

## PARTICIPATING IN SOLID WASTE MANAGEMENT AMONG HOUSEHOLD IN TERENGGANU

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**Abstract:** Solid waste is one of the greatest environmental challenges facing most municipalities in Malaysia. The household sector is the primary source of solid waste in Malaysia, accounting for almost 60% of the total. Other important sources of solid waste include industries, commercials, and institutions. This paper presents the result of the survey among the households in Kuala Terengganu regarding the attitude and participation in Solid Waste Management (SWM). The research argues that to achieve sustainability, public involvement in environmental and solid waste policies is crucial. No programmes or policies can be successful without the involvement of people and grassroots leaders. Thus, this paper will examine household attitudes and participation via a waste recycling programme to deliver a sustainability policy for SWM in Malaysia. To learn more about perceptions and attitudes about waste management, a questionnaire survey was distributed to households in Kuala Terengganu. A list of questions was asked of respondents, such as items from the level of education to personal and social background information. Accordingly, 100 questionnaires were distributed in selected areas in Kuala Terengganu. The survey results indicate a lack of concern among households about participating in recycling activities. The main factors for participation in the recycling programme were educational background, housing conditions, and level of established income. In summary, Terengganu's SWM system is poor and fragmented. The institutional structure and managerial aspects of SWM are also problematic. As a result, Malaysia's national SWM strategy is crucial to ensuring its sustainability. Campaigns and educational initiatives are needed to raise public awareness of the issues and effects related to the generation, collection, transportation, and disposal of solid waste.

Keywords: Solid waste management, recycling, sustainability, participation.

### Introduction

Solid Waste Management (SWM) is considered one of the significant problems in developing countries, particularly Malaysia. A total of 13.95 million tonnes of municipal solid trash was generated annually in Malaysia, equivalent to 38,207 tonnes generated per day by household, institutional, commercial, industrial (excluding scheduled garbage), and construction enterprises (MIDA, 2021). Over the past ten years, Malaysia has seen a more than 91% increase in the generation of Municipal Solid Waste (MSW), mostly as the consequence of accelerated urbanisation, rural-urban migration, rise in per capita income, and

changes in consumer patterns brought about by development. The primary generator is the urban population, which makes up more than 65% of the overall population.

The urban regions of Malaysia have experienced the greatest changes in lifestyle, which have exacerbated the country's garbage issues. As evidenced by the abundance of society's carefree or rather could not carelessly attitude and the abundance of easy domestic items in packaging, as well as the proliferation of fast-food restaurants and supermarket wrappers, there is an enormous amount of trash produced. Most of the garbage produced nowadays

is made up of non-biodegradable plastics. According to the 9<sup>th</sup> Malaysia Plan 2005-2010, food waste accounts for around 47% of solid waste, followed by plastic (24%), paper (7%), iron and glass (6%), and other materials (24%). As such, it appears that Malaysians are moving toward an unsustainable pattern of consumption by consuming more food than is necessary and producing more garbage than is appropriate.

Currently, the SWM system in the state of Terengganu is still ineffective. This includes the collection system, inappropriate provision of rubbish bins and poorly maintained landfill system (MHLG, 2020). Consequently, this situation will affect the environment and socio-economic system of the local population (MHLG, 2019). The study examines household participation and attitudes towards waste recycling programmes to deliver a sustainability policy of SWM in Kuala Terengganu. Notably, the Not-In-My-Backyard (NIMBY) mentality and the widespread perception that solid waste is a local municipal issue are the main causes of the failure of public participation in SWM in Malaysia (Agamuthu & Fauziah, 2011).

The theory of ecological modernisation highlights the relevance of consumers actively seeking green products and technology as the main engine for more sustainably planned everyday living in households (Mol, 2000). Malaysia's waste creation has decreased due to changes in consumer behaviour. (MHLG, 2003) However, it must be considered that the choices made by the consumer products industry and consumer behaviour may be the most crucial factors in dealing with SWM. This is attributable to the fact that managing solid waste after it has been created will not completely solve the problem, especially if the amount of solid waste keeps increasing as a result of packaging and consumer behaviour. While treating solid waste is necessary, it does not address the underlying issue of waste generation or the community's need to change its behaviour.

