



# SURVEY ON PUBLIC PERCEPTION TOWARDS PLASTIC WASTE & RECYCLING IN PENANG

2023



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# Executive Summary

The 'Survey on Public Perception Towards Plastic Waste & Recycling in Penang' was developed by the Penang Green Council (PGC) and the Resource Recycling Systems (RRS) to understand consumers' awareness and behaviour towards Penang's waste segregation and recycling. As part of a more extensive study on the 'Penang Feasibility Study for Recovery of Films and Flexible Plastic Packaging', findings from the survey will help inform a pilot project that involves the collection of films and flexible plastic packaging waste.

Films and flexible packaging are not commonly managed due to the lack of uptake by recyclers and the absence of an end market for this plastic waste. The survey addresses the most fundamental issue in recycling: understanding consumer challenges and opinions on waste segregation and recycling. Insights into current actions and constraints can then be translated into risks and opportunities in the collection of films and flexible packaging.

The survey's findings reflect the general public's distrust and lack of confidence towards the current waste management system and dissatisfaction with observed poor public behaviour in certain communities. This distrust needs to be remedied by establishing accessible and convenient recycling facilities for all people, accompanied by proper waste management education and guidance. Stringent enforcement is also vital to improve compliance in waste segregation and tackle littering, while incentives should be offered to incentivise people to alter their lifestyles and practices.

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# 1. Introduction

Penang is the second smallest state in Malaysia, located on the northwest coast of Peninsular Malaysia by the Straits of Malacca. The state comprises two parts – Penang Island and Seberang Perai on the mainland. Penang is divided into five administrative districts: Timur Laut and Barat Daya on the island and Seberang Perai Utara, Seberang Perai Tengah and Seberang Perai Selatan on the mainland.



Pic 1. Map of Penang<sup>1</sup>

In 2016, the Penang State Government implemented the **Waste Segregation at Source Policy (WSAS)**. The policy intends for citizens to segregate materials that can be recycled from trash destined for landfills. Implementing this policy throughout the state has not been without challenges. The results of this survey indicate a crucial need to understand what can be done to encourage more robust participation in waste segregation for recycling.

Simultaneously, **consumer awareness** of how to participate in recycling collection schemes is critical to the performance of recycling in Penang. However, often little attention is paid to the consumer aspect of recycling. Hence, the current awareness level of green practices and the recycling behaviour characteristic of Penang communities should be further studied.

With that, a survey titled '**Survey on Public Perception Towards Plastic Waste & Recycling in Penang**' was conducted to gather information about consumer awareness and behaviour.

<sup>1</sup> <https://mygeoname.mygeoportal.gov.my/exportpdf00.jsp?kodnegeri=07>

Feedback from this survey will be used to review the current waste management and recycling system. It will also inform the communications programme for a proposed pilot film and flexible packaging recycling program, as well as help the Penang government to gather the data needed to identify the elements required for establishing this pilot program.

As mentioned, one of the study's key focus is film and flexible packaging. Examples of flexible packaging include retail bags, pouches, snack packaging, confectionery packaging, single-serve sticks, and sachets. Unlike commonly recycled plastics like polyethylene terephthalate (PET) and high-density polyethylene (HDPE)<sup>2</sup>, flexible packaging is as challenging as it is diverse. Furthermore, flexible packaging is not typically collected for recycling either through formal or informal means. Hence, as a packaging category, films and flexible packaging are a priority for Penang to address.

The survey objectives are:

- To understand the general public's awareness level concerning waste segregation.
- To understand public perception towards plastic waste and recycling.
- To inform the communications and education for a film and flexible packaging collection pilot project.

## 2. Methodology

A survey designed by the Penang Green Council (PGC) and the Resource Recycling Systems (RRS) was conducted from 5th October to 30th November 2022. The survey is divided into three parts and aims to measure the population's perception and behaviour. These sections are:

- Part A: Details of Respondent(s)
- Part B: Assessment of the Understanding of Recycling and Segregation of Recyclables at Source
- Part C: Assessment of the Behavioural Change Towards Plastic Waste

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<sup>2</sup> Plastics for Change (2021). The 7 different types of plastic. Available at: <https://www.plasticsforchange.org/blog/different-types-of-plastic>

Created on Google Forms, the survey has been made available in English and Malay. The survey utilises both qualitative and quantitative research methods. With a total of 40 questions, the survey employs a combination of multiple-choice and short-answer questions.

The survey utilised random sampling to target people living in Penang specifically. Although the targeted number of responses is 2500, the survey only required a minimum of 664 pax to provide a comprehensive representation (i.e. using a 99% confidence interval with a 5% margin of error).

The survey was disseminated online and face-to-face. Online mediums included social media (e.g. Facebook, LinkedIn, Instagram), email and WhatsApp blasting. As for face-to-face, the survey was promoted during PGC's roadshows and other events. Digital and physical promotional materials such as web banners and posters were specially designed to capture social media users' attention.



**Pic 2.** Survey Web Banner



**Pic 3.** Promoting survey via roadshow

To encourage participation, respondents were eligible for a lucky draw upon completing the survey. Each of the hundred winners selected was awarded an RM10 Lotus's e-voucher. Survey enumerators were also employed to increase the response rate and to ensure sufficient coverage across the five districts in Penang. It was made clear to participants that participation is voluntary and all data is kept confidential throughout the study.

### 3. Results

#### Part A: Demographic Profile of Respondents

A total of 1313 responses were collected from the survey. As shown in **Table 1** below, 70% of respondents were female, and 30% were male. The most highly represented age group is the middle age group (30%), followed by the youngest age group (28%). The survey responses also reflected the ethnic diversity of respondents residing in Penang. Most survey responses came from respondents with tertiary qualifications (63%). When looking at survey responses from employment status, the majority of responses came from private sector employees (28%) and public sector employees (26%), as well as students (27%). Regarding the number of household members, the average results from respondents have indicated four pax.

Table 1 Demographic data of respondents

Demographic data of respondents	n=1313	Percentage (%)
<b>Gender</b>		
<i>Male</i>	394	30
<i>Female</i>	919	70
<b>Age Group</b>		
<i>15-24</i>	375	28
<i>25-34</i>	220	17
<i>35-44</i>	396	30
<i>45-59</i>	260	20
<i>60 and above</i>	62	5
<b>Ethnicity</b>		
<i>Malay</i>	445	34
<i>Chinese</i>	677	51
<i>Indian</i>	141	11
<i>Others</i>	50	4

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**Academic qualification**

<i>Tertiary education (Degree/Masters/PhD or equivalent)</i>	825	63
<i>STPM/A-Levels/Matriculation/Diploma/Skill Certificate or equivalent</i>	191	15
<i>Secondary education (PT3/PMR/SRP/SPM/O-Levels)</i>	278	21
<i>Primary education</i>	15	1
<i>I did not receive formal education</i>	4	0

**Employment Status**

<i>Housewife</i>	57	4
<i>Private sector employee</i>	366	28
<i>Public sector employee</i>	347	26
<i>Retired</i>	46	4
<i>Self-employed</i>	122	9
<i>Student</i>	349	27
<i>Unemployed</i>	26	2

**Average number of household members**

<i>Landed residential</i>	4 Pax
<i>Multi-storey housing/ Strata</i>	4 Pax
<i>Village premise</i>	5 Pax
<i>Public Housing Project</i>	4 Pax
<i>Other</i>	4 Pax

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The survey covered all five districts in Penang; Timur Laut received the highest number of responses at 40%, and other districts ranged from 8% to 18% (**Figure 1**).

