Jurnal
Pengguna Malaysia

ISSN 1511-998X

Jurnal Pengguna Malaysia

Jilid 28, Jun 2017

Jurnal Pengguna Malaysia

Malaysian Journal of Consumer

Jilid 28 Jun 2017 ISSN 1511 - 998x

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CURRENT PATTERNS OF WASTE SEGREGATION BEHAVIOUR AT SOURCE AMONG HOUSEHOLDS IN PUTRAJAYA

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Introduction

Efficient solid waste management has become one of the most daunting national challenges nowadays (Otitoju & Seng, 2014), typically in the cities of developing countries (Wang & Wang, 2013), including Malaysia. Fast population growth (Begum, Siwar, Pereira, & Jaafar, 2007), rapid changing lifestyle (Sakawi, 2010), great urbanization (Manaf, Samah, & Zukki, 2009) along with aggressive economic development (Iwan Budhiarta, Siwar, & Hassan Basri, 2012), and changes in consumption rate (Abas & Wee, 2014) have accelerated the daily generation and volume rate of municipal solid wastes in Malaysia.

According to statistics released by Ministry of Urban Wellbeing, Housing and Local Government (MHLG) in 2011, 23,289 tonnes of garbage were produced in Malaysia every day. Selangor was ahead of other states with generation of 4055 tonnes of garbage every day. It was then followed by Kuala Lumpur (3734 tonnes/day), Johor (3102 tonnes/day), Perak (2696 tonnes/day), and Kedah (2483 tonnes/day) (Abdullah, Rahman, & Azis, 2010). On average, each Malaysian produces 0.8 kg of waste every day. This amount is getting larger for those who live in urban areas because they are estimated to produce 1.5 kg of waste every day (Fatimah, Osmi, Mokhtar, Romali, & Che, 2013).

In general, some of the municipal solid wastes have been processed prior to disposal or recycled (Miafodzyeva, Brandt, & Andersson, 2013). Unfortunately, most of the wastes in Malaysia are disposed in landfills or they are dumped illegally (Vivian, 2011). Consequently, waste dumping and land filling may lead to many negative environmental issues (Saeed, Hassan, & Mujeebu, 2009) and serious environmental problems (Shaw, 2008). Hence, the best way in managing waste generation has to start from waste reduction

at source, that is, to eliminate the generation of waste at source (Boyle, 1998) and to carry out recycling for recovery or reusing waste materials.

Beginning September 2015, the Malaysian government has implemented the compulsory segregation of solid waste at source in stages under the Solid Waste Management and Public Cleansing Act 2007 (Act 672). It is an offence under the law for not separating solid waste at source. Households in Malaysia's seven states, including Putrajaya; are required to segregate their solid waste according to the types of garbage which can be recycled while waiting for their next garbage collection (MHLG, 2015). The main compositions of solid waste are cardboard, plastic, paper, food waste, glass, metal, farm waste, electric waste, and lump waste. By segregating the household solid waste at source, it will help in reducing the delivery of solid waste which are sent to landfills or garbage disposal sites. The research on current patterns of waste segregation behaviour at source among households in Putrajaya is very important to ensure a successful and systematic implementation of waste segregation at source in Malaysia. Consequently, this research was aimed to explore the current patterns of waste segregation behaviour at source among households in Putrajaya.

Literature Review

Waste segregation behaviour at source is expressed as a separation process which takes place onto the proposed "useful" material from waste stream which begins at the point of waste's generation (Sujauddin, Huda, & Rafiqul, 2008). They further explained that this action can be beneficial to all citizens because waste materials and discarded products potentially have economic value if returned to the technological cycle to be reused.

Verma, Borongan, and Memon (2016) revealed that municipal solid wastes as unwanted wastes or materials that are primarily produced by households, and also includes institutions, shopping complexes, hotels, housing estates, shops, offices, schools, and from municipal services of street cleaning and the maintenance of gardens, parks, and other recreational areas. Waste generation is an intrinsic part of human existence. However, the volume of solid waste day-by-day in Malaysia has increased proportionally with its population growth until it reached to the level of concern due to social, cultural, economic, and financial status among Malaysian citizens. Meanwhile, the population in Malaysia is approximately 30,485.2 million in 2015 and it is expected to rise up to 36.8 million by 2040 (Department of Statistics Malaysia, 2016).

