



WWF and Lendlease
are working in
partnership to reduce
waste in retail sector.



CIRCULARITY IN RETAIL

Tackling the Waste Problem

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FOREWORD



The study **Circularity in Retail - Tackling the Waste Problem** is a collaboration between Lendlease and WWF-Singapore. It aims to serve as a guide for the retail property management industry and its key stakeholders to identify existing challenges and potential opportunities to achieve greater waste reduction and recycling targets.

As Singapore moves towards becoming a zero-waste nation, this study shows that key stakeholders across the retail sector can play their part and contribute positively to the environment while remaining competitive.

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At Lendlease, we recognise the fundamental challenge that waste and plastic waste presents to the health of our planet and our communities. We have a responsibility to engage with our tenants, waste management contractors, authorities, and the public to shift towards a more circular economy. **We hope the research initiative catalyses even more industry collaborations, innovative solutions and a rethink of how we manage our waste.**

Ng Hsueh Ling, Managing Director, Lendlease Singapore;
Chief Investment Officer, Asia

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WWF-Singapore is excited to see more companies placing sustainability at the core of their business model. We would like to thank Lendlease and all valued stakeholders who actively supported this study, providing insights that are vital to the adoption of waste management and innovations in the retail sector. **Through these learnings, we hope to inspire more businesses to improve their waste reduction efforts towards a sustainable future.**

R. Raghunathan, Chief Executive Officer, WWF-Singapore

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ABOUT



Lendlease

Lendlease is an international real estate group with core expertise in shaping cities and creating strong and connected communities. Our purpose is **Together we create value through places where communities thrive**. Headquartered in Sydney, Australia, and listed on the Australian Securities Exchange, Lendlease has operations in Australia, Asia, Europe and the Americas, with approximately 9,500 employees internationally. Our core capabilities are reflected in our operating segments of Development, Investments and Construction.



A WWF INITIATIVE FOR
A CIRCULAR ECONOMY AND
NO PLASTICS IN NATURE BY 2030

WWF-Singapore and the PACT initiative

WWF is one of the world's largest and most respected independent conservation organisations. WWF's mission is to stop the degradation of the earth's natural environment and to build a future in which humans live in harmony with nature. As one of WWF's international hubs, WWF-Singapore supports a global network spanning over 100 countries. We work to meet key conservation goals, such as deforestation, haze pollution, food security, sustainable finance, sustainable consumption and illegal wildlife trade.

Plastic ACTION (PACT) is a business initiative that aims to eliminate plastic pollution in nature and move towards a circular economy. It recognises the integral role that businesses play to solve the issues of unnecessary use of plastics and plastic pollution. PACT provides businesses with guidance, life cycle assessments, resources and best practices, enabling them to make science-based decisions to reduce their waste footprint.

1 EXECUTIVE SUMMARY

As one of the largest generators of waste in Singapore, the retail sector has a critical role to advance circularity and support Singapore's Zero Waste Master Plan.

Singapore has disposed of seven times more waste over the past 40 years; of which in 2018, large shopping malls contributed 7% of the country's total waste disposed.¹ Its only landfill, Pulau Semakau, is filling up rapidly and is projected to reach its capacity by 2035. The launch of the Zero Waste Master Plan in 2019 outlines a waste reduction target for Singapore to help extend the landfill's lifespan and transition towards a circular economy approach. To address the high contribution of waste from retail, since 2014, it is mandatory for shopping malls in Singapore with more than 4,600 m² of Net Lettable Area to submit their waste data and a waste reduction plan to the National Environment Agency (NEA).

Initial efforts to reduce waste in the retail sector have met some success, but opportunities remain to achieve greater waste reduction and recycling targets.

Between 2014 and 2019, the average waste generated by the retail sector gradually fell from 52 kg/m² to 45 kg/m², with the recycling rate increasing from 6.7% to 11.4%.² This has been attributed to initiatives to minimise waste in the sector, for example, by installing food waste digesters and conducting training for tenants to recycle more. Despite the initial progress, barriers such as the lack of data on waste, unambitious reduction targets, and ineffective segregation practices by stakeholders prevents further improvement in the overall waste reduction.

'Circularity in Retail' identifies key solutions that the retail sector can implement in order to propel its efforts in reducing waste.

This study comes at a time when an in-depth analysis specific to Singapore's mall typology is much needed to fill the knowledge gap and facilitate progress. It focuses on the following problem statements:

- 1 What are the main types of recyclable waste streams in a typical retail mall in Singapore?***
- 2 What are the main sources of waste in a typical retail mall in Singapore?***
- 3 Which sources of waste have the least or greatest rates of recycling and why?***
- 4 What are the keys barriers to reduce waste and where are potential opportunities for improved waste management in a mall?***

This study analysed Lendlease's waste data collected from its four retail malls in Singapore, supplemented by additional on-site and off-site interviews and observations with key stakeholders, data collection and a plastic waste profiling exercise. This highlighted the issues surrounding waste generation and recycling at retail malls and provided a baseline to compare the performance of any future pilot initiatives.

As Singapore moves towards becoming a zero-waste nation, key stakeholders across the retail sector, including mall operators, retail tenants and waste management contractors, can play their part both individually and collaboratively. This study provides a way forward for circularity in retail by focusing on three categories of solutions, such as 1) Waste data monitoring, 2) Reducing waste at source, and 3) Increasing segregation of recyclables – [see all recommendations in Section 6](#). A critical next step will be to identify scalable initiatives for pilot trials.



2 SCOPE AND METHODOLOGY

Before any waste reduction or recycling recommendations can be made, it is important to conduct a baseline analysis of the composition of waste and recyclables that are disposed at each Lendlease mall. Lendlease has been monitoring and reporting waste data, including volumes and recycling rates, at all its malls since 2015. For this study, the waste data collected in 2018 and 2019 from three of its malls – Jem, 313@somerset and Parkway Parade – were reviewed. The data comprised of the following in terms of weight (kg):

-  **Monthly waste disposed**
-  **Monthly waste recycled (according to the types of recyclables)**
-  **Monthly total waste generated**



313@somerset is one of the first major retail developments by Lendlease in Asia and delivered through its fully integrated property business model, which includes investment management, development, project management and construction, as well as asset and property management services. The mall is 288,227 sq ft in size.

Major retailers include Food Republic and Zara.



Jem® is the first lifestyle hub in Singapore’s west where mid to mid-plus shopping meets entertainment; functionality meets experience and where community culture meets city inspiration. The mall is 584,000 sq ft in size.

Major retailers include Don Don Donki, FairPrice Xtra, Cathay Cineplexes, Cookhouse by Koufu, H&M, Uniqlo and IKEA.



Parkway Parade is one of Singapore’s largest suburban malls, catering to the needs of local families for the past 30 years. The mall offers the widest range of stores in East Coast. The mall is 565,697 sq ft in size.

Major retailers include Best Denki, Cathay Cineplexes, Cold Storage, FairPrice Xtra, Food Republic, Harvey Norman Superstore, Isetan, Marks & Spencer and Uniqlo.

The scope of the research can be summarised as follows:



Waste data analysis

- Analysis of waste data collected in 2018 and 2019 by Lendlease across three retail malls, namely Jem®, 313@somerset and Parkway Parade.
- Analysis of waste data collected in 2020 by an automated waste data QR code system in the fourth Lendlease mall, namely Paya Lebar Quarter (PLQ).
- Review of an internal waste report by Lendlease in 2019.



Supplementary waste studies

- Plastic profiling of the types of plastic waste discarded in Lendlease malls by six tenants from three high-waste generating tenant categories: supermarket, food and beverage, and fashion, using data collected for February 2021.
- Identification of recyclables, especially the types of plastic with recycling value, from the waste contractor.



On-ground interviews and observations

- Interviews with three key stakeholders involved in the operation of Lendlease malls: Lendlease asset operations managers, tenants and the waste contractor.
- A survey of waste management processes, including space issues in bin centres and tenants' back-of-house, housekeeping management plan, and waste training circulars.
- Review of the malls' tenancy mix (in 2018 and 2019) and tenancy agreements.



Desktop research

- Research on local and global best practices in waste management in the retail sector and other relevant sectors.

Case Study

Using technology for waste data collection at PLQ precinct

PLQ, a \$3.6 billion integrated development is a key cornerstone of the Paya Lebar central district, comprising three Grade-A office blocks, PLQ Mall and Park Place Residences, which comprise three residential towers with 429 units. PLQ Mall, as the newest Lendlease-managed mall, opened its doors in the fourth quarter of 2019.

To improve the efficiency of the recording of waste data, the asset operations team, in partnership with the waste contractor, introduced a QR code system in October 2019, whereby each tenant is assigned a unique QR code for waste disposal.

