ANALYSIS AND EVALUATION OF WATER QUALITY CHARACTERISTICS IN A WATER RESOURCE AT TIRUCHIRAPALLI

Abstract

Water is one of the most vital natural resources for all life on Earth. It has always been important to consider the availability and quality of water when selecting not only where people will live but also how joyful those lives will be. The nation's total utilizable water supply, which has been calculated to be approximately 1123 BCM (690 BCM from surface and 433 BCM from ground), represents only 28% of the water derived from precipitation. About 85% (688 BCM) of the water used for consumption is used for irrigation. This might reach 1072 BCM by 2050. Groundwater is a significant irrigation supply. Water use can refer to the quantity of water utilized by a country or a family [1]. Sustainable development and the Millennium Development Goals cannot be attained without water. In order to achieve growth, social and economic development, poverty reduction, and equity, water resources must be managed properly. One of the renewable resources, water is necessary for maintaining all life forms, producing food, fostering economic growth, and ensuring general well-being. It is difficult to substitute for most of its functions and is genuinely a one-of-a-kind gift from nature to humanity. Poor water quality puts industrial areas at danger, harming the environment overall and leading to financial loss. This study focuses on the physico - chemical parameters and heavy metal analysis of the Uyyakondan canal water from ten different stations in and around Tiruchirapalli district, Tamilnadu, India and reports the evaluation of characteristics for its suitability for drinking purpose.

Keywords: Water Resource, Tiruchirapalli, BCM

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I. INTRODUCTION

Water is one of the most manageable natural resources since it can be redirected, moved, stored, and recycled. These traits are what provide water its enormous human benefits. For activities including agriculture, forestry, fisheries, navigation, recreation, and the generation of hydropower and live stock, the nation's groundwater and surface water resources are essential. [2]. Everyone's life depends on water, which is present everywhere and in all forms [3]. In the modern world, urban areas' water quality has been impacted by pollution and climate changes, and several tests are conducted to evaluate the water's quality [4]. Poor water quality puts industrial areas at danger, harming the environment overall and resulting in financial loss [5]. Typhoid, diarrhea, and cholera have contaminated water as their primary causes in India due to rising industrialisation and urbanization [6].

In India, it is estimated that 77 million people are impacted by contaminated water, and this contributes to 21% of diseases [7], according to statistics from the WHO. India frequently has water shortages as a result of low rainfall and the drying up of the main reservoirs that provide water, making water one of the most valuable and scarce natural resources. Standards for water quality parameters have been developed by numerous organizations, including the WHO and BIS, and can be used to effectively assess the quality of water. Traditionally, collecting water samples and sending them to a lab for testing is necessary to determine the quality of the water, which is a time-consuming process [8]. It is simple to acquire the sensor values from a water sample, monitor, and forecast the water quality from the comfort of our homes using IOT and machine learning algorithms. IOT is a booming technology that enables sensors to exchange data among themselves or to the cloud without the need for human interaction [9]. The widespread use of machine learning regression can predict the water quality index, which aids in determining the quality of the water.

The most vital natural resource for maintaining life as we know it on planet is water. It serves as a medium for all life processes. All biological resources, including plant and animal life, depend on water. However, accurate monitoring of a water body's hydrology, physico-chemistry, and biology is the foundation for a thorough assessment [10]. However, the pursuit of technical innovation and the expansion of industrial operations to meet peoples' expanding needs and develop civilization have resulted in unintended harm to our environment. The water quality and a number of ecosystem biological processes are at risk from these damages.

All water masses undergo a continual shift during the hydrological cycle, which is the process by which water on Earth (in the atmosphere, hydrosphere, and crust) changes forms while being affected by gravity and solar radiation. In this planetary process, water is moved from the Earth's surface by evaporation, condensation of water vapor, precipitation (the movement of water masses from water bodies onto the Earth's surface and inside its crust), and precipitation with the aid of air currents. The amount of precipitation that falls on the Earth's surface each year is equal to the amount of water that evaporates from the surface of land masses and oceans.

1. **Water Resource:** Water resources are natural water sources that can be exploited as a source of fresh water. A little more than two thirds of the water on Earth is frozen in glaciers and polar ice caps, making up less than 3% of the total water on the planet, which is 97% salt water. Freshwater that hasn't frozen yet is mostly found below; only a little amount is found above ground or in the air. Natural sources of fresh water include surface water, ground water, frozen water, and river flows. Examples of artificial freshwater sources include desalinated seawater and reclaimed water.

2. **Surface Water:** Surface water bodies are a significant supply of water for people, but they are currently under severe environmental stress because of human activity. Due to pollution and encroachment, the majority of the water bodies have vanished. The type and scale of industrial, agricultural, and other anthropogenic activity in the catchments have a significant impact on a region's surface water quality [11].

3. **Groundwater and Surface:** water interactions are essential to the functioning of riparian habitats. Understanding and measuring groundwater and surface water exchange mechanisms is crucial for managing rivers sustainably. Several well-known approaches are available for parameter estimation and process identification in aquifers and surface waters. Recent substantial scientific research on the transition zone has called for the creation of pertinent approaches that can be used in this region. The approaches for calculating fluxes at the groundwater-surface water interface that are currently being used and discussed in the literature are outlined in this article. Scales of space and time, uncertainties, and application-specific restrictions are all factors that should be taken into account while selecting the best approaches. Estimates of fluxes between groundwater and surface water may be significantly constrained by a multi-scale approach integrating different monitoring methods [12]. Total evaporation from the ocean's surface and the continents is 577,000 km3 per year (earth's atmosphere has a mean thickness of 1.13 m).It uses an average of 88W/m3 of heat, which is more than a third of the earth's solar energy output. The entire 577,000 km3 of water falls on the Earth every year thanks to the way the water circulates on the planet. One important characteristic of water circulation is meridianal water vapor transfer. The most unpredictable element of the atmosphere is water vapor (H2O). Depending on the time of year and the location, its volumetric content might vary by a factor of 100,000.

   The highest water values are found in subtropical and equatorial regions, where they typically surpass 3-4%, while the lowest water values are either found above the Antarctic plateau or at a substantial height in the atmosphere. The amount of water vapor in a specific air volume (the percentage of the total atmospheric pressure produced by water vapor) is determined using a hypothetical water vapor pressure (partial pressure). This is the ratio of water vapor mass to humid air mass. Absolute humidity is defined as the ratio of water vapor mass to humid air volume [13]. The main source of water in the atmosphere is evaporation from land and ocean surfaces.

4. **Oceans, Inland Seas, Coastal Zones, and Estuaries:** Based on their location and level of isolation, the seas are categorized as interior (inland) or inter-insular. An inland sea is one that is almost entirely enclosed by land and connects to the ocean or other nearby seas only through comparatively small waterways. It is considered that interior waters are separated into intercontinental and continental varieties.

The World Ocean, the greatest depressed geomorphologic feature on Earth, is a body of water with a continuous water surface. It is composed primarily of common salt and envelops the continents and islands. The World Ocean covers 361.26 million km2 in total, or roughly 70.8% of the Earth's surface (61% in the northern and 81% in the southern hemispheres). The Mariana Trench in the Pacific Ocean has a maximum depth of 11 022 m and an average depth of 3711 m. There are roughly 1340.7 million km3 in all.

Landlocked seas with only a few confined passages connecting them to the ocean are known as inland seas. They typically have a lot of islands, straits, channels, noises, and sounds. The Seto Inland Sea, which lies between Japan's three largest islands and is connected to the Pacific Ocean by a few slender waterways, was the first inland sea to be officially recognized. It is one of the biggest inland seas in the world, with a marine surface area of 17,000 km2, 400 islands, 7,500 km of coastline, and water depths of up to 650 m along the coastal areas.

