Journal of Advances and Scholarly Researches in Allied Education
Vol. 19, Issue No. 3, April-2022, ISSN 2230-7540

Quality of Ground Water in Rahata Tahsil District, Ahmednagar State, India

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Abstract - According to the findings, the rahata region has access to generally clean ground water that may be used for agriculture. The quality of ground water has been suggested for little improvement and proper management. Monitoring water quality in a variety of situations is important for ensuring the public's health and safety since human activities, such as the use of pesticides and chemical fertilizers, may have an adverse effect on the natural quality of ground water. Water is an amazing material due to its unique ability to dissolve and transport a broad variety of compounds in suspension. The possibility of contamination exists. In spite of water's central role in maintaining life on Earth, it is the one natural resource that has suffered the most from human activity, both in terms of quality and quantity. The goal of this investigation is to identify the characteristics of the ground water in the area. Finally, we address the local water status, soil type, and other pertinent issues as they relate to ground water augmentation as a means of providing sustainability to ground water development in rahta tehsil. We also talk about water and its unique characteristics.

Keywords - Hardness, TDS, PH, EC, physio chemical parameters

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INTRODUCTION

The district of Ahmednagar occupies more land than any other in the state of Maharashtra. It occupies a swath of Survey of India degree sheets 47 E, 47 I, 47 M, 47 J, and 47 N in the middle of the state, between north latitudes 18°19' and 19°59' and east longitudes 73°37' and 75°32'. It is surrounded to the north by Nashik district, to the east by Aurangabad and Beed, to the south by Osmanabad and Solapur, and to the west by Pune and Thane. Area-wise, the district takes up 17114 sq km (5.54 percent of the overall State area). As of the 2011 census, the population density of the district was 265 people per square kilometer, with a total of 4,543,159 residents. Within the district's borders are 18 populated towns and 1581 uninhabited villages. There are 1,310 Gram Panchayats, 1 Municipal Corporation, and 14 Panchayat Samitis in the district.

We have always assumed that water, a fundamental natural resource for maintaining life and the environment, is freely accessible as a gift from Mother Nature. Rapid economic expansion and heightened human activity have had a profound impact. Where perennial surface water supplies are sparse, such as in arid regions, the use of ground water for household, industrial, and agricultural purposes have been steadily rising. Most water comes from rain, which fills up wells. The water level is affected by geology. Human activity contributes to water contamination as as much as natural factors do, if not more. Large amounts of chemical fertilizers and sprays are used in agriculture, which is a major contributor to groundwater contamination. Two sorts of resources exist: those that occur naturally and those that are created artificially. Human resources include things like quality, talent, and knowledge, whereas natural resources include things like soil, water, plants, etc. Because of this, people have gained personal and economic growth thanks to their intelligence, yet pollution levels have risen as a consequence.

Natural causes and human activities both contribute to widespread groundwater pollution today. As a result, water quality has to be monitored often so that strategies for its upkeep may be developed. In the rahata tahsil, sugarcane is the principal cash crop, and the ground water there is a significant supply of water for irrigation. Some factors that may degrade groundwater quality include excessive

irrigation, the use of pesticides, weed killers, chemical fertilizers, and wastewater from factories. This paper reports the findings of a comprehensive investigation of the physical and chemical properties of ground water in the Ahmednagar district of Maharashtra, India.

"Water is life," and it's crucial for all forms of life on Earth to have access to it. As a result, it's crucial and helpful to regularly assess the water supply in our immediate vicinity. Increasing numbers of people are tapping into underground aquifers for drinking, manufacturing, and farming needs. Rainfall is the primary water source, and it is responsible for replenishing the water table underneath. However, the quality of the water that seeps underground might vary depending on a number of factors. Since water can dissolve almost anything, agricultural runoff is a major source of water contamination due to the widespread use of toxic pesticides on crops. Both natural causes and human activities contribute to the widespread pollution of ground water today. As a result, it's crucial to keep a close eye on the water quality maintenance efforts. Evaluation of water quality indicators in a variety of settings. This also allows us to evaluate the composition of water in irrigated and non-irrigated regions.

Not just from a human perspective, but also from that of the many creatures that call the watery medium their home, water's position in nature is singular. Specially treated water may become contaminated because of its ability to dissolve and transport a wide range of substances. While water is essential for all forms of life on Earth, it is also the resource most negatively impacted by human activities. Water is the most essential of the five elements necessary for human survival. Water is plentiful everywhere yet scarce in certain regions. Nearly all of Earth's water never changes hands; instead, it continually cycles via the hydrological or water cycle. Urbanization, industrialization, and the widespread use of fertilizers and untreated sewage in agriculture have all contributed to a deterioration of our water quality.

