

East Asia and Pacific Region: **MARINE PLASTICS SERIES**

Market Study for Malaysia:

PLASTICS CIRCULARITY OPPORTUNITIES AND BARRIERS



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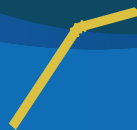
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PLASTICS CIRCULARITY OPPORTUNITIES AND BARRIERS



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Market Study for Malaysia: Plastics Circularity Opportunities and Barriers is a private sector focused market assessment of plastics value chains and the recycling market in Malaysia with the overall goal of identifying the opportunities and barriers for plastics circularity in the country.

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- Ministry of Environment and Water (KASA)
- Ministry of Housing and Local Government (KPKT)
- Ministry of International Trade and Industry (MITI)
- National Solid Waste Management Department (JPSPN)
- Pahang State Government
- Penang State Government
- Sabah State Government
- World Wildlife Fund (WWF) Malaysia

ABBREVIATIONS AND ACRONYMS

| | |
|------------------------|--|
| CAGR | Compound Annual Growth Rate |
| CFR | Collected For Recycling |
| EHS | Environmental, Health and Safety |
| EPR | Extended Producer Responsibility |
| Four key resins | Refers to the four plastic resins PET, HDPE, LDPE/LLDPE and PP that are the main focus of this study |
| HDPE; rHDPE | High Density Polyethylene; Recycled High Density Polyethylene |
| ISWM | Integrated Solid Waste Management |
| JPSPN | National Solid Waste Management Department |
| KASA | Ministry of Environment and Water |
| KPKT | Ministry of Housing and Local Government |
| LLDPE; rLLDPE | Linear Low Density Polyethylene; Recycled Linear Low Density Polyethylene |
| LDPE; rLDPE | Low Density Polyethylene; Recycled Low Density Polyethylene |
| Local | Unless specifically mentioned in the context of a local government unit, the term “local” refers to national-level as per industry usage of the term |
| MaSPA | Malaysia Sustainable Plastics Alliance (formerly known as Malaysian Plastic Pact) |
| MAREA | Malaysia Recycling Alliance |
| MCO | Movement Control Order (restrictions on movement due to COVID-19) |
| MESTECC | Ministry of Energy, Science, Technology, Environment and Climate Change |
| MFA | Materials Flow Analysis |
| MGTC | Malaysian Green Technology & Climate Change Centre |
| MITI | Ministry of International Trade and Industry |
| MPA | Malaysian Petrochemicals Association |
| MPMA | Malaysian Plastic Manufacturers Association |
| MPRA | Malaysian Plastics Recyclers Association |
| MPP | Malaysian Plastic Pact |
| MRF | Material Recovery Facility |
| MSW | Municipal Solid Waste |
| MVRP | Most Valuable Recycled Product |
| OPEX | Operational Expenditure |
| PBAT | Poly Butylene Adipate Terephthalate |
| PBS | Poly Butylene Succinate |
| PET; rPET | Polyethylene Terephthalate; Recycled Polyethylene Terephthalate |
| PHA | Polyhydroxyalkanoates |
| PIT | Plastics Institute of Thailand |
| PLA | Poly Lactic Acid |
| POY | Partially Oriented Yarn |

| | |
|-----------------|---|
| PRO | Producer Responsibility Organization |
| PP; rPP | Polypropylene; Recycled Polypropylene |
| PS | Polystyrene |
| PSF | Polyester Staple Fiber |
| PTT | Poly Trimethylene Terephthalate |
| PVC | Polyvinyl Chloride |
| RDF | Refuse Derived Fuel |
| SST | Sales and Service Tax |
| SW Corp | Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam |
| SWM | Solid Waste Management |
| TPD | Tonnes Per Day |
| TPC - ET | Thermoplastic Polyester Elastomers |
| TPM | Tonnes Per Month |
| TPY | Tonnes Per Year |

PREFACE



Dato' Seri Ir. Dr. Zaini bin Ujang

Secretary General

Ministry of Environment and
Water, Malaysia



The time has come for Malaysia to move towards plastic circularity by closing the waste loop... I hope this study will provide insights in unlocking potential wealth and income, and at the same time support the government and global agenda towards sustainability.

