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ANALYSIS OF PHYSICAL-CHEMICAL PARAMETERS (ACIDITY, ALKALINITY, BOD ETC.) OF WATER IN MANSAGAR LAKE (JAIPUR)

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Abstract : One of the most essential resources for all people living on earth is water, despite the fact that water pollution affects around two-thirds of the planet's surface. As pollution on earth continues to rise on a daily basis, the quality of the world's water continues to deteriorate. The pollution problem in the Man Sagar Lake is due to the inflow of wastewater by the increasing flow of partially treated wastewater and untreated wastewater with severe contamination. The lake is located in Jaipur, Rajasthan, and has a surface area of about 130 square kilometers. It was created in 1610 AD by Raja Man Singh by damming the Dravayavathi River. The lake is becoming more polluted day by day as a result of the discharge of untreated wastewater and other polluting elements, such as effluents from industrial processes, garbage from households, and waste from agricultural operations. All of these things alter the physicochemical properties of water, in addition to accumulating heavy metals and causing pollution in the body of water they are in. As a direct consequence of this, a number of phenomena, including eutrophication and slit decomposition, take place in the body of water, which ultimately results in a decline in the water's quality. The way of existence of every living creature that lives in water is altered as the water's quality deteriorates. The physiochemical research that was carried out on the water quality had an effect on the value, the total dissolved solid, the total alkalinity, the acidity, the calcium, the magnesium, the chloride, the sulphate, the nitrate, the biological oxygen demand, and other factors.

Key words- Acidity, Alkalinity, Biological Oxygen Demand, Contamination, Physiochemical

1. INTRODUCTION

Pollution is damaging air, water, and land alterations. Water comes from lakes and rivers. Earth's water is scarce. Water is a universal solvent. Water, an odorless, tasteless, colorless, transparent, inorganic chemical, is the most significant material on earth. Survival requires water. Clean water affects health and livelihoods. Polluted water causes millions of deaths and illnesses annually. It meets human requirements in different states. Human activity pollutes water when its quality or composition changes, rendering it unusable. By 2025, people will utilize 70% of freshwater from rivers, lakes, and underground aquifers [1]. This estimate indicates the population's influence on water resources. Nature has several water forms. Earth is 71% water. Water is a human solvent on Earth's surface. Water is crucial for agriculture and business. Agriculture uses 70% of humanity's freshwater. Salt and freshwater fishing are major sources of food for many people worldwide. It is common practise to use boats to carry crude oil, oil and gas, and finished products across seas, rivers, ponds, and canals. In homes and businesses, ice, cold, and heat are used in the cooling and heating processes, respectively. Water is an important component in manufacturing, as well as the culinary and domestic cleaning industries. It is an excellent solvent for a wide variety of mineral and organic chemicals. Rig-Veda addresses water. Rishis and Maharishis agree that water is both the nectar and the source of life. [H2O + X] denotes water that has been added with a controlled and measured dissolved ingredient. The uncontrolled state of X results in illness and water that cannot be consumed. The formation of water begins with an unequal connection between three atoms: two hydrogen and one oxygen.

Biological, toxic, chemical and inorganic contaminants contaminate 70% of India's surface water and a rising amount of its groundwater. These sources are often unsafe for human consumption, irrigation, and industry. Poor water quality limits its availability for human and environmental use, contributing to water scarcity. Water contamination occurs when unwanted materials enter the water, harming the ecosystem and human health. Water is essential for drinking and growth[2]. Safe drinking water is essential for global health. Water is an infection-causing solvent. WHO says 80% of illnesses are water-borne. Many countries don't meet WHO drinking water standards. Unclean water causes 3.1% of deaths.

Growing population produces various concerns, including water contamination. Population expansion increases garbage output. Rivers and streams are clogged with rubbish. Human waste pollutes water. Polluted water contains harmful germs. The government must expand to accommodate increased demand for fundamental services. Urban areas have better sanitation than rural ones. Polythene bags and plastic waste are polluting. Waste is tossed in plastic bags. Three out of ten urbanites defecate in public, according to estimates[3]. 77% of people use flush latrines, 8% use pit latrines. Urbanization spreads infectious diseases. Overcrowding, poor housing conditions, and poisoned water are urban health issues. One-quarter of urbanites are disease-prone.

1.1 Distribution of water on the earth's surface

Water is liquid, solid, and vapor on Earth's surface. The world's water supply is roughly 1.36 108 million-acre meters. 97.2 percent of this water is salty in the seas, while just 2.8% is fresh water on Earth.

The world's oceans and seas encompass about 70.9 percent of the surface of the earth. Minor amounts of water may be found in the air as mist, clouds (ice and fluid water suspended in the air), precipitation, glaciers and ice caps in Greenland and Antarctica (1.7% each), groundwater (1.7%), and glaciers and ice caps in Antarctica (1.7% each) (0.001 percent). Evaporation is one component of the water cycle.[4], transpiration, condensation, precipitation, and runoff, with most of it ending up in the sea.

