ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 5, Issue, 03, pp. 3955-3961, March, 2015

International Journal of
DEVELOPMENT RESEARCH

Full Length Research Article

GEO SPATIAL ANALYSIS OF SOLID WASTE MANAGEMENT IN KUMBAKONAM TOWN

Indhira, K., *Senthil, J., Vadivel, S. and Anand, P. H.

Department of Geography, Government Arts College (Autonomous), Kumbakonam-612001

ARTICLE INFO

Article History:

Received 18th December, 2014
Received in revised form
03rd January, 2015
Accepted 09th February, 2015
Published online 31st March, 2015

Key words:

GPS,
GIS,
ArcGIS

ABSTRACT

Kumbakonam Municipal town is selected for the present study.

Objectives: a) to trace the past and explore existing conditions of solid waste management practises in the Kumbakonam town, b) to map the existing number of dustbin locations and to find out the suitable and unsuitable locations dust bins in Kumbakonam town and c) to suggest the optimum locations for better management of solid wastes/dust bins using Geographical Information System.

Methodology: Global Positioning System (GPS) and Geographical Information System (GIS) were used to collect accurate measurements and create geographic data bases. GPS were used to find out the existing dustbins. These data were transformed into GIS, ArcGIS 9.0 software to depict the location of dustbins on the town maps. Further, buffering zones were created to extract suitable and unsuitable location of waste bins based on physical landscapes. Finally, to suggest proper solid waste management and waste disposal, the ward 24 has been selected for the allocation model to find out suitable location for dustbin.

Conclusion: The buffer zone map clearly showing that there are 146 dustbins have not been kept in the suitable area/location. The left over 356 dustbins were located in the right place. It has been observed that where the high density of population there were high production of solid waste and very low density of population has registered the very low weight of solid waste.

INTRODUCTION

Solid-waste management is the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease and spread by rodents and insects. The tasks of solid-waste management present complex technical challenges.

They also pose a wide variety of administrative, economic, and social problems that must be managed and solved. Solid waste management systems exist in most of the urban centres since last few decades. However, these systems have yet to emerge as a well-organized practice. Although, the solid waste characteristics in different urban centres vary significantly, there is an inadequate effort to tailor the system configuration to the waste characteristics. Dharasuram vegetable market in Kumbakonam town is famous for collection and distribution of vegetables. Accordingly, 78.26 per cent of organic, 10.86 per cent of garden waste, r 2.90 per cent of paper, 0.72 per cent of plastic and rubber, 0.72 per cent of glass and ceramic, 0.82 per cent of ferrous metal and aluminium and others 5.10 per cent were collected from the town. The municipality has been collected about 69 tons of solid waste per day in the year 2013.

Corresponding author: Senthil, J.
Department of Geography, Government Arts College (Autonomous), Kumbakonam-612001

Study Area

Kumbakonam is one of the important religious towns in South India. It is the second biggest town in Thanjavur District and well known for its agricultural activities. It is one of the first grade municipalities in Tamil Nadu with a population of 1, 41,814 in 2011.

Kumbakonam town extends from 10°51' North to 11°4' North latitudinal and from 79°17' East to 79°31' East longitudinally. It is a deltaic plain with smooth rolling surface towards to east coast and attitudinally its elevation is between 22 meters to 36 meters from mean sea level (Figure 1).