The Sustainable Development Goals (SDGs) outline 17 goals, one of which is aimed towards sustainable consumption and production (SDG12). SDG 12 focuses on resource and impact decoupling in transitioning towards a greener economy. In this sense, the plastics industry plays a pivotal role in wealth creation through sustainable use of natural resources and reduction of waste generation via the act of prevention, reduction, recycling and reuse.

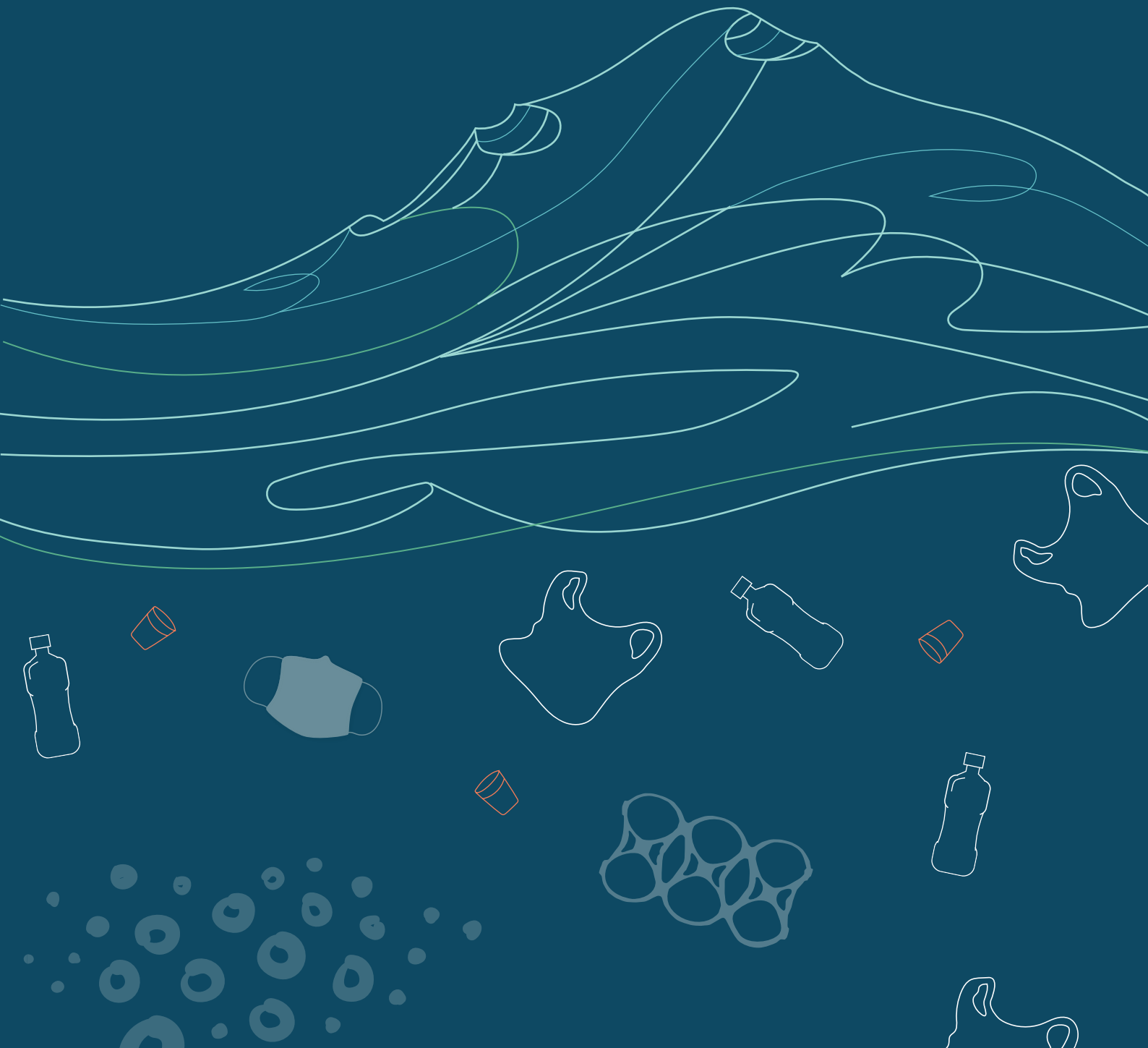
In Malaysia, the plastics industry contributes significantly to the economy, hence, has a great opportunity to shift the current linear economy to a more circular one. Not only will the shift benefit the planetary health, but it will also create more job opportunities and market share of global recycled plastic. This study reveals that Malaysia's total value of recyclable material that could be unlocked is USD 1.3 billion per year. However, only 19% of these materials are recycled, resulting in around USD 1 to 1.1 billion income loss annually.