Table 1 : distribution of water on the earth surface

Freshwater (2.8%)	Surface water (2.2%)	Glaciers and ice caps (2.15%)
		Freshwater (0.05 %)
		Lakes and streams (0.01%)
		Another form (0.04%)
	Groundwater (0.6%)	Drilling technology (0.25%)
		The remaining is at a greater depth of the earth’s crust.

1.2 Water Cycle

The continual flow of water on, above, and below the surface of the Earth is what is referred to as the water cycle, which also is called as the hydrologic or hydrological cycle. During the whole of this process, the state of the water will transition from one phase to the next; yet, the overall presence of water particles will stay unchanged. That is to say, even if one were to collect and boil one hundred grammes of water, the amount of steam produced would be one hundred grammes. [5] In a similar vein, if one were to collect and condense 100 gms of steam, the resulting amount of water would weigh the same. There are several different processes that water goes through, including evaporation, melting, and freezing, as well as sublimation, condensation, and deposition. All of these shifts require the expenditure of some kind of energy.

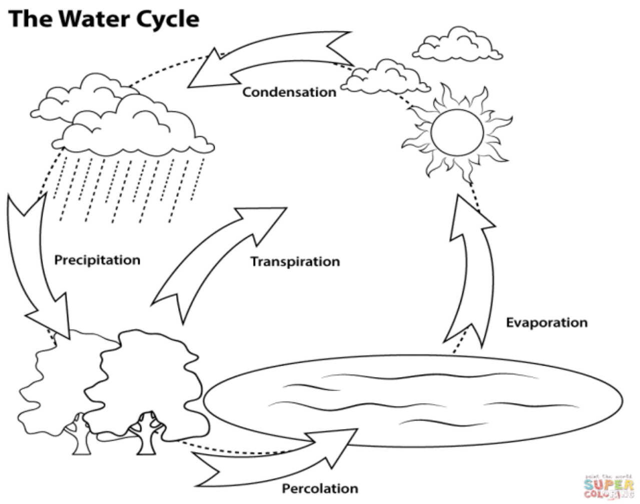

Figure 1: Stages of Water Cycle

1.2.1 Water Cycle Stages

A number of methods are involved in the movement of water. The water cycle's steps are given below.

Evaporation

In spite of the fact that the sun is the primary source of energy for the planet, it is also the primary cause of the majority of evaporation. Evaporation is the process by which water molecules that are located on the water surface bodies are prompted to move upward into the air.[6]. Clouds of water vapour may form when the molecules in the atmosphere that have the highest kinetic energy come together. When water is below its boiling point, it evaporates. Evapotranspiration is the process of evaporation via the leaves of plants. A considerable quantity of water in the atmosphere is due to this process.

Sublimation

Sublimation is the process through which snow or ice transforms directly into water vapour without melting into liquid water. Drying winds and higher humidity are the most common causes of this phenomenon. Whenever the air density is exceptionally low, it is possible to see sublimation taking place on mountain tops. The low pressure makes the process easier to understand and implement since it requires less energy to transform snow into water vapour. It is also possible to see sublimation during the phase in which fog forms from dry ice. The arctic ice that cover the poles of the earth are the largest contributor to the sublimation that occurs on the planet.

Condensation

The water vapour that has built up in the atmosphere over time ultimately becomes chilled as a result of low temperatures that exist at high altitudes. These vapours ultimately form into tiny droplets of water and ice, which contribute to the formation of clouds.

Precipitation

When the temperature is higher than zero degrees Celsius, the vapours turn into droplets of water as the temperature continues to rise. However, if there is no dust or any other kind of impurity present, it will not condense. As a direct result of this phenomenon, water vapour congregate on the particle's surface. After a certain number of drops have accumulated, it will fall from the sky to the earth below. This method is called as precipitation, and it involves (or rainfall). When the temperature is very low or the atmospheric pressure is very low, water droplets may freeze and fall to the ground as snow or hail.

1.3 Steps to prevent water pollution

• **Use of plastics is reduced**—avoid using plastics. After it has been created, it is incredibly difficult to disintegrate plastic [7]. Considerably the plastic, we use winds up in the world's water supply, making its removal and disposal much more challenging.

• **Reusable and recyclable materials**-It is better to reuse non-recyclable items, such as plastic, as many times as possible. If you must select between two things, choose the one that is readily recyclable.

• **Eat organic foods**—Organic foods may be treated with chemicals, but they're usually prepared with very minimal synthetic chemicals. The quantity of chemical pollution that reaches the water supply is reduced when people eat organically[8]. The food we eat has a significant impact on environmental quality due to the pesticides used to produce food, the gasoline used to transport the crops, and the fuel used to power agricultural equipment on industrial farms.

• **Prevent soil erosion**—Pollutants that penetrate the soil are distributed by the water because the topsoil is moved by the rain. This is common, but if the soil is exposed to too many phosphates or other hazardous substances, the ground may be severely harmed.

• **Garbage disposal**—Despite the fact that most houses have a garbage disposal in the sink, it is recommended to use it as little as possible. This technique can break down solid substances, however, such items are harmful to the water supply. If at all feasible, toss them in the trash.

