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Research Article

Environmental Impact of Industrial Effluent and Sewage in Chembarambakkam Lake at Chennai

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Abstract: The Chembarambakkam lake are located at Chennai city the waste water from the industries which is situated near to the ponds and the sewage water from the house hold living around the river at the distance of 1km are discharged through the drain into the river. During the rainy season, the rain water collects in the river. The rain water is main source of water to the wells and bore wells located around the rivers at a radius of 5km. The rainwater collected in the river is contaminated with industries waste water, and sewage water and pesticide waste water which percolates to the ground and reach the bore well and well. This causes the pollution of the well and ground water becomes unfit for domestic and agricultural purposes. This paper is discussing various pollution matter in this river and heavy metal analysis of this in around lake area.

Keywords: Chembarambakkam Lake, Industrial effluent, TDS, Electrical Conductivity

INTRODUCTION

Water pollution is the contamination of water bodies such as lakes, rivers, oceans, and groundwater caused by human activities, which can be harmful to organisms and plants that live in the water bodies¹⁻

³.Water pollution is a major problem in the global context. It has been suggested that it is the leading worldwide cause of deaths and diseases, and that it accounts for the deaths of more than 14,000 people daily^{4,5}.

Objective of the present work: To analyse the physic-chemical parameters of ground water at Irungattukottai and nearby villages of Chembarambakkam lake, in order to find the ground water quality and the lake water quality.

- To find a suitable remedial measure for the treatment of contaminated ground water using R.O.Plant.
- To suggest the people to go for R.O.Plant in order to get the potable water for domestic purpose.

MATERIALS AND METHODS

Location of the study area: The lake is the source of rain water collection during the rainy period. The lake water with is polluted by industry effluent. The polluted lake water percolates into the adjoining wells, Bore wells and other water resources.

People living in the lake basin and also at a distance 5 km observe the symptoms of water pollution. During survey many people reveals that in them wells, Bore wells water quality are changed. Agricultural productivity is also affected with poor yield due to the water pollution problems. Even bathing with polluted water causes itching of the skin and also leads to various skin diseases. On seeing the sufferings of the people a study is under taken to find problems of the water quality of the study area.

The rain water collected in the lake is contaminated with industrial waste water, sewage water and pesticide waste water which percolates to the ground and reach the bore well and well. It causes the pollution of the well and ground water and it becomes unfit for domestic and agricultural purposes.



Fig.1: study area

MATERIALS AND METHOD

Samples collected for chemical examination: For water and wastewater examination the laboratory conducts or prescribes the sampling programmed, which is determined in consultation with the user of the study area. The sample for water testing should meet the requirements of the sampling programme and should be handled in such a way than it does not become contaminated before it reaches the laboratory. Enough care should be taken to insure that the analytical results represent the actual sample composition. Important factors affecting results are presence of suspended matter or turbidity, the method chosen for its removal (If done in the field) and physical and chemical changes brought about by storage or aeration.

It is essential to ensure sample integrity from collection to data reporting. This includes the ability to trace possession and handling of the sample from the time of collection through analysis and final disposition. Always fix sampling points by detailed description, by mas or with the aid of stakes or land marks in a manner that will permit their identification by other persons without reliance on memory or personal guidance.

- Before filling, rinse sample bottle two or three times with the water being collected, unless the bottle contains a preservative or dechlorinating agent.
- Fill container full without leaving any air space. Even the handle of container should be filled with water. Close the inner cap. Place polythene sheet in between the inner outer caps and then tighten the outer cap. Place another polythene sheet over the outer cap and tighern the neck with a rubber band.

Table 1: Sample Collection-Study area

Sample No	Source
S ₁	Tap water
S ₂	Tap water
S ₃	Sewage water
S ₄	Open well
S ₅	Bore well/Hand pump
S ₆	Lake water
S ₇	Lake water near
S ₈	Bore well

Grab Sample: The sample collected at a particular time and place should be recorded. Grab samples collected at the sampling point at different times. A composite sample representing a 24hrs period is considered standard for most determinations. Individual portions are collected in a wide-mouth bottle

having a diameter of at least 35 mm at the mouth and a capacity of least 120ml. Collect the portions every 5 min and mix at the end of the sampling period in a single bottle. If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected

Distribution Systems: Flush lines sufficiently to insure that the sample is representative of the supply. For determining the extend of flushing the diameter and length of the pipe and the velocity of flow should be taken in account.

