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HOUSEHOLD SOLID WASTE DISPOSAL PATTERN IN MALAYSIA

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ABSTRACT

The progress of a developing country has resulted in a growing increase in solid waste. The growing population and the urbanization process have raised the problem of excessive use in today's society where it has adversely affected environmental sustainability. Zero waste management is an activity that maximizes the practice of recycling and minimizes excess waste, reduces usage and ensures that goods used can be recycled, reused, repaired and composted. The main objective of this study is to examine the pattern of household solid waste disposal among Malaysian consumers. A total of 605 respondents were involved in this study via multistage random sampling. The study area was divided into four main zones in Peninsular Malaysia, namely the north, west, south and east zones. One state among the gazetted states was selected from each of the zone and the main city was chosen as the location of the study resulting in four states namely Penang, Putrajaya Federal Territory, Negeri Sembilan and Pahang. The relevant cities were Seberang Perai, Putrajaya, Seremban and Kuantan. Visitors coming to the main mall in each city were approached to participate in the survey. The data were collected through a set of self-administered questionnaires and analysed using SPSS version 24 software. Respondents in this study involved various levels of age, race, gender, education level and income. Results found that most respondents (65.8%) knew about the zero waste program and more than half of the respondents (53.2%) were segregating solid waste at home. In addition, respondents also segregate solid waste almost daily according to the predetermined categories. It can be concluded that although respondents know about segregating of solid waste and always segregating but respondents still do not know about the collection system done by the authorities and ultimately it implicates the government and stakeholders to be able to play their role in the management of solid waste in the direction of these zero wastes.

Keywords: Household solid waste, zero waste, and sustainability

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ABSTRAK

Kemajuan negara membangun telah mengakibatkan peningkatan sisa pepejal yang semakin meningkat. Penduduk yang semakin meningkat dan proses pembandaran telah menimbulkan masalah penggunaan berlebihan dalam masyarakat masa kini di mana ia telah memberi kesan buruk terhadap kelestarian alam sekitar. Pengurusan sisa sifar adalah aktiviti yang memaksimumkan amalan kitar semula dan meminimumkan lebihan sisa, mengurangkan penggunaan dan memastikan barang yang digunakan dapat dikitar semula, digunakan semula, diperbaiki dan dikompos. Objektif utama kajian ini adalah untuk mengkaji pola pembuangan sisa pepejal isi rumah dalam kalangan pengguna Malaysia. Sebanyak 605 responden terlibat dalam kajian ini melalui pensampelan rawak pelbagai peringkat. Kawasan kajian dibahagikan kepada empat zon utama di Semenanjung Malaysia, iaitu zon utara, barat, selatan dan timur. Satu negeri di antara negeri yang diwartakan dipilih dari setiap zon dan bandar utama dipilih sebagai lokasi kajian yang mengakibatkan empat negeri iaitu Pulau Pinang, Wilayah Persekutuan Putrajaya, Negeri Sembilan dan Pahang. Bandar–yang berkenaan ialah Seberang Perai, Putrajaya, Seremban dan Kuantan. Pengunjung yang datang ke pusat beli-belah utama di setiap kota didekati untuk mengambil bahagian dalam tinjauan ini. Data dikumpulkan melalui satu set boring soal selidik yang dikendalikan sendiri dan dianalisis menggunakan perisian SPSS versi 24. Responden dalam kajian ini melibatkan pelbagai peringkat umur, bangsa, jantina, tahap pendidikan dan pendapatan. Hasil kajian mendapati bahawa kebanyakan responden (65.8%) mengetahui mengenai program sisa sifar dan lebih daripada separuh responden (53.2%) mengasingkan sisa pepejal di rumah. Selain itu, responden juga mengasingkan sisa pepejal hampir setiap hari mengikut kategori yang telah ditentukan. Dapat disimpulkan bahawa walaupun responden mengetahui tentang pengasingan sisa pepejal dan selalu melakukan aktiviti pengasingan, tetapi responden masih tidak mengetahui mengenai sistem pengumpulan yang dilakukan oleh pihak berkuasa dan akhirnya ini memberi implikasi kepada kerajaan dan pihak berkepentingan untuk dapat memainkan peranan mereka dalam pengurusan sisa pepejal ke arah sisa sifar.