The recyclables collected at PLQ are paper, metal, plastics, glass, food waste and used cooking oil. When tenants deposit general waste or recyclables at the bin centre, they have to scan the QR code, weigh the waste and indicate the type of waste in the system. This reduces errors arising from manual recording. Time is also saved from having to transfer the written record into a digital copy.

With the QR code system, waste data can be linked to specific tenants. Due to COVID-19 circuit breaker measures, only the data from January to March 2020 is reflective of typical waste generation. Despite these limitations, F&B tenants with dine-in operations were observed to be generally high waste generators. Only a handful of them segregated their food waste, and even then, they were not consistent in this action.



Image 1: The QR code system at PLQ's bin center (Source: Lendlease)

[Some potential barriers to consistency are explored in Section 4.1.2 →](#)

3 DATA REVIEW

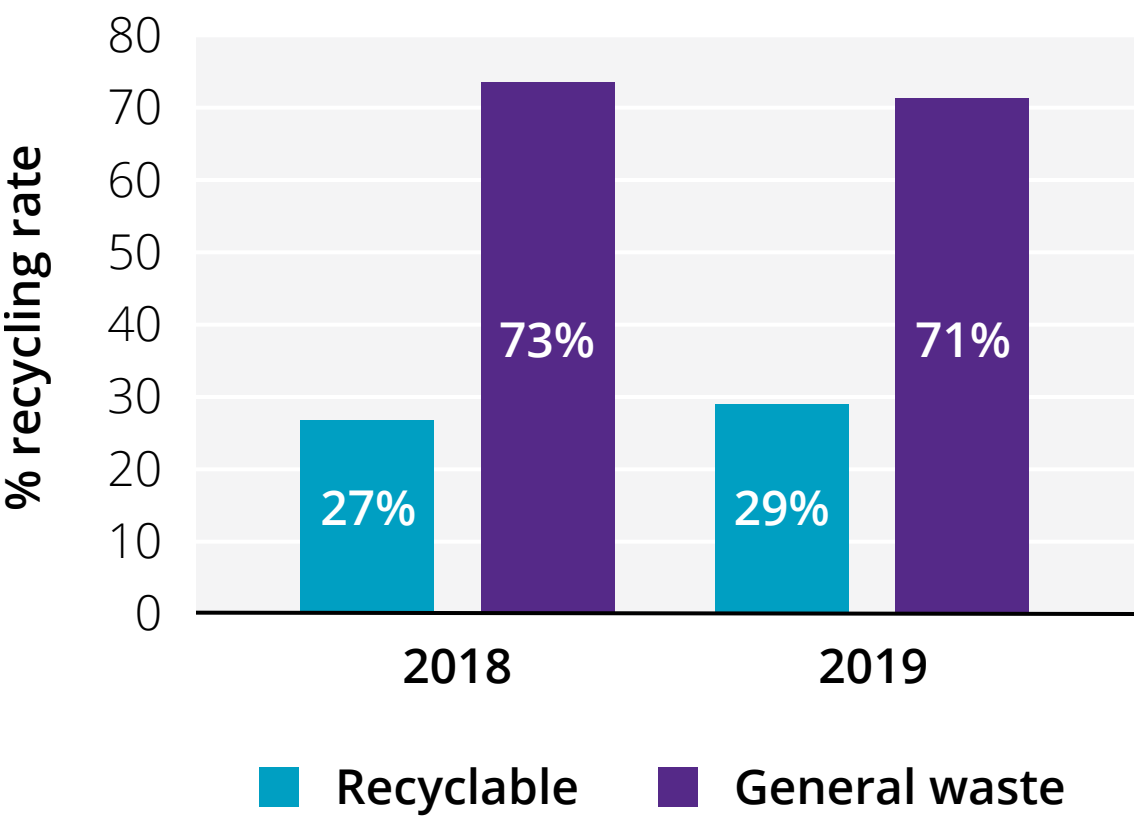
3.1 Waste Overview

Based on the waste data collected in 2018 and 2019, the average recycling rate across Lendlease malls (except PLQ) was 26.7% and 28.9% respectively (Figure 1) – more than double the national average of 11%.³

[Best practices from Lendlease which supports their higher recycling rates will be discussed further in Section 4.3 →](#)

The main types of waste that are recycled at the malls are paper/cardboard, metal and plastic, while certain malls also recycle food waste, glass, used cooking oil, horticulture waste and others.

Figure 1: Overview of the average recycling rate and waste generated by Lendlease malls in 2018 and 2019.



Case Study

Using technology for waste management to divert food waste from incineration



Image 2: Food digester at mall (Source: Lendlease)

Food waste is the largest waste stream in Lendlease malls, primarily because F&B tenants form a substantial part of the tenancy mix. This aligns with findings by the NEA, which show that food waste is one of the large waste streams in Singapore.³

Since 2013, Lendlease has been installing food waste digesters at its malls in Singapore. The asset operations team work closely with the major food waste generators such as supermarkets and food courts to ensure that their staff are trained and equipped to segregate food waste accurately. A dedicated personnel managing the food digester is also present to guide staff to the accurate food waste bins at the bin center.

In 2019, due to the food digester, two of the malls diverted approximately 1,040 tonnes of food waste from incineration, contributing to a 13% and 19% respective reduction in total general waste from each mall.



3.2 Plastic Waste: A Closer Look

In the plastic waste profiling exercise, plastic packaging that is brought into the Lendlease malls are categorised by recycling value from the recycler's perspective. The recycling value is the price the waste contractor is able to sell the recyclable material for. The higher the value, the more likely it will be collected for recycling in Singapore. The recycling value is relatively qualified from "high" to "low", according to the demand and market price that the waste contractor can get from its sale to overseas recyclers. "Rejected" means that there is no recycling market for the plastic packaging in Singapore at the moment, and it would be treated as waste and sent for incineration.

This perspective is used to provide insights according to the packaging types that were uncovered during site visits to the tenants, as shown in Figures 2 to 4. This helps to clearly identify the plastic packaging that should be segregated and prioritised for recycling. Even though most of the plastic packaging types are indicated with low recycling value, these are still collected for recycling.

[Recommendations for change for the rejected plastic packaging are provided in Section 4.4.3 →](#)



3.2.1 Plastic Waste Among Retail Fashion Tenants Surveyed

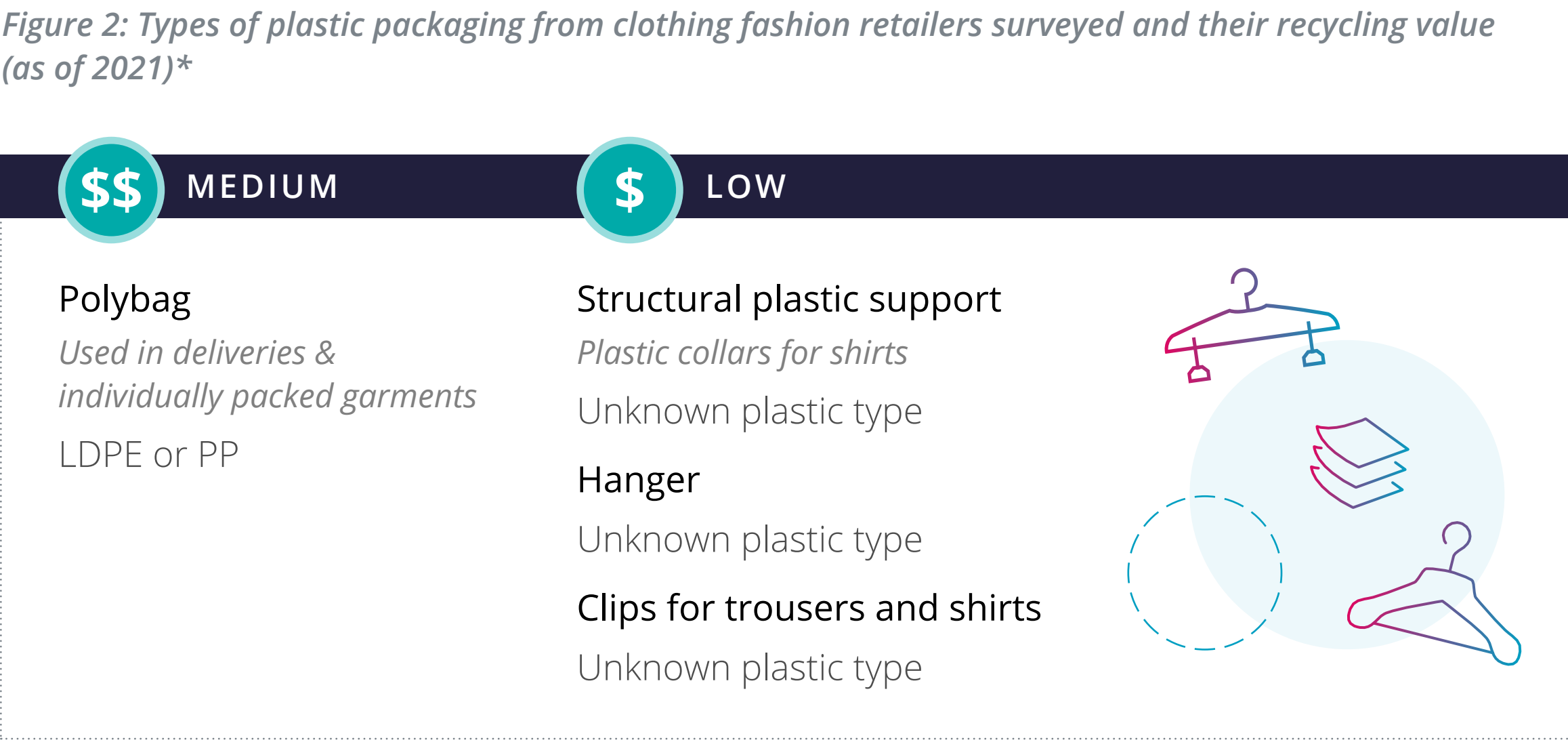
Plastic packaging from the surveyed fashion tenants has the highest potential for recycling as it is clean and not contaminated by food or other contaminants. The packaging type is also usually quite consistent, as listed in Figure 2.