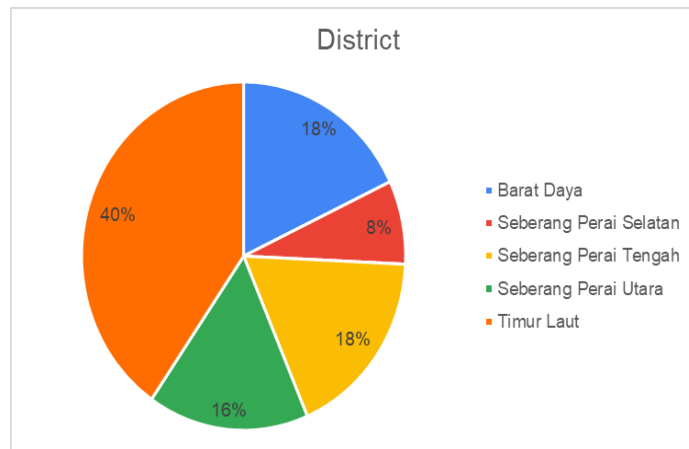


Figure 1 Percentage of respondents by district

The majority (76%) of survey respondents reside in urban areas, with an additional 17% and 7% from suburban and rural areas, respectively (**Figure 2**).

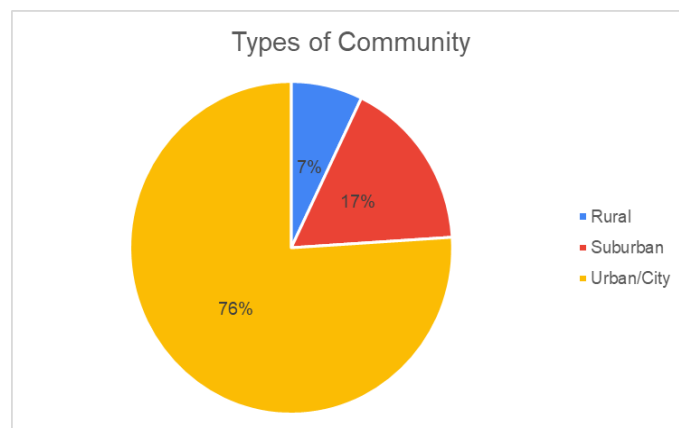


Figure 2 Percentage of respondents by types of community

In terms of the types of housing represented by respondents, the majority (47%) reside in landed properties (47%), and an additional (35%) live in high-rise properties (35%) (**Figure 3**).

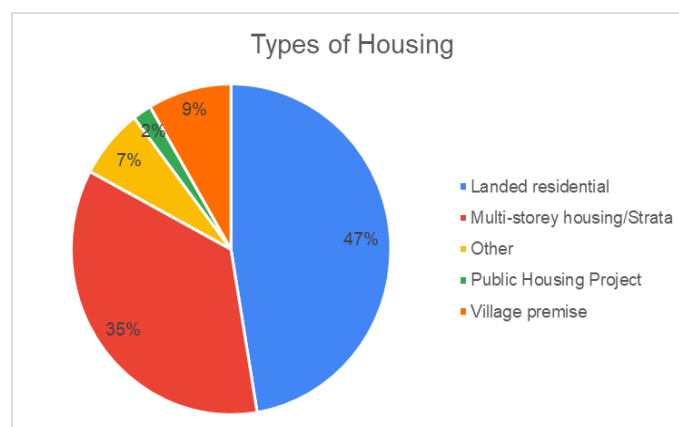


Figure 3 Percentage of respondents by types of housing

In terms of household income, nearly half the respondents fall within the middle-income group (47%), followed by the low-income group (38%), and then the high-income group (15%) (Figure 4).

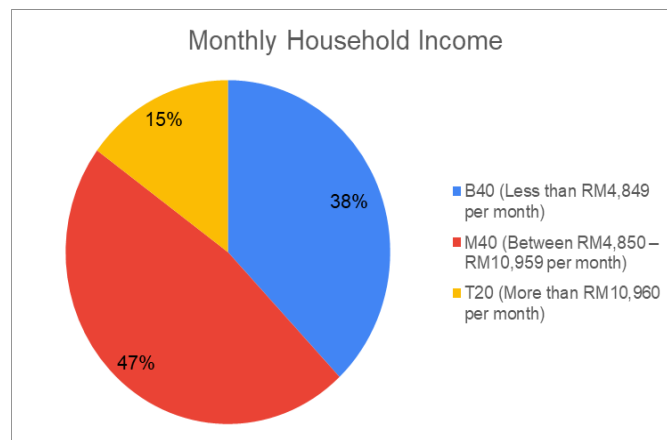


Figure 4 Percentage of respondents by monthly household income

## Part B: Assessment of the Understanding of Recycling and Segregation of Recyclables at Source

**Figure 5** compiles public opinion and perception on waste segregation and recycling. Results from respondents have indicated that:

- a. An overwhelming majority (99%) of respondents consider recycling important.
- b. Fifty-five per cent of respondents think that recycling collection facilities (e.g. recycling bins; recycling collection centres) are convenient to their home, and an additional 45% indicated that collection facilities are inconveniently located. This divergence in responses suggests a disparity in convenient access to recycling collection across Penang.
- c. This finding is reinforced by the fact that 43% of respondents indicated there are inadequate locations to recycle materials in their area (i.e. Within this 43%, those residing at high-rise and landed properties comprise 41% and 44%, respectively), while 36% felt that it is adequate; and the remaining 21% were unsure.
- d. When respondents were asked if they know what happens to materials sent for recycling, 54% considered themselves informed, 32% were unsure, and the remaining 14% answered no. Again, the significant divergence in responses suggests there is work to be done to develop consumer understanding of what happens to recycled materials.
- e. Most respondents (59%) believe that recyclables dropped off in recycling bins are recycled; 36% are unsure; 5% believe that recyclables will not be recycled (i.e. In terms of housing types, a relatively similar percentage applies to respondents residing at high-rise and landed residential buildings). While a majority of respondents trust that their recyclables are being recycled, a significant percentage of respondents are uncertain or distrustful that their recyclables are actually being recycled. There is room to understand better what drives trust in the system and how to improve it.

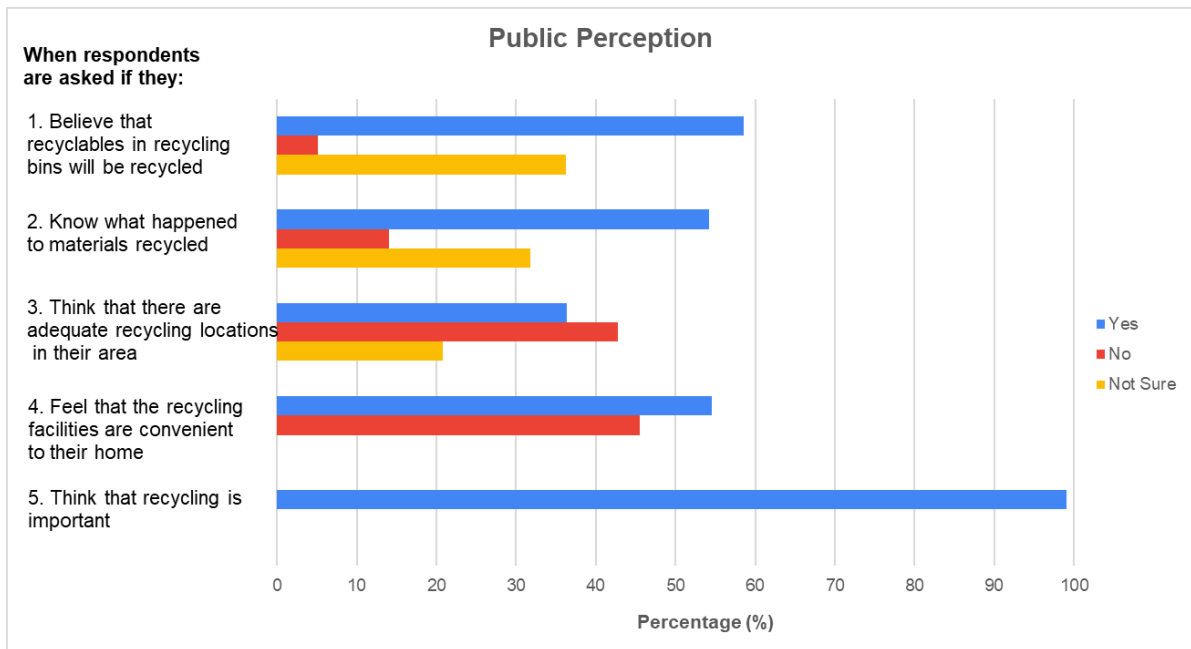


Figure 5 Perception of respondents towards recycling

The following section further studies the relationship between two selected variables featured in earlier sections: **districts** and a) **accessibility** (i.e. convenience of collection facilities) (**Figure 6**) and b) **adequacy of recycling facilities** (**Figure 7**), respectively. Regarding accessibility, respondents from Timur Laut indicated that although recycling facilities (e.g. recycling bins and collection centres) are accessible from their homes, there may not be enough convenient locations for recycling. Other districts demonstrated evenly divided public opinions on whether recycling collection locations were convenient and whether there were enough convenient locations. The data generally suggest that there are convenient locations and inadequate collection locations within a district for recycling; therefore, room for improvement is required.

