

Assessment of Groundwater Quality and its Suitability for Drinking And Agricultural Uses in the waluj MIDC, Aurangabad, Maharashtra, India

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ABSTRACT: The constant degradation of the water quality of central Maharashtra's basaltic aquifer is of great concern for different authorities and agencies involved in the water sector in the Maharashtra, India. The Waluj, which is one of the major polluted industrial area which is under clusters category receives all domestic and industrial waste water from the waluj MIDC Aurangabad. In order to evaluate quality of groundwater in the study area, fifteen ground water samples from different locations were collected and analysed for various parameters. Physical and chemical parameters of groundwater such as pH, TDS, EC, SO₄, NO₃, Ca chloride and heavy metals like Pb, Cr, Cd, Zn, and Cu were determined. The results show that groundwater of the area is generally unfit for domestic uses. Most of the physico-chemical parameters and heavy metals in the groundwater samples have higher value than the World Health Organization (WHO, 2006) and Bureau of Indian Standards (BIS, 2003) guidelines.

KEYWORDS: Ground water, Heavy Metals, Industrial pollution, Domestic uses.

I. INTRODUCTION

Water is very important life supporting material and required for all biotic communities. We depend on water for domestic, irrigation, sanitation and industrial purposes. Industrialization is considered vital to the nation's socio economic development as well as to its political standing in the international community. While development aims at bringing about positive changes in human life, uncontrolled consumption of natural resources both in developed and developing countries have inadvertently led to environmental degradation, pollution incurable diseases, and poverty social conflicts. Hence periodic assessment of groundwater becomes necessary to ensure the suitability of water for drinking and irrigation. The impairment of water quality due to the introduction of pollutant is a problem of industrial cities around the world. Heavy metal is major pollutant in water bodies because of industrial and municipal waste discharge into the environment without proper treatment. Heavy metals in groundwater are toxic even at low concentrations. Health risks of heavy metals include reduced growth and development, cancer, organ damage, nervous system damage, and in extreme cases, death. Exposure to some metals, such as mercury and lead, may also lead to autoimmunity⁸. Heavy metals become toxic when they are not metabolized by the body and accumulate in the soft tissues. As noted above, heavy metals may enter the human body via food, water, air, or absorption through the skin in agriculture, industrial. In recent past many researchers have worked on water quality for different purposes.

Problem

There are various sources of groundwater pollution in study area which includes domestic waste disposal activities, industrial effluent disposal, leaks and nonpoint source activities such as agricultural management practices. Here in

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surrounding area of the Waluj the groundwater is spoiled due to Industrial practices. Total quantity of industrial effluent generated from Waluj MIDC area is 10.72 MLD and total domestic effluent generated is 3.928 MLD. (Aurangabad MPCB report -2011). Therefore, water quality monitoring is necessary in Waluj MIDC. In the present work, attempts have been made to evaluate groundwater resources in the Waluj, Aurangabad district of Maharashtra, India by using conventional hydro-chemical methods and preparing thematic maps for the various water quality parameters

II.OBJECTIVES

1. To analyze physical and chemical water quality parameter of groundwater namely as pH, Total Dissolved Solid (TDS), Electrical Conductivity (EC), Sulphate (SO₄), Nitrate (NO₃), Calcium (Ca), Magnesium (Mg), Sodium (Na), Cl(Chloride), Potassium (K), Bicarbonate (HCO₃), TDS, Nitrate, electrical conductivity for agricultural and drinking water parameter testing.
2. To dispersion of contaminates in groundwater and its suitability for drinking and irrigation purposes.
3. To analyse soil quality parameters such as ph, organic carbon, copper, iron, zinc, phosphorous, hardness etc.