Most common types of plastic packaging found in fashion tenants surveyed (February 2021)



The overall recycling rate of 12.8% could have been higher since segregation of recyclables by retail staff was observed during the site visit. This means more could be done to segregate “polybags”, a polythene bag used to hold new clothing items, since they form the majority and have the highest recycling value compared to other plastic packaging. Compared to the waste data for the three malls in 2019, if the plastic recycling rate could be increased to 80%, fashion tenants could potentially contribute 0.5 to four times more plastic collected in terms of weight.

[This will be discussed further in Section 4.3.3](#) ➔



*The recycling value is the price the waste contractor is able to sell the recyclable material for. The higher the value, the more likely it will be collected for recycling in Singapore.

3.2.2 Plastic Waste From Food Courts Surveyed

Based on the food courts surveyed, their main sources of plastic waste are primarily associated with single-use containers, cutlery and straws.

Most common types of plastic packaging found in food courts surveyed (February 2021)

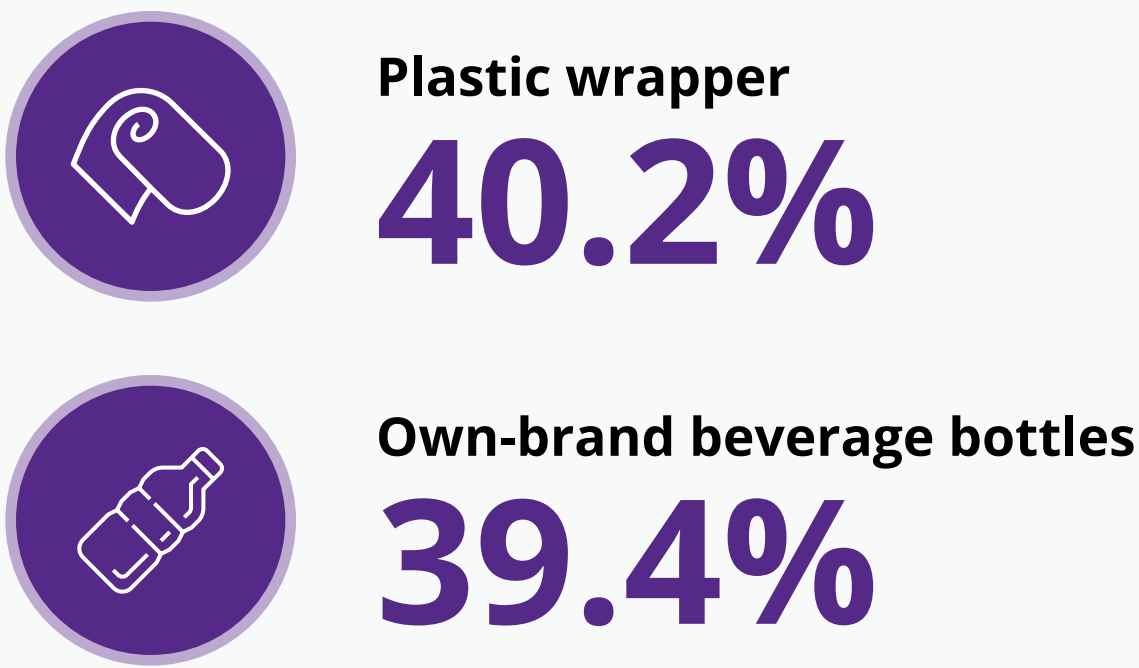


Figure 3 lists the types of plastic packaging that were found in the food courts and their recycling values. As expected, most of the plastic packaging cannot be recycled due to food contamination. These items, even if they were placed into the recycling bin, would be picked out and discarded as general waste instead. However, it is interesting to note that transparent cups and beverage bottles are accepted for recycling if they are empty. Currently, the food courts only carry out food waste segregation.

Figure 3: Types of plastic packaging from food courts surveyed and their recycling value (as of 2021)*

\$\$ MEDIUM	\$ LOW	REJECTED
Plastic wrapper used in bulk purchases of bottled drinks and cans LDPE	Beverage bottle PET Concentrated syrup bottle HDPE Transparent cup PP Cold cup lid PS Hot cup lid PP	Styrofoam cup EPS/Styrofoam Straw Unknown plastic type Dessert spoon PS Coffee stirrer PP Saucer plate Unknown plastic type Glove Unknown plastic type Cling wrap Unknown plastic type

*The recycling value is the price the waste contractor is able to sell the recyclable material for. The higher the value, the more likely it will be collected for recycling in Singapore.

3.2.3 Plastic Waste From Supermarket Tenants Surveyed

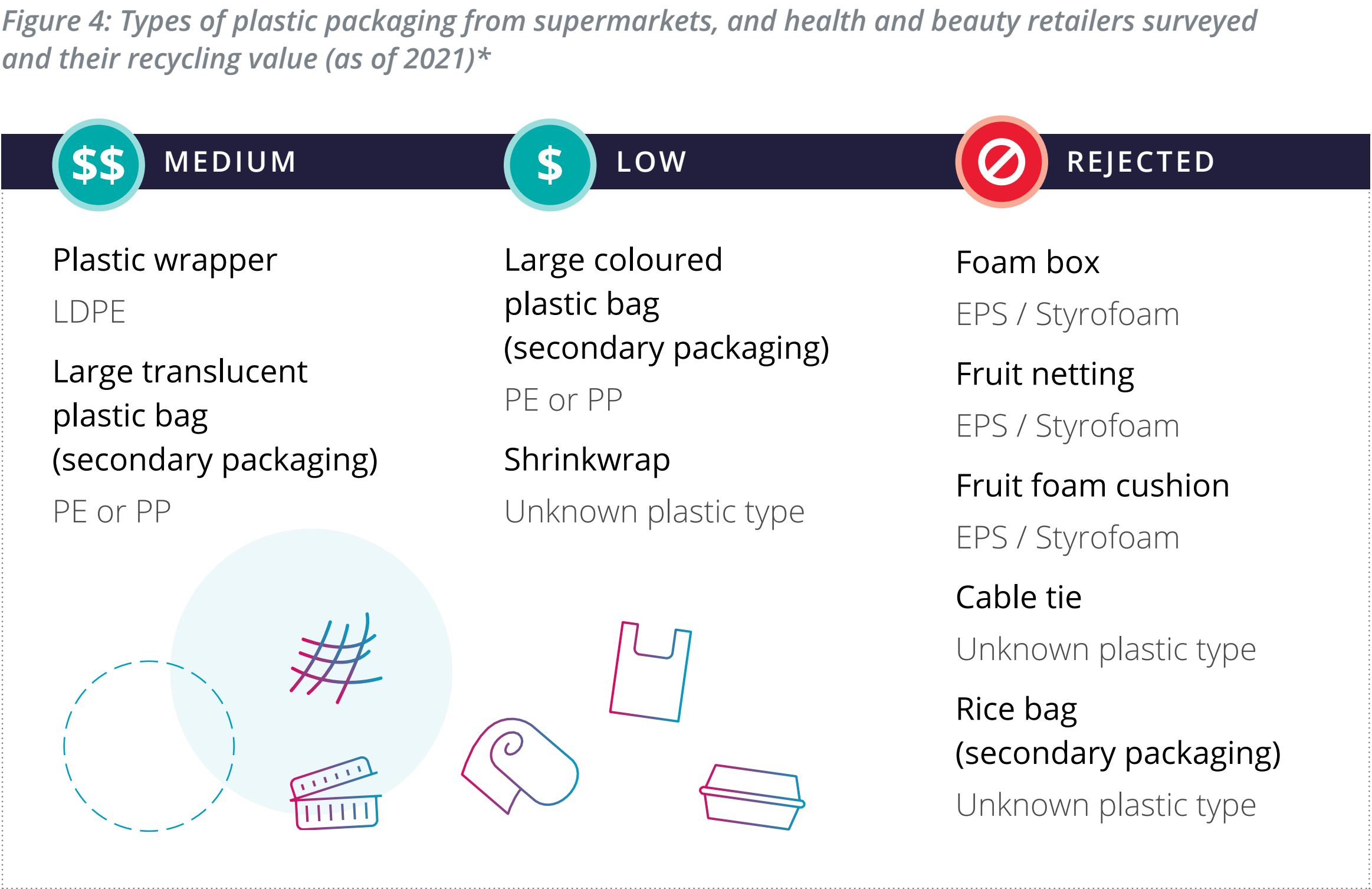
The variety of plastic packaging that can be found in a supermarket is higher than food courts or retail tenants potentially due to the variety of products.

