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**ASSESSMENT OF DRINKING WATER QUALITY
IN METTUR AND MECHERI REGIONS OF SALEM DISTRICT,
TAMILNADU WITH USING
JAL – TARA WATER TESTING KIT**

A THESIS

submitted by
TINKERING WORKSHOP STUDENTS



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With kind regards

(Tinkering workshop team.....)

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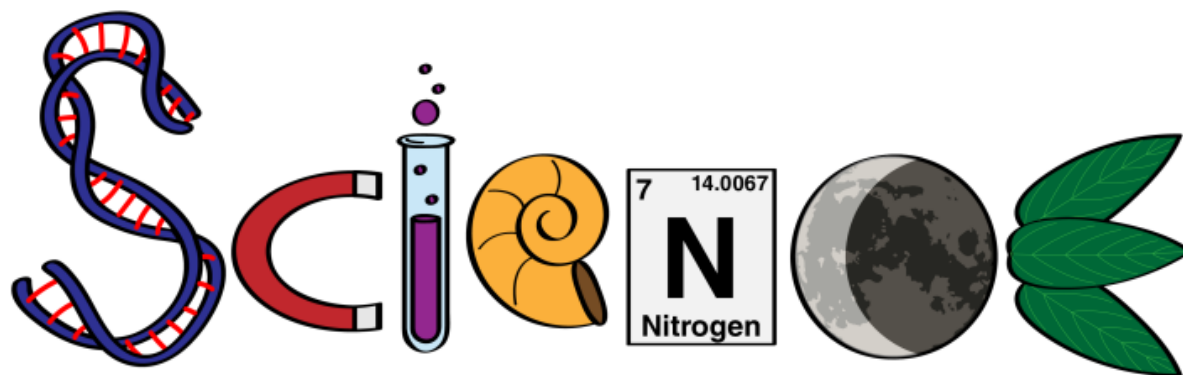
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ABSTRACT

A few water samples were collected from various sources, viz., open wells (OW), bore wells (BW), hand pumps (HP) and river water (oct- Dec 2019) from Mettur Taluk, Salem District. The physico-chemical parameters viz., Temperature, pH, Total Dissolved Solids, Total Hardness, nitrate, iron, turbidity, dissolved oxygen, ammonia, phosphorus, chloride, faecal pollution, residual chlorine, Total Alkalinity and Fluoride were determined for the water samples. Each Parameter was compared with the standard permissible limit prescribed by World Health Organization (WHO). The Water Quality Index (WQI) reflected that most of the samples are fit for drinking.



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INTRODUCTION





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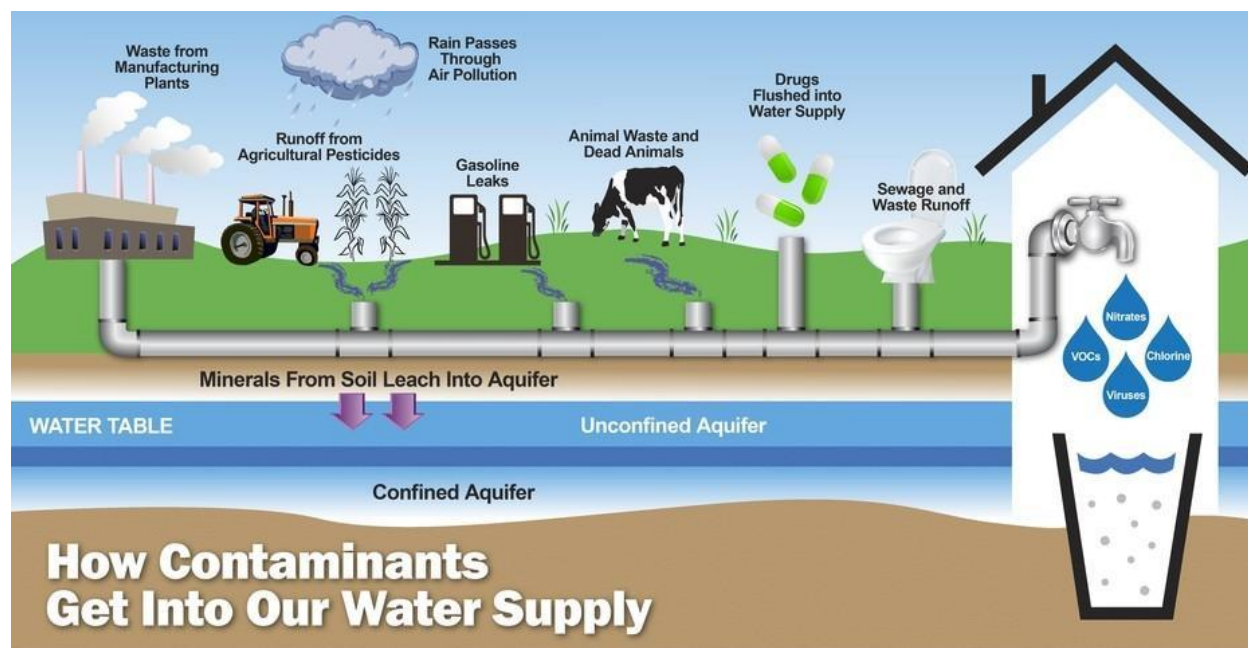


1. INTRODUCTION

Water is an indispensable natural resource and a unique substance on which all life depends. Urbanization, population growth, industrialization, modernization and discharge of untreated effluents from factories are the major factors of water pollution. Drinking water should satisfy the drinking water standards prescribed by World Health Organization (WHO). In India, research on the qualitative studies of groundwater especially with reference to fluoride has been carried out by various workers. The present study has an objective to characterize the quality of water samples for their potable status in Mettur Taluk, Salem District in Tamil Nadu.

Water Pollution

Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment. Water pollution affects plants and organisms living in these bodies of water. In almost all cases the effect damages individual species, populations of species, and also causes harm to the natural biological communities.



Surface water and groundwater are interrelated. Surface water seeps through the soil and



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becomes groundwater. Conversely, groundwater can also feed surface water sources. Sources of surface water pollution are generally grouped into two categories based on their origin.

1. Point sources

Point source water pollution refers to contaminants that enter a waterway from a single, identifiable source, such as a pipe line or a ditch. Examples of sources in this category include discharges from a sewage treatment plant, a factory, or a city storm water drain.

2. Non-point sources

Non-point source pollution refers to contamination that does not originate from a single discrete source. It is often the cumulative effect of small amounts of contaminants gathered from a large area. A common example is the leaching out of nitrogen compounds and pesticides from agricultural lands. Nutrient runoff in storm water from "sheet flow" over an agricultural field or a forest is also cited as examples of Non-Point Sources of pollution.



Other contaminants

Contaminants may include organic and inorganic substances. Organic water pollutants include:

- Detergents
- Disinfection by-products found in chemically disinfected drinking water, such as chloroform



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- Food processing waste, which can include oxygen-demanding substances, fats and grease
 - Insecticides and herbicides, a huge range of organ halides and other chemical compounds
 - Petroleum hydrocarbons, including fuels (gasoline, diesel fuel, jet fuels, and fuel oil) and lubricants (motor oil), and fuel combustion byproducts, from storm water runoff
 - Tree and bush debris from logging operations
 - Volatile organic compounds (VOCs), such as industrial solvents, from improper storage.
 - Chlorinated solvents, which are dense non-aqueous phase liquids (DNAPLs), may fall to the bottom of reservoirs, since they don't mix well with water and are denser.
 - Polychlorinated biphenyl (PCBs)
 - Trichloroethylene
 - Perchlorate
 - Various chemical compounds found in personal hygiene and cosmetic products
 - Drug pollution involving pharmaceutical drugs and their metabolites
- Inorganic water pollutants include:
- Acidity caused by industrial discharges (especially sulfur dioxide from power plants)
 - Ammonia from food processing waste
 - Chemical waste as industrial by-products
 - Fertilizers containing nutrients--nitrates and phosphates—which are found in storm water runoff from agriculture, as well as commercial and residential use
 - Heavy metals from motor vehicles (via urban storm water runoff) and acid mine drainage
 - Silt (sediment) in runoff from construction sites, logging, slash and burn practices or land clearing sites.



