To Analyze the Physiochemical parameters for Groundwater resources

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Abstract*-In daily living, drinking water is crucial. It's crucial to evaluate groundwater to determine its quality. Groundwater was the subject of a research to determine whether the water in a specific area was fit for human consumption. Geological and meteorological methods were used to examine the water and conduct a water analysis as well as surface and subsurface research. Different physico-chemical parameters were determined for the collected samples, such as pH, EC, TDS, Turbidity, Alkalinity, Chloride, DO, Fluoride, Iron, Calcium for which the waste quality guidelines give limit values. The goal of the current study was to determine the quality of the groundwater by the SPSS software in the villages close to the wardha area in the Nagpur district of Maharashtra. During the post monsoon season of 2022, a total of 16 groundwater samples were taken. From each village there are two samples are collected one is domestic and other is agriculture.*

Keywords: drinking water, water quality parameters, underground water.

I.INTRODUCTION

Due to an enormous rise in the demand for fresh water caused by population development, groundwater is progressively becoming a major source of water supply in many places. Growing urbanization has had a negative impact on groundwater quality due to inappropriate waste disposal procedures and excessive resource utilisation. Because groundwater used for agriculture, water supply and other uses is becoming more and more salinized it is a serious problem. As a result, it is essential to evaluate the mobility of water before using it for human consumption. For a person to survive, they need water. The main causes of water contamination are industry and urbanization. Water sources can be found in rural areas with dams, canals, or rivers.

Research is being done to see if ground water can be used for agriculture in the absence of surface water. Recent research has shown that elevated human activity has greatly increased ground water pollution. As a result the frequency of water borne illness, a major contributor to health issues, has grown. Thus, basic concentration is required to monitor the water's quality and identify the numerous factors that lead to ground water pollution. This article largely analysed the water quality of several drinking water sources in the city of Wardha, including ground water.

