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GEOCHEMICAL BEHAVIOUR ON GROUND WATER AND SOIL QUALITY IN THE VICINITY OF INDUSTRIAL AREA, KATHIYAVADI

Sharpudin J*, Balakumar K, Dhayalan E, Gopi P.

* Department of Civil Engineering, C.Abdul Hakeem College of Engineering and Technology, Melvisharam, Tamilnadu, India.

[1,2]Assistant Professor and [3,4]Students in Department of Civil Engineering, C.Abdul Hakeem College of Engineering and Technology, Melvisharam, Tamilnadu, India.

ABSTRACT

In the current study, the Kathiyavadi village in the vicinity of industrial zone was assessed for its Ground Water and Soil quality status. In this area, majority of the industries are Tanning and Leather Industries. In the present study, 6 locations have been chosen within the Kathiyavadi Village, for monitoring the Water Quality Analysis. The soil samples were collected in the different depth of 0-10cm, 10-30cm, 30-60cm respectively in Agriculture Zone and Lake Zone in Kathiyavadi industrial zone. The testing was conducted to determine their Physio-Chemical Analysis. The results were compared with the Bureau of Indian Standards (BIS) and IS Codes to check whether the samples are within the prescribed limits. The soil samples has shown that the pH ranges from 8.23-14.4 in agricultural zone, lake zone pH ranges from 12.2-14.4, EC shows the maximum of 0.3 m/mho, 0.4 m/mho in agricultural zone and lake zone in different depth , Organic Carbon ranges from 0.02% -0.014% in agricultural zone, lake zone shows 0.017%-0.028%, Sodium shows the ranges from 2ppm-10ppm, Potassium ranges from 1ppm-2ppm in both zones. Hence, this industrial effluents can affects the ground water resources, soil quality and agricultural productions in the selected zone.

KEYWORDS: Ground water, Industries, Soil, Agriculture Soil.

INTRODUCTION

Soil is a natural body consisting of layers (soil horizons) of mineral constituents of variable thickness, which differ from the parent materials in their morphological, physical, chemical, and mineralogical characteristics. Soil is composed of particles of broken rock that have been altered by chemical and mechanical processes that include weathering and erosion. Especially the industries are developing in major cities and metropolitan city of the country. But in the mean while, biodiversity of the surrounding area of the industry would be destroyed .In major industrial areas, soil gets contaminated by the industrial activities. Heavy metal pollution is a problem associated with areas of intensive industries. Zinc, copper, cadmium and lead are four of the most common heavy metals. Toxic pollutants may percolate down via soil profile and reach in ground water, which ultimately cause the health hazards among human being and livestock after consumption as daily drinking requirements. The waste water without any treatment may cause adverse effect on the health of human, domestic animals, wildlife and environment. Contaminated ground water has deteriorated the drinking water and impacts on soil systems and crop productivity. Tannery waste characteristically contains a complex mixture of both organic and inorganic pollutants. Groundwater pollution is an introduction of certain pollutants into the groundwater which reduces the quality of groundwater making its use very limited, or in some cases impossible many different chemicals and various synthetic products we use today are usually the main causes of groundwater pollution Industrial growth is causing urban and industrial pollution. Rapid increase in urbanization and industrialization leads in to deterioration in groundwater quality which causes pollution.

MATERIALS AND METHODS

GENERAL

According to Census 2011 information the location code or village code of Kathiyavadi village is 630535. Kathiyavadi village is located in Wallajah Tehsil of Vellore district in Tamil Nadu, India. The total geographical area of village is 732.26 hectares. The Kathiyavadi has a total population of 3,525 peoples and males were 1,728 females are 1,797. There are about 828 houses in Kathiyavadi village.

Figure 1. Sampling Location of Kathiyavadi Industrial Site

Sample Details

Soil samples were collected in the area of Kathiyavadi near industrial sites. Two types of soil samples were collected; one at near the lake and another at the agriculture area near by industrial site. Soil samples were collected at three different depth intervals namely, 0-10, 10-30, and 30-60 cm from top surface.

The sampling bottles were made of plastic, usually polyethylene. The bottles were soaked with 10% HCl for 24 hours and then thoroughly cleaned and rinsed with distilled water. Water samples were collected from bore wells in the vicinity of industrial region Kathiyavadi.

