*International Research Journal of Environment Sciences*_____ ISSN 2319–1414
Vol. **2(4),** 34-38, April **(2013)** *Int. Res. J. Environment Sci.*

Environmental Impact of Industrial Effluent in Vaigai River and the Ground Water in and around the River at Anaipatti of Dindigul Distt, Tamil Nadu, India

Jesu A.[1,2], Prabudoss Kumar L.[2], Kandasamy K.[2] and Dheenadayalan M.S.[2]
[1]Kathir College of Engineering, Department of Chemistry, Neelambur, Coimbatore, Tamil Nadu, INDIA
[2]P.G. and Research Department of Chemistry G.T.N Arts College, Dindigul, Tamil Nadu, INDIA

Available online at: www.isca.in
Received 18th October 2012, revised 19th January 2013, accepted 31th January 2013

Abstract

Environmental includes water , air, land and the inter-relationship which exists among water, air, land and human being, other living creatures, plants, micro-organism and property. Environmental pollutant means any solid, liquid or gaseous substance presentation in concentration as may be injurious to environment. Environmental pollution means the presence in the environment of any environment pollutant. Hazardous substance means any substance or preparation which by reason of its physico-chemical properties or handling is liable to cause harm to human beings, other living creatures, plants, micro-organism, property or the environment. The problem of pollution of rivers and streams has assumed considerable importance and urgency to urbanization. It is therefore essential to ensure that the industrial effluent and domestic sewage water is not to be allowed to discharge in to the water courses without adequate treatment. As such discharges would render the water unsuitable as source of drinking water as well as for supporting fish life and also for use in irrigation. Pollution of rivers and streams also causes increasing damage to the country's economy. An attempt has been made to study the impact of untreated sewage in the river located Nilakkottai in Dindigul. In fact the sanitary waste water comprises about 99.9% of water along with micro-organism. Once the river water was used for bathing, washing and also for agricultural purpose, but at present the water has become the place of collection of sewage water along with industrial effluent. In order to evaluate the physical, chemical parameters, the water samples from the river and also from the well and from bore well were collected from the residence located in and around the river and also on the banks of the Vaigai River. On any account the sewage water should not be discharged in to the river water, which causes river water pollution and ground water pollution. In long run the water becomes unfit for domestic and human consumption. The physico-chemical analysis of water in the river as well as the ground water sources around the river reveals that there is high turbidity, high TDS shows that the water cannot be used for drinking purposes. The electrical conductivity, the total hardness, the high chloride value in the ground water sources indicates that the water cannot be used for human consumption. The safest way for the residence is to abandon the river water sources in order to escape from the water borne diseases caused by the use of polluted river water.

Keywords: groundwater, physico-chemical, total dissolved solids, E. c, water quality.

Introduction

Over 97% of all the water an earth is salty and most of the remaining 3% is frozen in the polar ice caps[1]. The Atmosphere, River, lakes, and underground stores hold less than 1% of all the fresh water needed to support the earth's population[2]. Most fresh water pollution is caused by the addition of organic material is mainly sewage but can be food waste or farm effluent, bacteria and other micro-organism feed on organic matter and large populations quickly develop using up much of the oxygen dissolved in the water[3]. The chemical waste products from industrial process are sometimes accidentally discharged in to river[4]. Examples of such pollutants include cyanide, zinc, lead, copper, cadmium, and mercury[5]. This substance may enter the water in such high concentration that fish and other animals are killed immediately[6]. These are several source of water pollution which work together to reduce overall river water quality[7].

Industry and agriculture discharge liquid waste product[8]. Rain as it falls through the air or drains from urban areas and farmland absorbs contaminants serious incidents resulting from spillage or discharges of toxic chemicals from the pollution of river[9]. Many industrial wastes discharged in to water mixtures of chemicals which are difficult to treat[10]. Some industrial wastes are so toxic that they are strictly controlled, making them an expensive problem to deal with some companies try to cut the costs of safety dealing with waste by illegally dumping chemicals[11].

Need for the present study: The number of sewage water and the industrial effluents discharges in to the VaigaiRiver is increasing day by day. The absence of treatment plant to treat the sewage water and effluent treatment plant lead to the spoilage of environment. One fine morning, people will not be able to get good quality of drinking water from the river and wells. In the study area of sewage is discharged in to the right bank of River Vaigai. The industrial effluent is also discharged from the left side of river. Polluted water contaminates the surface and ground water. The environmental damage caused by water pollution by the discharge of sewage water and industrial

effluent in Vaigai River has not been so for studied. Hence the present investigation was carried to study the comprehensive pollution impact of sewage water and the industrial effluent on Vaigai River and ground water.