Pathogens

Disease-causing microorganisms are referred to as pathogens. Although the vast majority of bacteria are harmless or beneficial, a few pathogenic bacteria can cause disease. Coliform bacteria are a commonly used bacterial indicator of water pollution, although not an actual cause of disease. Other microorganisms sometimes found in surface waters which have caused human health problems include:

- *Burkholderia pseudomallei*
- *Cryptosporidium parvum*
- *Giardia lamblia*
- *Salmonella*
- Novovirus and other viruses
- Parasitic worms (helminths).

High levels of pathogens may result from inadequately treated sewage discharges.

RAINFALL AND CLIMATE

The district receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the district. Rainfall data from four stations over the period 1901-2003 were utilized and a perusal of the analysis shows that the normal annual rainfall over the district varies from about 800 mm to 1600 mm. It is the minimum around Sankari (800 mm) in the southwestern part of the district. It gradually increases towards north, northeast and east and attains a maximum around Yercaud (1594.3 mm) in the northern part. The district enjoys a tropical climate.

The weather is pleasant during the period from November to January. Mornings in general are more humid than the afternoons, with the humidity exceeding 75% on an average. In the period June to November the afternoon humidity exceeds 60% on an average. In the rest of the year the afternoons are drier, the summer afternoons being the driest. The hot weather begins early in March, the highest temperature being reached in April and May. Weather cools down progressively from about the middle of June and by December; the mean daily maximum temperature drops to 30.2°C, while the mean daily minimum drops to 19.2°C and 19.6°C in January in Salem and Mettur Dam respectively.



Chemical contaminants in drinking-water

Ammonia

The term ammonia includes the non-ionized (NH_3) and ionized (NH_4^+) species. Ammonia in the environment originates from metabolic, agricultural and industrial processes and from disinfection with chloramine. Natural levels in groundwater and surface water are usually below 0.2 mg/l. Anaerobic groundwaters may contain up to 3 mg/l. Intensive rearing of farm animals can give rise to much higher levels in surface water. Ammonia contamination can also arise from cement mortar pipe linings. Ammonia in water is an indicator of possible bacterial, sewage and animal waste pollution.

Ammonia is a major component of the metabolism of mammals. Exposure from environmental sources is insignificant in comparison with endogenous synthesis of ammonia. Toxicological effects are observed only at exposures above about 200 mg/kg body weight.

Ammonia in drinking-water is not of immediate health relevance, and therefore no health-based guideline value is proposed. However, ammonia can compromise disinfection efficiency, result in nitrite formation in distribution systems, cause the failure of filters for the removal of manganese and cause taste and odour problems.

Chloride

Chloride in drinking-water originates from natural sources, sewage and industrial effluents, urban runoff containing de-icing salt and saline intrusion. The main source of human exposure to chloride is the addition of salt to food, and the intake from this source is usually greatly in excess of that from drinking-water.

Excessive chloride concentrations increase rates of corrosion of metals in the distribution system, depending on the alkalinity of the water. This can lead to increased concentrations of metals in the supply. No health-based guideline value is proposed for chloride in drinking-water. However, chloride concentrations in excess of about 250 mg/l can give rise to detectable taste in water.



Chlorine

Chlorine is produced in large amounts and widely used both industrially and domestically as an important disinfectant and bleach. In particular, it is widely used in the disinfection of swimming pools and is the most commonly used disinfectant and oxidant in drinking-water treatment. In water, chlorine reacts to form hypochlorous acid and hypochlorites.

Concentrations of chlorate and some perchlorates increase in hypochlorite solutions upon storage at high ambient temperatures or when new hypochlorite is added to old hypochlorite.

Fluoride

Fluorine is a common element that is widely distributed in Earth's crust and exists in the form of fluorides in a number of minerals, such as fluorspar, cryolite and fluorapatite. Traces of fluorides are present in many waters, with higher concentrations often associated with ground waters. In some areas rich in fluoride-containing minerals, well water may contain up to about 10 mg of fluoride per litre, although much higher concentrations can be found. High fluoride concentrations can be found in many parts of the world, particularly in parts of India, China, Central Africa and South America, but high concentrations can be encountered locally in most parts of the world.

Virtually all foodstuffs contain at least traces of fluorine. All vegetation contains some fluoride, which is absorbed from soil and water. Tea in particular can contain high fluoride

Concentrations and levels in dry tea are on average 100 mg/kg.

Fluoride is widely used in dental preparations to combat dental caries, particularly in areas of high sugar intake. These can be in the form of tablets, mouthwashes, toothpaste, varnishes or gels for local application. In some countries, fluoride may also be added to table salt or drinking-water in order to provide protection against dental caries. The amounts added to drinking-water are such that final concentrations are usually between 0.5 and 1 mg/l. The fluoride in final water is always present as fluoride ions, whether from natural sources or from artificial fluoridation.



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Total daily fluoride exposure can vary markedly from one region to another. This will depend on the concentration of fluoride in drinking-water and the amount drunk, levels in foodstuffs and the use of fluoridated dental preparations. In addition, fluoride exposure in some areas is considerably higher as a consequence of a range of practices, including the consumption of brick tea and the cooking and drying of food with high-fluoride coal.

Hardness

Hardness in water is caused by a variety of dissolved polyvalent metallic ions, predominantly calcium and magnesium cations. It is usually expressed as milligrams of calcium carbonate per litre. Hardness is the traditional measure of the capacity of water to react with soap, hard water requiring considerably more soap to produce a lather.

Natural and treated waters have a wide range of mineral content, from very low levels in rainwater and naturally soft and softened water to higher levels in naturally hard waters. Bottled and packaged waters can be naturally mineralized or naturally soft or demineralized. Thus, the mineral consumption from drinking-water and cooking water will vary widely, depending upon location, treatment and water source.

Drinking-water can be a contributor to calcium and magnesium intake and could be important for those who are marginal for calcium and magnesium. Where drinking- water supplies are supplemented with or replaced by demineralized water that requires conditioning, consideration should be given to adding calcium and magnesium salts to achieve concentrations similar to those that the population received from the original supply. Modification of calcium and magnesium concentrations in drinking-water for health reasons should comply with the technical requirements to provide water suitable for distribution.

Iron

Iron is one of the most abundant metals in Earth's crust. It is found in natural fresh waters at levels ranging from 0.5 to 50 mg/l. Iron may also be present in drinking- water as a result of the use of iron coagulants or the corrosion of steel and cast iron pipes during water distribution. Iron is an essential element in human nutrition, particularly in the iron(II) oxidation state. Estimates of the minimum daily requirement for iron depend on age, sex, physiological status and iron bioavailability and range from about 10 to 50 mg/ day.



Nitrate

Nitrate (NO_3^-) is found naturally in the environment and is an important plant nutrient. It is present at varying concentrations in all plants and is a part of the nitrogen cycle. Nitrite (NO_2^-) is not usually present in significant concentrations except in a reducing environment, as nitrate is the more stable oxidation state. It can be formed by the microbial reduction of nitrate and in vivo by reduction from ingested nitrate. Nitrite can also be formed chemically in distribution pipes by *Nitrosomonas* bacteria during stagnation of nitrate-containing and oxygen-poor drinking-water in galvanized steel pipes or if chloramination is used to provide a residual disinfectant.

Nitrate can reach both surface water and groundwater as a consequence of agricultural activity (including excess application of inorganic nitrogenous fertilizers and manures), from wastewater disposal and from oxidation of nitrogenous waste products in human and animal excreta, including septic tanks. Surface water nitrate concentrations can change rapidly owing to surface runoff of fertilizer, uptake by phytoplankton and denitrification by bacteria, but groundwater concentrations generally show relatively slow changes. Some groundwaters may also have nitrate contamination as a consequence of leaching from natural vegetation.