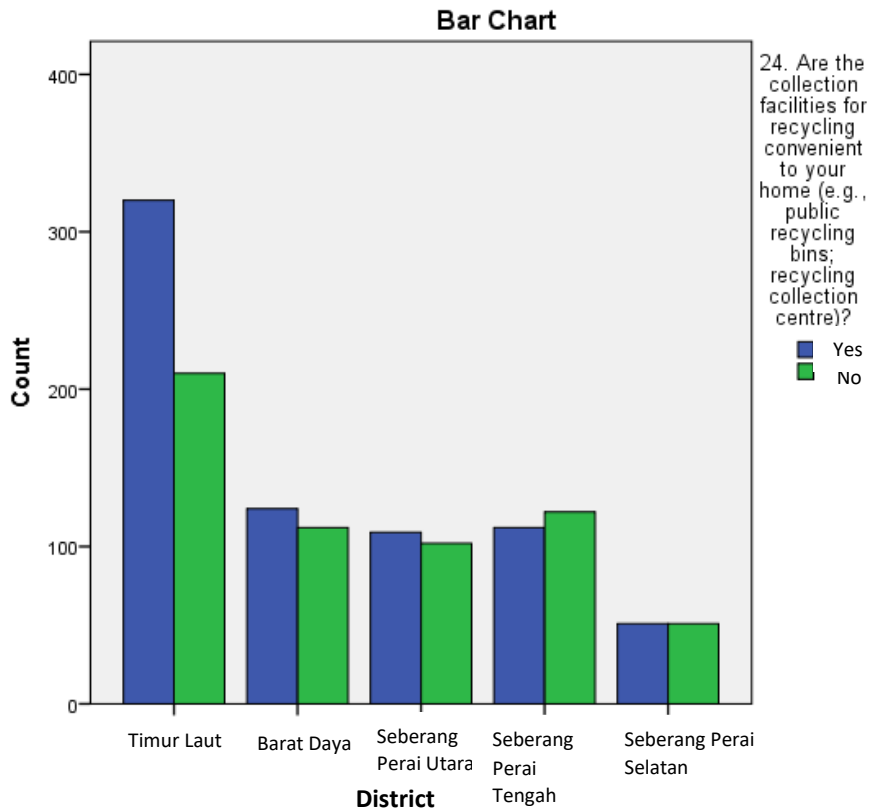


Figure 6 Accessibility to recycling facilities against district

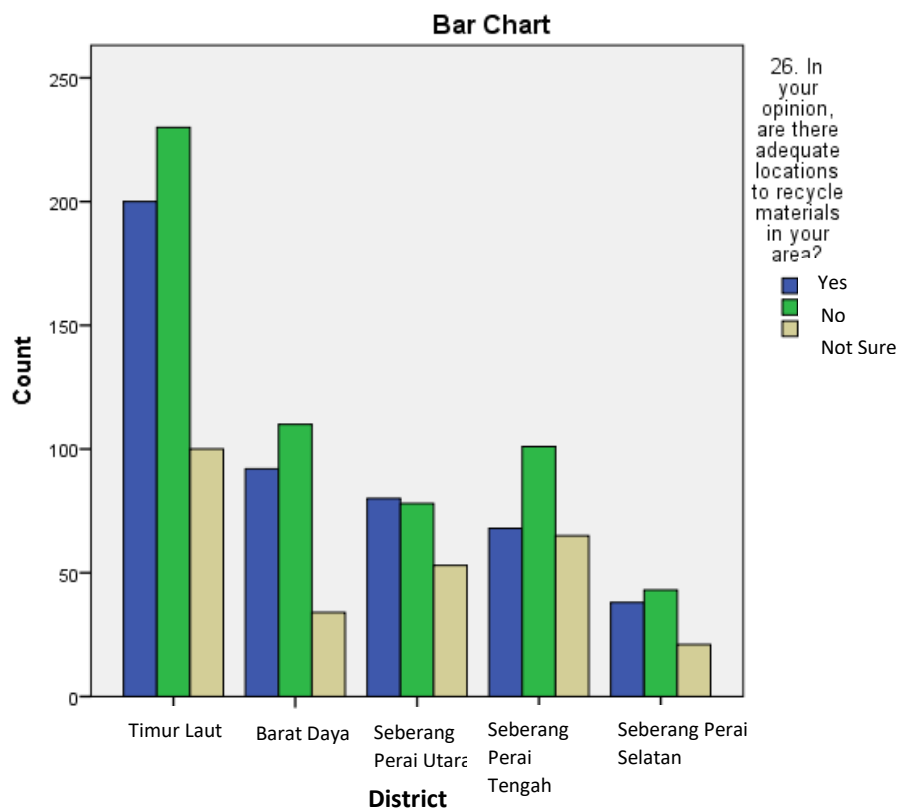


Figure 7 Adequacy of recycling locations against district

The relationship between the different variables above is further assessed using the **Chi-Square Test of Independence** – a test to determine whether there is an association between categorical variables (i.e., whether the variables are independent or related)<sup>3</sup>. In this case, the Chi-square test was utilised to test if the district is independent or related to the two variables assessed above.

Results from the test are as follows:

**a. Access to recycling facilities from home**

The chi-square test indicated a significant association between districts and convenience in accessing public recycle bins and collection centres from their home.  $\chi^2(4, N = 1313) = 0.009$ ,  $\phi = 0.101$ . The result indicates that different districts in Penang do have different accessibility to recycling facilities.

**b. Adequacy of locations for recycling**

The chi-square test indicated significant association between districts and the adequacy of locations to recycle materials.  $\chi^2(8, N = 1313) = 0.011$ ,  $\phi = 0.123$ . This indicates that different districts in Penang have different opinions on the adequacy of locations to recycle their materials.

In another analysis, the relationship between **types of housing** and a) the **accessibility of collection for recycling** and b) the **adequacy of recycling locations** was assessed. Again, views about the accessibility to recycling facilities appear divided. However, the results indicate that more respondents living in multi-storey housing experience convenient recycling facilities (**Figure 8**). As for the adequacy of recycling locations, it is observed that most respondents residing in landed residential properties generally felt that recycling locations are insufficient (**Figure 9**). The findings suggest there is an opportunity to improve recycling opportunities for village premises, landed properties, and public housing.