1.4 Improve Water Quality and Access

Improve Overall sanitation by installing toilets & latrines that are connected to a sewer or that are contained inside a secure building. [9].

• Education may play a role in helping to promote healthy hygiene practises. It's possible that washing your thoroughly with soap and warm will cut the amount of times you have diarrhoea by as much as 35 percent.

• Have rainwater harvesting equipment installed so that rainfall may be collected and stored for use as drinking water or for the purpose of replenishing subsurface aquifers. Drill wells in order to get contaminated groundwater from aquifers that are located underground.

• Install water treatment equipment in your house, such as filtration, solar disinfection systems, or flocculants, in order to guarantee the availability of potable water.

• At least once a year, drain your water heater[10]. Sediment, bacteria, and metals may build up in the water heater tank. This might affect the quality and pressure of the water in your house.

In order to enhance the quality of the water, you should advocate for low-cost options such as chlorine pills or plastic water bottles that can be heated up in the sun.

Before using the water for cooking or drinking, let the cold water faucets run for two minutes. If water is left unused for an extended amount of time and allowed to remain stagnant in pipes for an extended period of time, the water's quality may deteriorate.

• It is important to remember to change filter cartridges on a routine basis. It's possible for bacteria and metals to accumulate in filter cartridges. Make sure that the filter is changed in accordance with the recommendations provided by the manufacturer.

1.5 Area of research (Man Sagar lake in Jaipur)

In India, Jaipur is well known as the best tourist destination. Man Sagar Lake is situated in Jaipur. Mansagar lake is surrounded by the Nahargarh hills (western side of the lake), Amber hill (northern side of the lake), Amargarh hills (eastern side of the lake) in Jaipur. This is an artificial lake. Jal Mahal, an architectural monument, is situated in the middle of Man Sagarlake which is constructed in the 18th century. Man Sagar Lake is a typical traditional hydraulic water harvesting structure known commonly as Water Reservoir. In the late 16thcentury, it came into existence which is made by Raja Man Singh. The lake is approximately 300 acres km^2 area covered presently.

MANSAGAR LAKE-

Location	Jaipur
Coordinates	26.956°N 75.85°E
Lake type	Artificial
Catchment area	23.5 km^2
Basin Countries	India
Surface area	139 ha (1.39 km^2)
Maximum depth	4.5 m (15 ft)

1.5.1 Evaluation of Man Sagar Lake

Man Sagar lake has 130 hectares. More than 150 bird species call the lake home. Fish, birds, insects, microorganisms, and aquatic plants need water to survive. The lake has siltation and settled deposits, pollution from wastewater input, surface area loss due to eutrophication-induced artificial land expansion, and summer water loss due to outflow for downstream irrigation. Untreated sewage pollutes the lake and surrounding ground water. This contamination makes groundwater unsafe to drink and presents a health concern. Rainwater mixing with the lake's toxic water stinks. The lake contains 20 mg/L BOD and total nitrogen.

The Rajasthan government has made many attempts to improve the lake's biology, ecosystem, and surrounding land. None of these restoration efforts were successful owing to a lack of funds and incentives. In 2000, India Infrastructure and Finance Services (IL&FS) was charged with developing the project.

1.5.2 Plants, trees and shrubbery

The Aravalli hills surrounding the lake area have quartzite rock to a north east of Jaipur. In parts of the project area, residences were built on exposed rock. The hills of Kanak Vrindavan valley, where a temple complex is situated, slope north east toward the lake. The lakebed is covered with mud, sand, and alluvium. Wind and water have increased soil erosion caused by deforestation in steep areas. The lake's bed-levellevel rose as silt collected. The catchment's flora is directed by the subsidiary Edaphic type of dry tropical forests; the total forest area of 9.01 sq.km (3.48 sq mi) consists of dense forest cover of 6.45 sq.km (2.49 sq mi), a degraded forest of 0.95 square kilometers (0.37 sq mi), and encroachment of 1.61 sq.km (0.37 sq mi) (0.62 sq mi). Main regional flower is Dhauk (Anogeissus pendula). High slopes and little vegetation cause erosion, which drains into the lake. The western Nahargarh hills, outside the urbanised zone, have been denuded, limiting their moisture retention.

1.5.3 Major problem

1.) Summer irrigation wastes water.
2.) Untreated industrial effluents pollute the lake.

Man Sagar Lake restoration

Improving water quality and quantity; building a diversion drain between Brahmapuri and Nagatalai Nallas; renovating and modifying the North Zone STP; establishing a Territory Treatment Plant for Territory Wet Land Treatment; building a settling tank from Amber-Check Dam on the lake's northeast side; building an irrigation diversion channel downstream of the dam; stabilizng lily pads.

Organization of the paper

Organization of the paper is as follows section 2 deals with the review of literature and section 3 explained about proposed methodology, section 4 presented the results and discussion and section 5 concluded the work.

Contribution of the study

Contribution of the study is about finding the chemicals present in Man Sagar Lake. studying the parameters availability in the lake and use of the parameters. understanding the permissible limits and suggesting the necessary actions to restore the lake.