Most common types of plastic packaging found in supermarkets surveyed (February 2021)



Plastic packaging collected by a supermarket and a health and beauty retailer are compiled in Figure 4, together with their recycling values. Unfortunately, almost half of the packaging, which is made of expanded polystyrene (EPS or styrofoam) cannot be recycled, according to the waste contractor. The limitation is due to the lack of appropriate technology to recycle EPS in the region, thus rendering it as non-recyclable.

Opportunities to reduce non-recyclable packaging are addressed in Section 4.4.3 →



*The recycling value is the price the waste contractor is able to sell the recyclable material for. The higher the value, the more likely it will be collected for recycling in Singapore.

4 KEY FINDINGS

4.1 Waste Streams in a Retail Mall

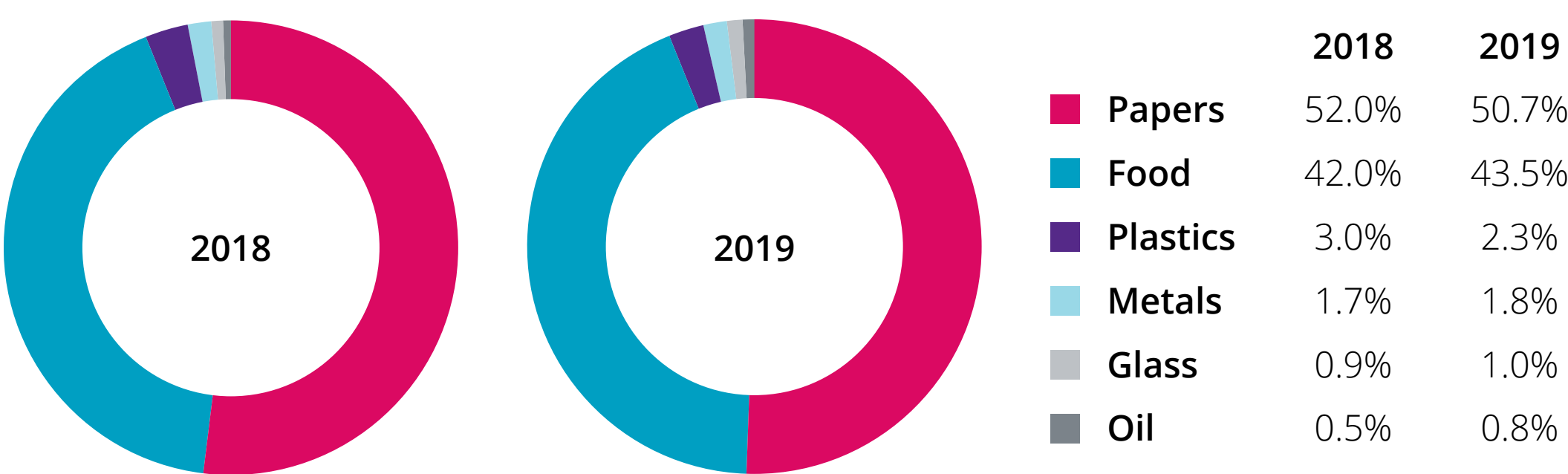
4.1.1 Observations and Learnings

The analysis of different waste streams that can potentially be collected in a retail mall in Singapore is crucial to understand the:

- Types of recyclables; and
- Sources of recyclables from retail categories.

Based on Lendlease data, the top two recyclables by weight are paper and food waste, while the recycling rate of plastics and metals have the most potential to grow (Figure 5).

Figure 5: Composition of the main types of recyclables collected across Lendlease malls (note that not all malls collect food waste and oil)



Paper

Paper and cardboard are among the most segregated recyclables in Lendlease malls. First, this form of packaging is bulky and does not fit into normal trash bags or bins. Second, the mall’s housekeeping team collects the cardboard once or twice daily. All these factors make it easy for the tenants to ensure the cardboards are segregated to be collected by housekeeping, thus ensuring a high recycling rate. It also helps that paper and cardboard currently have a high recycling market value.



WASTE INSIGHT 1

Although the recycling rate of paper is the highest among the recyclables, more could be done by tenants to reduce or avoid paper packaging. A prime example of this was observed at the participating health and beauty tenant, which received goods from a centralised warehouse in reusable boxes. **A more circular approach to reduce disposable packaging and use reusable packaging instead could be explored.**

[This is discussed further in Section 4.4 →](#)

Food Waste

During on-site visits to malls with food digesters, it was observed that the food waste that was going into the digester was mainly uncooked food from the supermarkets, most of which appeared visually edible. Waste data showed that more than 90% of the food waste came from supermarkets. The large amount of food waste is an indication of a bigger food waste problem for most supermarkets which often includes rough handling of fresh produce by the consumers, leading to unsellable conditions; and having to manage consumers' expectation of not wanting to see empty shelves. The waste data also shows that supermarkets have been consistent in their efforts to segregate food waste from general waste.



Among F&B tenants, the food courts at the malls were observed to carry out food waste segregation diligently. Additional insights gained from the QR code system implemented at PLQ indicated inconsistent food waste segregation practices among dine-in F&B tenants, resulting in mixed rates of recycling.

[This is discussed further in Section 4.1.2 →](#)



WASTE INSIGHT 2

According to an internal study carried out by Lendlease in 2019 of their operating food digesters, up to 10% of additional food waste from its malls could be diverted from incineration if more F&B tenants actively segregated their food waste. Additionally, at the mall which does not have a food digester, **the potential waste diversion from incineration was 24%, suggesting the critical importance of a digester to address food waste in a mall.**

[Solutions and opportunities are discussed further in Section 4.1.3 →](#)

Metal and Glass

Although metal and glass have infinite recycling cycles, tenants do not sufficiently segregate these materials. Currently, only metal has a high recycling market value and has reasonable volume. Glass however, is often generated when there are F&B tenants that serve a significant volume of alcoholic drinks.



Based on the procurement data collected from one of the food courts in February 2021, up to three tonnes of metal cans can potentially be segregated per month. This could translate into a two to tenfold improvement in the recycling rate of metal. No similar data was collected for glass as the food courts covered in the study do not sell glass bottled beverages.



WASTE INSIGHT 3

Although metal and glass recycling facilities are readily available in the Lendlease malls, the overall recycling rate of these materials is low. One of the possible reasons for this could be food contamination, especially so for metal containers usually used to contain viscous food items and are difficult to be cleaned thoroughly before recycling.

[Solutions and opportunities are discussed further in Section 4.1.3 →](#)

Plastics

The large variety of plastic packaging uncovered in this study across different tenant categories from Section 3.2 can be broadly categorised as the following packaging type:

- **Flexibles** - bags, wrappers, shrink wraps
- **Bottles** - individual beverages, bulk concentrated syrups
- **Rigids** - hangers, clips
- **Rejected** - styrofoam, packaging contaminated with food



Larger bin centres were cited during the interviews as a potential reason why recycling rates were better in some Lendlease malls. However, this was disproved by the data – there was no correlation between bin centre sizes and recycling rates.

The waste operator indicated that the waste collection frequency can be increased if the recycling bins are full, however, this needs to be balanced with other operational logistics including traffic management and contractual obligations.



WASTE INSIGHT 4

Most of the clean, flexible plastic packaging waste have recycling value and based on their high volumes (approximately 2.7 tonnes for all the malls and participating tenants in February 2021), this type of packaging should be targeted for segregation and recycling.

Based on data for February 2021, the amount of clean plastic wrappers and polybags brought in by the food court tenants comprised 40.2% of its total plastic packaging, and 95.8% for the fashion retailer. Furthermore, compared to the waste data for the three malls in 2019, if the plastic recycling rate of the fashion tenant discussed in Section 3 could be increased up to 80%, similar fashion tenants could potentially contribute 0.5 to four times more plastic in terms of weight.