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<sup>3</sup> <https://libguides.library.kent.edu/spss/chisquare>

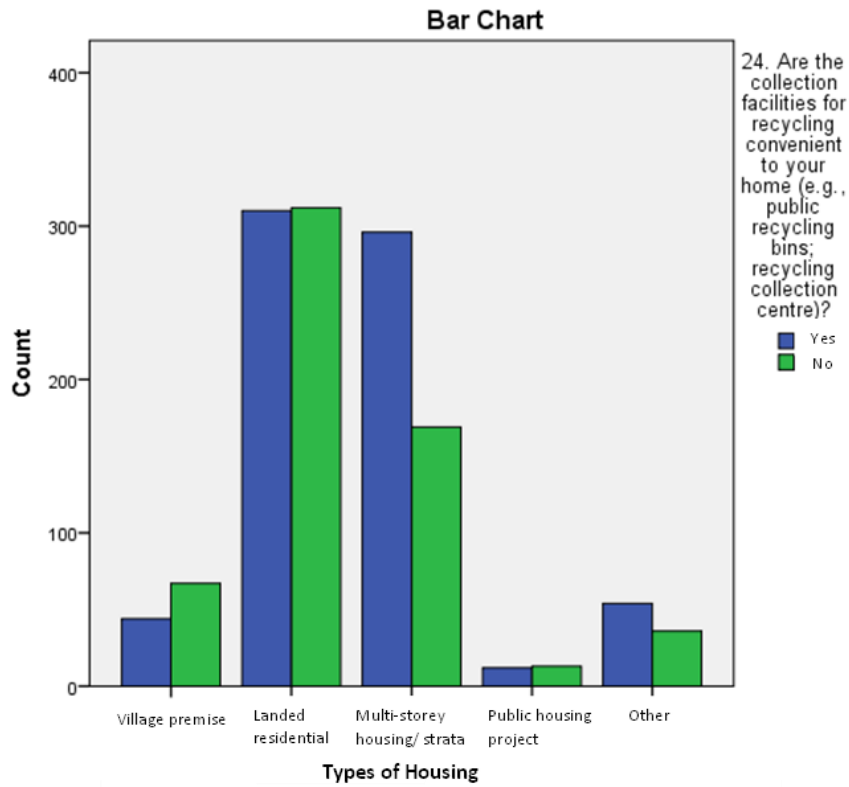


Figure 8 Accessibility to recycling facilities against types of housing

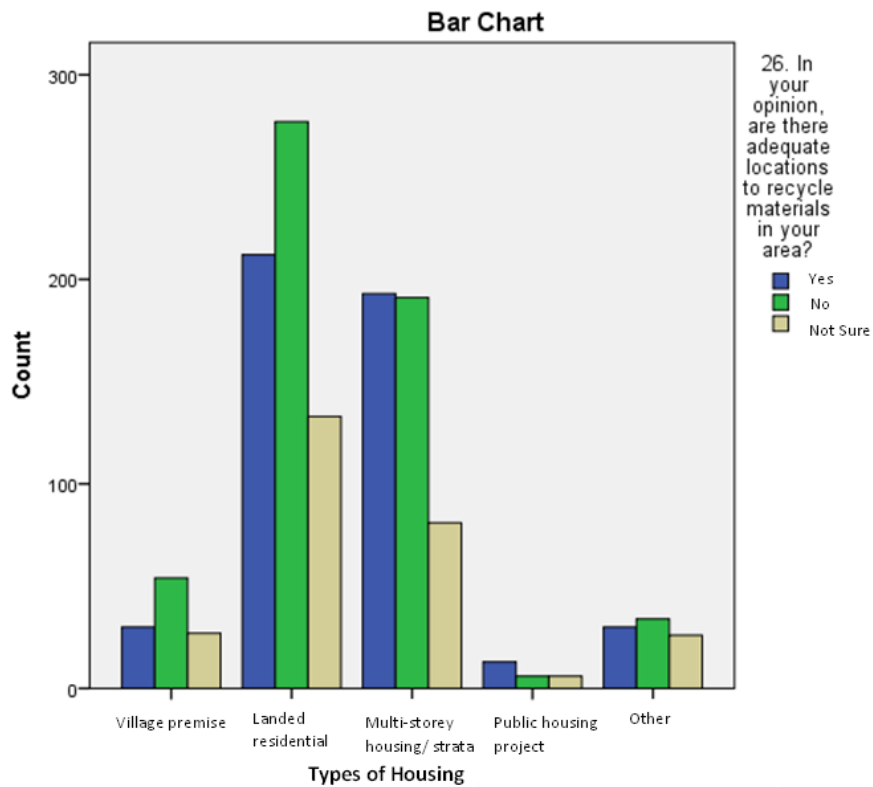


Figure 9 Adequacy of recycling locations against types of housing

Again, a Chi-square test is used to test if housing types are independent or related to the two sets of variables assessed above. The results from the test are as follows:

**a. Access to recycling facilities from home**

The chi-square test for independence indicated a significant association between the type of housing and accessibility to recycling collection (e.g. recycling bins and centres).  $\chi^2(4, N = 1313) = 0.000, phi = 0.158$ . This indicates that different types of housing in Penang have different levels of convenient access to recycling facilities.

**b. Adequacy of locations for recycling**

The chi-square test for independence indicated a significant association between types of housing and respondent opinions on the adequacy of locations to recycle materials.  $\chi^2(8, N = 1313) = 0.013, phi = 0.121$ . Adequacy of location refers to the number of locations. This indicates that different types of housing in Penang have different opinions on the adequacy of recycling bins and centres in their area.

In addition, results from a simple analysis of the survey data observed that nearly half (48%) of the respondents perceive themselves as possessing good environmental awareness (**Figure 10**) and that more than half (61%) of the respondents claim to practise waste segregation (**Figure 11**).

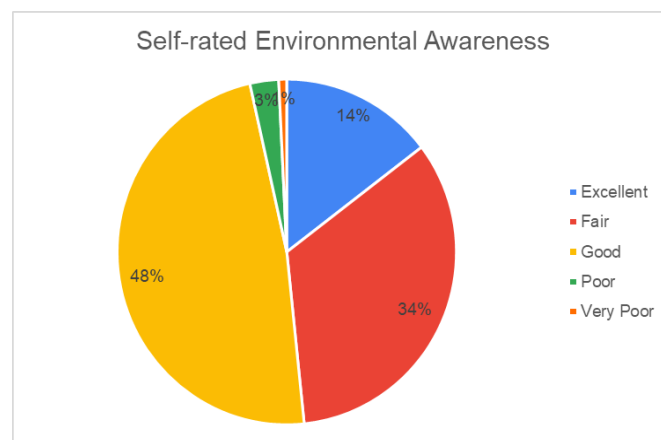


Figure 10 Self-reported level of environmental awareness by respondents



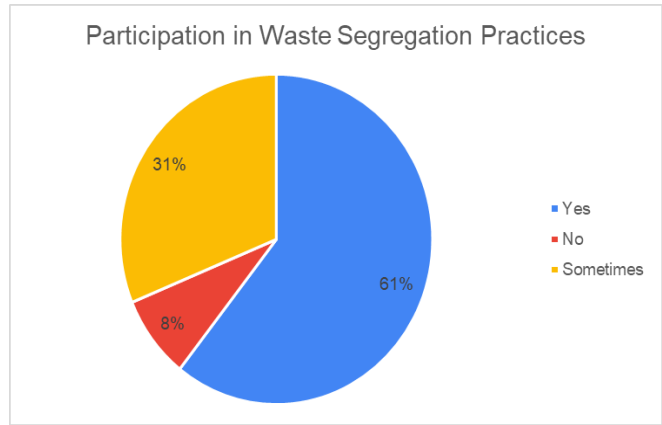


Figure 11 Respondent participation in waste segregation practices

When further asked what prevents respondents from recycling, the most common reasons are the absence of collection bins near respondents' homes, followed by inconvenient recycling collection facilities, and the lack of space at home to store recyclables (**Figure 12**).