The coastal zone is a dynamic area since it is where the land, ocean, and atmosphere all interact. Before the satellite remote sensing era began in the 1970s, India's extensive coastline was not properly monitored. India has a highly strong remote sensing program, and during the past 40 years, changes in coastal ecosystems, landforms, shorelines, and other factors have been noted using the Indian Remote Sensing Satellite (IRS) family of satellites. The classification and geometric accuracy of items, as well as the classification scheme for coastal ecosystems, were standardized. Mangrove communities and coral reef characteristics were given in-depth information. Using satellite data, the high and low tide lines were precisely drawn over the whole coastline. The coastline data base for the entire nation was established once all these data were grouped in a GIS. On coastal ecosystems, the effects of numerous threats, including cyclones, tsunamis, and sea level fluctuations, were reported. Using elevation data acquired from satellite data, coastal multi-hazard vulnerability maps for the coastline of India were created based on topography, shoreline changes, and tides. The data on sea surface temperature and ocean color were used to create prospective fishery advisories, which are sent out to fishermen every day. It is possible to forecast the coastal zone and take appropriate action.

To pinpoint coastal control zones, marine protected areas, sensitive zones, etc., the coastal database was efficiently used. For the benefit of society, a number of services were developed for the tsunami, fishing, and coral reef bleaching. In order to foresee impending threats and likely changes in the coastal zone and take appropriate action, models for the coastal zone are planned.

An estuary is a body of water that is created when freshwater from the land mixes with saltwater from the ocean and is partially confined. Estuaries are unusual habitats, and plants and animals have developed specifically to exist there. Estuaries are protected from the impacts of the ocean by reefs, barrier islands, headlands, and deltas. They help move and trap nutrients and sediment in conjunction with freshwater flow, wind, waves, and tidal movement.

Over the past 15,000 years, sea level has slowly increased while being steady for the previous 6,000 years. River valleys and glacier troughs were flooded as the sea rose. Estuaries are excellent sediment traps once they have formed, collecting silt from both the sea and the land. Mud and clay from the land are carried by rivers as sediment, but clean sand from the sea is typically driven into the estuary by waves and tidal currents. Additionally, silt can be produced by shells, wind-blown sediment, and coastline erosion [14].

5. **River, reservoirs, lakes and wetland:** One of the most significant continental geomorphic systems that have supported civilizations for more than 5000 years is comprised of large river systems. Typically, large rivers meet one or more of the following criteria: drainage area (A) = 800000 km2, river length (Lr) = 2500 km, average discharge (Q) = 7500 m3/s, and suspended and dissolved load (SDL) = 100 mt/yr. There are various ways to approach the topic of huge rivers. From a modern standpoint, the hydrology, sediment transport, and network structure of large rivers are highlighted. This perspective also considers the process-based understanding of rivers and river management in the context of future human civilizational sustenance. It has been noticed that methods like sedimentary basin analysis and long-term alluvial architectural evolution can be used to reconstruct old enormous river systems from a geological or stratigraphic perspective. Large, long-lived deltas that have been important in both deep and shallow waters can be found in the majority of large rivers. The majority of large rivers and their valleys have alluvial stratigraphic records that have been preserved, allowing scientists to understand how huge rivers developed over numerous time scales, including centuries, millennia, tens of thousands of years, millions, and tens of millions of years.

A river is a body of water that flows through a naturally formed bed that is supplemented by surface and groundwater. Together with all of its tributaries, it creates a river system whose character and growth are influenced by the climate, relief, geologic structure, and basin size.Rivers can be further classified between plain rivers, which flow more slowly in broad valleys with terracing, and mountain rivers, which typically flow quickly in small valleys. The type of river augmentation and the local climate are the key determinants of the water regime. About 47,000 km3 of river runoff enters the world's ocean each year. A lake is a naturally occurring water storage area with a lake basin that is not immediately connected to the ocean. Basins are divided into tectonic, glacial, fluvial, coastal, sinkhole (in karsts and thermokarsts), volcanic, and dammed basins based on their origin.

Less than 0.4 percent of all continental fresh water, or 0.009 percent of all free water, is contained in freshwater lakes, which make up very little of the total amount of freshwater that is added to the world hydrologic cycle. Inland seas and salty lakes contain an additional 0.0075 percent of the total amount of free water. However, freshwater lakes contain much more than 98 percent of the accessible substantial surface waters. The majority of other continental waters, aside from the water in salt-water bodies, are trapped in glaciers and ice sheets, while the remaining percentage is in groundwater. Despite the fact that there are lakes all over the world, more than 70% of the lake water is found only on three continents: North America, Africa, and Asia. Although studies of their volume and other characteristics have only lately been undertaken, the Antarctic ice sheets also include lakes. One-fourth of the world's lakes are small, and they are spread out all over the place.

The world's largest lakes produce abundant harvests for commercial fisheries and other food-related sectors. However, due to pollution in many lakes, the quality of the fish catch has continuously declined, with the more desirable species becoming less common and the less desirable species gradually taking over the total.

Faulting has been crucial in the creation of basins in other parts of the planet as well. The two deepest lakes in the world, Lake Baikal and Lake Tanganyika, are located in basins created by complexes of grabens (down dropped faulted blocks). These lakes, along with other graben lakes, especially those located within the East African Rift System, which runs through the East African lake system and encompasses the Red Sea, are some of the oldest modern lakes. Three different types of lakes can be identified based on the characteristics of the lake bed:

- Fluvial, valley, and coastal dammed lakes (including reservoirs)
- Moraine, karst, thermokarst, deflation, volcanic, tectonic: hollow lakes.
- lakes with a mixed heritage.

In India, there are several wetlands, which sustain a wide range of exotic habitats. These wetlands provide a range of ecological goods and services but are also under a great deal of stress as evidenced by the decline in their geographic extent and the hydrological, economic, and ecological functions they perform as a result of rapid urbanization, industrialization, and agricultural intensification. Wetlands are among the planet's most productive ecosystems and offer a variety of crucial functions to the modern world. They are, nonetheless, ecologically sensitive and adaptable systems (Turner et al., 2000). Wetlands are incredibly diverse in terms of their origins, location, water chemistry and regime, dominating species, and soil and sediment features. Wetland habitats cover an area that varies from 917 million hectares (m ha) to more than 1275 m ha worldwide.

There are many different water spread areas in wetlands. Inland Wetlands typically have a wide variety of water dispersal places. In post monsoon and pre monsoon conditions, coastal wetlands have water spread areas of 1.2 and 1 million hectares, respectively, whereas interior wetlands have 7.4 and 4.8 million hectares, respectively. From post-monsoon until the height of summer, the water spread area significantly declines across all categories of wetlands, illuminating the gains and losses wetlands endure. This has a big impact on the amount of water available to these wetlands overall and the range of activities they may perform all year long. In all wetlands, the percentage decrease in water spread area is greatest in land wetlands (35%) and least in coastal wetlands (16%). Reduction is notably larger in man-made varieties of inland wetlands (49.5%) than in natural types (24%), which are under pressure to meet diverse irrigational and non-irrigational purposes and are also vulnerable to higher evaporation losses. The average water spread area of man-made coastal wetlands is the greatest of all wetland types.

6. **Ground Water:** Water in the sedimentary rock layers and massively crystalline rock features of the Earth's crust is referred to by this word in all of its physical phases. In India, ground water is the most desired source of water for many different consumer sectors because to its nearly universal availability, dependability, and minimal initial investment. The country's growing reliance on ground water as a dependable source of water has led to indiscriminate extraction in different regions without proper consideration for the aquifers' ability to recharge and other environmental issues. On the other hand, some regions of the nation experience subpar ground water development despite the availability of adequate resources, while canal command areas experience issues with water logging and soil salinity as a result of the gradually rising ground water levels. According to the most recent estimate, the nation's annual replenishable ground water resource is anticipated to be 433 billion cubic meters (bcm), of which 399 bcm is thought to be suitable for development for a variety of uses.

   This industry continues to dominate ground water demand, using 92% of its annual outflow for irrigation. The development of the nation's ground water is highly uneven and varies drastically from region to region. Despite the fact that the overall stage of ground water development is around 58%, the average level of ground water development in the North Western Plain States is significantly higher (98%) than the Eastern Plain States (43%) and Central Plain States (42%). Managing groundwater supplies is a highly challenging problem in the Indian context. Due to the distribution's severe inequality and utilization, it is hard to establish a single management approach for the entire nation.