Kata kunci: *Sisa pepejal isi rumah, sisa sifar, dan kelestarian*

INTRODUCTION

Solid waste has become a major issue not only in terms of the impact and consequences but in terms of resources used. The increase in population leads to an increase in the amount of waste generated by consumers. The latest data from the Ministry of Housing and Local Government, the total solid waste is 36,243.88 kg per day and the estimated per capita generation rate (kg per carp per day) is 0.76 (Ministry of Housing and Local Government, 2018). In general, this is associated with culture and consumption habits contributing to the production and composition of domestic solid waste (Han et al., 2018).

As a responsible consumer, solid waste management practices need to be practiced daily so that it becomes a regular habit and production of the waste can be reduced. The responsibility to segregate solid waste is a personal responsibility. The government has imposed the rule on the separation of solid waste at home from

September 1, 2015 (Ministry of Housing and Local Government, 2015). This program is aimed towards achieving zero residuals. The remaining "zero waste" has been introduced in the West since the 1980s. The implementation of zero waste has a great role in producing a new phenomenon to save the earth from excessive and uncontrolled waste. Zero waste management involves maximizing practice of recycling and minimizing excess waste, reducing consumption, and ensuring that the goods used can be recycled, reused, repaired and composted. According to the official portal of the Institut Kefahaman Islam Malaysia (2014), zero remnants are the best approaches to managing resources. Zero waste is also a concept that reduces waste to garbage disposal sites. In addition, the zero residue also involves maximizing the practice of recycling and minimizing excess waste, reducing consumption, and ensuring that the goods used can be recycled, reused, repaired and composted (Muhammad Hisyam, 2014).

The existence of zero waste is an implication of efforts towards managing environmental management especially solid manure or man-made waste to achieve a quality of life so that life becomes more comfortable and prosperous. In addition, rapid urbanization, population growth, industrial, commercial, institutional and residential growth, as well as increased use resulted in more and more wasted goods (Teuku Afrizal & Abdul Rahman, 2013). Solid waste management is not only a problem in Malaysia and developing countries but it is also a problem in developed countries. This is evidenced by *the Environmental Protection Agency, EPA* (2012) where US residents have generated 200 million tonnes of solid waste for a year and caused congestion at the landfill. Hence, in line with the rapid growth of the population, an effective approach needs to be implemented to address the problem of increasing solid waste as a result of population growth can be addressed.

In addition, according to Hasnah, Dody, Noraziah, Maznah, and Sharifah (2012), garbage disposal works in managing municipal solid waste cost a lot more than collection work. This is true if the community intends to improve environmental hygiene performance through the use of modern technology such as the use of incinerator. Examples of cost estimates for solid waste management using the landfill method and collecting cost were only about RM13,351.98 as compared to the disposal method using incinerator, which is about RM130,792.29 where the incinerator will require less expenditure of RM118, 562.66 (Mohd Nasir, Rakmi, Zamri, and Syaifullah, 1995). The approach in removing a high amount of expenditure in junk waste disposal is higher than the cost of collection work. This is a problem that needs to be addressed in an effort towards implementing zero residuals. Previous studies have discussed recycling behaviors specifically on aspects of knowledge, attitudes and practices using various instruments such as studies by Zuroni, Bukryman, and Laily (2012); Mumtazah and Norhafidah (2009); Karlson, Srebotnjak and Gonzales (20007); Laroche, Bergeron and Barbaro-Forleo (2001); De Young (1990); knowledge aspect, Iwan, Chamhuri and Hassan (2012); Hasnah et al. (2012); aspects of attitude and practice errors, Jamilah,, Hasrina, Hamidah and Juliana (2011); and Muhammad Hisyam (2014).

