Analyzing Drinking Water Quality in Panodi Village, Ahilyanagar District: Emphasis on Total Dissolved Solids (TDS) and Electrical Conductivity (EC)

Zine Aruna Santosh[1], Gadekar Deepak Janardhan[2], Jadhav Vikrant Patilba[3]

Manuscript ID:
IJWGAFES-2025-020803

DOI: 10.5281/zenodo.17197540

DOI Link:
https://doi.org/10.5281/zenodo.17197540

Volume: 2
Issue: 8
August
Year: 2025
E-ISSN: 3066-1552

Submitted: *08 July2025*

Revised: *10 July 2025*

Accepted: *05 Aug 2025*

Published: *31 Aug 2025*

[1,3]PG Department of Environment Science And Research Centre, Padmashri Vikhe Patil College of Arts Science & Commerce, Pravaranagar, Maharashtra, India, Affiliated to Savitribai Phule Pune University Pune, India

[2]Department of Geography and Research Centre, Padmashri Vikhe Patil College of Arts Science & Commerce, Pravaranagar, Maharashtra, India Affiliated to Savitribai Phule Pune University Pune, India
Email: deepak.gadekar007@gmail.com

Address for correspondence:
Gadekar Deepak Janardhan
Department of Geography and Research Centre, Padmashri Vikhe Patil College of Arts Science & Commerce, Pravaranagar, Maharashtra, India Affiliated to Savitribai Phule Pune University Pune, India
Email: deepak.gadekar007@gmail.com

How to cite this article:
Zine, A. S., Gadekar, D. J., & Jadhav, V. P. (2025). Analyzing Drinking Water Quality in Panodi Village, Ahilyanagar District: Emphasis on Total Dissolved Solids (TDS) and Electrical Conductivity (EC). International Journal of World Geology, Geography, Agriculture, Forestry and Environment Sciences, 2(8), 11–19.
https://doi.org/10.5281/zenodo.17197540

Abstract

The present study evaluates the Total Dissolved Solids (TDS) and Electrical Conductivity (EC) of drinking water in Panodi Village, Ahilyanagar District, and Maharashtra State. Panodi Village is situated between 19° 27' 49.068" to 19° 46' 36" N latitude and 74° 21' 20.7" E to 74° 35' 57" E longitude, as indicated on Survey of India toposheets no. 47 I/7. To assess water quality, eight samples of raw water (inlet) and eight samples of purified water (outlet) from water purifiers were collected and analyzed for TDS and EC. TDS levels in plain water were generally found to range from 262 to 510 ppm, while in purified water the TDS levels were generally found to range from 148 to 280 ppm. Also, the EC water levels in the study area ranged from 397 to 677 µS/cm, which clearly show that the water quality in terms of TDS and EC is excellent in the study area. This condition can have adverse health effects due to the lack of TDS and EC in purified water. Researchers recommend that the TDS of water filters should be between 300 and 600 ppm to maintain water quality in the field.

Keywords: *Quality, Drinking, Total Dissolved Solids, Health, Water, Electrical Conductivity.*

Introduction

It would not be wrong to say the sentence 'There is water, there is life' because the entire living creation and human activities depend on water. Maintaining the quality of water is the primary duty of humans. Because in the era of modern technology and industrialization, urbanization, chemical fertilization, water pollution is occurring on a large scale. The impact of all this is becoming negative on human health and nature. Therefore, it is necessary to develop drinking water in an environmentally sustainable way. For this, it is necessary to analyze the quality of drinking water. For this, it is necessary to test various properties of physical, chemical, biological water. It is important to study what substances are mixed in such contaminated water. By doing so, care should be taken that these substances do not adversely affect human health, and also that they do not adversely affect animals in nature. It is necessary to follow regulatory standards to identify the quality of contaminated water and substances in contaminated water, which can be useful in protecting all living things from waterborne diseases and environmental hazards. Water is used for various purposes, mainly for domestic use, irrigation, business, various activities, industrial processes. Water is used for various purposes, and it is also used for various purposes in rural areas. First of all, water use for agriculture is at the top of the list in rural areas. It is necessary to maintain the quality of water properly in these rural areas. Due to the use of chemical fertilizers in rural areas, the groundwater level and water quality are deteriorating. Water is a natural resource. Water production can occur naturally, but it is currently impossible for humans, so it is necessary to have access to suitable water for human use and drinking. Water filters are used mostly in rural areas for water purification, but due to human misunderstanding, water filters are being used in small quantities in rural areas. Therefore, in order to get water suitable for humans to drink, it is necessary to have the right quality and measurement of the biological chemical components in the water. This research has studied the quality of filtered water and unfiltered water in Panodi village. It is true that water pollution is increasing in many parts of India due to biological and chemical factors. This includes surface water and groundwater. For this, proper water management is necessary (Kulkarni, 1990). The main reason for the decline in water quality is the waste water due to agricultural, industrial and domestic use. In short, the most important reasons are wastewater (Handa, 1981, Bhargava, 1985).