In general, the most important source of human exposure to nitrate and nitrite is through vegetables (nitrite and nitrate) and through meat in the diet (nitrite is used as a preservative in many cured meats). In some circumstances, however, drinking-water can make a significant contribution to nitrate and, occasionally, nitrite intake. In the case of bottle-fed infants, drinking-water can be the major external source of exposure to nitrate and nitrite.

In humans, methaemoglobinaemia is a consequence of the reaction of nitrite with haemoglobin in the red blood cells to form methaemoglobin, which binds oxygen tightly and does not release it, thus blocking oxygen transport. Although most absorbed nitrite is oxidized to nitrate in the blood, residual nitrite can react with haemoglobin. High levels of methaemoglobin (greater than 10%) formation in infants can give rise to cyanosis, referred to as blue-baby syndrome. Although clinically significant methaemoglobinaemia can occur as a result of extremely high nitrate intake in adults and children, the most familiar situation is its occurrence



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in bottle-fed infants. This was considered to be primarily a consequence of high levels of nitrate in water, although there have been cases of methaemoglobinaemia in weaned infants associated with high nitrate intake from vegetables.

Bottle-fed infants are considered to be at greater risk because the intake of water in relation to body weight is high and, in infants, the development of repair enzymes is limited. In clinical epidemiological studies of methaemoglobinaemia and subclinical increases in methaemoglobin levels associated with drinking-water nitrate, 97% of cases occurred at concentrations in excess of 44.3 mg/l, with clinical symptoms associated with the higher concentrations. The affected individuals were almost exclusively under 3 months of age.



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2. OBJECTIVE OF THE STUDY.

The main objective of this study is to assess the quality of water from the various sources of drinking water in Mettur and mechari regions. Specifically, the present study seeks to:

- Determine the physicochemical quality of water.
- Identify the possible sources of contamination.
- Evaluate the spatial similarities or differences between sampling sites.
- Compare the various parameters with World Health Organization's (WHO) guideline values
- Survey and selection of sites for ground water samples Open well and Bore well (OW and BW) which mainly includes in Mettur and Mechari regions.
- Investigation of physico-chemical aspects of collected samples. To find pH, Electrical Conductivity, Chlorides, Total Dissolved Solids (TDS), Total hardness, Dissolved Oxygen (DO), Calcium, Magnesium, Sodium, Potassium and Alkalinity.
- Comparative data between OW and BW in relation with water quality standard.
- In order to specify the present ground water and open well water for portability and use for other purposes (Domestic and Industrial).
- Integration of data for WQI interpretation.
- Awareness among the public.
- Accurate and timely information of the quality of water is necessary to shape, sound public policy and to implement water quality improvement program effectively and efficiently



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Details of Study Area

Mettur Taluk situated between $11^{\circ}48'$ to $11^{\circ}80'N$ and $77^{\circ}48'$ to $77^{\circ}80'E$ is one of the nine Taluks of the District of Salem in Tamil Nadu. The Taluk covers an area of 14.55 km^2 . Mettur is 52 km North West of Salem Town. The Mettur dam, a source of power generation, built by the British in 1934 is one of the best in the country and it attracts a large number of tourists. The area is usually arid and semiarid with temperature varying from $18.9^{\circ}C$ to $37.9^{\circ}C$. The geographical formation of study area comprises hard rock types of granites, charnockite, dunite, mica, pyroxenite, and quartzite. The study area receives rainfall in the South-West (SW) monsoon and North-East (NE) monsoon. Steel and Cottage industries have been established in the Taluk. Figure 1 depicts the Districts of Tamil Nadu and map of the study area with sampling sites.



Sampling site 1 : Nangavalli



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Sampling site 2: Thermal power plant



Sampling site 3: Mettur dam



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Sampling site 4: Jalagandapuram Lake

Administrative Details of salem district

Salem district is having administrative divisions of 9 taluks, 20 blocks, 376 Panchayats and 631 Revenue villages.

Basin and sub-basin

The district is a part of Cauvery and Ponnaiar river basins and Sarabanga, Tirumanimuttar, Vasista and Suveda are the important watersheds/sub basins.

Drainage

Salem district is drained by tributaries of Cauvery and Vellar rivers. Cauvery river, which is perennial in nature, flows along the western and southern boundaries of the district.

Sarabanga and Tirumanimuttar are important tributaries of Cauvery river and originate in the Shevroy hills. The Swetha and Vasishta rivers are tributaries of Vellar river. The Swetha river originates in the Kollimalai and flows eastwards and joins the Vellar river. The Vasishta river originates in the chitteri hills and flows southwards and joins the Vellar river. In general, the district is characterized by dentritic drainage.



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Fig.1 District in Tamil Nadu and map of the study area with sampling sites



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MATERIALS AND METHODS



3. MATERIALS AND METHODS

Water samples from the 4 selected sites were collected from open wells (OW), bore wells (BW), hand pumps (HP) and river water (RW). All the samples were analyzed by following the standard guidelines.

3.1 Physico-chemical analysis

The collected samples were analyzed for major physical and chemical water quality parameters (Table 1) using standard procedures. All the parameters are expressed in milligram per litre (mg/l) except pH (units).

Table 1 Methods of analysis and instrumental details

Parameters	Method
Physical parameters	
1. pH	pH paper
2. TDS	TDS meter
3. temperature	Thermometer (Jal – tara water testing kit)
4. turbidity	Turbidity tubes
Chemical parameters	
1. Total Hardness	Volumetry - EDTA method
2. Total Alkalinity	A1 and A2 solution (Jal – tara water testing kit)
3. Fluoride	Zirconyl alzarine (Jal – tara water testing kit)
4. phosphorus	Ammonium molybdate (Jal – tara water testing kit)
5. iron	Reagent Fe A and B
6. nitrate	NEDA
7. dissolved oxygen	Starch and sodium thiosulphate
8. residual chlorine	Ortho toluidine
9. chloride	Silver nitrate
10. ammonia	Nessler reagent



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RESULTS



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4. RESULTS

4.1 Physico-chemical parameters and potable status of water samples

The summary of the physico-chemical parameters for the ground water samples and their potable status for the Mettur Taluk in the pre-and post-monsoon seasons.





1. SITE OBSERVATION RECORD SHEET- METTUR DAM (sampling site)

Sampling site: Mettur

Site name: mettur dam date: 5-10-19 Time: 10:00am

Code No: _____ collected by: team -A

Site description

Location mettur dam

Environmental conditions (weather, climate) humid

General Observations normal

Surroundings

Upstream (causes): no symptoms

Note presence and characteristics of:

Litter? yes

Faeces? no

Household effluents? yes

Factory/industry effluents? yes

Animals (drinking, bathing)? yes

Bank stability/soil erosion? no

Riverbank vegetation? no

Habitat destruction/ rehabilitation? no

Agricultural runoff? no

Washing directly at the water (pump, well or river)? yes

Downstream (usage)

Describe the water uses observed: bathing, drinking, washing, irrigation, factory plants, recreation, etc?