Soil sample preparation, processing and storage

Soil samples collected at near industrial sites were air dried to a constant weight, sieved to < 150 micron through a stainless steel sieve. Then the soil samples were further homogenized with the help of mortar and pestle and preserved in clean plastic containers for subsequent use.

Figure 2. Soil Preservation and Storage

PHYSIO – CHEMICAL ANALYSIS OF SOIL AND GROUNDWATER

Each sample at different depth intervals were undergone several tests for determining the soil quality. Ten grams of soil was mixed with 100 mL of distilled water (10:1 liquid to solid ratio) and shaked in a mechanical shaker

for 18 h. The water extracts were analyzed for the parameters such as pH, electrical conductivity, total dissolved solids (TDS), chlorides, total hardness, COD, sodium and potassium.

Figure 3. Testing of Physico - Chemical parameters

RESULTS AND DISCUSSION
GENERAL
The physio-chemical parameters of the samples have been determined from different depth and locations in Kathiyavadi Village. The Testing was conducted to analyze the Industrial Zone soil samples in the depth of were (0-10 cm, 10-30 cm, 30-60 cm) respectively, where the locations were surrounded by leather industries. The Testing was conducted to analyze the water samples. The six water samples were collected in Kathiyavadi where the locations are surrounding by leather industries.

Results for Physio-Chemicals analysis of the Soil Samples

| S.No	Parameters	Units	Agriculture Zone			Lake Zone		
			10cm	30cm	60cm	10cm	30cm	60cm
1.	pH	-	8.23	9	14.45	12.6	12.76	14.4
2.	EC	dS/m	0.2	0.3	0.2	0.4	0.2	0.2
3.	TDS	mg/L	76	65	61	67	68	74
4.	Chloride	mg/L	52.35	54.84	104.7	72.29	64.81	59.83
5.	COD	mg/L	340	710	1040	1540	830	1170
6.	BOD	mg/L	450	1070	1520	1860	1120	1360
7.	Specific Gravity	-	2.32	2.41	2.2	2.3	2.3	2.29
8.	Carbon	%	0.02	0.014	0.004	0.022	0.028	0.017
9.	Moisture content	%	13.64	6	9.9	15.74	17.32	19.29
10.	Na	Ppm	2	7	10	7	8	10
11.	K	Ppm	1	1	1	2	2	1

pH
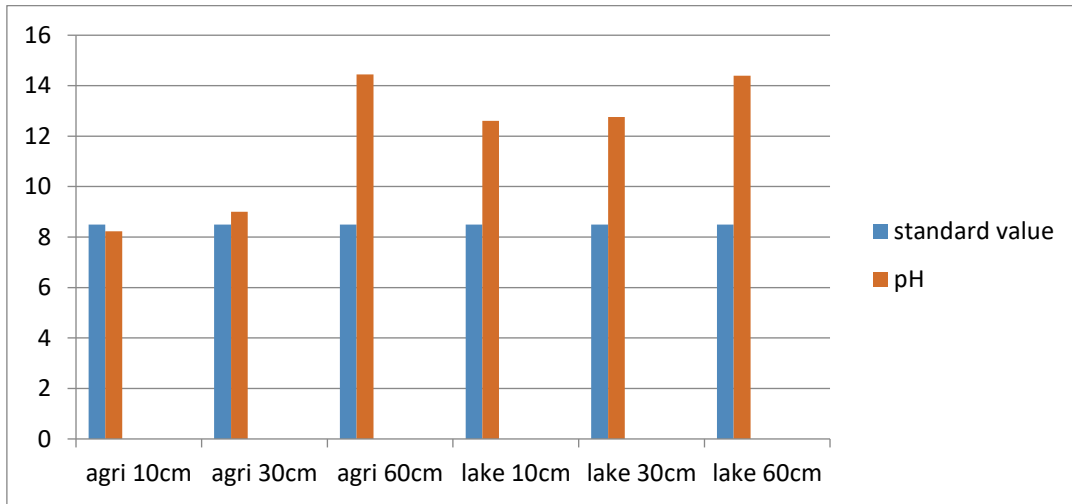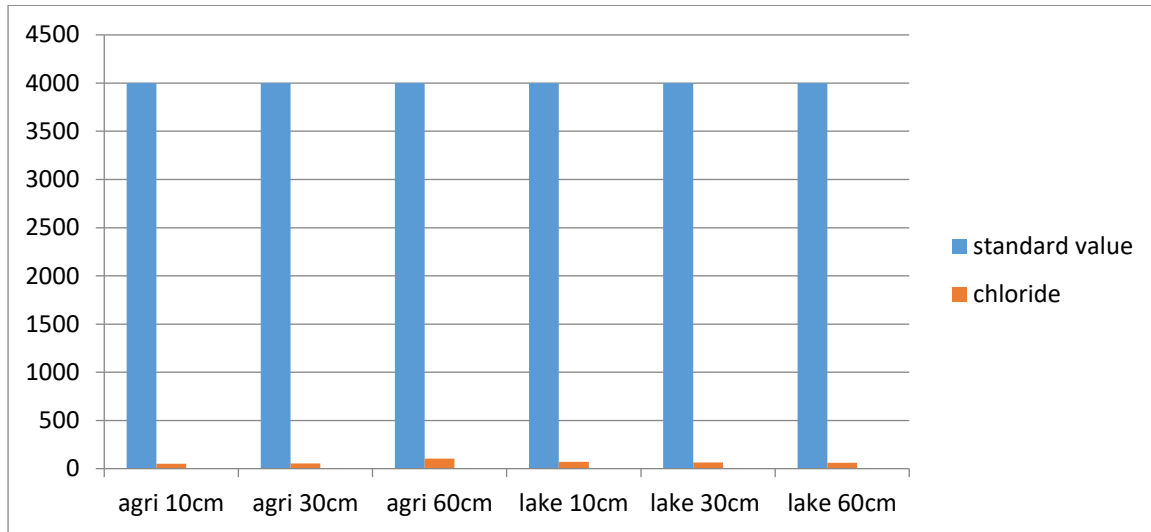