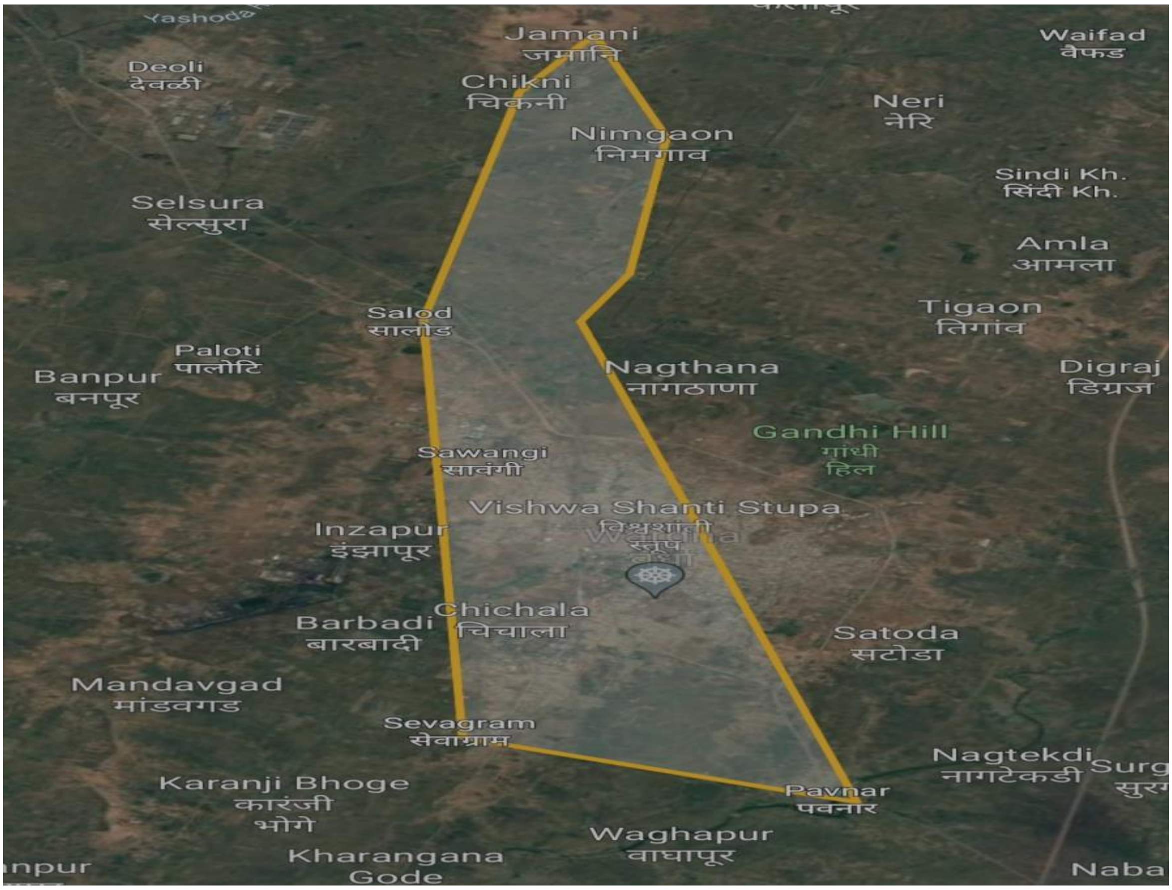
II.LITERATURE REVIEW

In a particular Wardha city area, we have performed a physic-chemical examination of the ground water. In this study, many parameters like pH EC, TDS, Turbidity, alkalinity, chloride, DO, fluoride, iron, calcium, etc. were analysed. The water is almost fit fit for drinking purpose when compared to WHO standard. We conducted a physical-chemical examination of the ground water in India's Wardha district. The current work has been carried out by moneoring teo types of ground water, namely dug well water and bore well, and it is gathered from 16 villages. Two samples are obtained from each villages, one for domestic use and the other for agriculture use. Numerous parameters were used in this investigation, including as pH, EC, TDS, Turbidity, Alkalinity, Chloride, DO, Fluoride, Iron, Calcium forms. The conclusion can be drawn from the outcome.

Objective

- To identify the status of water quality in wardha with respect to physic-chemical parameters.
- Testing of ground water samples.
- To evaluate the water quality index of the study area using the SPSS software.

Study Area



(Samples collection area)

The study area spreads in eight villages in the vicinity of Wardha District, viz., Pavanar, Sevagram, Padhegaon, Salod, Chikni, Nimegaon, Dhotra, Jamini. It is covered in the Survey that the Dham River in the Pavanar is the tourist attraction, Sevagram was the place of Mahatma Gandhi's ashram and his residence from 1936 to his death 1948. Padhegaon is the region where the weather is tropical dry and sub-humid climate. The climate of the area is characterized by a hot summer and general dryness throughout the year except the monsoon. Its latitude is 20.716759 and longitude is 78.522402. The average temperature in the summer of the area ranges from 40 to 48 °C, while in winter the minimum temperature is 12°C. The average annual rainfall in the region ranges from 985 to 1100 mm, and it rises steadily from the north western to south-western.

Geology

The soil of the district is basically derived from Deccan trap Basalt and almost entire district consist of black and dark brown soil over a sheet of Deccan trap basalt. Deccan trap seven flows amid the vast piles of almost horizontal flows that make up basalt have been identified down to a depth of 120m. Porosity and permeability have been discovered to vary within a flow, between flows, and from location to location.

At shallower depth, ground water obtain occurs in an unconfined state, while at deeper depth, it typically occurs

in a semi-confined state, the restricting layer are red bole and dense massive basalt. Except for interconnected fracture systems that are being refilled, deeper confined aquifers are less productive than shallow semi-confined and phreatic aquifers.

I. METHODOLOGY

- Sterilized and disinfected sample bottle will be used for sampling purpose.
- Analysis of various parameters will be carried out in the laboratory as per referred literature.
- Water quality parameters of collected water sample will be compared with the standard values of water parameter.
- Analysis of water sample will be done to investigate its utility in various
  Sector.