REPORTING:

PH (units) 7.33 units

nitrate: 46.4 mg/l

Temperature ($^{\circ}\text{C}$): 27.2 $^{\circ}\text{C}$

iron: 0.33 mg/l

Faecal coliform: no yes or no

hardness: 41 mg/l

Fluoride: 1.3 mg/l

chlorides: 354 mg/l

Dissolved oxygen Residual chlorine (min) 8.2 mg/l

ammonia - mg/l

Phosphorous - mg/l Turbidity (NTU) 6 NTU

alkalinity 400 mg/l



WATER QUALITY DATA RECORD – METTUR DAM (sampling site)

Sl. NO	Parameter (mg/l)	Observed value	Standard permissible/ desirable limits		remarks
			Drinking water	River water	
1.	PH (units)		6.5 – 8.5	7.33	
2.	Temperature ($^{\circ}\text{C}$)			27.2	
3.	Faecal coliform		absent	-	
4.	flouride		1 – 1.5	1.3	
5.	Dissolved oxygen	$X_1 \times 20$		8.2	
6.	Residual chlorine (min)		0.2	0.5	
7.	phophorous			-	
8.	nitrate		45	46.4	
9.	iron		0.3 – 1.0	0.3	
10.	hardness	$X_2 \times 400$	300 - 600	41	
11.	chlorides	$X_3 \times 354.5$	250 - 1000	354	
12.	ammonia		-	-	
13.	Turbidity (NTU)		5 - 10	6	
14.	alkalinity	$X_4 \times 400$	200 - 500	400	

X_1 = Amount of sodium thiosulphate consumed in ml

X_2 = Amount of EDTA consumed in ml

X_3 = Amount of silver Nitrate consumed in ml

X_4 = Amount of Al – 1 consumed in ml



2. SITE OBSERVATION RECORD SHEET- THERMAL POWER PLANT

Sampling site: mettur
Site name: Thermal power plant date: 19.10.19
Time: 10.30am
Code No: B collected by: TEAM B

Site description

Location Thermal power plant
Environmental conditions (weather, climate) rainy
General observations normal
Surroundings
Upstream (causes):
Note presence and characteristics of:

Litter? no
Faeces? no
Household effluents? no
Factory/industry effluents? yes
Animals (drinking, bathing)? no
Bank stability/soil erosion? no
Riverbank vegetation? yes
Habitat destruction/ rehabilitation? yes
Agricultural runoff? no
Washing directly at the water (pump, well or river)? no

Downstream (usage)

Describe the water uses observed: bathing, drinking, washing, irrigation, factory plants, recreation,

REPORTING:

PH (units) <u>7.32</u> units	nitrate: <u>47.5</u> mg/l
Temperature (⁰ C): <u>27.8</u> ⁰ C	iron: <u>0.35</u> mg/l
Faecal coliform: <u>no</u> yes or no	hardness: <u>40</u> mg/l
Fluoride: <u>1.5</u> mg/l	chlorides: <u>354</u> mg/l
Dissolved oxygen Residual chlorine (min) <u>8.6</u> mg/l	ammonia <u>-</u> mg/l
Phosphorous <u>-</u> mg/l Turbidity (NTU) <u>.2</u> NTU	alkalinity <u>410</u> mg/l



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WATER QUALITY DATA RECORD- THERMAL POWER PLANT

Sl. NO	Parameter (mg/l)	Observed value	Standard permissible/ desirable limits		remarks
			Drinking water	Thermal power plant	
1.	PH (units)		6.5 – 8.5	7.32	
2.	Temperature ($^{\circ}\text{C}$)			27.8	
3.	Faecal coliform		absent	absent	
4.	flouride		1 – 1.5	1.5	
5.	Dissolved oxygen	$X_1 \times 20$		8.6	
6.	Residual chlorine (min)		0.2	0.2	
7.	phopporous			-	
8.	nitrate		45	47.5	
9.	iron		0.3 – 1.0	0.3	
10.	hardness	$X_2 \times 400$	300 - 600	40	
11.	chlorides	$X_3 \times 354.5$	250 - 1000	708	
12.	ammonia		-	-	
13.	Turbidity (NTU)		5 - 10	7.5	
14.	alkalinity	$X_4 \times 400$	200 - 500	410	

X_1 = Amount of sodium thiosulphate consumed in ml

X_2 = Amount of EDTA consumed in ml

X_3 = Amount of silver Nitrate consumed in ml

X_4 = Amount of Al – 1 consumed in ml



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3.SITE OBSERVATION RECORD SHEET - NANGAVALLI

Sampling site: mettur

Sampling site: Nanagavalli

Site name: vanavasi date: 2.11.19 Time: 10.30am

Code No: A collected by: TEAM C

Site description

Location Vanavasi

Environmental conditions (weather, climate) rainy

General observations normal

Surroundings

Upstream (causes): no symptoms

Note presence and characteristics of:

Litter? no

Faeces? no

Household effluents? no

Factory/industry effluents? no

Animals (drinking, bathing)? yes

Bank stability/soil erosion? no

Riverbank vegetation? yes

Habitat destruction/ rehabilitation? yes

Agricultural runoff? no

Washing directly at the water (pump, well or river)? no

Downstream (usage)

describe the water uses observed: bathing, drinking, washing, irrigation, factory plants, recreation,

REPORTING:

PH (units) 7.3 units

nitrate: 45 mg/l

Temperature ($^{\circ}\text{C}$): 27.3 $^{\circ}\text{C}$

iron: 0.35 mg/l

Faecal coliform: no yes or no

hardness: 46 mg/l

Fluoride: 1 mg/l

chlorides: 357 mg/l

Dissolved oxygen Residual chlorine (min) 8.55 mg/l

ammonia - mg/l

Phosphorous - mg/l Turbidity (NTU) 8.5 NTU alkalinity 360 mg/l



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WATER QUALITY DATA RECORD

Sl. NO	Parameter (mg/l)	Observed value	Standard permissible/ desirable limits		remarks
			Drinking water	Thermal power plant	
1.	PH (units)		6.5 – 8.5	7.3	
2.	Temperature ($^{\circ}\text{C}$)			27.3	
3.	Faecal coliform		absent	absent	
4.	flouride		1 – 1.5	1	
5.	Dissolved oxygen	$X_1 \times 20$		8.55	
6.	Residual chlorine (min)		0.2	0.25	
7.	phophorous			-	
8.	nitrate		45	45	
9.	iron		0.3 – 1.0	0.35	
10.	hardness	$X_2 \times 400$	300 - 600	46	
11.	chlorides	$X_3 \times 354.5$	250 - 1000	357	
12.	ammonia		-	-	
13.	Turbidity (NTU)		5 - 10	8.5	
14.	alkalinity	$X_4 \times 400$	200 - 500	360	

X_1 = Amount of sodium thiosulphate consumed in ml

X_2 = Amount of EDTA consumed in ml

X_3 = Amount of silver Nitrate consumed in ml

X_4 = Amount of Al – 1 consumed in ml



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4. SITE OBSERVATION RECORD SHEET – JALAGANDAPURAM

Sampling site: mettur

Site name: Jalagandapuram date: 9.11.19 Time: 11.30am

Code No: A collected by: TEAM D

Site description

Location Jalagandapuram

Environmental conditions (weather, climate) rainy

General observations normal

Surroundings

Upstream (causes): no symptoms

Note presence and characteristics of:

Litter? no

Faeces? no

Household effluents? no

Factory/industry effluents? yes

Animals (drinking, bathing)? yes

Bank stability/soil erosion? no

Riverbank vegetation? yes

Habitat destruction/ rehabilitation? no

Agricultural runoff? no

Washing directly at the water (pump, well or river)? no

Downstream (usage)

Describe the water uses observed: bathing, drinking, washing, irrigation, factory plants, recreation,

REPORTING:

PH (units) 7.35 units

nitrate: 45.2 mg/l

Temperature ($^{\circ}\text{C}$): 27.5 $^{\circ}\text{C}$

iron: 0.35 mg/l

Faecal coliform: no yes or no

hardness: 42.5 mg/l

Fluoride: 1.2 mg/l

chlorides: 354 mg/l

Dissolved oxygen Residual chlorine (min) 8.1 mg/l

ammonia - mg/l

Phosphorous - mg/l Turbidity (NTU) 5.7 NTU alkalinity 300 mg/l



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WATER QUALITY DATA RECORD - JALAGANDAPURAM

SI. NO	Parameter (mg/l)	Observed value	Standard permissible/ desirable limits		remarks
			Drinking water	jalagandapuram	
1.	PH (units)		6.5 – 8.5	7.35	
2.	Temperature ($^{\circ}\text{C}$)			27.5	
3.	Faecal coliform		absent	absent	
4.	flouride		1 – 1.5	1.2	
5.	Dissolved oxygen	$X_1 \times 20$		8.1	
6.	Residual chlorine (min)		0.2	0.25	
7.	phophorous			-	
8.	nitrate		45	45.2	
9.	iron		0.3 – 1.0	0.35	
10.	hardness	$X_2 \times 400$	300 - 600	42.5	
11.	chlorides	$X_3 \times 354.5$	250 - 1000	354	
12.	ammonia		-	-	
13.	Turbidity (NTU)		5 - 10	5.7	
14.	alkalinity	$X_4 \times 400$	200 - 500	300	

X_1 = Amount of sodium thiosulphate consumed in ml

X_2 = Amount of EDTA consumed in ml

X_3 = Amount of silver Nitrate consumed in ml

X_4 = Amount of Al – 1 consumed in ml



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4.1 pH VALUE

The pH is a measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. It has no direct adverse effect on health, however, a low value, below 4.0 will produce sour taste and higher value above 8.5 shows alkaline taste. A pH range of 6.5 – 8.5 is normally acceptable. In the present study, the fluctuation of pH in the samples is from 7.32 to 7.53

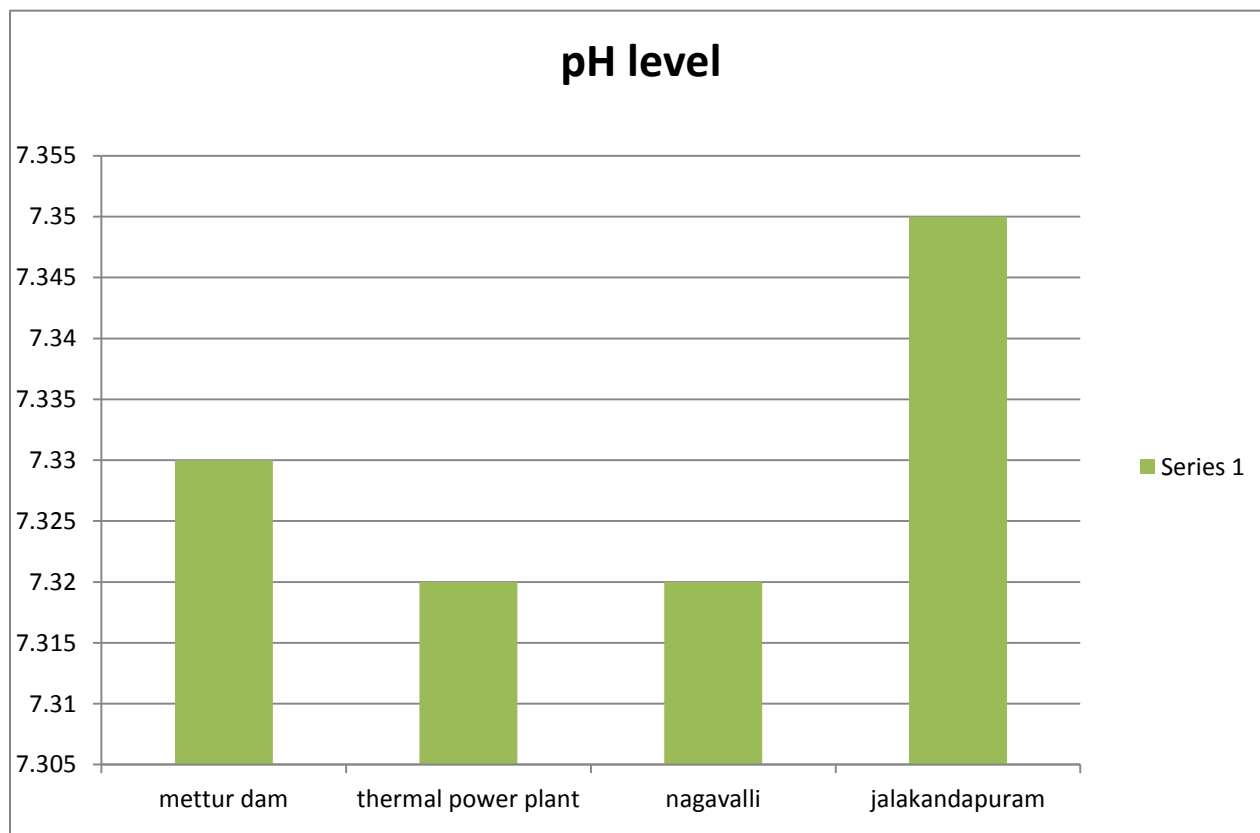


Table .4.2. Average pH level of the samples from different areas.





4.3 TEMPERATURE

It is found that the temperature of the water supplied to the mettur dam nangavalli,thermal power plant, nangavalli within the permissible limit. As the result in figure 4.1 shows the Temperature of the tap water collected from mettur dam nangavalli,thermal power plant, nangavalli during winter. (oct-dec -2019)

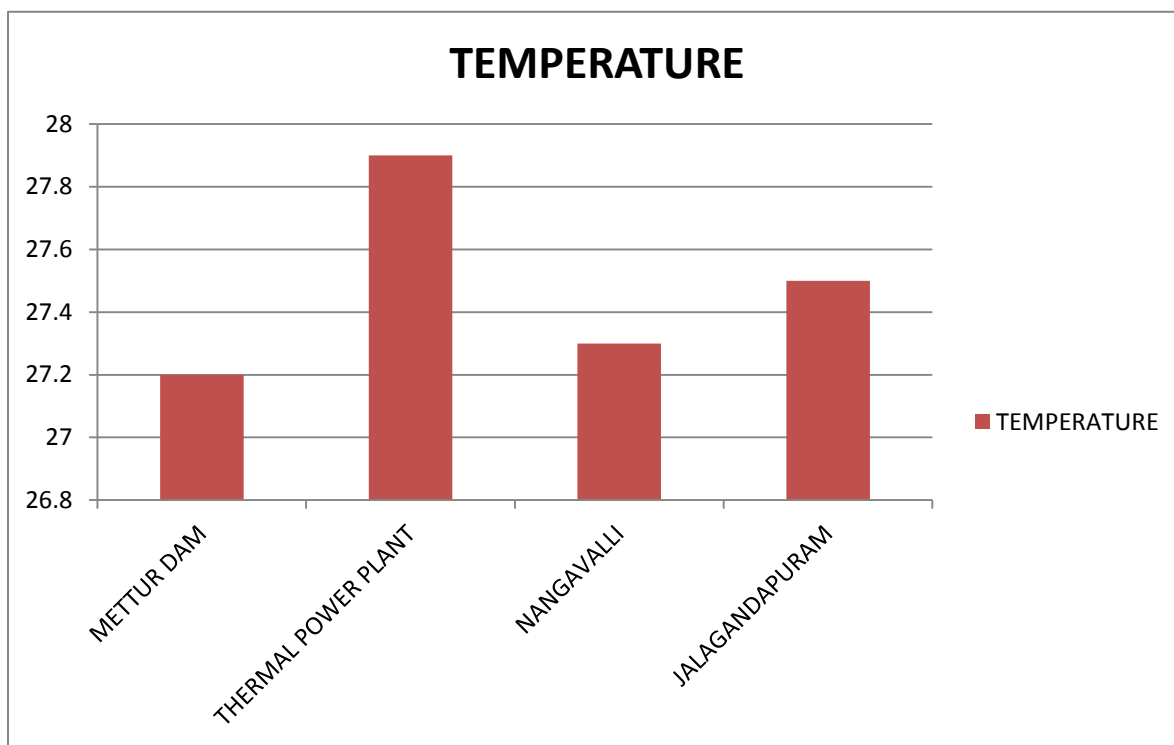


Table . 4.3. Average temperature of the samples from different areas.





