washington, DC. "Water Quality Standards Review and Revision." 2006.

6. WHO (2004) "Guidelines for Drinking-water Quality". Volume 2. Health Criteria and Other Supporting Information. 3nd edition, World Health Organization, Geneva.

7. BIS (2012) "An Indian standard specification for drinking water IS: 10500", Bureau of Indian standards, New Delhi..