Solid Waste Management – A Study on the Problems Faced By Hotels in the Municipalities of Kerala

ISSN 2321 – 371X
Commerce Spectrum 3(2) 35 - 42

drsanstpeters@gmail.com
http://www.stpeterscollege.ac.in/

P. S. Ajith
Associate Professor, SAS SNDP Yogam College, Konni, Kerala, India

P. N. Harikumar[1]
Associate Professor, P.G. Department of Commerce, Catholicate College, Pathanamthitta, Kerala.

Abstract
Municipal Solid Waste Management is fast becoming a social menace in Kerala. Extreme scarcity of free space for landfilling acts as a hurdle for Local Bodies to dispose waste. The rapid population growth overwhelms the capacity of Municipalities in the State to offer even the very basic solid waste services. Being, a major waste contributor in Municipal limits, Solid Waste Management of hotels is an area deserving special attention of Authorities. The main objective of the study is to know the physical and chemical composition of Municipal Solid Waste in the State and major problems faced by hotels operating in each Region and Area to which the Municipalities belong. By Random Sampling method 173 hotels belonging to different Municipalities are selected to identify the major problems faced by them and a Structured Questionnaire was administered to collect the primary data. The study reveals that the Average Density of Municipal Solid Waste is 541.63 Kg/M^3, the Average Moisture Content is 55.74 per cent, Average Calorific Value is 1638.75 K.Cal/Kg and Average Ph is 7.31. Through a Factor Analysis seven factors are identified such as Environmental Management Issues, Waste Collection Issues, Waste Disposal Issues, Negative Impact of Waste Management, Limitations of Waste Management, Support from Government and Private Participation. As a concept Integrated Solid Waste Management will find solutions to the manifold problems persisting in Kerala.

Keywords
Waste management, Problems in waste management, Hotels in Kerala

Introduction
Any human activity creates waste in one form or the other. Due to population increase and unplanned urban development unlike past, a slight mismanagement of waste will invariably damage human health and environment. Rapid urbanization and increased population density coupled with improper waste management make the State of Kerala a breeding place for a variety of life threatening, rare diseases. The State accounts for 1 per cent of the area of India but contains about 3 per cent of country's population. The population density of the State is about 859 people per square kilometer, three times the national average. So, it is one of the densest States in the country. Hence, extreme scarcity of free space for landfilling acts as a hurdle for Local Bodies to dispose waste. Kerala has five Corporations, sixty Municipalities and around one thousand Grama Panchayats. In a rapidly urbanizing state like Kerala issues related with Municipal Solid Waste Management is a subject of utmost preference. The rapid population growth overwhelms the capacity of Municipalities in the state to offer even the very basic solid waste services. Even though, Kerala is having a developed modern society occupying a prime position compared to the other states of India in all human and social development indices, its Solid Waste Management efforts are not up to the mark. Being, a major waste contributor in Municipal limits, Solid Waste Management of hotels is an area deserving special attention of Authorities. The paper attempts to examine the problems faced by hotels of municipalities in Kerala.

Statement of the Problem
World over, Kerala-the small state lying in the south west corner of India, is famous for its high literacy rate, low infant mortality rate, high life expectancy and other social development indices. Kerala is known for its highly sensitive population and high social awareness. At the same time, it is a mere

[1] **Corresponding author:**
P. N. Harikumar, Associate Professor, P.G. Department of Commerce, Catholicate College, Pathanamthitta, Kerala. Email: sushahari@gmail.com

contradiction that, its environmental sanitation level is surprisingly low. Both the Municipal Authorities as well as the Public are equally responsible for the problems. Municipalities lack professionalism and commitment in Solid Waste Management. A group of Government Servants called *`Health Wing'* in each Municipality is responsible to manage solid waste but, they lack training and are not properly qualified either. Besides, Municipalities in Kerala, which account for about 25 per cent of the total waste generated are starving for fund and free space for waste treatment and disposal. In urban areas, as the commitment of people are too low, the efforts of the State Government and Urban Local Bodies for an organized Solid Waste Management System are not hitting the target. Even though, people are well aware about the problems and issues that, improper Solid Waste Management can create, they are highly reluctant to participate in the work for a Sustainable Solid Waste Management System. Hence, Municipal Solid Waste Management is really a burning issue in a state like Kerala where, population density is three times the national average. Hence, it is a subject which needs the immediate attention of the Government, different agencies and groups of people because of the potential health threats and environmental damage it can cause.