2. Literature Review

Many of the authors discussed about the water quality in the lakes and they are also proposed their own methods to restore the lake. In this we discussed some of the articles related to the topic.

[11] This article described a study of Man Sagar Lake's physio-chemical parameters. Man Sagar Lake is a Jaipur attraction. The Indian government put the lake in the National Lake Conservation Plan in December 2002 due to its deteriorating condition. Analyzing the government's conservation efforts and water quality was agreed upon. By comparing lake water measurements to NPCA standards, we may conclude that Man Sagar Lake has a pH of 7.16–8.85, which meets the C category but exceeds the other categories. Dissolved oxygen values in the B, C, and D categories are 3.6–5.8 mg/L. BOD between 15.4–27.9 mg/L is not acceptable for any NPCA category. Man Sagar Lake water is unfit for any NPCA-recommended application. Measures such as identifying point sources of pollution, sewer treatment, proper discharge of industrial pollutants, sediment withdrawal/dredging, deweeding/weed regulation, rehabilitation of feeding drainages, therapeutic interventions of river catchment, proper waste management, awareness campaigns and involvement in preservation, regular review of conservation programs can be taken to control BOD and reduce lake

pollution. Cascading aerators or waterfalls may be installed in the lake to enhance its look while enhancing dissolved oxygen and decreasing BOD.

[12] The WAWQI and CCMEWQI indices were used in this study to assess the quality of the groundwater in the Satlasana area, which is located in the Mehsana district of northern Gujarat. 50 different groundwater sources in nine different localities were tested for pH, turbidity, TDS, TH, TA, DO, and chloride on a monthly basis for a period of six months. These are the most important standards for water quality, particularly for water that will be consumed. The IS, WHO, and CPCB criteria were used for the comparative study. In this study, physicochemical properties were examined, and water quality indexes were used. According to the results, the quality of the groundwater in Satlasana is satisfactory for drinking after undergoing the typical treatment. In order to improve the quality of the groundwater, standard water treatment may lower the total hardness, total alkalinity, total dissolved solids, and turbidity. Salt reductions, pollutant absorption, and electrochemical treatments are all examples of procedures that may be used in water treatment. In-situ therapies may involve, in addition to ex-situ remedies, the practise of diluting tainted water with rain or other sources of fresh water. The groundwater resources indices demonstrate that rural groundwater is pristine since there are no sources of groundwater contamination that originate in urban or industrial areas. The outstanding water quality at Satlasana is an indication of the unspoiled character of the community's water supply, which must be preserved. The replenishment of the groundwater level and maintenance of water quality may be assisted by collecting rainwater.

[13] The case study's WQI results reveal the water's overall quality. It displays significant Physico-chemical parameters affecting the river's water quality. Seasonal water quality data from seven sample sites in the river channel were utilized to evaluate WQI seasonal changes. The baseline data obtained in this research, together with their analysis and interpretation, will improve our understanding of the Kolong River's water quality and the variables impacting it. Academically and practically relevant study. Based on WQI results, To improve the water quality of a river, it is necessary to develop a strategy for the management of water quality and implement appropriate treatment processes. Reduce the amount of raw sewage that is introduced from residential and commercial businesses, limit the amount of direct storm water drain discharge, and prohibit river communities from continuing to dispose of solid waste. In order to increase the carrying capacity of the river channel, desilting methods will need to be used. Additionally, encroachments from settlements and infrastructure will need to be removed.

[14] The purpose of this study is to research the chemical quality of the water and water used for irrigation in the Mothkur area of Telangana. The geology of Mothkur is classified as Archaean crystalline. Groundwater is used for drinking, cleaning, and irrigation by the vast majority of people. The concentrations of Na+, Mg2+, Cl, and F at the study site are higher than the maximum levels allowed by WHO and BIS (BIS). The salinity chart for the United States shows that around sixty percent of surface water and forty-four percent of groundwater samples are suitable for irrigation in practically all soil types. According to Wilcox, just 36 percent of groundwater samples are appropriate for irrigation, while the remaining 40 percent range from allowed to problematic, and the other 20 percent are classified as doubtful to unsuitable. According to the results of 56 percent of ground and surface water testing, salt levels are below acceptable limits for irrigation. According to the amounts of residual sodium carbonate in the water samples, 56 percent of the groundwater and all of the water samples collected are suitable for irrigation. The permeability index of the irrigation water in the area under investigation is rather high.

[15] This study investigated the levels of heavy metal pollution found in the Gomti River in Lucknow. HPI was used in order to investigate the presence of heavy metal pollution in the Gomti River in Lucknow. Conduct an investigation into the possible sources of heavy metal contamination in the River Gomti by using principal component analysis and hierarchical cluster analysis to investigate the relationship between metals, sources, and sample locations. The origin of the HMs that were found in the River Gomti was investigated with the use of factor analysis and principal component analysis (PCA). In order to locate the origins of heavy metal pollution, PCA was used to water quality datasets in order to select important PCs for further analysis. The study's high heavy metal levels are alarming. 60% of the river's sites are 'critically contaminated,' 30% are'seriously polluted,' and 10% are'moderately polluted,' according to the HPI. The cluster analysis indicated that upstream site S1 had the least heavy metal pollution, suggesting that human encroachment affected water quality midstream and downstream. PCA results highlight As, Pb, and Cd's potential damage to humans and aquatic biota. The correlation analysis suggests to HM contamination from untreated or inadequately treated household and industrial wastewater discharges.