### Research Methodology

The study employed a questionnaire survey among households in Kuala Terengganu to

gather data on perceptions and attitudes towards waste management. A list of questions was provided to respondents, ranging from level of education to personal and social background information. A total of 100 questionnaires were distributed in selected areas in Terengganu. From the 100 questionnaires distributed, 97 usable questionnaires were received and analysed. The questionnaire was divided into three sections: (a) Household socio-economic characteristics, (b) Household level of environmental awareness and attitude towards solid-waste recycling, and (c) Solid-waste collection service. Statistical Package for Social Sciences (SPSS) was used to analyse the quantitative data from the household survey. Data from the household survey will be analysed using logistic regression analysis. This study estimated a Logit regression to predict the probability of participation in 3R practice by the respondents. The dependent variable was defined as whether the respondents practised the 3R programme at least once a month. The basic function form for this model (a) is as follows:

$$Pr(\text{Participation}) = \alpha + \sum_{i=1} \beta_i X_i + \varepsilon. \quad (1)$$

In this case,  $\alpha$  is the constant,  $X_i$  is one of the independent variables,  $\beta_i$  is the coefficient of the independent variable  $X_i$ . The dependent variable is a dichotomous variable when practising the 3R programme (1 is yes, and 0 is no). The main predictor dichotomous variables are gender, willingness to pay extra charges, involvement in the 3R programme, and taking note of the need to segregate waste at source.

### Analysis and Discussion

The socio-demographic background and characteristics of the respondents of this study are summarised in Table 1. The majority of the respondents are female (N = 74, 76.3%) and aged between 20 and 30 years old (N = 67, 69.1%). Most of the respondents have completed a degree (N = 72). About 48% of respondents are employers and earn below MYR 2,500 per month. Most households consist of four to six occupants (67%) and live in a terrace house type (60%).

Table 1: Socio-demographic characteristics and respondents' background (N = 97)

Variables	Descriptions	Frequency (n)	Percentages (%)
Gender	Male	23	23.7
	Female	74	76.3
Age (years old)	20-30	70	72.2
	31-40	12	12.4
	41-50	9	9.3
	51-60	6	6.2
Level of education	Secondary	6	6.2
	Diploma/degree	82	84.5
	Master/Ph.D	9	9.3
Occupation	Private sector	22	22.7
	Civil servant	25	25.8
	Self-employed	5	5.2
	Student	42	43.3
	Others	3	3.1
Monthly income (RM)	< 2,500	62	63.9
	2,501-5,000	19	19.6
	5,001-11,000	10	10.3
	> 11,000	6	6.2
Residential house type	Terrace	54	55.7
	Apartment	3	3.1
	Bungalow	3	3.1
	Village	34	35.1
	Others	3	3.1
Number of occupants living in the household	1-3	32	33
	4-6	27	27.8
	> 6	38	29.2

### ***Solid Waste Attitude and Participation in Recycling Activity Among Households***

The result reveals that the public is aware of problems dealing with solid waste. However, their attitude is still low with regard to the practice of recycling (Figure 1). Environmental awareness and behavioural knowledge have been demonstrated to significantly affect waste management behaviour. In this study, recycling is regarded as one of the most practical approaches for managing and accessing the sustainability of SWM in Terengganu, both economically and environmentally.

The majority (82.5%) of respondents claimed that they were aware of a recycling programme in their area. Note that only less than

30% of them participated in the programme. Most respondents (85.6%) also do not compost the waste (Table 3). Television (92%) and local authorities (6%), followed by newspapers and friends (1%), are by far the most popular sources of information on recycling programmes for all respondents. Nevertheless, integrated use of all media may increase public participation (Abdelnaser *et al.*, 2006), whereas traditional promotion strategies, such as media campaigns, leaflet distribution, and newsletters, to name a few, have a limited impact on changing the public's perception, behaviour and attitude (Grodzinska-urczak *et al.*, 2006).