Waste materials are usually categorised by their quality, nature, and components. The major types of municipal solid wastes in Malaysia are paper,

plastic, glass and ceramic, metal, aluminium and steel, electronic waste and appliances, leather, rubber and fabric, garden and farm waste, hazardous waste, and bulky waste (MHLG, 2015). According to data which was published by Solid Waste Management and Public Cleansing Corporation (SWCorp) in 2017, recyclable waste collection from Johor, Kedah, Melaka, Negeri Sembilan, Pahang, Perlis, Wilayah Persekutuan Kuala Lumpur, and Wilayah Persekutuan Putrajaya has increased dramatically from 73.5 tonnes in September 2015 to 194.0 tonnes in August 2016.

Methodology

A survey-correlation research was utilized to seek responses particularly with regards to waste segregation behaviour at source. Putrajaya was purposely selected as present research location because it was selected to be a showcase city for "Pioneer Township in Green Technology" in 2010. A preliminary study which consisted of three sub-sections being "Cooler Putrajaya", "Low Carbon Putrajaya", and "3R Putrajaya" were also carried out in Putrajaya in order to fulfil the goal of developing a Low Carbon Society by 2025 (Siti Norbaizura & Tomohito, 2011). Furthermore, an integrated solid waste recycling facility will be built in Putrajaya by 2025 in order to manage the pre-treatment of generated waste before they are sent to landfills for final disposal process (Norbaizura, 2013).

In addition, the 400 households in Putrajaya were selected as target population of this research via a systematic sampling method. As a result, the sample was chosen by selecting a random starting point and then picking every 10^{th} element in succession from sampling frame to answer the questionnaire. In other words, the sampling unit would be 10, 20, 30, 40, and so on until a total of four hundred respondents were selected in the present research to answer the questionnaire. The necessary data were collected by using a set of bilingual self-administered questionnaire given to the 400 households regardless of races, religions, and ages. Meanwhile, all the statements had been adjusted after reliability and validity tests. Completed questionnaires were collected for analysis. Subsequently, descriptive analysis was used to describe the characteristics of respondents by using IBM SPSS Statistics Version 24.0. At such, frequency distribution and percentage were used in describing and summarizing the distribution of households' socio-demographic information and present patterns of waste segregation behaviour at source in the research.

Instrumentation

The questionnaire was set in both open-ended and close-ended questions which consist of two sections. Section A is on socio-demographic information of respondents and Section B comprise of general questions on current patterns of waste segregation behaviour at source. Hence, Section A consist of questions about the socio-demographic profile of respondents which include age, sex, ethnic group, religion, highest academic qualification, marital status, category of occupation, monthly individual income and monthly household income. On the other hand, Section B contained five closed-ended questions which aimed to explore the current patterns of waste segregation at source among households in Putrajaya. Respondents were required to respond according to their daily behaviour on waste segregation at source. The statements in this section were asked in a general manner reflecting the frequency of practicing waste segregation behaviour at source, medium to obtain the information, major solid waste materials segregated in daily routine, challenges that discourage them to practice waste segregation at source and motivators that drive them to practice the habit every day.

Results

Socio-Demographic and Socio-Economic Information of Respondents

Data were collected from a total of four hundred respondents which consisted of 40.3 percent male (n=161) and 59.8 percent female (n=239) from total households. As depicted in Table 1, the mean age of respondents as a whole was 33.6 years old. The youngest and the oldest in this sample were 17 and 64 years old respectively. 39.5 percent of the respondents' age ranged from 22 to 31 (n=158). Only two respondents were aged above 61 years old while 18 of the respondents' age ranged from 52 to 61. For ethnicity, Bumiputera respondents appeared as the largest group in the sample (93.8%). It was followed by Chinese and Indian people, both comprising percentage distribution of 3.5 percent and 2.3 percent respectively. 71.5 percent of respondents' monthly income were under RM 3000 (n=286). However, only two respondents' monthly incomes were over RM 9000. 35.5 percent of the respondents' household monthly income ranged between RM 3001 to RM 5000 (n=142). The mean monthly household income was RM 3789.46. The respondents who never married were 59.3 percent (n=237) while those married were 39.8 percent (n=159).

With respect to respondents' highest education qualification, 33.5 percent of the respondents had education qualification of at least bachelor's degree

(n=134). A minority of the households (3.5%) were found to have academic qualification of LCE/*SRP/PMR/PT3*. The remaining of the households was found having secondary qualifications of MCE/*SPM/SPM (V)* (22.3%), Certificate/HSC/*STP/STPM* (21.8%), Diploma (14.8%) and Master or PhD (4.3%) in specific. Pertaining to the category of occupation, the biggest group of respondents (22.8%) was categorized as service and sales workers, followed by 20.8 percent of professionals, 15.5 percent of clerical support workers, and 14.0 percent of elementary occupation workers. A minority of respondents (3.8%) were reported as senior officials and managers.

