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Investigation on Physico-Chemical Analysis of Ground Water around Polyfibre Industry Harihara, India

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ABSTRACT: The problem of environmental pollution due to toxic metals has emerged as a big concern now in most of the industrial belts. Many of the rivers, lakes and oceans have been contaminated by pollutants. The Tungabhadra River, once used as a major source of water is now entirely contaminated due to household, agricultural and industrial wastes while the original river dried up at present, it is carrying industrial and municipal wastewater which is mainly used for the irrigation of crops because of cost and non availability of freshwater. The groundwater samples are collected and analyse physical and chemical properties of soil namely pH, Alkalinity, Chloride, Total Hardness, Calcium, Magnesium, total dissolved Solids, Sodium and Potassium using laboratory analytical methods.

KEYWORDS: pollution, ground water, waste water.

I. INTRODUCTION

The industrial and municipal sewage wastewater generated is mainly used for the irrigation of crops in major metropolitan cities because of cost and non availability of fresh water. Application of sewage water and sludge to agricultural soil is a common practice due to easy availability in peri-urban ecosystem. Heavy metal transfer is rapid in soil profiles and they can pollute ground water supplies also. The soil is like a reservoir for contaminants as it possesses an ability to bind various chemicals and different forces keep them bound to soil particles. The excessive accumulation of heavy metals in agricultural soils through waste water irrigation contaminates soil profile and in turn it affects the serious problems in food chain contamination because of potential accumulation and bioaccumulation. Movement of heavy metal is higher where sewage waste is disposed on sandy, acidic and low organic matter soils, receiving high rainfall or irrigation water.

Rapid urbanization and industrialization with improper environmental planning often lead to discharge of industrial and sewage effluents into water bodies. The problem of environmental pollution due to toxic metals has begun to cause concern now in most major cities.

II. METHODOLOGY

A. GROUNDWATER SAMPLING IN THE STUDY AREA

Careful planning and preparation of a groundwater-sampling trip was made to save time and help reduce the number of difficulties that commonly occur with fieldwork. Correct sampling procedure begins with thorough preparation in the office and laboratory before sample collection. Each sample bottle is to be thoroughly cleaned and protected from any contamination during sample collection, preservation, and shipment to assure a high quality sample. Filtering equipment is to be rinsed thoroughly to remove any mineral deposits in hoses or

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support container vessels. The sample containers and hoses for organic analyses are to be acid-washed and rinsed several times with deionised water.

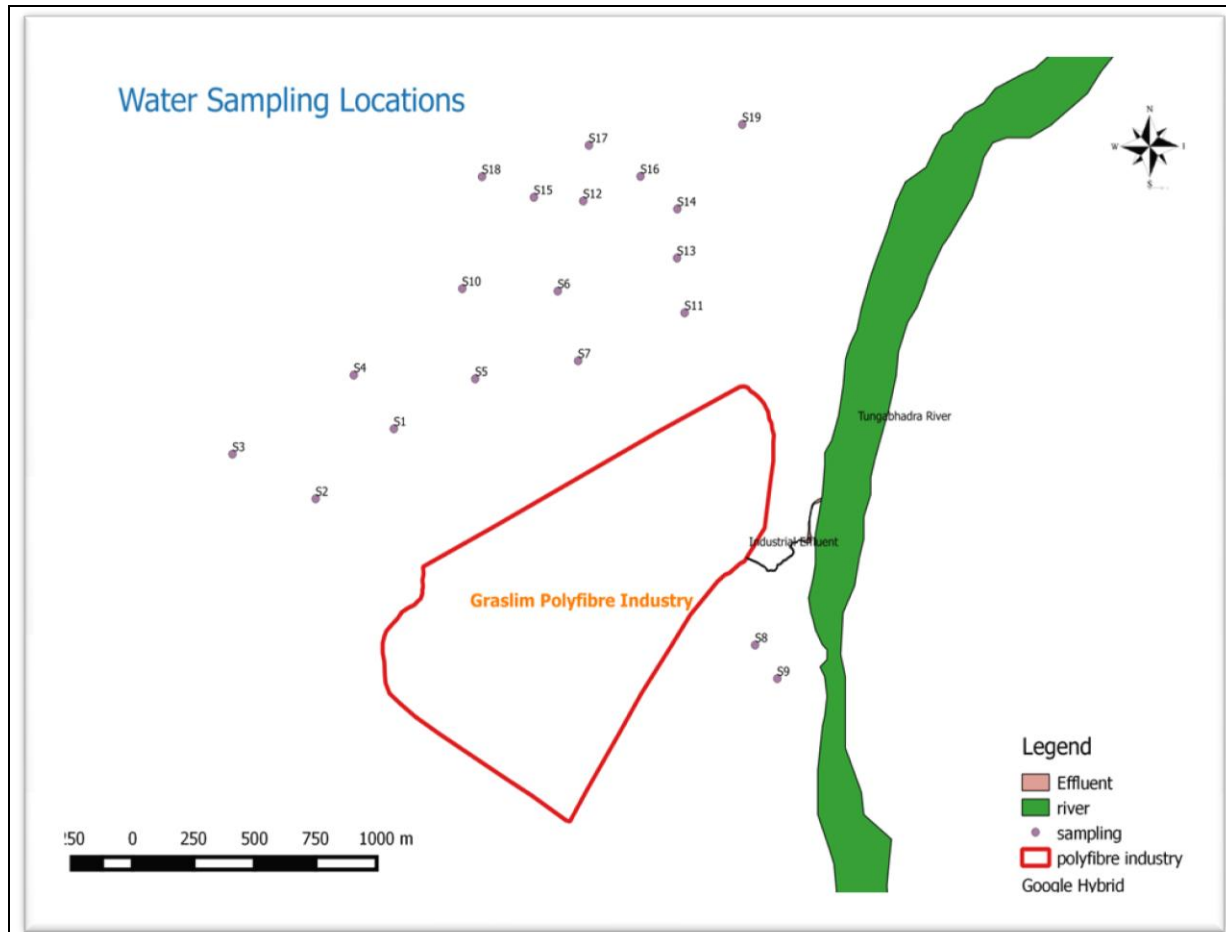


Fig1: Groundwater sampling points around Polyfibre industry

Grab sampling has been adopted to collect groundwater samples. 19 groundwater samples were collected in polythene containers of 1 liters capacity for chemical analysis after pumping out sufficient quantity of water from the source such that, the sample collected served as a representative sample. The samples thus collected were transported to the laboratory condition. Water sampling location is shown in the fig1.