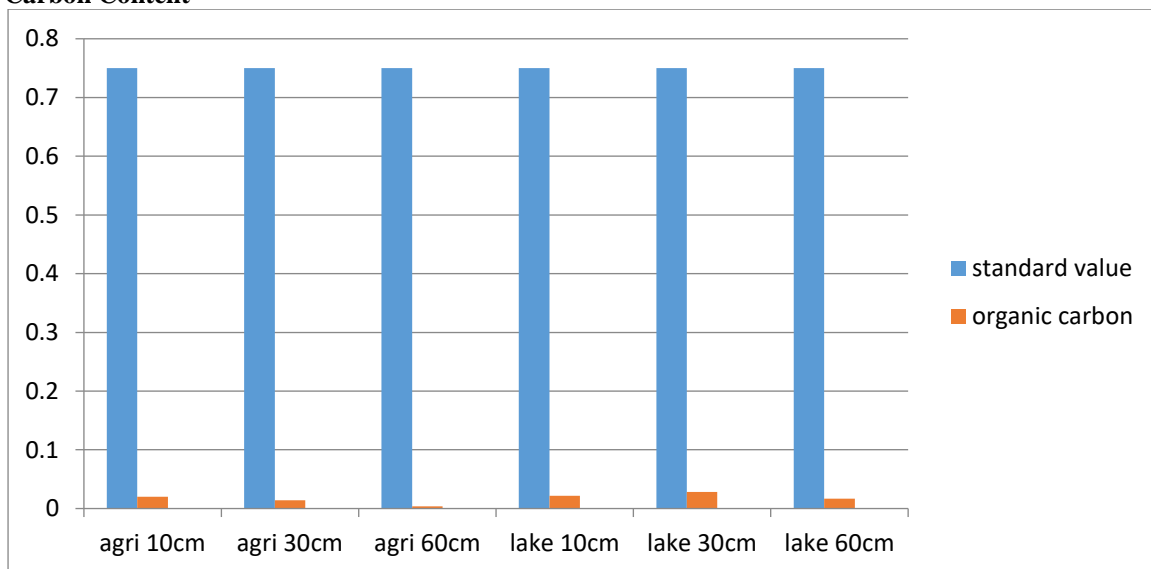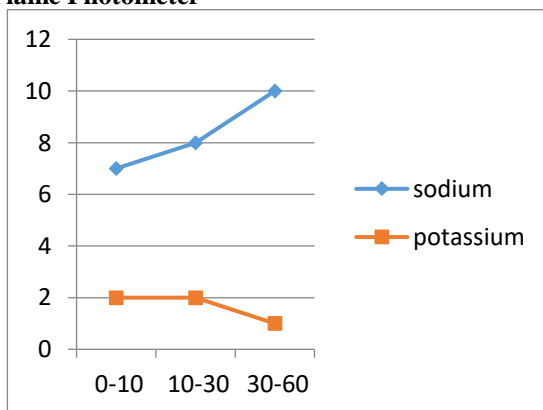**ELECTRICAL CONDUCTIVITY**
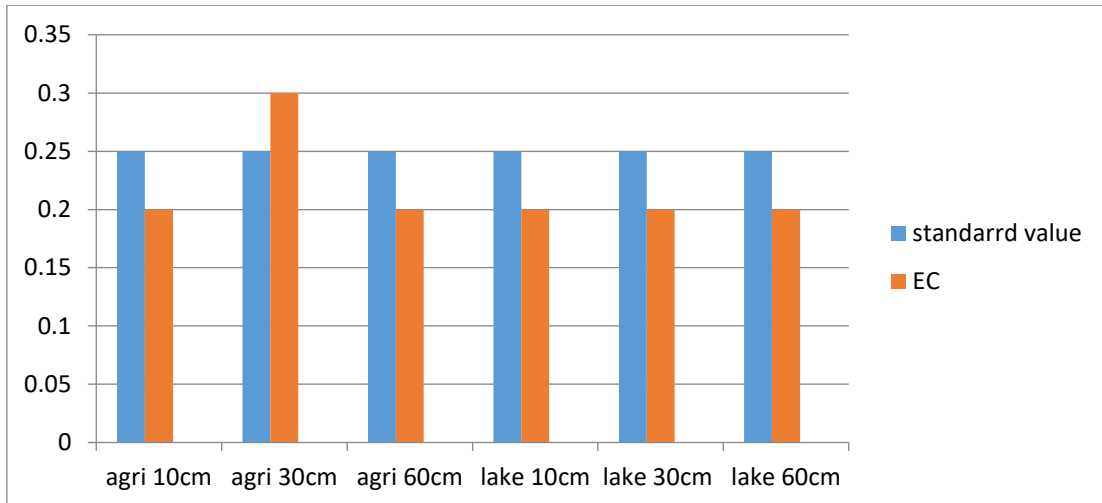
