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Towards sustainable solid waste management: Investigating household participation in solid waste management

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Abstract. The aim of this paper is to assess the readiness of Iskandar Malaysia community to accept solid waste recycling. The research is based on quantitative research design and descriptive survey of the households at Iskandar Malaysia using the stratified sampling method for a sample of 670. The survey was conducted using a structured questionnaire that covered two basic principles; a) recycling knowledge; b) willingness to recycle. Data was analysed using the SPSS to carry out statistical analysis. The finding shows households' knowledge towards the solid waste recycling is good and positive. However, finding also shows that respondents have incomprehensive knowledge on the method of disposal as more than 50% of householders only recycle papers and textiles. Most of the households agreed to participate in the activities of the separation of waste if the facility will be made available at their kerbside. Therefore, it is recommended that government should provide more in-depth knowledge by intensifying the awareness of the households in the recycling programs. In term of urban planning and management, the location of recycling facility can be analysing by using GIS. This is important to understand the catchment area of each neighbourhood or precinct to ensure effective household participation.

1. Introduction

Solid waste management is a critical problem in most of the local authorities throughout the world. Malaysia is one of the rapidly developing countries that face similar problems such as insufficient facilities, slight enforcement, ineffective of policy implementation and lack of technology [1]. This is due to population growth, economic growth, law enforcement inadequate waste, infrastructure and public attitudes among others encountered. It remains a major challenge for municipalities to collect, recycle, treat and dispose of increasing quantities of solid waste, especially in a changing climate. Recycling has been identified as the significant factor towards sustainable waste management and not only can reduce the amount of waste, it also enables the creation of new products from old materials, thus benefiting both the environment and economy. Malaysia has a population of approximately 29.7 million in 2013 [2] with a per capita GDP of USD17,776 in 2013 [3]. Urban population in Malaysia constitutes more than 65% of the total population [1]. Waste generation has increased more than 91% over for the last 10 years due to the rapid development of urban areas, rural-urban migration, increase per capita income and change on consumption patterns that brought about by development [1]. Almost 28,500 tonnes (95%) in 2012 of municipal solid waste have disposed directly into landfills daily in Malaysia [4]. The national average per capita waste generation is 0.9kg [5]. Waste composition in Malaysia is dominated by organic waste, that comprises more than 40% of the waste stream. World Bank (2011) report that Johor state's per capita waste generation is about 1.35 kg as one of the second highest in Malaysia after Kuala Lumpur (1.57 kg). In year 1993 and 2001 a major effort of recycling was launched in Malaysia by the Ministry of Housing and Local Government. Unfortunately, limited recycling activities were taken [6]. Concern and awareness among the public in Malaysia have not evolved in parallel with the living standards. Therefore, participation towards

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sustainable waste management through 3Rs is severely lacking [7]. The Malaysian Government will be implementing the requisite separation of solid waste at source as early as 2015. It is in line with the enforcement of the Solid Waste Management and Public Cleansing Act 2007 (Act 672) in Peninsular Malaysia on Sept 1 2011 in order to achieve GHG reduction. In line with the issues highlighted above, this study was carried out for the finding of households' participation in solid waste management Malaysia in Iskandar Malaysia Region. This paper aims to assess the readiness of communities to accept the solid waste recycling.

2. Literature Review

Sustainable solid waste management of household is a challenging task. It needs a change in public behaviour to minimize the volume of their waste and the same time will increase the recycling rate. According to the United States' Environmental Protection Agency (U.S.E.P.A) (2012), recycling can be defined as "the series of activities by which materials that are no longer useful to the generator are collected, sorted, processed, and converted into raw materials and used in the production of new products." The success of any recycling program depends highly on people participation actively and sorting activities. An individual behavior changes occur when the individual is aware of the problem or need that gives individuals an initial reason or incentive to follow a particular course of action. Normally the awareness is raised by external factors such as experience of peers [8]. Behavioural change can also be through by awareness-raising campaigns and educational programmes. However, such communicative instruments will have to be supported by economic instruments. Theory of Planned Behaviour (TPB) by Azjen, 1998 is frequently used in the literature exploring pro environmental behaviour including recycling. This model explained three determinants of behavioural intention:

- a. Attitude (opinion of oneself about the behaviour)
- b. Subjective norm (opinion of others about the behaviour)
- c. Perceived behavioural control (self-efficacy towards the behaviour)

Tonglet et. Al (2004) identified that the TPB provided valuable insights into the factors which motivate participation. Attitudes are the major contributor to recycling behaviour such as having appropriate opportunities, facilities and knowledge to recycle. Numerous studies have been conducted on recycling behavior including the effect of socio-economic status and demographics on recycling, and the effect of knowledge and attitude on recycling (Vining and Ebreo 1990; Oskamp et al, 1991; Ebreo and Vining, 2001)[9].

3. Methodology

The study was conducted in the Iskandar Malaysia Region consisting of the area that covered by the local authorities of Johor Bahru City Council (MBJB) and Central Johor Bahru Municipal Council (MPJBT) respectively. It is located in southern of Johor Bahru District. The study areas were selected from communities with the large population sizes and defined as those communities which are well established with adequate waste collection services that provided by local councils or waste contractors appointed by the SWM Environment Sdn Bhd. Residents of the study areas come from various socioeconomic backgrounds and live in planned, mixed residential developments. The research is based on the quantitative research design. A total of 670 household were sampled. The survey was conducted using a structured questionnaire that covered two basic principles; a) recycling knowledge; b) willingness to recycle. Data was statistically analysed using the SPSS.

4. Findings

4.1 Socio demographics and characteristic of households

This study found that 58.8% of the respondents were male and 41.2% female. Malaysia's population (2010 Census) sex ratio showed that male did outnumber female with 106. The average age was 41years old. More than 60% the respondent were over 35 years old. The middle age group (25 to 34

years old) is 24.7% and youngest group (18 to 24 years old) only 8.2%. The result of this study showed that over 83% of respondent were married, only 12.59 % were never married. In this survey the highest percentage of the respondents had secondary school level (60.1%) followed by diploma (16.04%), primary school (11.7%), only 8.9% had bachelor degree and 2.10% had no formal education. Only a few of respondent had postgraduate degree and professional degree. This study found that 69.7% of the respondents were Malays, 19.3% were Chinese, 9.8% were Indian, and 0.9% were others. Majority of the respondents were employed (44.5%), and about 11.5% were self-employed. The percentage for the unemployed was about 28.9%, and most of them were housewives and they were the people who categorized as older group (55 years old and above). On average, monthly income of respondents was RM3,989. Majority (60%) of the respondent had income range RM3,000 and above. While 34% of the respondents had income range RM1,000 up to RM3,000 and only minority, had income below RM1000.

4.2 Public Perception on Solid Waste Management

Currently households are required to place their waste bags in waste bins, in front of their houses. The collectors collect the wastes twice or thrice a week [10]. Households are required to pay collection services as part of the annual assessment tax set by the local authorities with the service provider. The perception of the households towards the present collection system was captured through the questionnaire. This study found that most households (61%) were reasonable satisfied with the existing solid waste management system. Only 17% were very satisfied. However, very few households (18%) were not satisfied to the current system. The reasons of dissatisfaction were due to the method of collection as well as problems associated with waste management such as not systematic, failure of collection time and odour.

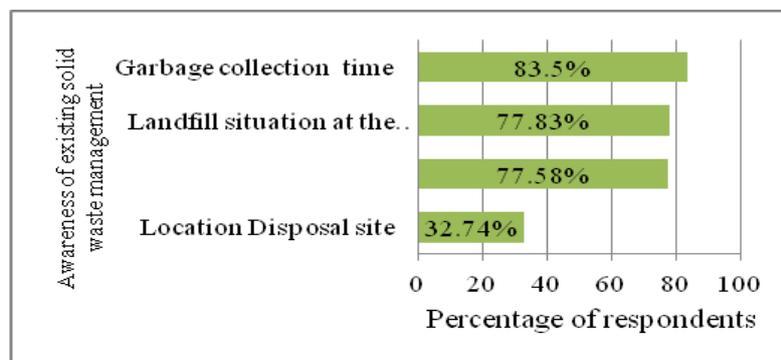


Figure 1. Awareness of current solid waste management system.