A complete and environmentally sound Solid Waste Management requires effective contribution from all those who are involved in this problem. Everyone is part of the solid waste generation problem and everyone shall also be part of the solution of solid waste problem. Hotels being a major waste generator in urban areas, it is considered appropriate to conduct a study on the problems faced by hotels of Municipalities in Kerala.

Objectives of the Paper

1. To know the physical and chemical composition of Municipal Solid Waste in the State.
2. To know the problems faced by hotels operating in Municipalities of Kerala due to improper Solid Waste Management.
3. To find out the most important problem faced by hotels operating in each Region and Area to which the Municipalities belong.

Methodology and Sampling Design

The Paper uses both primary and secondary data. Secondary data is collected from different published sources of various Government Departments, other Agencies and Municipal Authorities. For the purpose of this Paper the entire state of Kerala is divided into three Areas viz. South, Central and North. Out of the total sixty Municipalities in Kerala, three Municipalities each belong to Coastal, Plain and Hilly Regions are selected from each Area. Altogether, nine Municipalities are selected for the study. By Random Sampling Method 173 hotels belonging to different Municipalities are selected to identify the major problems faced by them. A Structured Questionnaire was administered to 173 hotels to collect the primary data. The tools used for analysis of primary data consist of Arithmetic Mean, Standard Deviation, ANOVA and Factor Analysis.

Physical Composition of Municipal Solid Waste

Even though, there are sixty Municipalities in the state, as of high level of urbanization, most of the Grama Panchayats are showing the characters of urban areas particularly in respect of solid waste generation. So the state should plan to have waste management system in all the Grama Panchayat areas. Out of the total waste generated 13% accounted by City Corporations, 23% by Municipalities and the rest by Gram Panchayaths. On the basis of a primary survey conducted among experts the following components of MSW are arrived at;

Table 1: Physical Composition of Municipal Solid Waste in Kerala

Type of Waste	Percentage
Compostable Organics	70
Paper	9
Plastic	6
Metals	1.5
Rubber, Leather	1.5
Clothe	1.5
Wood Waste	0.5
Others	10

From the Table 1 it is clear that 70 % of the State's MSW contains compostable organic waste. So composting and biogas generation are high priority technology options suitable for the State. Even though, the physical composition of waste is available the problem in Kerala is lack of segregation of waste. Segregation of waste is extremely important to choose a strategy and is fundamental in the success of Solid Waste Management. So technology will succeed only if it is supported by technology users. The Municipalities are getting waste in a mixed up form and not in a segregated form, which make the task of treatment of waste extremely difficult.

Chemical Composition of Municipal Solid Waste

Chemical composition of MSW is a major factor influencing soil, water and air quality which directly or indirectly affecting plant, animal and human life. Extreme Ph value of soil and water, variations in air ambient quality etc. are serious threats to ecology. The following table gives an idea of average chemical composition of MSW of the state (Average value based on nine Municipalities of the state);

Table 2: Chemical Composition of Municipal Solid Waste in Kerala

Density (Kg/M3)	Moisture Content(%)	Calorific Value (K.Cal/Kg)	Ph	Organic Matter (%)	C (%)	N(%)	C/N	P(%)	K(%)
541.63	55.74	1638.75	7.31	33.80	19.60	0.51	39.61	0.41	0.50