Table 1: Distribution of Respondents' Socio-Demographic and Socio-Economic Information, N=400

Variables	Number of Respondents (n)	Percentage (%)
Age (years old)		
≤ 21	30	7.5
22 – 31	158	39.5
32 – 41	118	29.5
42 – 51	74	18.5
52-61	18	4.5
> 61	2	0.5
Mean = 33.6		
Sd = 9.6289		
Sex [a]		
Male	161	40.3
Female	239	59.8
Ethnic Group [a]		
Bumiputera	375	93.8
Chinese	14	3.5
Indian	9	2.3
Others	2	0.5
Highest Academic Qualification [a]		
UPSR	0	0.0
/*SRP/PMR/PT3*	14	3.5
MCE/*SPM/SPM (V)*	89	22.3
Certificate/HSC/*STP/STPM*	87	21.8
Diploma	59	14.8
Bachelor's Degree	134	33.5
Master or PhD	17	4.3

Table 1 (continues)

Variables	Number of Respondents (n)	Percentage (%)
Marital Status [a]		
Never married	237	59.3
Married	159	39.8
Widowed	2	0.5
Divorced	2	0.5
Separated	0	0.0
Category of Occupation [a]		
Senior officials and managers	15	3.8
Professionals	83	20.8
Technicians and associate professionals	40	10.0
Clerical support workers	62	15.5
Services and sales workers	91	22.8
Elementary occupations	56	14.0
Others	53	13.3
Monthly Personal Income [a]		
≤ RM 3000	286	71.5
RM 3001 – RM 5000	79	19.8
RM 5001 – RM 7000	20	5.0
RM 7001 – RM 9000	13	3.3
> RM 9000	2	0.5
Monthly Household Income [a]		
≤ RM 3000	111	27.8
RM 3001 – RM 5000	142	35.5
RM 5001 – RM 7000	73	18.3
RM 7001 – RM 9000	36	9.0
> RM 9000	38	9.5
Mean = 3789.46		
Sd = 3624.40		

Note: Sd = Standard Deviation, N = Total number of respondents, % = Percentage,
[a] = Totals do not sum to 100.0 due to rounding.

Respondents' Current Patterns of Waste Segregation Behaviour at Source

In relating to the frequency of practicing waste segregation behaviour at source, 24.3 percent of respondents had indicated that they never practice waste segregation behaviour at source in the past six months, followed by once a month (24.0%) and once in the past six months (16.0%). Meanwhile, a marginal group of them (6.3%) had stated the practice frequency of twice a week in the past six months.

Relating to the medium of obtaining information about waste segregation behavior at source, two predominant groups were devoted to receiving that particular information from "radio/ television/ internet" (37.5%) and newspapers/ magazines/ flyers/ posters/ catalogues" (26.5%) respectively. Subsequently, 18.3 percent of the total respondents had reported getting the information via "schools/community centres/government/non-governmental organizations" and a minority of the respondents (17.8%) had indicated acquiring the information from "family members/relatives/friends".

Corresponding to the most major solid waste material segregated in daily routine, more than half of the respondents in this research (51.8%) had reported that paper as the most major solid waste material in their daily life. It was followed by plastic (19.0%), hazardous waste (7.8%), and bulky waste (7.5%). However, there were just four respondents who stated that electronic waste and small electronic appliances as their least major solid waste material segregated in their daily routine.

By deriving figures found in Table 2, a substantial number of respondents (31.0%) revealed that insufficient technologies and facilities as the most major challenge that discouraged them to practice waste segregation behaviour at source, followed by lack of awareness (27.8%), and insufficient incentives (16.5%). Nevertheless, there were only 14.3 percent of respondents had responded in which the lack of recycling market as the least major challenge.

Lastly, "practice solid waste management systematically" (26.5%) was denoted as the major motivator which encouraged them to practice waste segregation behaviour at source. It was then followed by "availability of waste bins at home" (26.0%) and "gifts and rewards" (16.8%). A minority of the respondents (14.3%) had indicated that "clear and comprehensive explanation" as the major motivator which drove the households to perform waste segregation behaviour at source.

To the best of knowledge of researchers in the field of social sciences, there was no trail of previous research conducted to examine the distribution of respondents' patterns of waste segregation behaviour at source, especially in the context of Malaysia, in terms of frequency in practising this habit, the most major medium to obtain the related information, the most major solid waste material segregated in daily routine, the most major challenge that discouraged them to practice waste segregation at source, and the most major motivator that drove them to practice the habit every day. Hence, this research could be represented as one of the preliminary attempts in evaluating and discussing these respective elements in a particular research.