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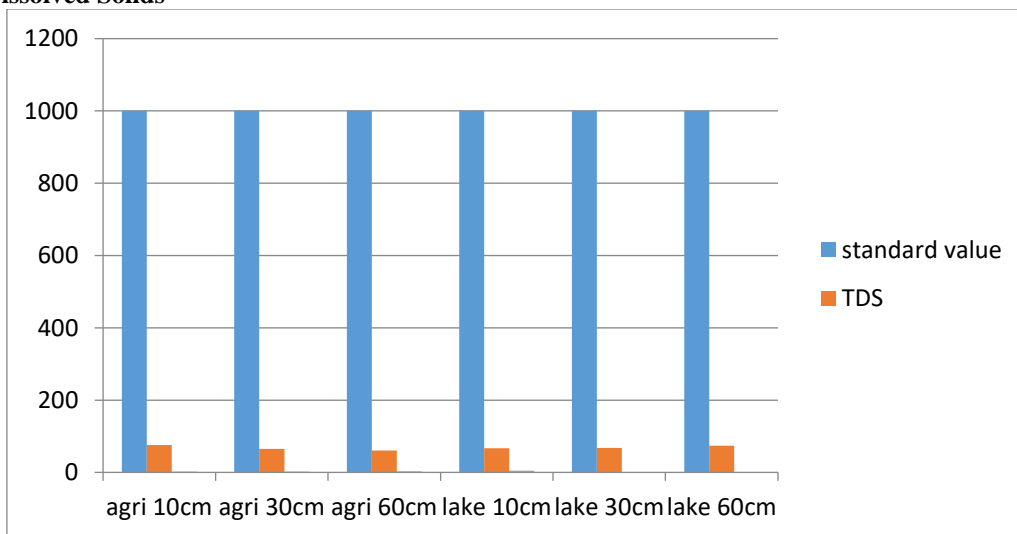
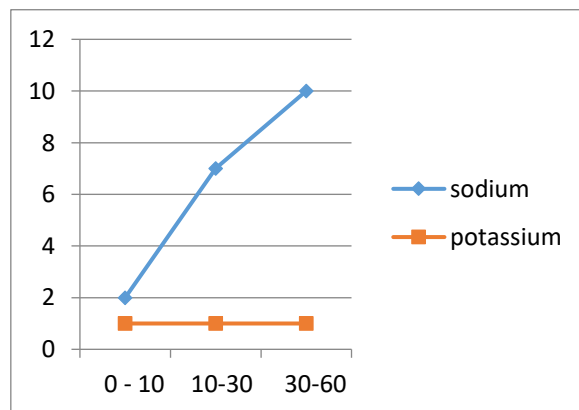**Chloride**