Since the 7th Malaysia Plan, the country has implemented high targets for sustainable development. Additionally, the National Consumer Policy has also implemented that

consumers should be aware of the aspects of sustainable use and improve sustainable practices in managing restricted resources. It is hoped that it will increase the country's preparation to achieve developed nation in line with Shared Prosperity Vision 2030 (SPV2030) and Sustainable Development Goals (SDG's). In particular, this study focuses only on the pattern of household solid waste disposal in Malaysia. Hopefully, this study will help the relevant parties increase their knowledge and hope that this study will be a source of reference for future studies.

LITERATURE REVIEW

Household Solid Waste Disposal Pattern

The amount of garbage generated is increasing from year to year and even more. The waste generated by the consumer is about 0.8 kilogram per day (Ministry of Housing and Local Government (2015). While the National Solid Waste Management Department (2015) shows the generation of garbage in Malaysia for every day of 19, 300 tonnes. According to Agamuthu (2001), the average waste production rate is estimated to increase as a result of increasing consumption. In 2010, 2015 and 2020, it is expected that the municipal solid waste generated in Peninsular Malaysia 8, 196 000, 9, 111000, and 9, 820000 tonnes respectively. This value is based on an increase in municipal solid waste at 2.14% from 1998 to 2000 (Johari et al., 2012). Composition studies in Malaysia generally show that the per capita waste production rate is about 0.5-0.8 kg per person per day (Samsudin & Mat Don, 2013), while the data of the Ministry of Housing and Local Government (2018) shows the average per capita waste per day in this country 0.76 per person. While the study by Tahir et al. 2019 found that on average the amount of waste produced by each individual in the study area was 0.89 kg per day per person.

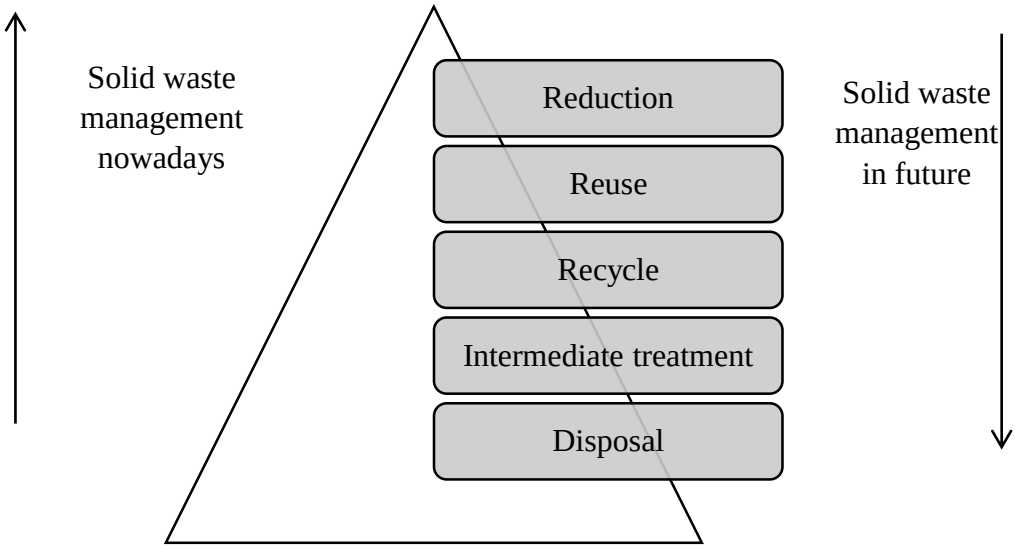
The issue of raising the volume of solid waste in Malaysia is a popular issue that is warmly discussed in mass media today. According to Hasnah et al. (2012), population growth, socioeconomic upgrades and changes in lifestyles of the community now followed by increased domestic waste contributes to the increase in solid waste. The total amount of solid waste produced per day is 1.8 million tons of which 760 00 tons per day is from residential housing (Hasnah et al., 2012; Sharifah Azizah and Jasmine, 2009; Stren, 1992). According to Magrabi et al. (1991), consumption is the determinant of wellbeing, the creation of human capital and is an important social and economic input to the function of a country. In addition, Hasnah et al. (2012) found that the capacity for landfill is very limited. The landfill site in Malaysia is usually 5 to 36 hectares (20 to 150 acres) depending on the location and total generation.