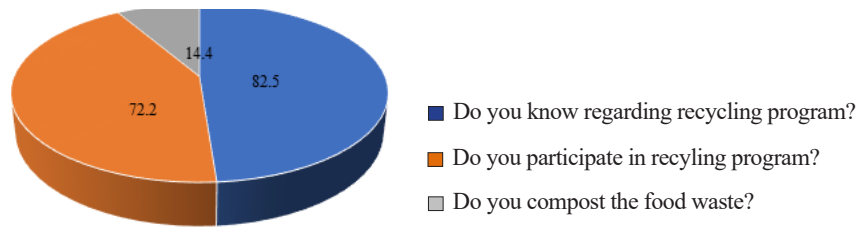


Figure 1: Householders behaviour knowledge regarding municipal solid waste advertisements

It will be necessary to run an education campaign to motivate the community to practice positive recycling and waste minimisation behaviours as well as to encourage householders' participation in the programme from a life cycle perspective (MHLG, 2005). The survey results indicate that the educational campaign should focus on improving residents' attitudes toward environmental protection, which has been proven to be one of the main drivers of waste management and recycling minimisation behaviour. Razali *et al.* (2020) proved that public participation is crucial to a recycling program's effectiveness. To raise public awareness, increasing household involvement must be accomplished by utilising all available media, including radio and television networks, as well as newspapers. Notably, new strategies and systems will not be used effectively without the right information and increasing public awareness (Mohd Noor *et al.*, 2023; Latifah, 2021). A regular leafleting effort to assist in sustaining public awareness, interest, and understanding was also mentioned in the study by Evison *et al.* (2001) as being essential for remaining positive reactions.

In order to increase household participation, the public must be adequately informed about recycling and other forms of appropriate waste management. This will help residents change their habits, behaviour, and traditions and help local authorities reach government goals for recycling and recovery (Ling *et al.*, 2022). The visual effect of the sites themselves appears to have been the best advertisement, in contrast to advertisements placed in the local press to

promote a project in Glasgow, Scotland, that did not seem to have much of an impact on the public.

When housing conditions and other socio-economic matters are considered, differences in attitudes toward recycling are observed. Most clearly, this is the case in rural areas, where they do not know of a recycling programme or how to participate in recycling activities. On the other hand, a less educated background and low income also influence their attitude to involvement in recycling. For example, the survey reported that respondents who lived in rural areas exhibited less concern and were willing to be involved in recycling programmes. However, in urban areas, the public demonstrates a good effort to contribute to recycling activities. This survey also indicates that men, in general, and people without a college education are normally less likely to recycle.

The study suggested several recommendations for the government's recycling strategy that might lead to long-term success. Sustainable waste management programmes depend heavily on the efforts of the local government and the public. First, the ease of recycling facilities can be enhanced by putting recycling bins in more easily accessible and noticeable locations, especially in small cities and rural regions. The typical trashcan, a dependable and handy single point of disposal, is viewed by numerous residents as a better alternative than recycling. Thus, local governments must make their recycling programme dependable, convenient, and simple to use (Anshassi & Townsend, 2023).

According to Gibovic and Bikfalvi (2021), households are the main factor in rising recycling rates. Méndez-Lazarte *et al.* (2023) noted that in order for recycling to be successful, there must be public participation and has to be a market for recyclables. As a result, it is crucial to determine how the general public feels about purchasing goods made of recycled materials. Secondly, in order to create a variety of waste containers that are appropriate for a certain location, local authorities must collaborate closely with businesses in the private sector and NGOs. In this situation, it is essential to provide clear instructions on how the schemes operate, describe the advantages of recycling, and highlight that it does not have to be challenging or take up a lot of time or space in the home (Mohd Noor *et al.*, 2023; Debrah *et al.*, 2021). Thirdly, environmental knowledge and concern should be taught to children from a young age. Unfortunately, the current primary and secondary school system in Malaysia does not have a specific topic devoted to achieving this goal.

The survey also discovered that the involvement of local authorities, private sectors, and NGOs in promoting recycling programmes demonstrates a weak commitment. The study suggests that the government should encourage civil society and community groups to keep collaborating with local communities as well as with the government. Parts of civil society are in a good position to work with communities on various waste-related issues, such as assisting with education about waste reduction and better waste management. They can do this by participating in larger waste awareness campaigns, network building around specific locations or services, facilitating volunteerism, and collaborating with communities to increase their involvement in local decision-making on waste-related issues. The study argues that cooperation and the building of social capital between stakeholders are crucial to the ecological modernisation platform.

