



A Study on Problems of Solid Waste Management with Special Reference to Palakkad Municipality, Kerala, India

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Abstract

Today, the scenario is quite different and the urban environment all over the world poses serious threat from excessive generation of solid waste. Rapid increase in production and consumption, urban society rejects and generates solid material regularly which leads to considerable increase in the volume of waste generated from several sources such as, domestic wastes, commercial wastes, institutional wastes and industrial wastes. There are many environmental benefits that can be derived from the use of these methods. With this background the current study aims to assess the practices of SWM and problems due to solid waste among the households in palakkad municipality. The universe of the study consists of all households who practicing the solid waste management in Palakkad. From the sampling frame of these households, a random sample of 100 households was drawn using systematic random sampling method. After cross checking our households confined to 94 and study was carried out during the period August, 2013. The study found that the size of household is directly related to the quantity of waste generated in the household. Quantity of waste created by the respondents is 2kg to 4kg waste per day and they depend upon the door to door collectors. Majority of the respondents opined that recycling is the best way of reducing solid waste, followed by reuse and reduce respectively. The study pointed out that absence of recycling unit, inefficiency of labour, no segregation of waste at source, effect of inefficient recycling, unclean waste dumping, absence of organized primary collection and lack of financial resources are the problems of solid waste management.

Keywords: Solid waste, Practices, Reduce, Reuse, Recycle.

Introduction

Solid waste management is one of the most challenging issues in India than elsewhere at the global. The quantity of solid waste has also increased tremendously with improved life style and social status of the populations in urban centers. Today, the scenario is quite different and the urban environment all over the world poses serious threat from excessive generation of solid waste. Municipal corporations of the developing countries are not able to handle the increasing quantity of waste, which leads to uncollected waste on roads and other public places¹. According to World Bank study, urban per-capita waste management rate for most of the low-income countries will increase by approximately 0.2 kg per day by 2025 because of relatively high annual growth rate of GNP and urban population².

In developed countries, per capita waste generation increased nearly three-fold over the last two decades, reaching a level five to six times higher than that in developing countries. With increase in population and living standards, waste generation in developing countries is also increasing rapidly and it may double in volume in the current decade. If current trends continue, the world may see a five-fold increase in waste generation by the year 2025³.

In recent years, Indian cities are invariably filled with huge amounts of garbage and solid waste in open places and corners. There is continuous increase in industrial growth; waste has been increasing in variety and volume. The stray dogs, rats and cats meddle with this open disposal of garbage, which spreads diseases. Garbage disposal is severe in slum areas where people live in acute poverty, poor housing and unhygienic conditions without basic facilities. In our society very few people have the civic sense of using dustbins to throw garbage. Solid Waste Management (SWM) is a science associated with the management of generation, storage, collection, transportation, segregation, processing and disposal of solid waste using the best principle and practices of public health, economics, engineering, conservation, aesthetics and other environmental conditions. As the Solid Waste Management (SWM) is of local native it is the responsibility of the state which in turn has entrusted to local authorities who carry out the solid waste management in areas under their control using mostly their own funds, staff and equipment⁴.

Solid waste management was never taken up seriously either by public or by concerned agency or authorities and now the large amount of waste is threatening our health, environment and well being⁵. In solid waste, organic domestic waste poses a serious

threat, since they ferment, creating conditions favourable to the survival and growth of microbial pathogens. The direct exposure to wastes can lead to diseases through chemical exposure as the release of chemical waste into the environment leads to chemical poisoning. Uncollected solid waste can also obstruct storm water runoff, resulting in the formation of stagnant water bodies that become the breeding ground of disease. Direct dumping of untreated waste in rivers, seas, and lakes results in the accumulation of toxic substances in the food chain through the plants and animals that feed on it. Although India has formulated legislation relating to municipal solid waste, hazardous waste, and biomedical waste, the compliance and awareness of rules among communities and municipalities are lagging behind. With this background the current study aims to assess the practices of SWM and problems due to solid waste in Palakkad.