4.4 TOTAL SOLIDS AND TOTAL SUSPENDED SOLIDS

Total Dissolved Solids may be considered as salinity indicator for classification of groundwater. The TDS in groundwater is due to the presence of Calcium, Magnesium, Sodium, Potassium, Bicarbonate, Chloride and Sulphate ions. In the study area TDS varied from 145 to 175 mg/l. As prescribed limit of TDS for drinking water is 500 mg/l, all the water samples have TDS concentration well below the prescribed limit. Total Suspended Solids in the study area varied from 2.419 to 2.863 mg/l.

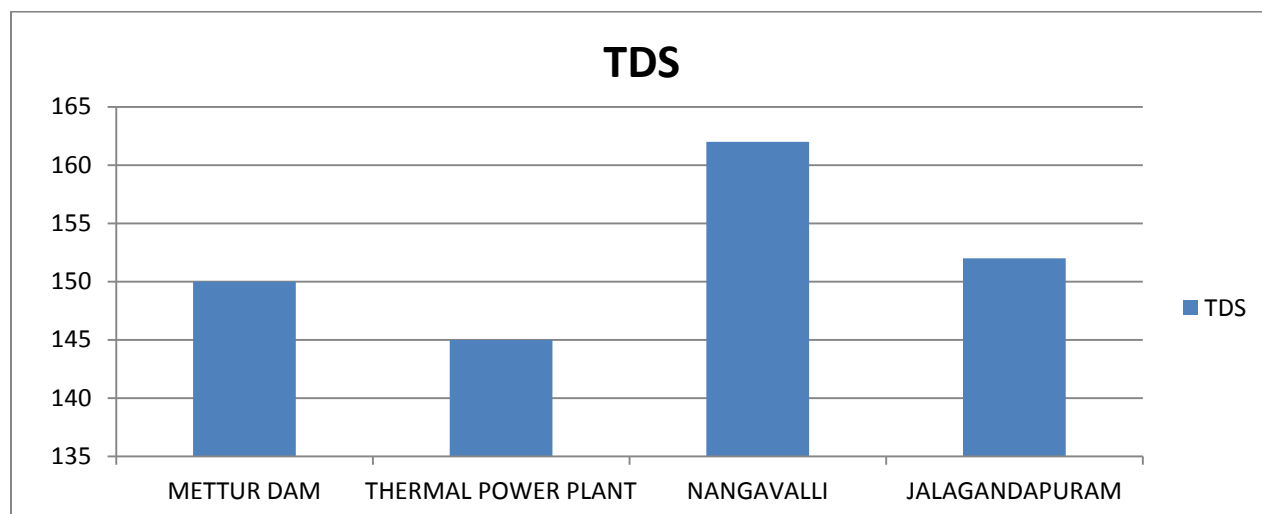


Table .4.4. Average TDS of the samples from different areas.





4.5 DISSOLVED OXYGEN (DO)

Dissolved oxygen content in water reflects the physical and biological processes prevailing in water and is influenced by aquatic vegetation. Low oxygen content in water is usually associated with organic pollution. DO is ranged from 8.61 to 8.96 mg/l in the study area, where as the prescribed limit for DO is 5.0 mg/l.

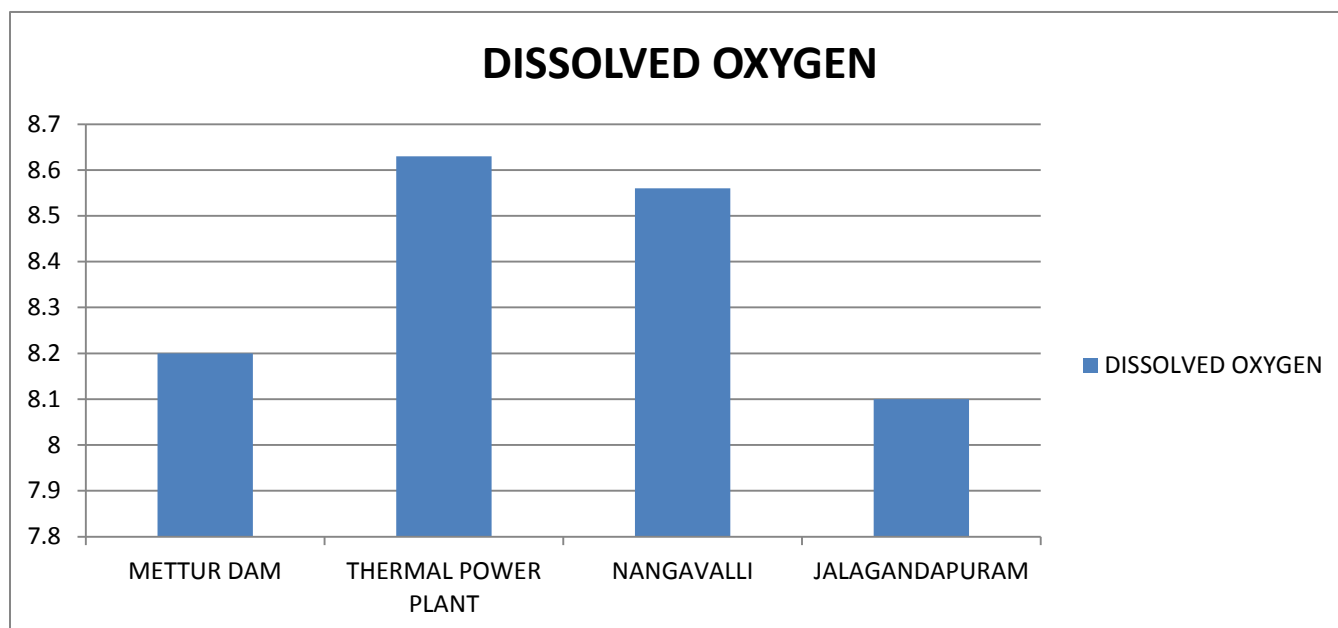


Table .4.5 Average DO of the samples from different areas.





4.6 CHLORIDE

In the study area there is no significant change in chloride concentration and it ranged from 21.0 to 21.4 mg/l. Chloride which have been associated with pollution as an index are found below the permissible value set at 250 mg/l in most of the study area. Chloride in excess (> 250 mg/l) imparts a salty taste to water and people who are not accustomed to high Chlorides can be subjected to laxative effects.