[This will be discussed further in Section 4.3.3 →](#)



4.1.2 Challenges

Food Waste

Some of the challenges in increasing uptake of food waste segregation and recycling facilities among tenants:

- Lack of manpower to carry out waste segregation.
- F&B tenants that are located on the upper levels are less likely to participate in food waste segregation as they are further from the bin centre, which is located in the basement.
- Lack of space for dedicated recycling bins at the F&B tenant's back-of-house.
- Due to COVID-19, cleaners are unwilling to carry out segregation of post-consumer food waste due to hygiene reasons.
- Potential occupational health and safety issues associated with transporting wet food waste through the mall's service corridors.



Metal and Glass

In the Lendlease malls, F&B tenants are the key contributors of metal and glass recyclables, which are mainly used to store food content. These food-contaminated containers would likely be rejected if the food content is not thoroughly emptied for recycling.



Plastic

Plastic packaging is more challenging to segregate compared to other recyclables as they are lightweight and easily mixed into general waste.

Some of the main challenges for the malls in general, are identified as outlined below:

- The use of multi-material plastic packaging by consumers and tenants, which will reduce the recycling value. Some examples of multi-material packaging include plastic hangers with a metal hook and PET bottles (i.e. PET body, PVC outer sleeves and HDPE cap).
- The use of single-use plastic packaging at the food court, which are not recyclable due to food contamination.
- The use of styrofoam by some F&B tenants and supermarkets for food containment, even though it is not recyclable.



4.1.3 Opportunities

Food Waste

Supermarkets can reduce its total food waste output by:

- Discounting or donating food items to food banks or soup kitchens that are damaged or close to expiry.
- Collaborating with research institutions or other companies to convert bruised food into value-added products.

F&B tenants should segregate leftover uncooked and cooked food waste to be processed in the food digester. This helps to reduce the moisture content of the general waste and the associated cost that comes with transporting the additional weight to the incineration plant. This can be done by:

- Exploring strategic locations in the kitchen to place food waste bins.
- Exploring the possibility for cleaners to collect the food waste twice daily directly from the F&B outlets, similar to Lendlease's current best practice to collect used cooking oil from tenants.
- Using food waste containers that do not emit any odours during transportation from F&B outlets to the bin centre.

Authorities may also consider the following for future buildings:

- Mandating the design and inclusion of food digesters, food waste chutes, or sinks with grinders at F&B outlets to transport the food waste directly to the bin centre or basement for collection. Such systems would minimise both the need to allocate a space for food waste recycling bins within the tenants' units, resulting in a more hygienic kitchen as well as involve less manpower needed to transport food waste recycling bins to the bin centre.

Case Study

Increasing food waste segregation at PLQ

In order to address the low food waste recycling rates at PLQ in early 2020, the asset operations team began to actively engage its F&B tenants. The team conducted daily visits to educate tenants on food waste segregation, and also partnered with NEA to conduct educational talks to emphasize the importance of food waste reduction and recycling. The importance of continued education and communications is reflected in the team's success to **increase PLQ's food waste recycling rates from 10% to 35% within the past year.**



Contaminated metal, glass and plastic packaging

Rinsing contaminated metal, glass and plastic packaging is necessary to prevent the attraction of pests in the storage area, but this requires considerable time and effort by the tenant.

Mall operators and retailers could consider the following opportunities to implement:

- Partner with the waste industry to employ technological solutions to help improve the decontamination (cleaning) and segregation of these mixed recyclables to increase recycling rates. For example, utilising existing Materials Recovery Facilities for automated segregation of recyclables.
- Arrange more frequent collection cycles by waste contractors to minimise the duration of time that contaminated materials are stored at waste collection bays before collection and processing.
- For canned food, where the food content tends to be viscous, it would take more effort to achieve reasonable cleanliness. Food court operators could consider a soaking area in the washing area of food courts to soak used cans.
- Support the upcoming Deposit Refund scheme⁴ by placing the reverse vending machines in strategic locations within the Lendlease malls for the convenience of consumers. The scheme may provide more incentives for consumers to segregate plastic bottles and drink cans (and potentially glass bottled drinks, depending on the coverage of the scheme) at reverse vending machines to get back their deposits.



Mall operators and retailers can also consider using behavioural nudges such as:

- Provide clearer instructional infographics on bins and supplementary training to tenants and cleaners in food court areas on appropriate segregation and cleaning requirements.
- Label recycling bins at common areas and bin centres according to the packaging type that has recycling value, rather than material, as this often results in contaminated items being collected. For example, the Plastic recycling bin should be named “Plastic Bottles” while Metal should just simply be “Drink Cans”, with pictorial guidance.

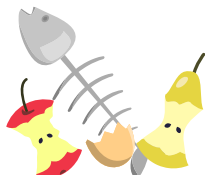






4.2 Sources of Waste in a Retail Mall

4.2.1 Observations and Learnings

The different waste streams, as observed during on-site visits and through interviews with mall operators, can be associated with the type of retail and waste generating activities (see Table 1).

Table 1: Expected recyclable waste streams and their possible sources at a retail mall in Singapore, based on data collected from Lendlease malls.

RECYCLABLE WASTE STREAM	MAJOR SOURCES OF WASTE
 Food waste	Cooked and uncooked food waste derived from supermarkets, food courts and other F&B tenants
 Cardboard	Carton boxes used for deliveries from all tenants
 Cooking oil	Used cooking oil from F&B tenants
 Metals/glass	Canned or bottled drinks, or canned food from F&B tenants
 Plastics	Bottled drinks, single-use cups, and secondary ⁵ or tertiary ⁶ packaging like polybags, from F&B, supermarkets and fashion tenants

Data from the QR code system at PLQ identified key retail categories that generate high general waste such as Beauty & Health, Entertainment, Fashion, F&B, and Supermarket.

There is an opportunity to share this information with tenants which would allow them to take action to reduce their waste and identify areas of improvement. Access to data by both the mall operators and tenants is critical in reducing main sources of waste.

4.2.2 Challenges

The lack of granular waste data limits the understanding of tenant-level waste issues. As a result, baseline information is not accessible to identify major waste generators and major waste streams. Tenants are also not able to identify their own monthly waste output and make a comparison with their peers. This lack of “feedback” to tenants on their waste production can be a barrier to tenant engagement and understanding of the waste problem.

4.2.3 Opportunities

To identify major waste generators and waste streams at retail malls, mall operators could consider taking the following measures to improve waste data monitoring, which are derived from key practices and learnings observed at Lendlease malls:

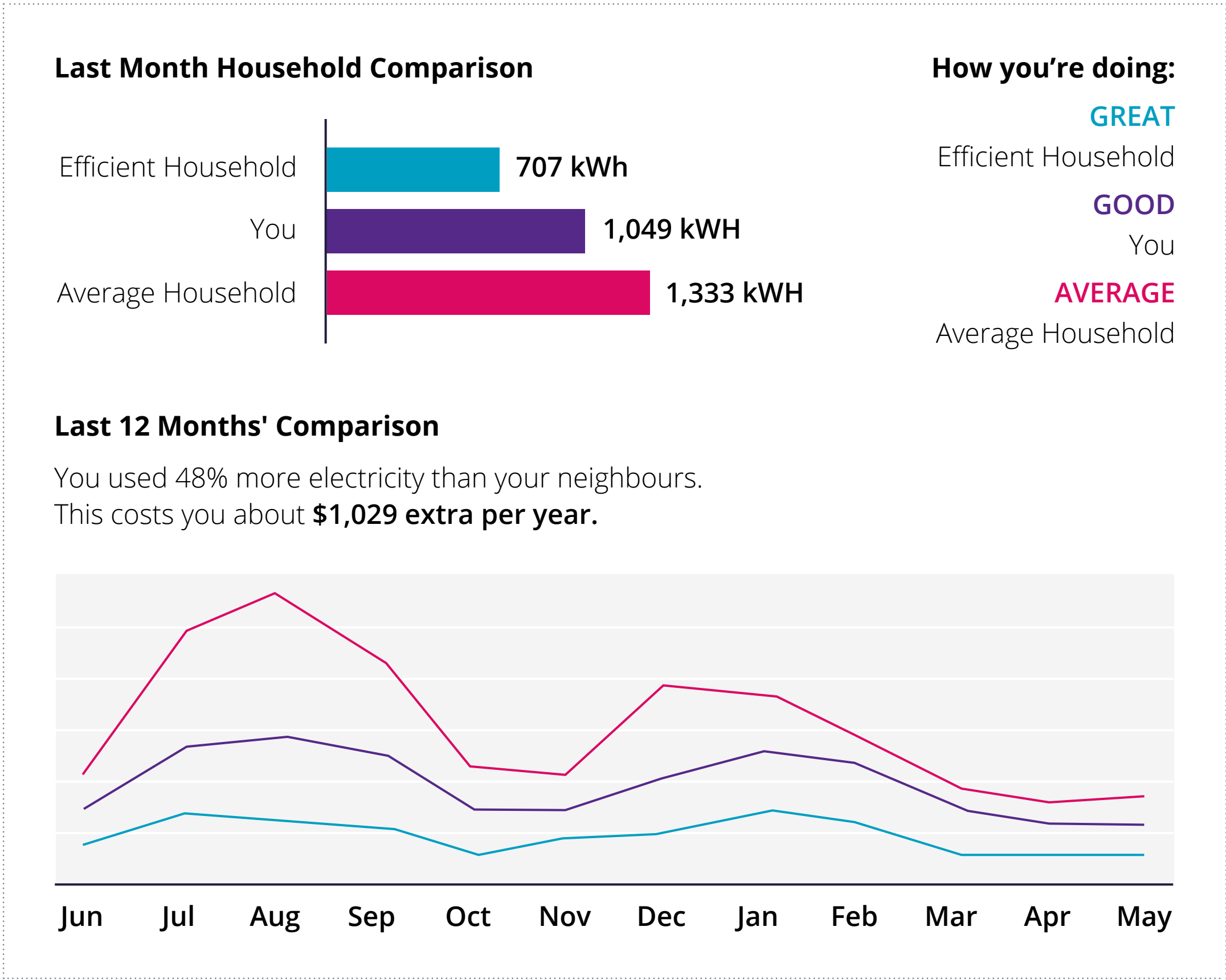
Identify waste reduction goals for each tenant with improved waste data collection