Objectives: i. To know the socio-economic background of the selected households, ii. To analyze the waste collection process in the selected area, iii. To examine the problem of households regarding the waste disposal.

Review of Literature: Edward and Kumar (2009) evaluated the situation of the municipal solid waste management in Trivandrum, with emphasis on unscientific landfills of solid waste. It also tried to find the challenges faced by the present system in the city. They suggested proper management plan including mitigation measures and monitoring program to be implemented in the system to prevent or minimize the potential impact of landfills on the environment⁶. Mojisola et.al pointed that there is an inadequate solid waste management facility in Ndola even though up to 80 percent of households in medium density areas indicated willingness to pay for waste collection and disposal services. The lack of environmentally friendly, sustainable and affordable waste management has led to the wide spread open dumping and open burning of solid waste⁷. To assess the generation and collection practices of organic Kitchen waste in households of Manipal, Simon et.al conducted a study. The general steps in waste management are generation, collection, sorting, separation, transfer, transport and disposal. This study was aimed at understanding the management practices at the first two steps only ie. generation and collection. The study brought out the various types of wastes generated, the constituents and their quantum in organic kitchen wastes as well as the activities which happen at the generation and at the two waste collection points⁸. Monney et.al (2013) stated that household solid waste is dominated by organic waste (48 percent) and inert materials (33 percent). The characteristics of the solid waste management system include disparities in waste collection services, lack of waste recovery mechanisms, disposal of comingled waste and lack of regulation and monitoring of the private waste collection company. The study identified that waste recovery can reduce to almost a third of the amount of household solid waste that end up at the landfill. The study recommends the pay-as-you-dump method as a cost recovery mechanism to offset waste collection costs⁹.

Methodology

Palakkad district with a total area of 4,480 km is one of the largest districts in Kerala. It is bounded on the east by the Coimbatore district of Tamilnadu, on the north and northwest by Malappuram district and on the south by Thrissur district. Palakkad Municipal Corporation is responsible for collection of solid waste which is produced day by day from different areas of palakkad. Palakkad Municipality's plan to install waste treatment plants in all houses, flats, colonies and offices for effective waste disposal has not become a reality so far. Palakkad generates as much as 35 tonnes of waste every day and the Municipality disposes only less than 10 tonnes of waste per day. The Municipality collects the remaining waste and dumps it at the 5.86 acres of land at Theruvushala. The mere dumping of garbage that takes place here is not an effective method of disposal of waste. The primary data forms the basis of the study. The universe of the study consists of all households who practicing the solid waste management in Palakkad. From the sampling frame of these households, a random sample of 100 households was drawn using systematic random sampling method. The required information pertaining to the study was compiled by administering an interview schedule to the selected households. After cross checking our households confined to 94. The field investigation and data collection for the study was carried out during the period August, 2013.

Results and Discussion

The social environment is the combination of factors such as religion, caste, family structure, marital status, size of family and age, while economic environment is made up of factors such as education occupation, income etc. A clear insight into the socio- economic factors is of paramount significance to establish the influence of these factors on the life and activities of the respondents. The socio-economic background of the sample households is presented in Table-1.

Among the respondents surveyed, it was found that 57 percent of the respondents had male headed family and only 43 percent had female headed family. Majority of the surveyed respondents belonged to nuclear family and belongs to the age group of 25-50. The size of household is directly related to the quantity of waste generated in the household. Higher number of members in a family greater is the waste generation. Majority of the respondents (54 percent) had only below four members highlighting the predominance of nuclear family. Among the respondents, 22 percent were graduates and 45 percent had higher secondary education. Only 33 percent of respondents had master's degree and other higher qualification. In the study, among the samples, 21 percent of respondents were employed in various private firms, 32 percent of respondents were government employees, 27 percent earned their livelihood from self employment and only 20 percent of them were leading a retired life and few have taken voluntary retirement. The survey revealed that the most of the respondents (45 percent) were earning an income in the range of Rs 15000 – 30000 and 31

percent had earned income below Rs 15,000. Only 25 percent had more than Rs 30,000/- income per month.

