SHORT NOTE

A NOTE ON THE INFLUENCE OF HOUSEHOLD BEHAVIOR ON THE GENERATION OF MUNICIPAL SOLID WASTE IN JOHOR BAHRU TENGAH

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Abstract: This note presents results of a study involving 885 residents in Johor Bahru area. The average solid waste generated per household was 1.93 kg per day. Several behavioral factors were found to be influencing the amounts of solid wastes generation.   Based on multiple regression analysis, the significant explanatory variables are lifestyle and eating habit, housing characteristics such as length of stay in a particular home, marital status, and the family size. The R^2 is 0.4. Surprisingly, income level has no significant effect on the solid waste generation in the study area.

Keywords: *Municipal Solid Waste; Human Behavior; Lifestyle; Multiple Regression Analysis.*

The relationship between income and solid wastes remains true even as recycling per capita continues to grow (McCollough, 2001). Higher income groups tend to consume more products and thus generated more wastes in Malaysia (Agamuthu, 1997, 2001; Ahmad Termizi and Fadil, 1992; Mohd. Razman and Fadhil, 1994; Mohd. Nazri, 1994). Further studies, however, are needed to explore other factors affecting the generation of wastes. The purpose of this study is to analyse how income and other demographics as well as behavioral factors affect the amount of waste generation. Our focus is on various housing settlements from urban and rural areas of different socio-economic backgrounds of the residents in Johor Bahru District.

The study area represents both urban and rural areas within the southern region of Peninsular Malaysia. It involved established communities within Johor Bahru Tengah City Council or *Majlis Perbandaran Johor Bahru Tengah* (MPJBT) as well as less developed villages in the surrounding areas. A survey involving 885 residents was carried out mainly in communities surrounding the district, particularly area north of the city center. Of the total number of respondents, 500 came from six residential areas, namely Taman Johor Jaya, Taman Perling, Taman Sri Skudai, Taman Mutiara Rini, Taman Universiti, and Taman Sri Pulai. The remainder (385 respondents) were from

seven villages, i.e. *Kampung* (Kg) Sungai Danga, Kg. Pasir, Kg. Sungai Melayu, Kg. Pertanian, Kg. Jaya Sepakat, Kg. Sri Gunung Pulai, and Kg. Baru Ulu Choh. With a total population in the study area of more than 100000, the present sampling intensity is expected to yield a 90% confidence level (Yamane, 1983).

The criteria used for selecting the study sites were housing characteristics and demographic background, such as the socio-economic status of the population, and the solid wastes handling practices (i.e., the use of rural drop off and burning, or dumping into holes). Majority of the homeowners in the rural areas were involved in agricultural activities. Altogether, 1778 families live in these villages with a total population of 8870 (Johor Bahru Tengah City Council, 2002).

During the survey, respondents were asked to answer a set of questionnaires covering demographic information and personal background, characteristics of their housing units, as well as the frequency of their home-cooking and dining out activities. The variables were ranked based on a Likert Scale. The amount of waste were obtained by weighing them from each house. Bulky and yard wastes were excluded.   Weights were measured on dry days to ensure consistency and avoid the influences of moisture and seasonal factors on the total waste weights.

The total amount of waste generated in the study area was 1707 kg per day with an average of 1.93 kg per household and a standard deviation of 1.36. The amount is lower than the state's average of 1.3 kg per capita per day (i.e. 5.2 kg per household, assuming four persons per household (Department of Statistics, 2002). This could probably due to the omission of bulky and yard wastes in the present study.

This study found that most of the wastes were organics in nature (39 %) followed by paper and newspapers (18 %), plastics (10.5 %), ceramics (9.6 %), cardboards (7.7 %), and textiles (5.6 %) (Table 1). In general, the finding agreed with Wan M. Rahim (1992) who also found that organic and paper wastes were the most abundant

Table 1: Household wastes by composition

	Average by category (Kg per household)	Total (Kg)	Percent
Paper	0.64	565	18
Plastics	0.38	334	10.5
Cardboards	0.28	244	7.7
Ceramics/glasses	0.35	308	9.6
Organics	1.40	1237	39
Textiles	0.20	179	5.6
Others	0.34	305	9.6
TOTAL	3.59	3172	100

Based on the multiple regression analysis, an equation describing the relationship between the amount of waste generation and the contributing factors was developed as follows:

$$W = \quad 0.28 \quad + \quad 0.56\,MS + \quad 0.12HC + \quad 0.23FS - \quad 0.07LS \tag{1}$$
$$\text{SE} \quad (0.221) \quad (0.092) \quad (0.32) \quad (0.64) \quad (0.33)$$

where W is waste amount (kg), MS is marital status (1=Single; 2=Married; 3=Separated/Divorced), HC is frequency of home-cooking activity, FS is family size, LS is length of stay (Years) and SE is the standard error of estimate for each coefficient. All variables except for 'length of stay' are significant at $p < 0.01$ with coefficient of multiple determination, R^2 of 0.4. Interestingly, income level did not influent the amount of waste generation in the study area.

As expected, married respondents and those who cooked more often at home generated more wastes. Home cooking frequency and marital status have significant effects on the amount of household wastes in the communities. Those living in a big family and those who have stayed longer in their residential units tend to generate more wastes. The result disagrees with Kemper and Quigley (1976) who found insignificant effect of family size on the waste amount generation. Other factors such as income, age and sex as well as housing and ownership factors did not appear to be important explanatory variables in the whole study area. This result did not support the previous studies (e.g. Wertz, 1976; Kemper and Quigley, 1976; Richardson and Havlicek, 1978; Ahmad Termizi and Fadil, 1992; Wan M. Rahim, 1992; Mohd. Nazri, 1994; Sabarinah, 1998) which generally indicated a strong influence of income on the wastes quantities.

Although income level has no significant effect on the waste generation in the study area, it is premature to make a generalization throughout the state of Johor. The conclusion is made based on the data obtained at the time of the survey and is site specific. The limitation of a linear equation here is that it will probably differ to another similar study if it were to be carried out elsewhere. It is also important to note that this study ignores wastes that would be generated if the respondents were to cook at home instead of dining out. Future studies should include social and lifestyle factors in the assessment and management of solid waste.

Acknowledgement

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