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Waste: Awareness and Responsibility

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Abstract: Urbanization and population growth had generally increased the standard of living in Malaysia which also increase the waste generation. The main purposes of the study are to gather information regarding the composition of waste produced from the entire campus of UiTM Pahang and to develop a representative estimation of the university's solid waste stream. This study was carried out for three months in 2014. The waste was collected from three different sites in UiTM Pahang. The wastes were segregated to eight different categories and the weight was recorded. The solid waste composition showed that the major contributor to the total waste output in UiTM Pahang was from commercial sites about 37% followed by domestic 36% and office 27%. On the other hand, the largest proportion of solid waste by percentage is contributed by putrescible waste (30%). This is followed by paper (20%), plastic (10%) and metal (5%). In conclusion, the wastes from UiTM Pahang are highly biodegradable and place a great potential for recycling. Regardless of the type of recyclable materials, the awareness toward waste recycling is poor and most individuals are not able to translate their concerns to act upon the matter.

Keywords: Awareness, Recycling, Solid waste

1. Introduction

Solid Waste Management in Malaysia has posed great challenges especially in recent years due to rapid nationwide development, industrialisation, increased population and more complex nature of wastes being generated on daily basis. In addition to these problems, the numbers of landfill sites too, are coming towards the final phase of its lifecycle. Due to these factors, the environment quality in many developing countries particularly in urban areas is affected in a great length and swiftly deteriorating (Nesadurai, 1999). As far as environmental quality is concerned, improper and inadequate municipal solid waste management has certainly become a major contributor (Nadi et al., 2011). In Malaysia, having a population of more than 29 million, approximately 25 000 metric tonnes of domestic waste per day was estimated in year 2012. The average per capita generation of solid waste in Malaysia is estimated to be about 0.85 kg/person/day and varies in term of economic and geographical markings (Budhiarta et al., 2011). The national average generation rate and the amount of solid waste generated are contributed largely by rapidly-developing and urbanised cities, such as cities in Klang Valley, Kuala Lumpur, Johor Bharu, Penang and Kuching. The amount of solid waste generated in busy cities like in Kuala Lumpur city and Selangor, for instance comprised of one-third of the total amount of solid waste generated in Malaysia (Nasir, 2002).

Waste composition in Malaysia is largely due to organic waste that stands at more than 40% of the overall waste stream. The characteristics of solid waste components also play an important role to determine the suitability of the disposal systems. According to Visvanathan et al. (2004), solid waste composition in most Asian countries is highly biodegradable. It contains high moisture properties such as food residual, papers, agricultural waste, rubber, leather, woods, metals, glasses and textiles. In Malaysia, the average components of solid waste are quite similar and predominantly consist of food waste (45%), plastic (24%) followed by paper (7%), iron (6%) and lastly 3% for glass and others (Zamali et al., 1999). Therefore, on-going

efforts are mandatory to identify the most suitable alternative for long terms waste management to reduce the burden of existing solid waste disposal systems (open dumping and landfilling). A proper disposal of solid waste in Malaysia has taken a great pressure on local authorities and making them continuously seek a newer technologies and strategies to deal with these loads of waste as well as to find more new sites for landfills. Currently, the waste management approach via landfill is being adopted. However, due to the rapid development and lack of spaces available for new landfills, authorities in most cities in Malaysia are now looking at different angle of innovation for a better waste management approaches. One such approach that has been advocated is waste recycling method as a long-term strategy as stated in the 8th Malaysian Plan (2001-2005). Starting from 8th Malaysia Plan (2001- 2005) onwards, the government has included few policies and goals including waste minimisation, promoting on reuse, to develop recycling and implementation of projects. Meanwhile, in the 9th Malaysian Plan (2006 – 2010), further emphasis was given to the continuation of reduce, reuse and recycling (3Rs) policies. Further approach and steps are taken for greater use of environmentally friendly products (Zaipul et al., 2011). Despite these efforts, recycling activities proved futile and did not hit the public as expected. This is probably due to the lack of concern and awareness in Malaysia which have not evolved in parallel with the living standards. Therefore, participation towards sustainable waste management through 3Rs is severely low.

According to the United States Environmental Protection Agency, recycling is defined as activities carried out to make use of materials that are no longer useful and are collected, sorted, processed and converted into useful raw materials used in the production of new products. The success of any recycling program depends highly on active participation of the public (Anwar et al., 2014). Correct channelling of information and awareness on the knowledge of recycling is important to predict recycling behaviour in public. Basically, increasing knowledge will transform into changes in behaviour. So, a change in public behaviour is needed to minimize the volume of their wastes and at the same time it will definitely increases the recycling rate (Shaufique et al., 2010). Lack of regulations and guidelines is one of the most serious problems that hinder 3Rs programmes in Malaysia.