Table-1
Socio-Economic Profile of the Households

Characteristics		Frequency	Percentage
Head of the family	Male	54	57.4
	Female	40	42.6
Age (in years)	Below 30	14	14.9
	30-50	44	46.8
	Above 50	36	38.3
Type of family	Nuclear	51	54.3
	Joint	43	45.7
Household size (Numbers)	Below 4	35	37.2
	4-6	20	21.3
	Above 6	39	41.5
Education	School level	42	44.7
	Graduates	21	22.3
	Post graduates	31	33.0
Occupation	Government job	30	31.9
	Private firms	20	21.3
	Self employed	25	26.6
	Others	19	20.2
Income(in Rs)	Below 15000	29	30.9
	15001-30000	42	44.6
	Above 30000	23	24.5
Total		94	100.0

Source: Field survey, 2013

Practices of Solid Waste Management: Solid Waste Management is a science associated with the management of generation, storage, collection, transportation, processing and disposal of solid waste using the best principle and practices of public health, economics, engineering, conservation, aesthetics and other environmental conditions. But, in most Indian cities, the MSWM system comprises only four activities, i.e., waste

generation, collection, transportation, and disposal. Wastes that arise from a typical urban society comprises of garbage, rubbish (package materials), construction and demolition wastes, leaf litter, hazardous wastes, etc. Solid waste generation is an inevitable consequence of production and consumption activities in any economy¹⁰. In the current study has taken up all aspects of solid waste management which includes the quantity of waste generated, collection process, transportation and disposal of waste by selected households.

Table -2
Practices of Solid Waste Management

Practices		Frequency	Percentage
Generation of solid waste	Below 2kg	20	21.3
	2kg-4kg	60	63.8
	Above 4kg	14	14.9
Method of primary collection	Door to door	53	56.4
	Community bins	24	25.5
	Others	17	18.1
Transportation	Open hand cart	39	41.5
	Trucks	28	29.7
	Others	27	28.7
3R's	Reduce	26	27.7
	Reuse	32	34.0
	Recycle	36	38.3
Total		94	100.0

Source: Field survey, 2013

The data pertaining to the quantity of waste generated reveals that majority (64 percent) of respondents created 2kg to 4kg waste per day. Around 21 percent of respondents generate less than 2 kg of waste and only 14 percent of respondents generate above 4 kg of waste per day. The waste collection methods that are mainly adopted in India are door to door collection and Community method. Community bin method has been the most commonly adopted method in India. Out of the total respondents, it is clear from the table that 56 percent of respondents depend upon the door to door collectors, 26 percent dumped their waste in community bins and nearly 18 percent of respondents were disposed their waste in other methods, like burning and other improper methods of waste disposal. Meanwhile Sharholly and Mahmood stated that improper placement of bins, bins not designed as per quantity of

waste generated and bins not being covered causes problems like odour, stray dog nuisance and unaesthetic appearance¹¹. For transporting the waste 42 percent were handled by open hand cart and 30 percent were used trucks and 29 percent of them were used other ways of transportation.

Waste minimization can be achieved in an efficient way by focusing primarily on the first of the 3R's, "reduce," followed by "reuse" and then "recycle." The waste hierarchy refers to the "3R's" i.e., reduce, reuse and recycle, which classify waste management strategies according to their desirability. Waste reduction and reuse of products are both methods of waste prevention. They eliminate the production of waste at the source of usual generation and reduce the demands for large scale treatment and disposal facilities.

Recycling refers to the removal of items from the waste stream to be used as raw materials in the manufacture of new products. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste. The data revealed the respondent's opinion towards the 3R's. The study found that 38 per cent of respondents opined that recycling is the best way of reducing solid waste, followed by reuse (34 percent) and reduce (28 per cent) respectively.