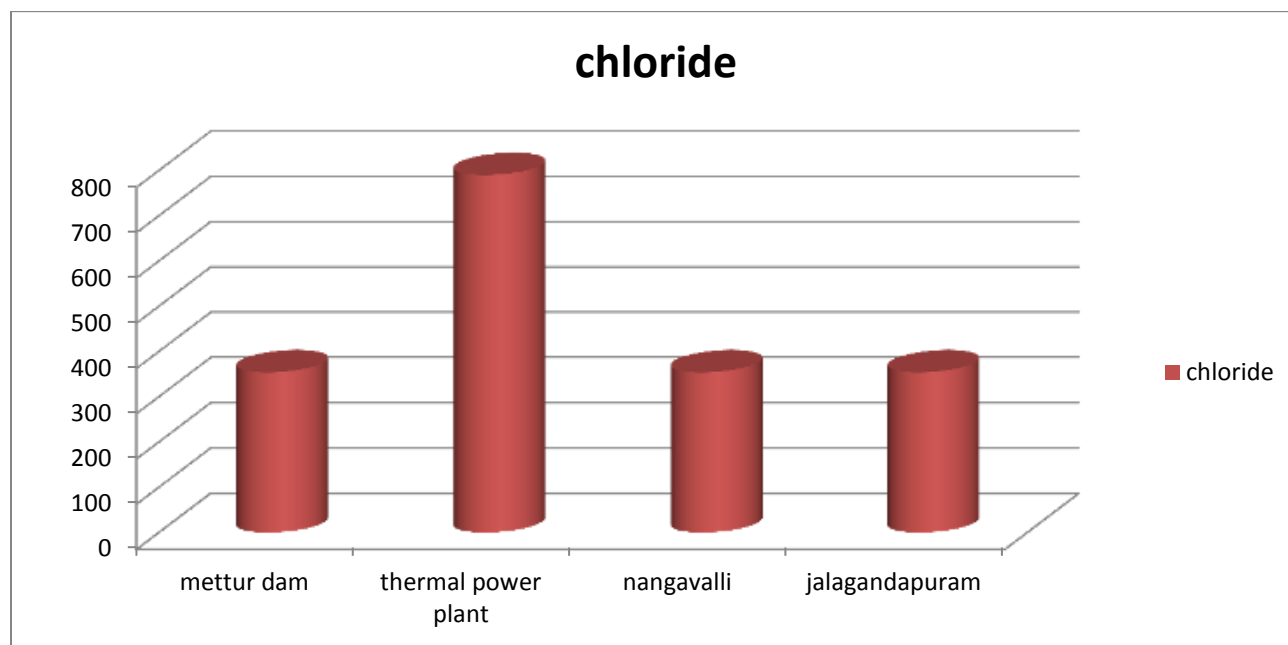


Table .4.6 Average chloride present in the samples from different areas





4.7 TOTAL HARDNESS

Hardness of water is objectionable from the view point of water use for laundry and domestic purposes since it consumes a large quantity of soap. Based on present investigation, hardness varied from 40.2 to 45.2mg/l. However the permissible limit of Hardness for drinking water is 300 mg/l (IS 10500). The no of water samples of the study area can be classified as given in table 4.7.

Classification of the water according to hardness

TDS Range	Description
0-60	Soft
61-120	Moderately hard
121-180	Hard
>180	Very hard

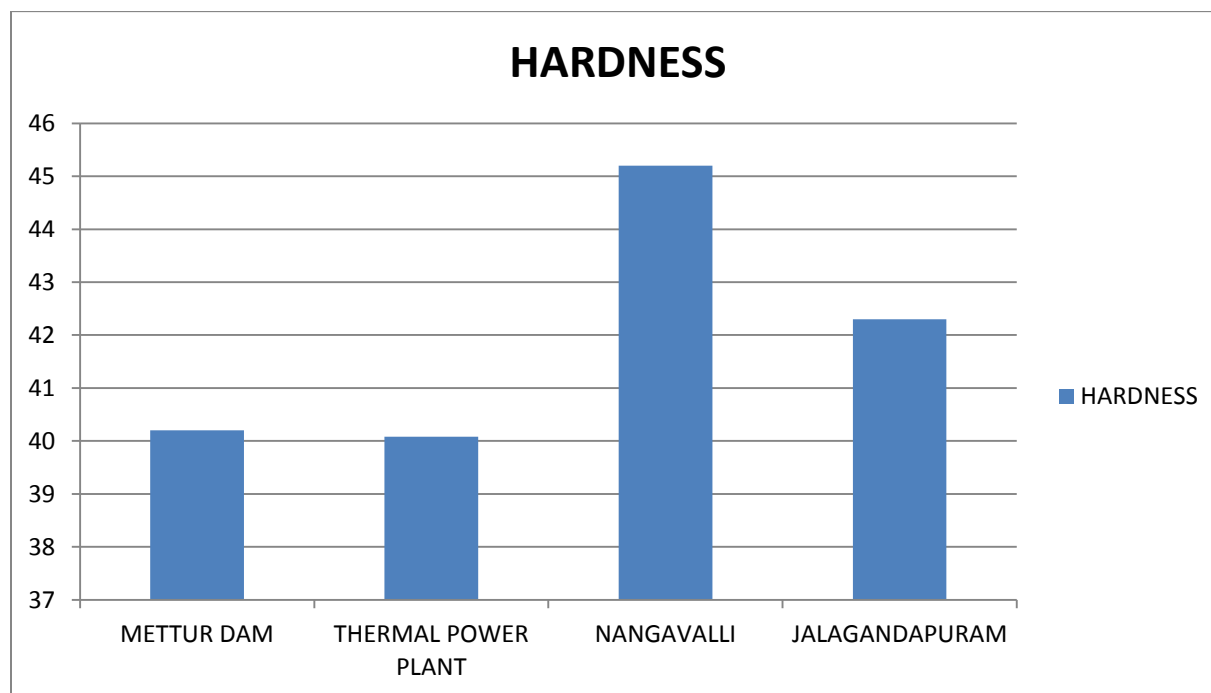


Table .4.7 Average hardness of the water samples from different areas



4.8 ALKALINITY

In the present study Phenolphthalein Alkalinity was absent in all samples and Methyl Orange Alkalinity was ranged from 200mg/l to 500mg/l, this indicates the absence of Hydroxyl and Carbonate and presence of Bicarbonate. However the prescribed limit for Total Alkalinity is 300-500 mg/l

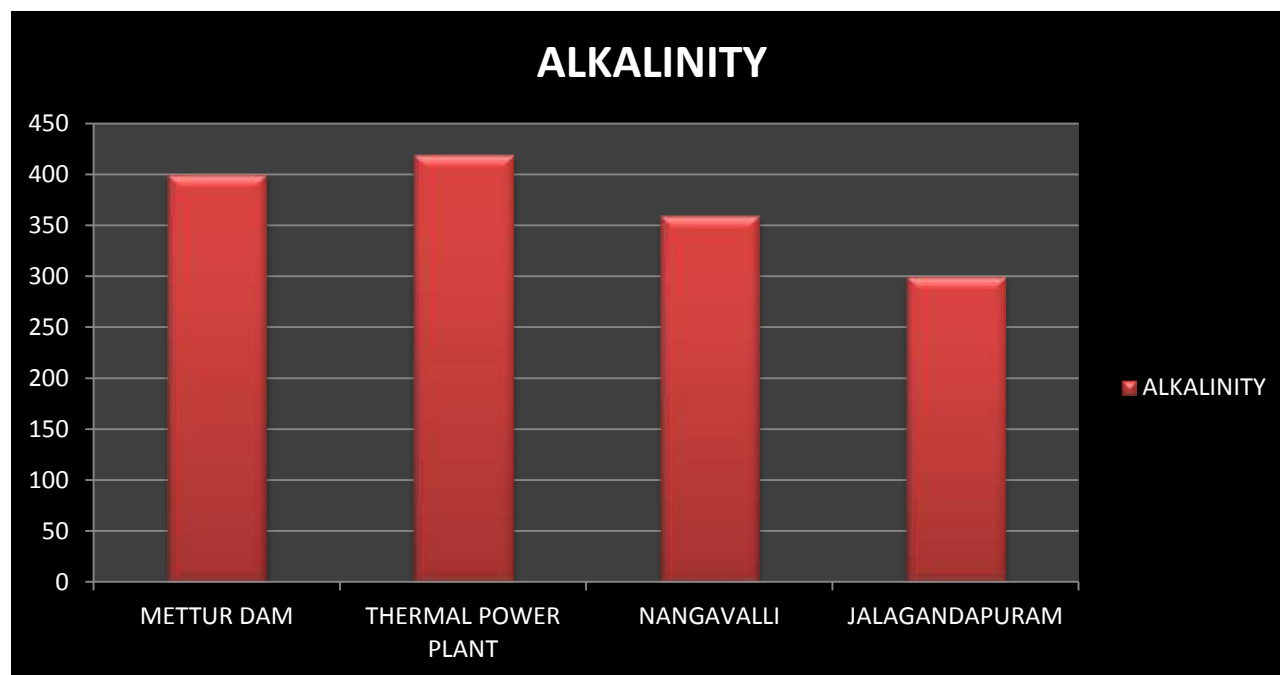


Table.4.8. Average Alkalinity of the water samples from different areas.