LITERATURE REVIEW

Sonkar, Soniya et.al. (2021) Ground water quality varies between sample locations in the research region, as shown by a physico-chemical analysis of water from the area downstream of the Pravara River in Rahuri taluka. Geographical factors and human actions may play a large role in explaining this diversity. The research shows that the rahuri area has access to relatively safe ground water for agriculture purposes. It is recommended that the quality of ground water be somewhat enhanced and then appropriately maintained. This research has the potential to provide light on the quality of ground water supplies in the region.

Ranjendra, Sonawane et.al. (2021) The current research is a comparative study of the physicochemical properties of Pravara River water in Maharashtra's Ahmednagar district. The samples were taken in January 2019 and stored in one-liter sterile polythene vials for further analysis. The Pravara River was sampled at four different points along its length to determine the values of 12 different physicochemical parameters. Wilson dam, Nilwande, Kalas, and Ashwi in the Pravara River were used to gather morning water samples. Physical criteria like pH and chemical ones like conductivity, calcium, magnesium, sodium, palash, carbonate, bio -carbonate, chloride, sulfate, sodium stable ratio, and residual sodium carbone are evaluated.

Santosh, Mr et.al. (2021) The years 1992–1997, 2012–2016, and the forest itself serve as the primary data sources for this study. In this study, the Ahmednagar district and its 14 tehsils serve as the focus. There are 1,704.8 square kilometers of land in the Ahmednagar District, and 11,70 percent of it is covered by forests. The land, water, and forests that make up a country's natural resources are the backbone on which its economy rests. Natural vegetation relies heavily on the availability of water, soil, and climate. When compared to other tehsils in the Ahmednagar District, Akole tehsil has the densest cover of vegetation. Kalsubai, Harishchandra Garh Wildlife Sanctuary (WLS), Rehekuri Wildlife Sanctuary (WLS), and Maldhok Wildlife Sanctuary (WLS) form the protected area (Part).

Gadekar, Deepak et.al. (2021) Water is very necessary for life, and it is crucial that we do all we can to keep its purity intact for the sake of the environment. However, modern-day water pollution causes a decline in supply. Since we found that many residents in NimgoanJali did not have access to water purification systems, we chose to collect samples of both pure and unpurified water to use in our research. The analysis compares the findings of the analysis of the various physicochemical parameters of drinking water with the standards set by the World Health Organization and the Bureau of Indian Standards. The results showed that, with a few exceptions, pure and unpurified water samples did not differ significantly from one another. If they keep their water supply clean, the results of this research show they won't need to invest in water purification systems.

Gadekar, deepak et.al. (2020) Rainfall's volume, frequency, and severity are the three most distinguishing features. The significance of precipitation changes significantly from one day to the next, one location to another, one season to the next, and so on. Akole tehsil is the rainiest region in the state, whereas Karjat and Jamkhed tehsils are the driest. Akole tehsil receives more rain than any other region because of its topography. Study region drought-related precipitation patterns and features. In this study, we analyze precipitation information from the Ahmednagar district's statistics department website, which spans the years 1981 through 2014.

GROUND WATER SCENARIO

Hydrogeology

The basaltic lava flows that underlie the majority of the area were created by sporadic fissure-type eruptions that occurred from the late Cretaceous to the early Eocene. The Deccan Trap has a series of 19 large flows between 420 and 730 meters above sea level (amsl). The predominant units in these flows are vesicular and massive Basalt. There are also recent stretches of alluvium along the paths of important rivers that have been deposited over the Traps.

Water Level Scenario

50 NHNS stations in the Ahmednagar district are checked by the Central Ground Water Board four times a year, in January, May (Pre monsoon), August, and November (Post monsoon).

Aquifer Parameters

As a result of CGWB's comprehensive hydrogeological studies, data on water table/phreatic aquifer characteristics is readily accessible. The specific capacity of wells drilled in Deccan Trap Basalt varies from 1 to 731 lpm/m of drawdown, the permeability from 2 to 98 m/day, and the transmissivity from 2 to 357 m2/day. Exploratory wells have shown transmissivity values between 3.31 to 389.13 m 2 /day during pumping tests. The specific capacity of wells drilled into alluvium varies from 60 to 691 lpm/m of drawdown, the permeability from 85 to 253 m/day, and the transmissivity from 21 to 598 m 2 /day. According to CGWB exploration data, the transmissivity of shallow tube wells may be anywhere from 9.63 to 1560 m 2 /day, while the specific capacity can be anywhere from 0.26 to 8.90 lpm/m of drawdown.

Yield of Dugwells, Tubewells and Borewells

The location, diameter, depth, etc. all have a role in determining a well's yield, but the permeability and transmissivity of the 9-aquifer encountered are also important factors. Ground water is mostly sourced from either dug wells or borewells in this area. The productivity of drilled wells varies with the composition of the rocks being exploited. The flow rate of wells drilled through Deccan Trap Basalt varies from 2 lpm to 3655 lpm. High-yield drilled wells are always located in physiographic lows with a developed worn and fractured zone. According to CGWB exploration data, the output of borewells varies greatly, from 0.14 lps to 33.63 lps. The yield of the excavated wells in alluvium varies between approximately 1 and 53 lps, whereas the yield of shallow tube wells varies between about 0.05 and 7.14 lps.