Wells: Collected sample after sufficient pumping to insure that the sample represents the ground water source. It is pump at specified rate to achieve characteristics drawn down. Record the pumping rate and drawn down.

Lakes and Reservoir: Choose location, depth and frequency of sampling depending on local conditions and the purpose of the investigation. Avoid sampling at weirs. Generally collect sample beneath the surface of the quiescent area. Lakes and reservoirs are subjected to considerable variations from normal causes such as reasonable stratification. Rainfall, run off and wind.

Expect foe dissolved oxygen, for analysis of other parameters, Use two liter white, and polythene container foe sample collection. For analysis of use container rinsed with (1+1) HNO₃. For samples containing organics, avoid plastic containers.

Use labels to prevent a sample misidentification. The label should contain the following particulars. Name of scheme, scheme type (Hand Pump/ Power Pump) source (Open well / Bore well / Infiltration / Surface water etc.)

Location, Habitation and code, census village and panchyat, Union and District, Dept of Well, Water level below ground, Remarks on surroundings and pollution of source. Purpose of testing, Source finding / Monitoring, of existing source / periodical monitoring of existing scheme / observation well other programme / construction purpose previous reference if any of testing, collected by date of collection.

RESULTS AND DISCUSSION

In the study area problems untreated industrial waste water is in the Sembarabakkam Lake located at Chennai. The lakes have become the collection of industrial waste water from the industry located near the lakes. Due to the industrial effluent mixing, percolation the lake and the ground water sources around the lakes are completely polluted⁶.

To above study has thrown useful information on status of water quality in and around the water resources. The quality of water in the lake and most of the bore wells around the lake are not good and it may not be possible to use for drinking and domestic purpose. The physical examination of the lake reveals that the lake waste water as well as the ground water is unfit for domestic⁷.

The residential ground water analysis in and around the lake reveals that the water quality parameters are higher than the permitted level as per ISI standard. Specifically turbidity, TDS and electrical conductivity value is high, which indicates that lake and ground water should treated before using of human consumption⁸.

The chemical examination of the lake water and the ground water around the lake has high value of Calcium, Magnesium, Ammonia, chlorides. This result also reveals that the study area water is highly polluted⁹.

Table 2: analysis results of collected samples

Sl. No.	Water quality parameters	(Desirable Limit)	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
		CPHEEO STANDARD	1	2	3	4	5	6	7	8
1	Colour, (Hazen units, Max)	5	Colourless	Colourless	Whitish	Blakish	Yellowish	Yellowish	No colour	Colourless
2	Odour	Unobjection able	NO	NO	Algae smell	Fishery	Odoured	Odoured	NO	NO
3	Turbidity	5	2	3	28	2	3	2	2	1
4	Total dissolved solids	500	822	1160	314	802	575	603	517	857
5	Electrical Conductivity		1175	1657	448	1145	831	576	596	1224
6	pH	6.5	7.16	7.28	7.2	7.55	7.34	8.15	8.16	7.41
7	Alkanity Total	200	440	468	128	504	380	260	256	352
8	Total Hardness as CaCO ₃ (Mg/I)	300	288	344	128	360	316	128	152	392
9	Calcium (as Ca) mg/lit, Max	75	64	96	29	53	46	27	30	80
10	Magnesium as Mg mg/I	30	31	73	13	31	24	14	18	46
11	Sodium as Na mg/I		204	312	248	240	192	240	220	192
12	Potassium (K mg/I)		34	32	18	16	18	24	16	18
13	Iron as-Fe (mg/I)	0.1	0.39	0.43	1.28	0.12	0.29	0.06	0.43	0.39
14	Manganese - Mn (mg/I)	0.05	0	0	0	0	0	0	0	0
15	Ammonia - NH ₃ (mg/I)		0.09	0.09	0.6	0.09	0.09	0.08	0.08	0.08
16	Nitrite -NO ₂ (mg/I)		0.09	0.07	0.15	0.08	0.07	0.07	0.08	0.05
17	Nitrate - NO ₃ (mg/I)	45	4	15	3	8	6	3	3	14
18	Chloride- Cl (mg/I)	200	114	260	66	76	50	40	48	208
19	Fluoride (mg/I)	1	0.4	0.6	0.6	0.3	0.4	0.3	0.4	0.5

20	Sulphate - SO ₄ (mg/l)	200	37	70	15	48	30	14	22	40
21	Phosphate- PO ₄		0.04	0.06	0.16	0.03	0.04	0.02	0.09	0.05
22	Tidy's test 4 hrs as O ₂ mg/l		0.16	0.12	0.57	0.24	0.12	0.2	0.12	0.16