Objectives of the present study: To study the impact of industrial effluent and sewage water on river water quality. To study the ground water quality in the wells and bore wells on the river bank. To suggest a suitable remedial measures for the treatment of water.

Material and Methods

Geography of the study area: Vaigai River selected for the study is located in the southern part of Tamilnadu, India. Vaigai its origin in the Western Ghats and flows through Periyakulam and has its reservoir at Nilakottai called Vaigai Dam in Anaipatty. The river flows across the TalukNilakottai of Dindigul District towards Madurai.

The Vaigai River has many industries in the tank, located at Vilampatty, Nilakottai Talk on the banks of the river. The effluents released from the industry causes pollution of water in the river. The ground water around the river and the industry are also polluted.

Table-1
Guidelines of bureau of standard (BIS) and significance / health effects of chemical parameters

Parameters	BIS guideline	Significance/ health effects
Color in pt/co scale	25	Consumer acceptance decreases
Turbidity	10 NTU	Consumer acceptance decreases
TDS	500mg/L	Undesirable taste, gastro-intestinal irritation, corrosion
P^H	6.5-8.5	Beyond this range ,mucous membranes affected, corrosion, Life affected
$CaCo_3$	600mg/L	Poor lather with soap, scale forming, skin irritation, food poor in quality, boiled meat, deterioration of cloths.
Ca	200mg/L	Poor lather with soap and deterioration of cloths scale formation.
Mg	100mg/L	Poor lather with soap and deterioration of clothes, with sulfate laxative, encrustation in water supply structure.
Fe	1.0mg/L	Poor or sometime bitter taste, stinging of materials, iron bacteria, iron causing slime.
NH_3	-	Indicates pollution, growth of algae.
NO_2	-	Forms nitrosamine's which are carcinogenic.
NO_3	100mg/L	Blue baby disease, algal growth.
SO_4	400mg/L	Taste affected, laxative effect, gastro intestinal irritation.
Cl	100mg/L	Taste affected corrosive.
F	1.5mg/L	Dental and skeletal flourish, non-skeletal manifestation
PO_4	-	Algal growth

Figure-1
The investigator collecting samples from river water and the ground water on the Vaigai River bank

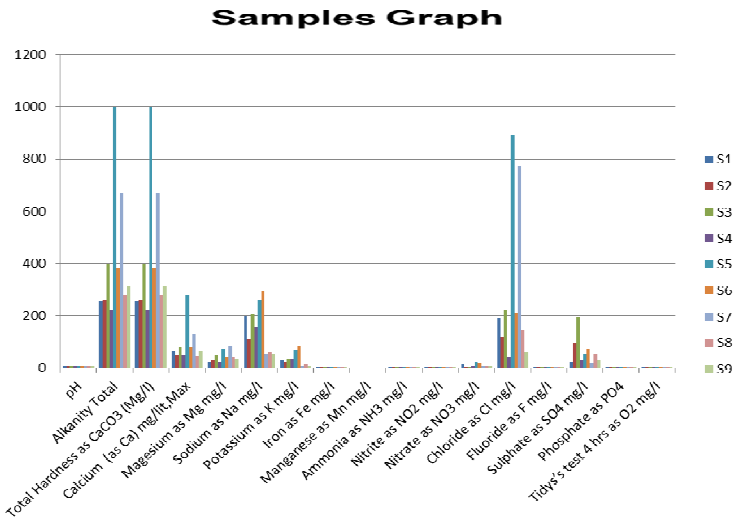

Figure-2
Chemical Parameters of Various sample graph
(S_1 TO S_9 – Samples)

Table-2
Water Quality Analysis

S.No	Water quality parameter	Methods of analysis
1	Colour	Visual comparison
2	Turbidity	By Nephelometric method
3	Total dissolved solids	By Conductivity meter
4	electrical conductivity	By Conductivity meter
5	P^H	By Digital P^H meter
6	Total hardness $CaCo_3$	By EDTA method
7	Alkalinity	By Titration method
8	Calcium	By ETDA method
9	Magnesium	By EDTA method
10	Iron	By Calorimetrically
11	Manganese	BySpectrophotometer
12	Ammonia	By Nesslerization method
13	Nitrite	By Spectrophotometer
14	Nitrate	By Spectrophotometer
15	Sodium and pottassium	By Flame photometer
16	Chloride	By Argentometric method
17	Fluoride	By Calorimetrically
18	Sulphate	By Gravimetric method
19	Phosphate	By Calorimetrically

Results and discussion

The physical and chemical parameter analysis of river water and the ground water on the Vaigai River bank are presented and discussed.