Carbon Content

Flame Photometer

*Lake area*   *Agriculture area*

Results for Physio-Chemicals analysis of the Water Samples

| Sample location	pH	Chlorides (mg/L)	Total Hardness (mg/L)	Sulphates (mg/L)	EC(µmho/cm)	TDS (mg/L)	Chromium (mg/L)	Turbidity (NTU)
Lake entrance	13.2	124	180	320	0.3	62	0.09	8.5
K village	6.5	1171	1605	440	2.6	445	0.08	7.1
Run-0ff stream	10.6	772	525	220	1.8	346	0.07	7.9
Lake center	7.4	114	170	270	0.1	61	0.01	2.0
Agricultural bore water	7.1	573	865	370	1.3	274	0.05	4.9
Line village	6.3	1699	1630	220	3.7	557	0.06	6.5

pH
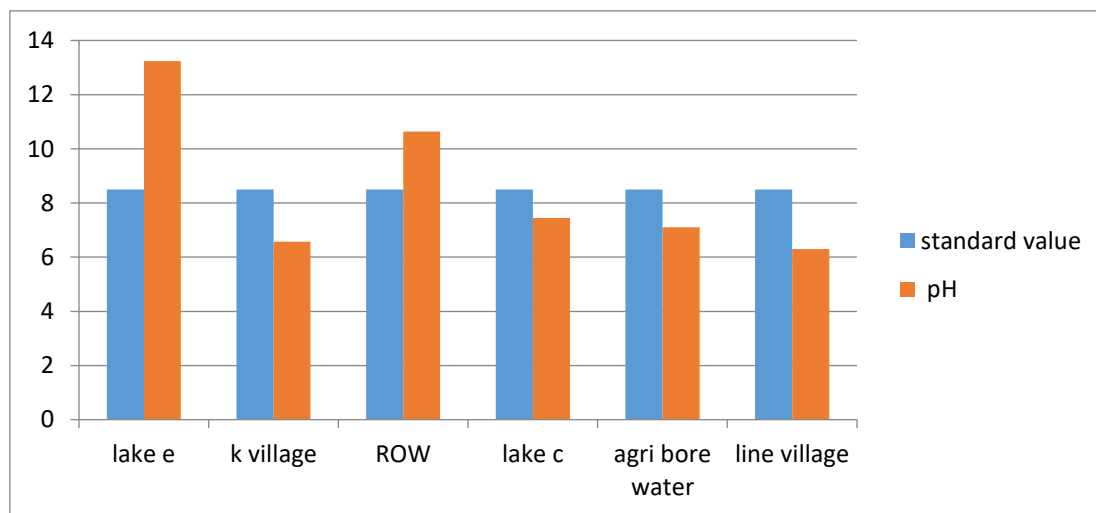
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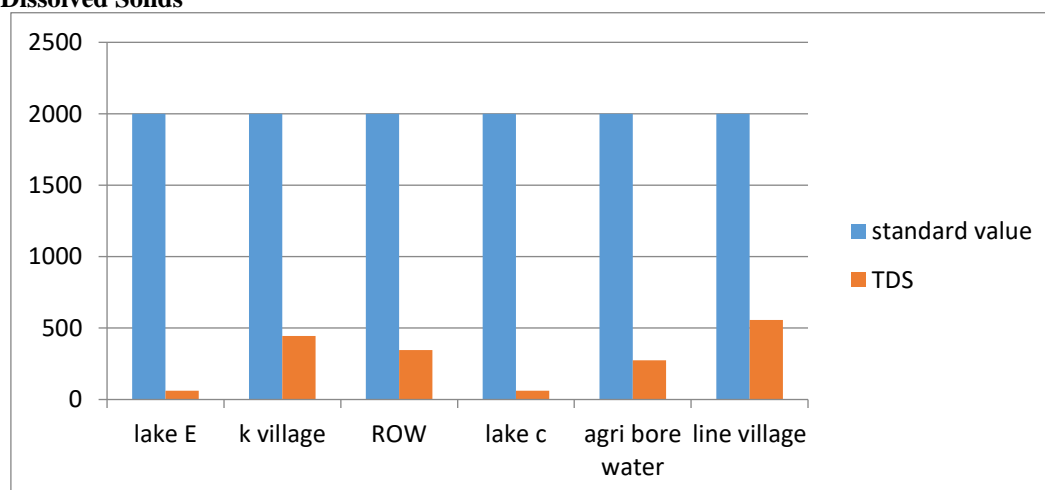
Chloride
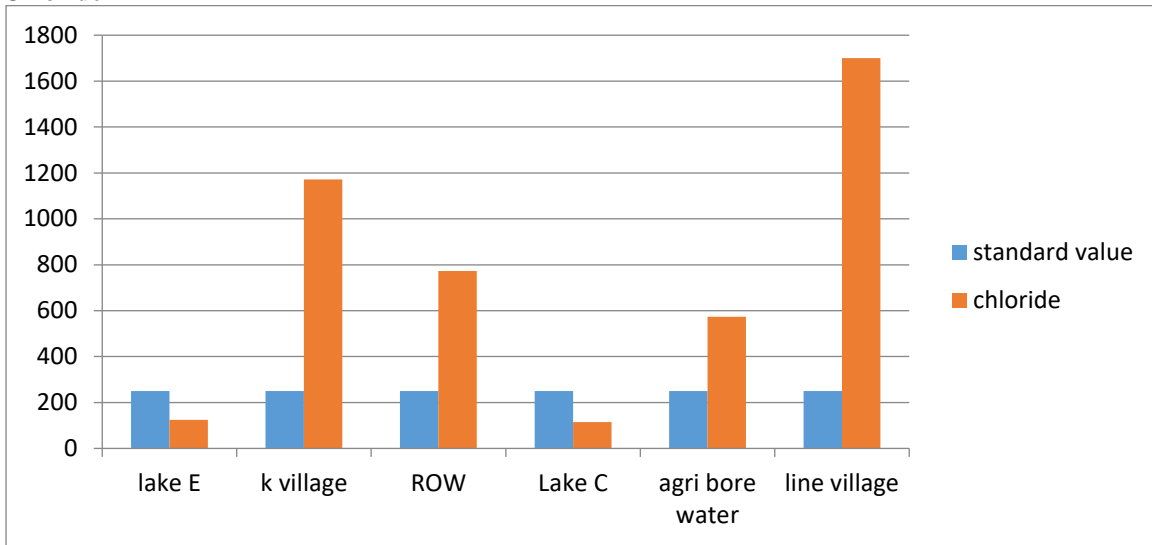
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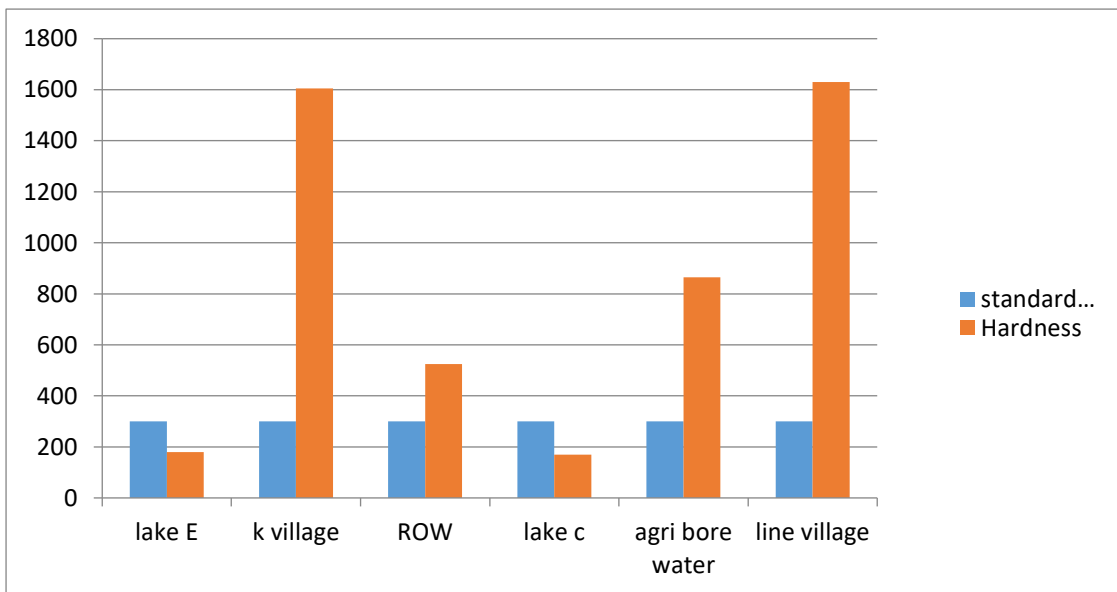
Sulphate
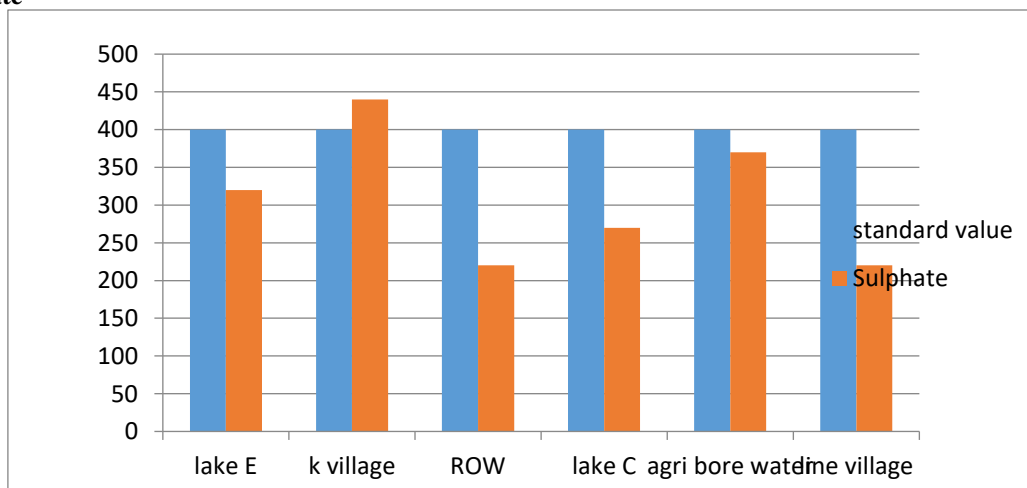
CONCLUSION