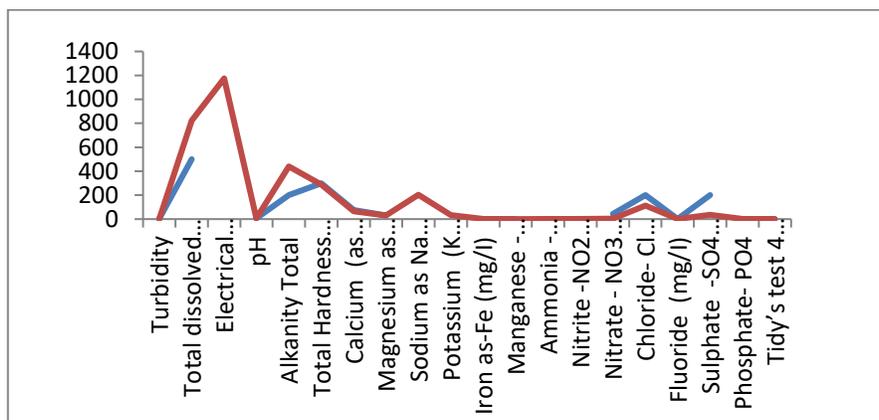


Fig.2: analysis of Sample-1

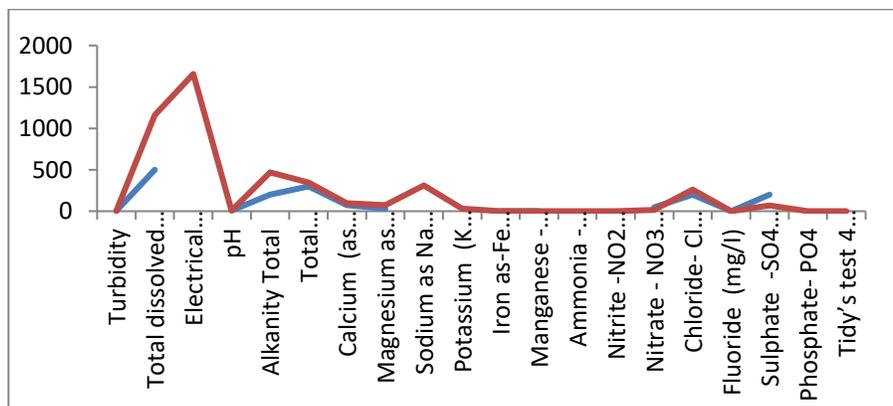


Fig.3: analysis of Sample-2

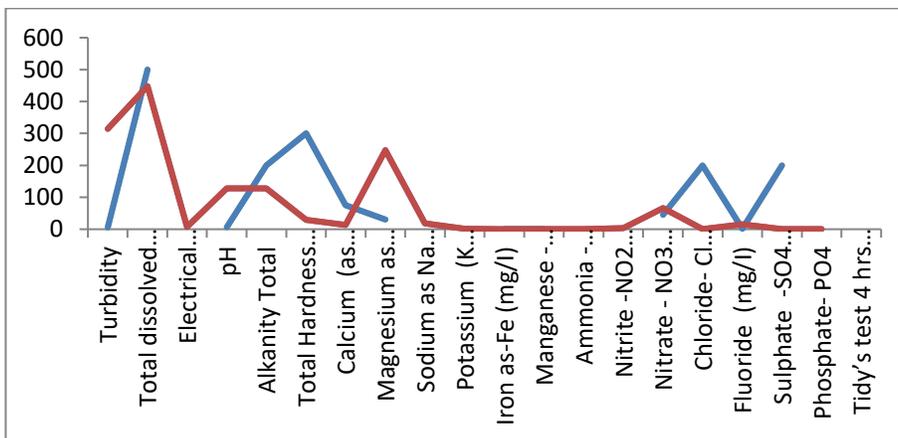


Fig.4: analysis of Sample-3

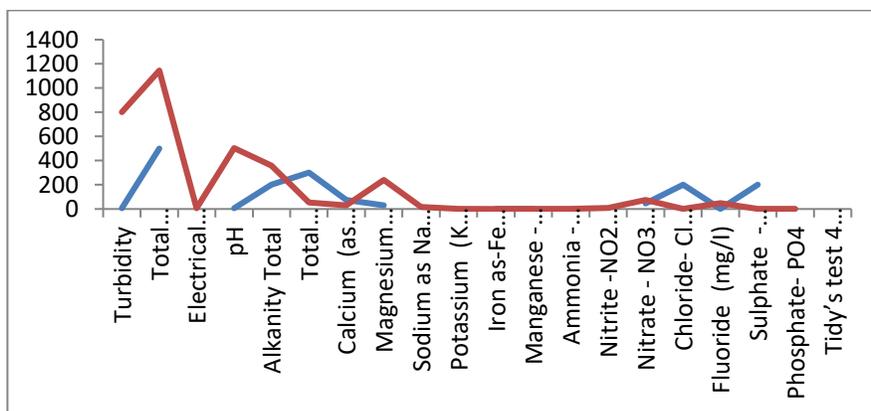


Fig.5: analysis of Sample-4

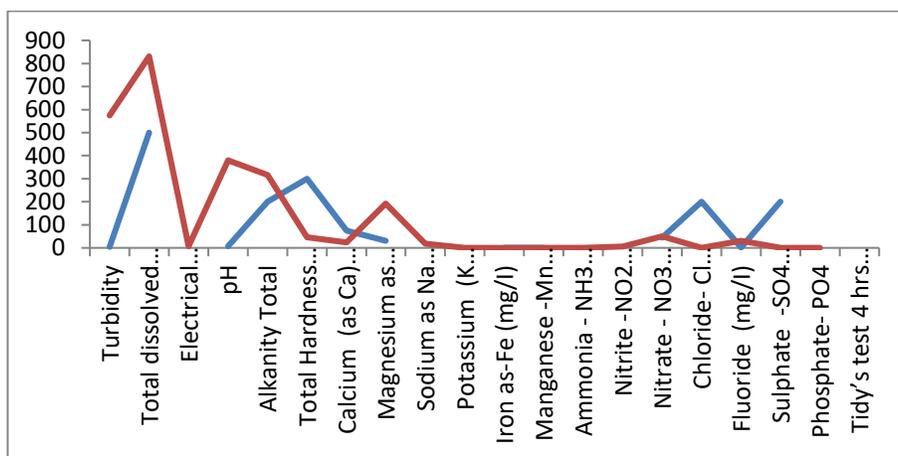


Fig.6: analysis of Sample-5

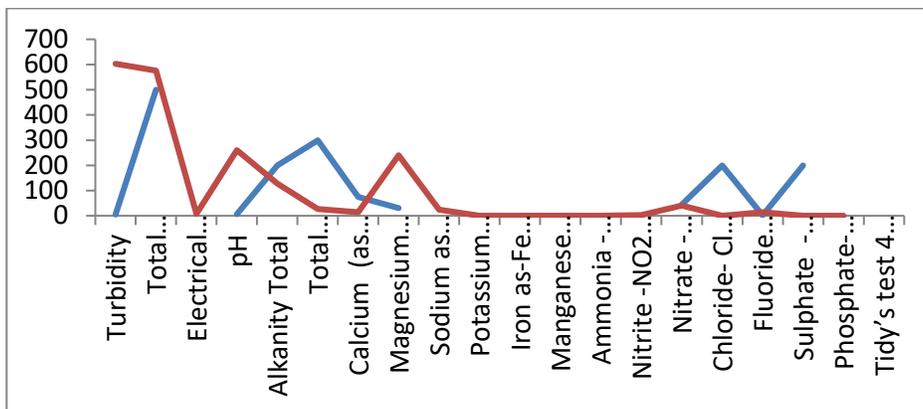


Fig.7: analysis of Sample-6

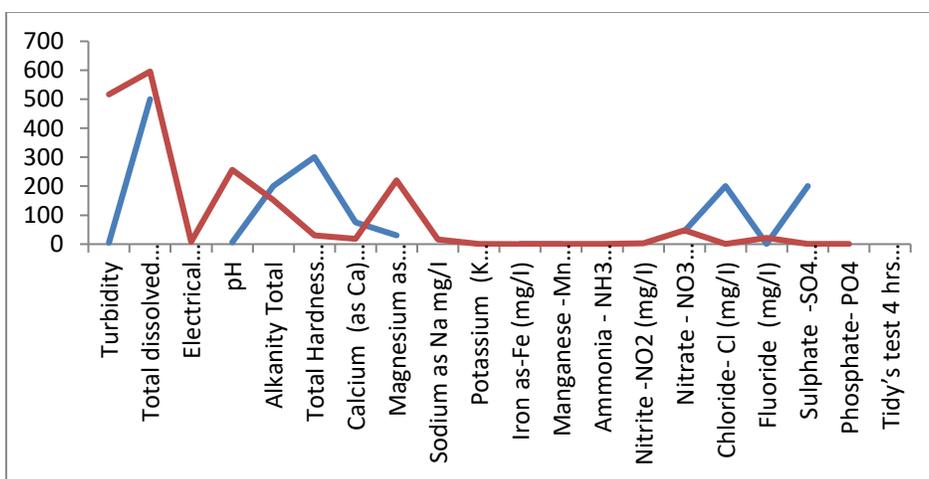


Fig.8: analysis of Sample-7

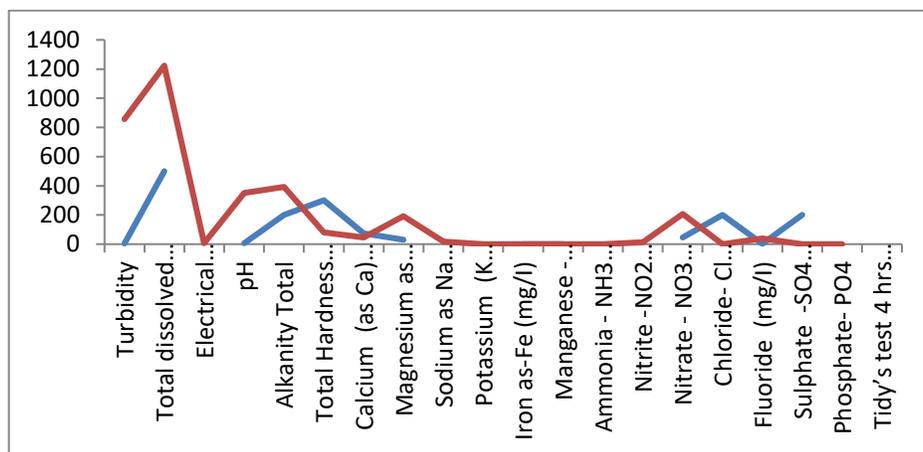


Fig.8: analysis of Sample-7

CONCLUSION

The adjoining ground water sources are mostly affected and the water becomes very salty with very high TDS. Physico-chemical analysis of various water samples collected at the study area are having the higher value of sensitive parameters like TDS, Calcium, Chloride, Magnesium, Nitrate, Fluoride, pH, Turbidity, hence the people cannot use that water to any domestic purposes. So the people have to bring the water from municipal water.

Hence the polluted water is must treated by RO process. The treated water has agreeable taste and most of the sensitive parameters are within the permissible limit. Hence it is suggested to the residents of the sembarabakkam lake area people to install domestic reverse osmosis plant in order to convert the available ground water for domestic use.