   Groundwater has emerged as the primary democratic water source and tool for eradicating poverty in India's rural areas. Due to its nearly universal availability, dependability, and low capital cost, it is the most chosen source of water in India to meet the needs of various user sectors. India's economy has expanded tremendously, and the socioeconomic development of the nation has been significantly influenced by ground water. The importance of this uncommon natural resource in the Indian context may be shown by the fact that more than 85% of India's residential water demands in rural areas, 50% of those in urban areas, and more than 50% of those for irrigation all originate from ground water resources. Due to the country's increasing reliance on ground water as a reliable source of water, ground water has been produced widely and frequently without taking into account aquifer recharge capacity or other environmental factors.

   There are several different chemical components that make up groundwater, including isotopes, neutral molecules, colloids, organic-mineral complexes, and numerous ion types. A collection of hydrogeological, physical-geographical, soil-vegetation, climate-related, etc., factors.

7. **Glaciers, icebergs, and ground ice:** The most prevalent solid on Earth is ice. It is capable of existing in a wide variety of pressures and temperatures. A total of 2423 x 1022 tons of ice are found in glaciers, icebergs, ground ice, snow cover, and the atmosphere. The Greenland and Antarctic ice sheets contain more than 96.6% of the world's ice surface and 90% of its volume as a result of climate change. There are few lone ice domes outside the ice sheet area. A large portion of the Antarctic continent is surrounded by vast slabs of floating ice known as ice shelves. The ice sheet that feeds the

ice shelf is taken into account. Icebergs come in a variety of shapes, including tabular, pyramidal, domelike, and destroyed.

There are 28 different varieties of fresh ice, which can be categorized into three groups: ground ice (also known as sedimentation ice), metamorphic (glacier), and congelation ice (all ice found in freshwater reservoirs and streams). The origins of floating ice can be classified as sea, river, lake, and land.

All varieties of ice that form in freezing and frozen ground are together referred to as ground ice. Excessive ice-containing sediments are frequently referred to as "ice rich" or "icy" sediments. This classification includes buried ice from glaciers, the sea, lakes, and rivers, leading to 10 mutually incompatible ground ice formations. When ground ice is generally pure and has an average ice content of at least 250% over a thickness of several meters, it is referred to as huge ice or massive ice bodies.A soil with a significant ice content is referred to as segregated ice [15].

More over 16.3 x 106 km2, or 11% of the Earth's surface, is covered in ice. Modern glaciers contain between 26.8 and 30.3 x 106 km3 of ice overall. If the Earth were completely covered by this ice sheet, it would be around 55–60 meters thick. Ice does not, however, exist everywhere on Earth. Due to the local environment, the Greenland and Antarctic ice sheets contain more than 96.6% of the world's ice surface and 90% of its volume.

- Summit glaciers (caldera glaciers, flat summit glaciers, and summit glaciers).
- Slope glaciers, including hanging glaciers, glaciers in corries, and glaciers in corrie-valleys.
- Valley glaciers, including expanded-foot or bulb glaciers, valley glaciers, dendritic glaciers, piedmont glaciers, and basin glaciers.
- Glaciers on plateaus, glaciers in difficult terrain, glaciers that have receded, and others.

Mountain glaciers provide a significant percentage of the irrigation water for many of the Earth's arid regions. Where there is a snow line, glaciers form in an otherwise dry area. More solid precipitation is forming above the snow line than is being lost to melting, evaporation, or runoff. The snow line level can range from sea level on the Antarctic Plateau to 6000–6500 m above sea level on the Tibetan Plateau, depending on the moisture and heat balance, regional climatic conditions, and location.

8. **Soil water:** Typically, the term "soil water" refers to liquid moisture that is concentrated in the pore space of the soil, or the top layer of the earth. Plants and soil-dwelling organisms both rely on soils to transport water for survival. Nutrients from the soil enter the roots of plants as they take in water. Water enters the soil through large holes (macrospores), where it is trapped in countless microscopic pores (micro pores). In porous soils, the ratio of large to small pores is balanced.

The volumetric or gravimetric water content of the soil is a measure of how much water is stored in the soil at any particular time. The most helpful way to represent water content for creating a water budget, which is covered in the next section, is volumetric water content, which is the amount of water per unit volume of dry soil. The mass of water per unit mass of dry soil is known as the gravimetric water content. The gravimetric water content (in cm3 per gram) multiplied by the bulk density (in grams per cm3) of the soil yields the volumetric water content (percent, unit less).

Water seeps into and passes through soil in a way described by infiltration and permeability. The word "water content" refers to the amount of water a soil contains. Both gravimetric (g water/g soil) and volumetric (ml water/ml soil) methods can be used to measure water content. The most common way to express water content is volumetrically. We can quickly calculate the weight of water and instantly know its volume because 1 gram of water is equal to 1 milliliter of water. The discussion that follows will look at water content on a volumetric level.

The soil is deemed saturated when every soil pore is filled with water. The percentage of porosity is equal to the saturation water content of the soil. The amount of water in the soil after it has been saturated and given time to drain adequately for 24 to 48 hours is known as the field capacity. Free drainage occurs as a result of the water being pulled downward by gravity. We can be certain that a force other than gravity is keeping the remaining water in the soil when water stops draining. The soil's water content reaches its perpetual wilting point when plants have absorbed all the water they can. A plant will wilt to the point of permanent wilting and not recover. Unavailable water is that portion of the soil's water content that is tightly bound to aggregates and soil particles and cannot be accessed by plants. As films covering soil particles, this water is retained. These expressions represent soil in its wettest and driest states.

There are several other names for the water that is included between these different water contents. Gravitational water is the amount of water that the soil can store between saturation and field capacity. The term "water holding capacity" describes how much water can be kept in the soil against gravity or how much water can be held in the soil overall at field capacity. Plant available water, also known as available water capacity, is the amount of water maintained between the field capacity and wilting point. This is the proportion of the water storage capacity that the plant can take up. The total quantity of water contained in a specific soil volume at a specific moment is the volumetric water content measured. All water that might be present is included, including gravitational, accessible, and inaccessible water.

Using a sponge makes it simple to show how these various physical states of soil's water relate to one another.Because it has solid and porous space, a sponge is exactly like soil. Obtain a sponge that measures about 6 x 3 x 1/2 inch. Put it in a dishpan with water and let it soak up all the water it can. The sponge is saturated at this point. The sponge should now be cautiously lifted out of the water while being supported by both hands. When the sponge reaches field capacity and stops draining, gravity water has freely drained out. Squeeze the sponge once more until no more water is released. The water that was squeezed out of the sponge represents its water holding capacity, and the sponge is now permanently wilting. This water's availability to plants can be attributed to around half of it. You could note that the sponge still has water in it. This water is the unavailability.

The soil surface is penetrated by water from irrigation or precipitation. Before water can start to travel downward, all of the pores at the soil's surface are filled with water. Water infiltrates into the unsaturated zone by descending from the saturated zone. The wetness front is the boundary between these two areas. Gravitational water will continue to percolate after rain or irrigation stops until the field's capacity is achieved. Between soil particles and aggregates, there are huge pores that allow water to seep through before entering the smaller pores.

The forces that hold available water in soil pores depend on the size of the pore and the surface tension of the water. The smaller the pores and the stronger the tension keeping water in the soil, the closer together soil particles or aggregates are. Large pores hold water with less resistance, which makes it more easily drainable. Similarly, because it requires less energy to draw water from larger pores than from smaller holes, plants first absorb water from the larger pores in the soil.

There is no practical interpretation possible when using % volume-based estimates of soil water. As a result, water is typically expressed as inches of water per foot of soil rather than as a percentage of volume.

II. BASIC TYPES OF WATER

1. **Tap Water:** Tap water is what we get right out of the faucet. Pipelines are typically used to transport tap water to our homes from a dam or river. For home tasks like cleaning, gardening, cooking, and washing clothing, tap water is perfect. However, tap water must adhere to the criteria established by the regional municipal organizations. In particular, if the pipelines are old and have leaks, tap water might never be safe to drink.

