MUNICIPAL SOLID WASTE COMPOSITION IN MARAN, PAHANG (MALAYSIA) LANDFILLS

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ABSTRACT

In Malaysia, 0.7 to 1.2 kg per capita of municipal solid waste is generated and sent to 144 landfills throughout the country for disposal. The landfills could only cope with the current waste generation of 1.07 million tonnes per year. Due to rapid urbanization, active landfills would be running out of space as a result of the increment of waste volume. This study was conducted to compile data and collect the necessary information from selected landfills in Maran, Pahang, Malaysia. The landfills involved in this study are Jengka 10 landfill (Open dumping) and Batu 55 landfill (Upgraded landfill). The wastes were sorted into paper, putrescible waste, textile, metal, non metal, glass, plastic, rubber, wood, disposable diapers, aluminum and others items for quantification. Putrescible waste (on fresh weight basis) ranged from 11% to 47% in Jengka 10 landfill, whereas in Batu 55 landfill it ranged from 27% to 31%. The average percentage was approximately 28% from both landfills. The average percentages of paper received by Jengka 10 and Batu 55 landfills were 18% and 22%, respectively. The average percentages of plastic separated at both landfills were 13% and 32%, respectively, while metal ranged from 3% to 6%. The average percentages of rubber waste disposed at the landfills were 9% and 10%, respectively. Disposable diapers contributed up to 4% of the total waste received at both landfills. Since both landfills are receiving extremely heterogeneous mixture of waste ranging from recyclable plastic and papers and others, it calls for a need of an integrated waste management system to optimize resource recovery.

INTRODUCTION

Concerns on environmental issues and environmental destruction had alarmed the public over the years. The growing population generates bigger volume of waste particularly due to the economic bloom where consumers are able to increase their expenditure accordingly. This can be observed in Malaysia where with 5.6% increment of GDP, trends of higher consumption of goods lead to higher waste generation (Agamuthu 2001). The Ministry of Housing and Local Government (1999) reported that in 1998, 15,268 tonnes/day of waste were generated in the country, resulting in the increment of environmental pollution as well as the needs for more disposal sites. In the seventh Malaysia Plan (1995-2000), the federal government had spent RM 20.9 million to build 9 sanitary landfills and upgraded 27 existing landfills in 34 local authorities (MHLG 1999). Investment in solid waste management mostly limited to procurement of collection truck and landfill development (Hoornweg 1999).

Options for MSW disposal range from landfill to incineration and biogassification. However, due to cost constrain, particularly in developing countries, landfill has become the most preferred choice (Wong 1995; Tchobanoglous et al. 1993). This is also the case in Malaysia. Despite the cost-saving factors several other advantages, landfills can develop into a major source of environmental pollution to the land, air and water systems, as well as the main irritation to public health with disturbing odour, pest and rodents, as well as, the abhorrence sight due to the lack of proper management (Fauziah & Agamuthu 2003; Nurmazveen & Hassan 2002; Ham 2000). In addition to the polluting aspects of landfill sites, proper and best effective management should also be looked into seriously due to the scarcity of suitable land. However, in most cases, open dumping is being practised and takes place at about 50% of the total landfill in Malaysia.

In general, MSW consists of putrescible waste, paper, plastics, metal, glass and others, contributing a very big percentage of combustible portion (Eden 2000; Hoornweg 2000), and Malaysian practice in particularly, resulted in 98% of the waste to be sent directly to landfills for disposal (Fauziah & Agamuthu 2003). As awareness among the public is still lacking, hazardous waste including aerosol spray cans, medicine, oil filters and batteries, can be found in the MSW (Hassan 1998; Hasan & Asaari

1996) causing the presence of unwanted metal and non-metal elements in the leachate. The low rate of recycling activities among Malaysia public had caused loss of valuable resources to landfilling activities (Fauziah & Agamuthu 2003). This study was carried out to gather necessary data and information on current trends of solid waste management in order to improve and enhance a better MSW management system in Maran.

MATERIALS AND METHODS

Waste composition studies were conducted at two landfills in Maran, Pahang. The landfills involved in this study were Jengka 10 landfill and Batu 55 landfill. The studies were carried out for 6 months at each landfill, where the quarter load of a randomly selected compactor was analyzed for the study. The sample quarter was separated into their appropriate groups of putrecible waste, paper, plastics, glass, metal, non metal, wood, textile, rubber and miscellaneous. The separated wastes were weighed and its volume were determined using a known volume container. The weights were recorded and compiled for comparison.

RESULTS AND DISCUSSIONS

Waste Composition Studies

The main types of waste in the sampled MSW during the studies ranged from food waste or putrescible waste to plastic, paper and miscellaneous items including disposable diapers. The putrescible waste received by Jengka 10 landfill was found to be the highest, ranging from 11% to 47% as indicated in Table 1, while the second highest portion was paper, ranging from 4% to 28%.

The waste component received by Batu 55 landfill did not show a big variation. The highest portion of the waste comprised of plastic waste ranging from 30% to 35%. It is acceptable as Batu 55 landfill receives wastes from Temerloh and Mentakab where major commercial activities take place. According to DSM 2002, the wide variations in waste composition depended on the activities conducted in area where the waste originated.

The maximum percentage of paper received in Jengka 10 landfill was 28% while the minimum rate was 4%. Paper received in the studied landfills consisted of various types of clean paper including newsprint, white paper, colour paper, corrugated paper, as well as, mixed paper .

The highest percentage of metal was received in Batu 55 landfill (9%) while the lowest was found to be at Jengka 10 landfill (1%). The metal component comprised of heterogenous mixture of metal types ranging from bimetal cans and metal-made items like motorcycle parts and others.

