



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 9, September 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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# Assessment of Ground Water Quality in Municipal Waste Dumpyard - P.Velur, Namakkal, Tamilnadu

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**ABSTRACT:** Improper waste dumping is one of the major threats to the ground water resources. The Waste which dumped openly is infiltrated by precipitation. These gets into the anaerobic decomposition and a material called leachate is formed, it contains organic and inorganic compounds. The leachate accumulates at the bottom of the landfill and percolate into the soil. The area near to dumpyard has a greater risk of groundwater pollution. In this study, the ground water quality has been undertaken to study the problem of open dumping of municipal solid waste (MSW) at Paramathi Velur dumpyard of Namakkal Municipal Corporation. The ground water samples were collected from the bore and open wells around the dump yard. The ground water quality parameters such as pH, total dissolved solids, and alkalinity, total hardness, calcium, magnesium, chlorides and sulphates through physico-chemical analysis were tested. The obtained results were compared with the Indian Standards. From the research work, the suitability of water for drinking and the extent of deterioration of its quality were assessed.

**KEYWORDS:** Precipitation, Anaerobic Decomposition, Leachate, Municipal Solid Waste, Physico-Chemical Analysis, Dumpyard.

## I. INTRODUCTION

Groundwater is an important source of drinking water for many people around the world. In India, about eighty percent that the water we drink and use every day is partly or wholly from groundwater. Ninety-five percent of Indians in rural areas are dependent on their own wells to provide all their water needs. Many town and city dwellers also drink groundwater, as the vast majority of public water supply systems use groundwater too. In addition to rural households and public water supplies that depend on wells and groundwater, farmers to use groundwater for irrigating crops and for their animals.

Many commercial businesses and industries in India also depend on groundwater for their processes and operations. Groundwater beneath the earth surface is considered free from contamination, hence usable but anthropogenic as well as natural factors affecting the quality as well as the quantity of this valuable resource. It has been estimated that once pollution enters the subsurface environment, it may concealed for many years, becoming dispersed over wide areas of groundwater aquifer and rendering groundwater supplies unsuitable for consumption. Groundwater can be contaminated by a wide range of sources, including the septic tanks, underground storage tanks, improperly disposed of industrial wastes, mining waste, fertilizer and pesticides.

## II. OBJECTIVE

The main objective of the present study is to make a groundwater quality assessment based on the available Physico-Chemical data from 13 locations in the Paramathi Velur region.

- To Study about Municipal Waste Generation Rate and Physical composition Rate at Namakkal City.
- To collect the water sample around the municipal waste dump yard.
- To study about groundwater modeling.
- To study about the impact of leachate percolation on ground water quality is estimated from the unlined open dump site near Namakkal Municipal Corporation.
- To assess the quality of water sample around the dumpyard, check whether fit for drinking or not.



### III. RELATED WORKS

- Bocanegra et al., (2001) studied about leachate is the liquid seeping from landfills. Municipal Solid Waste discarded into inadequately controlled landfills undergo decay and oxidation. Moreover the waste deposited in landfills generates leachate, which migrates from the landfill and joins the hydrological regime, thereby contaminating the surface water and groundwater (Fatta et al 1999, Banar et al 2006, Esakku et al 2007, Vasanthi et al 2008b).
- Mohan and Gandhimathi (2009) carried out a study on the characterization of the solid waste and the effect of the leachate from the Perungudi dumping site. Chemical analysis of both the leachate and water samples indicates high concentration of heavy metals, especially lead. This would adversely affect aquatic life and ultimately enter into the food chain, the consumption of which can cause adverse health effects.
- Caputo and Vaccaro (2006) bring out the lithological variability in the contaminant transport process. Predicting the quantity and quality of groundwater flowing in an aquifer requires accurate information about the geometry and hydraulic properties of the aquifer. The information can be obtained by drilling, logging and analyzing the sediments obtained from the boreholes (Paillet and Reese 2000).

### IV. METHODOLOGY

The method of systematical, theoretical analysis applied to a field of study is called methodology; it comprises the theoretical analysis of the body of method and principles associated with the branch of knowledge.