III.STUDY AREA

In Maharashtra, Aurangabad is one of the famous industrial and fastest developing city and which is well known for its Industrial auto cluster. It is situated in the central part of Maharashtra. The summer temperature is max 43° C and Min. 28°C and winter temperature Max 32°C to 5°C. The sources of irrigation are streams, percolation tanks and wells in study area. Ground water plays a major role for irrigation as well as domestic uses. The Study area covers the Aurangabad Waluj area which lies between 74 to 76 Degree East longitude and longitude 19 to. 20 Degree North. Kham River, which is one of the major tributaries of the Godavari River, receives all domestic and industrial waste water from the Aurangabad city and MIDC waluj.

We will take 13 water samples and 8 soil samples, in aurangabad and using handheld gps and we will do the chemical analysis on the samples taken over the area and then will do the mapping using gis.

Name of wells	Latitude / longitude	Address
1.	19°50'5.11"N	Near hospira health pvt ltd. itawa
	75°11'52.13"E	
2.	19°49'15.17"N	Naitikniwas, jogeshwari
	75°12'11.05"E	
3.	19°51'6.49"N	Near swapnil abrasive pvt ltd, sankaj steel pvt. Ltd.
	75°12'18.42"E	
4.	19°49'24.60"N	Bajaj autoroad, near bajajcantin.
	75°13'57.02"E	
5.	19°51'35.71"N	Near deogiri industries, k sector, Aurangabad.
	75°13'50.43"E	
6.	19°48'57.00"N	Nagar paithan link road, AMW, pandharpur.
	75°14'45.47"E	
7.	19°50'37.34"N	Data mandir road, sakhi general stores.
	75°14'55.17"E	
8.	19°51'8.10"N	Near panchaganga seeds pvt. Ltd. Beside endurance technology.
	75°13'16.26"E	
9.	19°50'35.33"N	Near sahyadri hospital, jai bhavanichawk. M sector
	75°13'56.46"E	
10.	19°50'24.69"N	Near shrikrushnagramin bank, nagar road, ranjangaon, Aurangabad.
	75°12'58.48"E	

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11.	19°47'52.17"N	Near Maharashtra gramin bank, nagar road, Aurangabad
	75°13'9.08"E	
12.	19°48'52.26"N	Ganesh mandir, near bajaj auto road, valuj, aurangabad
	75°13'26.45"E	
13.	19°49'45.15"N	Near jama masjid, kamlapur road, valuj, aurangabad
	75°13'6.64"E	

Table 1: Location of sampling station.