Contaminants often infiltrate the phreatic zone of aquifers, resulting in unacceptable concentrations of Total Dissolved Solids (TDS) (Pondhe et al., 1992). Such polluted water can spread diseases like cholera, typhoid, diarrhea, and hepatitis. These studies indicate that water quality issues pose significant threats to rural populations.

In many villages, people rely on readily available water sources such as wells and sometimes bore wells. While pure water from precipitation would be ideal for human consumption, achieving the highest water quality criteria in rural areas is often impractical. Therefore, it is necessary to adhere to minimum water quality standards for drinking water. The World Health Organization first outlined these criteria in 1958 as international standards for drinking water, with revisions in 1963, 1971, and 1984-85, and subsequent editions in 1993 and 1996 (WHO, 1996).

Water quality parameters such as pH, hardness, calcium, magnesium, dissolved oxygen, biological oxygen demand, and chemical oxygen demand are crucial for evaluating water quality (Pal et al., 2015). However, TDS and Electrical Conductivity (EC) are frequently used parameters because they are interrelated (TDS = k(EC)) and can be easily measured (Anna F. Rusydi, 2017). The value of k increases with the concentration of ions in water but often depends on the activity of specific dissolved ions, the average activity of all ions in the liquid, and the ionic strength (Hem, 1985; Hayashi, 2004; Siosemarde et al., 2010).

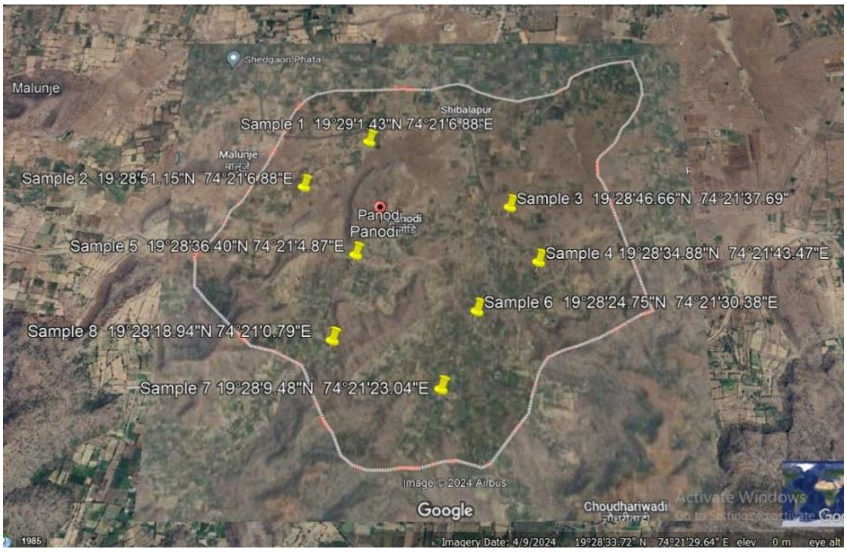
Literature reveals that prolonged consumption of water with high TDS levels can lead to kidney stone formation, and such water may taste bitter, salty, or metallic, and have unpleasant odors. High TDS levels can interfere with the taste of foods and beverages, making them less desirable to consume. Additionally, some individual mineral salts that contribute to TDS can pose various health hazards.

The most problematic contaminants in water include nitrates, sodium, sulfates, barium, cadmium, copper, and fluoride. Even water with extremely low concentrations of TDS can be unacceptable for human health due to its flat, insipid taste and corrosive nature, which can lower the pH of the water Therefore, drinking water should have an optimal quantity of TDS and, consequently, EC. While TDS plays a role in maintaining homeostasis, an imbalance can affect body functions such as glucose concentration, calcium levels, magnesium levels, fluid volume, body temperature, and acid-base balance. Additionally, disease, physiological issues, or major nutritional deficiencies can exacerbate the problem (Sana Akram and Fazal-ur-Reheman, 2018).

The palatability of drinking water is rated by panels of tasters in relation to its TDS levels: excellent (less than 300 ppm), good (between 300 and 600 ppm), fair (between 600 and 900 ppm), poor (between 900 and 1200 ppm), and unacceptable (more than 1200 ppm) (Bruvold and Ongerth, 1969). According to the Bureau of Indian Standards (BIS), the ideal TDS for drinking water is below 300 mg/L, with a maximum permissible limit of 600 mg/L. The World Health Organization (WHO) recommends a TDS level of 300 mg/L and an EC of no more than 1500 µS/cm (Anna F. Rusydi, 2019).Therefore, the present work focuses on evaluating the TDS and EC of drinking water in Panodi Village to assess its quality.

Study Area:

Panodi is a village located in Sangamner tehsil of Ahilyanagar district in the state of Maharashtra. The total geographical area of this village is 22.5 square kilometers**.** The Toposheet no. 47 I/7 of the Survey of India and lies between 19° 27' 49.068’’ to 19o 46’ 36’’ N latitude and 74° 21' 20.7" E to 74o 35’ 57’’ E longitude (Map.1).



Map 1: Showing sampling station in the study area.