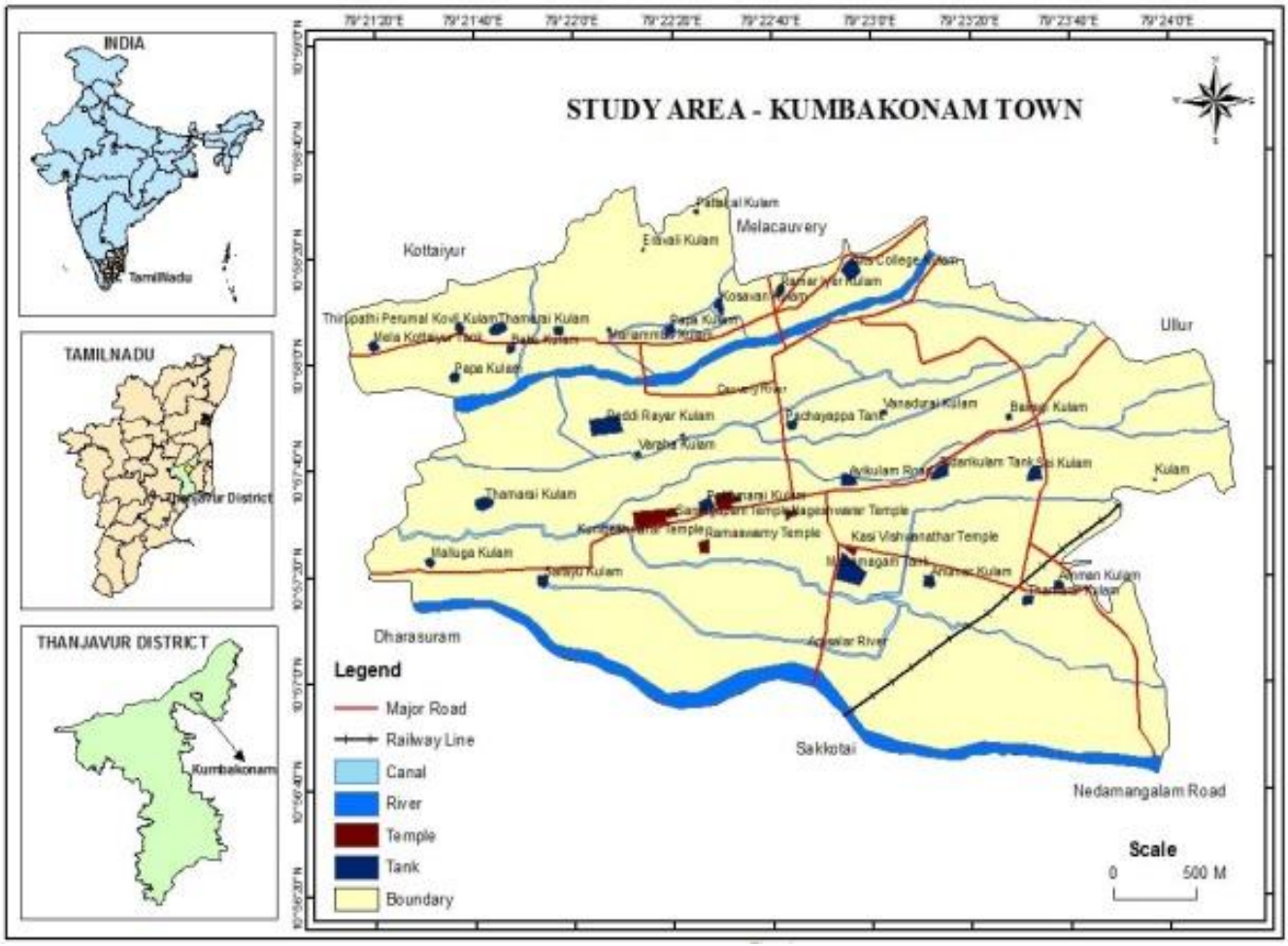

Figure 1

OBJECTIVES

a) To trace the past and explore existing conditions of solid waste management practises in the Kumbakonam town,
b) To map the existing number of dustbin locations and to find out the suitable and unsuitable locations dust bins in Kumbakonam town and,
c) To suggest the optimum locations for better management of solid wastes/dust bins using Geographical Information System.

MATERIALS AND METHODS

Global Positioning System (GPS) and Geographical Information System (GIS) were used for the research present research to collect accurate measurements and create geographic data bases. GPS was used to find out the existing dustbins in Kumbakonam twon. The data were transformed into GIS, ArcGIS 9.0 software to depict the location of dustbins on the town maps. Further, buffering zones were created to extract suitable and unsuitable location of waste bins based on physical landscapes. Finally, to suggest proper solid waste management and waste disposal, the ward 24 has been selected for the allocation model to find out suitable location for dustbin. As a result, the primary and secondary data have been gathered from various sources to address the solid waste management.

RESULTS AND DISCUSSION

Proposed location of suitable and unsuitable area for dustbin

The buffer zone map (Figure 2) is depicting the canal, river, and lake/tank based on the physical features. These areas are inappropriate place to keep dustbins because the solid waste material can pollute the river, canal and lake/tank. Environment and pollution control board has been suggested that the dustbin should not be located within the premises of such physical features.

In contrast, when compare to the buffer zone map with the dustbin location map (Figure 3). It is clearly showing that there are 146 dustbins have not been kept in the suitable area/location. They are 1in ward 2, 1 in ward 4, 6 in ward 6, 1 in ward 8, 8 in ward 9, 4 in ward 10, 2 in ward 11, 3 in ward 12, 6 in ward 13, 1 in ward 14, 4 in ward 17, 4 in ward 18, 9 in ward 19, 6 in ward 20, 3 in ward 21, 1 in ward 22, 2 in ward 23, 11 in ward 24, 3 in ward 25, 8 in ward 26, 1 in ward 28, 1 in ward 30, 7 in ward 31, 1 in ward 33, 2 in ward 34, 3 in ward 35, 2 in ward 36, 4 in ward 37, 5 in ward 39, 3 in ward 40, 3 in ward 41, 8 in ward 42, 7 in ward 44 and 2 in ward 45. The left over 356 dustbins were located in the right place.