B. ANALYSIS OF GROUNDWATER SAMPLES

The groundwater quality was assessed by the analysis of chemical parameters such as pH, Total Dissolved Solids, Alkalinity, Chlorides, Total Hardness, Calcium Hardness, magnesium hardness sodium, potassium. The Bureau of Indian Standards (BIS) for drinking water quality for various parameters is presented in the table 2. The analytical methods used to measure chemical parameters of groundwater samples collected from all the sampling stations are listed in the table 1. The water samples were analysed adopting standard methods in the Environmental Laboratory, Dept of Environmental Engineering, UBBDT College of Engineering, Davanagere.

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Table1: Methods Used for Groundwater analysis (Laboratory analytical methods)

Sl. No	Physic-chemical Parameter	Method
1	pH	Potentiometry (pH meter)
2	Alkalinity	Argentometry (Titration)
3	Chloride	Argentometry (Titration)
4	Total Hardness	Complexometry by EDTA titration
5	Calcium	Argentometry (Titration)
6	Magnesium	Argentometry (Titration)
7	Total Dissolved Solids	TDS Probe
8	Sodium	Flame photo meter 128
9	Potassium	Flame photo meter 128

Table 2: Bureau of Indian Standards (BIS) for drinking water (IS 10500: 2003)

Sl. No.	Characteristics	Desirable limit	Permissible limit
1	Colour, (Hazen units)	5	25
2	Odour	Unobjectionable	Unobjectionable
3	Taste	Agreeable	Agreeable
4	pH value	6.5-8.5	No relaxation
5	Total hardness (mg/l as CaCO ₃)	300	600
6	Iron (Fe), mg/l	0.3	1.0
7	Manganese (Mn), mg/l	0.1	0.3
8	Chloride, mg/l	250	1000
9	Total dissolved solids, mg/l	500	2000
10	Calcium, mg/l	100	200

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11	Sulphate, mg/l	200	400
12	Nitrate, mg/l	45	100
13	Fluoride, mg/l	-	1.5
14	Alkalinity, mg/l	200	600
15	Mercury, mg/l	0.001	-
16	Cadmium, mg/l	0.01	-
17	Lead, mg/l	0.05	-
18	Zinc, mg/l	5	15
19	Chromium, mg/l	0.05	-
20	Coli form, MPN/100 ml	1	-

III. RESULTS AND ANALYSIS

A. GROUNDWATER QUALITY OF STUDY AREA

To assess the groundwater quality of the study area, the groundwater samples collected were analysed for 19 physico-chemical parameters. The physico-chemical parameters were assessed within 48 hrs of sample collection. The water samples were analysed adopting Standard Methods in the Environmental Laboratory, Dept of Civil Engineering, UBDT college of Engineering, Davanagere.. The results of all the parameters for groundwater samples collected from existing 19 bore wells are presented in the Table 3. One of the purposes of the study is to understand the quality of groundwater around Polyfibre industrial area Harihara.

Table: 3 results of physio-chemical analysis characteristics of ground water in study area

Sample	pH	TDS (mg/l)	Alkalinity (mg/l)	Total Hardness (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (ppm)	K (ppm)	Cl ₂ (mg/l)
1	6.76	1315	504	714	328	92.64	305.55	5.56	312.75
2	6.63	1948	600	1030	300	175.2	477.85	5.21	487.5
3	6.61	1342	480	760	248	122.8	276.35	4.87	327.65
4	6.9	1410	468	810	290	124.8	280.05	4.86	375.3
5	6.94	1450	485	880	208	161.28	286.05	10.6	374
6	7.14	757	562	420	174	59.04	228.4	7	134
7	6.67	1075	502	664	280	92.16	209.85	11.61	238.3
8	6.4	1682	844	840	410	103.2	429.7	11.79	327.75
9	6.57	1700	718	710	400	74.4	237.6	6.64	407
10	6.58	671	580	316	136	43.2	222	5.86	94.25
11	6.62	675	596	286	106	43.2	237.05	5.09	85.38
12	6.73	558	536	234	104	31.2	206.2	4.91	66.52
13	6.6	515	490	284	144	33.6	149.5	6.49	77.44
14	6.55	524	482	328	140	45.12	158.95	6.42	77
15	7.22	610	500	394	164	55.2	166.95	7.78	109.2
16	6.67	407	524	260	132	30.72	191.25	7.1	67.45
17	6.47	487	464	294	128	39.84	216.25	7.48	60.56
18	6.5	459	490	292	116	42.24	207.75	6.93	63.5
19	6.48	503	506	286	126	38.4	188.95	6.63	69.5

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IV.CONCLUSIONS

- The study reveals that pH and TDS are well within the permissible limit and alkalinity, calcium, magnesium, sodium, and Total Hardness not well within the permissible limit prescribed by BIS standards in most of Groundwater samples.
- It can conclude that from the obtained result to monitor the groundwater quality and assess periodically to prevent the further contamination also needs certain degree of treatment before consumption.

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