In general the use of RO system for the people living around the Sembarabakkam Lake are advised not to use untreated contaminated due to the percolation of industrial waste mixed lake water. Hence it is suggested to all the people to install RO system in the houses to treat the ground water. After the treatment the water will be suitable for drinking purposes.

In order to prevent the lake water from further pollution by industrial waste, hence drainage canals must be constructed around the existing, to prevent the industrial waste from the lake. During rainy season, the rain water harvesting in the lake is essential to reduce the impact of industrial pollution by dilution.

In order to prevent the lake water and the ground water from further pollution by industrial waste, use of synthetic detergents and soaps containing phosphates and the people around the lake should be banned. No person should be allowed to use the lake water for washing, bathing, and other purposes. The lake should be a place for rain water harvesting to improve the ground water around the lake. Nonuse of synthetic detergents will prevent the eutrophication in the lake. Eutrophication causes the shelter for the material parasites. This can cause malarial diseases. The industrial waste water which mixes in the lake water should be diverted in to the proper underground drainage systems. During the rainy season the rain water harvesting is essential in the pond to reduce the impact of industrial waste pollution by dilutions. In order to improve the quality of ground water around the lake residential area a suitable RO system can be recommended to the people to remove salts present in the water resources.

The mosquito's problem prevailing in the lake water can be controlled by the use of recent trends, on type of stones collected from the volcano's larvae. This is fixed with one type of bacterium which can control mosquito population. From the values of TDS and other physical and chemical parameters given in the table show the presence of pesticide in the water. The lake which is directly polluted by the industrial waste has higher TDS and the lake which is indirectly polluted by the same has lower TDS. So we have to use the previous lake water after the proper treatment then only we can avoid the consequences. Because this water is directly introduced to the paddy field which then get in to the human system through food. Therefore prevention must be taken that is proper treatment plant must be introduced before the human use.

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