Fe (%)	Mn (ppm)	Ni (ppm)	Cd (ppm)	Pb (ppm)	Cr (ppm)	Cu (ppm)	Zn (ppm)
1.32	191	22.71	1.88	164.57	66.57	106.58	190.83

Analysis and Discussion

Factor Analysis

Factor Analysis is used for the purpose of determining the underlying factors from twenty nine independent variables describing problems faced by hotels due to improper Solid Waste Management in different Municipalities of Kerala. Through Factor Analysis seven factors are identified. Factor Analysis has been carried out with Principal Component Analysis with Varimax Rotation. The results are given below;

Table 3: Communalities

	Initial	Extraction
Lack of waste collection service coverage	1.000	.681
Untimely waste collection	1.000	.520
Absence of door to door collection	1.000	.724
Unexpected stoppage of waste collection and disposal	1.000	.704
Deteriorated waste collection service quality	1.000	.824
Inadequate number of community bins	1.000	.661
Distance of collection point/community bin	1.000	.657
Inadequacy and insufficiency of waste collection equipments	1.000	.758
Outdated equipments	1.000	.643
Water pollution	1.000	.846
Air pollution	1.000	.818
Dust	1.000	.811
Smoke & Fumes	1.000	.797
Noise Pollution	1.000	.783
Odour from waste dumps/landfills	1.000	.728
Diseases and health problems	1.000	.786
Floods due to blocked drains followed by diseases	1.000	.748
Environmental degradation	1.000	.788
Soil quality deterioration	1.000	.783
Improperly maintained landfills	1.000	.725
Littering and unsanitary conditions around waste bins, waste dumps and landfills	1.000	.765
Scavenging animals, birds, flies and mosquitos around the waste dumps makes the surroundings totally unhealthy	1.000	.667
Lack of professionalism in SWM	1.000	.743
Attitude of waste collection workers	1.000	.694
Lack of support from Govt. and other bodies	1.000	.748
Improper complaint management and complaint redressal	1.000	.634
Excess service fee	1.000	.809
Insufficiency of public campaigning efforts	1.000	.712
Private participation makes SWM irresponsible	1.000	.794
Extraction Method: Principal Component Analysis.		

Source: Survey Data

A perusal of the Communalities shows that they are fairly large with the minimum being 0.520. All the variables are retained for further analysis.

The Factor Analysis is carried out with Principal Components Extraction Method under the standard framework where all the components having Eigen Value greater than one being retained. Thus, the results are shown below where, it is seen that seven Factors are getting retained, resulting in an explanation of variance to an extent of 73.622 per cent.

Table 4: Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.526	25.951	25.951	7.526	25.951	25.951	7.032	24.247	24.247
2	5.149	17.756	43.707	5.149	17.756	43.707	4.544	15.669	39.916
3	3.553	12.251	55.958	3.553	12.251	55.958	2.834	9.771	49.687
4	1.514	5.222	61.180	1.514	5.222	61.180	2.445	8.431	58.118
5	1.474	5.081	66.261	1.474	5.081	66.261	1.992	6.868	64.986
6	1.074	3.703	69.964	1.074	3.703	69.964	1.349	4.651	69.637
7	1.061	3.658	73.622	1.061	3.658	73.622	1.156	3.985	73.622
8	.907	3.127	76.749						
9	.843	2.907	79.656						
10	.602	2.076	81.732						
11	.587	2.026	83.757						
12	.513	1.770	85.528						
13	.442	1.523	87.051						
14	.429	1.481	88.532						
15	.385	1.328	89.860						
16	.358	1.234	91.094						
17	.311	1.071	92.166						
18	.299	1.030	93.195						
19	.270	.931	94.126						
20	.242	.836	94.962						
21	.228	.785	95.748						
22	.221	.761	96.509						
23	.207	.715	97.224						
24	.186	.643	97.866						
25	.162	.557	98.423						
26	.142	.490	98.913						
27	.133	.457	99.371						
28	.110	.381	99.751						
29	.072	.249	100.000						

Extraction Method: Principal Component Analysis.