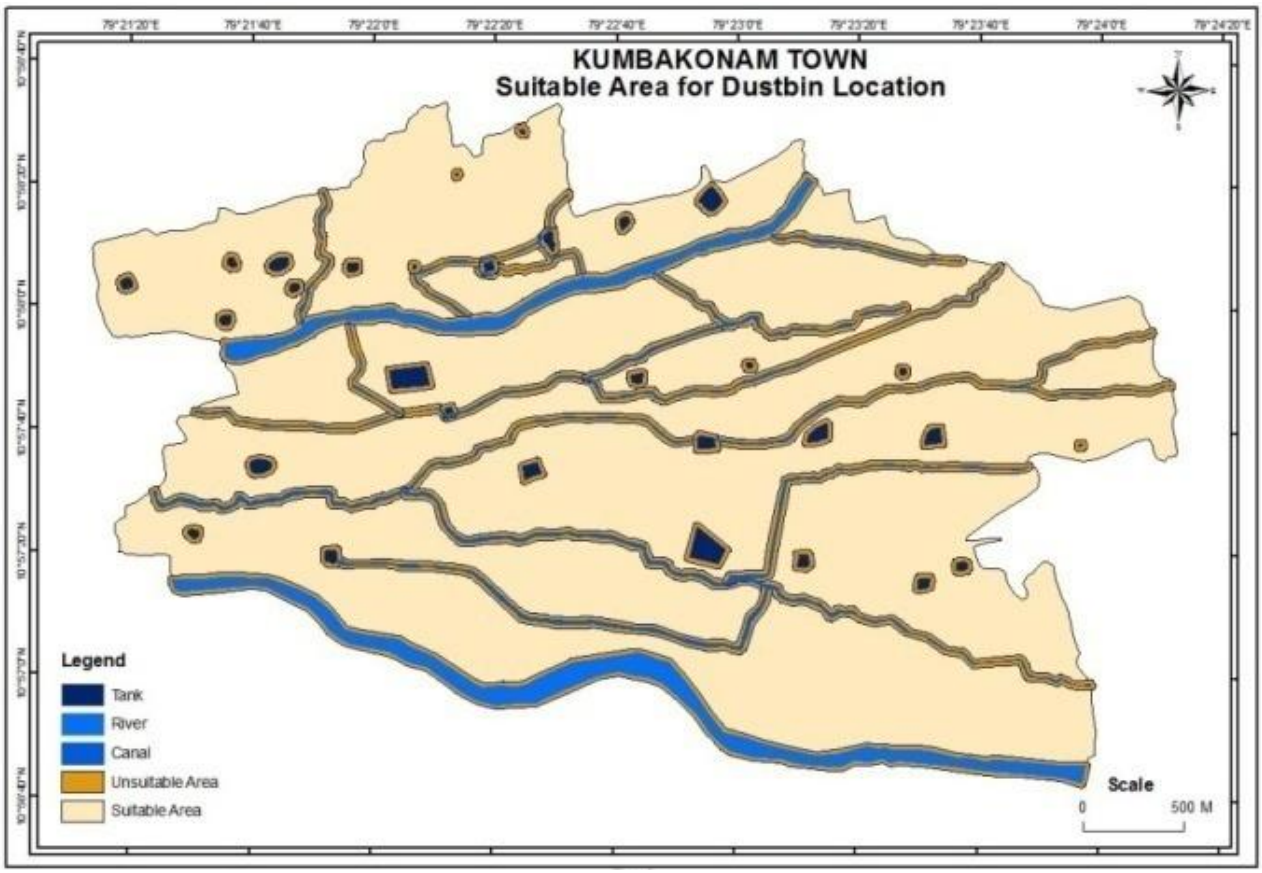

Figure 2

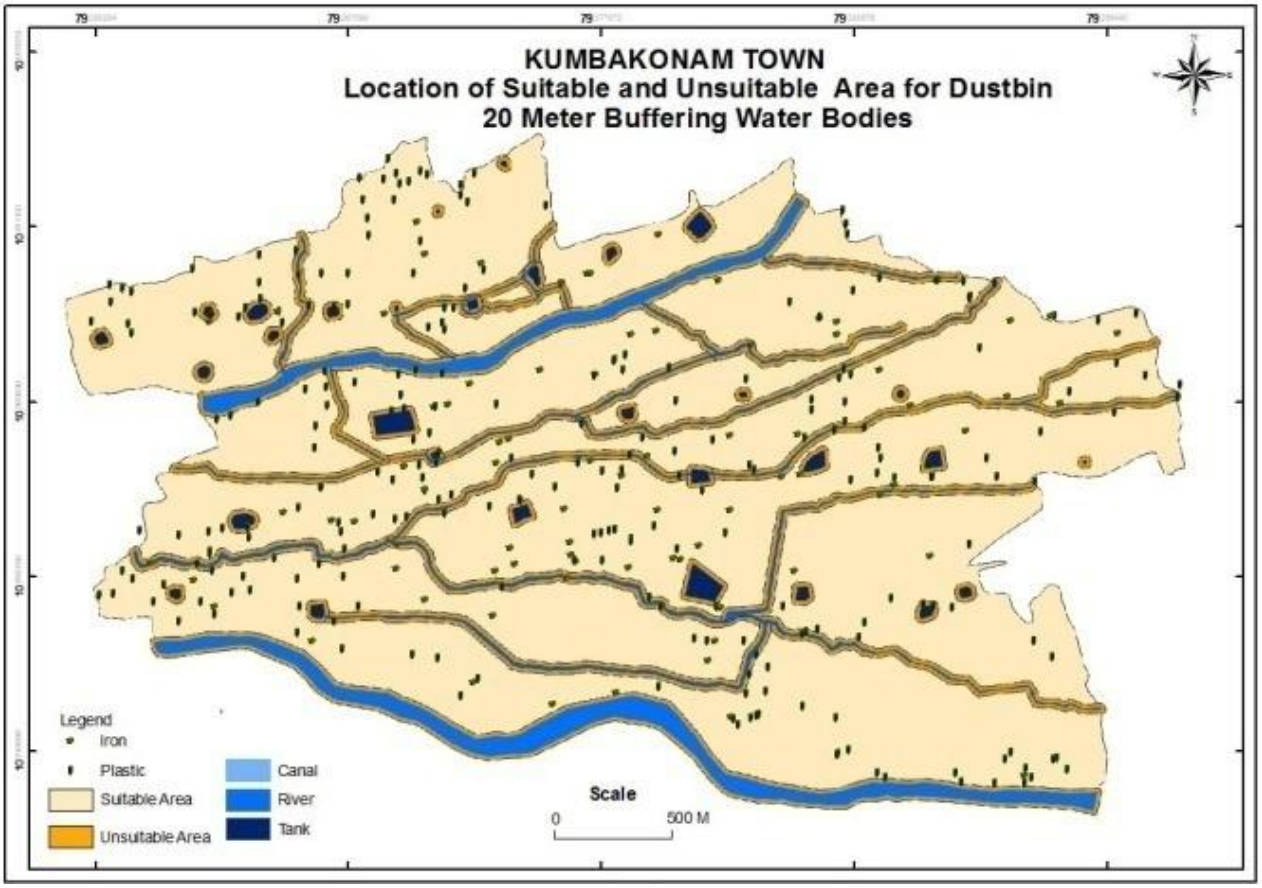

Figure 3

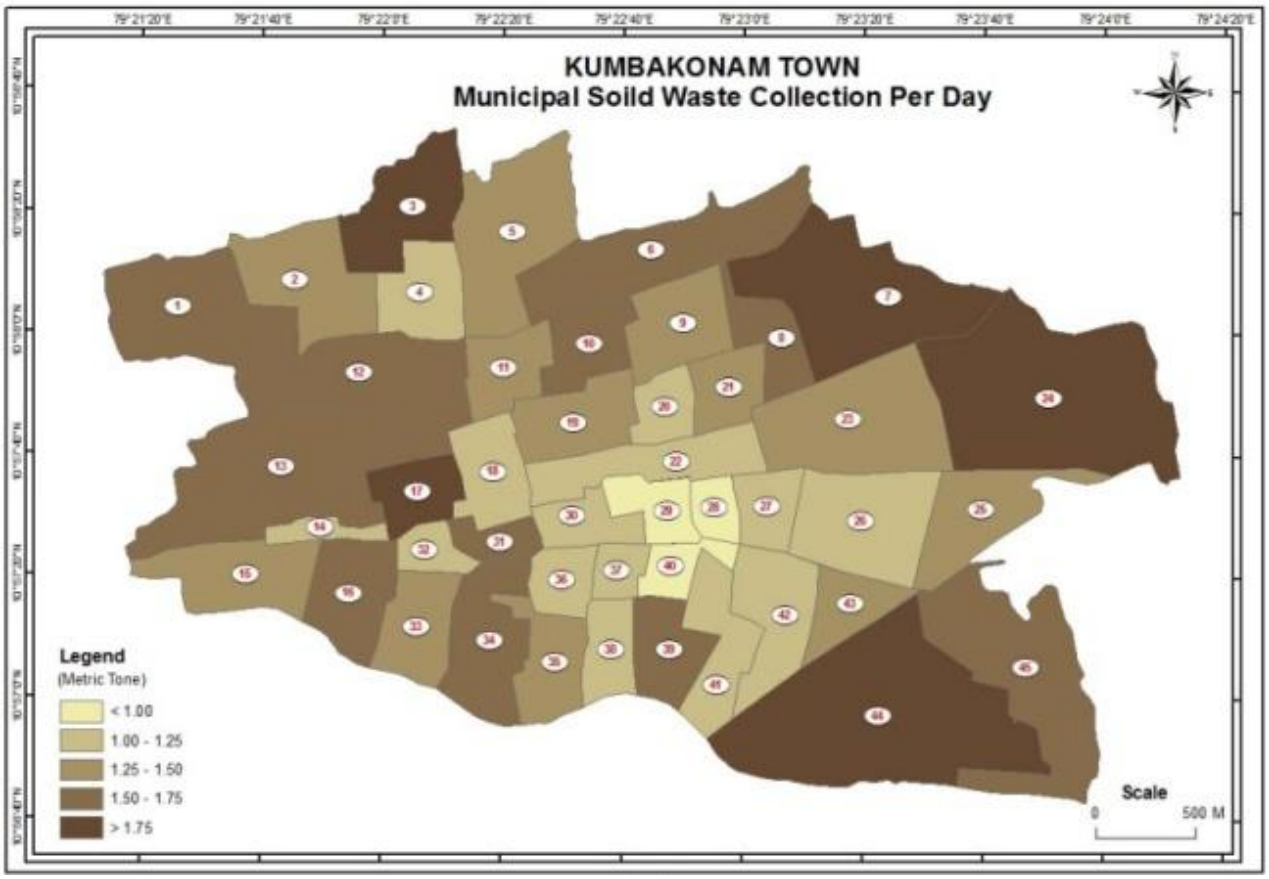

Figure 4

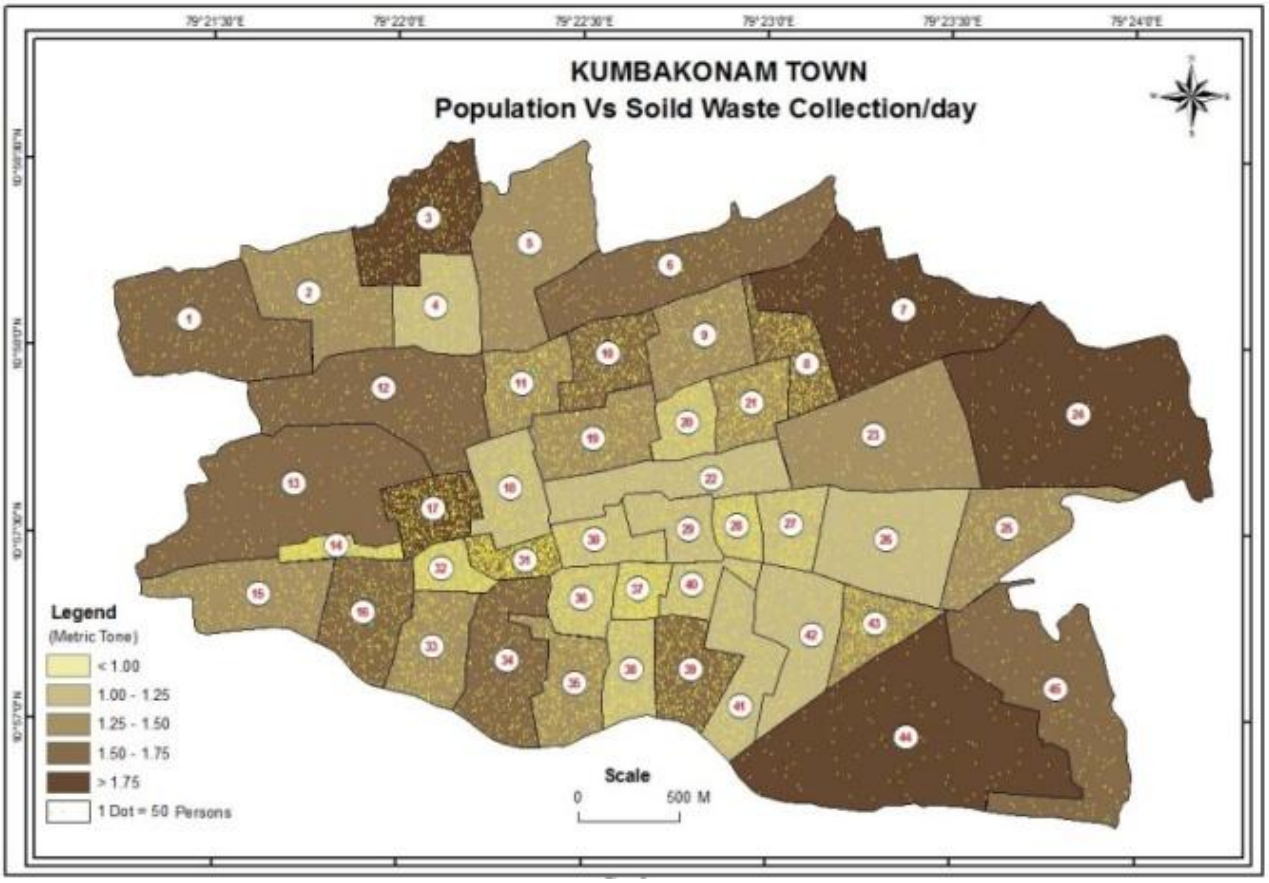

Figure 5

Production of municipal solid waste

The production of solid waste is determined by the number of household and size of population in a town. Accordingly, the Figure 4 shows that the overlays map of population density with the production of solid waste per day (Metric Tons) in Kumbakonam town. The very high density of population were found in the ward 3, 7, 17, 24, and 44; these wards were produced about 8166, 10507, 8318, 8189 and 8835 metric tons of solid waste per day respectively. (Figure 5) The high densities of population were noticed in 1, 6, 8, 10, 12, 13, 16, 31, 34, 39 and 45 wards and their production of waste were 7563, 7852, 