The existing waste or residual product should be recycled or reused for the purpose of reducing the amount of waste. Currently, solid waste separation programs have been implemented and enforced in eight states in Peninsular Malaysia (National Solid Waste Management Department, 2015). According to Muhammad Hisyam (2014), the concept of zero residual is wider and more complete than the concept of recycling. Recycling begins when wastes are created, while the zero waste concepts start as early as the creation of the goods and it involves consumers, producers and policy makers. Producers, as an example need to produce non-hazardous goods

and services and produce the least waste after they are used. It should also ensure that the packaging and product aspects themselves or their parts can be recycled and reused to produce the next product. According to Muhammad Hisyam (2014), by practicing zero waste, manufacturers are not only helping to preserve the environment but also benefit in the form of cost saving operations.

Various efforts have been made in Malaysia to address this solid waste management problem and cost millions of ringgit in its management (Hasnah et al., 2012). Among them is the recycling program launched by the Ministry of Housing and Local Government in 1993 and zero solid waste campaign through the 'No Plastic Bag' campaign by the Selangor government every Saturday from 1 January 2010. According to Iwan et al. (2012), Malaysians know (94%) and understand (77%) about zero waste programs and recycling programs, but only a small part (14%) do these activities. For example, "no plastic bags" campaign that has been implemented in Selangor since 2010. According to Fitriyah, Choong, and Dzurllkanian (2019), the household in Malaysia is still far behind compared to other countries in engaging waste separation behaviour and recycling practice. One of the reasons to explain this matter is the lack of awareness by household towards the significance of waste separation and recycling activities (Sinar Harian, 2017).

Solid waste management has its own hierarchy that involves certain components arranged according to priority. Every individual needs to know about the solid waste management hierarchy to make it easy and helpful in every activity in this regard. Therefore, the knowledge of this hierarchy is very important for each of individual (Figure 1).



Source: Adapted from Tchobanoglous, 2003.

Figure 1: Integrated Solid Waste

Management Hierarchy

Recycling practices need to be practiced by individual, so these become a common habit within themselves. Once used this activity from childhood, it becomes a routine to continue household waste segregation and waste reduction. It can be seen that recycling is the first three steps before reaching the top or best steps in waste management. If recycling is always done, then it can save costs and indirectly benefits the individual or the community (Hamidi, 2007; Hasnah et al., 2010). Therefore, every individual and society need to be aware of the surroundings to ensure the well-being and preservation of the environment in their respective places.

METHODOLOGY

Sampling and Data Collection

Data collection was conducted in eight states involved with a solid waste management program which was enforced beginning 1 September 2015 under the Solid Waste and Public Cleansing Management Act 2007 (Act 672). The random sampling technique has been used and focused on states that were gazetted by the government under Act 672 namely the Kuala Lumpur and Putrajaya Constituency and the states in Peninsular Malaysia comprising of Perlis, Kedah, Negeri Sembilan, Melaka, Johor and Pahang. According to the sampling schedule by Krejcie and Morgan (1970) noted that as the population size increases, the sample size increases at a diminishing rate and remains relatively constant at slightly more than 380 respondents. However, the target sample was set higher at 700 due to the various group differences in the overall research project and to consider for non-responses.