Figure 1 shows the awareness of households on current solid waste management system in their housing area. In accordance with the households that said “yes”, the study found that most of the respondents aware to garbage collection schedule (83.5%) followed by deficiency on existing solid waste management system (77.6%), and landfill situation (77.5%). The result indicated that the respondents had adequate awareness on the current waste management scenario. However, the study showed that only 32.6% of respondents knew about the location of the disposal site. This showed that the respondents did not have a clear and in depth awareness as information on the disposal site location did not give them a direct and strong view on particular management situation.

4.3 Knowledge Towards Sustainable Solid Waste Management

Knowledge is important to predict recycling behaviour. Basically increasing knowledge will translate into a change in behaviour. Knowledge of household recycling is about where, what, when and how to practice in a real life [10]. Figure 2 shows the result for those who answered ‘Yes’ to the list of knowledge about recycling. The result showed that most of the respondents were knowledgeable on recycling. Nearly all of the respondents understood the type of recyclable materials (96%). A majority (85%) of the respondents also claimed that they knew how to separate their household waste.

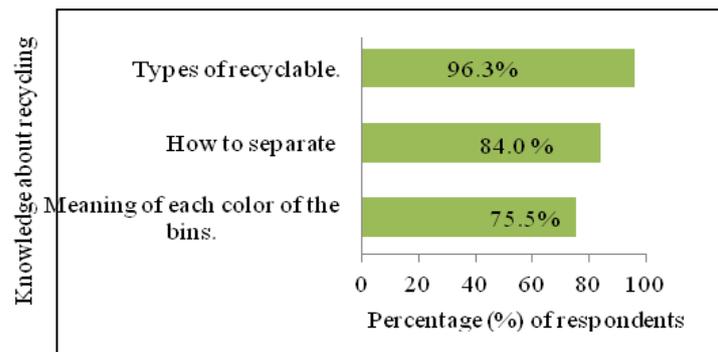


Figure 2. Knowledge about recycling.

However, further analysis showed that respondent do not have sufficient knowledge on recycling. The analysis on how to handle their waste demonstrated only two types material recyclable were recycled. Contradict to the previous finding, Figure 3 shows handling method of recycling found to vary with material types. The result indicates the low level of implementation in line with the level of knowledge and understanding of respondents on recycling. Basic recyclable materials namely newspapers, old clothes, magazines, and others papers hit more than 50%. This is response to the current situation where few materials are sold to door to door collectors. The door to door collection is done by private collectors or Non Governments Organization (NGOs) with a variety of systems especially by lorry or van. On the other hand, most of the households dispose their wastes such as polystyrene, plastics, glass and food waste into the waste bin without separation. Nonetheless, the result also indicates a positive sign as aluminium, plastic and pet bottles are recycled with acceptable involvement (40% to 48%).

