



# Assessment of Groundwater Quality in Mondaikadu in Kanyakumari District

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## Abstract:

Water is the most important element in our daily life. Water used for the various purposes like drinking, domestic and industrial purposes. In this study the effect of ground water near coconut retting area and intrusion of salt water is analyzed through the tests. The ground water is being polluted due to various natural as well as artificial factors. Groundwater in mandaikadu near kanyakumari coconut husk retting area is being affected by the coconut husk that is being soaked in water and this water might get mixed with the ground water aquifer resulting in contamination. The water samples were collected from eleven wells and nine bore holes. The location of the wells (Latitude, Longitude and elevation) was determined by using the instrument GPS-72 H. Among the twenty samples taken, ten samples were good for use and the most suitable sample for use was from the location belonging to: Latitude: 8°9.651'N, Longitude: 77°17.137'E Elevation: 62.7.

**Keywords:** Water quality, Ground water, coconut husk, contamination of water.

## 1. INTRODUCTION

Water is the important source for all living organisms in the world. Pure water is the chemical compound of molecules contains two hydrogen and one oxygen atoms. Whenever the rain water flows over the ground surface various particles will pick up the flowing water it includes dissolved solids, suspended solids, sewage waste, human waste, pesticides and human waste. These particles will affect the quality of water and human life. To ensure the safety of water the water must be treated safely and there limits should be within the permissible limits. In this study we are collecting the water samples and identifying the quality of different samples. Kanyakumari district is receiving the rainfall under the influence of both south west and northwest monsoon. Most of the time this district receives the rainfall due to the cyclonic storm effect caused in the depression of Bay of Bengal. The normal annual rainfall varies between 826 to 1456mm. The south west monsoon contributes the little part of rainfall over the year. But the North West monsoon contributes the significant effect of precipitation. The highest humidity recorded in May with the value of 95 % whereas the minimum of 45% is recorded during February. The maximum wind speed is recorded 17.74 km/hr during August and the minimum wind speed of 5.53 km/hr is recorded during December. Wind velocity is less from October to December. The Sun Shine Hours is March-April forms the average bright sunshine hours. The maximum of 12.74 hrs/day has been recorded during April and the minimum of 5.74 hrs/day is recorded during November. The temperature data indicate higher and lower temperatures prevailed during monsoon period. The average maximum temperature during May is 35.93°C. The average minimum temperature recorded is 23.85°C during January. The annual mean minimum and maximum temperatures are 23.78 and 33.95°C respectively.

## 2. LITERATURE REVIEW

There are three articles explained how the ground water quality is affecting by various factors like geological and geographic.

Erb *et al*, explained the karst aquifer settings for the western great lakes in north America states. The main issue of this paper describes effectiveness of executing the recommendation of karst task force report on maintaining the ground water quality in the states. Four countries were studied for change in water quality (brown water incidents and detection of bacteria) by estimating the years before and after 2007. Two of the countries studied and adopted that winter manure spreading restriction on snow covered shows the significant reduction in the brown water incidents and also the well water quality problems. Pitkanen *et al*, articles determines the chemical and biological characteristics of drinking water in 20 water supply wells in Finland. He evaluated for enteric pathogens like Giardia, Cryptosporidium, Campylobacter, noroviruses and various indicator microbes. Determination of some fecal indicator bacteria and enteric pathogens, including Giardia, has exposed a surface water interaction in some of the wells. Their study is significant because most water supplies in the country serving drinking water without disinfection treatment. The paper by Bellia *et al*, mentioned a thorough geochemical and isotopic explanation of a groundwater system in at Mt. Etna Volcano (Sicily, Italy) to better define the groundwater characteristics of its aquifers. This study revealed that the geochemical composition varied in parts of the volcano, with most of the groundwater being the Na-Mg Ca-HCO<sub>3</sub> type. Rainfall is the dominant source of recharge to the aquifers, although seawater mixing is important in coastal areas. Diffusion of gases formation controlled by tectonic structures in the volcano, and the ascent of deep brines also plays a important role. This article explaining the groundwater quantity and quality issues face a water-rich part of the world in the western Great Lakes region of the United States. Luczaj and Masarik describe a comprehensive overview of this topic for the state of Wisconsin. Despite the fact that the region contains some of the world's most abundant surface and groundwater supplies, residents of this state face some significant groundwater quantity and quality problems. Over exploitation of confined and unconfined aquifers have led to significant drawdown in some areas, with unconfined aquifer

drawdown affecting surface water resources. Water quality concerns are generally more significant issues, but vary in origin and severity throughout the place. Naturally evolving contaminants include radium, arsenic and associated heavy metals, fluoride, strontium, and others. Anthropogenic contaminants are nitrate, bacteria, viruses, etc. The broad coverage of groundwater quantity and quality issues in the paper will allow it to distribute as a solid foundation reference for researchers in the region.