PARAMETERS												
Year	Season	Stations	Replicates	pH	EC	Turbidity	Chloride	DO	Alkalinity	Fluoride	Iron	Calcium
1	1	1	1	7.01	530	12.4	0.5	6	280	0.43	0.14	106
1	1	1	2	6.84	700	5.3	1.2	6.7	330	0.68	0.2	134
1	1	2	1	6.96	600	7.5	1.4	6.4	300	0.53	0.13	123
1	1	2	2	6.96	730	8.1	2	6.2	500	0.61	0.8	129
1	1	3	1	6.85	540	9.8	0.8	7.7	300	0.63	0.14	111
1	1	3	2	6.89	750	5.9	1	6.3	290	0.45	0.15	122
1	1	4	1	7.15	730	8.3	1.4	7.6	410	0.62	0.18	117
1	1	4	2	7	790	5.3	2.6	6.5	500	0.48	0.16	107
1	1	5	1	6.82	590	3.1	1.2	6.9	395	0.42	0.12	108
1	1	5	2	6.69	520	5.5	1.4	6.1	410	0.43	0.14	106
1	1	6	1	6.54	690	1.4	2	6.7	500	0.59	0.17	114
1	1	6	2	6.56	830	2.6	2.2	7.6	500	0.51	0.13	123
1	1	7	1	6.6	580	10	1	6.4	380	0.49	0.14	115
1	1	7	2	6.7	739	5.1	6.4	6.1	600	0.53	0.9	108
1	1	8	1	6.34	590	7.6	0.8	4.8	290	0.66	0.22	125
1	1	8	2	6.54	610	6	0.7	5.4	330	0.54	0.18	123

Only those bore wells used for drinking and household usage were used to gather ground water samples for the current study. For the 2022 post-monsoon seasons, 16 groundwater samples including 8 bore well and 8

Agricultural samples were collected in one litre plastic bottles. Before being taken outside, bottles were carefully washed with distilled water. The bottles were once again washed with the corresponding bore well and agricultural water before collecting the samples in the field.

These samples underwent physicochemical analysis for pH, EC, and main ions (Ca, Cl, and F). Digital devices were used to assess pH and EC right away after the sample was collected. Using the common hydro chemical analytical methods, other chemical parameters were examined. Ca and Cl were determined by titration using a flame photometer, while NO, F, and SO were examined using a spectrophotometer. The outcomes were evaluated against the requirements provided by BIS (2003) and WHO (1997) for suitability for drinking and general usage. It was assessed if groundwater was suitable for irrigation.

VI.PARAMETER INCLUDED IN WATER QUALITY ASSESSMENT RESULT AND DISCUSSION

Odour, colour and Test

The samples colour should be translucent. There should not be any organic or suspended particles. The sample must have no smell. The sample should pass the test for colour and smell.

pH

The most crucial factor in determining, how corrosive water is pH. The more corrosive water is, the lower the pH value. Accordingly total alkalinity and electrical

Conductivity had a positive relationship with pH. Low oxygen levels corresponded with higher temperatures throughout the summer due to diminished photosynthetic

activity, the absorption of carbon dioxide and bicarbonates which is ultimately what cause pH to rise. The pH of water Can alter due to number of circumstances. The higher pH value found imply that changes in physiochemical conditions have a greater impact on carbon dioxide, carbonate-bicarbonate equilibrium. The hydrogen ion concentration in water is indicated by the pH value of the water**.**

EC (Electrical conductivity)

Temperature, pH , alkalinity, calcium, total dissolve solid, fluoride concentration, chloride concentration, dissolved oxygen and ion content are nine characteristics that significantly correlated with conductivity. Accordingly, managing the conductivity of water may be used to regulate water quality in other research area as well as efficiently assess the quality of the subterranean drinking water in the study region. The resistance provided by the water between two platinized electrodes is measured using an EC meter the device has known conductance values that are measured using a reference KCL solution.

Turbidity

The samples light scattering intensity under particular conditions to the light scattering intensity of a standard reference suspension under the same circumstances. Turbidity increases with dispersed light intensity.

Alkalinity

Acetic water pH might be lower than 7. A lot of acetic water is dangerous for people for alkalinity serves as a pH as stabilizer and is mostly made up of carbonate and bi-carbonate. The toxicity of numerous compounds in the water is influenced by alkalinity, pH and hardness. It is determined using a straight forward dilute HCL titration in the presence of the indicators phenolphthalein and methyl orange. The main causes of alkalinity in boiler water are hydroxyl and carbonates ions. The presence of hydroxyl alkalinity in boiler water is required to prevent corrosion in the boiler. Other operational issues like foaming result from too much causticity. An "embrittlement" caustic assault on the boiler can occur when the causticity levels are very high.

Chloride (Cl)

The circulation of groundwater through salt-bearing strata and other anthropogenic sources, such as fertilisers, manure, and human and animal waste, are the main sources of chloride in groundwater. High chloride levels in drinking water may have a laxative effect. According to BIS (2003), the ideal limit is 250 mg/L, although it can be increased to 1000 mg/L. For the pre-monsoon and post-monsoon seasons, respectively, the Cl concentration in the groundwater of the research region varies from 34 to 320 mg/L and 28 to 127 mg/L.

