

Solid Waste Generation in Pau Ludhiana Hostels: Present Scenario

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Abstract—Generation of wastes and especially the solid waste management (SWM) is now one of the newest challenging issues for modern societies due to change in consumption pattern and uncontrolled growth of urbanization and industrialization. Under SWM, Municipal Solid Waste (MSW) may include household, commercial, institutional, street sweeping, construction and demolition, and sanitation waste. Solid waste management (SWM) is a critical problem for developing countries such as India. It is estimated that India's current population of 1,200 million will continue to grow at the rate of 3-3.5% per annum. With the per capita waste generation increasing by 1.3% per annum, the yearly increase in waste generation is around 5 % annually. The present paper generates certain issues related to Waste generation in PAU Ludhiana in hostel complex during first quarter of 2017 and various techniques are proposed related to Waste management in present scenario.

Keywords: Solid waste, Solid waste management, Cost estimate, Society, Generation of solid waste.

1. INTRODUCTION

In present era, the quantity of Solid Waste Management (SWM) is now one of the challenging issues for modern societies due to rapid change in consumption pattern and uncontrolled urbanization and industrialization in almost every nook and corner of the countries and especially in a developing country like India.. Municipal Solid Waste (MSW) might include waste generated in household, commercial, institutional, street sweeping, construction and demolition, and above all also sanitation waste. MSW also contains recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), compostable organic matter (fruit and vegetable peels, food waste) and soiled waste (blood stained cotton, sanitary napkins, disposable syringes) (Sharholy et al., 2008).

Global Waste Management Market Assessment (2007), reported 2.02 billion tones MSW generation globally and annual increase rate of 8%. In India increasing urbanization and changing life styles, accelerate MSW generation in cities eight times more MSW than they did in 1947. About 90 million tons of MSW were generated annually (Sharholy et al.,

2008). Per capita MSW generated rate increased to 1–1.33% annually (Bhide and Shekdar, 1998; Shekdar, 1999; Pappu et al., 2007). The composition and the quantity of MSW generated in India differ greatly with that in the western countries (Jalan and Srivastava, 1995; Shannigrahi et al., 1997; Gupta et al., 1998) particularly with hazards characteristics. Sharholy et al. (2008) mentioned that, MSW in urban areas contained large fraction of compostable materials (40–60%) and inert (30–50%). The relative percentage of organic waste in MSW was generally increasing with decrease in socio-economic status; so rural households generate more organic waste than urban households. It has been noticed that the physical and chemical components of MSW depends upon a number of factors such as food habits, standard of living, degree of commercial activities, seasons etc. where the total MSW generation depends on total population. Effective collection and proper disposal of MSW depends greatly upon accurate prediction of generation of solid waste (Chang and Lin, 1997). MSW prediction cannot be made directly and depends on many qualitative and quantitative factors.

The present paper generates certain issues related to Solid Waste generation and its management which have been experienced while being involved in various hostels arena of PAU Ludhiana and picks up certain unaddressed issues related to Waste management involved in it.. The main aim of this paper is to combine the opinion with a learned group of participants and try to evolve an updating of existing pathway for its management.

2. REVIEW OF LITERATURE:

Solid waste management (SWM) is a critical problem for developing countries such as India. It is estimated that India's current population of 1,200 million will continue to grow at the rate of 3-3.5% per annum. With the per capita waste generation increasing by 1.3% per annum, the yearly increase in waste generation is around 5 % annually. The government is under constant pressure to efficiently handle the ever growing amounts of solid waste and make cost effective changes. Added to constrained budget allotments in the solid

waste sector, poor administrative management practices have been a focus of increasing concern (ERM, 2004). A review of literature of SWM in India highlights institutional/financial issues as the most important ones limiting improvements in SWM (Hanrahan et al 2006) specifically notes that “There is an urgent need for much improved medium term planning at the municipal and state level so that realistic investment projections can be developed and implemented.” New methods for cost planning will support waste managers when faced with difficult decisions (Milke, 2006).

3. COST ANALYSIS OF SOLID WASTE MANAGEMENT IN INDIA

To get an estimate of the actual costs of Solid waste management services in India, an attempt had been made to analyze the extensive cost data of SWM; that was first published in 2005 by the National Institute of Urban Affairs (NIUA), India in their report entitled “Status of Water Supply, Sanitation and Solid Waste Management in Urban India” and correlated them to the district population of India. After omitting missing values, the dataset used in this paper covered a sampled population of 132 million distributed in 268 cities out of close to a total of 700 districts in India. The sampled cities and towns in turn represented the entire country, i.e., the 28 States and 7 Union Territories. A municipality’s solid waste expenditure can be analyzed most simply by its average costs. Average cost requires that the cost of a service be divided by some metric, usually tons or number of persons.

