Water Quality Assessment around Ballarpur industries limited (BILT) Ballarpur, District Chandrapur, Maharashtra

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Abstract: In many water quality studies, evaluation of groundwater is an important. But here we give the importance to both water samples for investigation purpose. As the quantity of waste water is more the usability is extra for agriculture or irrigation purpose. So, we determined its chemical and physical properties of both water samples i.e. ground water and waste water. As for as drinking and for irrigation purpose too. The sustainability of water for drinking purpose is judged on the basis of pH, EC, TDS, Hardness, Total alkalinity, Chloride, Nitrate, Sodium and Potassium, etc. The sustainability of groundwater for irrigation purpose is judged on the basis of sodium contents and electrical conductivity.
[Rajdeep P. Fulzele, and Hari S. Patode. **Water Quality Assessment around Ballarpur industries limited (BILT) Ballarpur, District Chandrapur, Maharashtra.** *World Rural Observ* 2017;9(3):7-11]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). http://www.sciencepub.net/rural. 2. doi:10.7537/marswro090317.02.

Keywords: Physico-Chemical, Parameters, Permissible Limit, Chemical standards, Drinking water, Chandrapur

1. Introduction

Water is the world's most precious resource because the life of animals and plants depends on it. Most industries also require water for various applications, so the global economy depends on it as well. Springs are the places where ground water is discharged at specific locations on the earth and they vary dramatically as to the type of water they discharge. Many of the springs are the result of long cracks or joints in sedimentary rock. (Young, 2007) Hot springs are defined as springs where the temperature of water lies significantly above the mean of annual air temperature of that region. (Thompson, 2003 and Young, 2007) Hot ground water can be used to drive turbines and generate electricity, or it can be used directly to heat homes and other buildings. Energy extracted from the Earth's heat is called geothermal energy. (Thompson and Turk, 2005).

Water is one of the abundantly available substances in nature. It is essential constituent of all animal and plants material and forms about 75% of matter of earth crust. It has been argued previously that geochemical energy-yields may be a key determinant of microbial community structure and diversity in thermal environments (Amend and Shock, 2001) Rainfall, an important and largest source of water, other sources are surface water and sub-surface water or ground water. (Sharma B.K., 2001) Water is mostly important for industrial and municipal purposes. In addition to the direct consumption of water at homes and farms, there are many indirect ways in which water affects our daily life.

The physical, chemical and biological composition of water is influenced to a great extent by different factors including climate, geomorphology and geology. Also, the physical variables which include temperature and turbidity; chemical variables in that non-toxic variables such as pH, total dissolved salts, salinity, conductivity, ions, nutrients, organic matter and dissolved gases and toxic variables like biocides and trace metals. The objectives of the present work are to analysis and discuss the suitability of water for drinking and sanitation.

Ballarpur, it has many problems regarding the water for drinking and agriculture purpose. The study of groundwater and its quality for drinking and agriculture purpose is very essential. Keeping this view in mind it is decided to investigate, "Study of water quality around Ballarpur industries Limited (BILT), Ballarpur district Chandrapur Maharashtra" within the subsequent purposes. Likewise, to study the Physico-chemical characteristics of Groundwater and to find out if Groundwater is polluted or not. To find out groundwater quality with reference to irrigation requirements. Also find industrial water suitability for irrigation purpose in the present research in terms of water quality assessment in Ballarpur area.

2. Material and Methods

Study Area

Chandrapur district is one of the eleven districts of Vidarbha region of Maharashtra. It is bounded on south by Telangana state and east by Gadchiroli district on north by Bhandara, Gondia, Nagpur and Wardha district on by west by Yavatmal district. Wardha river forms the western boundary whereas Wainganga river form the eastern boundary of the district. The district lies between 190 30' and 200 45'

North latitudes and 780 46' and 800 00' East longitudes. It falls in part of the survey of India of toposheet number 55H, 55L, 56E, and 56I coming an area of 10920 sq. Km.