In the first stage of sampling, the study area was divided into four main zones in Peninsular Malaysia, namely the north, west, south and east zones. One state among the gazetted states was selected from each of the zone and the main city was chosen as the location of the study resulting in four states namely Penang, Putrajaya Federal Territory, Negeri Sembilan and Pahang. The relevant cities were Seberang Perai, Putrajaya, Seremban and Kuantan. Visitors coming to the main mall in each city were approached to participate in the survey. Due to rejection to participate, the study involved only 605 respondents from the total target and having various social backgrounds with different income levels.

Research Instrument

The data is gathered through self-administered questionnaire. The questionnaire consists three parts. Part A about socio-economic background by using open and closed questions. While part B on the pattern of solid waste disposal and part C consists of questions related to the solid waste collection system. The questions were adopted and adapted from previous studies. Data were analysed using Statistical Packages for Social Sciences (SPSS) version 24 using descriptive analysis to achieve the objectives.

RESULTS AND DISCUSSION

Respondents' Background Information

The respondents' demographic background consists of age, gender, ethnicity, marital status, number of households, educational level, employment sector and household income. A

summary of the respondents' background indicates about 59.0% of the respondents were women and majority (86.3%) of respondents were adults, age between 19 and 64 years. Most of the ethnic (60.3%) who answered this questionnaire were Malays or Bumiputera, while the marital status indicated that half of the respondents (51.6%) were married. Based on household size, 34.2% had four or less than four. The respondents' educational level (34.2%) had STPM or Certificate or Diploma while 35.5% respondents are working at the government sector. For the estimated household income, slightly more than half of respondents (55.2%) earn less than RM 3,860 (B40) income level. Table 1 shows the results of an analysis related to a more comprehensive respondents' background.

Table 1: Respondents' Background Information (N=605)

Variables	n	%
Gender		
Male	284	41.0
Female	357	59.0
Age (years)		
≤ 18 (Teenagers)	82	13.6
19 - 64 (Adults)	522	86.3
≥ 65 (Senior citizens)	1	0.2
Ethnic		
Malay or Bumiputera	365	60.3
Chinese	176	29.1
Indian	59	9.8
Others	5	0.8
Marital status		
Single	280	46.3
Married	312	51.6
Divorce	13	2.1
Household size		
≤ 4	317	52.4
5 -8	275	45.5
≥ 9	13	2.1
Level of education		
Never attended school	3	0.5
SRP or PMR	43	7.1
SPM or SPMV	202	33.4
STPM or Certificate or Diploma	207	34.2
Bachelor	125	20.7
Master or PhD	22	3.6

Others	3	0.5
Job sector		
Goverment sector	215	35.5
Private sector	147	24.3
Self employed	51	8.4
Retirees	5	0.8
Housewife	35	5.8
Student	152	25.1
Monthly income*		
< RM 3,860 (B40)	334	55.2
RM 3,850 – RM 8,319 (M40)	220	36.4
≥ RM 8,319 (T20)	51	8.4

*Source: Budget 2018

Involvement in Household Waste Segregation

The result in Figure 2 shows that only 53.2% of respondents are involved in household waste segregation activities at home while another 46.8% did not. This indicates that only half of respondents were involved. According to Tahir et al. (2019), although many segregation activities were done, there is still a high percentage (59.0%) did not carry out segregation. For most people who are not concerned about the need for waste segregation, some use the method of collecting and burning because it is easier to practice (Nurpratiwiningsih et al., 2015). Therefore, it is necessary to think of the best way to encourage the segregation of household waste among household.