Source: Survey Data

The Factor Loadings for the seven Factors extracted are rotated using Varimax Rotation and the loadings are reported below. The dominant loadings in each Factor are shown in block letters, which are used to identify Factors.

Table 5: Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
Lack of waste collection service coverage	.398	.399	.050	.000	**.567**	.199	.029
Untimely waste collection	-.041	**.700**	.100	-.031	.038	-.054	-.112
Absence of door to door collection	-.126	.421	-.066	.062	**.686**	.081	.213
Unexpected stoppage of waste collection and disposal	-.070	**.802**	.218	.065	-.018	-.067	-.007
Deteriorated waste collection service quality	-.082	**.893**	-.002	.088	.092	.035	.049
Inadequate number of community bins	-.016	**.703**	-.143	.298	.235	.040	-.005
Distance of collection point/community bin	.090	**.790**	.000	.056	.026	-.043	.139
Inadequacy and insufficiency of waste collection equipments	**.605**	.498	.002	-.145	.246	.215	.129
Outdated equipments	-.070	**.740**	.001	.166	.098	.087	-.211
Water pollution	**.873**	-.103	.005	.192	-.055	.096	.153
Air pollution	**.854**	-.137	.041	.195	-.094	.040	.140
Dust	.143	.087	**.826**	-.243	-.119	.082	.147
Smoke & Fumes	.123	-.035	**.817**	-.280	.095	-.039	.155
Noise Pollution	**-.664**	.082	.544	-.039	.036	-.176	.083
Odour from waste dumps/landfills	**.789**	.103	.213	.070	-.073	-.194	-.048
Diseases and health problems	**.842**	-.081	.142	.208	-.027	-.062	.046
Floods due to blocked drains followed by diseases	-.022	.138	.298	.169	**.640**	-.438	-.103
Environmental degradation	.149	.154	-.207	**.809**	-.003	-.147	-.152
Soil quality deterioration	.083	.155	-.122	**.854**	.043	.081	-.025
Improperly maintained landfills	**.779**	.141	.081	-.010	.209	.124	-.181
Littering and unsanitary conditions around waste bins, waste dumps and landfills	**.853**	.007	.008	-.026	.180	.048	-.033
Scavenging animals, birds, flies and mosquitoes around the waste dumps makes the surroundings totally unhealthy	.518	-.138	.092	-.005	**.599**	-.107	-.024
Lack of professionalism in SWM	**.748**	-.056	-.013	.042	.167	.353	-.157
Attitude of waste collection workers	.017	.148	**.671**	-.129	.333	.302	-.051
Lack of support from Govt. and other bodies	.339	-.020	.276	.213	-.091	**.709**	-.017
Improper complaint management and complaint redressal	**.526**	.297	.281	.119	.109	.280	-.293
Excess service fee	**-.746**	.226	.361	.226	.043	-.125	-.054
Insufficiency of public campaigning efforts	.158	.169	-.296	**.690**	.091	.289	.055
Private participation makes SWM irresponsible	-.013	-.039	.228	-.095	.078	-.002	**.852**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 16 iterations.

Source: Survey Data

Table 6: Significant Loadings of Variables on Varimax Factor 1

Problem No.	Problems	Loadings
14.10	Water Pollution	0.873
14.11	Air Pollution	0.854
14.14	Noise Pollution	-0.664
14.15	Odour from Waste Dumps/Landfills	0.789
14.16	Disease and Health Problems	0.842
14.20	Improperly Maintained Landfills	0.779
14.21	Littering and Unsanitary Conditions around Waste Bins/Waste Dumps/Landfills	0.853
14.23	Lack of Professionalism in Solid Waste Management	0.748
14.26	Improper Complaint Management and Complaint Redressal	0.526
14.27	Excess Service Fee	-0.746

Source: Survey Data

Table 6 identifies ten problems as a group with highest loadings, having some common concept from among twenty nine common problems faced by public due to improper Solid Waste Management among 173 hotels selected for the study from nine different Municipalities in Kerala. These problems are categorized as Factor 1 and named after the common concepts identified as *`Environmental Management Issues' (EMI)*. The 1st Factor explains 25.951 per cent of the total variance.