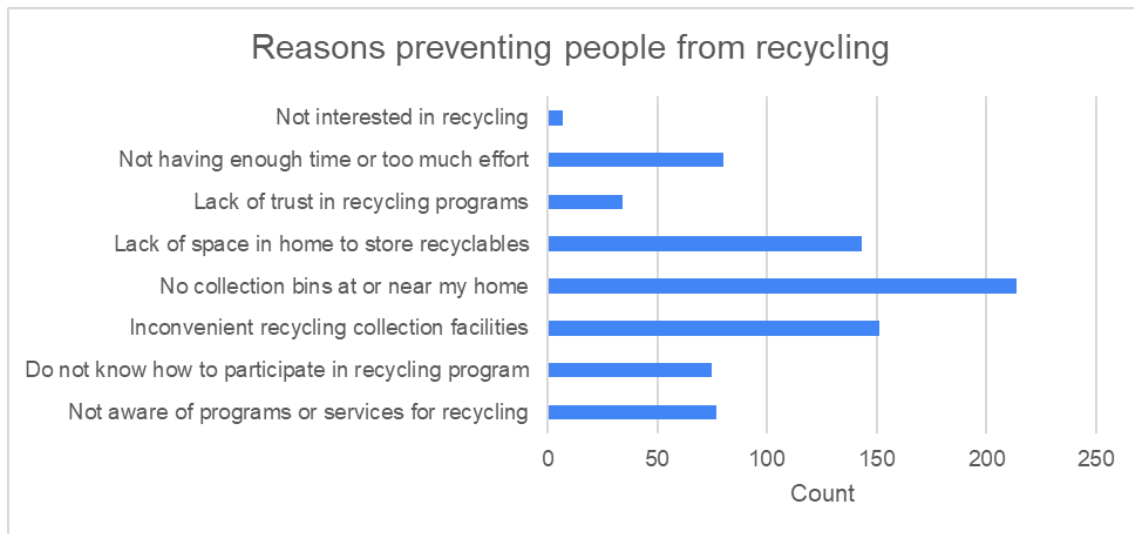


Figure 12 Respondents' perception about reasons preventing recycling

To gauge what would encourage more people to recycle, respondent opinions have leaned strongly towards being provided with more convenient collection for recyclables (**Figure 13**).

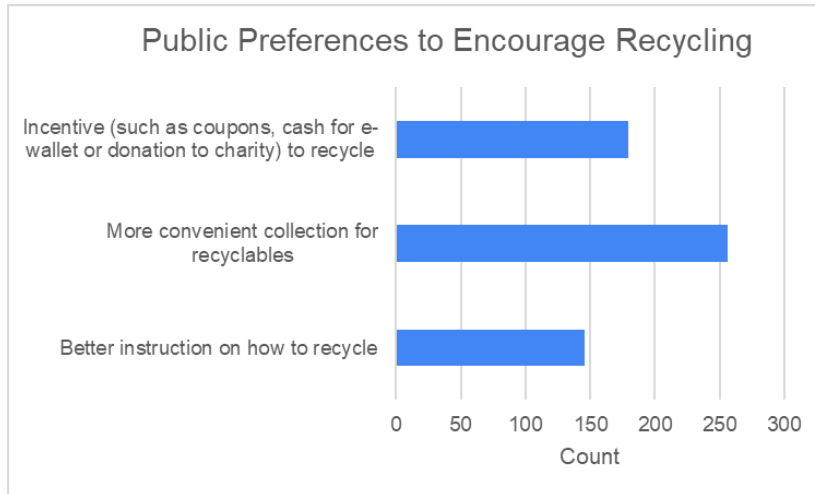


Figure 13 Understanding motivations to improve recycling

The survey results also indicate that recycling is mainly practised by respondents to reduce environmental pollution, preserve the natural environment and keep the community clean (Figure 14).



Figure 14 Respondents' reasons for recycling

In terms of types of waste segregated for recycling, the results show that respondents have a higher tendency to segregate paper waste such as newspapers, magazines, and boxes (Figure 15). It is also observed that rigid plastics such as bottles and containers are commonly segregated. Conversely, soft plastics such as films and soft packaging are rarely, if ever, segregated. In fact, this soft packaging waste, which is the main focus of this study, is the least segregated and recycled.

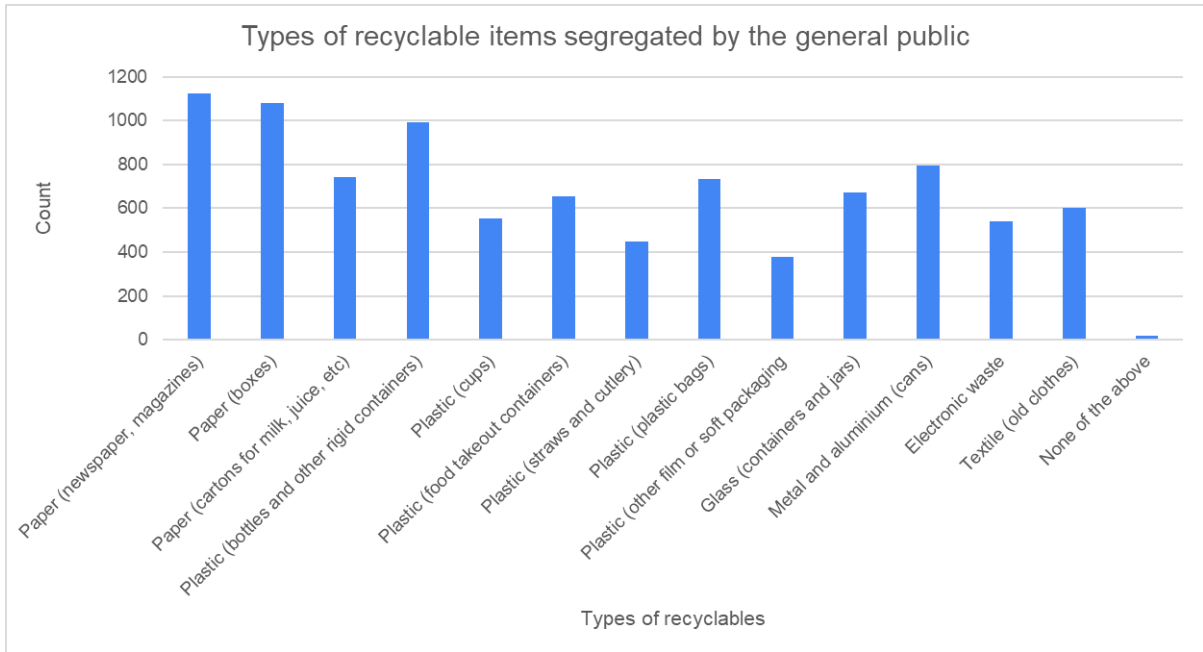


Figure 15 Selection of types of waste segregated by respondents

The results show that when segregated, recyclables are most frequently sent to the nearest recycling centre or placed in recycling bins (**Figure 16**). Responses also indicated that people use the local council’s recyclable waste collection every Saturday and sell collected recyclables directly to companies that segregate and sell recyclables.

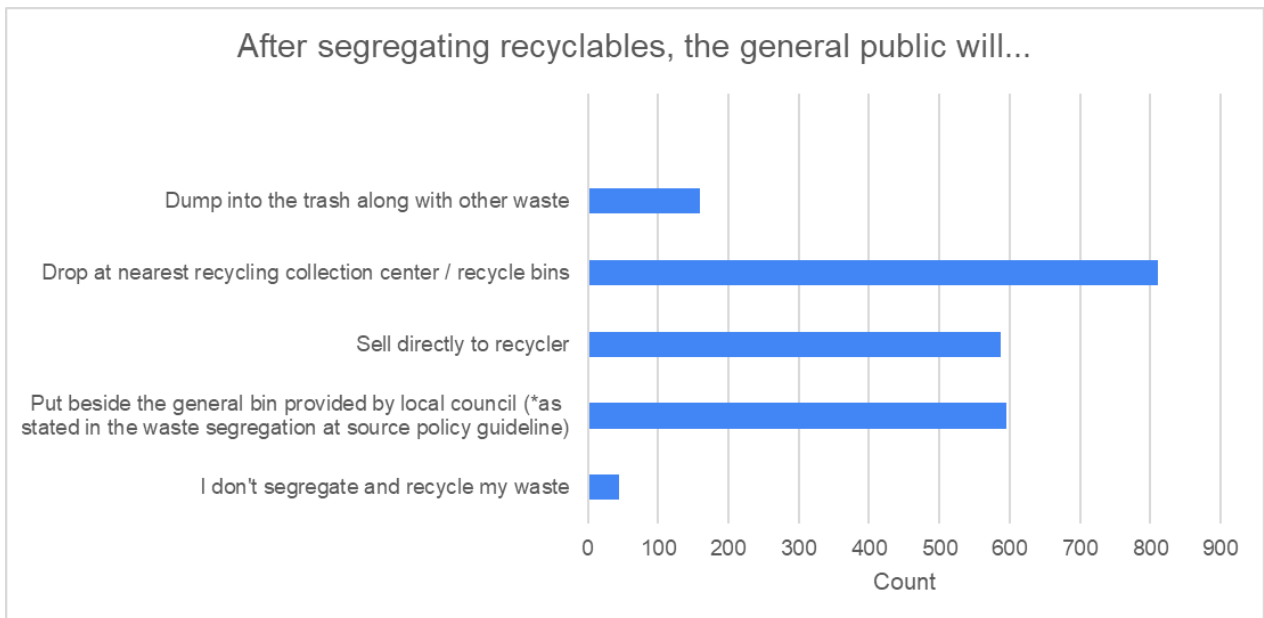


Figure 16 Action taken by respondents after waste segregation

Moreover, it is common practice that recyclables are only sent for recycling after households have accumulated sufficient amounts (**Figure 17**).