2. **Spring Water:** Natural springs generated from an underground source are where spring water is found. Spring water is unique since it comes straight from the source and is not recycled. Despite not coming from the ordinary communal water supply, natural spring water is safe to drink because it is underground.

3. **Mineral Water:** These necessary minerals are present in this type of water naturally. The minerals calcium, magnesium, and manganese are particularly abundant in mineral water since it is derived from subsurface sources. The water cannot have any more minerals added to it, nor can it undergo any further processing. Mineral water can, however, go through a few limited processes, like carbonation or iron removal before packing.

4. **Well Water:** In contrast to rural areas, where wells are the primary source of water supply, well water is not extremely frequent in urban areas. When it rains, water trickles down and seeps into the soil's crevices. Well water is distinguished by its direct access to the water source and availability on the surface through a drilled well. Since well water can potentially be contaminated, it must first go through a purification process before being used.

5. **Hard Water:** In India, the majority of dwellings have hard water. One oxygen atom and two hydrogen atoms are the only elements in plain water. But when water is delivered to our house, it passes through limestone and picks up undesirable minerals, hardening the

water. The water is made harder by an excessive amount of calcium and magnesium. In some regions, hard water can occasionally contain iron, aluminum, and manganese. Numerous issues, including dry skin, dull hair, and corrosion of plumbing fixtures, are caused by hard water.

6. **Alkaline Water:** To stay healthy, you must drink water that has the proper pH level. Our health is impacted when we drink water that is overly acidic. Alkaline water has a lower pH than regular water, alkaline minerals, and a low oxidative reduction potential (ORP). The proper pH level in water might assist us in balancing the body's excessive acidity. The aging process is slowed down and even prevented by drinking water with the proper pH level.

7. **Distilled Water:** Demineralized water, also known as distillate, is water that has undergone a process that involves distillation to eliminate all of its minerals and salt. Even though it is the purest water imaginable, drinking it is typically not recommended. It may lead to mineral shortages because it is devoid of all salts and the majority of the naturally occurring minerals in the water have been taken out as a result of this process. This water can cause a rapid loss of sodium, potassium, chloride, and magnesium when consumed.

8. **Ground Water:** The water beneath the surface of the earth that fills fissures and other gaps in rock and sand beds is known as groundwater, and it accounts for around 22% of the water we consume. It is found in sands and soils have the capacity to hold water. The distinction between saturated and unsaturated soil is marked by the water table. Water-filled rocks and soil can be found below the water table. According to a 2008 survey, nearly 13 million occupied households in the United States have their own well, making private household wells the largest source of well water overall.

9. **Rain Water:** Condensed from the clouds, this is. Rainwater can be used for both indoor and outdoor gardens because it is naturally suited for hydrating plants. Rainwater can be collected in watering cans and used to manually irrigate plants. Any rainwater collection system can be simply connected to an automatic irrigation system.

10. **Snow Water:** Rain that has frozen. No bacteria are eliminated by freezing. Mineral deposits that have hardened on every snowflake. Even the purest snow can get saturated with dirt, inorganic minerals, bacteria, and viruses when it melts.

III. WATER POLLUTION

Extreme droughts that the planet keeps sending our way serve as a gentle reminder that water is essential to life. It is a vital resource on which all life depends and is critical for all social and economic development, energy generation, and climate change adaptation. However, we are currently up against a tremendous obstacle. At the entrance to the Himalayas, in the Indian city of Rishikesh, the Ganges River flows crystal-clear and clean. Nobody in these mountains would have predicted that this water would become one of the most polluted rivers in the world, with fecal bacteria concentrations as high as 31 million per 100 milliliters. This is the case, according to reports from the Sankat Mochan Foundation, an organization aiming to restore the Ganges to its former splendor. These numbers show that water contamination, which the UN estimates affects one in three people worldwide, has been linked to the sacred river.

According to the World Health Organization (WHO), polluted water is defined as water whose composition has been altered to the point where it cannot be used. To put it another way, it is contaminated water that cannot be utilized for critical tasks like agriculture or for drinking. It also causes illnesses like diarrhea, cholera, dysentery, typhoid, and poliomyelitis, which claim the lives of more than 500,000 people annually throughout the world.

Bacteria, viruses, parasites, pesticides, medicines, plastics, excrement, nitrates, phosphates, and even radioactive elements are the main sources of water contamination. Since they don't usually change the color of the water, these substances are frequently unseen contaminants. To determine the water quality, small samples of water and aquatic life are tested.

IV. CAUSES OF WATER POLLUTION

Occasionally, it can be caused by nature, such as when mercury contaminates reservoirs, rivers, lakes, canals, and oceans after escaping from the Earth's crust. Nevertheless, the most frequent causes of water of poor quality are human activity and its impacts, which include the following list:Global warming: As a result of increased water heating brought on by CO2 emissions, less oxygen is present in the water.

1. **Deforestation:** Cutting down trees can reduce water supply and result in organic waste that can harbor harmful germs.

2. **Industry, Agriculture, and Livestock Farming:** The chemical runoff from these sectors is one of the major causes of water eutrophication.

3. **Dumping of Garbage and Feces:** The UN estimates that more than 80% of all sewage produced worldwide enters rivers and seas untreated.

4. **Maritime Traffic:** The majority of the plastic pollution in the ocean is caused by fishing boats, tankers, and cargo ships.

5. **Fuel Spills:** During storage and transportation, oil and its derivatives are prone to leaks that damage our water supplies.

6. **Ground Water Pollution:** Ground water contamination is almost often the result of human activity. In areas with a high population density and substantial human use of the land, ground water is particularly at risk. Ground water contamination could happen from almost any action that could cause the intentional or unintentional release of chemicals or pollutants into the environment. Groundwater contamination is difficult and expensive to clean up.

   Pollutants and groundwater can swiftly move through rock fractures. Finding and managing contaminants is a unique problem due to the fact that the fissures in fractured rock are often randomly distributed and do not follow the contours of the land surface or the hydraulic gradient. Contaminants can enter the ground water system through animal burrows, abandoned wells, macropore root systems, and other networks of holes and fractures.

The zone of contribution, a larger land area than the initial recharge area, contributes water to the well and the neighboring aquifer, raising the risk of contamination in the vicinity of pumping wells. Some drinking water wells really draw their water from nearby lakes, rivers, and streams. Contaminants in these surface waterways have the potential to pollute groundwater supplies. Some wells rely on artificial recharge to increase the amount of water that soaks into an aquifer, usually using water from agriculture, industrial processes, storm runoff, or treated sewage. This method has frequently resulted in increased concentrations of metals, bacteria, synthetic chemicals, or nitrates in the water.

V. MAJOR WATER POLLUTANTS

1. **Improper Disposal of Hazardous Waste:** A licensed hazardous waste handler or a municipal hazardous waste collection system should always be used to safely dispose of hazardous material. Numerous chemicals should not be deposited in household septic systems, including oils (such as cooking or motor), chemicals for the lawn and garden, paints and paint thinners, disinfectants, pharmaceuticals, chemicals for photography, and chemicals for swimming pools. Similarly, as they can contaminate a source of drinking water, many compounds used in industrial processes shouldn't be dumped in workplace drains. All chemicals used on the job site should be handled and disposed of safely, according to employers. Due to the extensive and heavy use of chemicals in industrial settings, proper waste disposal is especially important for safeguarding ground water.

   Use a municipal hazardous waste collection system or a licensed hazardous waste handler wherever possible to properly dispose of dangerous products. Oils (such as cooking or motor), chemicals for the lawn and garden, paints and paint thinners, disinfectants, medications, chemicals for photography, and chemicals for swimming pools are just a few of the chemicals that shouldn't be dumped in domestic septic systems. Similar to this, many substances used in industrial operations shouldn't be deposited in workplace drains because they can contaminate a supply of drinking water. Employers recommend that all chemicals used on the job site be handled and disposed of safely. Proper waste disposal is especially crucial for ground water conservation at commercial and industrial facilities because they produce a wide variety of trash and generate significant amounts of it.