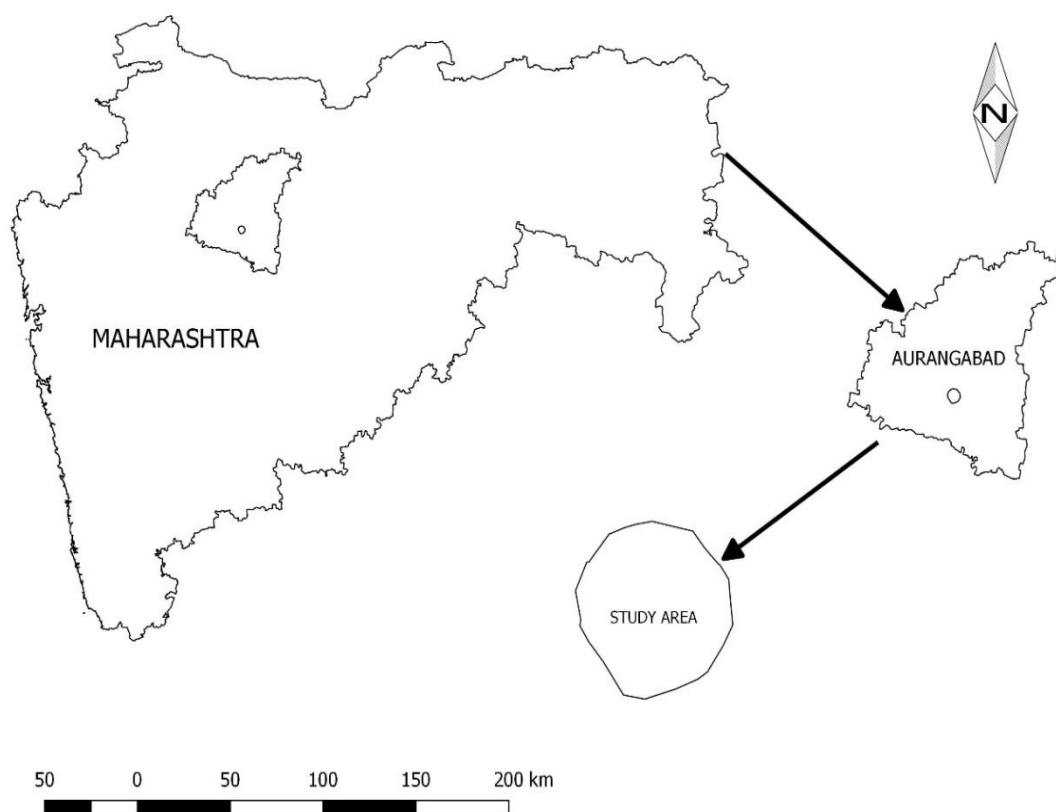


Fig 1: Location of study area

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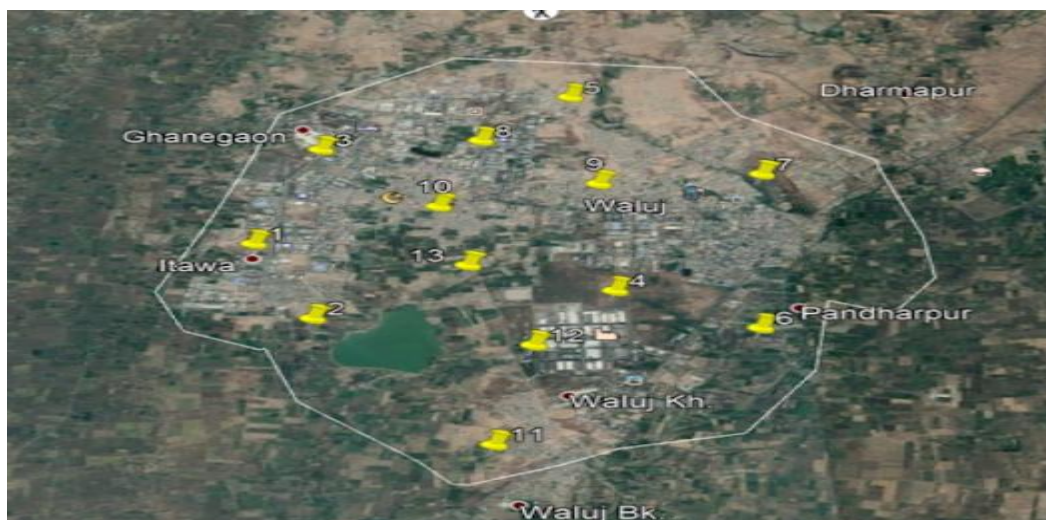


Fig 2: Details of sample Collection Points in Waluj Industrial Area

IV. MATERIALS AND METHODOLOGY

The aim of the study is to assess the impact of industrialization and rapid growing developmental activities in the study area on the quality of ground water and to locate various sources and types of pollutants which are responsible for changes in ground water quality. To assess the ground water quality thirteenth sampling stations (bore wells), which are scattered in the main areas of Waluj MIDC. The selected sites are of approximately 1000 to 1500 m far from each other. Analysis of the samples. Water samples are collected in 1000 ml polyethylene bottles in good quality screw-capped and labelled, tightly pack, transported immediately to the laboratory, and storing at 4°C for chemical analyses. The sampling bottles are thoroughly rinsed two or three times, using the groundwater to be sampled. The parameters like temperature and pH were measured in the field by using thermometer and pocket digital pH-meter while other parameters such as electrical conductivity, total dissolved solids, total hardness, calcium, chloride, magnesium, sodium, sulphates, phosphate, were estimated in the laboratory in accordance with standard methods of water chemical analysis (APHA 1992). The ground water quality parameter were collected and analysed in the laboratory. The water quality parameters are given in database to QGIS (2.14). The KML file of the study area was prepared and given to QGIS (Fig.1). spatial interpolation was done on the basis of attribute values of the water quality parameters and for each parameter the spatial analysis was done and map was created. Finally integrated water quality map of the study area was prepared considering the ground water quality data using QGIS(2.14) (Fig. 2). Geographic information system (GIS) is an effective technique for the zone mapping, risk assessment and also useful for taking quick decisions on environmental health problems.

