



## Drinking Water Analysis of Industrial Town at Chennai, India

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### Abstract

Water is indispensable for the drinking purpose. The water must be safe and pure must be without contaminants due to urbanization and industrialization. The present study evaluated the physical and chemical parameters of the water taken from four sampling sites located at the industrial city known as Maraimalai Nagar Town near Chennai city. More than 150 industries are located in the site. The standard methods are use for evaluation of the parameters and the water samples are found to have more concentrations of iron and alkalinity in the area. Hence, suitable water treatment is required to make it drinkable.

**Keywords:** Physical parameters, Chemical parameters and Ground water.

### Introduction

In the late years, the expanding danger to the ground water quality because of human exercises has accepted of extraordinary significance. The antagonistic impacts on ground water quality are the aftereffects of man's movement on the ground surface, on account of agrarian, residential and mechanical effluents, and in addition sub-surface or surface transfer of sewage and modern squanders<sup>1</sup>. The nature of ground water is of extraordinary significance in deciding the suitability of a specific ground water for a sure utilize (open water supply, watering system, modern applications, power era and so forth)<sup>2</sup>. The nature of ground water is the resultant of the considerable number of procedures and responses that have followed up on the water from the minute it consolidated in the environment to the time it is released through a well. Along these lines, the nature of ground water from season to season with the profundity of the water table, and is basically represented by the degree and organization of the broke up solids.

**Sources for Ground Water Pollution:** The contamination sources are indicated in the following list:

**Agricultural Sources:** Pesticides, manures, herbicides and creature waste are farming wellsprings of groundwater contamination.

**Industrial Sources:** Groundwater contamination happens when utilized water is come back to the hydrological cycle. Current monetary movement needs capacity of material utilized as a part of assembling, handling, and development. Along the route, some of this materials can be lost through spillage, or disgraceful taking care of. The transfer of squanders connected with the above exercises adds to another wellspring of groundwater defilement.

**Residential Sources:** These category contaminants are microbes, infections, nitrates from human waste. Infusion wells utilized for local waste water transfer (septic frameworks, cesspools, seepage wells for tempest water overflow, and groundwater revive wells) are of specific worry to groundwater quality if found near drinking water wells and paints, oils, meds, disinfectants, chemicals, pesticides, gas and diesel fuel can prompt groundwater pollution<sup>3</sup>.

**Sea Water Intrusion:** At the point when managing the abuse, rebuilding and administration of crisp groundwater in beach front aquifers, the key issue is ocean water interruption. Saltwater interruption is a kind of characteristic groundwater pollution, where the regular harmony in the middle of freshwater and saltwater in beach front aquifers is aggravated by groundwater withdrawals and other human exercises that lower the groundwater levels, lessen crisp groundwater stream to waterfront waters, and at last make saltwater interfere into the seaside aquifers, making those aquifers no more accessible for use. Saltwater interruption along the coasts, the bringing down of the water table by waste waterways can likewise prompt saltwater interruption<sup>4</sup>.

**Study Area:** Chennai, earlier known as Madras, is the capital city of the condition of Tamilnadu, and India's fourth biggest metropolitan city. It is situated on the Coromandel bank of the Bay of Bengal. The scope of the city is 13.04o N and longitude 80.17o E. The city covers a zone of 174 Km<sup>2</sup>. It is 368 years of age and the 31st biggest metropolitan territory on the planet. There are three water bodies viz., Adayar waterway, Coom stream and the Buckingham Canal. The Chennai Metropolitan region comprises of three areas, to be specific, Chennai city and the regions of Kancheepuram and Thiruvallur. The city is isolated on the premise of its sythesis into four noteworthy parts, North, South, West and Central Chennai.

## Maraimalai Nagar Town

Maraimalai Nagar Town is arranged in the south at a distance of 40 km from Chennai city. Maraimalai. It is arranged at 12°41'30" scope and 74°58'00": longitude. This town is named as Maraimalai Nagar in memory of Maraimalai Adigalar and has no legacy back-ground. The Municipality involved Kattankulathur, Potheri and Thirukatchur, Peramanur Villages. It is situated on the National Highway No: 45.

The town is isolated into 21 wards. The degree of the city range is 58.08 Sq.Km. There are around two hundred and twenty commercial ventures in the SIDCO Industrial Estate of the Town. The popular Ford (India) Ltd., and India Pistons, are arranged in the Industrial Estate. Eight Sampling stations were chosen from the study range, 1 each from diverse wards of the town. The number of inhabitants in the town is 81,361 as per 2011 registration.