7706, 6688, 7620, 7126, 6982, 7169, 6867 and 6789 metric tons per day respectively. Similarly, the wards 2, 5, 9, 11, 15, 19, 21, 23, 25, 33, 35, and 43 were having medium density of population and they have generated 6401, 6403, 5800, 5714, 5915, 6260, 5623, 5900, 6621, 6067, 6237, and 6428 metric tons of solid waste per day in order. The low densities of population were observed in the wards 4, 14, 18, 20, 22, 26, 27, 30, 32, 36, 37, 38, 41 and 42 and these wards were produced 4550, 3908, 5197, 4714, 4640, 4911, 4827, 4870, 4967, 5090, 4702, 5463 and 5156 metric tons of solid waste respectively. The very low density of population has registered the very low weight of solid waste, evidencing that the wards 28, 29 and 40 were produced 3214, 2377 and 2818 metric tons of solid waste per day respectively. Therefore, the result shows that the increase of population with increase of waste generation and vice-versa.

Collection of dustbin and transportation to the landfill yard

The Figure 6 is showing that the transportation (dustbin carriers) network of dustbins. This is clearly indicating that there are nine transportation routes are there to carry dustbins to the land filling area-Karikulam. The vehicle route one has been collecting dust bins from the ward 1, 2, 3, 4, 5, 6 and 7; The route two gathering waste bins from the ward 18, 19, 20, 21, 22, 23, and 25; and route three has accumulating dustbins from the ward 8, 9, 10, 11, 12, 17, 30 and 31; route four taking

Table 1. Municipal Solid Waste Collection per Day

S.No	Ward No	Census Population	Households	Total Quantity of MSW (MT)
1	1	3878	970	1.551
2	2	3282	821	1.312
3	3	4187	1047	1.674
4	4	2333	583	1.110
5	5	3283	821	1.313
