

**A STUDY OF PERFORMANCE OF MUNICIPAL SOLID WASTE MANAGEMENT****¹Dr. Vishal Deshmukh, ²Dr. Rajesh Kanthe and ³Dr. Mrs. Sheetal Deshmukh**¹Associate Professor, ²Director and ³Assistant Professor¹Department of Business Administration and ³Department of Computer Application^{1,2&3}Bharati Vidyapeeth Deemed to be University, Pune Yashwantrao Mohite Institute of Management Karad**Abstract**

Household waste, construction and demolition debris, sanitation residue, and waste from streets are considered as municipal solid waste. This waste is generated mainly from residential and commercial complexes. Municipal Solid Waste is defined as household waste and any other waste collected by a Waste Collection Authority (WCA) or its agents, including waste from parks, beaches, commercial establishments, offices, industries and fly tipping.

This paper presents an overview and performance of current solid waste management practices adopted by selected municipalities in Satara, Solapur and Kolhapur districts. This paper elaborates the solid waste management system adopted by these selected municipalities. This study mainly focuses on the performance parameters of solid waste management such as timely collection of public waste, waste disposal methods, budgetary allocations, placement of public bins, regular replacement of public bins, and quality of equipments used for collection of waste, dumping site management etc.

Keywords:Demolition, Residential, Commercial, Performance.

Introduction

In the twentieth century, due to industrial revolution and technology development, consumption patterns of the people, all over the globe, have changed. The use of natural resources and goods has increased manifold. Due to this, huge quantities of different types of solid wastes are produced every day, creating an alarming problem of their disposal. It is now recognized that proactive management is required to deal with this problem, i.e., it is required to reduce the generation of solid waste, effective collection of solid waste and utilization of solid waste rather than concentrating on disposal alone. Thus, solid waste management involves management of activities associated with generation, storage, collection, transfer and transport, reuse and recycling, processing and disposal which should be environmentally compatible, adopting to the principles of economy, aesthetics, and energy conservation.

Waste: According to the Wikipedia, waste is also known as rubbish, junk, garbage and litter. It is a pejorative term for unwanted materials. The term can be described as subjective and inaccurate because waste to one person may not be another person. Waste may consist of unwanted materials left over from a community, household activities and organizations such as agriculture, production, mining, construction etc. The material may be discarded or accumulated, stored, or treated (physically, chemically, or biologically), prior to being discarded or recycled. It is also used to describe something we use inefficiently or inappropriately. ⁽¹⁾

Solid waste management (SWM) is associated with the control of waste generation, its storage, collection, transfer and transport, processing and disposal in a manner that is in accordance with the best principles of public based on the source and type, classify the waste generated in your locality. Note: a) Write your answer in the space given below. b) Check your answer with the one given at the end of this Unit. Unit 1: Introducing Municipal Solid Waste Management health, economics, engineering, conservation, aesthetics, public attitude and other environmental considerations.

Municipal Solid Waste Management, according to UNDP (2004), is a complex task which must go beyond purely technical considerations to political, institutional, social, financial, and economic aspects. ⁽³⁾ Municipal solid waste includes refuse from households, non-hazardous solid waste from industrial, commercial and institutional establishments (including hospitals), market waste, yard waste and street sweepings. Municipal Solid Waste Management includes various functions as; collection, transfer, treatment, recycling, resource recovery and disposal of municipal solid waste. Generally, most of the municipalities follow a solid waste management system as depicted in the figure below:

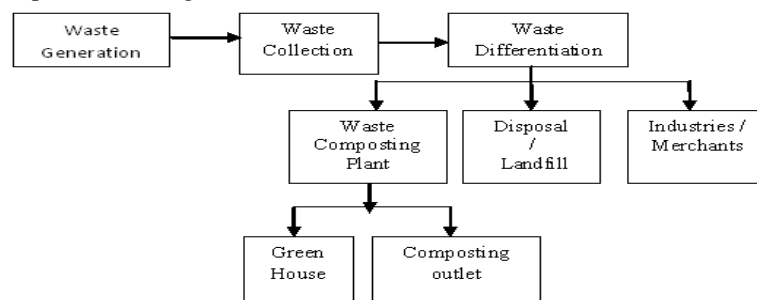


Figure:solid waste management system



Objective of The Study

To study the performance of solid waste management practices adopted by selected municipalities in Satara, Solapur and Kolhapur districts.