Retail malls could consider digitizing their waste data collection infrastructure at bin centers to collect data of each tenant’s waste output efficiently and provide tenants with access to this information via a “Waste Statement” showing consumption and trends similar to the electricity bill received in Singapore (Figure 6). Simply sharing this information with the tenant will empower asset operations teams to establish waste baselines and feasible waste reduction targets for tenants.

Identify major waste generators and generate monthly waste reports for tenants

Waste data could normalise the waste contribution to the floor area of a tenancy unit to identify the major waste generators. Mall operators could then utilise the data as a feedback mechanism for tenants to track their monthly waste output and see their performance compared to fellow tenants.

Figure 6: Example of a monthly electricity bill, which compares energy use for each household. Such a report could be replicated for waste for each tenant.



4.3 Increasing Recycling in a Retail Mall

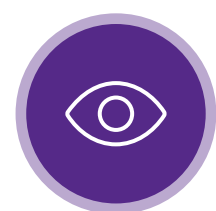
4.3.1 Observations and Learnings

On average, the recycling rate at Lendlease malls is 28.9%, which is more than double Singapore's average of 11.4%. This can be attributed to the following best practices by the malls' asset operations teams and waste contractor:



Efficient segregation

- Paper/cardboard and waste oil: Due to the twice daily door-to-door collection by Lendlease housekeeping staff.
- Food waste: Availability of an in-house food digester to divert food waste from general waste.



Effective monitoring

- Stationing of an employee from the waste contractor at the bin centre to ensure correct segregation of recyclables.



Clear communication of tenants' waste management obligations

- Tenants' obligations contractually stated in the green lease agreement
- Instructions (in hardcopy) for food waste segregation
- Training tours of bin centre for tenants
- Physical visits to build rapport with tenants
- Feedback channels for tenants via concierge and email
- Reminders in terms of circulars

However, it is critical to note that these practices by the malls can be limited in their effectiveness if tenants do not segregate their waste. The different recycling rates observed among tenants is mainly due to their own back-of-house practices and implementation of designated recyclable bins for segregation.

The major sources of waste and the drivers affecting their recycling rates as observed from surveyed tenants:



Supermarket tenants have a high volume of waste, but higher recycling rates, which may be due to having a designated space at the back-of-house for individual recycling bins and a clear protocol on how to segregate food waste, paper and plastic recyclables.



F&B tenants have low recycling rates, which could be improved by segregating other recyclables besides food waste, like metals, as this would significantly improve the mall's recycling rate and reduce the amount of waste sent to incineration.



Fashion tenants have one of the lowest recycling rates. Despite segregating cardboard boxes well, plastic packaging is discarded with general waste, instead of being segregated. More could be done to [increase their plastic recycling rates](#).



4.3.2 Challenges

Challenges for tenants and their corporate offices:

Retail Staff's awareness of mall targets

Few tenants were aware of the mall's specific targets to reduce overall waste or to increase its recycling rates. Some of the retail staff, despite having worked at their respective retail outlets for more than a year, had not attended any training related to waste management or recycling in the mall. It is also challenging for the asset operations team to keep conducting training or to keep track of manpower changes at the retail outlets. Retail tenant staff are routinely rotated among the branches, which also makes it difficult for the asset operations teams to build rapport with them. All this has led to gaps in communication and inconsistent awareness of the mall's waste management systems or policies.

Alignment of communications between Corporate Headquarters and retail outlet operations

Balancing communication and engagement on operational waste management procedures between the tenant's head office (which often sign the green lease commitments) and their retail staff is also a challenge. Training tenants on the mall's recycling programme and disseminating regular circulars might not translate into action if the instructions do not come from the tenant's corporate office.

Lack of influence over the supply chain due to centralised procurement decisions

Retail staff at the mall may lack influence over supplier waste packaging as procurement decisions are often managed by the corporate head office.

Challenges for the asset operations team:

Insufficient instructions on other recyclables

The training deck and circular for tenants could be further improved since segregating other recyclables requires even more specific instructions on the dos and don'ts.



4.3.3 Opportunities

Opportunities for tenants and their corporate offices

There are several opportunities for tenant and their corporate offices to align engagement on recycling initiatives at their retail operations:

- Obtain the standard operating procedure (SOP) for waste segregation from the tenant’s corporate headquarters.
 - ▶ The SOP should include, but is not limited to, defining the recyclables that will be segregated in-house, the location of recycling bins at the back-of-house and training instructions for new retail staff.
 - ▶ The SOP would also help to standardise training of staff on recycling protocols such that when a retail staff is transferred to another branch, the same segregation habit should prevail.
- Tenants could place recycling bins at strategic locations and assign responsibility with the retail outlet manager. For example:
 - Fashion** - Plastic recycling bins for polybags could be placed behind the cashier, near the fitting room and in the storeroom.
 - Food court** - A recycling bin for plastic wrappers could be placed in the storeroom or behind the drink stall counter. A separate metal recycling bin for metal tins can also be placed behind the drink stall counter. The trolleys used to clear patrons’ tables could be designed to include two bins instead of the current one bin.
 - Other F&B** - Food waste recycling bins could be placed within the kitchen and washing area.

Opportunities for mall operators

In general, retail malls could consider enhancing their engagement and communication with tenants and other stakeholders through the following key best practices observed during this research:

- Provide tenants access to information and resources
 - ▶ Display waste segregation instructions prominently in all tenant unit’s back-of-house or strategic locations (e.g. above recycling bins) so that retail staff are clear on requirements.
 - ▶ Provide clear and easy-to-understand infographics or pictorial posters with multilingual translations (Figure 7).
- Introduce incentives to increase tenant participation and cooperation, such as rewards, branding and/or marketing recognition (through sustainability awards) for tenants in mall communications.

Figure 7: An example of a step-by-step poster for shoppers on what they would need to do before placing a transparent plastic cup into the recycling bin.



Opportunities for increased government incentives for tenants

Currently, the recycling programme by Lendlease is voluntary for mall tenants and is aligned to its GreenMark building commitments. Although Lendlease has specified tenant obligations under the waste management clause in its green lease, there is no regulatory obligation for tenants who do not comply with waste management targets of the respective mall. Regulatory authorities could strengthen this obligation via:

- Developing a regulatory framework for mall operators to include a waste management clause in their green leases, including standardising the penalty imposed for noncompliance.
- Incentivising good waste reduction and recycling behaviour using grants and tax rebates.
- Extending the Extended Producer Responsibility policy to include medium-sized companies and/or tenancies that occupy an area within a retail mall over a certain size, or tenants from a particular retail sector.



4.4 Reducing Non-Recyclable Waste in a Retail Mall

4.4.1 Observations and Learnings

On average, general (non-recyclable) mixed waste comprised around 70% of the total waste generated by Lendlease malls. Through on-site observations, the general waste mostly consists of:

- Cooked food waste and inedibles like vegetable skin, roots and bones;
- Non-segregated and/or contaminated recyclables;
- Contaminated single-use packaging from the purchase of take-away food consumed within the mall; and
- Expired food and non-food products.

Increasing recycling rates is not the only strategy to reduce waste in the retail sector. The upstream supply chain responsible for designing, manufacturing, transporting and using packaging materials is well-placed to reduce the overall need for packaging materials and increase the circular economy through extended producer responsibility or taking back their packaging waste for repurposing or reuse. Upstream suppliers could re-examine the functionality of the packaging and develop novel packaging designs that serve the intended function with reduced material.