6	6	4026	1007	1.610
7	7	5387	1347	2.154
8	8	3951	988	1.580
9	9	2974	744	1.190
10	10	3429	857	1.371
11	11	2930	732	1.172
12	12	3907	977	1.562
13	13	3541	885	1.416
14	14	2004	501	0.910
15	15	3033	758	1.213
16	16	3654	913	1.462
17	17	4265	1066	1.706
18	18	2665	666	1.066
19	19	3210	803	1.284
20	20	2417	604	0.967
21	21	2883	721	1.153
22	22	2379	595	0.952
23	23	3025	756	1.210
24	24	4199	1049	1.679
25	25	3395	848	1.358
26	26	2518	630	1.007
27	27	2475	619	1.000
28	28	1648	412	0.659
29	29	1219	305	0.566
30	30	2497	624	1.110
31	31	3580	895	1.432
32	32	2547	637	1.019
33	33	3111	777	1.244
34	34	3676	919	1.470
35	35	3198	800	1.279
36	36	2610	653	1.044
37	37	2411	603	1.025
38	38	2668	667	1.067
39	39	3521	880	1.408
40	40	1445	361	0.675
41	41	2801	700	1.120
42	42	2644	661	1.057
43	43	3296	824	1.318
44	44	4530	1132	1.812
45	45	3481	870	1.392
	Total	140113	35028	56.679