### **Waste Disposal Habits of Households**

Climate, cultural factors, housing conditions, expectations on the responsibilities of (local) governments, and other factors influence waste disposal practises or behaviour. Additionally, several waste traits (such as smell and rodent and fly activity) have a distance decay function. People look for alternative rubbish collection services when the regular provider is unreliable. When regulation is either absent or is followed in its breach rather than compliance by a majority, there are incentives to dump the wastes in open access spaces such as streets and public spaces. In hot and humid climates, there are disincentives for the accumulation or storage of wastes and positive incentives for disposing of wastes as and when they arise. Hence, waste management in any city in the developing world requires understanding and realigning these incentives in institutional arrangements.

The survey suggests that the majority (70%) of respondents have a problem with waste storage in their area. The current condition of on-site storage differs from region to region. On-site storage is typically not enough, however, as it is not secure and does not permit efficient collection, leading to health and environmental issues. In particular, dustbins are frequently left open, which increases the danger of infectious disease outbreaks such as hepatitis, typhoid fever, animal anthrax, tetanus, and pneumonia. At the same time, infection pathogens such as *Salmonella typhi*, *Salmonella paratyphi*, *Bacillus anthracis*, *Clostridium tetani*, and *Clostridium perfringens*, many of which are prevalent in medical waste, can easily spread when placed in open bins (Choon *et al.*, 2017).

Residents in rural regions, especially those lacking suitable trash storage facilities, frequently hang garbage in plastic bags outside their homes or hang it from trees, fences, or roadside ditches. In addition to the aesthetic issues, this makes the collection less effective. Since there are not enough shared garbage cans, the storage space turns into a landfill. Consequently, the trash finally ends up being dispersed around the site due to rat and stray animal scavenging, which is filthy and can harm the surrounding population's health.

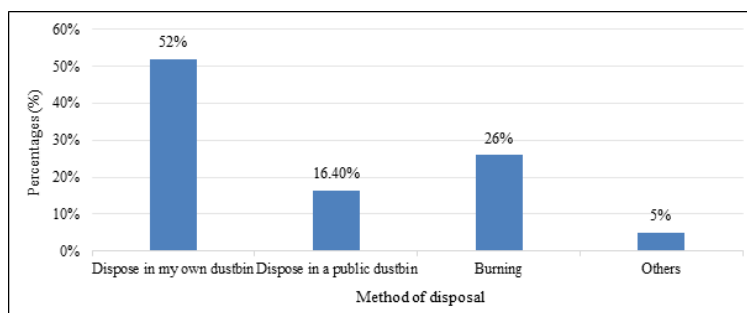


Figure 2: Method of disposal among the households in Terengganu

The survey discovered that households have few options to dispose of their waste (Figure 2). The result reveals that 50% of the respondents, normally in urban areas, throw their waste in the bin that is provided by local authorities. Meanwhile, 16% of respondents used communal bins where only one bin was provided in every area, and sometimes respondents found it difficult to throw their trash since the bin was always overloaded. This survey also reported that 26% of respondents burn their waste as an option to dispose of their waste, and it seems this happens in small villages in Malaysia. Other disposal methods include putting in a plastic bag placed at the curbside and piling waste loose at the curbside (5.1%).

### ***3R Practices among Household in Terengganu***

The results of the logistic regression performed were to demonstrate the 3R practices' prediction. The model contained seven independent variables: gender, age, willingness to pay charges, involvement in 3R, taking note of the need to segregate waste at source, and satisfaction with enforcement and services by the MBKT. The full model indicated that all predictors were statistically significant ( $8, N = 67$ ) = 95.866. This suggests that the model provides a better fit to the data compared to a model with no predictors. The model explained between 29.6% (Cox and Snell) and 40.1% (Nagelkerke) of the variance in 3R practice.

These values indicate that the predictors collectively explain a moderate proportion of the variability in whether respondents participate in 3R practices and correctly classify 73.2% of cases. The model accurately predicted whether respondents practised the 3R programme at least once a month in 73.2% of instances.

As summarised in Table 2, the independent variables for gender (female), age, willingness to pay charges, involvement in 3R and satisfaction in enforcement are statistically significant at the 5% level. Inverting the odds ratio for gender indicates females are less likely 4.54 times than males to practice the 3R program. In terms of willingness to be charged extra by the MBKT for good quality and satisfactory services, respondents with an agreed answer are less likely 3.36 times to practice the 3R than those unwilling to pay charges. In addition, although many respondents participated in the 3R programme organised by MBKT, those who did 3R at home were the opposite. These findings indicated that the majority of respondent were inclined to pay extra charges and join the 3R programme rather than practice the 3R by themselves. Meanwhile, respondents aged 40-51 years are 6.4 times more likely to practice the 3R than other age groups. The variable satisfaction in the enforcement of waste segregation by the authorities significantly influences the practising 3R among the respondents. Furthermore, variable satisfaction with the services provided by the authorities is not significant.