2. **Releases and Spills from Stored Chemicals and Petroleum Products:** Petroleum fuels and other chemicals are frequently stored in above- and below-ground storage tanks. For instance, many houses have subterranean tanks for heating oil. In-house tanks are used to store gasoline, diesel fuel, fuel oil, or chemicals by several companies and municipal highway departments. Industries utilize storage tanks to house hazardous wastes until they can be picked up by a licensed transporter or to contain chemicals required in industrial processes. There are 4 million underground storage tanks in the United States, and many of them have had their contents leak or spill into the environment throughout

time. If the tank develops a leak, which usually occurs when the tank ages and corrodes, the contents of an underground storage tank may move through the earth and reach the groundwater.

3. **Landfills:** In thousands of municipal and commercial landfills across the nation, solid waste is disposed of. Municipal landfills occasionally get chemicals that should be disposed of at hazardous waste landfills. In addition, many domestic garbage disposal practices are unregulated.

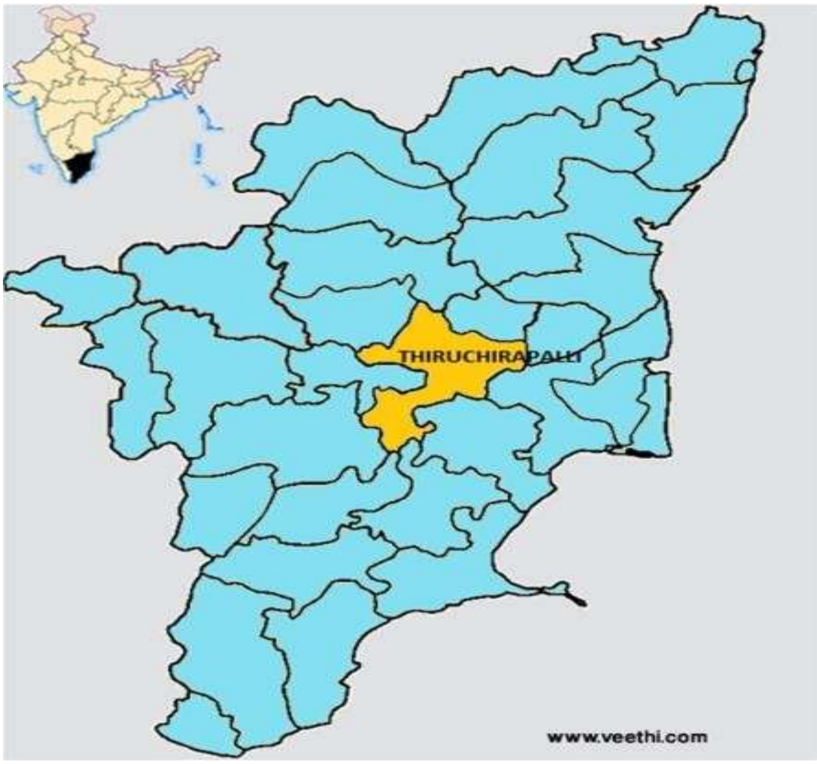
   As a result, through precipitation and surface runoff, pollutants may contaminate groundwater. New landfills must contain leachate (liquid from polluted trash) collecting systems and clay or synthetic liners in order to protect ground water. However, older landfills do not have these safeguards. Older landfills were typically situated above aquifers, adjacent to surface waters, and in permeable soils with shallow water tables, which raised the risk of leachate contaminating ground water. Closed landfills can still pose a concern for ground water contamination if they are not covered with an impermeable material (like clay) before closure to halt the leaching of toxins by precipitation.

4. **Improperly Abandoned Wells:** These wells may act as a conduit for contaminants to enter an aquifer if the well casing has been removed, as is routinely done, or if the casing is broken. In addition, some people dump waste in defunct wells, including used motor oil. These wells may plunge into an aquifer that supplies adjacent wells with drinking water. A channel for contaminants may exist in test hole wells or abandoned exploration wells (such as those for gas, oil, or coal), which are frequently left exposed.

5. **Water pollution-Control measures:** pH Control The cleaning method used can have a big impact on how acidic the waste waters are. Since the effective coagulation will only operate under specific pH conditions, the pH of the effluent must also be changed first. Use NaOH, Na_2CO_3, $CaCO_3$, or $Ca(OH)_2$ for acidic wastes (low pH). H_2SO_4 and HCl are utilized for alkali wastes (high pH).

   Coagulation By adding a chemical or natural coagulant, tiny particles that are scattered in a liquid form can be gathered into larger aggregates or turn into flocs. The dissolved organic substance will be absorbed by these particles (flocs). The size distribution of floc aggregates is a crucial design and control factor during coagulation and flocculation. In solid-liquid separation processes like sedimentation, aggregate shape, density, and aggregate size distribution all play major roles. Turbidity and dissolved chemical species in liquids are both decreased by the entire procedure. Due to its effectiveness, simplicity, and ability to be accomplished using both chemical and electrical methods, coagulation is one of the most often employed physicochemical processes in the treatment of water and wastewater. Coagulation lessens the turbidity of the wastewater by removing the organic matter, colloidal materials, suspended/dissolved (particularly non-settleable solids and color), and suspended/dissolved substances.

VI. STUDY AREA



Tiruchirappalli, the fourth-largest city in Tamil Nadu, is located on the banks of the Cauvery River. It was an early Cholas stronghold that was eventually conquered by the Pallavas. Built around the Rock Fort, Trichy is an excellent fusion of heritage and modernity. There are other temples that date back to the 1760s in addition to the Fort. The Nayaks of Madurai constructed the town and fort that are currently in Trichy. Great leaders and academics with major social achievements have come from this district.

From 300 B.C. forward, Woraiyur, a portion of modern-day Tiruchirappalli, served as the Cholas' capital city. Ancient writings and archaeological data also corroborate this. Additionally, literary sources claim that Woraiyur remained governed by the Cholas throughout the Kalabhra interregnum (A.D. 300–575).

The district of Tiruchirappalli is practically exactly in the middle of Tamil Nadu. A total of 4,404 square kilometers make up the district. Perambalur district, Namakkal district, Ariyalur district, Thanjavur district, Pudukkottai district, Sivagangai district, Madurai district, Dindigul district, and Karur district form its northern, northwest, southeast, southwest, and eastern borders, respectively. The district has the most border sharing of any district in the state with ten other districts. The district's main source of irrigation and drinking water is the Kaveri river, which runs the entire length of the district. Nearly in the middle of Tamil Nadu's state territory sits the Trichy district. The area is bounded by latitudes of 10° 48' 18o in the north and longitudes of 78° 41' 8.16o in the east.

The elevation of the region is given as 88 meters, roughly representing the statistical average. The history of the region, as shown by its topography, is essentially represented by a surface without slope or tilt, in which no portion is higher or lower than another.

Salem, Perambalur, Thanjavur, Pudukkottai, Sivaganga, Madurai, Dindigul, Karur, and Namakkal are the districts that border Trichy's 146.7 square kilometer territory on the north, northeast, east, southeast, southwest, and northwest, respectively.

People in Trichy can escape the sweltering weather during the months of August through October, when the region has a moderate climate followed by significant rainfall. The local community typically becomes excited during the chilly and lovely November to February period because of the weather. Mist and fog are extremely uncommon in this area. But if you're lucky, you might get to appreciate them in the winter. In the Trichy district, the North-East monsoon season lasts from November to December. Rainfall in the district is sporadic throughout this time. Every year, the district receives 722.6 mm of precipitation. The temperature ranges from 37.2oC at its highest point to 20.6oC at its lowest.