Table 1: Average Costs Both in Cost Per Capita and Cost Per Ton

City with Population	Cost Rs Per capita/Year	Cost Rs Per Tonnage/Year
Metro City	150/-	1100-1200/-
Class I city	110/-	450-500/-
Class II city	70-80/-	700-800/-

Table 1 could be referred to compare the average costs both in cost per capita and cost per ton over three population ranges (i.e. Metropolitan1 , Class I, and Class II cities) using a five-number summary: the median, the 25th and 75th percentiles, and the minimum and maximum observed values, outliers and extreme values if any. Outliers and extreme values are given special attention because with a large dataset such as ours they are bound to exist due to problems such as incorrect data accounting by certain municipalities, population of extended city not taken into account etc, to name a few. Excluding outliers was quite confusing in this study as removing one outlier results in creating another due to the high scatter in the data (Data issues discussed separately in next section). Hence it was decided to retain outliers and all further analysis and model fitting was done using the complete dataset. The unit costs mentioned here could be of interest not only because they offer a benchmark for comparing average costs internally between different population ranges within India but also

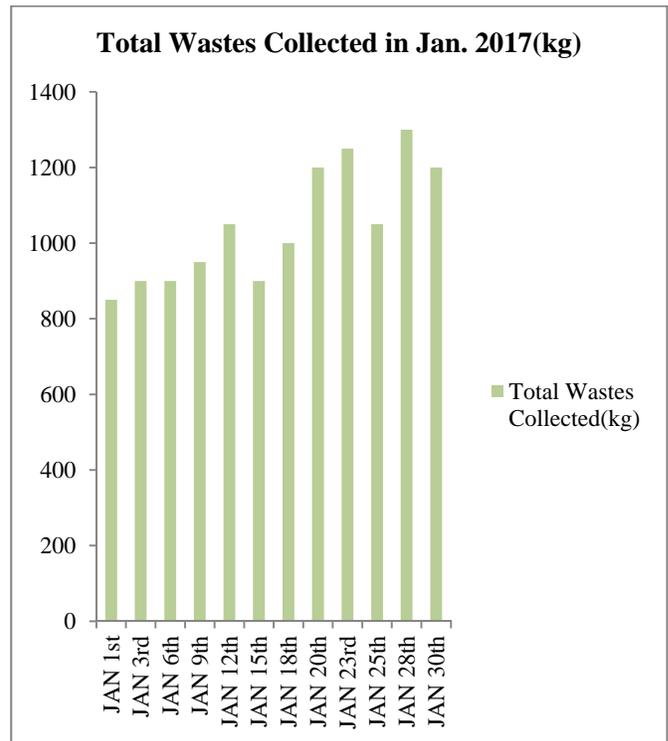
because they can also be used to compare unit costs with other developing economies in the world. It also gives a quick measure to monitor costs over time. Through such monitoring, one might be possible to identify inefficiencies and set goals for productivity improvements.

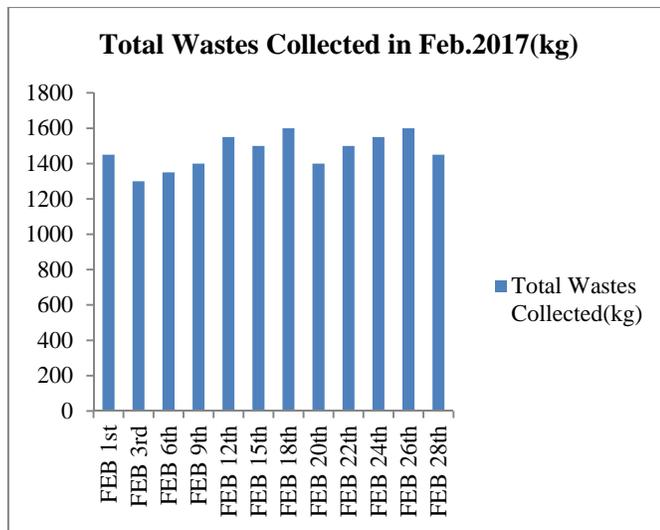
4. MATERIALS AND METHODS:

The data for the solid waste generated in various hostels of PAU Ludhiana was studied and it was analyzed to get a suitable technology for its safe disposal. The solid waste generated in Hostels mainly consist of paper based materials, vegetable peelings, grass, fine dust, glass, polythene, plastics and metals in varied quantity. The wastes are collected from the rooms and the mess compounds on alternate day basis depending on the quantity of solid waste generated. There are ___ hostels in the campus. The waste so generated is taken to disposal site after proper segregation. The waste generated is disposed off in a static compactor.