Problems Encountered Due To Solid Waste Management: Rapid urbanization and unplanned township has created the major problem of solid waste collection, segregation and engineered waste management practices. The problem of waste management arises also due to the unsustainable consumption system typically developed countries. Many areas, particularly in developing countries, still have inadequate waste management; poorly controlled open dumps and illegal roadside dumping remain a problem. Ecological impacts such as land degradation, water and air pollution are related with improper management of municipal solid waste. Such dumping spoils scenic resources, pollutes soil and water resources, and is a potential health hazard to plants, animals and people¹².

Factor analysis was used to examine the structure of the relationship among variables representing the problems due to solid waste management from the perspective of sample respondents. To determine the appropriateness of applying factor analysis, the KMO and Bartlett's test measure were computed and the results are presented in Table-3. KMO statistics is 0.729 which is signifying higher than acceptable adequacy of sampling. The Bartlett's test of Sphericity was also found to be significant at one percent level providing evidence of the presence of relationship between variables to apply factor analysis.

The communalities for each variable were assessed to determine the amount of variance accounted by the variable to be included in the factor rotations. All the variables had value greater than 0.50 signifying substantial portions of the variance accounted by the factors. Table 3.1 enlists the Eigen values, their relative

explanatory powers and factor loadings for 20 linear components identified within the data set.

Table-3
KMO and Bartlett's Test Measures

KMO and Bartlett's Test	
Kaiser-Mayer -Olkin measures of sampling adequacy	.729
Bartlett's test of sphericity Approx. Chi-square	308.129
Degrees of freedom	65
Significance level	.000

Source: Estimation based on field survey, 2013

Factor 1 has significant loadings for five dimensions namely paucity of financial resources, absence of recycling unit, inefficiency of labour, no segregation of waste at source and effect of inefficient recycling. These dimensions explained nearly 17 percent of the variance. Factor 2 has significant loadings for four dimensions namely manpower inadequacy, no transfer station, irregular street sweeping and no system of primary collection from door which explain nearly 14 percent of the variance. Factor 3 has significant loadings on three dimensions namely disposal of waste, current practices are grossly unscientific, landfill area is not allocated, inappropriate disposal of waste at open dumping grounds and explains 10 percent of the variance. Factor 4 has significant loading on three dimensions namely not using technological treatments in SWM, no partition to separate the bio degradable waste and non-biodegradable waste and unclean waste dumping explains nearly 8 percent of the variance. Factor 5 and 6 has significant loadings on dimensions namely weak institutional set up, poor civic sense of the people, absence of organized primary collection and lack of financial resources which explained 7 percent of the variance.

Hence these are the various factors acts a problem of solid waste management. Similarly Bhojar et al also stated that due to the absence of adequate storage capacity for the refuse generated and poor discipline among the generators, the wastes are continually dumped on the road. The collection of waste needs to be done at least on a daily basis to keep the environment clean and also to protect people from health hazards¹³.

Conclusion

The study found that the size of household is directly related to the quantity of waste generated in the household. Quantity of waste created by the respondents is 2kg to 4kg waste per day and they depend upon the door to door collectors. Majority of the respondents opined that recycling is the best way of reducing solid waste, followed by reuse and reduce respectively. The study pointed out that absence of recycling unit,

inefficiency of labour, no segregation of waste at source, effect of inefficient recycling, unclean waste dumping, absence of organized primary collection and lack of financial resources are the problems of solid waste management. The effective and efficient management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. Solid waste management system in Palakkad municipality is inadequate and system needed to be upgraded. The disposal site should be assessed for their suitability and the solid waste has to be disposed off scientifically through sanitary landfills and

recyclable practice of the waste should be salvaged. The residents should be sensitized towards the importance of segregation of waste at source. The government needs to ban the usage of plastic bags and plastic products. A system approach needs to be adopted for optimizing the entire operation of SWM encompassing segregation at source, timely and proper collection, transportation routes and types of vehicles and development and proper operation of sanitary landfill site. In order to get the public awareness, training and educational programmes need to be conducted to educate the public about their role in the solid waste management.