This paper attempts to gather information regarding the composition of waste produced within the campus of UiTM Pahang and to develop a representative estimation of the university's solid waste stream. The data compiled are used to develop an overview of Malay awareness on recycling activities. As a matter of fact, UiTM Pahang represents a sub community of Malays in the campus with almost 100% in which it may indirectly reflects upon total population of the Malays as whole.

2. Methods

Solid waste analysis was conducted within UiTM Pahang, Jengka Campus in a time frame of three months starting June until August 2014. Solid waste analysis was done on three types of wastes which were domestic waste, commercial waste and office waste with a different coverage area in UiTM Pahang, Jengka Campus. The selected area for domestic site was the staffs' residential area. Meanwhile, the selected area for commercial sites were cafeteria at Female College and the cafeteria at Fast Track building while the selected area for office site was lecturer's block in Infra Science Tech building. The types of solid waste composition were papers, putrescible waste, clothes, metal, non-metal, glasses, plastics, rubbers, woods, disposable diapers, aluminium and others. The waste products were collected by picking them up from their respective littering bins that were set up at the selected areas. Then, the wastes were segregated whereby every waste was divided into their composition. The wastes were then weighed using weighing scale.

3. Results and Discussion

Fig. 1 summarises the percentage of solid waste received by different sites in UiTM Pahang with 37% (by weight, w/w) from commercial site, followed by domestic site that contribute up to 36% (w/w) and office site 27% (w/w). The results of the waste composition across these three sites provide an overview that the main source of solid waste are from commercial and domestic. Whereas office site contributes about 10% less compared to commercial and domestic sites. The possible cause is office site is only occupied with staff during office hours, from 8 am until 5 pm during 5 days in a week starting from Monday until Friday.

Fig. 1 Waste quantities (% w/w) received by different sites in UiTM Pahang

The main types of waste in the sampled sites during the studies ranged from food waste or putrescible waste to paper, plastic, metal and miscellaneous items including disposable diapers. According to DSM (2002), the wide variations in waste composition depend on the activities conducted in the area where the waste originated. Table 1 compares composition of wastes from three different sites for the major categories of waste from UiTM Pahang. Wastes from the commercial sources contain large amounts of putrescible waste (12.0%-38.0%) and plastic (8.0%-11.0%) as shown in Table 1. This waste stream also contains typical recyclable materials which are paper and aluminium ranging from 0.1% to 4.5%. Putrescible waste (18.0% to 38.0%), paper (10.0%-22.0%) and metal (6.0%-8.0%) comprised the greatest fraction of the waste stream from domestic sites. The main waste generated from office mostly are from categories others ranging from 24.0% to 28.0% followed by paper (15.0%-20.1%). In this study, paper plate, cups, dirty paper tissues and paper towels was categorised as 'others' because it was assumed that this portion of paper would not be available for recycling. 'Others' also included batteries, light bulbs and decoration items.

There are a few items of interest from Table 1 which are residential and commercial waste contains a diverse mix of materials encompassing almost all the major categories. Besides, residential and commercial waste is reasonably similar. Putrescible waste mainly food scraps contributed to the greater amount of the solid waste collected from domestic and commercial site. It is reasonable to get the maximum record of putrescible wastes because of the commercial waste covered the cafeteria site. Cafe near to office with uncongested living area provided place and time for staff having their lunch at cafe or home and this suggested the reason of small amount of putrescible waste from office. In Solid Waste Management (1999),

the development of the community and the state of its economy affect the abundance and composition of solid waste received.

All sites received significantly quite a large amount of plastic. It is not surprising at all since plastic bags are still widely used in buying activities in Malaysia. Plastic contributes up to 9.5% (midrange value) and it is the second highest categories received by commercial site. It may be due to most of the food sellers used plastic to wrap and pack their food instead of serving the food on plates. Besides, the packed class in a day made the packed food more convenient for the students to eat meals anywhere and anytime.