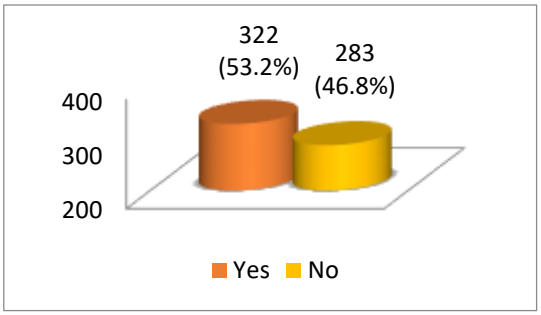


Figure 2: Involvement in Household Waste Segregation

Household Solid Waste Management

Various methods can be used by respondents to dispose waste in their homes. However, the methods often used by respondents which throwing in their own bins (55.7%) and also throwing in public garbage bins from private sources (32.4%). While other respondents like to throw away their waste in front of their own home (5.5%), burn (5.3%) and other methods (1.2%).

In each area, the people who run the solid waste management services system vary. Therefore, in this study the parties involved for all affected

sites have been identified. The result shows that the Municipal Council (47.6%) is involved in this matter. In addition, consortiums such as Alam Flora, Environment Idaman and SMW Environment (26.6%) are also involved in areas such as Putrajaya District, Johor Baharu and other areas as these areas are not managed by local authorities. Private sector (8.6%) is also involved in some areas (3.8%) from local and other local organizations (1.5%). However, there were also respondents (11.9%) who did not know which party was involved in solid waste management services at their area. When you are at home, people who are always in the kitchen will know all about the kitchen business. Starting from the layout of the goods until throw to the garbage. Therefore, in this study the respondents need to answer who performs or manages household waste at home. When all members are taught and educated to segregate, then indirectly the whole family will do so without waiting for instructions from others. The results of this study showed that most of the participants were household members (51.9%). However, housewives (23.5%) were still most likely to do so and were followed by household head (13.7%). While maids (5.8%), female household head (3.5%) and others (1.7%). This shows that there are still some people who do not perform household waste segregation activities.

Household Solid Waste Disposal Pattern

The frequency of waste disposal is not on a daily basis, sometimes there are also respondents who throw their waste for a period of two days or so. More than half of the respondents who disposed daily waste were food waste (68.8%), kitchen waste (61.5%) and disposable diapers (42.9%). They are also disposing their waste twice a week. The rest is like kitchen waste (21.5%), food waste and dirty and polluted materials (85%). For residual waste once a week such as paper (18.3%), plastic (16.4%), and can, aluminum or steels (15.4%) which there are wastes recycling. There were also respondents who disposed waste such as plastic (12.2%), can, aluminum or steels (12.1%) and garden waste (9.9%) for a period of two weeks. While for the waste that was thrown away once a month by respondents were tin or aluminum (20.7%), paper (16.9%) and glass or ceramic (14.7%).

Recyclable waste such as fabrics, shoes, rubber or leather (23.3%), glass or ceramic (23%), and small electronic or electrical items (19.7%) were discarded by respondents for several months. However, there are also respondents who remove waste materials, shoes, rubber, leather (17%), small electronics or electricity (13.4%), and hazardous waste (11.9%) per year. For Bulk waste (26.8%) respondents dispose in the last few years because it is a waste that can be used for a very long period of time. There were also respondents who cast waste fabric, shoes, rubber, leather (16.4%) and small electronic or electrical items (19.2%) after several years. However, there were also respondents who never disposed of the rest of the garden waste (33.2%), bulk waste (32.5%) and disposable diapers (25%). Respondents who have never disposed of disposable waste are likely to be students sitting at home with their friends and do not have children or elderly people who are ill. Figure 3 shows the percentage of total residual residuals and residual waste.