Hypothesis of The Study

The performance of solid waste management practices adopted by selected municipalities is average.

Methodology Adopted for The Study

The researcher studied the existing practices of solid waste management adopted by selected municipalities. This research has both exploratory and descriptive in nature and also utilizes both quantitative and qualitative data collection tools. In view of the objectives and hypothesis stated above the methodology adopted for the present study is elaborated as under:

Firstly, before the pilot survey the researcher has decided the stakeholders which were Chief Officer of the municipality, health department employees, citizens of the municipality and organizations.

Sources of Data

The researcher has adopted Survey Method to collect the required information for the study. The researcher has used primary and secondary data collection methods for this research.

Primary Data: The researcher has collected required information from the respective officers and employees of the selected Municipalities. The primary data has been collected through questionnaire, discussion, interviews, observation and necessary field work. The researcher has selected appropriate number of samples. The data has been collected on the basis of present practice of solid waste, sources of waste generation, process of collection of waste from various places, waste transportation schedule, waste disposal process, total manpower and infrastructure deployed, management of all the types of waste at landfill site, problems with existing solid waste management system, and future plans about municipal solid waste management. The researcher has covered and refers five years data from 2008 to 2013.

Secondary Data: The researcher has collected necessary information from Books, M.Phil. Ph.D. research work, magazines, internet, different websites, newspapers, articles, Govt. publications and Govt. offices.

Statistical Methods Used

Researcher has used appropriate statistical methods for data analysis and interpretation such as mean, percentage and Graphs etc. Researcher has also used Excel spread sheet, SPSS computerized software for finding inter relationship between and among different variables.

Sample Design

Universe of study for sample selection: In Satara district there are in total eight municipalities. Solapur district has nine municipalities and Kolhapur district also has nine municipalities. Therefore, the three districts have a total of twenty-six municipalities. Hence for the present study the size of the universe is twenty-six municipalities.

Sampling Method: Using Cluster Sampling Method 9 municipalities 3 each from three districts were selected. Stakeholders of the municipalities are person, group or organizations that are directly or indirectly associated with solid waste management practices of the municipalities. The groups of stakeholders selected for the research are:

1. Chief Officer of the municipality.
2. Health Department Employees of the municipality.
3. Citizens of the municipality.
4. Organisations in the municipality.

Using Purposive Quota Sampling Method 600 citizens each from the 9 municipalities were selected. All the 9 Chief Officers of the 9 municipalities were selected and 45 health department employees 5 each from the 9 municipalities were selected. In addition, 5 organizational representatives such as hotels from each municipality were selected. The sample size is calculated by using the following formula.

$$n = \frac{Z^2 * N * \sigma_p^2}{(N - 1) e^2 + Z^2 * \sigma_p^2}$$

Where, N= Size of population.

n = Size of sample.

e = Acceptable error.

σ_p = Standard Deviation of population.

Z = Standard Variate at a given confidence level



The total sample size is 5499. The sample design is detailed out in Table No. 1.2 below.