Tiruchirappalli has a tropical savanna climate (Köppen classification: As) with a dry summer and no seasonal variation in temperature. The climate is characterized by high temperatures and little humidity. With an average annual temperature of 28.9 °C (84.0 °F) and monthly average temperatures ranging from 25 °C (77 °F) to 32 °C (90 °F), the city is the warmest in the state.[105] During the warmer months of April through June, the city frequently experiences dust storms. In Tiruchirappalli, the lowest temperature ever recorded was 13.9 °C (57.0 °F) on February 6, 1884, while the highest temperature ever recorded was 43.9 °C (111.0 °F) on May 2, 1896. The Kollidam and Kaveri rivers, as well as the absence of any vegetation in the region, have been held responsible for the city's high temperatures. Tiruchirappalli is on the Deccan Plateau, hence the climate there is hot and dry most of the time. The cold breezes that blow from the southeast make the evenings cooler. From June through September, the city experiences a mild temperature; however this is tempered by violent thunderstorms and downpours. The north-east monsoon winds cause the climate to be cold and damp from December to February, while rainfall is at its greatest between October and December. The local average is 841.9 mm (33.15 in), compared to the state average of 945 mm (37.2 in) for annual precipitation. Only in the winter can dew and fog typically occur.

VII. MATERIALS AND METHODS

1. **Sample Collection:** The samples were collected in 1-liter plastic bottles that had been well cleaned, then filled with distilled water, and brought to the sampling site. To gather water, the bottles were repeatedly washed and emptied. Additionally, the sample vials were aggressively shaken after being partially filled with the collected water to detect any smells. After collection, the sample bottles were immediately tightly covered, and the temperature was recorded. In order to lower the rates of bacterial and chemical reactions, they were then placed in a refrigerator at 4°C. Standard methods were used to analyze every parameter.

2. **Quantity of Sample:** Typically, 2.5 liters of samples are enough for the majority of physical and chemical analyses. However, larger samples were acquired for a few unique determinations.

3. **Sample Container:** Plastic 2.5 L cans were used to collect the samples. The cans were properly cleaned before use by cleaning them with tap water, 1% nitric acid, and then distilled water. The bottles were then labeled, chilled, and dried. Well-sterilized BOD vials were used to estimate DO, BOD, and COD. The analysis followed the same procedure.

4. **Time Interval between Collection and Analysis:** In general, the results will be more accurate the faster the data is collected and analyzed. There is no predetermined window of time between collection and analysis. This is dependent on the sample's nature, the components to be identified, and the storage circumstances. The samples were maintained at a low temperature (4°C) and out of the light to prevent microbial growth. The samples were fixed on the field itself for the DO analysis. Heavy metals and physico-chemical parameters were measured in a lab.

5. **Preservation of Samples:** The samples used to estimate COD and heavy metals had preservatives added to them.

   The preservatives/conditions are:
   - COD: Con. H_2SO_4
   - Heavy Metals: Con. HCl
   - BOD estimation: the samples were stored at 4°C for 24 hrs.

VIII. METHODOLOGY

1. **pH:** The concentration of H+ ions in a solution is expressed as the negative log10 of pH. Utilizing different indicators or paper strips, it can be measured using colorimetric techniques. The employment of colorimetric techniques, however, is less practical and less precise. Hydrogen ion sensitive electrodes are used in electrometric procedures to detect pH accurately.

   There are many different models of pH meters. Additionally, battery-operated portable pH meters are available for purchase. Depending on the manufacturer, the pH accuracy can range from 0.01 to 0.1. While other pH meters might combine glass and reference electrodes, some pH meters include an indicator electrode made of glass and a reference electrode made of calomel. To eliminate inconsistencies brought on by shifting temperatures, the majority of pH meters also have a temperature correction function.

   Prior to use, all pH meters (Elico-Model CM-180) must be calibrated using the appropriate buffers. Additionally, pH-value buffers are offered for sale. Calibrate the pH meter with a buffer whose value is near to the anticipated pH of the sample.

2. The steps that follow can be used to create buffers in the lab with various pH values:

- **Potassium hydrogen phthalate buffer:** To make 1000 ml of potassium hydrogen phthalate buffer, 10.2 g of potassium hydrogen phthalate was dissolved in water.

- **Phosphate buffer:** 3.40 g of KH2PO4 and 4.45 g of NaHPO4.2H2O were dissolved in 1000 ml of water for the preparation of phosphate buffer.

- Borax buffer: 1000 ml of borax buffer was prepared by dissolving 3.81 g of Na2B4O7.10H2O crystals with water.

3. Electrical Conductivity: The ability of a substance to carry an electric current in water is known as electrical conductance. Using a digital conductivity meter, electrical conductivity was measured. (Elico-Model CM-180).

4. Total Dissolved Solids (TDS): The residue left over after the filtered sample evaporated was used to calculate the total dissolved solids.

- The samples were placed in an evaporating dish, fired in a muffle furnace for about an hour at 550°C to 500°C, then dried and weighed.
- Glass fiber filter paper was used to filter the sample.This filtered sample was evaporated in the pre-weighed evaporating dish at a temperature not exceeding 98°C for 100 ml (or more if the solids are less than 25 mg/L).
- The final weight was calculated after the residue had simmered for an hour at 103-105°C and cooled in desiccators.

Calculation

TDS (mg/l) = A-B × 1000 × 1000/V

Where A = Final weight of the dish in gram

B = Initial weight of the dish in grams

V = Volume of the sample taken in ml

5. Total Hardness: In an alkaline environment, EDTA combines with Ca and Mg to form a soluble chelated complex. Ca and Mg ions generate wine red color with Eriochrome black T in alkaline conditions. Ca and Mg divalent ions combine when EDTA is introduced as a titration, causing a dramatic change from wine red to blue color that reveals the titration's endpoint. This titration's pH must be held constant at 10.0 0.1. The Mg2+ ion precipitates at a higher pH (about 12.0), leaving only the Ca2+ ion in solution. Murexide indicator and Ca2+ combine to form a pink color at this pH. Ca2+ becomes complexed when EDTA is introduced, altering the hue from pink to purple to signify the completion of the reaction. Interference from metal ions does occur, however it can be prevented by adding inhibitors.

Total hardness, calcium hardness, magnesium hardness, DO, biochemical oxygen demand, and chemical oxygen demand all underwent standard analyses.

6. **Heavy Metals:** Using atomic absorption spectroscopy, the heavy metal elemental analysis of water samples has been determined. Elements like iron, nickel, zinc, lead, and copper have all been studied. Flame spectroscopy is a quantitative and qualitative analytical technique for identifying the element in a sample. In this method, a homogenous liquid sample is placed in a flame where thermal and chemical reactions create "free" atoms that can absorb, emit, or fluoresce at particular wavelengths. In the often used flames for atomic absorption spectroscopy, the great majority of free atoms are in the ground state. The light source used to excite the free atoms produced in the flame emits a constricted spectral line with the energy signature of element 37. The amount of light's energy loss (absorption) is then measured. According to the Lambert-Beer law, the absorption is inversely related to the number of free atoms in the flame.

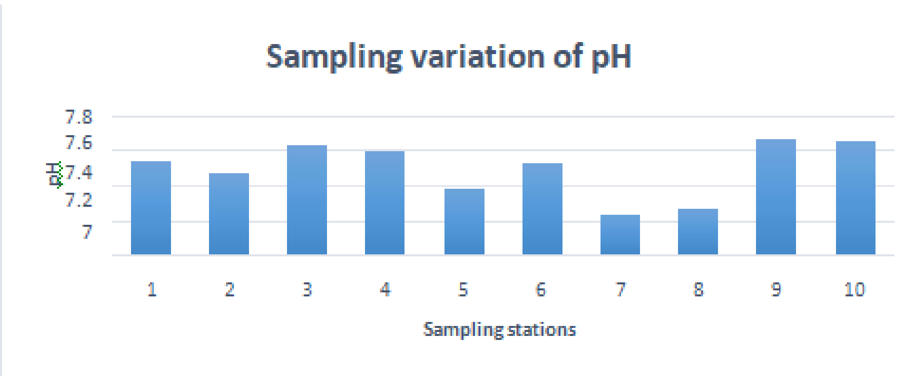
   Absorbance = log I0 (I0 / It) = k c l

   Where I0 = Intensity of incident radiation emitted by the light source It = Intensity of transmitted radiation (amount not absorbed) c = Concentration of sample (free atom)
   k = Constant (can be determined experimentally) l = Path length.