Table 7: Significant Loadings of Variables on Varimax Factor 2

Problem No.	Problems	Loadings
14.2	Untimely Waste Collection	0.700
14.4	Unexpected Stoppage of Waste Collection and Disposal	0.802
14.5	Deteriorated Waste Collection Service Quality	0.893
14.6	Inadequate Number of Community Bins	0.703
14.7	Distance of Collection Point/Community Bin	0.790
14.9	Outdated Equipments	0.740

Source: Survey Data

Table 7 identified six problems with highest loadings as the next Factor. Considering the characteristics of the problems Factor 2 is termed as `*Waste Collection Issues' (WCI)*. The 2nd Factor is accounted for 17.756 per cent of the total variance.

Table 8: Significant Loadings of Variables on Varimax Factor 3

Problem No.	Problems	Loadings
14.12	Dust	0.826
14.13	Smoke & Fumes	0.817
14.24	Attitude of Waste Collection Workers	0.671

Source: Survey Data

Similarly, as per Table 8 three problems with highest loadings are identified through Factor Analysis having an underlying factor and Factor 3 is termed as `*Waste Disposal Issues' (WDI)* based the group features of the problems. The 3rd Factor is responsible for 12.251 per cent of the total variance.

Table 9: Significant Loadings of Variables on Varimax Factor 4

Problem No.	Problems	Loadings
14.18	Environmental Degradation	0.809
14.19	Soil Quality Deterioration	0.854
14.28	Insufficiency of Public Campaigning Efforts	0.690

Source: Survey Data

As per Table 9 Factor Analysis revealed three problems with highest loadings with common characteristics as Factor 4 and named as `*Negative Impact of Waste Management' (NIWM)*. The 4th Factor explains *5.222 per cent* of the total variance.

Table 10: Significant Loadings of Variables on Varimax Factor 5

Problem No.	Problems	Loadings
14.1	Lack of Waste Collection Service Coverage	0.567
14.3	Absence of Door to Door Collection	0.686
14.17	Floods Due to Blocked Drains Followed by Diseases	0.640
14.22	Scavenging Animals, Birds, Flies, Mosquitos around the Waste Dumps Makes the Surroundings Unhealthy	0.599

Source: Survey Data

Table 10 is constructed with problems having common characteristics with highest loadings and referred as Factor 5 which is termed as `*Limitations of Waste Management' (LWM)*. The 5th Factor extracted is 5.081 per cent of the total variance.

Table 11: Significant Loadings of Variables on Varimax Factor 6

Problem No.	Problems	Loadings
14.25	Lack of Support from Government and Other Bodies	0.709

Source: Survey Data

Table 12: Significant Loadings of Variables on Varimax Factor 7

Problem No.	Problems	Loadings
14.29	Private Participation Makes Solid Waste Management Irresponsible	0.852

Source: Survey Data

Two independent problems without any affiliation and not sharing any common features with one or more of the problems are traced out in Factor Analysis and represented in Table 11 and 12, which are identified as Factor 6 and Factor 7, named as `*Support from Government '(SFG)* and `*Private Participation'(PP)*. Again, 6th and 7th Factors

explained 3.703 per cent and 3.658 per cent of the total Variance. Altogether, as per Table – showing Initial Eigenvalues, 73.622 per cent of the total variance is explained by the seven Factors identified in Factor Analysis.