In order to study the impact of industrial effluent and sewage water disposal in the VaigaiRiver a study is carried out to assess the extent and magnitude of surface water contamination and ground water contamination along the downstream of Vaigai River. The results of the sample from the river and the ground water for the various physico-chemical analyses from the Vaigai River are discussed. The variation in the various physic-chemical parameters of the river water and the ground water at different distance from the river were measured[12]. The level of various physico-chemical factors indicates the pollution was found to exceed water the quality standards and affects the water quality and water utility pattern[13]. The ground water was found to be of low quality near the rivers and the level of pollutants found to decrease with increase in distance of the water source from the polluted river[14]. Electrical conductivity is an important parameter to find the dissolved electrolytes in water. The normal value of electrical conductivity is 1 to 2 micro mhos/cm. but the river has the values of 451 and 457 micro mhos/cm. These values are higher than the permissible limit. The higher values are recorded at ground water sources adjacent to the river.

The total dissolved solids in water include all the dissolved solids. In the present study the total dissolved solids ranges from 562 mg/l and 1456 mg/l. Physical and chemical parameters changes in water are depends on pH of the water. The chemical examination of the water samples shows that the pH value from 6.84 to 7.67. The permissible limit prescribed by WHO and BISstandards are 7.0 to 8.5. Hardness is the measure of calcium and magnesium in the water. The highest desirable limit prescribed by BIS is 100mg/l for drinking water. But the hardness of the samples is higher than the permissible limit. It means the water is very hard. According to BIS the highest acceptable chloride concentration is specified as 200mg/l for drinking purpose. In the present study the chloride values are higher than the permissible limit. Hence the water cannot be used for the domestic purposes. The increase of calcium in water contributes to hardness in water and thereby reducing the utility of water for domestic purposes. The normal acceptable limit prescribed by BIS is 75mg/l. But in the present study the river water has the values of 80 and 280.

Conclusion

The present study is attempted to evaluate the extent of pollution of ground water in and around the Vaigai River located at Nilakottai at Dindigul District. This study was carried out to assess the magnitude of the pollution problems in Vaigai River. The aim is to analyses and understands the toxic effect of sewage water and solid wastes in drinking water and to assess the day to day life of people nearby Vaigai River. Based on findings of the investigation, it is concluded that the sewage water must be treated before discharge. The absence of any organized industrial and sewage disposal system in Nilakottai, the community wastes often find their way to the nearby Vaigai River.

The physico-chemical analysis of water in the river as well as the ground water sources around the river reveals that there is high turbidity, high TDS shows that the water cannot be used for drinking purposes. The electrical conductivity, the total hardness, the high chloride value in the ground water sources indicates that the water cannot be used for human consumption. In order to prevent the river water pollution, use of synthetic detergents containing phosphate should be banned. This will prevent the eutrophication in the river. The sewage water which used to mix in the river water should be diverted in to the underground drainage system. During the rainy season the rain water harvesting in the river bed is essential to reduce the impact of sewage pollution. In order to improve the quality of ground water around the river a suitable R.O. system can be used to remove salts present in the water.

Table-3
Result of the sample from the river and the ground water for the various physico-chemical analyses from the Vaigai River

water quality parameters	CPHEEO STD A	CPHEEO STD B	S1	S2	S3	S4	S5	S6	S7	S8	S9
Physical parameters:											
Colour, (Hazen units, Max)	-	-	Colour less	Colour less	Colour less	Colour less	Colou r less	Colour less	Colour Less	Colou r less	Colour less
Odour	Unobjec tonable	Unobjec tonable	None	None	None	None	None	None	None	None	None
Turbidity (NTU, Max)	2.5	10	5	4	6	5	5	6	4	3	4
Total dissolved solids mg/lt	500	2000	562	541	609	1029	1400	1456	760	1020	550
Electrical Conductivity	-	-	1220	585	1670	590	2750	1790	2610	1020	650
Ph	7.0-8.5	6.5-9.2	7.02	6.66	7.21	7.18	7.56	7.74	7.04	7.03	7.26
Alkanity Total	200	600	256	260	400	220	1000	380	670	280	312
Total Hardness as $CaCO_3$ (Mg/I)	200	600	245	255	398	215	998	370	672	276	310
Calcium (as Ca) mg/lit,Max	75	100	84	80	80	78	280	80	128	45	64
Magesium as Mg mg/I	30	150	23	31	48	24	72	43	84	40	36
Sodium as Na mg/I	-	-	196	112	204	156	260	296	54	59	54
Potassium as K mg/I	-	-	31	24	34	35	68	86	8	15	8
Iron as Fe mg/I	0.1	1	0.93	0.2	0.07	0.14	0.3	0.09	0.9	0.5	0.9
Manganese as Mn mg/I	0.05	0.1	0	0	0	0	0	0	0	0	0
Ammonia as NH_3 mg/I	-	-	0.03	0.03	0.09	0.08	0.07	0.08	0.08	0.04	0.08
Nitrite as NO_2 mg/I	-	-	0.02	0.05	0.09	0.05	0.11	0.12	0.06	0.05	0.06
Nitrate as NO_3 mg/I	45	45	15	4	4	5	24	18	5	5	5
Chloride as Cl mg/I	200	1000	190	120	220	42	890	210	775	144	60
Fluoride as F mg/I	1	1.5	1.0	0.6	1.2	0.3	0.6	1.5	0.8	1.0	0.7
Sulphate as SO_4 mg/I	200	400	22	95	194	29	54	72	20	56	31
Phosphate as PO_4	-	-	0.68	0.04	0.04	0.06	0.42	0.5	0.21	0.24	0.21
Tidys's test 4 hrs as O_2 mg/I	-	-	0.32	0.32	0.16	0.19	0.24	0.28	0.28	0.32	0.28