Criteria for the selection of Bore Wells / Tube Wells / Hand pumps: For the choice of the groundwater quality study area, the accompanying criteria were remembered: i. Drinking water wells ii. Ells closer to the contaminating sources, similar to commercial enterprises, urban wastewater channels, trash, dumpsites and so forth. iii. Wells associated with regular contaminants like fluoride, iron, arsenic or such toxins.

Test accumulation, transport, protection and examination: Tests were gathered from one of the following three sorts of wells i. Open delved wells being used for household or watering system water supply, ii. Tube wells fitted with a hand-pump or a force driven pump for local water supply or watering system, iii. Hand Pumps, utilized for drinking<sup>5</sup>.

Open burrowed wells, which are not being used or have been surrendered, were not utilized for testing. For the accumulation of tests, a weighted specimen jug or sampler was utilized to gather the example from an open well. Tests from the creation tube were gathered subsequent to running the well for around 5 minutes. For bacteriological specimens, when gathered from tube wells/hand pump, the spout/outlet of the source was sanitized under fire by a soul light, before the accumulation of the example in the compartment. From open wells the specimens were gathered straightforwardly into pre-cleaned glass bottles<sup>6</sup>. The specimens were transported to the research center. The specimens were dissected instantly for parameters like Coliform, BOD, COD and supplements. Different parameters were broke down inside of a week's chance. The water tests for the follow component investigation were gathered in corrosive filtered polyethylene bottles, and safeguarded by including ultra immaculate nitric corrosive (2 mL/lit.). Tests for the pesticides examination were gathered in glass bottles, while tests for bacteriological investigations were gathered in disinfected high-thickness polypropylene/Glass jugs secured with aluminum foils. Every one of the specimens were put away in inspecting units kept up at 4°C and conveyed to the lab for definite concoction and bacteriological examinations<sup>7</sup>.

**Table-1**  
**Methods used for Estimation of Physical Parameter**

| Parameter               | Method                       |
|-------------------------|------------------------------|
| Colour                  | a. Visible Comparison Method |
| Electrical conductivity | Conductivity Meter           |
| pH Value                | pH Meter                     |
| Suspended solids        | Gooch crucible               |
| Temperature             | Thermometer                  |
| Total Dissolved solids  | Gravimetric                  |
| Turbidity               | Nephelometric                |

**Table-2**  
**Methods used for the Estimation of Chemical Parameters**

| Parameter       | Method                                |
|-----------------|---------------------------------------|
| Alkalinity      | Colour Indicator Titration            |
| Arsenic (As)    | Atomic Absorption Spectrophotometer   |
| Boron (as B)    | Colorimetric (Curcumine or Carmine)   |
| Cadmium (as cd) | Atomic Absorption Spectrophotometer   |
| Calcium (as ca) | Titrimetic (EDTA)                     |
| Fluoride (as F) | Distillation followed by colorimetric |
| Total Hardness  | Titrimetic (EDTA)                     |
| pH              | pH Meter                              |
| Iron (as Fe)    | Colorimetric (Phenanthroline)         |
| Temperature     | Thermometer                           |

## Results and Discussion

Alkalinity of all the values are above the normal limits, pH values of every one of the estimations lie beneath as far as possible and the Shade of the water of the sampling stations are drab, unscented the stations. The temperature of the station 1 is 24°C and whatever is left of alternate stations is 25°C. The convergence of cadmium in every one of the stations is beneath as far as possible.

The estimation of calcium is very low in station5 and the centralization of chloride is higher in station 2. The estimations of chromium in every one of the stations are beneath as far as possible.

possible and. The estimations of Chemical Oxygen Demand are normal. The fluoride values are beneath the cutoff. The estimations of aggregate hardness is over as far as possible in station 1 and the concentrations of iron is higher in station 3 and a station 4.

**Table-3**  
**Standards as per is Water Quality 10500**

| Parameter                   | Unit        | IS0500 Norms |
|-----------------------------|-------------|--------------|
| Alkalinity to methyl orange | mg/l        | 200          |
| Aluminium                   | mg/l        |              |
| Arsenic                     | mg/l        | 0.05         |
| Cadmium                     | mg/l        | 0.01         |
| Calcium                     | mg/l        | 75           |
| Chloride                    | mg/l        | 250          |
| Chromium                    | mg/l        | 0.05         |
| Colour                      | Hazen units | 10           |
| Conductivity                | µmhos/cm    | -            |
| Fluoride                    | mg/l        | 1.0          |
| Handness total              | mg/l        | 300          |
| Iron                        | mg/l        | 0.3          |
| Total Dissolved solids      | mg/l        | 500          |