Table- 3.1
Rotated Component Matrix

Problems	Components					
	1	2	3	4	5	6
Absence of organized primary collection						.699
Lack of financial resources						.664
Manpower inadequacy		.821				
Weak institutional set up					.853	
Poor civic sense of the people					.731	
Paucity of financial resources	.848					
Poor co-operation from the people						
Absence of recycling unit	.663					
Inefficiency of labour	.923					
No segregation of waste at source	.817					
Disposal of waste, current practices are grossly unscientific			.787			
Landfill area is not allocated			.822			
Inappropriate disposal of waste at open dumping grounds			.642			
Not using technological treatments in SWM				.774		
No partition to separate the bio degradable waste and non-biodegradable waste				.768		
No Transfer station		.644				
Irregular street sweeping		.738				
No system of primary collection from door		.765				
Unclean waste dumping				.794		
Effect of inefficient recycling	.709					
Eigen value	3.323	2.801	1.944	1.556	1.448	1.311
Percentage of variance	16.613	14.006	9.718	7.781	7.241	6.553
Cumulative percentage	16.613	30.619	40.337	48.118	55.358	61.911

Source: Estimation based on Field Survey, 2013, Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization, rotation converged in 10 iterations.

References

1. Begum Zareena (2001). Solid Waste Management. Dissertation Submitted to Madras School of Economics, Chennai, Tamil Nadu.
2. Chakrabarti S. and Sarkhel P. (2003). Economics of Solid Waste Management: A Survey of Existing Literature. Economics Research Units, India Statistical Institute, 1-58.
3. Sathishkumar R., Chanakya N. and Ramachandra T.V. (2001). Feasible Solid Waste Management No. 86. *Centre for Ecological Science*, Bangalore.
4. Joseph Kurian (2006). Stakeholder Participation for Sustainable Waste Management. *Journal of Habitat International*, 30(4), 863-871.
5. Chouhan B.M. and Reddy B.K. (1996). Bio-energy scenario in India. *IREDA News*, 7(1), 20-27.
6. Edward Sunil and Kumar Vijitha V (2009). Assessment of the Solid Waste Management System in Trivandrum City. 10th National Conference on Technological Trends (NCTT09), 216-221.
7. Mojisola Sichamba Victora and Ntengwe Felix (2012). Solid Waste Management-Case Study of Ndola, Zambia. *International Journal of Plant, Animal and Environmental Sciences*, 2(3), 248-255.
8. Simon Lalitha, Patel Shivali, Mattu Anysha and Chirayil Teresa (2013). Generation And Collection Practices of Organic Kitchen Waste in Households of Manipal. Proceedings of 1st Annual international interdisciplinary conference, AIIC, April, Azores Page number 24-26, Portugal.
9. Monney Isaac, Tiimub Benjamin Makimula and Bagah Henry Chendire (2013). Characteristics and management of household solid waste in urban areas in Ghana: the case of WA. *Civil and Environmental Research*, 3(9), 10-21.
10. Eugenia Georgina and Ramil (2002). Solid Waste Segregation and Recycling in Metro Manila: Household Attitudes and Behaviour Resources. *Environment and Economics Centre for Studies*, Philippines, 45-67.
11. Sharholy Ahmad and Mahmood Trivedi (2008). Municipal solid waste management in Indian cities-A review. *Waste Management*, 28(2), 459-467.
12. Bhoyar R.V, Titus S.K., Bhide A.D and Khanna P (1996). Municipal and Industrial Solid Waste Management in India. *Journal of IAEM*, 23, 53-64.
13. Waste Consult International (2016). Waste Consult. www.wasteconsult.de.