The climate of this study area is mainly dry with a maximum temperature of 42 degrees Celsius in summer and a minimum temperature of 10 degrees Celsius in winter. The average annual rainfall in this study area is 600 millimeters and the rainfall here mainly falls from the southwest monsoon. The entire part of the study area is rural. There is no modern water supply system of any kind. The locals mainly use wells and taps for drinking water in these villages. In short, a comparative study has been done to study the quality of drinking water in this village, the quality of water used by water purifiers and the quality of water in places where water purifiers are not used.

Aims and Objective:

The main objective of this research is to study the water quality of Panodi village. A comparative study has been conducted between purified water and non-purified water for this water quality.

1. Analyzing Drinking Water Quality in Panodi Village.

2. Finding the relation between TDS and EC in sampling water

Material and Method:

To obtain reliable data on TDS and EC in water quality investigation, several important considerations were taken into account: the methods employed the purpose of the study, and the data needed. Accordingly, both field and laboratory methods were adopted to fulfill the study's objectives. Specifically, the grid method was used for sampling selection and collection of water.

A total of eight raw water samples (S1 to S8) from the inlet of water purifiers and eight corresponding purified water samples from the outlet were collected simultaneously from the village in September and November 2023. The collected samples were filtered and analyzed for TDS and EC in the laboratory following the methods outlined by APHA and AWWA (1975) and Trivedy and Goel (1986).

Key Parameters in Drinking Water Quality Analysis:

Drinking water quality is assessed through a combination of physical, chemical, and biological parameters, each providing insight into specific aspects of water safety:

1. Physical Parameters:

Turbidity: The odor of water is considered an important physical parameter. The clarity of water is measured by the odor in this water. If the odor is high in water, then that water should be sterile, as such water can interfere with the process of disinfection.

Color and Odor: The color and taste of water are considered important factors for water quality. If the color of the water is clear, the water should be suitable and the taste should also be suitable. If the amount of chemical components in the water is high, then the color of such water is naturally different and the taste of the water is also different.

Temperature: The growth of microorganisms in the water depends on the temperature of the water. If the temperature is high, bacteria can be encouraged in such places.

2. Chemical Parameters:

pH: The pH level in water determines the acidity, alkalinity, and salinity of the water. The ideal range for water should be 6.5 to 8.5.

Dissolved Oxygen (DO): The amount of oxygen dissolved in water is considered the most important factor. The freshness of water indicates the level of oxygen in the water.

Heavy Metals: Water is harmful to health if it contains high levels of heavy metals. These include metals like lead, mercury, and arsenic, which can cause stomach or various cancers in large quantities.

Nitrates and Nitrites: This element dissolves in water due to the large-scale use of chemical fertilizers in agriculture (blue baby syndrome) in infants.

Organic Compounds: Insecticides, volatile organic compounds (VOCs), and drugs can pollute water sources, affectation a health risk.

3. Biological Parameters:

Total Coliforms and Fecal Coliforms: Indicators of microbial contamination, often from sewage or animal waste.

Pathogens: Specific bacteria (*Salmonella*), viruses (norovirus), and protozoa (*Cryptosporidium*) can cause waterborne diseases.

Algal Toxins: Produced by harmful algal blooms, toxins like microsystems can affect liver and neurological function.

Result and Discussion:

It is observed from Table 1 that the raw (inlet) water in the water purifier shows TDS levels ranging from 262 to 510 ppm in the study area. The higher concentration of TDS (510 ppm) at the S8 sampling station may be attributed to the dissolution of salts from rocks as a primary source (USDA, 1954; Raymahashay, 1986) and agricultural runoff in the area (Daji, 1985). Similarly, EC ranges from 397 to 637 µS/cm, indicating a linear relationship with TDS in the area (Anna F. Rusydi, 2019). The water quality, in terms of TDS and EC, is excellent too good at all sampling stations.

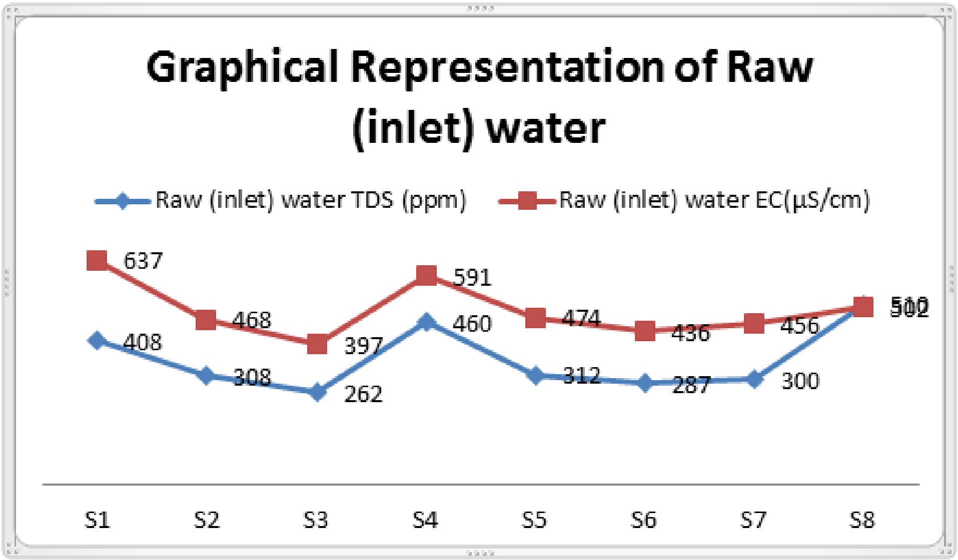
The provided dataset includes measurements of Total Dissolved Solids (TDS) in parts per million (ppm) and Electrical Conductivity (EC) in microsiemens per centimeter (µS/cm) for raw (inlet) and purified (outlet) water across eight sampling stations (S1–S8). Below is an interpretation of the data, comparison with drinking water quality standards, and potential causes of the observed values.The average results obtained from these analyses are presented in Table 1.