Figure 17 Frequency of recycling items

Overall, the respondents' results demonstrate that the closer the distance between the recycling station and their dwelling, the more convenient it is for consumers to recycle (**Figure 18**). Furthermore, survey respondents are very much in favour of dropping off recyclables at community centres.

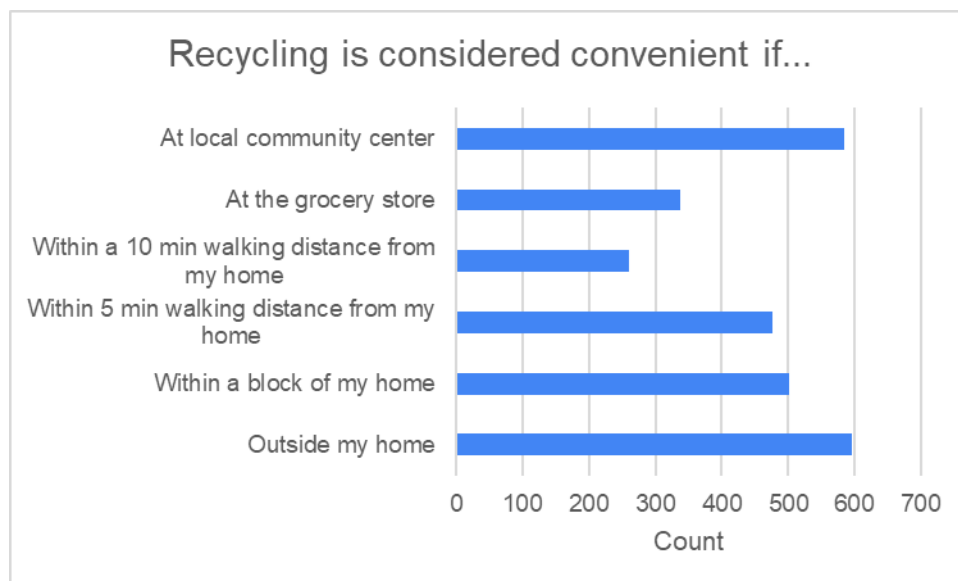
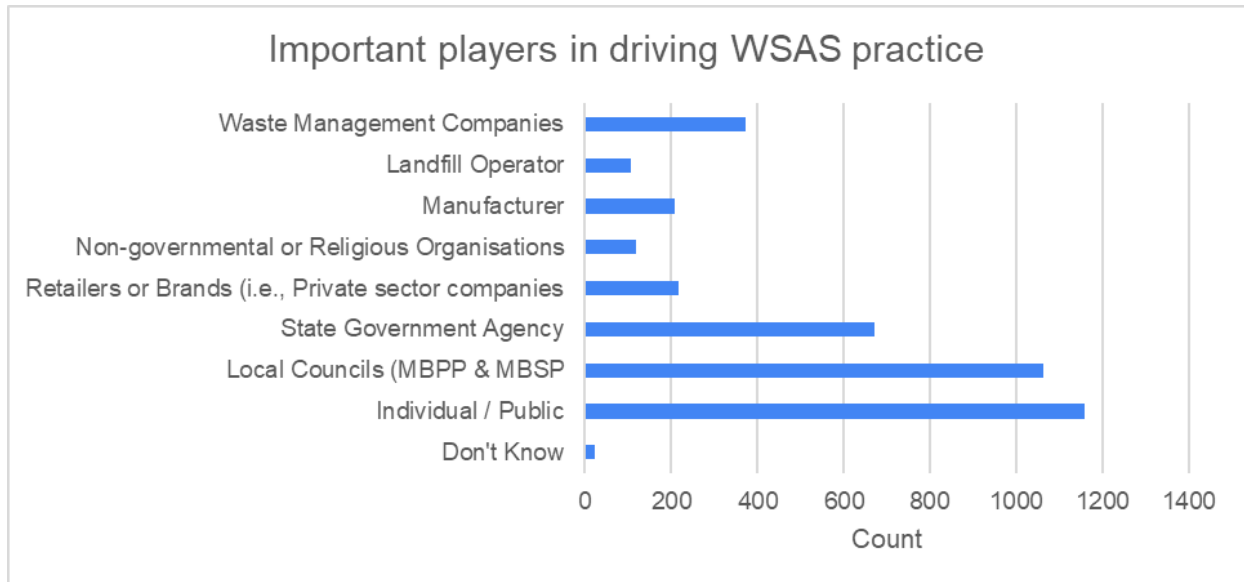


Figure 18 Respondent perception of recycling convenience

When respondents were asked to rank the most important stakeholders responsible for recycling, the results indicated that the public and individual citizens are the most important, followed closely by the local councils and then the state government agency (**Figure 19**).



*Figure 19 Perceived importance of stakeholder groups in driving WSAS practice*

## Part C: Assessment of The Behavioural Change towards Plastic Waste

Plastics are widely used in packaging and the delivery of goods. One question in the survey assessed the relationship between different modes of shopping and the respondents' frequency of shopping to gain insights into the most significant channels contributing to household packaging waste. There is a correlation between shopping frequency and the dominance of food takeout and grocery shopping for respondents who shop more than once per week versus respondents who shop less than once per week and for whom online shopping is most important.

The results are summarised in **Figure 20** below:

- Grocery shopping in stores: Respondents tend to shop 1-2 times a week.
- Online grocery shopping: Respondents tend to shop less than once a week.
- Online shopping (e.g. Shopee, Lazada): Respondents tend to shop less than once a week.
- Food delivery service (e.g. Grab Food, Food Panda): Respondents tend to shop less than once a week.
- Food takeout: Respondents tend to shop 1-2 times a week. However, for shopping frequency of three times and above, it has the highest response count among the different modes of shopping.