- Study on Municipal Waste Generation Source in Namakkal
- Physical Composition of Municipal Waste Generation Rate
- Study on Dumpyard
- Study on Ground Water Modelling
- Identification of Wells or Borewells near Dumpyard
- Collection of water samples
- Analysis of Physico – Chemical parameters of ground water
- Comparison of Characteristics with BIS
- Evaluate the Water Quality Index
- Check whether the Ground Water suitable for drinking or not

#### 4.1 STUDY ON DUMPYARD

The Namakkal Municipal Corporation generates 750 tons of municipal solid waste every day. 550 tons of waste is currently dumping in open space at Paramathi Velur every day by large vehicles. The dump yard is located at latitude of 11.744 and longitude 78.1528. Due to poor scientific management of landfill the groundwater may be contaminated through the leachate.

Types of Vehicles	Numbers	Collection frequency	Capacity	Total capacity
Truck	30	2	5tons/day	350 tons
Lorry	15	3	10tons/day	400 tons

Mode of Transportation

#### 4.2 COLLECTION OF WATER SAMPLES

The Water samples were collected from 13 locations around the Paramathi Velur dumpyard. 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 around the dump yard in Namakkal region in high grade bottles of 1 litre capacity after rinsing it with distilled water and thrice



with the sample water before collection.

S.NO	SAMPLENO	LONGITUD E (N)	LATITUDE (E)	TYPE OFWELL
1	S1	11.736500	78.152800	Bore well
2	S2	11.735800	78.154000	Bore well
3	S3	11.734770	78.157890	Bore well
4	S4	11.737330	78.160110	Bore well
5	S5	11.731611	78.156096	Bore well
6	S6	11.738760	78.158910	Bore well
7	S7	11.740100	78.159910	Bore well
8	S8	11.735800	78.152860	Open well
9	S9	11.736800	78.149200	Bore well
10	S10	11.741709	78.156479	Open well
11	S11	11.738928	78.155003	Open well
12	S12	11.743061	78.160234	Bore well
13	S13	11.737490	78.157556	Open well

Location of Collected Water Samples

## V.TREATMENT METHOD

### 5.1 PHYSICAL PARAMETERS

- Temperature
- Total Dissolved Solids
- Electrical Conductivity

### 5.2 CHEMICAL PARAMETERS

- pH
- Alkalinity
- Total hardness
- Calcium hardness
- Magnesium hardness
- Chloride
- Sulphate



**5.3 METHOD FOR ANALYSIS PHYSICO CHEMICAL PARAMETERS**

S.NO.	PARAMETERS	METHODS
1	pH	Electro metric method by pH meter
2	Electrical Conductivity ( $\mu\text{s}/\text{cm}$ )	Instrumental method by conductivity Meter
3	Total Dissolved Solids (mg/L)	Gravimetric method
4	Total Hardness (mg/L)	EDTA titrimetric method
5	Calcium Hardness (mg/L)	EDTA titrimetric method
6	Magnesium Hardness (mg/L)	EDTA titrimetric method
7	Alkalinity (mg/L)	Titrimetric method
8	Sulphates (mg/L)	Gravimetric method
9	Chlorides (mg/L)	Argentometric method

**5.4 PRESCRIBED STANDARDS OF DRINKING WATER**

S.NO	Parameter	Bureau of Indian standards(BIS) recommendations mg/L	
		AcceptableLimit	Permissible limit
1	pH	6.5-8.5	-
2	Temperature ( $^{\circ}\text{C}$ )	30	32
3	Electrical Conductivity ( $\mu\text{s}/\text{cm}$ )	-	2000
4	Total Dissolved Solids (mg/L)	500	2000
5	Total Hardness (mg/L)	200	600
6	Calcium Hardness (mg/L)	75	200
7	Magnesium Hardness (mg/L)	30	100
8	Alkalinity (mg/L)	200	600
9	Chlorides (mg/L)	250	1000
10	Sulphates (mg/L)	200	400



VI. RESULT AND DISCUSSION

TEST RESULTS (PRE MONSOON DATA)

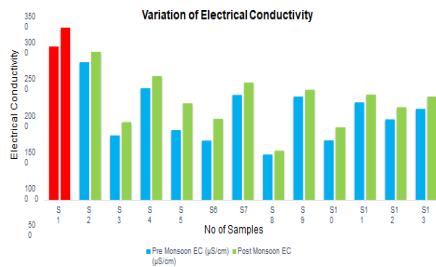
TEST RESULTS (POST MONSOON DATA)