Table 1: TDS and EC of Raw (Inlet) and Purified (Outlet) Water Samples in Panodi Village, Ahmednagar District

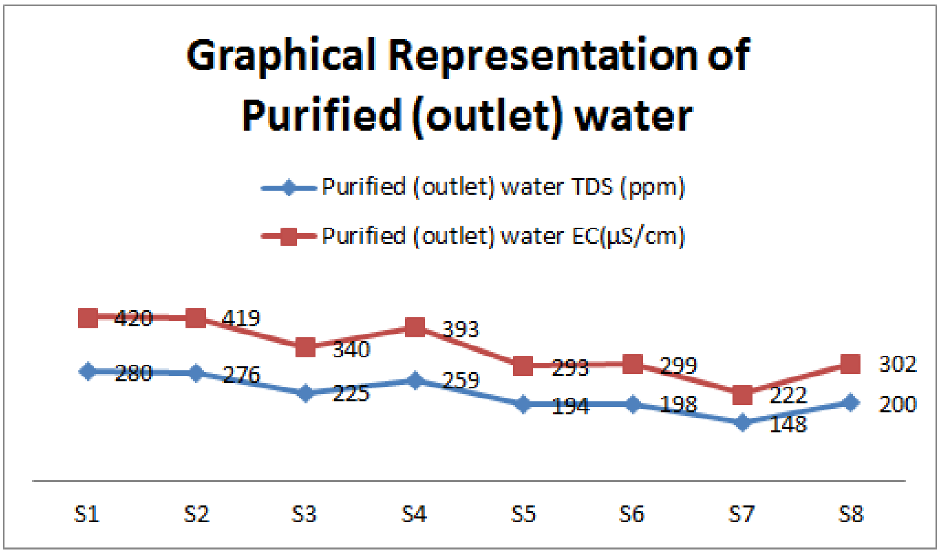
Sample No. (S- Sampling station)	Raw (inlet) water		Purified (outlet) water	
	TDS (ppm)	EC(µS/cm)	TDS (ppm)	EC(µS/cm)
S1	408	637	280	420
S2	308	468	276	419
S3	262	397	225	340
S4	460	591	259	393
S5	312	474	194	293
S6	287	436	198	299
S7	300	456	148	222
S8	510	502	200	302

Source: Calculated by Researcher (Water Sampling)

Graph 1- Represents the values of TDS and EC of Raw (inlet) Water



Graph 2- Represents the values of TDS and EC Purified (outlet) water



However, the purified (outlet) water shows TDS levels ranging from 148 ppm (S7) to 280 ppm (S1). The low concentration of TDS in purified water in the study area may pose health risks due to its flat, insipid taste and corrosive nature, which can lower the pH of the water.

1. **Total Dissolved Solids (TDS):** TDS is the total dissolved solids content of water. It mainly includes salts and organic matter. All these factors affect the quality of water, or whether it tastes good or not, and the use of water depends on these factors.

Raw Water (Inlet):

1. TDS ranges from 262 ppm (S3) to 510 ppm (S8).
2. According to the World Health Organization (WHO) and U.S. Environmental Protection Agency (EPA), TDS levels below 600 ppm are generally considered acceptable for drinking water, with 50–150 ppm being excellent and 150–500 ppm being good for palatability.
3. All raw water samples fall within the acceptable range (<600 ppm), but higher values (e.g., S8 at 510 ppm, S4 at 460 ppm) suggest elevated mineral or salt content, which may affect taste or indicate contamination from natural or anthropogenic sources.

Purified Water (Outlet):

1. TDS ranges from 148 ppm (S7) to 280 ppm (S1).
2. Purification significantly reduces TDS across all stations, with reductions ranging from 30.4% (S2: 308 to 276 ppm) to 50.7% (S7: 300 to 148 ppm).

3. All purified water samples fall within the "excellent" (50–150 ppm) to "good" (150–500 ppm) range, indicating effective treatment processes and suitability for drinking.

2. Electrical Conductivity (EC)

The EC factor in water, which measures the ability of water to conduct electricity, is closely related to the pH and TDS of water.

1. Raw Water (Inlet):

1. EC ranges from 397 µS/cm (S3) to 637 µS/cm (S1).
2. Typical EC values for drinking water are 50–1500 µS/cm, with lower values indicating purer water. All raw water samples are within this range but on the higher side, particularly S1 (637 µS/cm) and S4 (591 µS/cm), suggesting higher ionic content, possibly from dissolved salts or minerals.