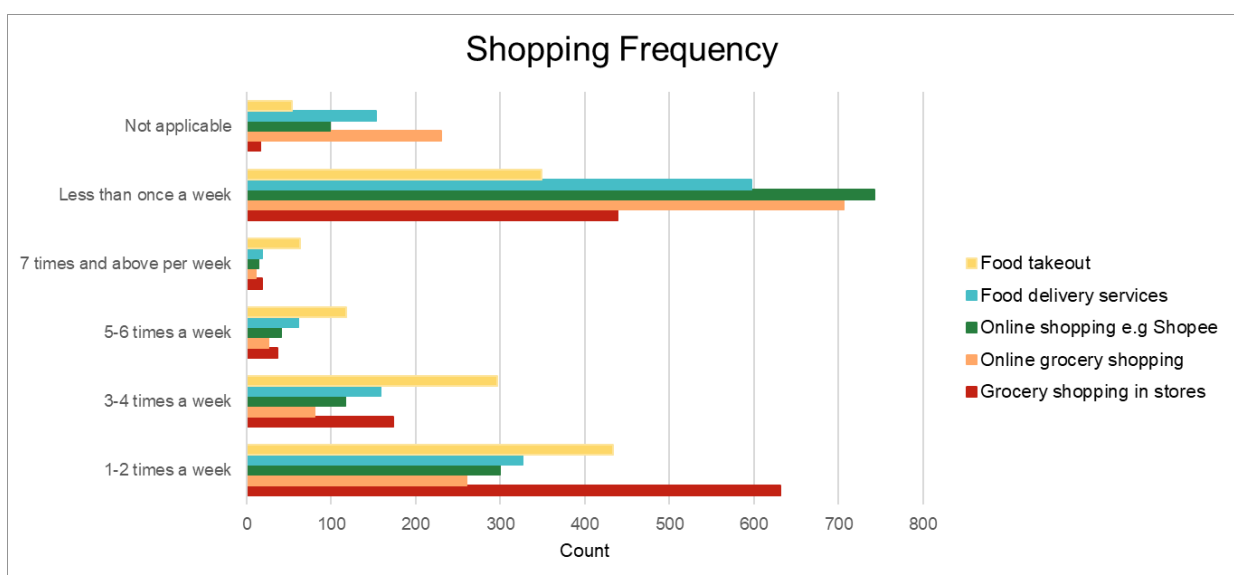


Figure 20 Frequency of different modes of shopping

The relationship between **monthly household income and shopping frequency** has also been examined. From the Chi-square test, a significant association was found between monthly household income and the frequency of shopping for the following shopping modes:

**i. Grocery shopping in stores:**  $\chi^2(10, N = 1313) = 0.022$ ,  $\phi = 0.126$ . This indicates that different types of income groups are significantly associated with grocery shopping in-store.

**ii. Online grocery shopping:**  $\chi^2(10, N = 1313) = 0.035$ ,  $\phi = 0.122$ . This indicates that different income groups have a significant association with online grocery shopping.

In terms of income group, findings from the survey suggest that both types of grocery shopping, in-store and online, are most frequented by the M40 income group (50%), followed by the B40 income group (15-16%) and the T20 (34-35%) income group. This finding is aligned with the demographic data shown in Figure 4.

Plastics are lightweight, move easily through the environment, and accumulate on land or in water, where they take centuries to degrade. Single-use plastics pose a particular challenge as they are used on the go and are used only once before being disposed of. They tend to represent a disproportionate amount of mismanaged plastic. Single-use plastics include water bottles, snack and candy packaging straws, stirrers, sachets, takeout foodservice ware and cutlery. Without proper collection and management, these types of plastics contribute to environmental problems on land and in the aquatic environments.

As shown in **Figure 21**, the vast majority of the general public is on board with reducing single-use plastic. More than half of the respondents indicated they would bring their personal reusable bags most of the time (**Figure 22**).

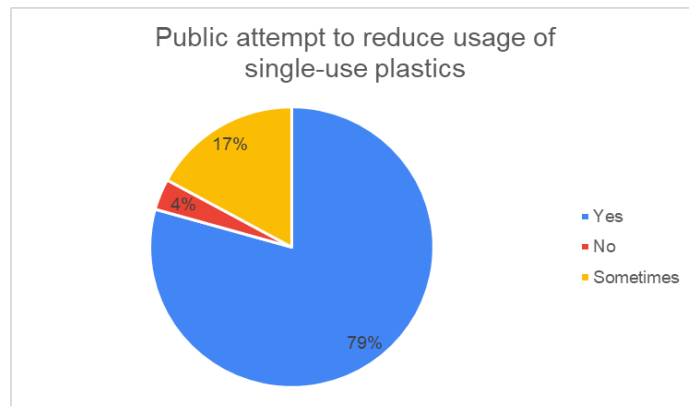


Figure 21 Respondents' usage of single-use plastics

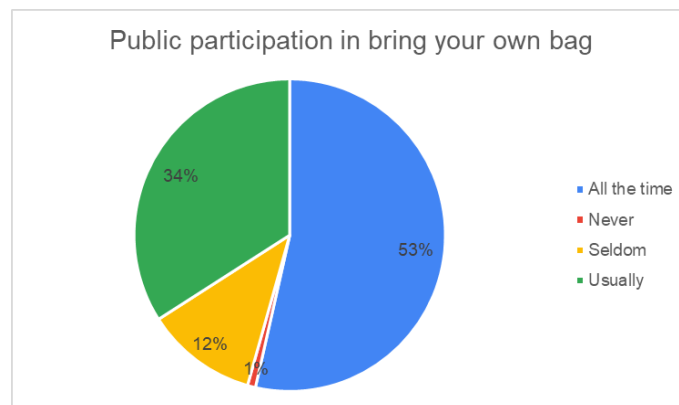


Figure 22 Respondents' using their own reusable bag

Film and flexible waste, the centre of this study, encompasses a wide range of plastic encountered daily. In this study, items classified as this type of plastic include retail bags, food pouches, snack packaging, confectionery packaging, online packaging, and single-serve sticks and sachets.

When asked whether films and flexible packaging waste can be recycled, more than half of the respondents think it is possible (**Figure 23**). This is a surprising finding considering that household film and flexible collections are unavailable.



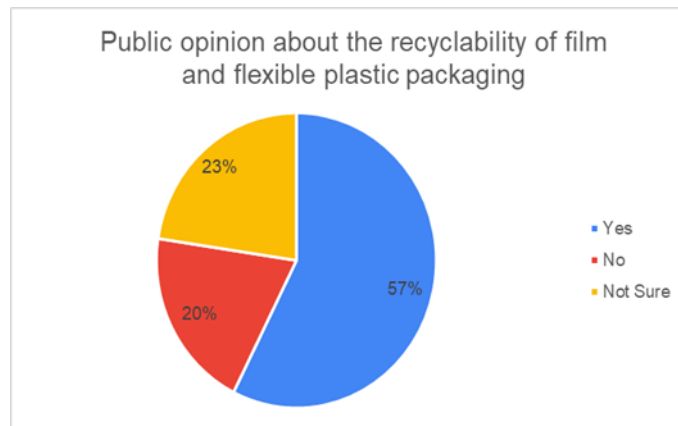


Figure 23 Respondents' opinions on the recyclability of films and flexible packaging

As for the cause of plastic pollution, littering was unsurprisingly identified as the main culprit (Figure 24). No insights into the causes of litter were investigated in the survey.

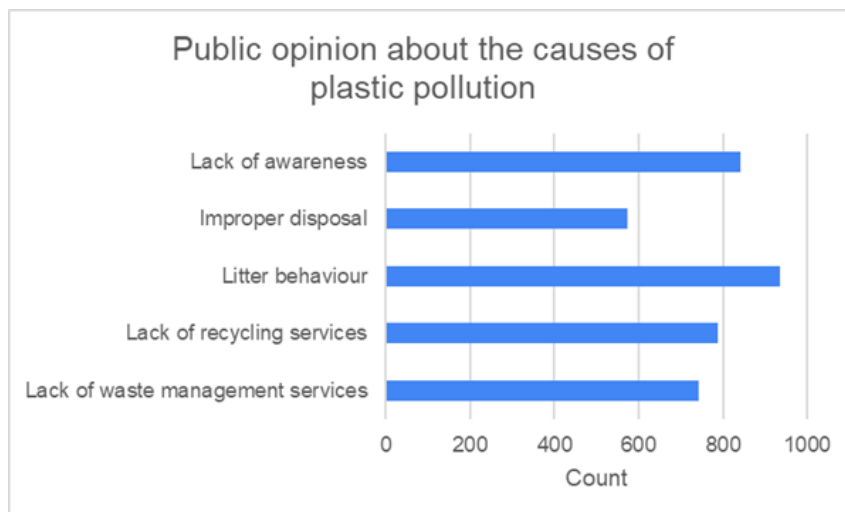


Figure 24 Respondents' opinion on the causes of plastic pollution

After using film and flexible packaging, survey respondents indicated they are likely to reuse the packaging (Figure 25). It is assumed this refers principally to plastic bags. Aside from putting it in the trash, a fair number of respondents tried to recycle films and flexibles by dropping them inside a recycling bin.