Health Impacts of the results: Iron over-burden for the most part is brought about by the sickness, hemochromatosis. It is a hereditary infection brought on by a change (transformation) in a quality that is essential in constraining the ingestion of iron from the digestive tract. On the off chance that an individual is homozygous for a changed quality, that is, transformed qualities are found on both chromosomes that contain the quality, iron ingestion from the digestive tract is anomalous expanded. Thus, iron amasses in organs inside of the body. Thusly, in this circumstance, liver, heart, and pancreatic harm from the iron is profoundly likely, however not perpetual. On the off chance that an individual is heterozygous for a transformed quality, that is, stand out of the chromosomes contains a changed quality and the other chromosome contains an ordinary quality, there may be an increment in assimilation of iron. On the other hand, the increment in retention is less, and there is no unmistakable proof that organs are harmed. All people with relatives with hemochromatosis ought to have their qualities examined subsequent to the mutant qualities can be distinguished in many

patients who have them. This is prescribed principally to reveal people who are homozygous and, along these lines, would advantage by treatment before harm happens. Hereditary testing likewise recognizes people who are heterozygous (bearers). You recommend that you are a transporter, however hereditary testing is the best way to authoritatively decide your status- ordinary, heterozygous, or homozygous. On the off chance that you experience hereditary testing, it additionally may let you know something about your tyke. On the off chance that you have no changed qualities, your tyke ought to have no issue with the iron-containing water. That is on account of your kid would have typical qualities that would guarantee that the digestive tract does not assimilate unnecessary iron. (It's far-fetched that your youngster would get a transformed quality from your spouse unless your spouse's family has a past filled with hemochromatosis or maladies that may be connected with hemochromatosis, e.g., unexplained liver illness) . On the off chance that you have one quality that is transformed, your kid has a half risk of getting that quality. For this situation, testing your kid would figure out if or not he or she got the changed quality and is a bearer. Testing your youngster would be critical likewise on the grounds that he or she may get one changed quality from you and, however far-fetched, a second one from your spouse. In this unrealistic circumstance, your kid would have a high probability of creating hemochromatosis<sup>8</sup>. In the event that an individual has two ordinary qualities, he can drink water with elevated amounts of iron. On the off chance that he is heterozygous for a hemochromatosis transformation, he presumably ought to drink filtered water as opposed to water containing large amounts of iron, despite the fact that this may be pointless<sup>8</sup>. Obviously, on the off chance that he is homozygous for a hemochromatosis transformation, he ought to drink filtered water instead of watercontaining large amounts of iron. Also, he ought to be assessed by a doctor to figure out whether he obliges treatment to expel iron from his body and if there as of now has been harm to his organs. Alkalinity: In the event that the ground water is higher in alkalinity the bubbled rice gets to be yellowish and is not fit for drinking purpose.

### Conclusion

CPCB has given the accompanying suggestions to forestall ground water contamination, after a point by point overview in different metros in India. All the ground water extraction structures ought to be enlisted and directed to maintain a strategic distance from over misuse and weakening of ground water quality. The water got starting from the earliest stage structures ought to be tried and examined to guarantee the suitability of ground water for human utilization<sup>9</sup>. The ground water deliberation sources and their environment ought to be legitimately kept up to guarantee hygienic conditions and no sewage or dirtied water ought to be permitted to permeate specifically to the ground water aquifer. Proper concrete stages ought to be developed encompassing the ground water reflection sources to dodge<sup>10</sup>.

**Table-4**  
**Observed Physico - Chemical Parameters of the Sampling Stations during the Summer Season of the Study Area**

| S.NO. | Parameter       | Unit | Station 1 | Station 2 | Station 3 | Station 4 |
|-------|-----------------|------|-----------|-----------|-----------|-----------|
| 1     | Alkalinity      | mg/l | 328       | 312       | 418       | 418       |
| 2     | Arsenic (As)    | mg/l | <0.01     | <0.01     | <0.01     | <0.01     |
| 3     | Boron (as B)    | mg/l | <0.01     | <0.01     | <0.01     | <0.01     |
| 4     | Cadmium (as cd) | mg/l | <0.01     | <0.01     | <0.01     | <0.01     |
| 5     | Calcium (as ca) | mg/l | 102       | 57        | 45        | 45        |
| 6     | Fluoride (as F) | mg/l | 0.06      | 0.06      | 0.08      | 0.12      |
| 7     | Total Hardness  | mg/l | 426       | 124       | 132       | 132       |
| 8     | pH              | -    | 7.12      | 7.4       | 7.18      | 6.86      |
| 9     | Iron (as Fe)    | mg/l | 0.1       | 0.48      | 1.48      | 1.16      |
| 11    | Temperature     | °C   | 25.0      | 25.0      | 25.0      | 24.0      |

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