2. **Purified Water (Outlet)**:

1. EC ranges from 222 µS/cm (S7) to 420 µS/cm (S1).
2. Purification reduces EC significantly, with reductions ranging from 10.3% (S2: 468 to 419 µS/cm) to 51.3% (S7: 456 to 222 µS/cm).
3. Purified water EC values are well within acceptable limits, indicating effective removal of ionic compounds and improved water quality.

3. Relationship between TDS and EC

TDS and EC are correlated, as EC is driven by the ions contributing to TDS. A rough conversion factor (TDS ≈ 0.5–0.7 × EC) is often used. For example:

- S1 Raw: TDS (408 ppm) ÷ EC (637 µS/cm) ≈ 0.64
- S7 Purified: TDS (148 ppm) ÷ EC (222 µS/cm) ≈ 0.67 The data shows a consistent TDS-to-EC ratio (~0.6–0.7), confirming the reliability of measurements and the expected relationship between these parameters.

4. Effectiveness of Purification

- **TDS Reduction**: Ranges from 30.4% (S2) to 50.7% (S7), with an average reduction of ~40%. S7 shows the highest purification efficiency, reducing TDS from 300 ppm to 148 ppm.
- **EC Reduction**: Ranges from 10.3% (S2) to 51.3% (S7), with an average reduction of ~35%. S7 again shows the highest efficiency.
- The purification process (likely involving filtration, reverse osmosis, or ion exchange) is effective across all stations, with S7 demonstrating the best performance and S2 the least.

Potential Causes of Observed Values:

1. Raw Water Quality

High TDS/EC (e.g., S8: 510 ppm, S1: 637 µS/cm):

Natural Sources: Elevated TDS/EC could result from geological factors, such as water passing through mineral-rich aquifers containing calcium, magnesium, or sodium salts.

Anthropogenic Sources: Agricultural runoff (e.g., fertilizers containing nitrates or phosphates), industrial discharges, or sewage contamination may increase dissolved solids and ionic content.

Environmental Factors: Seasonal variations, such as reduced dilution during dry periods, can concentrate dissolved solids in source water.

Variability across Stations: Differences in TDS/EC (e.g., S3: 262 ppm vs. S8: 510 ppm) suggest variations in source water, possibly due to different geographical locations, aquifer types, or proximity to pollution sources.

2. Purified Water Quality

Lower TDS/EC Post-Purification:

The consistent reduction in TDS and EC indicates effective treatment, likely through reverse osmosis, distillation, or deionization, which remove dissolved solids and ions.

S7's superior performance (TDS reduced to 148 ppm, EC to 222 µS/cm) may reflect a more advanced or well-maintained treatment system at that station.

Residual TDS/EC in Purified Water: Values like 280 ppm (S1) or 419 µS/cm (S2) suggest that some dissolved solids or ions remain post-treatment, possibly due to:

Incomplete Removal: Treatment systems may not remove all ions, especially if designed to retain beneficial minerals (e.g., calcium, magnesium) for taste or health.

System Limitations: Variations in treatment efficiency (e.g., membrane wear in reverse osmosis) could explain differences, such as S2's lower reduction rate.

3. Potential Issues

S8 Anomaly: Raw water at S8 has a high TDS (510 ppm) but a relatively low EC (502 µS/cm), which is unusual as EC typically scales with TDS. This could indicate:

1. Non-ionic dissolved solids (e.g., organic matter) contributing to TDS but not EC.
2. Measurement errors or calibration issues with the EC meter.

S2 Low Purification Efficiency: The minimal reduction in TDS (10.3%) and EC (10.3%) at S2 suggests potential issues with the treatment system, such as clogged filters, inadequate maintenance, or insufficient treatment capacity.

Recommendations:

1. **Investigate S8 Raw Water**: Conduct further tests to identify the composition of dissolved solids (e.g., ion chromatography for specific ions, organic matter analysis) to confirm the cause of the high TDS/low EC discrepancy.
2. **Inspect S2 Treatment System**: Evaluate the purification process at S2 for potential inefficiencies, such as worn-out membranes or inadequate treatment stages.
3. **Regular Monitoring**: Continue routine testing of TDS and EC, supplemented with specific contaminant tests (e.g., heavy metals, nitrates) to identify sources of elevated values in raw water.
4. **Source Protection**: Implement measures to reduce contamination in raw water, such as controlling agricultural runoff or industrial discharges near water sources.