Hydrology of the Subsurface The district's ground water resources have been calculated using the GEC-97 technique by the Central Ground Water Board and the Ground Water Survey and Development Agency (GSDA). Table 4 shows the same information. The total area estimated to have ground water resources was 15624.75 square kilometers, of which 3681.34 square kilometers are under command and 11943.40 square kilometers are not.

GROUND WATER QUALITY

Since the 1970s, CGWB has used its network of monitoring wells to track changes in the quality of the ground water in the Ahmednagar area. The purpose of this monitoring is to compile a picture of the ground water quality in the district as a whole. In 2011, the Board monitored the quality of ground water at 15 different wells. Most of these wells are artificial boreholes that tap into the shallow aquifer. The groundwater in these wells was sampled in the month of May, 2011. (pre-monsoon period). Immediately after collection, water samples were sent to the Board's Regional Chemical Laboratory in Nagpur, where they were analyzed for a number of different criteria. pH, EC, TH, NO3, and F are some of the tested variables (F). Standard procedures from the American Public Health Association's Handbook for the Examination of Water and Wastewater were followed throughout the sample collection, preservation, storage, transportation, and analysis processes (APHA, 1998). First, we made sure that all of the information produced on ground water quality was present and correct, and then we validated the information using industry standards. As a further step, we interpreted the data to provide a comprehensive picture of ground water quality in the region in 2011.

STATUS OF GROUND WATER DEVELOPMENT

The yield of the aquifers already presents in a location, as well as the availability of other resources, the nature of the local economy, and the water needs of the crops grown there, are all important considerations in ground water development. Irrigation is by far the largest consumer of ground water. According to the results of the 2006–07 Census of Minor Irrigation, the total area that is irrigated is 5165 square kilometers; of this, 5008 square kilometers is irrigated by ground water, 157 square kilometers are irrigated by surface water, and the remaining 165 square kilometers are unirrigated. As a result, it is abundantly evident that ground water provides the vast majority of irrigation water (96%), while surface water provides just 4%. With 1,76,608 drilled wells, the district has the ability to irrigate 4,464.65 square kilometers. However, only 3,539.04 square kilometers of this area were actually irrigated. Furthermore, in 2006-07, 20,320 bore/tube wells irrigated 359.31 square kilometers.

The State of Maharashtra places a high value on ground water for agricultural growth. In certain sections of the State, ground water development has progressed to a critical point, leading to a precipitous decline in ground water levels. Therefore, to ensure

the long-term viability of ground water development, it is necessary to employ an integrated strategy that develops ground water resources in tandem with ground water augmentation.

GROUND WATER POLLUTION AND CONTAMINATION IN INDIA

It is impossible to overstate the importance of groundwater as a decentralized source of drinking water for millions of rural and urban households. Some estimates place its share of India's local water demands at over 80%, with another 50% going toward meeting the needs of India's metropolitan areas. When compared to bodies of surface water, groundwater is often more resistant to pollution and contamination. Water that recharges groundwater systems also loses the natural pollutants that are present in it as it percolates through the soil. However, in India, this precious resource is being tainted by a wide range of land- and water-based human activities. Groundwater in India is used extensively for water systems and industrial uses. In some places, overuse has led to a desecration of aquifers, while in others, impromptu upgrades based on insufficient knowledge of groundwater stream dynamics and geo-hydro material formations have led to mineralization. Fourteen of India's states—Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal—have fluoride concentrations in excess of the 1.5 ppm threshold, affecting a combined 69 districts. Sixty-five percent of Indian cities, by some estimates, are in the path of a fluoride threat. Six regions of West Bengal's alluvial fields have arsenic concentrations much over the safe limit of 50 parts per billion (ppb). Andhra Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, and five squares in Delhi are among the 40 locations in 13 states where groundwater is dangerously close to being contaminated by excessive metals. Fresh groundwater biological communities are under grave risk because to non-point pollution produced by manures and pesticides used in agriculture, which are often spread out over large areas. High nitrate fixations in groundwater are caused by the excessive use of compound composts in ranches and the careless transport of human and animal waste to the beach. One of the major concerns in many urban and contemporary communities in India is groundwater contamination caused by the disposal of industrial effluents and municipal garbage in water bodies. In 1995, the Central Pollution Control Board conducted research that found that contemporary effluents were the primary cause of groundwater pollution in 22 locations across 16 states in India. Center for Science and Environment has conducted an examination of eight locations in Gujarat, Andhra Pradesh, and Haryana, and found evidence of excessive levels of metals including lead, cadmium, zinc, and mercury. Ludhiana city's primary source of drinking water, a shallow aquifer, has been contaminated by a stream that receives effluents from 1,300 businesses. Kachchh and Saurashtra in Gujarat, Chennai and Calicut in Tamil Nadu, and Calicut in Kerala have all experienced seawater interruption due to pollution sparked by the excessive removal of groundwater from coastal aquifers.