4.4.2 Challenges

There are no reliable sources of data on the exact composition of general waste and their respective percentages as this requires more detailed tracing and monitoring of general waste by both tenants and the waste management contractor. This could be an area to look into for future study.

4.4.3 Opportunities

There are several opportunities to reduce the volume of mixed waste, however, it is acknowledged that some of the measures suggested require more time to implement as it involves stakeholders up the supply chain.

Single-use food packaging

Fast food restaurants and food courts were the most common sources of single-use food packaging for dine-in services. This included cups, straws, cutlery and containers, which cannot be recycled due to food contamination. To address this, these outlets should adopt long-term solutions, such as using reusable crockery for dine-in customers and investing in dishwashing facilities where possible.⁷

While transitioning to long-term solutions, F&B outlets and mall operators can actively encourage and consider incentivising customers to bring their own reusable containers or bags by providing discounts or introducing a points system to reward shoppers accordingly.

Responsible procurement

Retailers generally closely monitor food products that are nearing expiry and typically offer discounts for such items to reduce disposal, though it cannot be completely eliminated. There is a growing trend for businesses to adopt leaner, just-in-time procurement. This considers the amount of goods that need to be procured without overbuying (or even under-buying). Besides reducing waste, this also reduces lost value for businesses.



Logistics packaging

Logistics packaging is used in the delivery of products from distributors to retail stores and may require a range of packaging types including pallets, corrugated cardboard boxes, styrofoam boxes and plastic wrapping.

Tenants and their suppliers and/or logistic partners could work together to identify areas where they can:

- **Redesign products** to enable compact packing of products during shipment and logistics. This will help minimise air voids and the need for protective packaging like bubble wrap in shipments.
- **Redesign packaging** to eliminate unnecessary packaging or reduce freight volumes/weight by redesigning existing packaging to use less materials or to increase recyclability.
 - ▶ For example, for fashion retail tenants: Ensure the hangers used in stores are either reused or made with a single material (either wood, cardboard or plastic) to optimise recyclability.
- **Redesign secondary and tertiary packaging with logistics partner and/or wholesale partner** to introduce reusable logistics packaging and eliminate single-use ones. The following could be explored:
 - ▶ Replacing large plastic bags used in secondary packaging with cable ties.
 - ▶ Replacing styrofoam boxes with carton boxes or reusable boxes in areas where it will not affect the longevity of the food item, e.g. vegetables.
 - ▶ Exploring alternative materials for foam netting and cushion dividers that can be used to protect fragile goods.
 - ▶ Removing large plastic bags usually used to contain products already packed in carton boxes.

Case Study

Reducing disposables at public hawker centres

As part of the national drive towards Singapore's Zero Waste Master Plan, NEA has taken action to reduce the use of disposables for dine-in meals at public hawker centres.

Common reusable crockery and centralised dishwashing services were introduced to new hawker centres built, after almost a 30-year hiatus in building such facilities. Between 2015 and 2017, 6 new hawker centres commenced operations and started using common reusable crockery and centralised dishwashing services. This eliminates the need to use disposable crockery for dining in and alleviates the hawkers' burden of washing their own dishes. Similar centre-level initiatives were introduced to existing hawker centres under the Productive Hawker Centres programme launched in 2017. Thus far, 6 hawker centres have come onboard the Productive Hawker Centres programme.

With effect from Sep 2018, NEA has required all cooked food hawkers taking up new stall tenancies in hawker centres managed by the NEA and NEA-appointed operators to serve dine-in patrons with only non-disposable crockery.

The case study demonstrates the short-term investments needed to switch from disposables to reusable crockery in F&B outlets. New F&B tenants in malls should consider switching to reusables and setting aside dishwashing facilities when planning their new operations.



Image 3: A centralised dishwashing system in Yishun Park Hawker Centre (Source: NEA)

5 INNOVATION & TECHNOLOGY IN WASTE SEGREGATION

In addition to the opportunities highlighted above, to accelerate efforts to improve waste management and segregation practices at retail malls in general, the following are suggested technologies that can be adopted:

Waste Data Monitoring



Digitalisation of waste collection data

Lendlease began digitising its waste data collection using a QR code system. A best practice is to further categorise tenants according to their retail category, as this would allow the tenants to know how much waste they are generating compared to their peers.



Food waste monitoring technologies

F&B tenants could benefit from installing food waste monitoring systems that digitally measures and monitors what goes into the bins during the preparation of food. Long-term data collection will allow the restaurant to identify areas to reduce food waste and adopt smarter procurement practices.

Segregation of Recyclables



Bin level monitors

Using bins with sensors would reduce the number of unnecessary trips that housekeeping teams would have to make to monitor the level of waste in bins around the mall. This would free them to carry out other tasks such as door-to-door recyclable collection.



Electric trolleys

The door-to-door collection of recyclables could be made less physically strenuous with the use of electric trolleys that can be either driven or controlled by housekeeping staff.

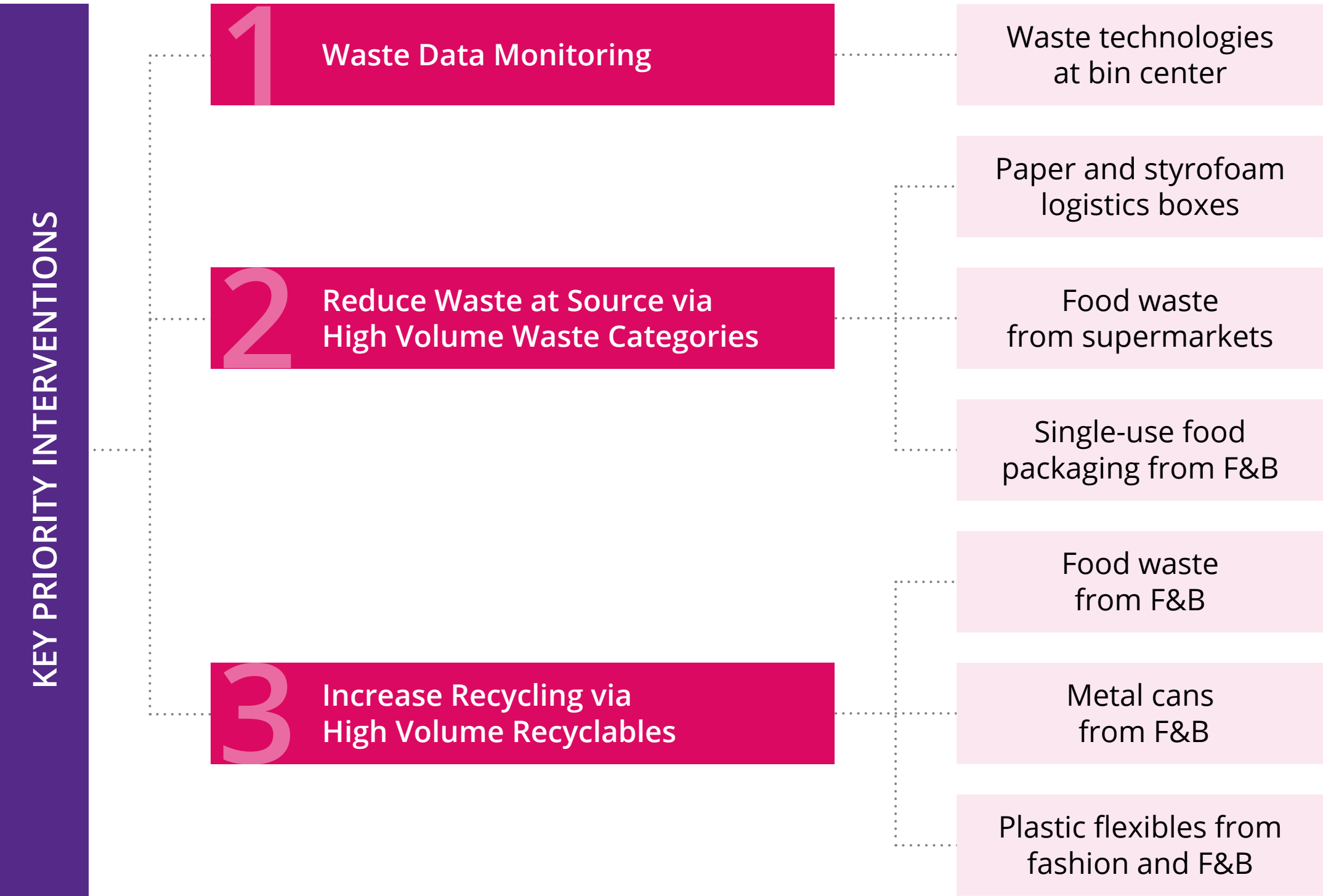


Sink grinders

F&B tenants situated at the upper levels of the malls would benefit from installing a sink grinder to process food waste. This would reduce the space needed to store the food waste, and it is more hygienic than using food waste bins since such grinders are usually installed under a sink. This could be further expanded into directly transporting the food waste to the bin centre through a specially designed pipe system, reducing the manpower needed.