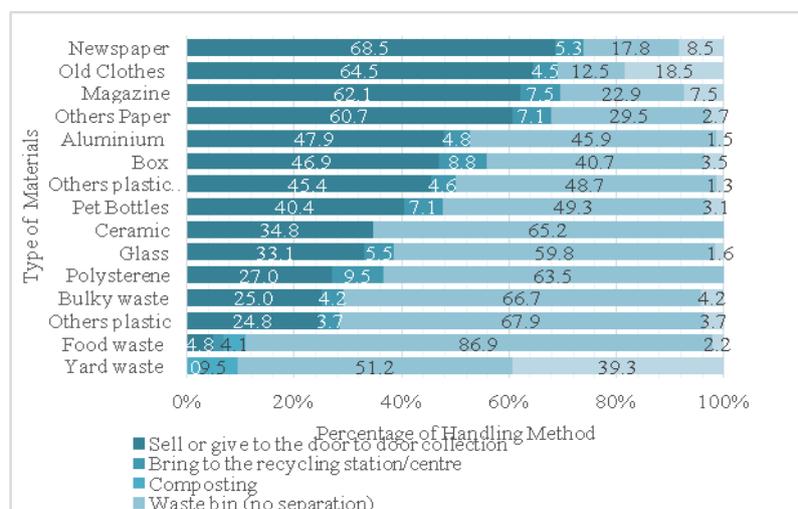


Figure 3. Handling methods of household waste by materials.

4.4 Willingness to participate

Figure 4 shows the respondents willingness to participate in household waste recycling. The response ‘Yes, more likely’ to participate was the highest (80%) that received in Iskandar Malaysia Region. The result showed positive feedback by respondent. However, the result shows in the figure 6 that older age group (45 to 64 years old) are more likely to participate in recycling activities. It was demonstrated in the majority of studies that older households are more likely to recycle [11,12]. This study found that elders are more willing to participate in recycling practices than the younger ones.

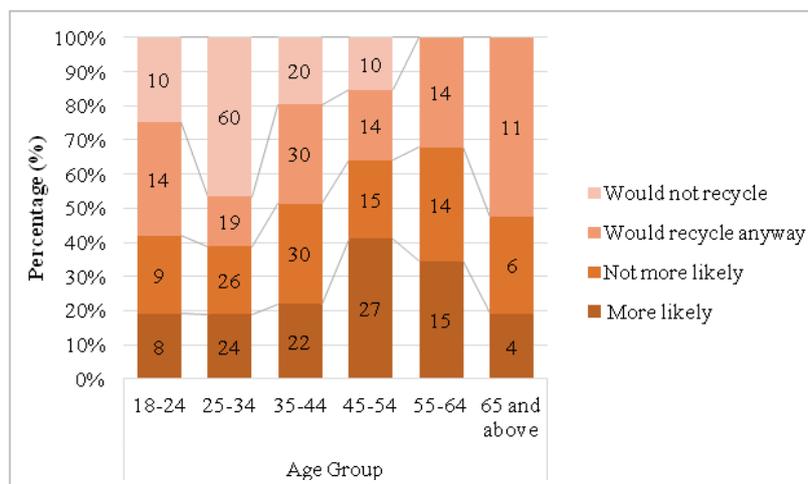


Figure 4: Willingness to participate in recycling activities by Age Group.

5. Conclusion

This study demonstrated that Iskandar Malaysia households have awareness on recycling management but, most of them have insufficient knowledge on material types and handling method. Over 60% of basic materials namely newspaper, old clothes, and magazines are favourably recycled compared to others. However, the others materials such as box, aluminium, plastic and pet bottles showed a positive sign for 40% to 48%. The households are also highly willing to participate in recycling activities that showed positive sign. In this study found that elder people are more interested to participate. Thus, there is a need to encourage youngster to get interested and actively involved in the recycling program. The sufficient knowledge is highly needed in line with the adequate services in the housing to manage all recyclable materials. The Malaysian Government will be implementing the requisite separation of solid waste at source as early as 2015. Therefore, it is recommended that government should provide more in-depth knowledge by intensifying the awareness of the households in the recycling programs. For recommendation, in term of urban planning and management, analysis of location of recycling facility using Geographical Information System (GIS) is recommended. It is important to understand the catchment area of each neighbourhood or precinct to ensure effective household participation. The system is also, useful to analyse the suitable location for that particular service. Furthermore, the system is useful where map projections, spatial analysis and the design of spatial database is required, which is the case in Solid Waste Management, where information is derived from various geographical areas in the region as well as the country. It is anticipated that the GIS-based system will be most useful for the new SWM entity, and relevant authorities in programme and project planning.

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