Table 2: Distribution for Respondents' Current Patterns of Waste Segregation Behaviour at Source, N=400

Variables	Number of Respondents (n)	Percentage (%)
Frequency of Practising Waste Segregation Behaviour at Source [a]		
Never	97	24.3
Once in the past 6 months	64	16.0
Once a month	96	24.0
Once a week	61	15.3
Twice a week	25	6.3
Everyday	57	14.2
Medium to Obtain Information [a]		
Radio/Television/Internet	150	37.5
Newspapers/Magazines/Flyers/Poster/Catalogues	106	26.5
Family Members/Relatives/Friends	71	17.8
Schools/Community Centres/Government/NGOs	73	18.3
The Most Major Solid Waste Material Segregated in Daily Routine [a]		
Paper	207	51.8
Plastic	76	19.0
Glass/Ceramic	5	1.3
Metal/Steel/Aluminium Cans	10	2.5
Electric Waste/Small Electronic Appliances	4	1.0
Leather/Rubber/Shoes/Fabric	8	2.0
Hazardous Waste	31	7.8
Bulky Waste	30	7.5
Garden/Farm Waste	29	7.3
The Most Major Challenge to Practise Waste Segregation at Source [a]		
Insufficient technologies and facilities	124	31.0
Lack of recycling market	57	14.3
Insufficient incentives	66	16.5
Insufficient regulations	41	10.3
Lack of awareness	111	27.8
The Most Major Motivator to Practice Waste Segregation at Source [a]		
Moral Support	66	16.5
Clear and comprehensive explanation	57	14.3
Availability of practical waste bins at home	104	26.0
Practice solid waste management systematically	106	26.5
Gifts and rewards	67	16.8

Note: N = Total number of respondents, % = Percentage, [a] = Totals do not sum to 100.0 due to rounding, NGOs = Non-governmental Organisations

Conclusion

This research created several positive managerial contributions in order to analyze the determinants of households in practicing waste segregation behaviour at source. From the data analysis, there was a higher percentage of respondents who never practice waste segregation behaviour at source compared to other distribution of surveyed respondents. They got to know about this practice via radio, television or internet. It also could be concluded that they segregate paper the most in their daily routine. However, insufficient technologies and facilities acted as the main obstacle for them to perform waste segregation behaviour at source. Meanwhile, the core motivator of this behaviour could be seen by creating a more systematic solid waste management for citizens.

Statistics from this research will enable local pro-environmental groups to build up their publicity forces via mass media (Chan, 1998) with the aim to educate the environmental significance for waste segregation behaviour at source. Associated with that, bad and good examples about the practices of waste segregation at source in the community can be included in a bid to establish a social influence because the influence from social network is mainly symbolic (Hamid & Cheng, 1995). In addition, leaders and artists can be role models in generating their personal influence through the mass media channels to demonstrate what kind of behaviours are friendly to the environment. This may increase citizens' awareness on the importance of waste segregation behaviour at source in their daily routine.

Other than that, another conspicuous managerial implication for this research is on the perspective of marketing. Marketers should communicate to the targeted community that performing pro-environmental behaviours which in turn have a significant effect on the welfare of environment. Through a properly targeted advertising campaign, marketers can encourage positive attitudes and behaviours of ecologically friendly people. Consequently, consumers will also feel good to portray waste segregation behaviour at source which is less damaging to the environment.

The results of this research are also beneficial to Malaysian governmental bodies involved in playing significant roles in municipal solid waste management in the country. Examples of these are the National Solid Waste Management Department, Solid Waste Management and Public Cleansing Corporation, and Ministry of Urban Wellbeing, Housing and Local Government. The findings will also contribute to building a good dataset with respect to waste segregation at source for these relevant bodies in Malaysia in order to enlighten the understanding and recognising the sources of problem and improve planning for future policies and regulations.

However, it is unfortunate that this research was limited in terms of research location. The place for data collection, however, was only focused at a specific location, which is Putrajaya. Thus, in terms of generalization, the research location proposed through this research exhibits limitation. Consequently, the generalizability of these findings may not be representative of the entire Malaysian household as a whole. Therefore, the results should be interpreted with caution.

In this case, it is suggested that instead of just exploring the current patterns for waste segregation behaviour at source among households in Putrajaya; further research might enlarge the scope to the whole country in order to have a better understanding to the holistic behavioural patterns and factors which influence it in Malaysia. As the research is done in a more detailed way, more accurate results for further investigation and experimentation on the patterns of waste segregation at source on every type of solid wastes can be more comprehensive.

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