Table 1: Ranges of the waste components (%w/w) received by the landfills

	Jengka 10		Batu 55	
Category	Range (% w/w)		Range (% w/w)	
	Low	High	Low	High
Paper	**4**	**28**	**20**	**25**
Putrecible waste	**11**	**47**	**27**	**29**
Textile	**2**	**13**	**undetected**	**5**
Metal	**1**	**3**	**5**	**9**
Non metal	**undetected**	**10**	**3**	**7**
Glass	**undetected**	**8**	**3**	**7**
Plastic	**7**	**19**	**30**	**35**
Rubber	**undetected**	**19**	**6**	**10**
Wood	**undetected**	**14**	**2**	**6**
Disposable diapers	**undetected**	**4**	**undetected**	**4**
Alluminium	**undetected**	**undetected**	**undetected**	**4**
Others	**undetected**	**27**	**11**	**14**

*** undetected means less than 1**

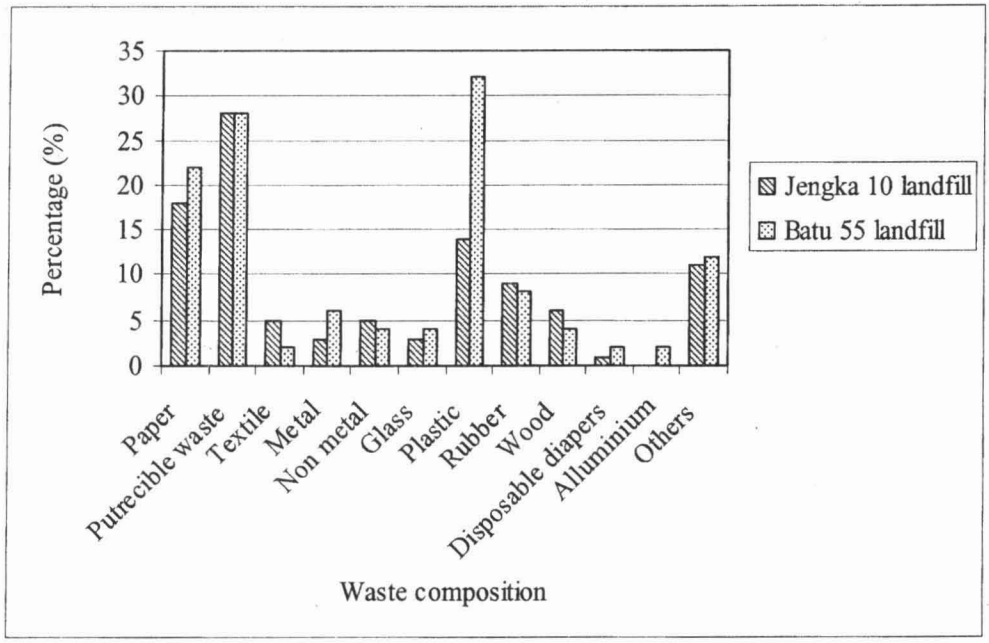

Figure 1: Municipal Solid Waste Components (% w/w) in Jengka 10 landfill and Batu 55 landfill, Maran, Pahang.

Results from this study indicated that at Jengka 10 landfill, the highest waste percentage consisted of putrecible waste, ranging from 11% to 47%, while plastic waste received by Batu 55 landfill contributed the highest portion (32%). This is commonly observed at Malaysian landfills and a typical characteristic of the MSW in the country (Fauziah & Agamuthu 2003; Nurmazween & Hassan 2002; Choy et al. 2002). The average of putrecible waste at both landfills was approximately 28%. The percentage of plastics and paper was quite high at both landfills in Maran. Due to the low density, plastics would generate more problems in waste compaction at the landfills (Fauziah & Agamuthu 2003). At Jengka 10 and Batu 55 landfills, a big portion of waste consisted of paper at approximately 18% and 22% respectively with recyclability potential. Dirty paper such as tissue, paper towels, paper plate and cups was categorized as 'others' in the study because it was assumed that this portion of paper would not be available for recycling. The role of paper in the waste stream is important since paper also provides carbon and nitrogen sources for composting of the organic fraction.

Disposable diapers contributed up to 4% of the total waste received by both landfills. This is alarming due to the risk of pathogen contamination to ground water. Aluminium waste ranged from less than 1% to 4% at Jengka 10 landfill. Recycling of aluminium cans has been informally practised by scavengers in the area.

In order to achieve an efficient landfill management, an integrated waste management system incorporating recycling and composting should be introduced. Composting program can be accomplished successfully due to the high percentage of putrescible components in the waste. This would prevent the loss of sources, i.e. of high carbon and nitrogen content, and generate value added product from waste in terms of compost production (Fauziah & Agamuthu 2001).

The implementation of recycling program would reduce the volume of waste for disposal and decrease the need to utilize natural resources. By establishing an integrated waste management system in all of the landfills, the operational period of the landfills can be lengthened and may reduce the risk of pollution from landfill sites.

CONCLUSION

Wastes from the landfills in Maran were highly mixed and ranged from various types of waste. Consistent with the previous studies, the highest portion of waste was putrecible waste, ranging from 1% to 49%, with an approximate average of 28% (Fauziah & Agamuthu 2003; Choy et. al. 2002;

Nurmazween & Hassan 2002), followed by plastics and paper averaging at 23% and 20% respectively. Other wastes, including metal, textile, rubber, glass, and wood, contributed a considerable percentage to the total waste volume received by the landfills. Therefore, establishing an appropriate waste management system is very essential to fully extract and regain the resources available in the waste stream through composting and recycling programs (Fauziah & Agamuthu 2003; Burke et al. 2000). The implementation of solid waste management system will contribute positively for the betterment of the environmental quality and the prosperity of economy.

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