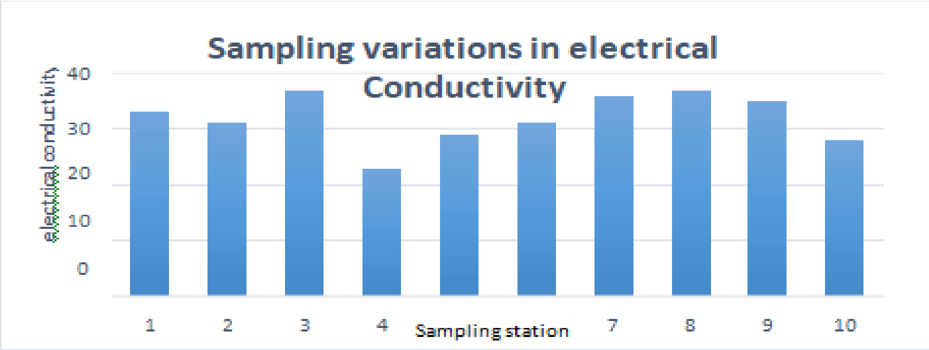
   The most widely used strategy is the one where interfering effects are known to be absent. Typically, at least three standards and a blank are used to cover the absorbance range of 0.1 to 0.8. The instrument is calibrated using the calibration blank solution.

IX. RESULTS AND DISCUSSION

1. **pH:** pH, quantitative measure of the acidity or basicity of aqueous or other liquid solutions. The expression translates the hydrogen ion concentration, which normally ranges between 1 and 1014 gram equivalents per liter, into numbers between 0 and 14. It is frequently used in chemistry, biology, and agronomy. The pH ranged from 7.2 to 7.6. The pH of drinking water should range from 6.5 to 8.5.



2. **Electrical Conductivity:** A material's electrical conductivity can be used to determine how much current it can transport or how well it can do so. In the presence analysis, the EC values in every water sample were found to be higher above the allowed limits established by the WHO (600 micro ohms/cm). The electrical conductance ranged from 1140 to 5080 micro ohms/cm.



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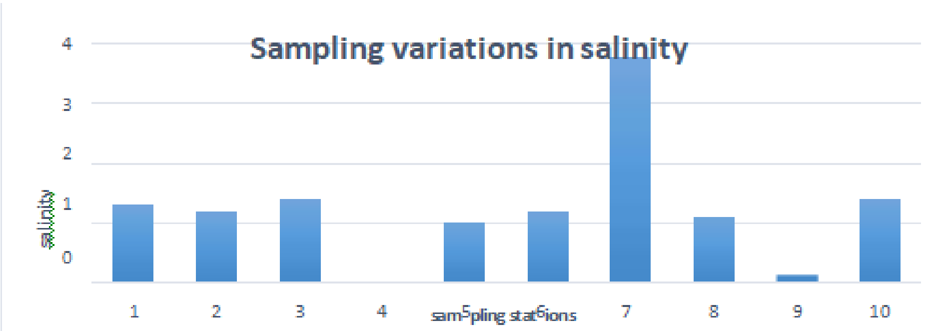
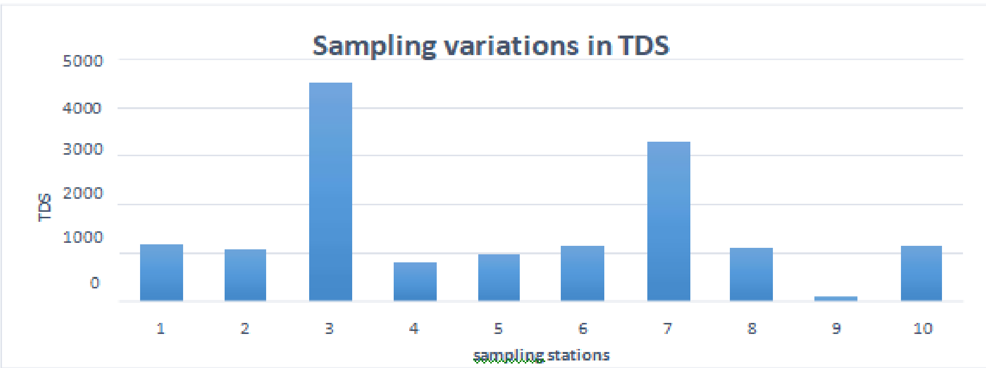
3. **Salinity:** "Salinity" is the scientific term for the concentration of salt in water or soil. The three different types of salinity that might exist are primary salinity (also known as natural salinity), secondary salinity (also known as dry land salinity), and tertiary salinity (also known as irrigation salinity). The salinity of drinking water can range between 1-2.



4. **TDS:** The entire number of mobile charged ions, such as minerals, salts, or metals, dissolved in a specific volume of water is known as total dissolved solids (TDS), often known as parts per million (ppm). TDS are measured in milligrams per liter (mg/L) of water.TDS affects everything that utilizes, consumes, or lives in water, whether it is an organic or inorganic substance. TDS and water quality and water purification system quality are strongly connected. Total dissolved solids values are shown to range from 800 to 1500 ppm. Not all water sample values exceed the permissible level set by the WHO at 500 ppm.



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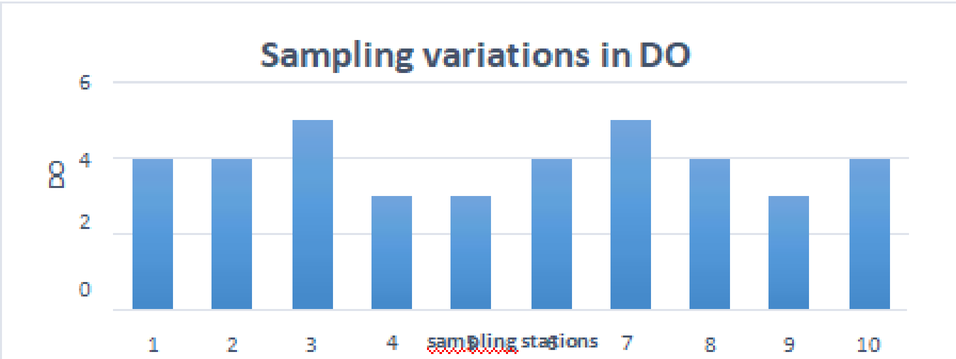
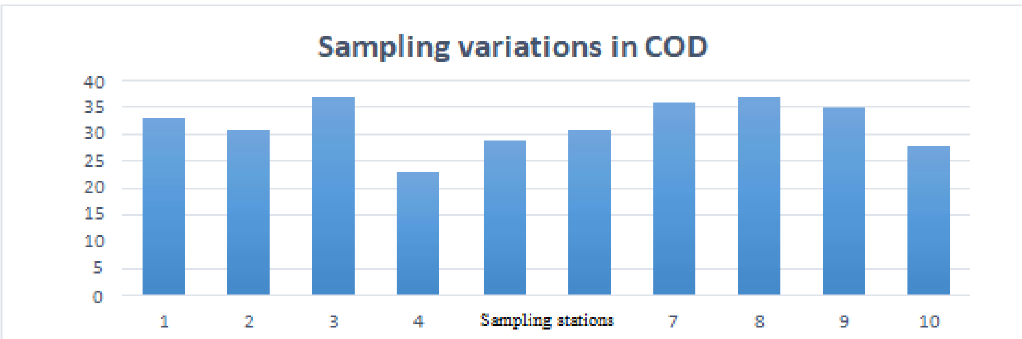
5. **DO:** The amount of free oxygen dissolved in water, expressed in mg/L, parts per-million The amount of free oxygen dissolved in water is measured in milligrams per liter (mg/L), parts per million (ppm), or percentage of saturation, where saturation refers to the maximum amount of oxygen that could potentially be dissolved in water at a certain height and temperature. It is demonstrated that the range of dissolved oxygen concentrations is 3- 5 ppm. The dissolved oxygen permissible limits established by the WHO are 5 ppm.