Figure 25 Respondents' habits and attitudes towards film and flexible plastic packaging waste

Again, the respondents were asked to rank the essential players in the management of film and flexible packaging waste. Similar to the findings above for driving waste segregation at source practice, individuals and the general public were the most important option, followed by local councils and the state government agency (Figure 26).



Figure 26 Perceived importance of stakeholder groups in the management of film and flexible plastic packaging waste

## **Respondents' View on Waste Management**

Based on the perspectives of survey respondents, the problem surrounding waste management can be broadly categorized into:

### **a. Lack of Infrastructure**

Respondents generally commented on the lack of infrastructure, chiefly insufficient recycling bins and recycling or collection centres. Many expressed the inconvenience of not having recycling infrastructure near their homes, resulting in a low recycling participation rate. The survey also found that there are insufficient categories of collection bins for different recyclables. For instance, electronic waste was one category frequently raised in the feedback. Respondents reported that in certain areas, the recycling bins are not large enough to accommodate the volume sent by the whole community. Additionally, some bins within recycling centres are always locked, impeding recycling efforts.

In essence, respondents would like to see more recycling bins made available and at convenient locations. These bins could be established in residential areas, schools, and shopping areas. Respondents also indicated a need for more recycling stations or centres with a higher collection frequency. Frequency of collection is vital to ensure recyclables are well managed and do not contribute to litter. All recycling bins should also accompany a recycling guide with clear instructions to make recycling easier.

### **b. Public Attitude**

Littering is an issue that the survey respondents repeatedly raised. Such behaviour has caused unsightly neighbourhoods and blocked drainage systems posing flood risks. Respondents think that a lack of cooperation and bad attitudes are the root cause of these issues. Other issues raised included contaminated recycling bins due to reckless or negligent disposal of waste, such as unclean recyclables. The collection and recycling centres are not exempted from human misbehaviour. These centres have also been receiving non-recyclable and dirty materials, creating a nuisance for nearby people who utilise these facilities. One of the survey's findings is that more work is needed to determine if the root causes of littering in Penang is largely due to behaviour or if there are other significant contributors like mismanaged waste bins or trucks, etc.

### **c. Lack of Education and Awareness**

Many survey respondents have indicated that the general public has been unwilling or unable to conduct proper waste segregation due to low public awareness and knowledge. This conflicts somewhat with the finding that a significant portion (61%) claim to segregate recyclables from waste. However, the survey indicated that almost 40% of respondents either do not segregate recyclables from waste or do so only occasionally (Ref Figure 11). Aside from the lack of civic-mindedness, many claimed that people simply do not know what can be segregated from waste; hence much guidance is needed. The survey results suggest that not knowing how to segregate recyclables from waste is most prevalent among the elderly age group. However, the data also indicates that the adult and student age groups also throw recyclables into waste bins. In addition to being taught how to segregate recyclables from waste, the general public must also be informed of where recycling collection and/or collection centre facilities are located.

The survey feedback shows that people are strongly aware of certain NGOs involved in collecting recyclables and are more inclined to send their recyclables to them. Feedback also indicated that the government should lead by example. It was noted that the practice of using reusables for takeaway should start within the public sector, such as government offices, hospitals, and medical centres.

Respondents suggested effective environmental education at all levels of education to ramp up awareness and readiness. Apart from schools, there is a need for more awareness campaigns, be it through traditional or social media, to drive behavioural change in the general public and to educate households on proper segregation. As set out in the waste hierarchy, respondents also called for more emphasis and actions on 'waste reduction', such as addressing single-use plastics.

### **d. Improper Waste Management**

A general lack of confidence is noted in the survey towards the local council's waste collection system. Many respondents indicated that general waste, including recyclables, are not collected regularly. While this forced some respondents to personally drop off their

recyclables personally at a collection centre, the uncollected general waste has led to odour and pest issues.

Respondents reported that despite properly segregating recyclables into separate bags, they observed waste collectors dumping recyclables and general waste into the garbage truck. The same applies to respondents residing in high-rise buildings, who stated that there is a need for the Joint Management Body (JMB) to address the waste segregation at source policy and to establish a proper collection system.

Respondents also suggested that collecting recyclables should be more frequent. To establish a systematic recyclable collection system, respondents suggested having recycling companies engage directly with housing areas to manage collecting recyclables. Contracted recycling vans or lorries can go around the neighbourhood to collect recyclables from every house. Each type of recyclable can be assigned different collection days, i.e. such as Monday for paper, Tuesday for plastic etc.; and coloured plastic bags could help differentiate waste types.

#### **e. Issues Related to Recyclers.**

Many respondents expressed exasperation towards recyclers that are selective towards the types of recyclables collected. Certain recycling companies and organisations are thought only to collect profitable recycling items, such as cardboard, while low-value items like glass, are often unaccepted. Other unaccepted items that are consistently mentioned include electronic waste and soft plastics. Currently, recycling in Penang is offered through a combination of private for-profit service providers, non-profit and charitable organisations, and municipal service. For there to be a universal collection of all recyclables, there needs to be policy and adequate funding to collect and recycle materials with lower inherent value, otherwise the system will focus on the most valuable materials.

#### **f. Lack of Enforcement**

Respondents think the key issues surrounding waste management arise from the lack of enforcement of the waste segregation policy. Several respondents have stated that enforcement should come after education, and the authorities must fine households that do not conduct waste segregation.

### **g. Government (and Stakeholder) Support**

The waste segregation at source policy is a recognised foundational strategy to support effective recycling. However, some survey respondents claim that many people have yet to hear about the policy and furthermore, recycling campaigns by local governments are too few and far between and have not adequately informed the whole community. This situation might indicate a disconnect between policy and practice in certain local communities.

Waste management is a process that involves multi-stakeholder cooperation. For it to succeed, respondents think engaging with stakeholders such as the local community leaders and private sector (i.e. manufacturers and recyclers) is important.

Survey respondents suggest appointing a leader or representative in every community to take charge of recycling. Respondents even suggested that a recycling ambassador, represented by a local celebrity, could encourage more recycling.

Another suggestion is for the government to support businesses involved in manufacturing sustainable recycled products to ensure they are marketable. Corporations, on the other hand, should be required to include recycling instructions on product packaging. As for addressing waste reduction, responses indicate a need to address single-use plastics usage among food hawkers and in wet markets.

### **h. Incentive/ Reward**

Survey respondents indicated that incentives would motivate recycling practices. Incentives that respondents find appealing include coupon exchange either over the counter or from reverse vending machines; refill schemes; monetary incentives; credit exchange and reward systems, etc.

Among the many types of incentives recommended, respondents believe that people maintaining or looking after the recycling infrastructure should be awarded. Recognition can be given to buildings and areas that perform well.

## 4. Summary

Survey respondents have generally demonstrated a good understanding and support for waste segregation and recycling. However, the prevailing waste collection conditions are perceived by respondent as unfavourable and poor public behaviour in certain parts of the Penang community is discouraging, thereby posing a challenge to individual efforts. Due to the lack of public trust in the current public recycling and collection system, individuals among the general public primarily rely on NGOs and private collectors as go-to solutions.

To enable recycling across households, it is imperative to have an efficient and reliable collection system, sufficient recycling facilities and enhanced public education and awareness in all areas. The system must also explain transparently what happens to the collected recyclables to gain the public trust. This means while making recycling more accessible and convenient, there must also be continuous education to foster behavioural change and promote an informed public. In addition, the 'carrot and stick' approach is undeniably a critical component to increase the recycling rate.

The same applies to the collection of the key focus item in this study, which is films and flexible plastic packaging waste. More efforts are required to drive the segregation and recycling of this particular waste type, as it is not as prevalent as other types of recyclables that are more renowned and have better market value.

Ultimately, the role of stakeholders is crucial in realising sustainable waste management. Closer collaborations between the government, recyclers, the private sector etc., are essential in driving behavioural changes and setting up a holistic waste management system. This will win the general public's trust and increase participation in waste segregation and recycling.