The time has come for Malaysia to move towards plastic circularity by closing the waste loop. In this regard, the Ministry of Environment and Water (KASA), through the implementation of Malaysia's Roadmap towards Zero Single-Use Plastics, is committed to providing the needed support and guidance to all stakeholders involved in the plastic value chain. I hope this study will provide insights in unlocking potential wealth and income, and at the same time support the government and global agenda towards sustainability.



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EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

Plastics are an integral and important part of the global and Malaysian economy. Since the 1950's, the use of plastic products globally has expanded twenty-fold, reaching 360 million tonnes¹ in 2018 due to their low cost, various functional properties, durability and wide range of applications. In Malaysia, the plastic industry contributed RM 30.98 billion (USD 7.23 billion) to the national economy, representing 4.7% of Malaysia's GDP, in 2018.²

Mismanaged plastic waste has growing economic and environmental consequences.

Mismanaged plastic waste from land-based sources, especially in the form of packaging, generates significant economic costs globally and in Malaysia by reducing the productivity of vital natural systems and clogging urban infrastructure. Asia contributes more than 80% of the global 5 to 13 million tonnes of plastic waste that enters the ocean every year, and 8 of the top 10 countries for plastic pollution into marine environments are from Asia.³ Wastage from single-use plastics results in an estimated USD 80-120 billion worth of material value lost from the global economy each year due to lack of recycling and suboptimal value creation where recycling does exist.⁴ All this has led to an increased awareness of plastic waste management globally and in Malaysia.

Malaysia is playing an active role at the regional level and setting ambitious national goals.

At the regional level, Malaysia is part of the Coordinating Body of the Seas of East Asia (COBSEA) and the ASEAN Working Group on Coastal and Marine Environment (AWGCME), which are working on the development and protection of the marine environment and coastal areas, including addressing marine debris and plastic pollution. National policy-level intervention is also underway. The Malaysian government, under the Ministry of Environment and Water (KASA), implemented the "Malaysia Roadmap Towards Zero Single-Use Plastics, 2018-2030," while also developing a Circular Economy Roadmap to address plastic production, consumption, recycling and waste management. Major plastic industry associations and private companies in Malaysia are also exploring plastics circularity initiatives.

This study addresses a critical need for a market assessment of the plastics value chain in Malaysia.

To successfully implement its plastic recycling goals and develop local solutions, the Government of Malaysia is targeting private sector participation and support. This is especially relevant in Malaysia as much of the recycling happens separate from the solid waste management (SWM) system via upstream diversion directly by the informal sector (e.g. waste pickers, collectors, junk shops and aggregators) leading to a parallel economy for collection of high-value recyclables.

1 [Plastics – the Facts 2019](#)

2 [MPMA, White Paper on An Advanced Plastics Recycling Industry for Malaysia](#)

3 [Jenna Jambeck, "Plastic waste inputs from land into the ocean"](#)

4 [Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics \(2016\)](#)

KEY FINDINGS



Malaysia recycled about **24% of the key plastic resins** in 2019.