4.9 Nitrate

In the study area there is no significant change in nitrate concentration and it ranged from 45 to 50 mg/l. nitrate which have been associated with pollution as an index are found below the permissible value set at 46 mg/l in most of the study area.

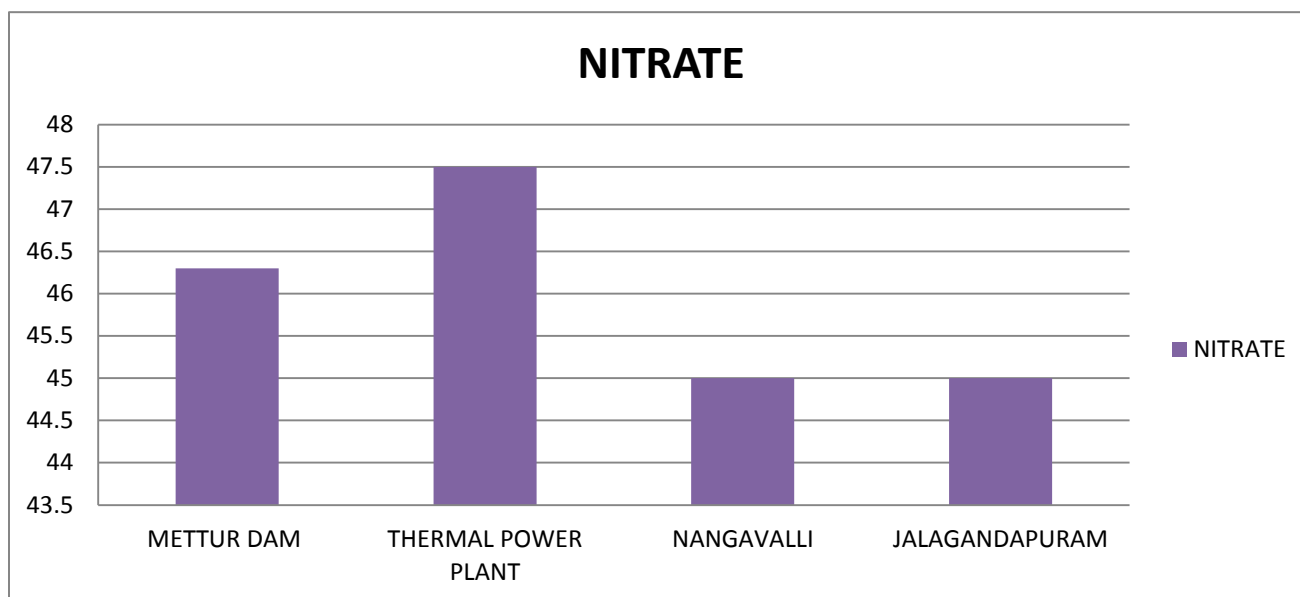


Table .4.9. Average nitrate of the water samples from different areas.





4.10 Fluoride

In the study area there is no significant change in fluoride concentration and it ranged from 1 to 1.5 mg/l. fluoride which have been associated with pollution as an index are found below the permissible value set at 1 mg/l in most of the study area.

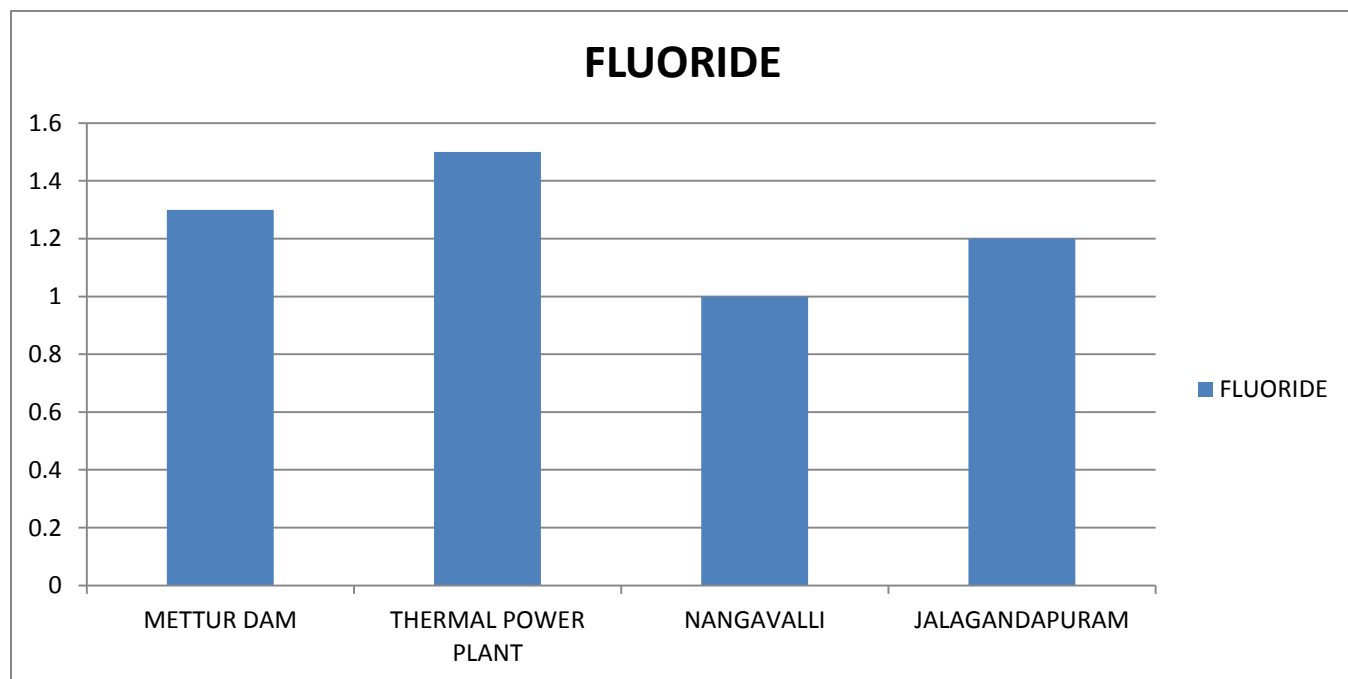


Table .4.10. Average of the water samples from different areas.





4.11 overall parameters of the water samples from different areas

Si. no	Parameter (mg/l)	Mettur Dam	Thermal power plant	Nangavalli	Jalagandapuram
1.	PH (units)	7.3	7.32	7.3	7.35
2.	Temperature (⁰ C)	27.2	27.89	27.3	27.5
3.	Faecal coliform	ab	ab	ab	ab
4.	flouride	1.3	1.5	1	1.2
5.	Dissolved oxygen	8.2	8.6	8.55	8.1
6.	Residual chlorine (min)	0.25	0.27	0.25	0.25
7.	phophorous	-	-		-
8.	nitrate	46.4	47.5	45	45.2
9.	iron	0.33	0.50	0.35	0.35
10.	hardness	41	40	46	42
11.	chlorides	354	708	354	354
12.	ammonia	-	-	-	-
13.	Turbidity (NTU)	6	7.2	5.5	5.7
14.	alkalinity	400	410	360	300

Table .4.11. Overall parameters of the water samples from different areas



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CONCLUSION



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5. CONCLUSION

The average ranges of physical and chemical characteristics of water quality are as per the ground water quality. The pH ranges from 7.3 to 7.4. The Turbidity, TDS ranged from 6 to 7 NTU, 145 to 175 mg/l respectively. The value of Turbidity was found to be within the permissible limit in all the. Hardness, ranged from 40 to 46 mg/l and it is found that the water supplied to the study area is soft. The Chloride and Alkalinity were in the range of 354 to 710mg/l and 200 to 500 mg/l respectively. The parameters studied resemble the drinking water quality.



- ❖ This picture shows explaining about water contaminants in drinking water by our student with local peoples.



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