Comparison of Factors Area-wise and Region-wise using ANOVA

The seven factors identified though Factor Analysis is used for analysis by using ANOVA to examine Municipalities in which Region and Area is most affected by these factors. The Table 13 explains this;

Table 13: Analysis of Variance of Factors, Area-wise and Region-wise

Factors ↓	Area									ANOVA	
	Coastal			Plain			Hilly				
	M	SD	N	M	SD	N	M	SD	N	F	Sig
EMI	44.43	7.38	53	47.65	5.16	66	**49.59**	6.44	54	9.14	0.000*
WCI	27.38	10.46	53	23.26	11.35	66	**29.69**	7.99	54	6.25	0.002*
WDI	3.94	1.46	53	3.94	1.59	66	4.20	1.61	54	0.53	0.590
NIWM	20.36	1.18	53	20.67	0.56	66	**20.78**	0.79	54	3.42	0.035*
LWM	16.25	5.29	53	14.20	4.36	66	**19.80**	7.40	54	14.27	0.000*
SFG	4.79	0.99	53	5.23	1.08	66	**5.56**	1.14	54	6.81	0.001*
PP	**3.30**	2.42	53	1.42	0.90	66	1.89	1.82	54	17.36	0.000*
Factors ↓	Region									ANOVA	
	South			Central			North				
	M	SD	N	M	SD	N	M	SD	N	F	Sig
EMI	47.11	4.78	53	**50.88**	6.56	59	43.92	6.25	61	20.51	0.000*
WCI	23.30	11.36	53	**33.31**	7.58	59	22.77	8.72	61	23.99	0.000*
WDI	4.13	1.62	53	**4.68**	1.84	59	3.30	0.61	61	13.93	0.000*
NIWM	20.75	0.43	53	**20.80**	0.76	59	20.30	1.15	61	6.42	0.002*
LWM	12.89	2.97	53	17.63	7.52	59	**18.75**	5.37	61	16.75	0.000*
SFG	5.21	1.18	53	5.39	1.19	59	5.00	0.93	61	1.88	0.156
PP	1.43	0.80	53	1.85	1.75	59	**3.05**	2.41	61	12.44	0.000*

Source: Survey Data

*Significant at 5 per cent Level of Significance

From Table 5.37, it is seen that, area-wise, with respect to hotels/ restaurants, among the seven Factors, Municipalities of the Hilly Area get the highest mean scores for factors such as, Environmental Management Issues, Waste Collection Issues, Waste Disposal Issues, Negative Impact of Waste Management, Limitations of Waste Management and Support from Government (49.59, 29.69, 4.20, 20.78, 19.80 and 5.56) While considering Private Participation, Municipalities in the Coastal Area record the highest Mean Score (3.30).

Similarly, with regard to the region to which the Municipalities belong, the Central Region gains the highest Mean Scores for Environmental Management Issues, Waste Collection Issues, Waste Disposal Issues, Negative Impact of Waste Management and Support from the Government (50.88, 33.31, 4.68, 20.80 and 5.39). While considering Limitations of Waste Management and Private Participation, the North Region marks the highest Averages (18.75 & 3.05). As a next step, the statistical significance is tested by using ANOVA one way classifications. The following hypotheses are formulated:

H_0: *There is no difference in the Mean Values of the Factors across areas/regions.*

H_1: *There is difference in the Mean Values of the Factors across areas/regions.*

These hypotheses are rejected at 5 per cent Level of Significance in all cases except Waste Disposal Issues (area) and Support from the Government (region). Apart from those two exceptions, there are significant variations in all Factors among different places (vide table 13 last column $p<0.05$ significant, $p\geq0.05$ not significant). Hence, it is concluded that, considering, hotels/restaurants, Municipalities that belong to the Hilly Area are most affected by Factors such as, Environmental Management Issues, Waste Collection Issues, Negative Impact of Waste Management, Limitations of Waste Management and Support from the Government, while, in the case of Private Participation, the Coastal Area is most affected. With respect to region, Municipalities of the South Region are the most affected by Environmental Management Issues, Waste Collection Issues, Waste Disposal Issues and Negative Impact of Waste Management. Similarly, with respect to

Limitations of Waste Management and Private Participation, the North Region suffers most.