Sample Design for selection of stakeholders

Sr No	Name of the District	Name of the Municipality	Sample Units to be selected			
			Chief Officer	Health Dept. Employees	People (Citizens)	Organizational Representatives
1	Satara	Satara	01	05	600	05
		Panchgani	01	05	600	05
		Mahabaleshwar	01	05	600	05
2	Solapur	Barshi	01	05	600	05
		Dudhani	01	05	600	05
		Pandharpur	01	05	600	05
3	Kolhapur	Ichalkaranji	01	05	600	05
		Murgud	01	05	600	05
		Panhala	01	05	600	05
	TOTAL	09	09	45	5400	45

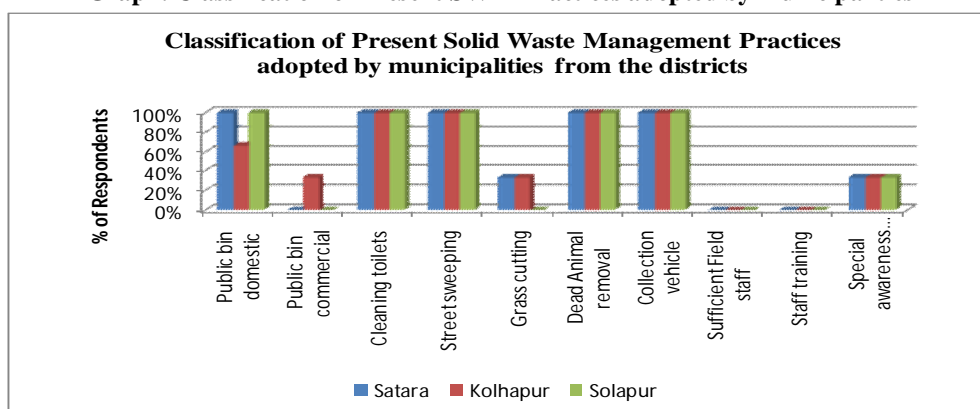
Data Analysis and Interpretation

Classification of Present SWM Practices adopted by municipalities

Present Solid Waste Management Practices adopted	Municipalities of Districts		
	Satara	Kolhapur	Solapur
Public bin (domestic use)	18 (100%)	12(66.66%)	18(100%)
Public bin (commercial use)	0(0%)	6(33.33%)	0(0%)
Cleaning toilets	18(100%)	18(100%)	18(100%)
Street sweeping	18(100%)	18(100%)	18(100%)
Grass cutting	6(33.33%)	6(33.33%)	0(0%)
Dead Animal removal	18(100%)	18(100%)	18(100%)
Collection vehicle	18(100%)	18(100%)	18(100%)
Sufficient Field staff	0(0%)	0(0%)	0(0%)
Staff training	0(0%)	0(0%)	0(0%)
Special awareness campaign	6(33.33%)	6(33.33%)	6(33.33%)

Source: Primary Data

Graph: Classification of Present SWM Practices adopted by municipalities



The above table and graph, it is observed that the most common present solid waste management practices adopted by the municipalities are provision of public bins for domestic households, provision of public bins for commercial establishments, cleaning the public toilets, street sweeping, grass cutting, removal of dead animal carcasses, provision of house-to-house waste collection vehicles, provision of special awareness campaign for the citizens.



It is concluded that, sufficient field staff should be recruited for the effective solid waste management. It is also concluded that regular training for waste handling is required for field workers.