The area consists of Archean metamorphic rocks, Vindhyan limestones, Gondwana formation and Deccan traps. In Archean formation consisting granites and granitic gneiss occur in most of the eastern part of the district of extending north –south from Nagbhid to Gondpipri. The rocks are generally devoid of primary porosity, but weathering, jointing, fracturing, sheering etc. create secondary porosity within which the groundwater generally occur in phreatic conditions.

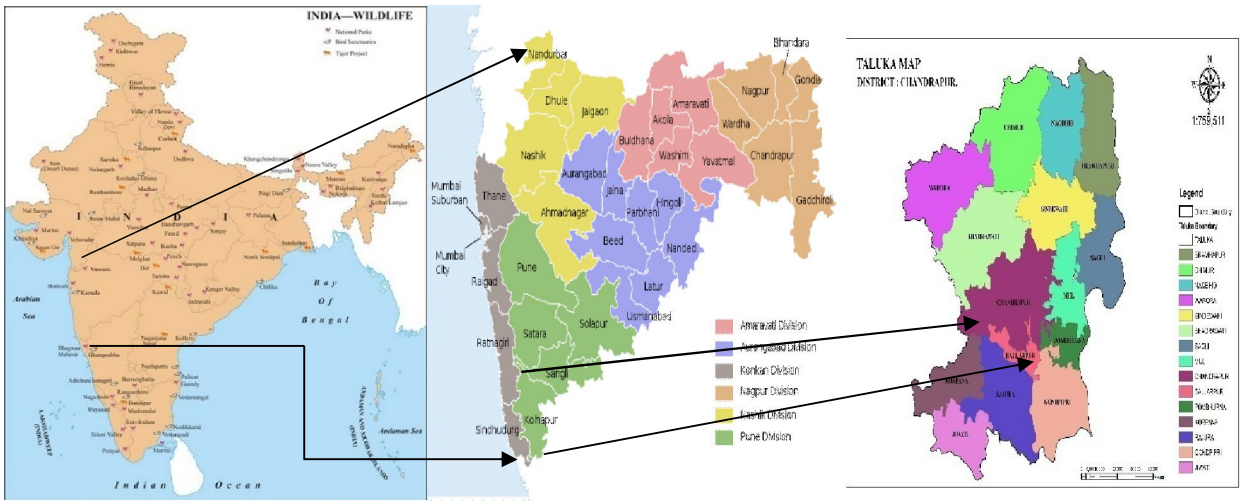

Figure: 1.1 showing the location map of the study area of Ballarpur

Sampling Methods

Preliminary survey followed by detailed survey will be carried out. The plan includes the selection of sampling sites, section of sampling sites decided on the basis of overall objectives of the present study. Collection of groundwater and effluent samples is to be carried out and the Physico-chemical parameters will be analyzed. The sampling and field work will be carried out during pre-and post-monsoon seasons for one year.

The pre-monsoons samples will be collected in the month of May and post monsoon in the month of December. For the present investigation samples were collected every month during the study year from June 2013 to May 2014 from 13 different sampling stations of Ballarpur industrial area. The water samples collected from the around Ballarpur industries limited (BILT) Ballarpur, District Chandrapur, Maharashtra and taken in pre-cleaned polyethylene bottle.

Methodology

In this study total 13 water samples; in pre-monsoon, 13 in monsoon, and 13 in post-monsoon ware analyzed from Ballarpur industries limited (BILT) Ballarpur, Chandrapur, Maharashtra. The number of physicochemical parameters like pH, EC, temperature, total dissolved solids, alkalinity, chloride, total hardness, calcium hardness, sodium, potassium and nitrate were performed.

The pH value of water sample measured by using Digital pH meter. EC values of the water sample under investigation were measured using Digital Conductivity meter. TDS of water samples measured using gravimetric method. The total hardness of the water sample was determined by complex metric titration with EDTA using Erichrome black T as an indicator. Total alkalinities of the water samples were determined by titrating with H_2SO_4 using phenolphthalein and methyl orange as indicators.