S.No.	Sample No.	EC (µS/cm)	TDS (mg/l)	pH	Alkalinity (mg/l)	Total Hardness (mg/l)	Calcium Hardness (mg/l)	Magnesium Hardness (mg/l)	Chloride (mg/l)	Sulphates (mg/l)
1	S1	2940.6	1852.2	7.6	180	410	75	98	440	455.6
2	S2	2645.4	1666.6	7.4	101.7	385	20.15	77.8	250	510.5
3	S3	1240.6	781.2	6.9	135	210	35	41.2	240	305
4	S4	2146.4	1336.9	7.1	165	398	75.16	69.7	310	445
5	S5	1343	946.09	7.4	70.4	390	77.17	62.17	298	300
6	S6	1138	716	7.4	78.6	310	86.17	49.75	170	370
7	S7	2018	1271	6.9	102.6	414	80	66	150	395
8	S8	875.6	580	7.6	176.7	303	79.4	48.06	320	510.7
9	S9	1985	1250.5	7.4	135.6	413	75.18	69.56	140	305
10	S10	1146	721.98	6.7	174.8	390	74.19	66.47	310	540
11	S11	1876	1181.8	7.5	107.7	575	70	89.72	289.5	610
12	S12	1546.7	973.9	7.4	154.6	355	90.16	51.76	250	375
13	S13	1748	1101.24	7.5	90.7	213	35	36.2	180	350

S.No.	Sample No.	EC (µS/cm)	TDS (mg/l)	pH	Alkalinity (mg/l)	Total Hardness (mg/l)	Calcium Hardness (mg/l)	Magnesium Hardness (mg/l)	Chloride (mg/l)	Sulphates (mg/l)
1	S1	3296	2077	7.89	205.2	543	95.42	102.94	469	512
2	S2	2840.53	1840	7.53	115.5	412	22.32	89.62	264.91	520
3	S3	1492.17	940	6.85	148.4	240	47.29	44.55	254.91	325
4	S4	2380.24	1500	7.24	193.7	428	82.26	79.52	339.86	443
5	S5	1856.12	1088	7.61	75.2	400	85	72	320	312
6	S6	1555.56	980	7.35	89.56	330	95.15	54.08	195.32	396
7	S7	2253.96	1420	6.96	125.5	423	100	74.29	175.69	408
8	S8	944.58	560	7.75	184.2	320	97.45	51.18	344.15	540
9	S9	2112.45	1330	7.42	147.5	445	89.2	81.88	158.25	321
10	S10	1396.25	880	7.1	185.5	400	85.2	72.45	349	557
11	S11	2023.85	1275	7.86	125.1	610	90	119	310.8	652
12	S12	1778.12	1120	7.78	177	380	112.5	61.87	213	398
13	S13	1984.12	1250	7.56	94.56	248	47	46.23	185	380

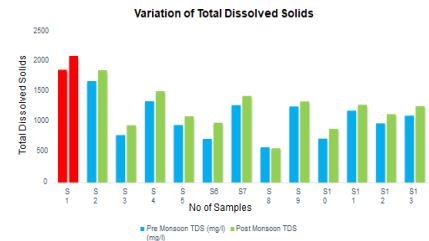
6.1 PHYSICAL AND CHEMICAL PARAMETERS RESULT

Variation of Electrical Conductivity

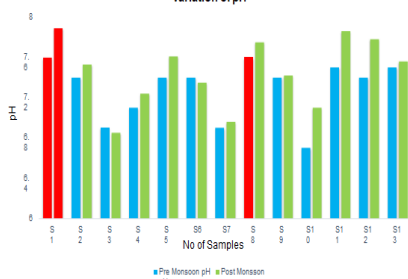


(Pre Monsoon VS Post Monsoon)

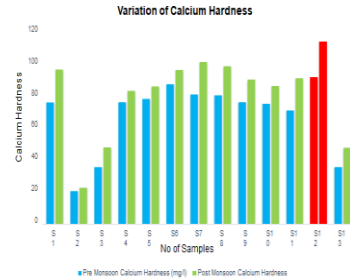
Variation of TDS



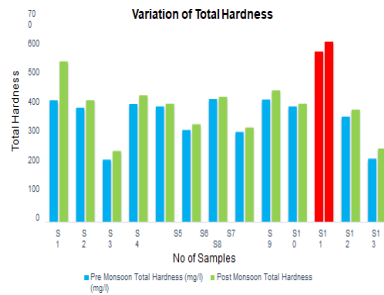
(Pre Monsoon VS Post Monsoon)