Source: Municipal office, Kumbakonam

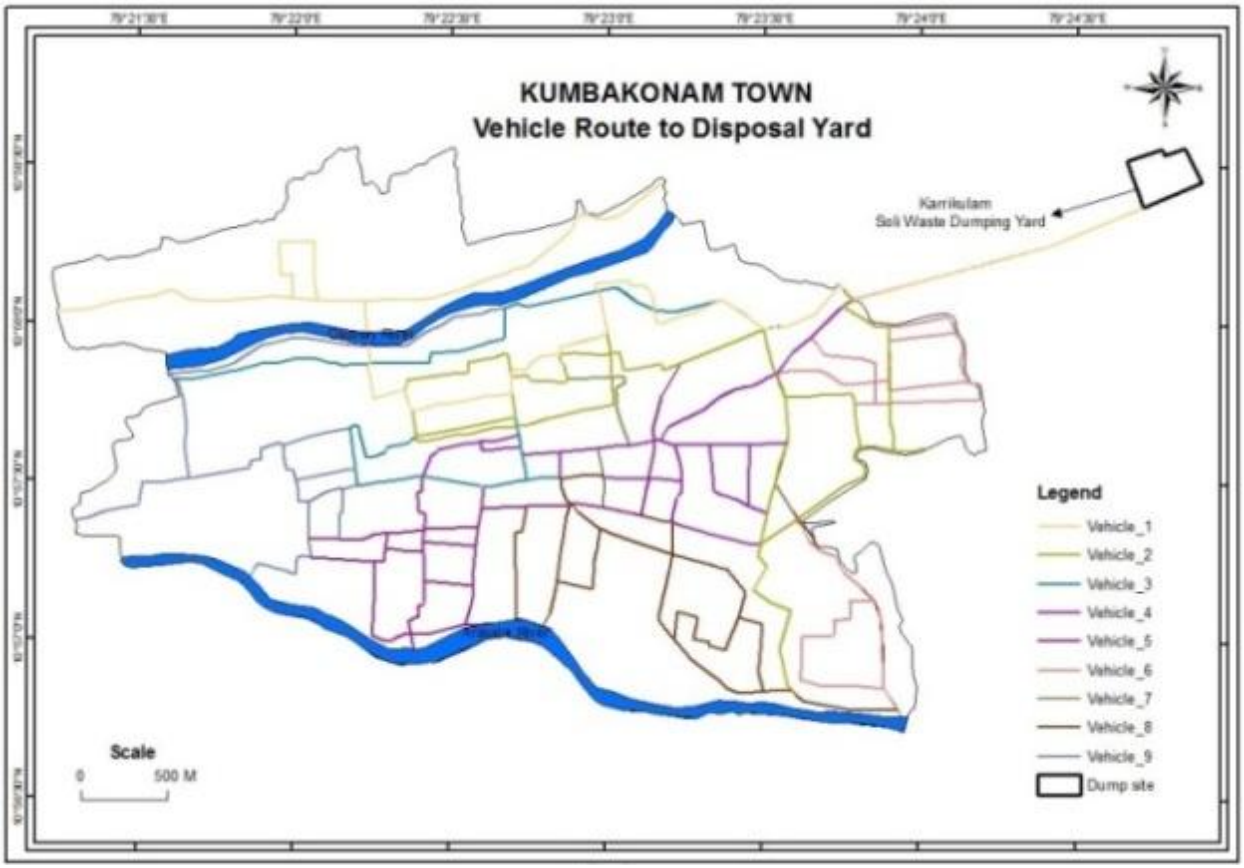

Figure 6

Figure 7

dustbins from the ward 26, 27, 28 and 29; the route five takes dustbins in the wards of, 32, 33 and 34; the vehicle route six taking from the ward 24, 44 and 45; route seven collecting solid waste dustbins from 36 and 37; route eight collecting dustbins in the wards of 35, 38, 39, 40, and 41 and finally, the route nine collecting the dustbins from 13, 14, 15 and 16 to the waste disposal sites (Karikulam).