6 THE WAY FORWARD

Based on the study, retail malls in general can focus on the following **three priority interventions**, 1) **Waste Data Monitoring**, 2) **Reducing Waste at Source**, and 3) **Increasing Segregation of Recyclables** in order to drive impactful measures for waste management in retail. Below is a summary of some of the key insights, challenges and opportunities per priority intervention.



1 Waste Data Monitoring



WASTE INSIGHT

A lack of data makes it hard to set waste reductions targets for tenants.

Challenges

- Currently, tenants are not aware of how much waste they are generating, nor are they able to compare their waste generation with other tenants in similar categories.

Opportunities

- Retail malls could consider digitising the waste collection data to trace the waste generation back to tenants. This allows the tenants to view their performance and where appropriate, set measurable targets.



2 Reducing Waste at Source by Targeting High Volume Waste Categories



WASTE INSIGHT

Reduce or avoid paper / carton / styrofoam boxes used in packaging to deliver goods to tenants in the first place.

Challenges

- Head offices, not retail staff, often have control over supply chain decisions, such as in reducing packaging waste.

Opportunities

Tenants and their suppliers/logistics partners can work together to:

- Eliminate unnecessary logistics packaging.
- Reduce freight volumes/weight by redesigning existing packaging to use less materials.
- Introduce reusable or returnable packaging.
- Replace non-recyclables like styrofoam boxes with carton boxes or reusable boxes in areas where product shelf life will not be affected.



WASTE INSIGHT

Reduce total food waste output from sources such as supermarkets.

Challenges

- Most of the food items are bruised and in unsellable condition but some may still be in edible state.

Opportunities

- Where possible, food items should be sold at a discount, or donated to food banks or soup kitchens, so long as it is done within NEA's food donation guidelines.
- Invest in food waste monitoring systems that will digitally capture amounts and types of food waste. Knowing the breakdown of perishable food will help supermarkets better strategise their procurement.
- Work with research institutes or other companies to convert badly bruised but edible food to other value-add products.



2 Reducing Waste at Source by Targeting High Volume Waste Categories



WASTE INSIGHT

Single-use food packaging for dine-in services are often used in fast food restaurants and food courts.

Challenges

- Such items are contaminated with food and cannot be recycled, even if the packaging is a recyclable material.

Opportunities

- A long-term solution is to switch to reusable crockery for dine-in customers.
- Consider using alternative packaging that has a lower environmental impact for take away food, taking into consideration Singapore's waste management system.
- Incentivise customers to [bring their own reusable containers or bags](#) by providing discounts or introducing a points reward system.



3 Increasing Recycling Rates by Targeting High Volume Recyclables



WASTE INSIGHT

Up to 10% of additional food waste from its malls could be diverted from incineration if more F&B tenants participate actively in segregating food waste.

Challenges

- It is inconvenient for F&B outlets located on the upper levels to bring food waste to the bin centre.
- Lack of space at back-of-house.
- Some tenants are unwilling to segregate post-consumer food waste due to hygiene reasons.

Opportunities

- Invest in well-sealed food waste containers and schedule door-to-door collection for food waste if possible.
- Install sink grinders. For future buildings, mandate the design to include direct piping of the sink grinders to the food digester in the bin centre for restaurants located on the upper levels.
- Focus on uncooked and cooked leftover food instead of post-consumer food.



WASTE INSIGHT

The metal recycling rate can be improved by 2 to 10 times in terms of weight if food courts segregate metal recyclables.

Challenges

- These are usually contaminated with food that is not easy to empty.
- Need to educate tenants and shoppers to empty out contents before recycling.

Opportunities

- Partner with the waste industry to employ technological solutions to help improve the decontamination (cleaning), e.g. utilising existing Materials Recovery Facilities.
- Place a simple visual at recycling bins to show how to empty out the contents from beverage packaging before recycling.
- Label recycling bins according to the packaging type that has recycling value, rather than material.
- Support the government-led Deposit Refund Scheme.



3 Increasing Recycling Rates by Targeting High Volume Recyclables



WASTE INSIGHT

More could be done to increase the recycling of clean plastic wrappers and polybags, which have a good recycling value. When a fashion tenant targets up to 80% for its plastic recycling rate, it could contribute an overall 0.5-4 times more plastic collected in terms of weight.

Challenges

- Lack of clear instructions for recycling at the back-of-house.

Opportunities

- Obtain the SOP for waste segregation from the tenant's local corporate head office as part of the lease agreement and ensure it is aligned with the mall's waste management goals and processes.
- Strategic location of small plastic recycling bins within the store that caters to the unpacking habits of the retail staff.



Next Steps

As waste segregation is currently voluntary, there is also an opportunity for authorities to establish a regulatory framework that allows landlords to impose incentives or penalties on tenants, without putting the retail industry at a disadvantage.

While the initiative has identified the key areas required for a retail mall in Singapore to successfully reduce its overall waste, WWF and Lendlease will continue to collaborate to expand the scope of the initiative and study how solutions can be further refined and implemented at scale.

To do so we will:



Facilitate discussions in the retail industry on collaboration opportunities



Work with the industry to highlight retail specific challenges and raise capacity on waste management



Propose solutions with the industry and relevant government agencies and potentially conduct pilot tests



APPENDIX

Appendix 1: Key Stakeholders

In the retail operation setting, we have classified stakeholders into three main categories, with their roles and expected responsibilities detailed as below. Under these categories, the personnel who have a direct role in ensuring the proper disposal of the waste generated were identified and interviewed. The questions focused on their recycling habits, challenges they faced if they carried out segregation of recyclables and their relationship with other players with regards to waste management issues. The outcome of the interviews was discussed in the relevant sections throughout this report.

Mall patrons were excluded from the study as the items discarded by them are usually contaminated and unlikely to be recycled. Furthermore, it would be difficult to study the waste generation and recycling behaviour of shoppers in a short period.

Lendlease's asset operations team

Asset operations teams are in charge of managing retail mall operations and managing Lendlease's relationship with tenants. In terms of waste management, they work very closely with the housekeeping team, particularly the facilities manager, who is responsible for the maintenance of the building systems, including the bin centre. The facilities manager is also in charge of the waste contractor's performance and ensures the mall meets cleanliness, hygiene and greenery standards. Duties include inspecting the bin centre daily and attending to any request or feedback made by tenants.

Tenants

Tenant operations are the source of waste generation in the malls. The type and amount of waste generated are dependent on their retail category. However, regardless of the category, there is an opportunity for them to segregate recyclables from general waste as recycling bins are provided in the respective malls. The challenge is more likely to be a lack of space at the back-of-house to store recyclables temporarily before bringing them to the bin centre.

Under the tenancy agreement, tenants are minimally obligated to support Lendlease's waste management objectives, which include segregating waste into organic waste, recyclables and general waste. The tenants are also expected to actively reduce the amount of packaging waste generated from deliveries by working with their suppliers.

Waste contractor

Lendlease has a contract with a waste contractor to collect waste and recyclables from all the malls. The recyclables include plastic, metal, glass and paper/cardboard. Used cooking oil is collected by an oil recycling company. The amount of waste and recyclables collected from the respective malls is recorded by the waste contractor and submitted to Lendlease's asset operations team every month.

An employee hired by the waste contractor is stationed at the bin centre. He/she is responsible for the maintenance and knowledge of the proper operation of the necessary equipment in the bin centre (e.g. the compactor and food digester). He/she also plays the role of a gatekeeper in ensuring that the recyclables are correctly segregated so that the contamination from improper disposal is kept to a minimum. Due to space constraints at the bin centre, once the respective bins are full, the employee has to contact the main office to deploy a collection truck.

As part of the contract, the waste contractor is required to be responsible for the mall's recycling programmes. Besides providing facilities such as recycling bins, the waste contractor is expected to promote waste reduction and recycling participation among the tenants through various avenues. This would include education, training janitors on the recycling programmes, as well as assisting the asset operations team to conduct briefings or site tours to tenants on a quarterly basis.



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Tenants in Lendlease retail malls
Lendlease Waste Contractor

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- 5 Secondary packaging groups several primary packages of the same or different products to provide them with protection and make them easier to handle during distribution and sales.
- 6 Tertiary packaging helps to facilitate handling and transport of a number of sales units or grouped packaging to prevent physical handling and transport damage.
- 7 In cases where reusable packaging is not possible, F&B businesses can also consider using alternative packaging that has a lower environmental impact for take away food. The WWF Alternative Materials Tool guides businesses towards single-use packaging materials with a lower environmental footprint, without transferring the environmental cost to another system. It provides a precise ranking of alternative materials and allows material comparisons. www.plastic-action.asia/alternative-materials-tool/