Correlation

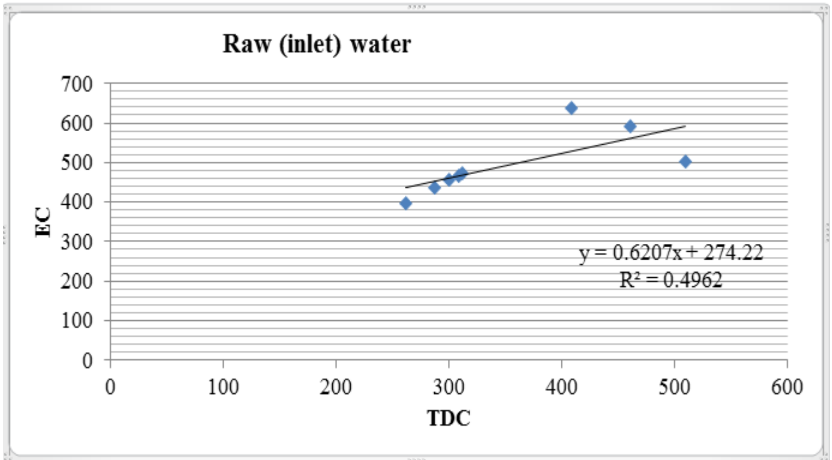
TDS and EC are expected to be strongly correlated because EC measures the water's ability to conduct electricity, which is directly influenced by the concentration of dissolved ions (contributing to TDS). A high positive correlation (r close to 1) would indicate that as TDS increases, EC increases proportionally, which is typical in water quality analysis due to the ionic nature of dissolved solids.

Steps for Analysis

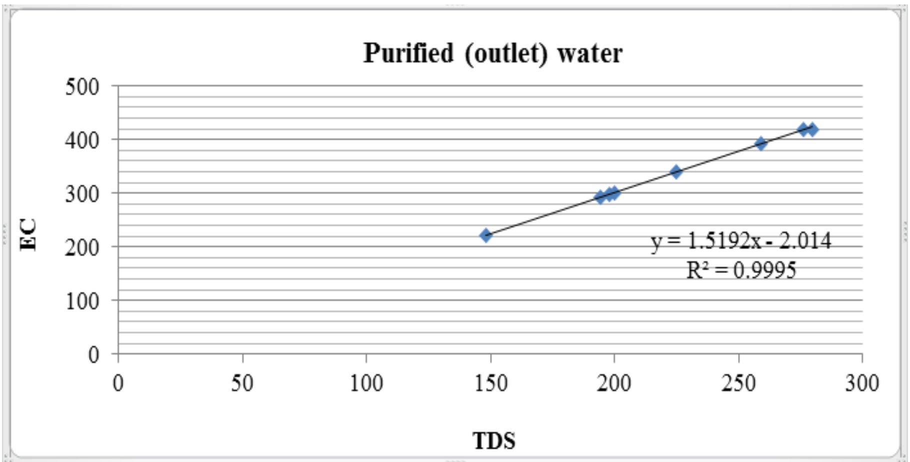
1. **Extract Data**: Use the provided TDS and EC values for raw and purified water.
2. **Calculate Pearson Correlation**:
1. **For raw water:** Correlation between TDS (ppm) and EC (µS/cm).
2. **For purified water:** Correlation between TDS (ppm) and EC (µS/cm).
3. **Interpret Results**:
1. **r> 0.7:** Strong positive correlation.
2. **0.3 < r ≤ 0.7:** Moderate positive correlation.
3. **r ≤ 0.3:** Weak or no correlation.
4. **Identify Anomalies**: Note any deviations, such as the unusual TDS/EC ratio at S8 for raw water (high TDS of 510 ppm but relatively low EC of 502 µS/cm), which may affect correlation.

Raw Water (TDS vs. EC): Pearson correlation coefficient ≈ 0.496
Purified Water (TDS vs. EC): Pearson correlation coefficient ≈ 0.995

Graph 3: Co- Relation between represents the values of TDS and EC Raw (inlet) water



Graph 4: Co- Relation between represents the values of TDS and EC Purified (outlet) water



Raw Water Correlation (r ≈ 0.4962)

- **Strength**: Strong positive correlation.
- **Interpretation**: There is a strong linear relationship between TDS and EC in raw water, indicating that higher TDS levels correspond to higher EC, as expected due to the ionic content of dissolved solids. However, the correlation is not perfect (r < 1), likely due to the anomaly at S8 (TDS = 510 ppm, EC = 502 µS/cm), where the EC is lower than expected for such a high TDS. This could suggest the presence of non-ionic dissolved solids (e.g., organic matter) or measurement inconsistencies.
- **Possible Causes of Deviation**:
  - Non-ionic compounds contributing to TDS but not EC.
  - Calibration errors in EC measurement at S8.
  - Variations in ion types (e.g., ions with different conductivities, such as sodium vs. calcium).

Purified Water Correlation (r ≈ 0.995)

Strength: Very strong positive correlation, near perfect.

- **Interpretation**: The near-perfect correlation indicates that TDS and EC are almost perfectly linearly related in purified water. This suggests that the purification process (e.g., reverse osmosis, ion exchange) consistently removes ionic compounds, resulting in a predictable relationship between TDS and EC. The high correlation reflects the effectiveness and uniformity of the treatment process across stations.

Implications: The sanitization system is dependable as the residual melted items are mainly ionic, causal proportionately to both TDS and EC.

Raw Water: The strong correlation (r ≈ 0.4962) checks the probable association between TDS and EC, though the slightly lower coefficient proposes possible differences (e.g., S8) that permit further examination such as testing for non-ionic solids or confirming quantity accurateness.