Fluoride (F)

Pre-monsoon and post-monsoon seasons' groundwater fluoride concentrations vary from 0.08 to 0.9 mg/L and 0.08 to 1.12 mg/L, respectively. This is under the permitted limit of 1.5 mg/L set by BIS (2003). The amount of fluoride weathering and leaching from rocks and soil determines the F content in groundwater. According to Edmunds and Smedley (1996), low fluoride levels in drinking water (0.5 mg/L) cause dental cavities, while excessive intakes can affect the metabolic processes of soft tissues such the thyroid, reproductive organs, brain, liver, and kidney.

Calcium (Ca)

Ca should not exceed 75 mg/L for drinking purposes as doing so causes encrustation in water delivery infrastructure. According to WHO (1997) and BIS (2003), the allowable limit has been increased to 200 mg/L. Pre-monsoon season variations in the Ca content in the research area's groundwater range from 38 to 196 mg/L (Table 3), whereas post-monsoon season variations range from 16 to 133 mg/L (Table 4). For both seasons, the Ca readings are within acceptable ranges.

Dissolved Oxygen

DO is regarded as a significant indicator of the health of an aquatic resource's capacity to support aquatic life. Using a calibrated water quality probe meter, levels of DO are measured for the National Aquatic Resource Surveys (NARS), typically in conjunction with readings for temperature and pH. Although each creature has a different DO tolerance range, waterways with DO levels below 3 mg/L are generally considered hypoxic and are typically lifeless. Waterways with values below 1 mg/L are also consider hypoxic.

Iron:

Rural groundwater sources frequently contain iron at levels between 0 and 50 mg/l, which is more than the 0.3 mg\l WHO recommendation. The aquifer naturally contains iron, however breakdown of ferrous borehole and hand pump components can raise groundwater levels. Iron-bearing groundwater frequently has an orange tint, which discolours clothing, and a bad flavour that may be tasted while drinking and cooking with it.

Drinking and Domestic Use

The appropriateness of groundwater for drinking and general household use was evaluated using the required limits of EC, TDS, TH, and SO established by WHO (1997) and BIS (2003). The groundwater is classed by Langenegger (1990) as excellent (0-333 mg/L), good (333-500 mg/L), permitted (500-1,100 mg/L), brackish (1,100-1,500 mg/L), and saline (1,500-10,000 mg/L) based on the salinity levels. This categorization places 53.33% of the pre-monsoon groundwater tests in the permitted water quality category and 6.66% of the pre-monsoon groundwater samples in the excellent water quality category. The remaining groundwater samples, totalling 39.99%, are classified as brackish to salt water (Table 3). Similar results may be seen for the post-monsoon season, where 13.33% of groundwater samples are of acceptable quality, 80% are of permitted grade, and the remaining 6.66% are of brackish quality (Table 4). TDS is a crucial component of standards for drinking water and other types of water quality. According on TDS levels, Carrol (1962) established four categories of water: fresh water (0,001 mg/L), brackish water (1,001–10,000 mg/L), saline water (10,001–100,000 mg/L), and brine (>100,000 mg/L). In the research region, fresh water makes up 100% of the post-monsoon samples and 80% of the pre-monsoon groundwater samples (Table 3-4). However, 20% of the pre-monsoon 4 samples are brackish water, and the concentration of soluble salts inside the geological formation is what causes certain samples to have such high salinity.

V.CONCLUSION

The geochemical analysis of the groundwater in the research region has revealed that, with the exception of a few groundwater samples with higher EC and NO concentrations, most of the analysed chemical parameters are within the allowed range, indicating that the water is suitable for irrigation as well as drinking. The BIS (2003) and WHO (1993) specifications were compared to the concentration ranges of several chemical parameters.

Except for station 8, where the pH readings were below the allowable range (6.34), all of the water samples' pH values were within acceptable limits. Electrical conductivity was below the acceptable level in every sample. An essential parameter that must be kept within acceptable bounds is turbidity. Except for station number 7, where the chloride concentration is beyond acceptable limits (6.4 ml), every sample indicates acceptable chloride levels. The most significant factor in a water sample is the amount of dissolved oxygen, which has an allowed limit of 4.8 to 7.8 mg/L. The range of acceptable alkalinity is 250 to 600 mg/l, and all samples, with the exception of station 7, fell within this range.

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