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A STUDY ON ENVIRONMENTAL CONTAMINATION AT COIMBATORE CITY AND ASSESSMENT OF MUNICIPAL SOLID WASTE IMPACT ON THE SOIL ENVIRONMENT IN VELLALORE DUMPING YARD, COIMBATORE CITY, TAMILNADU, INDIA.

Jenin Rajasingh J., C. Rajakumar, Ashiga T.S., Shruthi R., Jenisha G., Kalaiyarasan.G.

Department of Civil Engineering, KAHE, Coimbatore-21, India

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ABSTRACT

The prime objective of this work is the study the condition and quality of municipal solid waste, ground water and air in Coimbatore city. Coimbatore is the popular city in the south Indian state in Tamilnadu with an area of 246.8 km/sq. of 1.60 million as per 2001 sense. Coimbatore is the fastest growing city in India with major hub for Textiles Industries, Commerce, Education, Information Technology, Health Care and manifesting, it's also refers to as the pump city. Due to rapid increase in urbanization, industrialization and population which leads to increase in solid waste generation and it is disposed by dumping on landfill. Day by day, increase in municipal solid waste (MSW) and its inadequate disposal have become major environmental issues in urban areas. The study of soil characteristics was undertaken to assess the quality of soil due to solid waste dumped at Vellalore dumping yard. Proper municipal solid waste management is not practiced in Coimbatore, though several initiatives are taken by the corporation. This paper deals with the study of polluted soil. The Physico – Chemical characteristics of soil samples were analyzed based on standard procedure. The soil characteristics like major and secondary nutrients such as pH , EC, MC, OM, $Ca^{2+,}$ Mg^{2+}, Na^{+}, K^{+} and Minor nutrients were estimated and related parameters such as SAR, CEC and ESP were also calculated.

Key words: *Dumpsite, MSW, leachate, soil pollution, soil physico-chemical properties, soil macro-nutrients, comparative study.*

INTRODUCTION

Coimbatore city is spread over an area of 105.6 km^2.It had a population of 10.6 lakhs (as per census 2011). In 2012 the city expanded to 257 km^2 with an approximate increase of 16 lakhs popularation. In terms of solid waste generation, 850 Tons / Day (TPD) is generated in the city**.** Studies have revealed that waste generation rate varies from 0.12 to 0.60 kg per capita per day amounting to 115000MTs of waste per day i.e. 42 million tons annually in India. The moisture content in the MSW was observed to vary from 30 to 60 per cent while the C:N ratio was observed to be in the range of 20-40. The TATA Energy Research Institute (TERI) has estimated that the waste generation will exceed 260 million tons by 2047. Solid Waste includes all the discarded solid materials from commercial, municipal, industrial and agricultural activities. Leachate tend to migrate in surrounding soil may result in contamination of underlying soil and ground water. Rainfall is obtained from the South-west monsoon during June-September and North-east monsoon during October-December. The average annual rainfall of the year is 614 mm received annually of which about 60% fall during the period of August-December. The mean maximum and minimum temperature during study period were 34.2°C and 17.8°C respectively (Mohan and Lekeshmana Swamy 2014, Rajakumar and Meenambal 2015, Prem Sudha et al., 2016, Senthamilselvan and Palanivel 2016, Sivapraveena and Prasada rao 2016)). The aim of this study is to investigate the implications of soil properties due to solid waste dumping in Location Vellalore Dump yard**.**

SAMPLING AND METHODOLOGY

In the present study, the soil samples were collected from five locations (S1 to S5) from the Vellalore open dump site boundary. Soil samples were collected in four directions such as North, East, West, South and one sample taken from dumpsite. Soil samples were collected at surface (0–15cm) and subsurface (16-30cm). A total number of 10 samples were collected on the month of May and December, the sample were properly packed, labeled and moved to the laboratory for analysis. Dry soil sample of 25g, which is passed through 2.36mm size sieve for analyzing the result. The sieved soil sample is dissolved in 50.0 mL of distilled water and stirred well for 1 hour. Using Whatman filter paper No.42, the sample solution is filtered, and the filtrate is taken for analysis. The Physico–Chemical characteristics of soil samples were analyzed based on standard procedure. The soil characteristics like major and secondary nutrients such as pH, EC, MC, OM, Ca^{2+}, Mg^{2+}, Na^{+}, K^{+} and Minor nutrients were estimated and related parameters such as SAR, CEC and ESP were also calculated.