Purified Water: The near-perfect correlation (r ≈ 0.995) shows a highly reliable conduct process with TDS and EC closely united due to the exclusion of non-ionic pollutants and retaining of chiefly ionic solids.

Recommendations:

1. Examine the S8 raw water difference to classify the arrangement of melted solids (e.g., organic material analysis or ion-specific testing).
2. Continue checking TDS and EC to confirm the cleansing process upholds its high constancy.
3. Study extra factors (e.g., definite ion absorptions) to comprehend differences in raw water quality across positions.

Importance of Analyzing Drinking Water Quality:

Water quality analysis and study is very important to protect people's health and manage sustainable water quality. Regular assessment of water quality is necessary. In this water assessment method, it is important to identify metals, bacteria, viruses and chemical pollutants and chemical elements available in water and reduce water pollution. By doing so, serious risks to human health will not arise. Contaminated water can cause various diseases and disorders for humans in the long term. Water quality is studied by analyzing various contaminants dissolved in water, such as the pH of the water, the level of toxic substances present in the water, and various other factors. Testing the quality of drinking water helps to determine the amount and type of chemical and biological elements present in the water. This can help prevent adverse effects on human health. It also helps to study the geographical areas where water quality is deteriorating and the reasons for it. This will help prevent future human health and environmental problems.

The analysis of drinking water quality is critical for several reasons:

Public Health Protection: Pollutants such as pathogens (e.g., *E. coli*, *Giardia*), heavy metals (e.g., lead, arsenic) and chemical pollutants (e.g., nitrates and pesticides) can cause plain health issues, ranging from acute intestinal contagions to continuing conditions like cancer or neural complaints. Steady testing classifies these risks, allowing timely interferences.

Controlling Acquiescence: Governments and international organizations, such as the World Health Organization (WHO) and the U.S. Environmental Protection Agency (EPA), set rigorous rules for drinking water quality. Analysis confirms water meets values like the WHO's Guidelines for Drinking-Water Quality or the EPA's Safe Drinking Water Act requirements.

Environmental Monitoring: Water quality examination helps perceive environmental pollution such as industrial releases or agricultural overflow which can damage water sources and damage ecosystems.

Public Confidence: Clear and reliable testing nurtures faith in water supply organizations promising communities that their water is safe for feeding.

Early Cautioning System: Monotonous observing can detect developing pollutants or changes in water quality permitting experts to address issues before they intensify into public health disasters.

Challenges in Drinking Water Quality Analysis: Despite developments studying drinking water quality expressions some challenges:

Emerging Contaminants: New pollutants such as per- and polyfluoroalkyl substances (PFAS) or microplastics need progressive discovery methods that may not be extensively available.

Resource Limitations: In low-income regions contact to classy equipment or qualified people can be limited delaying complete testing.

Temporal and Spatial Variability: Water quality container varies seasonally or geographically needful common and extensive checking.

Data Interpretation: Composite datasets from many parameters need skilled analysis to draw correct conclusions.

Climate Change: Changes in precipitation, temperature and exciting weather events can change water quality confusing long-term checking efforts.

Conclusion:

From the above study, it is seen that the water quality in the study area is at a reasonable level. Despite this, in places where technology has been used to purify water, there is a deficiency of TDS. Therefore, in places where TDS is low in water, checking TDS will help in maintaining water quality. The data indicates that raw water across all stations has acceptable but elevated TDS and EC levels, likely due to natural mineral content or localized contamination. The purification process effectively reduces TDS and EC to safe and palatable levels, with S7 showing the highest efficiency. However, anomalies (e.g., S8's TDS/EC ratio) and lower efficiency at S2 warrant further investigation to ensure consistent water quality. Addressing these issues through targeted testing and system maintenance will enhance the safety and reliability of the drinking water supply. Analyzing drinking water quality is an indispensable process that safeguards public health, ensures environmental sustainability, and supports regulatory compliance. By evaluating physical, chemical, and biological parameters through a combination of laboratory and field techniques, water quality analysis identifies risks and informs corrective actions. Despite challenges like emerging contaminants and resource constraints, ongoing advancements in technology and monitoring strategies continue to enhance our ability to deliver safe drinking water. Through rigorous and consistent analysis, communities can maintain access to clean water, a fundamental pillar of health and well-being.

Acknowledgment
First of all, I would like to express my gratitude to the PG Departmental Environmental Science, Research Center and Department of Geography and Research Center, Padmashree Vikhe Patil College of Arts, Science and Commerce, Pravaranagar, Maharashtra for the facilities provided to me to complete this research. I would also like to thank the Principal and Campus Director of the college.

Financial support and sponsorship
Nil.