The physic-chemical parameters will be determined by the standard methods and the result of the analysis will be check by standard methods for the accuracy. The water quality parameters estimated by the standard methods given by APHA (1998) and Trivedy et al., (1998).

3. Result and Discussion

In the present study, the data revealed that there were considerable variations in the quality with respect to their physicochemical characteristics. The results indicate that the all physio-chemical parameters in all the sampling stations was found within the permissible levels as per WHO standards for drinking and for irrigation purpose. Physicochemical analysis of ground water around Ballarpur industries limited (BILT) Ballarpur was studied in different season (2013 - 2014). The average value of various water quality parameters had been mentioned in Table and represented in graphs.

Hydrogen Ion Concentration (pH)

The average of pH noted from ground water samples in an around Ballarpur industries limited (BILT), Chandrapur, Maharashtra. Ground water sample is 8.77 as maximum and minimum 5.1 was observed. Similarly, the higher values of pH may be due to the increased in nutrients and productivity in aquatic ecosystem was noted by Badve et al., (1993), Mohd et al., (2001) and similar observations are detected at Lonar lake, Buldhana district of Maharashtra, India, by Yannawar et al. (2013).

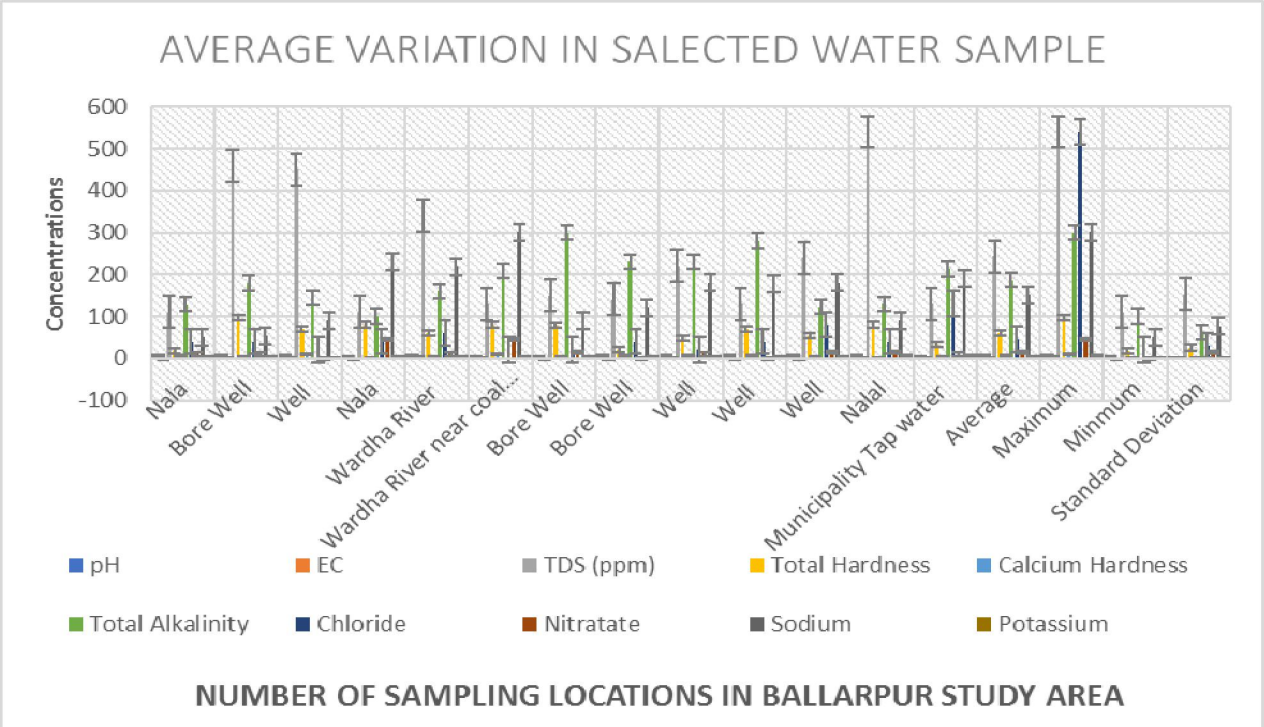

Fig 3.1: showing average observed variation of selected water samples from Ballarpur research area