RESULTS AND DISCUSSION

Table 1: Characteristics of soil samples collected at depth of 15 cm and 30 cm at the month of May

Soil Sample	Location	pH	EC	MC	OM	Ca	Mg	Na	K	Cl
S1 0-15 cm	North	10.04	0.932	5.83	4.537	103.94	4.3	21	130	124
S2 16–30 cm		9.28	1.031	6.97	3.27	106	10.67	43	76	177
S3 0-15 cm	East	9.82	1.004	4.95	4.002	82.48	21.63	44	10	230
S416–30 cm		9.12	1.038	6.592	3.004	93.28	10.44	64	15	266
S5 0-15 cm	West	9.57	0.544	6.17	3.15	63.82	13.11	53	23	283
S6 16–30 cm		8.68	1.032	7.141	2.58	82.64	13	15	10	453
S7 0-15 cm	South	9.98	0.144	5.05	3.596	88.59	38.18	56	114	653
S8 16–30 cm		9.41	1.037	7.0	2.8	97.52	14.67	79	91	763
S9 0-15 cm	Dumpsite	8.93	1.382	9.973	2.067	83.79	9.98	91	33	983
S10 16–30 cm		9.22	1.258	9.104	2.005	88.34	8.94	100	45	1199

Table 2: Characteristics of soil samples collected at depth of 15 cm and 30 cm at the month of MAY

Soil Sample	Location	TA	$CaCO_3$	Fe	Cd	Cu	Mn	Pb	Cr	Zn
S1 0-15 cm	North	1344	1190	3.10	0.73	8.24	17.68	1.23	2.3	0.5
S2 16–30 cm		1344	783	5.10	1.02	8.4	18.62	3.2	3.2	1.2
S3 0-15 cm	East	1264	1134	8.42	0.01	2.07	11.22	1.2	1.31	4
S416–30 cm		1236	1342	11.54	0.01	3.8	13.36	1.5	1.3	6
S5 0-15 cm	West	673	1782	23.28	0.01	6.24	10.98	4.3	1.01	1.3
S6 16–30 cm		782	1785	24.64	0.02	7.79	12.36	4.7	1.1	2.3
S7 0-15 cm	South	1285	1562	20.3	1.72	9.54	15.76	4.8	0.8	3.04
S8 16–30 cm		1263	1563	20.14	1.76	9.54	15.78	5.3	0.8	6.80
S9 0-15 cm	Dumpsite	1435	1850	25.26	2.12	10.48	18.74	22.1	3.14	7.66
S10 16–30 cm		1654	1723	26.04	2.13	11.54	19.81	23.7	4.12	9.23

Table 3. Characteristics of soil samples collected at depth of 15 cm and 30 cm at the month of DECEMBER

Soil Sample	Location	pH	EC	MC	OM	Ca	Mg	Na	K	Cl
S1 0-15 cm	North	10.41	0.836	4.65	5.387	119.48	12.02	50	164	170
S2 16–30 cm		9.32	1.043	7.0	3.7	110.24	13.66	62	96	192
S3 0-15 cm	East	10.21	0.909	5.461	4.353	91.04	38.87	58	62	248
S416–30 cm		9.23	1.039	6.843	3.184	97.52	17.77	64	40	301
S5 0-15 cm	West	9.5	0.866	5.533	2.294	71.78	34.81	12	30	345
S6 16–30 cm		8.92	1.033	7.238	2.65	89.04	16	20	15	567
S7 0-15 cm	South	9.6	1.055	6.142	4.178	98.06	10.8	102	206	672
S8 16–30 cm		9.6	1.044	7.128	3.094	99.64	15.72	115	111	873
S9 0-15 cm	Dumpsite	8.93	1.765	9.145	3.639	108.49	20.09	150	32	986
S10 16–30 cm		9.43	1.634	9.344	2.324	99.30	20.34	124	58	1298