[16] The authors of this study examined the factors that lead to organic, inorganic, and microbiological pollution in Ganga water. Their goal was to determine the extent to which pollution levels have changed over the course of the past ten years in comparison to earlier eras, as well as the potential dangers of consuming fish that have been contaminated with toxic substances. The Ganga, which is India's greatest river and a source of life for millions of people, has seen tremendous pollution. According to studies, the water from the Ganges includes carcinogens. the author conducted research using databases, online sites, and regulatory reports on pollution. The contamination of the Ganga was computed for each state. It is addressed the primary sources of contaminants, particularly metals and metalloids as well as pesticide residues. Researchers looked at the health risks associated with consuming polluted fish as well as the bioaccumulation of hazardous substances in Ganga fish. Although there has been a significant reduction in the amount of pesticides identified in Ganga water over the last decade (after the establishment of the NGRBA in 2009), certain organochlorine levels continue to exceed the range that are considered safe for consumption in water. The production of inorganic pollutants, particularly cancer-causing agents, has skyrocketed.

[17] This study examined a "Fuzzy River Health Index" (FRHI) to deal with subjectivity and ambiguity regarding river health along the Chambal River in India. Water quality is subjective and unclear. Fuzzification uses triangle membership functions; defuzzification uses the centroid technique. The recommended efficient approach uses WQ parameters and a fuzzy model with IF-THEN logic. Performance was compared using C-TSI and EHI (EHI). The FRHI Fuzzy model demonstrated that the Chambal River's health can be maintained for the foreseeable future. The estimates provided by FRHI are the most reliable when compared to the mean value of three indices obtained from each sampling point. The river's condition worsens after the monsoon, falling from pre-monsoon levels of 83.0–87.2 to post-monsoon levels of 79.7–86.4, but still being within an excellent range. This is something that has to be fixed in order to keep the river in good condition. Throughout the course of the investigation, the estimates generated by the fuzzy model of the FRHI are superior to those generated by the EHI and C-TSI for all categories of river health. The utility component of FRHI is especially relevant when river health varies geographically and temporally.

3. Methodology

The main purpose of this work is finding the chemicals present in Man Sagar Lake. studying the parameters availability in the lake and use of the parameters (PH value, total alkalinity, total hardness, calcium, magnesium, chloride, sulphate, sodium, potassium, nitrate, phosphate, total suspended solids, DO, BOD, COD). understanding the permissible limits and suggesting the necessary actions to restore the lake. We are determining all the parameters to know the use of those parameter in water.

PH Value

pH-value is a dimensionless quantity and therefore has no unit. a method of determining how acidic or basic a solution or material is. pH is measured on a scale from 0 to 14. In reality, pH is only a measurement of the proportion of free hydrogen ions to hydroxyl ions that are present in the water. Water that has a greater number of free hydrogen ions is considered to be acidic, while water that contains a greater number of free hydroxyl ions is considered to be basic. The degree to which chemicals in the water may alter the pH of the water is a significant indication of the degree to which the water is changing chemically.

Total alkalinity (as CaCo3)

Total alkalinity may be expressed as either milli grammes per litre (mg/L) or parts per million (ppm) of calcium carbonate in a water solution. Both of these units are used interchangeably. The term "carbonate hardness" may also be used to refer to total alkalinity. Because the gramme per molecular weight of calcium carbonate equals 100, parts per million (ppm) is the unit used to describe the hardness of water. It is not difficult to compute. This is the primary justification for describing the degree of difficulty using ppm. As a result of the fact that calcium carbonate does not dissolve in water, its concentration may be determined with relative ease.

Total hardness as (CaCo3)

The amount of hardness, as expressed as calcium carbonate, may be measured in milligrammes per liter (mg/L) or grains per gallon (gpg), depending on the context in which it is being used. The amount of hardness, expressed in milligrams of calcium carbonate equivalent, that is present in one liter of water. 1 milligrams per liter indicates that there is 1 milligrams of $CaCO_3$ equivalent in 1 liter of water. On the other hand, the mass of one kilogram of water is one thousand grammes, which translates to one part per million (ppm).

Calcium (Ca)

Calcium is element 20 with the symbol Ca. Many meals and drinks contain it. Calcium's buffering capabilities make it a vital water harnessing factor and pH stabilizer. Calcium sweetens water. Calcium interacts with water, creating hydrogen gas and calcium hydroxide precipitate. Softer than 75 mg/L. Moderately hard, 76 to 150 mg/L. Hard 151-300 mg/L. 300 mg/ - difficult. 400 ppm calcium is in seawater. Earth's crust is a major source of calcium in the water.