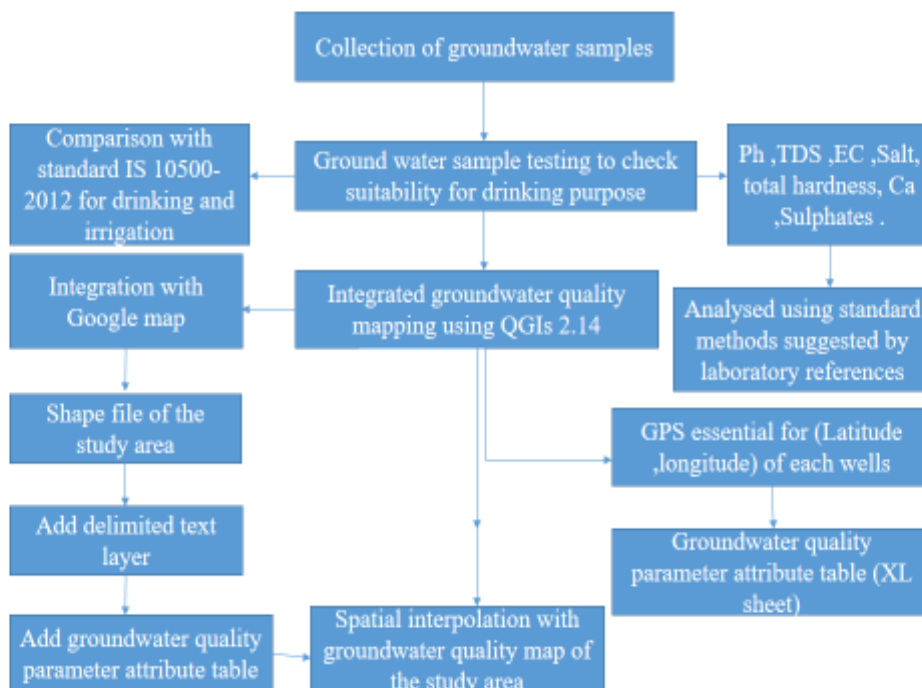


Fig 3: Flowchart of methodology

V.RESULTS AND DISCUSSION

- All the physiochemical analysis of water for irrigation and drinking purposes are carried out in laboratory with the guideline of (APHA-2011) and compared with standard values which is suggested by (BIS) and (IS-10500)
- All the results are represented in the tabular form in row column No of well location are shown in Table 2. And in column number of parameters are shown in table

Table 2. Variation of ground water quality parameter around Waluj industrial area

Name of wells	1	2	3	4	5	6	7	8	9	10	11	12	13
Ph	7.32	7.53	7.15	7.34	7.1	7.22	7.51	7.67	7.38	7	7.68	7.6	7.21
Hardness	1.04	0.93	2.04	0.88	1.51	2.63	2.21	0.46	1.56	1.35	2.84	0.93	0.96
Sodium	2.18	2.55	4.57	2.17	1.67	6.11	6.04	1.34	3.27	2.24	9.82	2.39	4.24
Calcium	7.6	8.4	14	6.4	9.2	17.4	12.6	6.2	11.2	6.6	9.4	6	16.2
Magnesium	4.2	4.2	4.4	3	4.4	3	4.8	2.4	4.4	3.2	9.4	3.6	3.4