Table 6: Characteristics of soil samples collected at depth of 15 cm and 30 cm at the month of DECEMBER

Soil Sample	Location	TA	$CaCO_3$	Fe	Cd	Cu	Mn	Pb	Cr	Zn
S1 0-15 cm	North	1335	1209	5.10	1.76	8.18	18.64	1.6	2.1	0.6
S2 16–30 cm		1398	983	9.64	1.076	8.18	18.68	2.1	2.1	0.7
S3 0-15 cm	East	1243	1289	6.24	1.89	0.81	14.72	1.2	1.4	3.1
S416–30 cm		1234	1293	7.79	1.98	1.67	14.82	1.23	2.1	3.4
S5 0-15 cm	West	678	1830	21.86	0.04	3.98	10.96	3.89	1.1	2.3
S6 16–30 cm		900	1852	21.96	0.05	5.10	11.22	4.5	1.3	2.45
S7 0-15 cm	South	1293	1672	11.54	1.25	8.42	15.96	5.9	0.56	6
S8 16–30 cm		1299	1562	17.54	1.28	8.44	18.70	6.4	0.78	6.2
S9 0-15 cm	Dumpsite	1532	1983	24.88	2.87	9.82	24.36	23.7	4.2	10.54
S10 16–30 cm		1529	1900	25.40	2.92	9.64	32.40	34.9	5.23	11.50

Table 7: Characteristics of Soil hazards parameters collected at depth of 15 cm and 30 cm at the month of MAY

Soil Sample	Location	SAR	CEC	ESP
S1 0-15 cm	North	2.04	259.24	8.10
S2 16–30 cm		4.08	235.67	18.25
S3 0-15 cm	East	4.56	158.11	27.83
S416–30 cm		6.45	182.72	35.03
S5 0-15 cm	West	6.32	152.93	34.66
S6 16–30 cm		1.59	120.64	12.43
S7 0-15 cm	South	5.40	296.77	18.87
S8 16–30 cm		7.71	282.19	28.00
S9 0-15 cm	Dumpsite	9.66	217.77	41.79
S10 16–30 cm		10.38	242.28	41.27

Table 8: Characteristics of Soil hazards parameters collected at depth of 15 and 30cm at the month of December

Soil Sample	Location	SAR	CEC	ESP
S1 0-15 cm	North	4.46	345.5	14.47
S2 16–30 cm		5.73	281.9	21.99
S3 0-15 cm	East	5.52	249.91	23.21
S416–30 cm		6.20	219.29	29.19
S5 0-15 cm	West	1.27	148.59	8.08
S6 16–30 cm		2.03	140.04	14.28
S7 0-15 cm	South	10.03	416.86	24.47
S8 16–30 cm		11.09	341.36	33.69
S9 0-15 cm	Dumpsite	13.78	310.58	48.30
S10 16–30 cm		11.85	301.64	41.11

CONCLUSION

Main problems of contamination ground water due to leachate. Leachate consist of organics substances, salts and heavy metals. Due to ground water contamination there is a possibility of potential pollution in all over nearby dumping site. The co-disposal waste of leachate has three major waste (i.e.), municipal soil waste, sewage sludge and sediment dredging. Leachate hazardous waste affects the public health. Even it affects the entire surface quality and ground water system and ground water system around the dumping site. Supplemental water addition on municipal solid waste, methane production and anaerobic digestion reactors, effects the leachate re-circulations. Leachate also affects the landfills. A landfill is identification as the major threats to ground water resources. Leachate differs in fill age waste. Health effects are acute expo-sure to leachate from landfills. Vellalore is a dump area where there is no proper waste disposal system due to improper waste management the soil is highly contaminated. The soil gets contaminated and damaged the growth of plants and nutrients of the soil. The soil samples are collected and tested, the parameters obtained shows high toxicity and concentrations in soil. This high contamination shows many problems to nature and public health.

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