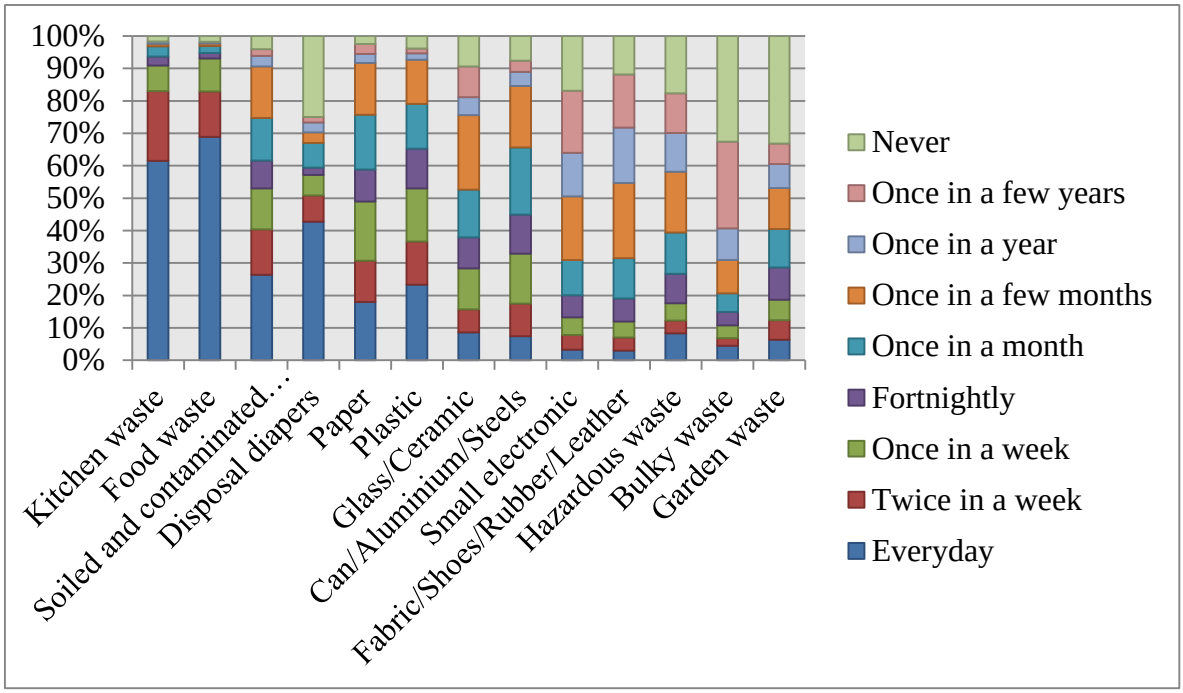


Figure 3: Household Solid Waste Disposal Pattern by Category

Household Solid Waste Collection System

Figure 4 shows the result of the frequency schedule of household solid waste collection system. It shows that residual waste such as kitchen waste (43.3%), food waste (45.5%), and disposable diapers waste (34.4%) were collected daily. There is a difference of study by Tahir et al. (2019), they found that 42.0% was kitchen waste, 24.0% was dirty material, 18.0% was food waste while disposable diapers were 16.0%. Result also stated that the kitchen waste (24.5%), food waste (22.8%) and soiled and contaminated materials (20.7%) were collected three times a week respectively. Besides the respondents stated that the waste collected twice a week were dirty and polluted (22.8%), paper (21%) and kitchen waste (20.3%).

The respondents indicated that waste recycling such as can, aluminum or steels (35%), glass or ceramics (31.6%) and plastic (31.1%) were collected once a week. According to Kumar (2016) recycling is the best option to reduce waste to landfills. For waste that was never collected based on the schedule of the collection system at the respondents' area were bulk waste (27.4%), garden waste (23.6%) and small electronic or electrical waste (23%). Figure 3 can be referred for further result.