1.07 million tonnes per year of plastics are disposed of and 81% of the material value of plastics is lost.



Several structural challenges cause a market failure for plastics recycling leading to a plastic material value loss of **USD 1-1.1 billion per year**.

This study defines the current state-of-play for the local plastic recycling industry—including demand and supply volumes, market opportunity, and growth drivers and constraints—and identifies the major private sector players in the Malaysian plastics value chain. An evaluation of SWM infrastructure and its costs, while a relevant parallel area, is not within the scope of this study. Additionally, while reduction at source and refill/reuse aspects of the circular economy are important, the key focus of this study is to identify scalable private sector investment solutions, which are primarily in plastic recycling. Where available, secondary research on the informal sector through past GA Circular work in Malaysia is used to identify their role in recyclables collection and to address challenges to recognize and better integrate the informal sector. This study recommends priority actions for the government and private sector stakeholders to increase plastics recycling, mitigate the growing environmental challenges of mismanaged plastic waste, and unlock new economic growth opportunities for Malaysia.

A detailed mapping of plastic value chains for four key plastics resins in Malaysia—Polyethylene Terephthalate (PET), High-Density Polyethylene (HDPE), Low-Density Polyethylene/Linear Low-Density Polyethylene (LDPE/LLDPE) and Polypropylene (PP)—revealed that interest in domestic recycling is increasing, demand for recycled plastic is slowly growing, and more investments are being made into adding or upgrading recycling facilities. These small gains in plastic recycling, however, are severely at risk due to the economic downturn inflicted by the COVID-19 pandemic, coupled with

the lockdowns and lack of government support for recyclers, which have brought many recyclers in Malaysia and wider Southeast Asia to the brink of bankruptcy or permanent closure.

Major global brands, especially from the fast-moving consumer goods (FMCG) industry, have made voluntary global commitments to incorporate recycled plastic content into their products and packaging. However, most suppliers of recycled resins in Malaysia are small to medium enterprises (SMEs), who are challenged by a lack of scale, standards and certifications, access to advanced technologies, and heavy reliance on informal and fragmented waste supply networks that work on cash terms. Additionally, competition from cheaper virgin plastics due to low oil prices, unclear government policies regarding the usage of recycled resins in food-contact applications, insufficient waste segregation at source, low waste collection rates and lack of design for recycling standards prevent recyclers from being able to capitalize on growing market demand for recycled plastic content.

To increase investments in plastics recycling and reduce plastic waste, an enabling environment is required. Components include: demand-side incentives to establish a strong market for recycled plastics (e.g. recycled content targets, green public procurement); government support in reducing capital investment risk (e.g. mandating source segregation, setting up EPR framework) and widening the existing government incentives for investments into adoption of newer technologies and processes (e.g. matching grants

such as the Industry 4.0 [Industry4WRD] Incentives⁵); increasing supply of quality plastics (design-for-recycling standards, industry targets for collection of plastics); and sharing of know-how, best-in-class innovations, technologies and processes. These measures would be a turning point in Malaysia, enabling equal opportunities and the growth of a resilient plastics recycling industry with high-quality outputs that retain high material value and the ability to increasingly replace virgin materials.

Detailed baseline data collection, analytical work and engagement with private sector stakeholders across the plastics value chain, government stakeholders and other experts in Malaysia, revealed **three key quantitative findings** and **six recommended interventions**, along with **28 priority actions** to accelerate plastics circularity in Malaysia.

Three Key Quantitative Findings on Collected For Recycling (CFR) Rates and Material Value Loss

1 | Malaysia recycled about 24% of the key plastic resins in 2019.