5. WASTE GENERATED IN HOSTELS:

The waste generated in hostels of PAU Ludhiana is given in tabular form Table 1, during Jan 2017, Feb.2017 and March 2017 along with graphical representation of the same as below:





Utilization of Materials Post-collection and segregation

- **Plastic** :- RDF material (Reduced Dry Fuel)

1. Used as a substitute to coal.
2. Even used in making electricity at Nakodar

- **Glass** :- Sold as it is.
- **Wood** :- Burning purposes.
- **Food wastes** :- Organic manures
- **Paper** :- Burning purposes.
- **Metals** :- Sold as it is
- **Fine Dust and Bricks** :- Mixed with cement and used for making interlocking tiles.

Rest of the materials are compacted with a static compactor and thus disposed off after manufacturing of compost.

6. CONCLUSION

Though the MSW rules 2000 have been in implementation for last about 15 years in India, there are many unaddressed issues which need to be addressed associated with the effective implementation of the rules. In some cases the rules need to be readdressed in context of present scenario. This may be noted that the MSW Rules 2000 are under revision and can be expected to be released anytime. Moreover the solid waste generated in PAU Ludhiana hostels are not of much large values and above all not much polluted. Therefore the waste generated can be easily compacted and generating compost as a by-product for use in agricultural fields.

7. ACKNOWLEDGEMENT

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REFERENCES:

- [1] Bhide AD, Shekdar AV (1998) Solid waste management in Indian urban centers. International Solid Waste Association Times (ISWA) 1:26–28.
- [2] ERM, (2004). Strategic planning guide for MSW management, published as CD, available at www.worldbank.org/urban/solid_wm/erm/start_up.pdf.
- [3] Garg, S.K. A Text book of Environmental Engineering vol.II, Khanna Publishers, new Delhi.
- [4] Global Waste Management Market Assessment.(2007). Key Note Publications Ltd , March 1, 2007, 166 Pages - Pub ID: KEYL1470786.
- [5] Gupta S, Krishna M, Prasad RK, Gupta S, Kansal A (1998) Solid waste management in India: options and opportunities. Resource, Conservation and Recycling 24:137–154.
- [6] Hanrahan, D., S. Srivastava, and A.S. Ramakrishna.(2006) Improving management of MSW in India, World Bank (India Country Office), New Delhi. 4).
- [7] Jalan RK, Srivastava VK (1995) Incineration, land pollution control alternative – design considerations and its relevance for India. Indian Journal of Environmental Protection 15 (12):909–913.
- [8] Milke, M.W., (2006). The Alchemist's dream resource, Waste Management, v. 26, p.1203-4.Ministry of Urban Development, 2004, Annexure to task force report on appropriate compost plant designs, Government of India, New Delhi.
- [9] NIUA (National Institute of Urban Affairs), 2005, Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas.
- [10] Pappu A, Saxena M, Asokar SR (2007) Solid Waste Generation in India and Their Recycling Potential in Building Materials. Journal of Building and Environment 42 (6): 2311–2324.

- [11] Shannigrahi AS, Chatterjee N, Olaniya MS (1997) Physico-chemical characteristics of municipal solid wastes in mega city. *Indian Journal of Environmental Protection* 17 (7):527–529.
- [12] Sharholy M, Ahmad K, Mahmood G, Trivedi RC (2008) Municipal solid waste management in Indian cities – A review. *Waste management* 28:459-467.
- [13] Shekdar AV (1999) Municipal solid waste management – the Indian perspective. *Journal of Indian Association for Environmental Management* 26 (2):100–108.
- [14] Zhu, D., Asnani, P.U., Zurbrugg , C., Anapolsky , S., Mani,S., 2008, improving municipal solid waste management in India, A source book for policymakers and Practitioners, The World Bank.

Table 1: Waste generated in PAU Ludhiana Hostels

	JAN 1st	JAN 3rd	JAN 6th	JAN 9th	JAN 12th	JAN 15th	JAN 18th	JAN 20th	JAN 23rd	JAN 25th	JAN 28th	JAN 30th
Total Wastes Collected(kg)	850	900	900	950	1050	900	1000	1200	1250	1050	1300	1200
	FEB 1st	FEB 3rd	FEB 6th	FEB 9th	FEB 12th	FEB 15th	FEB 18th	FEB 20th	FEB 22th	FEB 24th	FEB 26th	FEB 28th
Total Wastes Collected(kg)	1450	1300	1350	1400	1550	1500	1600	1400	1500	1550	1600	1450
	MAR 1st	MAR 3rd	MAR 6th	MAR 9th	MAR 12th	MAR 15th	MAR 18th	MAR 20th	MAR 22th	MAR 24th	MAR 27th	MAR 30th
Total Wastes Collected(kg)	1400	1550	1500	1550	1450	1500	1550	1600	1450	1500	1400	1450