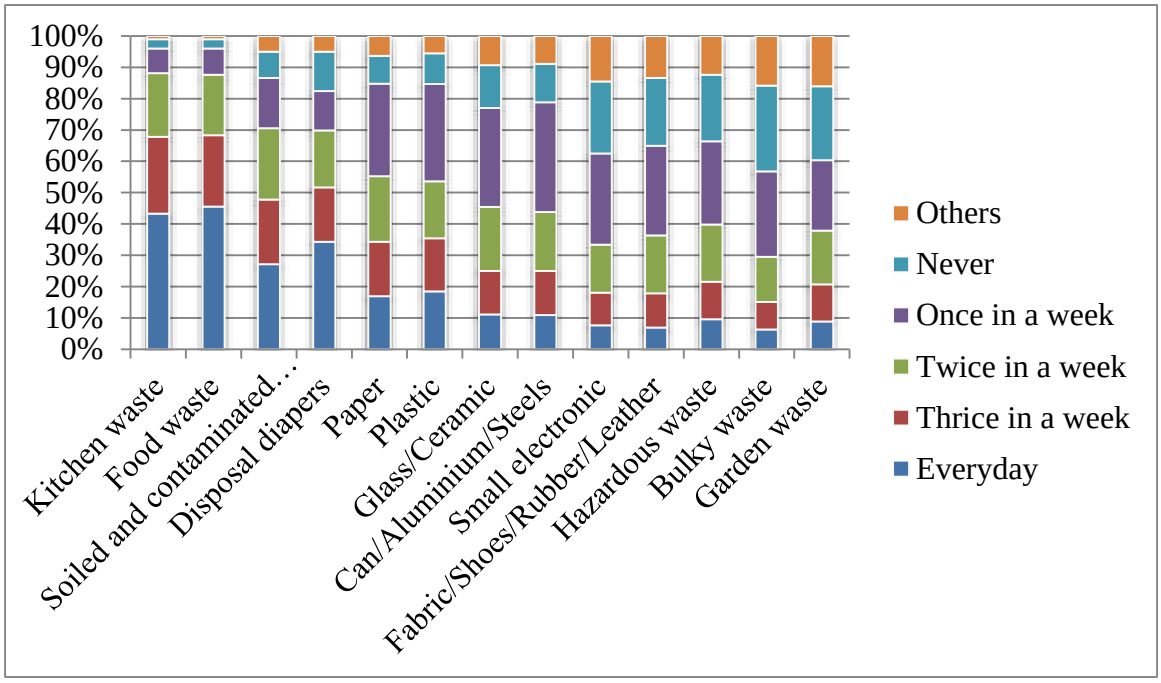


Figure 4: Frequency Schedule of Household Solid Waste Collection System

CONCLUSION AND SUGGESTION

In conclusion, the common method of household solid waste disposal was throwing in their own bins and also throwing in public garbage bins from private sources. In terms of household solid waste category, there are three (3) main categories of household solid waste disposal namely food waste, kitchen waste and disposable diapers. While for the collection system schedule, there are many respondents who are unaware and do not know about the schedule and garbage collection in their area.

Therefore, it is still necessary to provide better exposure to respondents. Exposure in various forms should always be made to increase the knowledge of respondents. According to by Tamby, Mohd, Lailia and Thiagarajan (2010), teaching and learning should be made either formal or informal form to increase knowledge. Therefore, exposure should be done from elementary to middle level so that it becomes synonymous in each individual. More exposure should be made for all age stages and need not distinguish between age levels. This is because the household solid waste management involving all segments of society as it is often done regardless of time and place.

Suggestions that can be used are to improve the implementation system through the delivery of information used by the authorities. In addition, respondents should also be sensitive to the latest information regarding their place of residence to avoid dropping out. What can be said is not just a party who needs to work hard on achieving success but it is also necessary to work together to accomplish that success. In this regard, not only the authorities and the stakeholders who need to work hard but the respondents also need

to work together to achieve the Shared Prosperity Vision 2030 (SPV2030) and Sustainable Development Goals (SDG's). To reduce the production of solid waste, awareness campaigns to educate and discipline the consumers shall be enhanced. Also relevant agencies should establish a sustainable solid waste management system so that public health is guaranteed, the environment is protected and preserved as well as natural resources are protected (Aslina and Haliza, 2015).

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