CPHEEO: central public health engineering and environmental organization. CPHEEO STD A – Acceptable limit. CPHEEO STD B – Cause for Rejection

References

1. Bhattacharya T., Chakraborty S. and Tuck Neha., Physico chemical Characterization of ground water of Anand district, Gujarat, India, *I. Res. J. Environment Sci.,* **1(1)**, 28-33 **(2012)**

2. Venkateswara Rao B., Physico-chemical analysis of selected groundwater samples of Vijayawada rural and urban in Krishna district, Andhra Pradesh, India, *International Journal Environmental Sciences*, **2(2)**, 710-714 **(2011)**

3. Basic Information in nitrates in drinking water, Basic information about regulated drinking water contaminants, US-EPA-Environment Protection Agency **(2012)**

4. Indrani Gupta, Salunkhe Abhaysingh, Rohra Nanda and Kumar Rakesh, Groundwater quality in Maharashtra, India, Focus on Nitrate pollution, *Journal of Environmental Science and Engineering*, **43(4)**, 453-462 **(2011)**

5. Rajmohan N. and Elango L., Nutrient chemistry of groundwater in an intensively irrigated region of southern India, *Environmental Geology*, **47**, 820-830 **(2005)**

6. Muhammad Barzani Gasim B. S., Ismail Ekhwan Toriman, Sujaul Islam Mir and Tan Choon Chek, A Physico-Chemical Assessment of the Baber River, Pahang, Malaysia, *Global Journal of Environmental Research,* **1(1)**, 07-11 **(2007)**

7. Sahu B.K., Rao R.J., Behara S.K and Pandit R.K., Effect of pollutants on the dissolved oxygen concentration of

the river ganga at Kanpur, In pollution and bio monitoring of Indian rivers, ABD publication, Jaipur, India, 168-170 **(2000)**

8. Sivakumar A. A. and Jaganathan R., Hydrology of River Bhavani, Tamilnadu, India, Ecology and conservation of lakes, reservoirs and rivers, 1246 **(2002)**

9. Jain Pradeep K., Hydrology and quality of groundwater Hirapur district, Sagar (M.P), *Pollution Research*, **17(1)**, 91-94 **(1998)**

10. Bhattacharya T., Chakraborty S. and Tuck Neha, Physico chemical Characterization of ground water of Anand District, Gujarat, India, *I. Res. J. Environment Sci.,* **1(1)**, 28-33 **(2012)**

11. Zahir Hussain A. and Abdul Jameel M, Monitoring the quality of groundwater on the bank of Uyyakondan channel of river Cauvery at Tiruchirappalli, Tamilnadu, India, *Environmental Monitoring and Assessment*, 10.10007/s 10661, **011**, 1910–14 **(2011)**

12. Lenin Sundar and Saseetharan, Groundwater quality in Coimbatore, Tamilnadu along Noyyal River, *Journal of Environmental Science and Engineering*, **50(3)**, 187-190 **(2008)**

13. Jain C.K., Bhatio K.K. and Kumar S.R., Groundwater quality in malaprabha sub-basin Karnataka, *International Journal of Environmental Protection*, **23(3)**, 321-329 (**2005)**

14. Chari K.V.R. and Lavanya M.G., Groundwater contamination in Cuddapah urban area, Andhra Pradesh, In Proceedings on regional Workshop of Environmental aspects of groundwater development. KU, Kurukshetram Oct. 17-19, Kurukshetra, India, 130-134 **(1994)**