Electrical conductivity (EC)

The average of Electrical conductivity recorded from ground water samples in an around Ballarpur industries limited (BILT), Chandrapur, Maharashtra is 4.53 uS/cm as maximum and 1.16 uS/cm as minimum recorded. Correspondingly, the higher values of EC may be due to the increased minerals and contaminants in water environment was noted at Sahastrakund waterfall, Nanded, by Shaikh et al., (2013) and similar observations are detected at waste water investigations at engineering sites by Yannawar et al. (2013).

Total Dissolved Solids (TDS)

The average of Total Dissolved Solids (TDS) recorded from ground water samples in an around Ballarpur industries limited (BILT), Chandrapur, Maharashtra is 540 ppm as maximum and 220 ppm as minimum recorded. Congruently, the higher values of TDS may be due to the increased turbidity and contaminants in water due to rain or anthropogenic activities of human beings as recorded at Nagzari dam is situated at Nagzari village of Kinwat, Nanded, Yannawar et al., (2013) and similar observations are detected at Hot Water Spring of Unkeshwar, Maharashtra by Vyankatesh B Yannawar et al. (2013).

Hardness

The mean value of observed total hardness from water sample is minimum 19 mgL-1 and maximum 97 mgL-1. The estimated calcium hardness of water samples was maximum as 10 mgL-1 and minimum 2 mgL-1 was noticed. Similarly, the higher values of hardness (Total hardness and Calcium hardness) due to the geochemistry and geology as recorded at landfill site of the Nanded city, of Maharashtra, Yannawar et al., (2012). Parallel observations are perceived at Lonar lake, Buldhana district of Maharashtra, India, during (2013) to Yannawar et al. (2013).

Total Alkalinity (TA)

The Total alkalinity of 13 sampling locations are observed water sample is below detectable limit in pre-monsoon and 300 mg/L maximum and minimum 100 mg/L. Average value of phenolphthalein alkalinity 186 mg/L. Similarly, the higher values of Total Alkalinity due to the geology as recorded at landfill site of the Nanded city, of Maharashtra,

Yannawar et al., (2012). Equivalent remarks are apparent at Lonar lake, Buldhana district of Maharashtra, throughout the year, Yannawar et al. (2013).

Chloride (Cl)

Chloride of 13 water samples noticed 540 mg/L maximum and minimum 20 mg/L. The estimated chloride of water samples in an average 45.4 mgL-1L. Similarly, the values are below the permissible limits of chlorides are also noted at Sahastrakund waterfall, Nanded, by Shaikh et al., (2013) and similar observations are detected at waste water examinations at industrial sites by Yannawar et al. (2013).

Nitrate (No_3)

The Nitrate of 13 water samples noted 45 mg/L maximum and minimum 0 mg/L. The average nitrate concentration investigated from water sample is 42.2 mgL-1. Similarly, lesser the values of nitrate were noted at landfill site of the Nanded city, Yannawar et al., (2012). Parallel observations are perceived at Lonar lake, Buldhana district of Maharashtra, India, during 2013 by Yannawar et al. (2013).

