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# CRITICAL STUDY OF GROUND WATER QUALITY IN RANCHI CITY

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## ABSTRACT :

The importance of water as a resource and life preservative is well known to us. The majority of human activities, including eating, drinking, bathing, cleaning, washing, farming, working in an industry, having fun, fishing, and navigating, require it. The world's surface is covered by water to a depth of about 75%. Because of its high salt content, the oceans, which contain 97% of the earth's water, are unfit for human usage. Only 1% of the remaining 2% is available as fresh water in rivers, lakes, streams, reservoirs, and ground water that is safe for human consumption. The remaining 2% is frozen in polar ice caps. Even though the world has made great strides in all areas of science and technology, many people still have a long way to go before they can access adequate and clean drinking water. The uneven distribution of water is to blame for this. This research paper reflects critical study of Ground Water Quality in Ranch City.

Keywords : earth, total dissolved solids, ground water, deserts, hills

## I. INTRODUCTION :

Nearly all of the Earth's surface, including hills, mountains, plains, and deserts, is covered in water. It is occasionally challenging to find, measure, and explain, and it is not always accessible or fresh enough to use without treatment. This water can be found at the surface of the ground, as in a marsh, or hundreds of feet below it, as in some desert regions of the countries. Water may only be a few hours old at extremely shallow depths, 100 years old at moderate depths, and many thousand years old at deep depths or after travelling a vast distance from its points of entrance.

A component of the natural water cycle is ground water. A portion of precipitation that falls on the surface of the ground seeps into the subsurface. Groundwater recharge is the portion

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that travels deeper into the soil until it reaches saturated rock material. The slowly moving water in the saturated groundwater system may eventually release into rivers, lakes, and oceans.

## II. GROUND WATER QUALITY :

The physical, chemical, and biological characteristics of groundwater make up its quality. The list of physical water quality parameters includes temperature, turbidity, colour, taste, and odour. Since most ground water lacks any discernible flavour, odour, or colour, we normally focus on its chemical and biological characteristics. Although items made from spring water or groundwater are sometimes marketed as "pure," their water quality is not the same as that of pure water.

Mineral ions are present in groundwater naturally. When water flows over mineral surfaces in the pores or cracks of the unsaturated zone and the aquifer, these ions slowly dissolve from soil particles, sediments, and rocks. These substances are known as dissolved solids. Some of the dissolved solids may have come from the river or precipitation water that recharges the aquifer.

Any water's vast list of dissolved solids can be broken down into three categories: Major constituents, minor constituents, and trace constituents. Total dissolved solids (TDS) concentration is the measurement of the mass of all dissolved components. Positively charged ions (cations) or negatively charged ions make up every dissolved substance in water (anions). Anions' total negative charge is always equal to their entire positive charge. More cations and anions are present in the water when the TDS is higher. The electrical conductivity (EC) of water rises as the number of ions increases. We can infer the TDS content of the water by measuring its electrical conductivity. Water turns salty when its TDS level is high. It is not advised to consume water with a TDS of more than 500 mg/l as drinking water (EPA secondary drinking water guidelines).

**Major constituents** (1.0 – 1,000 mg/l) of dissolved solids are :

Sodium, Calcium, Magnesium, Bicarbonate, Sulphate, chloride and Silica

**Secondary constituents** (0.01 – 10 mg/l) of dissolved solids are:

Potassium, Iron, Strontium, carbonate, nitrate, fluoride, boron

**Trace constituents** (0.0001 – 0.1 mg/l) are :

Antimony Aluminium, arsenic, barium, bromide, cadmium, chromium, cobalt, copper, germanium, iodide Lead, lithium, manganese, molybdenum, nickel, phosphate, rubidium, selenium, titanium, uranium, vanadium zinc

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**Trace constituents (less than 0.001 mg/l)** are :

Beryllium, bismuth, cerium, cesium, gallium, gold, indium, lanthanum, niobium, platinum, radium, ruthenium, Scandium, silver, thallium, thorium, tin, tungsten, ytterbium, yttrium, zirconium

## III GROUND WATER QUALITY IN RANCHI CITY :

Ranchi is the capital city of the Indian state of Jharkhand. The total area covered by Ranchi – Municipal Area is about 110 sq. km and the average elevation of the city is 2,140 feet above sea level.

Ranchi district experiences subtropical climate, which is characterized by hottest part of the year, extends from mid April to the middle of June, but even during this period the nights remain cool and pleasant.

Occasional rains help to keep down the temperature in summer. The monsoon commences from middle of June and continues upto the end of September. The winter is rather severe extending from middle of November to middle of February. Minimum temperature of about 10°C is recorded for the period during late December and early January. The normal annual rainfall data indicate that average rainfall is 1394mm. Maximum rainfall has been observed from June to October months. About 90% of the total annual rainfall is received to the monsoon period.

For the analysis of groundwater quality of the Ranchi city, samplings were carried out during rainy season , 2019. Thirty water samples were collected from well and tube well. The groundwater samples were collected in 500 polyethylene bottles. Temperature, electrical conductivity (EC) and pH values were measured in the collected area with a portable conductivity and pH meter. Then water samples were filtered through 0.45 μm Millipore membrane filters for separating suspended particles from water. Parameters were evaluated like pH, Total Dissolved Solid (TDS), Total Hardness (TH), Bicarbonate ($HCO_3$), Calcium ($Ca^{2+}$), Magnesium ($Mg^{2+}$), Fluoride ($F^-$), Chloride ($Cl^-$), Nitrate ($NO^{3-}$) and Sulphate ($SO_4^{2-}$).

## IV. CONCLUSION :

For 30 samples, the Water Quality Index (WQI) range from 29 to 139. The Water Quality Index (WQI) revealed that 85% of groundwater samples were found to be in the Very Good to Good

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category and may be used for direct consumption, while 15% of water samples were in the Poor category and cannot be used directly.

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