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Potassium	0.14	0.07	0.05	0.06	0.08	0.08	0.07	0.08	0.09	0.08	3.6	0.09	0.09
Chlorides	3.6	1.2	4.4	0.8	3.6	4.8	3.2	0.8	2.4	1.6	6	1.2	2.8
EC	1430	1821 .82	1955 .36	2020 .45	2073 .64	2063. 64	2196 .36	2107 .27	2254 .55	2265 .35	2298 .65	2293 .65	2299 .45
TDS	1071 .56	1364 .43	1465 .97	1514 97.	1552 .24	1545. 73	1645 .21	1579 .64	1685 .68	1798 .52	1799 .32	1865 .34	1985 .56
Nitrate	21.7 273	25.2 727	19.2 756	1927 27	24.4 545	24.81 82	25.3 636	27.5 455	25.4 545	26.5 895	25.3 565	28.6 254	29.8 264

Table 3. Variation of agricultural ground water quality parameter around Waluj industrial area

Water Testing Results													
Address ID parameters	1	2	3	4	5	6	7	8	9	10	11	12	13
Ph	7.32	7.53	7.15	7.34	7.1	7.22	7.51	7.67	7.38	7	7.68	7.6	7.21
Hardness	1.04	0.93	2.04	0.88	1.51	2.63	2.21	0.46	1.56	1.35	2.84	0.93	0.96
Sodium	2.18	2.55	4.57	2.17	1.67	6.11	6.04	1.34	3.27	2.24	9.82	2.39	4.24
Calcium	7.6	8.4	14	6.4	9.2	17.4	12.6	6.2	11.2	6.6	9.4	6	16.2
Magnesium	4.2	4.2	4.4	3	4.4	3	4.8	2.4	4.4	3.2	9.4	3.6	3.4
Potassium	0.14	0.07	0.05	0.06	0.08	0.08	0.07	0.08	0.09	0.08	3.6	0.09	0.09
Carbonates	0	0	0	0	1.2	0.4	0.8	0	0	0.4	0.06	0	0.8
Bicarbonates	5.6	6.2	3.8	5.4	5.2	6.6	6.8	5	6.2	5.4	0	6.4	6.4
Chlorides	3.6	1.2	4.4	0.8	3.6	4.8	3.2	0.8	2.4	1.6	6	1.2	2.8
Sulphates	4.92	7.82	14.8 3	5.42	5.35	14.79	12.7 1	4.22	10.3 6	4.72	3.2	4.49	13.9 3
Sodium Absorption Factor	0.9	1.02	1.51	1	0.64	1.91	2.05	0.65	1.17	1.01	13.6 8	1.09	1.35
Residual Sodium Carbonate	0	0	0	0	0	0	0	0	0	0	3.85	0	0

Table 4. Variation of soil quality parameter around Waluj industrial area

Soil Testing Results	1	2	3	4	5	6	7	8
Ph	7.58	7.19	7.11	6.95	7.28	7.92	8.81	7.68
Hardness	0.04	0.04	0.03	0.01	0.03	0.01	3.49	0.43
Organic Carbon	0.49	0.41	0.45	0.36	0.43	0.41	0.33	0.39
Phosphorous	9.43	7.02	12.82	14.76	10.89	9.92	8.47	11.61
Potassium	392.89	224.96	811.13	1612.76	84.49	136.24	136.24	380.22
Copper	3.74	2.06	6.64	15.78	2.26	2	0.82	3.82
Iron	2.02	6.6	6.78	6.74	1.9	0.94	0.92	1.2
Zink	0.92	2.64	10.06	10.4	0.76	4.54	0.5	0.82

GRAPHICAL RESULTS

- All the graphical results of each parameters are represented in the form of X-axis(No of well locations) and Y-Axis(standard value of each parameter).
- With all the results it is concluded that at some well locations there is contamination due to impact of chemical effluents and some other well location there is less contamination.
- The graph of highest contamination at each location for every parameters as shown in fig3.
- The graph of lowest contamination at each location for every parameters at shown in fig 4.