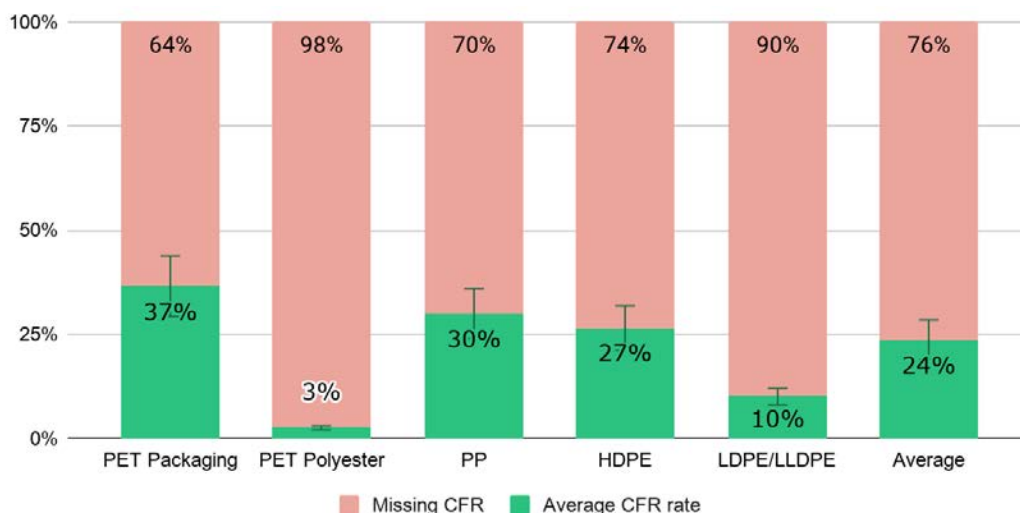
In 2019, 1.41 million tonnes per year (TPY) of the four key resins assessed in this study (PET, HDPE, LDPE and PP) were consumed in Malaysia, out of which an estimated 334,000 TPY (24%) were recycled. For comparison, the JPSPN (National Solid Waste Management Department)

recycling target for 2025 is 40%. As shown in Figure 1a, PET packaging has the highest collected for recycling (CFR) rates of all four resins. This is because the number of end-use applications used by PET packaging is limited compared to other materials, simplifying the collection process. Most PET packaging is for food and beverage applications and is easily identified and collected (e.g. PET bottles). On the other hand, resins, such as HDPE, LDPE and PP, are used in a wide range of applications (e.g. electronics, automotive and construction), complicating the collection and recycling process. However, recycling rates for individual resins/packaging formats are highly variable depending on the price of virgin plastic, the end use for recycled resin, and other market factors. The technology and high capacities for processing PET packaging into various applications already exists in Malaysia, giving PET packaging recycling a head start when compared to recycling for other resins. The rPET (recycled PET) products such as rPSF and rPOY can be readily absorbed by the fiber industry. With the right enabling policies, rPET could be well-integrated with the fiber industry in Malaysia and throughout the region as a short- to mid-term solution for recycling PET.⁶

5 MIDA – [Industry 4WRD \(National Policy on Industry 4.0\) Incentives](#)

6 While recycling into rPET fiber may not be as circular as recycling into food grade rPET it would be unrealistic to expect 100% of post-consumer PET collected to be recycled into food grade recycled material due to challenges, as discussed in section 3 of this report. Hence, the next best solution in the short- to mid-term would be to recycle post-consumer PET into textile grade material (as Malaysia already has a large recycling capacity for this).

Figure 1a.
ESTIMATED CFR RATES FOR EACH RESIN (2019)



2 | 1.07 million tonnes per year of plastics are disposed of and 81% of the material value of plastics is lost.

If all the resins in Malaysia covered in this study were to be recycled into the most valuable recycled products, the total material value that could be unlocked from recycling would equal USD 1.3 billion per year (see Figure 1b).⁷ However, due to a 24% recycling rate and a value yield of 77% for the resins which are recycled, only 19% of the total material value of plastics, or USD 234 million per year, is unlocked. This results in USD 1-1.1 billion of potential material value that is lost to Malaysia’s economy. Fully addressing this market opportunity will require public and private sector investments to improve waste collection/sorting, an enabling environment to improve recycling economics, and other systemic interventions.