Water Pollution

Water is a gift from God, but pollution is a product of human ingenuity. In "shastra," water is considered one of the five elements necessary for existence. Among the many resources that Man has used for his survival, water is among the most essential commodities. Pollution occurs when there is a detrimental change in the physical, chemical, radiological, or biological qualities of a resource (air, land, or water) that is either directly or indirectly attributable to human activity. A region's level of environmental protection and its geographical isolation both affect the quality of its water.

Surface Water Pollution

Surface runoff generally transports organic and inorganic contaminants, especially suspended particles, and pollutes surface water bodies. The dumping of sewage or industrial waste into them also contributes to their contamination. Surface water is contaminated with nitrates, pesticides, and excess salt from agricultural run-off.

Groundwater Pollution

Polluting groundwater occurs when the quality of the groundwater supply is diminished due to human activity. Water consumption for a number of reasons generates wastewater, which is then disposed of as a major source of pollution. Besides household and industrial pollutants, there is a wide variety of other potential sources and reasons that might affect the quality of groundwater.

WATER

Water's adaptability means that it can be used by humans in a wide range of climates. Water's unique anamolus qualities are what set it apart from other substances. Because of its polar nature, water is considered a universal solvent. They may be dissolved in it together with a wide variety of other chemicals. Here are some of its characteristics:

Physical properties of Water:

The physical characteristics of water are varied and distinctive. It may be solid, liquid, or gas at standard room temperatures and pressures. Water has a very high specific heat capacity and a high heat of vaporization. Extensive hydrogen bonding between water molecules is responsible for both of these characteristics. Given its high specific heat capacity, water is an effective medium for dispersing the sun's warmth over the planet. Water has high density,

which relies on the dissolved solids and temperature of the water. Water is one of a kind in the physical world because its solid form (ice) has a lower density than its liquid form. At 4 degrees Celsius, liquid water is densest. Water has a high surface tension as compared to other liquids owing to strong cohesion between molecules. Capillary action, which permits water to reach plant roots, is a result of surface tension. Water is the only material with a solid phase that can float atop its liquid phase. Intermolecular hydrogen bonding between water molecules is responsible for several of water's unique qualities, including its melting point, boiling temperature, viscosity, and sluggish heating and cooling. There is a large dielectric constant in water. In addition, the heat of vaporization of water is quite high. O2, CO2, N2, H2, SO2, and NH3 are only few of the gases that may be dissolved in water.

Chemical properties of Water:

Water's numerous positive qualities make it a suitable medium for many forms of life. Chemically, water has the formula H2O, and its shape is a curved sphere. Hydrogen bonding causes water to remain a liquid even when the temperature is above freezing. Water molecules are polar because both hydrogen atoms provide a positive electrical charge and the oxygen atom generates a negative charge. While it remains a liquid at room temperature, water dissociates into the gas's hydrogen and oxygen at higher temperatures. In very minute doses, water is capable of ionizing itself; yet, in pure water, the concentrations of hydronium ions and hydroxide ions are roughly equivalent. Therefore, distilled water has no inherent properties. Because of its structure, water may be both an acid and a base. As an oxidizing agent, water converts carbon to carbon monoxide, and as a reducing agent, it converts chlorine gas to hydrogen chloride.

Biological properties of Water:

Water is the most versatile solvent since it may be used to dissolve almost any material. Biotic molecules, biominerals, hormones, and vitamins all need water to go to where they need to go in the bodies of animals and plants. Because they occur in solution in the cytoplasm of live cells, all the metabolic processes necessary for life need water. Because of the polar nature of water molecules, they adhere to other polar substances. Because of this, plants may defy gravity by transporting water upwards via their xylem. It is impossible for aquatic life to exist without the oxygen provided by the air, which is dissolved in water.

CONCLUSION

Unregulated dumping of sewage and industrial waste into the ground, as well as regional variations, may contribute to this water quality variation. Using the physico-chemical data gleaned from the samples, the researchers concluded that the ground water in the study area was generally acceptable for irrigation and drinking, with some small exceptions. In all, 5165 square kilometers of land are irrigated by ground water and 157 square kilometers by surface water. In order to get ground water, the district makes use of both dug wells and borewells. The goal of the ground water augmentation project in the rahta tehsil is to make the development of ground water a sustainable endeavor. During the research period, the groundwater quality was sufficient for both human consumption and agricultural irrigation. Groundwater is safe for human consumption.

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