### 3. STUDY AREA

The Kanyakumari district has been selected for the present study. It is present at the bottom most part of India. It is one of

the most popular districts of Tamil Nadu. The study area is surrounded by Kerala state in western part, Tirunelveli district of Tamil Nadu at Northern part, Indian Ocean at Southern part, Bay of Bengal at Eastern part and the South West part is covered by Arabian Sea. Kanyakumari Districts is one of the smallest districts in the state having an area of 1584 square kilometer, of which 1541.3 square kilometer falls in rural area and the remaining part falls in urban area. The district lies between 77°06'36"E and 77°36'E longitude and 8°05'24"N and 8°35'24"N latitude. The coastal line extends over 58 Kms and is almost regular except for some points and land projecting into the sea at Kanyakumari. The base map has been prepared from the toposheet in 1:50000 scale.

**Table 1.1 Locations of the samples.**

SAMPLE	LATITUDE	LONGITUDE	ELEVATION
1	8°9.678'N	77°16.724'E	49.3
2	8°9.7'N	77°16.729'E	64.8
3	8°9.665'N	77°16.753'E	37.2
4	8°9.650'N	77°16.755'E	45.6
5	8°9.617'N	77°16.866'E	78.2
6	8°9.6'N	77°16.910'E	49.7
7	8°9.642'N	77°16.954'E	34.4
8	8°9.579'N	77°17.071'E	51.7
9	8°9.571'N	77°17.086'E	50.4
10	8°9.573'N	77°17.032'E	77.3
11	8°9.589'N	77°17.032'E	86.1
12	8°9.586'N	77°17.061'E	81.6
13	8°9.607'N	77°17.027'E	54.7
14	8°9.641'N	77°17.056'E	93.1
15	8°9.647'N	77°17.030'E	141.3
16	8°9.596'N	77°17.13'E	80.9
17	8°9.609'N	77°17.181'E	127
18	8°9.628'N	77°17.161'E	146.7
19	8°9.161'N	77°17.137'E	105.7
20	8°9.651'N	77°17.137'E	62.7



**Figure.1.1. Base Map of the Study area.**

### 4. METHODOLOGY

- Preparing the topo sheets for the study area
- Identifying the potential zones of the region to extract the datas.

- Samples to be collected and testing in the laboratory for finding the physical, chemical and biological characteristics of water.
- Comparing the test results with WHO standards for quality of water.

- Making the feasible solution to improve the ground water quality.

## 5. CHARACTERISTICS OF WATER.

### 5.1 Physical Characteristics of Water.

#### 5.1.1 Test for colour.

The transparency of water is analyzed through observation of naked eye.

#### 5.1.2 Test for odour.

The sample is filled in odourless bottle and observed for odour after shaking for two to three seconds.

#### 5.1.3 Determination of pH

The pH value of water was found using pH meter and pH paper.

#### 5.1.4 Determination of turbidity

The turbidity of water is analyzed using digital turbidity meter

#### 5.1.5 Calculation of Total solids, Suspended solids and dissolved solids

The total solids present in water were determined from the residues left after evaporation and drying of the unfiltered sample. The dissolved solids were determined after passing the water through filter paper and evaporating the sample.

Suspended solids=Total solids-Dissolved solids

### 5.2 chemical characteristics of water

#### 5.2.1 Determination of Total Hardness

The total hardness of water was determined by using EBT(Erichrome Black-T)as indicator titrated against EDTA

(Ethylene Diamine Tetra Acetic acid)and end point was the change of wine red to steel blue.

#### 5.2.2 Determination of Permanent Hardness

The permanent hardness of water was determined by using EBT(Erichrome Black-T)as indicator and ammonia as buffer solution, titrated against EDTA (Ethylene Diamine Tetra Acetic acid)and end point was the change of steel blue to wine red.

#### 5.2.3 Determination of chlorides

The presence of chloride ions in sample was determined using potassium chromate as indicator and the sample is titrated against silver nitrate. The end point is the change of colour from yellow to brick red.

#### 5.2.4 Determination of Total Alkalinity

The sample is titrated against standard sulphuric acid (0.02 N)against the water sample using Methyl Orange as the indicator. The end point is the appearance of pink colour.