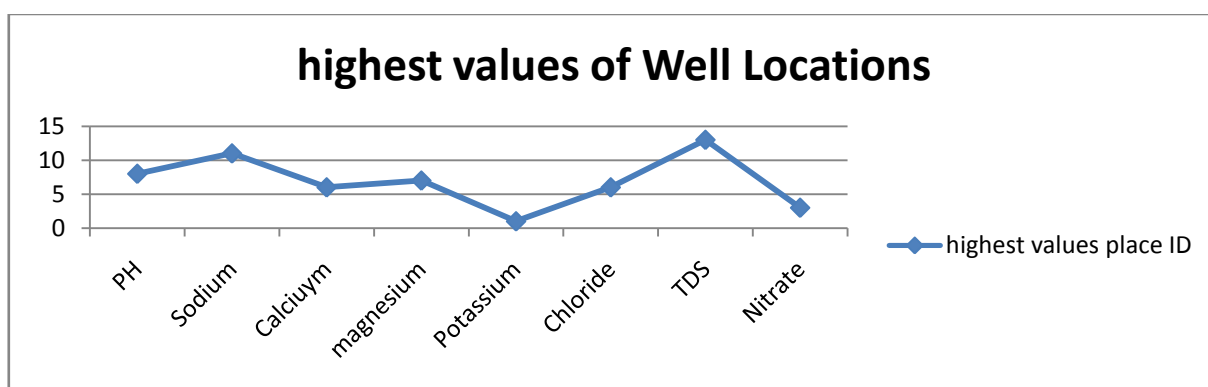


Fig 4. Highest value of well location

- X- axis shows number of parameters with their well locations and Y-axis shows maximum values of each parameters which is contaminated.
- All the values of each locations are beyond the standard Values of each parameters.

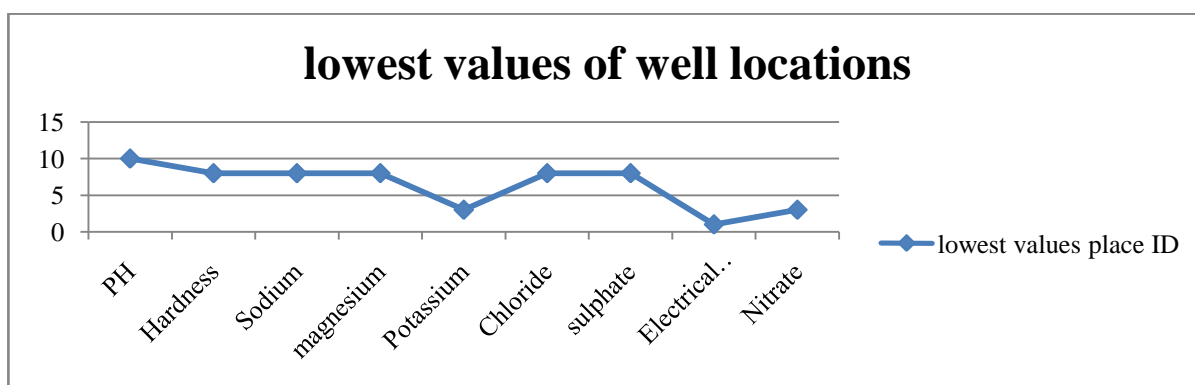


Fig 5. Lowest value of well location

- X- axis shows number of parameters with their well locations and Y-axis shows minimum values of each parameters which is less contaminated.
- All the values of each locations are within the standard Values of each parameters.



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IV. CONCLUSION

Bore well water samples under investigation are generally used for domestic purpose and only some time for drinking and irrigation purpose. But looking at the results obtained it can be concluded that bore well water is contaminated and should not be used for drinking purpose without pretreatment.

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