Table 2: Logistic regression predicting 3R practice

Variables	$\beta$	S.E.	$\rho$	Odd Ratio	95% CI for Odd Ratio	
					Lower	Upper
Gender (female)	-1.513	0.662	0.022	0.220	0.060	0.806
Age	1.850	0.801	0.021	6.361	1.323	30.583
Willing to pay charges	-1.209	0.593	0.041	0.298	0.093	0.953
Involvement in the 3R program	-1.990	0.685	0.004	0.137	0.036	0.523
Satisfaction in enforcement	0.613	0.269	0.023	1.845	1.090	3.124
Satisfaction in services	0.044	0.272	0.871	1.045	0.613	1.783
Take note of the need to segregate waste at source	-0.993	0.650	0.127	0.371	0.104	1.324
Constant	0.499	1.172	0.670	1.647		

Some of the common problems of storage in Terengganu are:

- Damaged bin lids are frequently not replaced, leaving garbage exposed, producing an odour, and luring flies, mice, and stray animals.
- Residents with no proper storage bins often hang waste packed in plastic bags outside the house, on fences, trees, or just left on the roadside; apart from the aesthetic problems, this makes collection less efficient.
- The storage space turns into a landfill. The storage space turns into a landfill since there are insufficient communal bins.
- The place eventually becomes filthy for the general public due to rat and stray animal attacks that leave waste spread throughout.

The survey highlighted that residents' haphazard storage collection, inadequate storage facilities, public attitudes, and the wide variety of types and sizes used all contribute to the inefficiency of collection. Notably, the main reasons for Malaysia's insufficient waste disposal are institutional and financial restrictions (Izham *et al.*, 2023). In particular, the introduction of SWM user fees merely provides funding for the expenses of collection and transportation, leaving almost no resources for the waste's proper disposal. Thus, by encouraging and

fostering private sector participation-either as standalone entities or as joint ventures-in trash recycling, marketing, and the use of SWM for environmentally beneficial initiatives, the government should strengthen the management aspects of SWM disposal. However, the management of such enterprises must be under the supervision of the government to monitor their effectiveness.

### Conclusions

The result from the survey among households in Kuala Terengganu demonstrates less concern about contributing to recycling activities. The main factors encouraging people to participate in a recycling programme were their educational background, the condition of their homes, and their established income. Other than that, there is also a lack of facilities provided by local authorities, such as recycling bins and information related to recycling, which influences people who are not concerned with recycling and are unaware of waste problems. In some cases, recycling bins are unavailable, especially in rural areas, making it impossible for the public to engage in recycling activities. The survey revealed that there are limited options available to respondents for getting rid of their trash. Hence, burning rubbish is a preference for 26% of respondents, especially in smaller cities. Respondents stated that the lack of storage by

the local authorities was the reason they chose to burn their garbage as a disposal method. As such, it appears that society in Malaysia is still unaware of waste problems, and some of them are uninterested in contributing to any activities that relate to SWM.

In summary, the whole system of SWM in Terengganu is still weak and fragmented. There are also problems in institutional arrangements and managerial aspects of SWM. Therefore, national policy for SWM in Malaysia is vital to ensuring the sustainability of SWM. Moreover, it is crucial to raise awareness of the issues and consequences related to the creation, collection, transport, and disposal of solid waste through campaigns and education. The government should become more open and flexible in adopting a more open and flexible approach to improve the SWM system and create a sustainability system for SWM in Terengganu. The effectiveness of the government initiative in providing good effects towards sustainability SWM depends significantly on public and private engagement. Theorists of ecological modernisation state that the growing awareness of environmental issues is beginning to fundamentally alter the structures and common social behaviours of modernity. In addition, the active participation of consumers who make decisions about their consumption drives the economy and government towards an acceptance of ecological rationality. Therefore, participation and household behaviour in SWM are crucial to delivering the sustainability policy of SWM in Terengganu.

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