#### 5.2.5 Determination of dissolved Oxygen

Water sample of 250ml was taken in BOD bottle,1ml of manganese sulphate,1ml of potassium iodide solution and 1.2 ml of sulphuric acid was pipetted into the BOD bottle. Allow the solution to settle which leads to the appearance of brown colour.20ml sample is taken from the prepared solution and titrated against sodium thio- sulphate which changes to yellow colour. A few drops of starch is added to the solution and titrated against sodium thio- sulphate.

## 6. RESULTS AND DISCUSSION.

Table.2. Test Result for 20 samples

sample	ph	Total Solids (mg/l)	Chlorides	alkalinity	Total hardness	Per. hardness	Tem. hardness	Dissolved oxygen	Bio Chemical demand	Fecal coliform
1	4.55	1	307.4	175	427.5	180.5	247	8.61	145.38	0
2	5.02	0	49.98	145	57	655.5	-598.5	10.42	66.75	0
3	4.94	1	49.98	155	142.5	427.5	-285.5	7.69	52.88	140
4	5.07	0	102.47	185	190	57	133	5.83	46.13	0
5	5.05	0.5	199.93	230	427.5	475	-47.5	4.88	69.5	0
6	5.09	1	87.47	490	114	142.5	-28.5	8.61	34.75	0
7	5.05	1	77.48	115	142.5	76	66.5	8.76	58.13	890
8	6	0.5	599.84	160	0	85.5	-85.5	5.83	47.5	0
9	7	3	0	710	475	76	399	6.23	50.11	0
10	6	1.5	474.85	950	57	57	0	4.88	75.63	30
11	6	0.5	1174.64	130	0	95	-95	5.83	59.75	10
12	5	1	162.45	675	47.5	142.5	-95	6.75	35.88	0
13	7	0	324.9	245	57	123.5	-66.5	4.82	33.43	0
14	5	1	124.96	250	0	95	-96	3.92	23.63	0
15	6	2.5	189.9	230	171	95	76	3.92	33.88	740
16	6	0.5	107	175	180.5	152	28.5	7.69	48	0
17	7	0.5	92.5	165	114	114	0	8.61	24	1270
18	5	4	94.97	100	123.5	142.5	-19	7.69	36.63	0
19	5	1.5	114.96	80	142.5	142.5	0	11.32	36.63	0.6
20	7	3	117.91	150	114	142.5	-28.5	4.88	92.5	370
Maximum standars	8.5	1500	600	400	600	600	600	7	150	10
Minimum standars	6.5	500	250	200	200	200	200	6	50	<10

**Table.2 Evaluation of samples used for drinking**

Parameters	Class based on quality			Sample tested	
	Good	Moderate	unsuitable	consume	Un consumable
Ph	6.5-7.5	7.5-8.5	>8.5, <6.5	9, 13,17,20	1-8, 10-12, 14-16, 18, 19
Total solids	<500	500-1500	>1500	1-20	-
chlorides	<200	200-600	>600	1-10, 12-20,	11
alkalinity	<200	200-400	>400	1-5, 7, 8, 11, 13-20	6, 9, 10, 12
Total Hardness	<200	200-600	>600	1-20	-
Temporary hardness	<200	200-600	>600	1-20	-
Permenant hardness	<200	200-600	>600	1, 3-20	2
Dissolved oxygen	<6	6.00- 7.00	>7	4,5, 8-15, 20	1-3, 6, 7, 16-18
BOD	<50	50 -150	>150	1-20	-
Fecal Caliform	0	< or = 10	>10	1, 2, 4, 5-9, 11-14, 16, 18, 19	3, 7, 10, 15, 17, 20

Samples numbered 4, 13, 14 are good to be used for various purposes like domestic and industrial uses. Samples 3 and 7 have been noted that they are worst for usage.

## 7. CONCLUSION.

In coastal area of the study area, the excessive use of groundwater has allowed the normal freshwater –saltwater interface to move both inland and never the ground surface. The intrusion of saltwater may be due over exploitation of groundwater near the coast for coconut plantation, domestic and industrial purposes. Efforts are being made to maintain groundwater levels by ponding surface runoff or river water. This will recharge the groundwater table. The installation of deep recharge wells has been able to control saltwater intrusion by creating a ridge of groundwater. Some barriers wells are constructed near the shore are used to collect saltwater and induce freshwater gradient towards the sea. Thus recharge wells, recharge basins and barriers wells are extremely useful in maintaining the proper hydraulic gradient between fresh and saline water. In and around the study area the rainwater harvesting may be practiced, this may improve the groundwater quality.

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