The physio-chemical parameters of the soil such as pH, EC, TDS, COD, BOD, Moisture Content, Specific gravity, Organic carbon, Na and K, have been analysed. The Sample of soil pH was noted to be increased with increase in depth of both Agriculture area as well as Lake Area. On the basis of organic carbon factor, it shows a very low concentration of both area . It is clearly indicated that the soil of industrial area of Kathiyavadi has lost their fertility. The Moisture Content of soil was noted to be increased with increase in depth Lake area compared with Agriculture area. The EC of soil was noted to be compared high concentration of EC was obtained of 0.3 and 0.4 in agriculture area in depth of 30cm and 10cm, respectively. The rest of the samples were prescribed limits. The Sodium and Potassium ranges of soil were shown less concentration of both Agriculture area as well as Lake Area.

From the results obtained from the analysis of ground water and soil quality in the vicinity of Kathiyavadi Industrial Area, it is concluded that the area under investigation is gradually getting polluted and may develop harmful effects to the public and also the environment. Different samples of soils in Industrial area showed difference in the physicochemical characteristics, it may be due to erosion of soil by industrial effluent in water. On the basis of organic carbon factor, Sodium and Potassium ranges shows a very low concentration of Agriculture and Lake Area. It is clearly indicated that the soil of industrial area of Kathiyavadi, Vellore City has lost their fertility**. Because soil organic carbon helps the plants system by providing sufficient nutrients presents in and around that place.

ACKNOWLEDGEMENTS

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