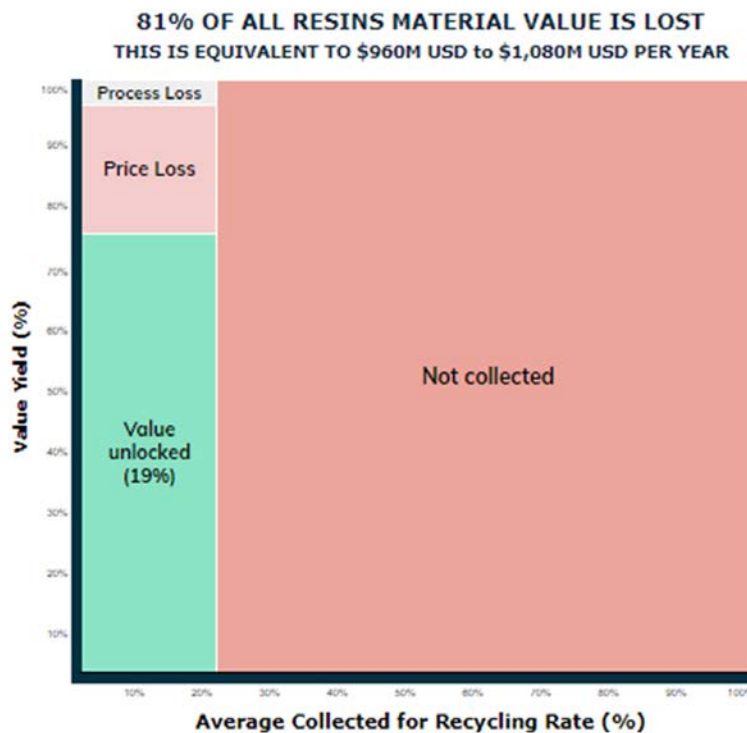
7 100% value yield is used in material value analyses across this study for illustrative purposes only, as targets are typically set based on 100% of market inputs/material.

3 | Several structural challenges cause a market failure for plastics recycling leading to a plastic material value loss of USD 1-1.1 billion per year.

This loss of USD 1-1.1 billion per year is the result of various structural challenges that impact the recycling rate and value yield, including:

- Lack of local demand requirements for recycled plastics across all key resins
- Gaps in recycling capacities and reliance on higher quality imports
- Investments in the plastic recycling industry remain small compared to recycling capacity needs
- Lack of market data (price and trade volume data) in the recycling value chain and detailed production data for packaging
- Falling and inconsistent supply from informal sector, and competition from informal recyclers
- Recyclables are of low quality due to lack of design for recycling

Figure 1b.
MATERIAL VALUE LOSS ANALYSIS FOR ALL KEY RESINS (DATA BASED ON 2019 VOLUMES)



- MSW system prioritizes collection and disposal over recycling
- Inability to capitalize on growing demand for recycled content in packaging
- Lack of clarity on the use of recycled content for food-grade applications
- Lack of organic waste treatment facilities to incentivize source separation and diversion
- Inability to comply with global Environmental, Health and Safety (EHS) standards

Many of these challenges were exposed and amplified during the ongoing COVID-19 pandemic, resulting in supply reductions to the recycling industry due to changes in consumption patterns and significant demand reductions for recycled products following low oil prices and economic slowdown.

Recommended Interventions and Priority Actions

Six recommended interventions and 28 actions across these interventions were identified to enable Malaysia to increase its recycling rates from 24%. These interventions, shown in Figure 2, will also enable Malaysia to increase the value yield of plastics recycling from 77% up to 94% and unlock maximum material value from recycled plastics. The recommended interventions for the government and private sectors, when implemented, have the potential to additionally unlock a material value between USD 256 million to USD 731 million per year (the impact of each of the interventions are interconnected and the potential for material value unlocked therefore overlaps). These interventions in plastic recycling could lay the foundation for plastics circularity, strengthen demand for recycled plastics and build a resilient recycling industry in Malaysia.