Magnesium (Mg)

Magnesium (Mg), one of the most prevalent chemical elements in nature, is a Group 2 (IIa) alkaline-earth metal and the lightest structural metal. Because magnesium causes water hardness, magnesium compounds are routinely removed from the water. Water softening does this. Magnesium hydroxide is a flocculant. Magnesium consumption should be 450–500 mg per day, and drinking water should include 25–50 ppm. Magnesium-rich mineral water contains at least 50 mg per liter. Labels must specify the precise quantity. Mineral Water has 108 mg per liter more magnesium than usual.

Chloride (Cl)

Elevated concentrations of chloride in streams can be toxic to some aquatic life. Additionally, the presence of chloride increases the potential corrosivity of the water. Corrosion in water distribution systems affects infrastructure and drinking water quality. High levels of chloride can corrode and weaken metallic piping and fixtures, give a "salty" taste to the drinking water, damage household appliances, and boilers, and, if the water is being used for irrigation, it may inhibit the growth of vegetation.

Sulphate (SO4)

Sulphate (SO_4^{2-}) is one of the most abundant chemical substances on Earth. 500 mg sulphate/L is advised for acute effects (no laxative effects). This number relies on the lack of osmotically active elements in drinking water, which might reduce the laxative sulfate level. Sulfate gives water a harsh or medicinal flavor and might be laxative. Lab tests can determine the sulphate content in your water. Some sulphate dissolves into groundwater when water travels through sulfate-rich soil and rock. Epsom salt, sodium sulfate, and calcium sulfate are sulfate-containing minerals (gypsum).

Sodium (Na)

Sodium has the symbol Na and the atomic number 11. People on low-sodium diets may be concerned about well-water sodium. The reaction fizzes heats up, and sodium bounces on the water's surface, producing flames. EPA advises that drinking water salt contents not exceed 30 to 60 mg/L for taste-sensitive populations. Sodium interacts with water to generate NaOH and hydrogen gas (H_2). Dissolved hydroxide creates a basic solution. Exothermic. Sodium interacts with water to generate sodium hydroxide, a strong base (NaOH). Chemists have rethought how the sodium metal-water explosion works. The metal reacts with water to generate sodium hydroxide, hydrogen, and heat, which ignited the hydrogen and caused the explosion.

Potassium (K)

Potassium has the symbol K and the atomic number 19. Small quantities occur naturally. The silvery-white metal of potassium may be readily sliced with a knife. Potassium metal interacts swiftly with atmospheric oxygen, generating potassium peroxide in seconds. Potassium interacts quickly with water to generate KOH and hydrogen gas (H_2). Dissolved hydroxide creates a basic solution. Exothermic. A pinch in water will do. So simple! Coconut water is low in sugar and high in electrolytes, notably potassium. Coconut waters are plentiful.

Nitrate (NO3)

Nitrate is a frequent contaminant in groundwater that may have serious health repercussions in big amounts. Nitrate is odorless and tasteless. Low amounts of naturally occurring nitrate are normal, but high levels may harm groundwater. 10 ppm nitrate is safe for drinking water (ppm). Nitrate levels exceeding 10 ppm are dangerous. Single exposures exceeding 10 ppm may be harmful. Nitrogen interacts with oxygen or ozone to generate nitrate. High nitrate levels in drinking water may be harmful to babies and pregnant women. Since it doesn't evaporate or bond to the soil, plants utilize it or it remains in the water.

Phosphate (PO4)

Phosphate occurs naturally as calcium phosphate in apatite. It's a natural source of phosphorus, a vital essential for life on Earth. Phosphorus is essential for human, animal, and plant nutrition and food production. Phosphorus is in many modern-day goods. Phosphates are used to address water quality issues caused by inorganic impurities If all phosphorus is utilized, plant growth stops, regardless of nitrogen. Total phosphorus levels are naturally below 0.03 mg/L. Phosphate levels are normally 0.005 to 0.05 mg/L.

Total suspended solids

To determine the total suspended solids (TSS) in a body of water, just take a sample of the water and run it through a filtering device. The dry density of suspended particles which are not dispersed in the water sample is referred to as the total suspended solids (TSS), and a filter may be able to retain these particles. the total quantity of solids in a sample of water by introducing the water to a beaker that has been thoroughly cleaned, dried, and weighed before receiving the water. After that, the water is removed from the beaker by placing it in a drying oven, and the glassware is reweighed after that. The mass of the entire solids is equivalent to the change in mass between the two points in time. Total suspended solids is the term used to describe the particles in the air that are big enough to be stopped by the filter (TSS).

Dissolved Oxygen (DO)

DO is dissolved oxygen. Air and plants provide oxygen to water. Stream water dissolves more oxygen than pond or lake water. DO is a key water quality indicator. Fish and aquatic species need it to survive. Winds aerate surface water, dissolving oxygen. Aquatic plant photosynthesis releases oxygen into the water. No physical-chemical link exists between dissolved oxygen and solution PH.