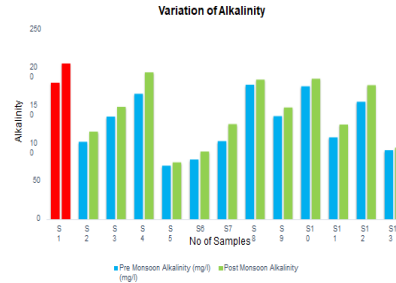
Variation of pH (Pre Monsoon VS Post Monsoon)



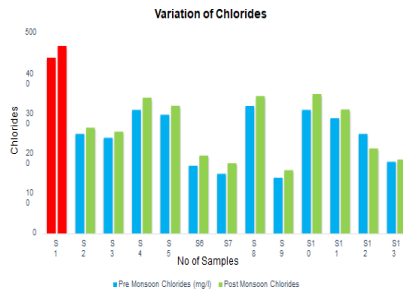
Variation of Calcium Hardness (Pre Monsoon VS Post Monsoon)



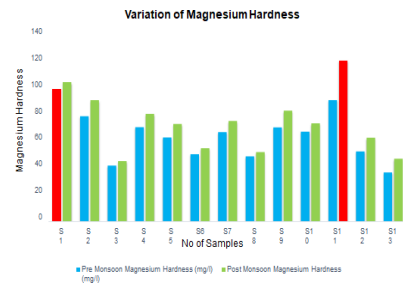
Variation of Total Hardness (Pre Monsoon VS Post Monsoon)



Variation of Alkalinity (Pre Monsoon VS Post Monsoon)



Variation of Chlorides (Pre Monsoon VS Post Monsoon)



Variation of Magnesium Hardness (Pre Monsoon VS Post Monsoon)

## VII. CONCLUSION

The present study on leachate and ground water analysis indicates that the quality of ground water was contaminated due to disposal of municipal solid waste at dump yard. It was confirmed by high EC, TDS, COD and BOD values of the leachate analysis. The heavy metals in the collected samples were found to be low concentration levels.

- The values of pH are within permissible limits as prescribed by the BIS.
- All the values of TDS, Total hardness, Magnesium hardness and Sulphates are beyond the acceptable limit.
- The pre monsoon EC value 4 out of 13 samples were beyond the permissible limit. Whereas in the post monsoon EC 6 out of 13 were beyond the permissible limit.
- In the alkalinity of premonsoon, all the samples were within the acceptable limit. In post monsoon, only one sample beyond the acceptable limit.
- The calcium hardness of premonsoon is 9 out of 13 samples beyond the acceptable limit. The post monsoon value 10 out of 13 samples beyond the acceptable limit.
- The premonsoon chloride value 7 out of 13 samples are within the acceptable limit. The post monsoon value of chlorides 5 out of 13 samples are within the acceptable limit.
- The heavy metals in the groundwater sample are within the permissible limit.
- The water quality index varies from 78 to 165 during pre-monsoon and 90 to 189 during post-monsoon. The WQI values from the present study indicate the poor water quality.

From this study, we conclude that water quality around 1.5km was affected by this open dumpyard.

## REFERENCES

1. Mor. S Ravindra. K, Dahiya R.P. and Chandra A, (2006), "Leachate characterization and assessment of groundwater pollution near municipal solid waste landfill site", Environmental Monit. Assess, Vol. 118, pp. 435-456.
2. Niininen M and Kalliokoski P, (1994), "Effect of organic contaminants in landfill leachates on Groundwater



quality in Finland", Groundwater Quality Management (Proceedings of the GQM 93 Conference held at Tallinn), IAHS Publ. no. 220.

3. Olaniya M.S, Khandekar P, and Bhide A.D, (1998), "Groundwater pollution due to refuse leachate: A laboratory study", Indian Journal of Environmental Protection, Vol. 18, No. 10, pp. 745-751.
4. Padmavathi M, (2008), "Assessment of groundwater contamination at Perungudi Municipal Dumping yard in Chennai", The 12 International Conference of International Association for Computer methods and Advances in Geo mechanics, Goa, India.
5. Sholichin M, (2012), "Field investigation of groundwater contamination from solid waste landfill in Malang, Indonesia", Inter. Journal of Civil & Environmental Engg, Vol. 12, No.2, pp.74-81.
6. Singh U.K, Kumar. M, Chauhan. R, Jha. P. K, Ramanathan. A.C. and Subramanian. V, (2008), "Assessment of the impact of landfill on groundwater quality: A case study of Pirana Site in Western India", Environmental Monitor Assess, Vol. 141, No. 1-3, pp. 309-321.





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