Conflicts of interest
The authors declare that there are no conflicts of interest about the publication of this paper

References:

1. Anna F Rusydi., (2017) "Correlation between conductivity and total dissolved solid in various type of water: A review'' Global Colloquium on Geoscience and Engineering, IOP Publishing at IOP Conference series 118.
2. Bhargava. D.S., (1985), Water quality variations and control technology of Yamuna River., Env. Pollution (Series-A) 37, pp355-376.
3. Bruvold W.H and Ongerth H.J., (1969) Taste quality of mineralized water. Journal of the American Water Works Association, 61:170.
4. Daji J. A.,(1985)A Textbook of soil Science,Media Promoters and Publishers Pvt.Ltd, Bombay, 380
5. Deepak Janardhan Gadekaret.,al(2021)The Study of Physico-Chemical Characteristics of Drinking Water: A Case Study of NimgaonJali Village, International Advanced Research Journal in Science, Engineering and Technology, 8(1) Pp 61-66 10. 17 14 8/I A RJ SE T. 202 1.8112
6. Gadekar, D. J. (2020) A Study of Chemical Characteristic of Pravara River, In Different Sites –Ahmednagar District, Maharastra , India, Our Heritage, 68(1)Pp 4977-4988.
7. Gadekar, D. J. (2024). Calculation of Water Quality Index and Physico-Chemical Analysis of Pravara River Water Ahmednagar District (Maharashtra). *ShodhKosh: Journal of Visual and Performing Arts*, *5*(3), 480–490. https://doi.org/10.29121/shodhkosh.v5.i3.2024.2202
8. Gadekar, D. J., Zine, A. S., &Raut, V. R. (2024). Physical and biological characteristics of soil: A perspective study. ShodhKosh: Journal of Visual and Performing Arts, 5(6), 219–228. https://doi.org/10.29121/shodhkosh.v5.i6.2024.219
9. Gulave, M. R., Gadekar, D. J., Medhe, R. S., &Zine, A. S. (2025). Statistical analyses on the seasonal rainfall trend and annual rainfall variability in Baramati Tehsil of Pune District, Maharashtra. Metallurgical and Materials Engineering, 31(1), 794–804. https://doi.org/10.63278/1329
10. Handa, B. K., (1981) Hydrochemistry, Water quality and Water pollution in UP Tech. Report, CGWB, Ministry of irrigation, PP 1-137.
11. Hayashi M., (2004) Temperature-Electrical Conductivity relation of water for Environmental Monitoring and Geophysical data inversion. Environ.Monitoring.,Asse. 96., 119-128.
12. Kulkarni, P. R., (1990) Techonological mission and drinking water quality in india, 22nd annual convention IWWA, PP 28-35.
13. Pal M. Nihar R. Samal, Roy P. K, Roy. M. B., (2015) "Electrical Conductivity of Lake Water as Environmental Monitoring –A Case Study of Rudrasagar Lake" IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) e-ISSN: 2319-2402,p-ISSN:2319-2399.Vol 9,Page No.66-71.
14. Pondhe.G.M, Pawar N.J and Patil. S.F., (1992) Contamination of ground water from sugar mill effluent in Sonai area, Ahemadnagar District, MH, Nat.Symp.onEnv., BARC Bomby,3-5 feb.
15. Raymahashay B. C., (1986) Geochemistry of bicarbonate in river water. Geological Society of India, 27,PP 114-118.
16. Sana Akram and Fazal-ur-Rehman (2018) Hardness in Drinking Water, its Sources, its Effects on Humans and its Household Treatment, Journal of Chemistry and Applications.4(1) PP 4.
17. Sana Akram and Fazal-ur-Rehman (2018) Hardness in Drinking Water, its Sources, its Effects on Humans and its Household Treatment, Journal of Chemistry and Applications.4(1) PP 4.

18. Sonawane V. R. et.,al (2020), "Analysis of Chemical Properties of Soil under Sugarcane Crop: A Case Study of Khandala, Shrirampur, Ahmednagar District, Maharashtra State, India:. Our Heritage Vol. 68, Issue, 30, Pp.6522-6547
19. Sonkar Soniyaet.,al (2021) "Physico-Chemical Characteristics of Ground Water in Rahuri Tahsil of Ahmednagar District, M.S., India". International Journal of Scientific Research in Chemical Sciences 8 (1) Pp4-8.
20. Thorat, A., &Dutta, A. (2022a). Quality of groundwater in RahataTahsil District, Ahmednagar State, India. Journal of Advances and Scholarly Researches in Allied Education, 19(3). ISSN: 2230-7540
21. Thorat, A., &Dutta, A. (2022b). The seasonal characteristics and variability of rainfall in the Ahmednagar District of Maharashtra, India: A statistical analysis. Journal of Advances and Scholarly Researches in Allied Education, 19(5). ISSN: 2230-7540
22. Trivedy R. K and Goel P. K., (1986) Chemical and biological methods for water pollution studies, Environmental publication.,Karad, 251p.
23. Zine, A. S.,et.,al (2024). A case study of the effects of agricultural practices on seasonal variation in groundwater quality. International Research Journal of Modernization in Engineering Technology and Science, 6(7). e-ISSN: 2582-5208
24. Zine, A., et.,al. (2024). Evaluation of groundwater quality throughout the season in the RahataTahsil District, Ahmednagar, Maharashtra, India. International Journal of Research Publication and Reviews, 5(3). ISSN: 2582-7421
25. Zine, A.S, et.,al. (2023). A review on the physico-chemical parameters for testing of water. In Revolutionary Perceptions in Science and Technology (RPST-2023) . ISBN: 978-93-340-7752-0