Biochemical oxygen demand (BOD)

The term "biochemical oxygen demand" (BOD) refers to the quantity of oxygen that is used up by bacteria and other microorganisms during the process of decomposing organic matter in an aerobic environment (one in which oxygen is available) and at a certain temperature. After 5 days, the BOD of water intended for consumption should be substantially below 1 mg/l. The BOD of wastewater that is acceptable to be discharged from a sewage treatment facility should be approximately 20 mg/l. Two separate measurements need to be taken in order to accurately assess the biological oxygen demand. The initial concentration of dissolved oxygen in the first sample is determined right away, whereas the concentration of dissolved oxygen in the second sample is determined after it has been incubated in the laboratory for five days (final).

Chemical oxygen demand (COD)

The amount of dissolved oxygen that is required to oxidize organic compounds such as petroleum is referred to as the chemical oxygen demand (COD). The chemical oxygen demand (COD) test determines how quickly oxygen levels in water are depleted by wastewater effluents. High chemical oxygen demand in water means more oxidizable organic matter and less dissolved oxygen (DO). Organic pollution may harm aquatic life. The chemical oxygen demand (COD) test indirectly measures organic waste components. It's stated in milligrams/grams per liter, which shows oxygen consumption per liter of solution. Older references may use ppm (ppm).

4. Results

In this section we determined each and every parameter (PH value, total alkalinity, total hardness, calcium, magnesium, chloride, sulphate, sodium, potassium, nitrate, phosphate, total suspended solids, DO, BOD, COD) to know the desirable limits and permissible limits. the availability of the parameters in the lake as well as the application of the parameters. Having an awareness of the allowable limitations and making suggestions for the required activities to restore the lake are both important.

Table 2: parameter values

Parameter	Unit	Result	Test method
PH value	----	8.17	IS-3025(P-11)
Total dissolved solid	Mg/l	700	IS-3025(P-16)
Total alkalinity (as CaCO3)	Mg/l	314.6	IS-3025(P-23)
Total hardness (as CaCO3)	Mg/l	374.49	IS-3025(P-21)
Calcium (as Ca)	Mg/l	42.5	IS-3025(P-40)
Magnesium (as Mg)	Mg/l	65.7	IS-3025(P-46)
Chloride (as Cl)	Mg/l	362.8	IS-3025(P-32)
Sulphate (as SO4)	Mg/l	18.6	IS-3025(P-24)
EC	Mho/cm	0.98	IS-3025(P-14)
Sodium (as Na)	Mg/l	28.2	IS-3025(P-45)
Potassium (as K)	Mg/l	2.8	IS-3025(P-45)
Nitrate (as NO2)	Mg/l	3.9	IS-3025(P-34)
Phosphate (as PO4)	Mg/l	0.58	RTHTS-07
Total Suspended solids	Mg/l	80.6	IS-3025(P-17)
Dissolved oxygen (DO)	Mg/l	1.98	IS-3025(P-38)
Biological Oxygen Demand	Mg/l	117.2	IS-3025(P-44)
Chemical Oxygen Demand	Mg/l	386.6	IS-3025(P-58)

In the preceding table, the PH value is 8.17 in test method IS-3025 (P-11). Test method IS-3025 yields 700 mg/l total dissolved solid (P-16). In test method IS-3025, total alkalinity (as CaCO3) is 314.6 Mg/l (P-23). In test method IS-3025, total hardness (as CaCO3) is 374.49 Mg/l (P-21). Test method IS-3025 yields 362.8 mg/l calcium (as Cl) (P-40). Magnesium (as Mg) is measured in Mg/l for test method IS-3025 (P-46). Chloride test method IS-3025(P-32 yields 362.8 mg/l. Test method IS-3025 yields 18.6 mg/l sulfate (P-24). EC test method IS-3025 yields 0.98 Mho/cm (P-14). Test method IS-3025 yields 28.2 mg/l sodium (P-45). Test method IS-3025 yields 2.8 Mg/ in potassium (P-45). Test method IS-3025 yields 3.9 mg/l nitrates (P-34). Phosphate test method RTHTS-07 yields 0.58 mg/l. Total suspended solids in IS-3025 is 80.6 mg/l (P-17). In test method IS-3025, dissolved oxygen (DO) is 1.98 mg/l (P-38). In test method IS-3025, Biological Oxygen Demand is 117.2 Mg/l (P-44). In test method IS-3025, Chemical Oxygen Demand is 386.6 Mg/l (P-58).