Figure 2.

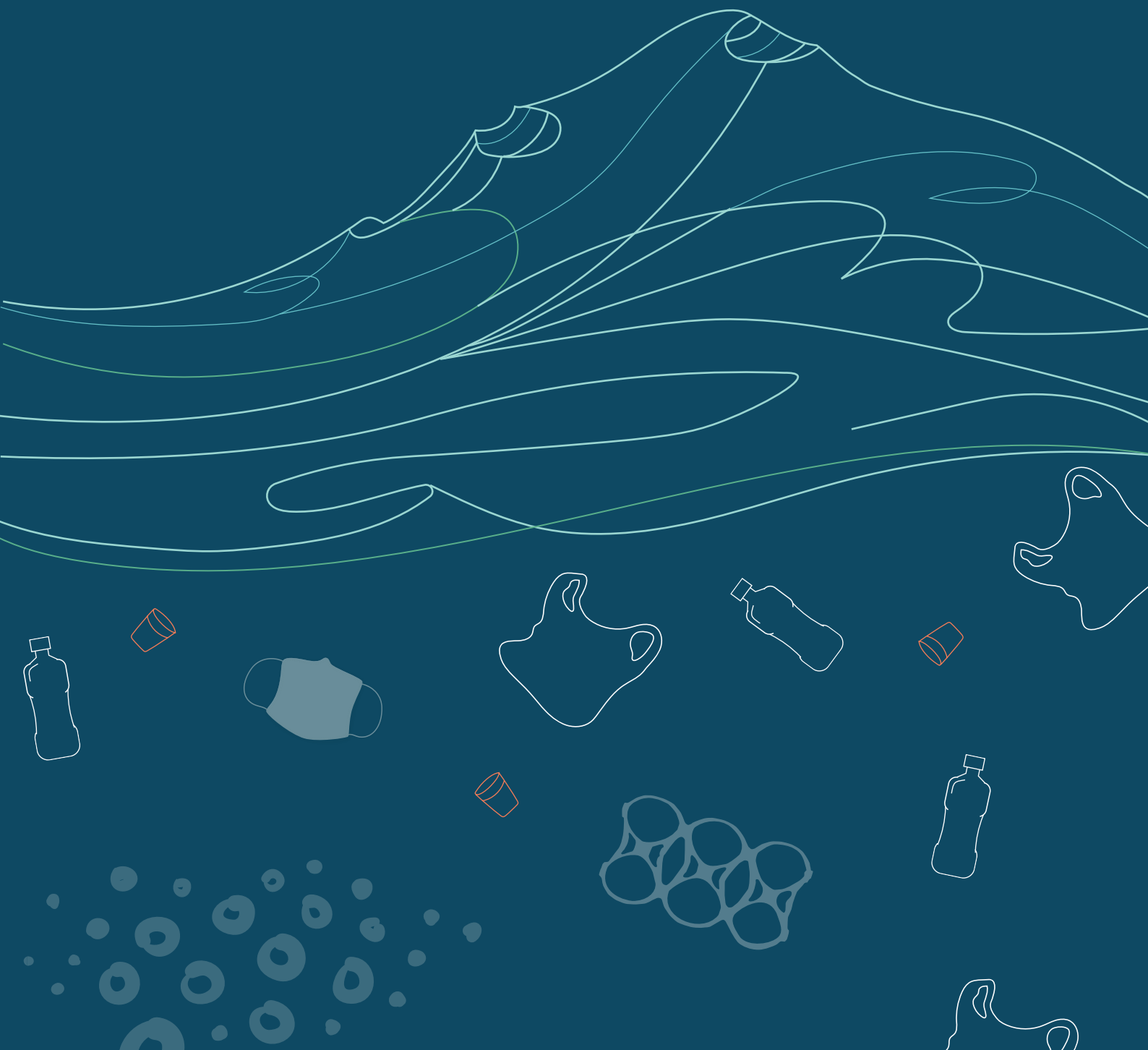
SUMMARY OF RECOMMENDED INTERVENTIONS AND PRIORITY ACTIONS

| Clusters Interventions | Lay Foundation: Actions that create the necessary foundation for plastics circularity 1-2 years | | Strengthen Demand: High-impact actions to strengthen CFR Rate & Value Yield 3-5 years | | | Maximise Value: Actions to unlock maximum possible value; build resilient recycling industry >5 years | |
|--|---|---|---|--|--|---|--|
| | (A) Increase waste collection and sorting efficiency of post-consumer plastics | 1 Harmonise & enforce source-segregation & separate collection standards & targets | 2 Establish dedicated MRFs as part of the waste collection system | 3 Develop awareness & behavior change campaigns | 4 Provide opportunities for informal sector inclusion | 5 Invest in treatment of organic waste | 6 Digitalise recyclables collection |
| (B) Set recycled content targets across all major end-use applications | 8 Communicate approved usage of food-contact recycled material & finalise Halal labelling decision | 9 Set recycled content targets & standards for major plastic use industries | 10 Develop & launch incentives for using recycled content usage | 11 Implement green public procurement of recycled plastic products | 12 Tax plastic applications without minimum recycled content | | |
| (C) Mandate "design for recycling" standards for plastics | 13 Align industries on "design for recycling" standards | 14 Voluntarily adopt "design for recycling" standards for all plastic products | 15 Mandate national "design for recycling" standards for packaging plastics | | | | |
| (D) Encourage increase in recycling capacities (mechanical & chemical) | 16 Incentivise increase in recycling capacities for polyolefins | 17 Incentivise PET recycling to higher-end recycled products | 18 Provide market pricing & volume data for virgin & recycled plastics | 19 Invest in chemical recycling (plastic-to-plastic) for low-value plastics | | | |