Findings

1. 70 per cent of the State's Municipal Solid Waste contains compostable organic waste. So composting and biogas generation are high priority technology options suitable for the state.
2. The Average Density of Municipal Solid Waste is 541.63 Kg/M^3,the Average Moisture Content is 55.74 per cent, Average Calorific Value is 1638.75 K.Cal/Kg and Average Ph is 7.31
3. Through a Factor Analysis seven factors are identified from twenty nine potential problems faced by hotels due to improper Solid Waste Management in different Municipalities of Kerala. The factors so identified are Environmental Management Issues, Waste Collection Issues, Waste Disposal Issues, Negative Impact of Waste Management, Limitations of Waste Management, Support from Government and Private Participation.
4. Municipalities that belong to the Hilly Area are most affected by Factors such as, Environmental Management Issues, Waste Collection Issues, Negative Impact of Waste Management, Limitations of Waste Management and Support from the Government,
5. In the case of Private Participation, the Coastal Area is most affected.
6. Municipalities of the South Region are the most affected by Environmental Management Issues, Waste Collection Issues, Waste Disposal Issues and Negative Impact of Waste Management.
7. Similarly, with respect to Limitations of Waste Management and Private Participation, the North Region suffers most.

Conclusion

Any type of man-made development should be sustainable and should not hinder the balance of the environment. Cautious efforts are highly demanded for making the fast depleting resources available for the future generation also. Human activities essentially generate waste. Unprocessed and untreated waste creates immense environmental damage and health problems. Sensing the potential problems Solid Waste Management can cause developed countries evolved a variety of solutions to treat and dispose waste with minimum harm to *`Mother Earth'*.

In Kerala, almost a quarter of the total waste generated is contributed by the Municipalities. But, Waste Management is not yet considered as a high priority area by Government which, extends only a handful of efforts to tackle the ever mounting waste issues. Here, the health scenario is extremely fragile as the drinking water sources are highly polluted t**h**rough the unplanned disposal of solid waste. Being an area, which should be highly prioritized but, currently receiving very little attention, it is high time, on the part of the Government, to come up with a series of legislative and other measures to tackle the unparalleled solid waste issues.

Now, people of the state are increasingly concerned about the health hazards due to mismanaged solid waste. The false notion that, Waste Management is the sole responsibility of the Municipalities in Municipal limits is getting changed and people are getting actively involved in treating and disposing the self generated waste. So the domestic level small scale solid waste treatment techniques like biogas production and composting are getting unexpected momentum in the state. As a concept Integrated Solid Waste Management will find solutions to the manifold problems persisting in Kerala. Cautious efforts are highly needed to cure the massive solid waste problem infected the so called *God's Own Country* and to bring back its beauty intact.

References

Bhide, A D and Sunderesan, B.B. (1983). Processing Method for Future Solid Waste Management in Developing Countries, Indian National Science Documentation Centre, New Delhi.

Sasikumar, K. and Krishna, Sanoop Gopi (2009), Solid Waste Management, PHI Learning Private Limited, New Delhi – 110001

Varma, R Ajayakumar (2007). Technological Options For Treatment of Municipal Solid Waste with Special Reference to Kerala, Suchitwa Mission.

Varma, R Ajayakumar (2007), Status of Municipal Solid Waste Generation in Kerala and Their Chracteristics.

Williams P, 1998, Waste Treatment and Disposal, John Wiley and Sons, Chichester ohioline.ag.ohio-state.edu, Ohio State University Fact Sheet, Community Development. Composting.

ohioline.ag.ohio-state.edu, Ohio State University Fact Sheet, Community Development. Integrated Solid Waste Management

http://www.kerenvis.nic.in/isbeid/w_disposal.htm, ENVIS Centre Kerala 2009, Kerala State Council for Science, Technology and Environment, Thiruvananthapuram.