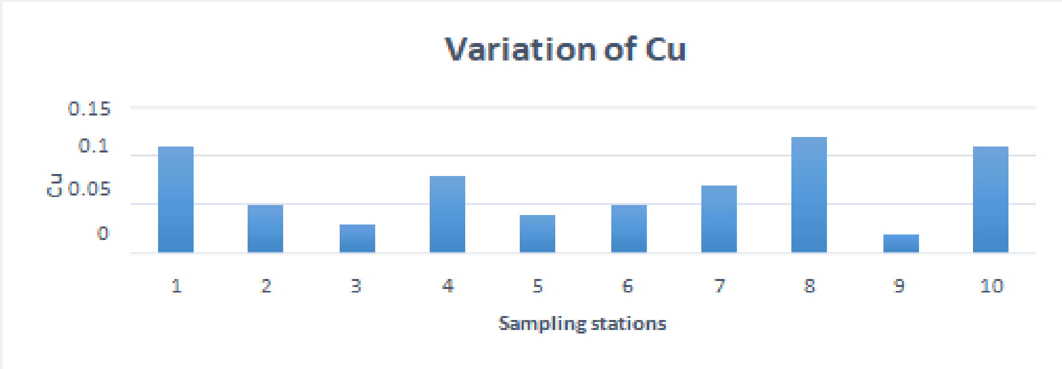


6. **BOD:** The term "Biological Oxygen Demand" refers to the quantity of dissolved oxygen that aerobic microorganisms need at a certain temperature and time in order to break down the organic components in a sample of water. BOD concentrations are typically between 14 and 29 ppm. The WHO-permitted level of 10 ppm for BOD was found to be exceeded in all river water tests.

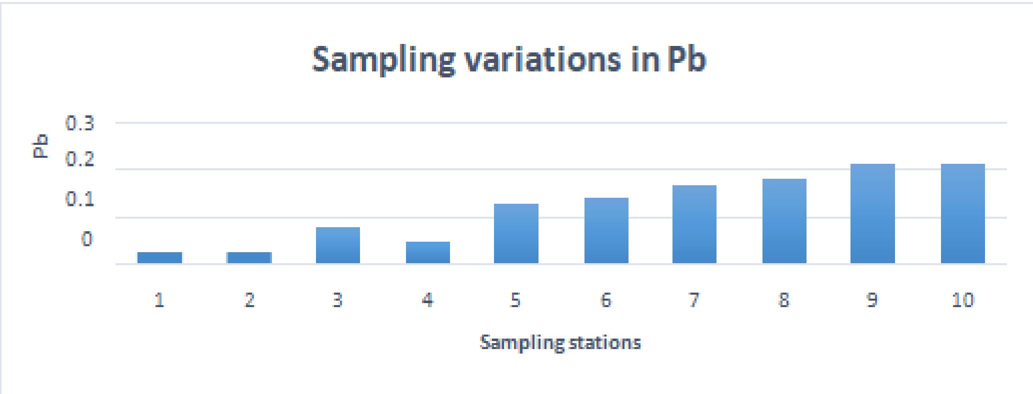
7. **COD:** A measurement of the quality of water and wastewater is the chemical oxygen demand (COD). The COD test is frequently used to evaluate the effectiveness of water treatment plants. The COD concentration is found to range from 23 to 37 ppm. All water samples from rivers were found to have COD readings that were higher than the WHO-permitted level of 10 ppm.



8. **Cu:** Copper is a metal that can be found naturally in rocks and soil as minerals. It is frequently present in natural water bodies at low concentrations. It is a crucial trace element that is necessary to preserve optimum health. The levels of copper are found to range from 0.03 to 0.11 ppm. The permissible quantity (2 ppm) for river water was confirmed to be present in all tests.



9. .**Pb:** The WHO's maximum allowed limit for lead in water from the Cauvery River is 0.01 mg/l, which is an acceptable norm. The maximum allowable limit of Pb and the WHO recommended limit are both exceeded in every water sample. The samples have pb concentrations ranging from 0.03 to 0.21 ppm.



10. **Nickel:** On Earth, nickel is a chemical element that is widely distributed, especially in the iron-nickel core of the planet. Additionally, it enters groundwater from agriculture runoff and is utilized in fertilizers. The average amount of nickel in an adult is 10 mg. Water generally contributes 0.005–0.025 mg daily. The nickel values are found to be in the range of 0.16-0.27ppm.

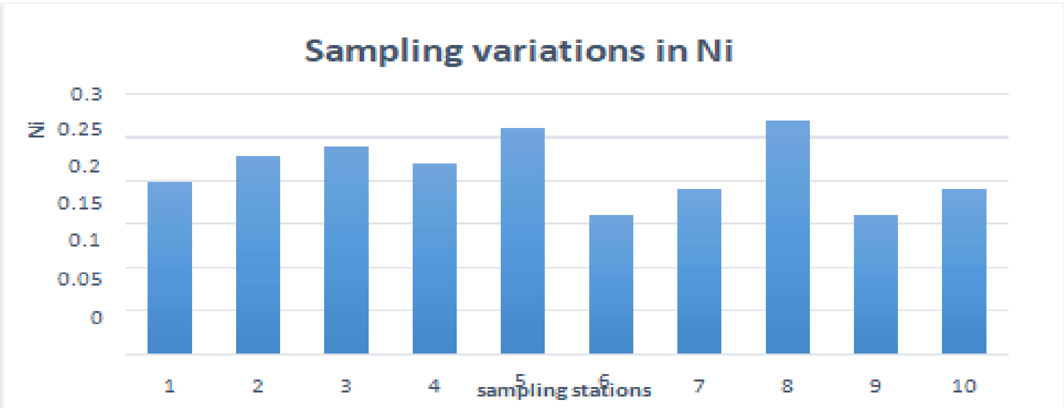


Table 1: Influence of industrial wastes in Uyyakondan canal water – Tiruchirappalli

parameters / Sampling station	pH	EC	Salinity	TDS ppm	DO ppm	BOD ppm	COD ppm	Cu ppm	Pb ppm	Ni ppm
A1	7.55	1803	1.3	1190	4	29	33	0.11	0.03	0.20
A2	7.48	1660	1.2	1070	4	22	31	0.05	0.03	0.23
A3	7.64	1900	1.4	1500	5	17	37	0.03	0.08	0.24
A4	7.60	1300	0	800	3	16	23	0.08	0.05	0.22
A5	7.39	1530	1.0	990	3	19	29	0.04	0.13	0.26
A6	7.53	1770	1.2	1140	4	16	31	0.05	0.14	0.16
A7	7.24	5080	3.8	3300	5	24	36	0.07	0.17	0.19
A8	7.27	1720	1.1	1110	4	26	37	0.12	0.18	0.27
A9	7.67	1140	0.14	900	3	24	35	0.02	0.21	0.16
A10	7.66	1310	1.4	1140	4	14	28	0.11	0.21	0.19

X. CONCLUSION

The river water samples were collected from Uyyakondan canal of ten different stations in and around Trichy district and the physico - chemical parameters like Salinity, Conductance, TDS, pH, DO, Biological oxygen demand, Chemical oxygen demand and heavy metals Copper, lead and nickel were analyzed by using standard procedures.

Most of the physico - chemical parameters and heavy metal concentrations were above the permissible limits of WHO values. The results are compared with the prescribed values of WHO for each parameter. According to the examination of the water quality parameter, PH, temperature, copper, and nickel are found to be below the WHO-permitted limit whereas EC, TDS, DO, COD, and BOD are found to be greater n the limit.

The water in this location is deemed acceptable for residential use but unfit for drinking due to the presence of industry in the neighborhood. So it is important to inform people about the water quality. To prevent water born diseases, sanitary practices and affordable water treatments like filtration and boiling would prove advantageous. To protect and safeguard the priceless water resources from pollution for future generations, corrective steps must be taken.

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