Aerial view of karikulam landfill area

The aerial view of landfill area (Karikulam) shows that the vicinity was normal, less solid waste coverage and large empty places in 2002. In contrary, the landfill site has owned one building and six segregation units, eastern side there are trace of incineration and heaps of solid wastes were noticed in 2009. Similarly, (Figure 7) four segregation units were noticed in the northern margins of landfill area and huge heap of solid waste dumping were found in a linear pattern along the southern side this site in 2012. In 2014, larger areas were under heaps of solid waste and few places were incinerated. Behind the western side of the land fill area were change of greeneries in to vacant/absence of greeneries due to this landfill site when compare to the year 2002. In the same location there were plots/land area are ready for sale for the purpose of building constructions.

Conclusion

Thus, the present study was an attempt to provide a micro-level research contribution to the Solid Waste Management of Kumbakonam town to evaluate the existing municipal solid waste management activities. Finally the following conclusions are made. The present locations of waste bins are not placed in convenient location and waste bins are not properly used by the people. Many of the waste bins are overflow, spreading on the floors and some are filled half or few. People were deposit their household wastes on either side of the road and cesspool. It will create awkward looking and odor smell for the surrounding areas due to the presence of waste bins in residential premises. The overflowing wastes are blocking the sewage water and it is creating stagnation of cesspool and it leads a breeding place of (larva) mosquitoes. Therefore, the reallocation model of waste bins will serve as; the predicted or allocated waste bin locations are suitably located and will serve for all people. There will not be natural or artificial barrier to use this waste bins and predicting the future scenario for settlement development. There will not be overflow or half filled because it is measured on the basis of sizes of people living in a house and waste generated by individuals per day.

REFERENCES

Afullo Augustine and Frank Odhiambo, 2009. The Primary Solid Waste Storage Gaps Experienced By Nairobi Households, *Ethiopian Journal of Environmental Studies and Management*, Vol.2 No.3

Angeli Joyce P. Barafon, 2013. To Induce or Not to Induce: The (Non) Participation of Local Development Actors in the Integrated Solid Waste Management of Tagbilaran City, Bohol, Philippines.

Beede, D.N. and Bloom, D.E. 1995. The economics of Municipal Solid Waste, World Bank Researc Observer, 10,2.

Carina Weingaertner Kohlscheen, 2003. Towards Integrated Solid Waste Management in Low-Income Housing Areas in Durban, South Africa, Trita-infra ex 03-001, Stockholm.

El- Fadel, M. and Massoud, M. 2002. Public–Private Partnerships for Solid Waste Management Services, *Environmental Management*, 30, (5): pp 621–630.

Jutta Gutberlet and Angela M. Baeder, 2008. Informal recycling and occupational health in Santo André, Brazil *International Journal of Environmental Health Research,* Volume 18, Issue 1.

Longe, E.O., O.O. Longe and E.F. Ukpebor, 2009. People's Perception On Household Solid Waste Management In Ojo Local Government Area In Nigeria, Iran. *J. Environ. Health. Sci. Eng*., Vol. 6, No. 3, pp. 209-216.

Mohamed Osman Saeed, Mohd Nasir Hassan and M. Abdul Mujeebu, 2007. Development of Municipal Solid Waste Generation And Recyclable Components Rate of Kuala Lumpur: Perspective Study.

Mohammad Ali Alanbari, Nadhir Al-Ansari and Hadeel Kareem Jasim, 2014. GIS and Multicriteria Decision Analysis for Landfill Site Selection in Al-Hashimyah Qadaa, *Natural Science*, 6, 282-304.

Mokanyane Abram Mosia, 2006. Feasibility of a Healthcare Waste Management Strategy In Soshanguve, The Department Of Management, Tshwane University Of Technology.

Mukisa Philemon Kirunda, 2009. Public Participation in Solid Waste Management: Challenges and Prospects. A case of Kira Town Council, Uganda, The University of Agder, Kristiansand.

Muttamara, S. and S.T. Leong, 1997. Environmental Monitoring and Impact Assessment of A Solid-Waste Disposal Site, Environmental monitoring and assessment, 48(1), pp. 1-24.

Nabaa Shakir Hadi, 2014. Estimation Of Municipal Solid Waste Generation Rate (Case Study Of Hilla City), *Journal of Kerbala University*, Vol. 12 No.1 Scientific.

Papiya, Sarkar, 2003. Solid Waste Management In Delhi – A Social Vulnerability Study, International Conference on Environment and Health, Chennai, India, 15-17 December, Chennai.

Shahjahan H. Bhuiyan, 2009. A Crisis in Governance: Sustainable Urban Solid Waste Management in Bangladesh, *Nepalese Journal of Public Policy and Governance*, Vol. xxiv, No.1, July.

Uwadiegwu, B.O. and Chukwu, K. E. 2013. Strategies for effective urban solid waste management in Nigeria. *European Scientific Journal March,* 2013, 9 (8), 1857-7431.

****