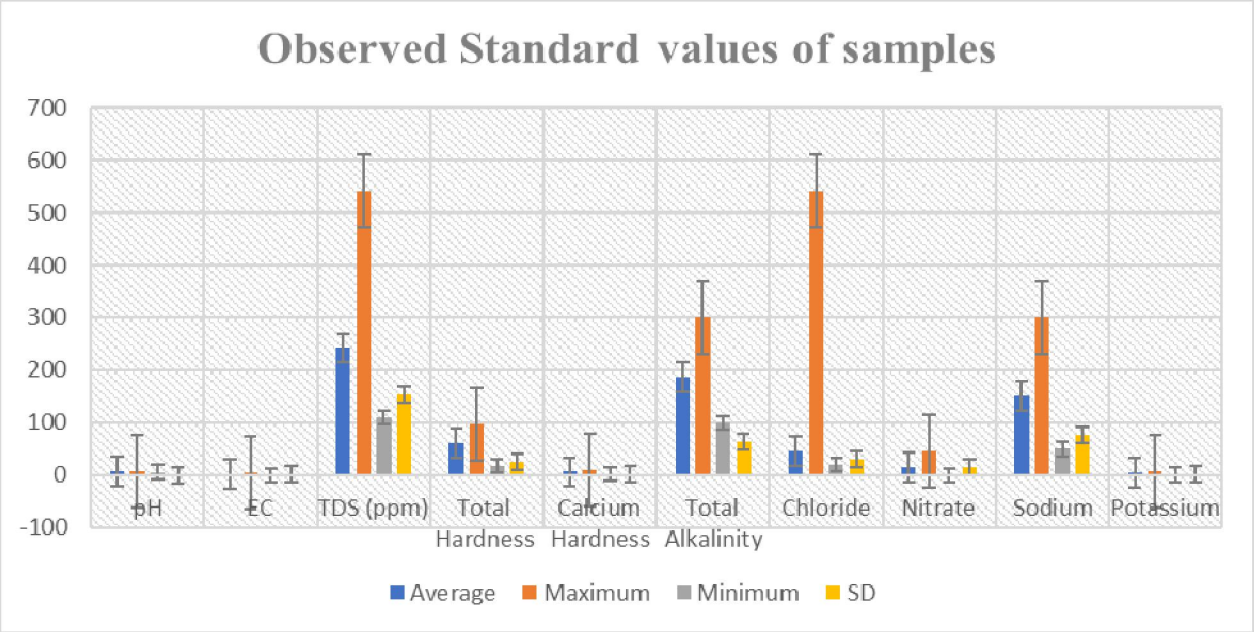

Fig. 3.2: showing observed standard values of water samples from Ballarpur research area

Sodium (Na) and Potassium (K)

The Sodium of 13 water samples recorded 301 mg/L maximum and minimum 50 mg/L. The average sodium concentration investigated from water sample is 151.6 mgL-1. The Potassium of 13 water samples verified 8 mg/L maximum and minimum 0.9 mg/L. The average sodium concentration investigated from water sample is 4.5 mgL-1 respectively.

Due to the anthropogenic activities of human beings the sodium and potisium lavel has been increasing day by day. Eventually the algal population are ostensible at Lonar lake, Buldhana district of Maharashtra, throughout the year, Yannawar et al. (2013). We also find the similar results for sodium and potassium by increasing the growth of phytoplankton's. Similar observations have been reported in the literature by Yannawar et al., (2014) and Narwade et al., (2015).

4. Conclusion

The Ballarpur is an industrial area, from last five decades there is industrialization working actively. So, there are the chances of ground water contamination in the adjacent area. And defiantly it may affect the surrounding land and soil by this water are used for irrigation. But as per as water quality assessment concern the water quality was good. As per drinking and irrigation concern water quality also good. The availability of waste water is more so, it should be used for agriculture. But the quality was not so bad or worst for farming purpose. As per ground water concern the its quality also good for consumption for as drinking and utilization too.

Acknowledgements:

We are thankful to the School of Earth Sciences of Swami Ramanand Teerth Marathwada University, Nanded for providing laboratory and library facilities.

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7/13/2017