Table 3: parameters with desirable and permissible limits

Parameter	Unit	Result	Desirable limit as per IS 10500:2012	Permissible limits as per IS 10500:2012	Test method
EC	Mho/cm	1040	Not specified	Not specified	IS-3025(P-14)
Sodium (as Na)	Mg/l	42.6	Not specified	Not specified	IS-3025(P-45)
Potassium (as K)	Mg/l	3.2	Not specified	Not specified	IS-3025(P-45)
Nitrate (as NO2)	Mg/l	4.6	Max 45.0	Not specified	IS-3025(P-34)
Phosphate (as PO4)	Mg/l	0.62	Not specified	Not specified	
Total Suspended solids	Mg/l	82.8	Not specified	Not specified	IS-3025(P-17)
Biological Oxygen Demand	Mg/l	114.6	Not specified	Not specified	IS-3025(P-44)
Chemical Oxygen Demand	Mg/l	412.2	Not specified	Not specified	IS-3025(P-58)

The unit of EC is Mho/cm and the result is 1040 in test method IS-3025(P-14). The unit of sodium is Mg/l and the result is 42.6 in test method IS-3025(P-45). The unit of potassium is Mg/ and the result is 3.2 in test method IS-3025(P-45). The unit of nitrate is Mg/l and the result is 4.6 in test method IS-3025(P-34). The unit of phosphate is Mg/l and the result is 0.62 in test method RTHTS-07. The unit of Total Suspended solids is Mg/l and the result is 82.8 in test method IS-3025(P-17). The unit of Biological Oxygen Demand is Mg/l and the result is 114.6 in test method IS-3025(P-44). The unit of Chemical Oxygen Demand is Mg/l and the result is 412.2 in test method IS-3025(P-58). The desirable limit as per IS 10500:2012 is Max of 45.0 for Nitrate and the remaining parameters are not specified. The permissible limit as per IS-10500:2012 is not specified for all parameters.

Table 4: parameters with desirable and permissible limits

Parameter	Unit	Result	Desirable limit as per IS 10500:2012	Permissible limits as per IS 10500:2012	Test method
PH value	----	8.39	0.0-0.5		IS-3025(P-11)
Total dissolved solid	Mg/l	11.50	Max 500.0	Max 2000.0	IS-3025(P-16)
Total alkalinity (as CaCO3)	Mg/l	279.6	Max 200.0	Max 600.0	IS-3025(P-23)
Total hardness (as CaCO3)	Mg/l	393.3	Max 200.0	Max 600.0	IS-3025(P-21)
Calcium (as CaCO3)	Mg/l	34.08	Max 30.0	Max 200.0	IS-3025(P-40)
Magnesium (as Mg)	Mg/l	70.6	Max 30.0	Max 100.0	IS-3025(P-46)
Chloride (as Cl)	Mg/l	304.67	Max 250.0	Max 1000.0	IS-3025(P-32)
Sulphate (as SO4)	Mg/l	64.6	Max 200.0	Max 400.0	IS-3025(P-24)

In the preceding table, the PH value is 8.39 in test method IS-3025 (P-11). Test method IS-3025 total dissolved solid is 11.50 mg/l (P-16). In test method IS-3025, total alkalinity (as CaCO3) is 279,6 Mg/l (P-23). In test method IS-3025, overall hardness (as CaCO3) is 393 mg/l (P-21). Test method IS-3025 yields 34.08 Mg/l calcium (as Cl) (P-40). Magnesium (as Mg) is Mg/l, and IS-3025 yields 70.6. (P-46). IS-3025 chloride test yields 304.67 mg/l (P-32). Test method IS-3025 yields 64.6 mg/l sulphate (P-24). IS 10500:2012 recommends 0.0-0.5 for PH, Max 500.0 for total dissolved solids, Max 200.0 for total alkalinity, Max 200.0 for total hardness, Max 30.0 for calcium, Max 30.0 for magnesium, Max 250.0 for chloride, Max 200.0 for sulphate.

IS 10500:2012 allows a maximum of 2.0 for PH, 600 for total dissolved solids, 600 for total alkalinity, 200 for total hardness, 200 for calcium, 100 for magnesium, 1000 for chloride, and 400 for sulphate.

5. Conclusion

Clearly, there is an immediate need to raise awareness about critical environmental issues and find solutions in close collaboration with research, governments, business, and other key parties. The proposed effort focuses on Man Sagar Lake and the different causes that contribute to pollution and that may be mitigated to some degree via the suggested measures. – Less plastic usage- Eliminate your usage of plastics. Plastic is almost impossible to degrade once it has been made. Much of the plastic we use ends up in the water supply, making it more difficult to remove and dispose of safely.

When acquiring non-recyclable materials, such as plastic, it is best to reuse them as much as feasible. If you have an option between two products, select the one that can be recycled easily. Utilize organic foods. Although organic foods might be chemically processed, they are normally produced with less synthetic chemicals. Eating organically reduces the amount of chemical pollution entering the water supply. The food we choose to eat has a significant impact on environmental quality due to the pesticides used to produce food, the gasoline used to transport crops, and the fuel used to power agricultural equipment on industrial farms. Pollutants that seep into the soil spread with the water because the topsoil is carried by the torrential rain. This is usual, but if the soil is exposed to an excessive amount of phosphates or other hazardous substances, it may sustain severe damage. Even though the majority of households have a garbage disposal, it is better to use it as little as possible. This technique may break down solid substances; nevertheless, these items are harmful to the water supply. Whenever feasible, dispose of them in the trash. After considering all of the elements, we can without a doubt prevent water contamination.

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