Table 1. Range of the waste components (% w/w) received from different sites in UiTM Pahang

Category	Sites								
	Office			Domestic			Commercial		
	Range (w/w)		MR	Range (w/w)		MR	Range (w/w)		MR
	Low	High		Low	High		Low	High	
Paper	15.0	20.1	17.5	10.0	22.0	16.0	3.0	4.5	3.75
Putrescible waste	ND	5.0	2.50	18.0	38.0	28.0	12.0	38.0	25.0
Textile	ND	ND	-	ND	1.3	0.65	ND	ND	-
Metal	ND	ND	-	6.0	8.0	7.0	2.0	3.0	2.5
Non-metal	ND	3.0	1.50	2.0	3.0	2.5	1.2	3.0	2.1
Glass	ND	ND	-	1.5	4.0	2.75	ND	0.5	0.25
Plastics	3.0	4.0	3.50	5.0	6.0	5.5	8.0	11.0	9.5
Rubber	ND	ND	-	5.0	7.0	6.0	1.5	2.0	1.75
Wood	ND	ND	-	4.0	8.0	6.0	ND	ND	-
Disposable diapers	ND	ND	-	4.0	8.0	6.0	ND	ND	-
Aluminium	0.6	6.0	3.3	2.0	2.5	2.25	0.1	0.2	0.15
Others	24.0	28.0	26.0	ND	0.3	0.15	ND	0.15	0.08

ND-Absent or less than 0.1%
MR-Midrange

The total amount of wastes generated for each sampling is up to 182.0 kg. Weighted averages as a midrange (MR) values were used to calculate the total solid waste by categories (data are not shown). Fig 2 shows the largest proportion of solid waste by percentage is contributed by putrescible waste (30%) followed by paper (20%), plastic (10%) and metal (5%). This is consistent with previous studies whereby the highest portion of waste was putrescible waste, a typical characteristic of municipal solid waste in Malaysia (Siti Suhaila et al., 2005; Fauziah & Agamuthu, 2003).

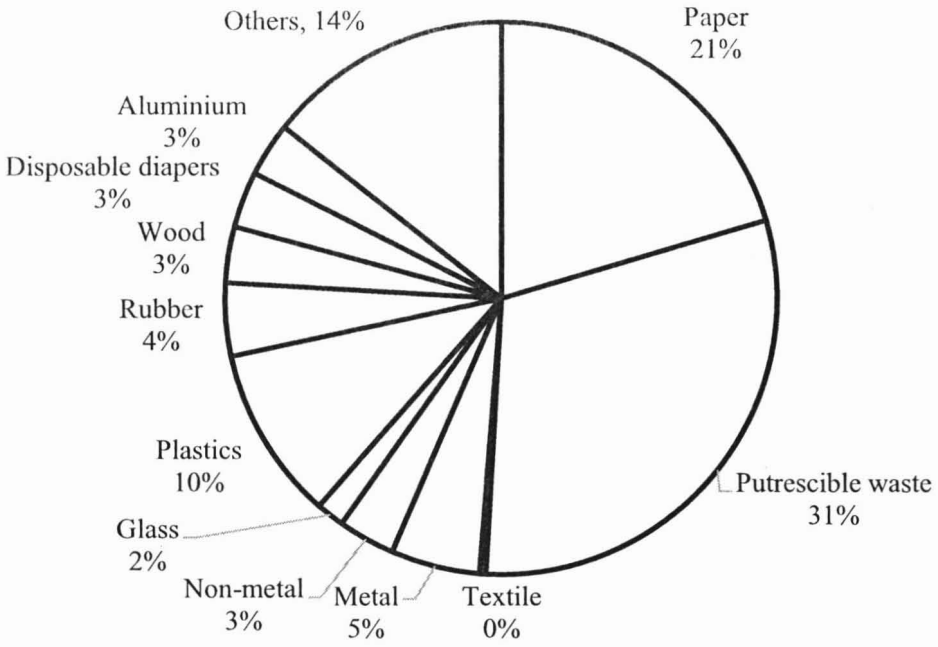

Fig. 2 Solid waste components (% w/w) in UiTM Pahang

Significant amount of recyclable materials such as paper, metal and aluminium in waste stream was rather alarming as this shows that recycling program in the Campus were not successfully practised and indirectly represents a small community of the Malay attitude. The enforcement of recycling activities will be implemented starting 1st September 2015 through waste collection schedule. Segregation of waste by household involves a few categories which are food waste and recyclable garbage such as plastic, paper, bottle and garden waste.

4. Conclusion

In conclusion, the wastes from UiTM Pahang are highly biodegradable and place a great potential for recycling. Irrespective of the type of recyclable materials, the awareness toward waste recycling is poor and most individuals are not able to translate their concerns to act upon the matter. Waste stream should be handled wisely through systematic waste management to show respect to the environment. Awareness and responsibility to make sure the success of waste management is everyone's job. The best practise of waste management is preventing or minimising the waste produce from the source. If waste production cannot be prevented then reusing and recycling are the next preferable options. Generating energy from waste is the third option, while the least favoured option is disposal. We should keep our beautiful earth for our next generation.

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