ANOVA Test for testing Performance of solid waste management practices

Performance Parameters	Stakeholders	Municipalities of Districts		
		Kolhapur	Satara	Solapur
Timely collection of waste	C.O	4.33	3.67	4.00
	H.D. E	4.20	4.27	4.13
	Citizens	3.50	3.63	3.26
	Organizations	3.73	4.33	3.27
	Average Mean	3.64	3.50	3.27
Waste disposal methods	C.O	3.67	3.67	4.00
	H.D. E	3.47	4.27	3.53
	Citizens	2.99	3.06	2.48
	Organizations	3.07	3.47	3.73
	Average Mean	3.07	3.00	2.50
Budgetary allocations	C.O	3.67	3.33	3.33
	H.D. E	3.40	4.07	3.73
	Citizens	2.69	2.75	2.34
	Organizations	3.47	2.80	3.07
	Average Mean	2.70	2.76	2.36
Placement of public bins	C.O	2.67	3.33	2.67
	H.D. E	3.07	3.00	3.07
	Citizens	2.26	2.57	2.30
	Organizations	3.33	2.67	3.33
	Average Mean	2.27	2.58	2.32
Regular replacement of public bins	C.O	2.67	4.33	2.67
	H.D. E	3.33	3.47	3.07
	Citizens	2.30	2.70	2.32
	Organizations	3.33	3.33	3.33
	Average Mean	2.32	2.72	2.34
Equipments used for waste collection	C.O	2.67	4.33	2.67
	H.D. E	2.93	3.47	3.07
	Citizens	2.65	2.77	2.32
	Organizations	3.33	3.33	3.33
	Average Mean	2.65	2.78	2.34
Dumpingsite management	C.O	2.67	4.33	2.67
	H.D. E	3.07	3.93	3.07
	Citizens	2.68	2.74	2.32
	Organizations	3.33	3.33	2.67
	Average Mean	2.69	2.76	2.33
Overall solid waste management	C.O	2.00	4.00	2.67
	H.D. E	2.53	3.47	3.07
	Citizens	2.62	2.76	2.33
	Organizations	2.67	3.33	3.67
	Average Mean	2.62	2.77	2.35

*H.D. E-Health Department Employees, C.O-Chief Officers,
Source: Primary Data



From the above table it is observed that,

- The performance of timely collection of waste by municipalities of Kolhapur district (3.64) is greater than municipalities of Satara district (3.50) and municipalities of Solapur district (3.27).
- The performance of waste disposal methods of municipalities of Kolhapur district (3.07) is greater than municipalities of Satara district (3.00) and municipalities of Solapur district (2.50).
- The performance of budgetary allocation of municipalities of Satara district (2.76) and municipalities of Kolhapur district (2.70) is greater than municipalities of Solapur district (2.36).
- The performance of placements of public bins of municipalities of Satara district (2.58) is greater than municipalities of Solapur District (2.32) and municipalities of Kolhapur district (2.27).
- The performance of regular replacement of public bins of the municipalities of Satara district (2.72) is greater than municipalities of Solapur district (2.34) and municipalities of Kolhapur district (2.32).
- The performance of equipments used for waste collection by municipalities of Satara district (2.78) is greater than municipalities of Kolhapur district (2.65) and municipalities of Solapur District (2.34).
- The performance of dumping site management of municipalities of Satara district (2.76) and municipalities of Kolhapur district (2.69) is greater than municipalities of Solapur District (2.33).
- The performance of overall solid waste management of municipalities of Satara district (2.77) and municipalities of Kolhapur district (2.62) is greater than municipalities of Solapur District (2.35).

Conclusion

It is concluded that, the performance of practice of a) timely collection of waste, b) waste disposal methods, c) placement of public bins, d) regular replacement of public bins, e) equipments, f) dumping site management and g) overall solid waste management practices in the selected municipalities is average and i) budgetary allocation practices is below average (not satisfactory).

Suggestions

1. A sound planning mechanism should be designed involving representatives from general public so as to take care of uncertainties. Thus, making solid waste management satisfactory.
2. Since modern equipments are available for solid waste management; proper training should be extended to the staff to optimize the use of these equipments.
3. The success of solid waste management depends largely on the cooperation from the citizens, general public and establishments. Therefore, the authorities of the town municipalities should organize public awareness campaigns regularly to educate the people and gain their cooperation.
4. The authorities should visit town municipalities/ municipal corporations, which have successfully implemented Solid Waste Management and make a study of such practices and implement them in their respective town municipalities.
5. The street corners, roads, streets and areas around public garbage bins should be kept clean and hygienic. Water jets and disinfectants should be used for regular cleaning so as to keep away stray dogs and other rodents. This practice should be given top priority by all the town municipalities.

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