| (E) Create industry-specific requirements to increase plastic waste collection and recycling rates | 20 Setup voluntary EPR systems (e.g. PRO) and implement actions | 21 Mandate collection targets for plastic using industries | 22 Mandate reporting framework for plastic products | | | 23 Mandate a compliance scheme to meet obligations | |
| (F) Restrict disposal of plastics into landfills and dumpsites | 24 Improve HS code tracking for import/export of plastic resins & products | 25 Assess feasibility of regional scrap plastics trade | 26 Mandate targets to lower landfill disposal rates for plastics | 27 Increase landfill tipping fees | 28 Reduce amount of unfair competition from illegal recyclers | | |

Legend: ■ Government ■ Private Sector Highest Impact (based on stakeholder feedback & analysis by study team)

SECTION 1:

WHY PLASTICS CIRCULARITY IS NEEDED



SECTION 1:

WHY PLASTICS CIRCULARITY IS NEEDED

1.1 PROJECT BACKGROUND

In 2018, Malaysia's plastics industry contributed RM 30.98 billion (USD 7.23 billion) to the national economy, representing 4.7% of the country's GDP⁸ and Malaysian plastic manufacturers produced 2.45 million tonnes of plastic resin. The growth of the plastics industry in Malaysia over five decades has brought wide ranging benefits to society. However, rapid urbanization, mismanaged plastic waste and litter from land-based sources is generating significant economic and environmental costs by reducing the productivity of vital natural systems such as the ocean and coastal areas and clogging urban infrastructure. Globally, the cost of such after-use externalities for plastic packaging, plus the cost associated with greenhouse gas emissions from its production, is conservatively estimated at USD 40 billion annually—exceeding the plastic packaging industry's profit pool.⁹ Approximately 40-50% of marine plastic pollution is contributed by single-use or short-use consumer packaging, and 5 to 13 million tonnes of plastic waste enters the oceans every year.¹⁰ Malaysia, ranked by one global study as the eighth highest contributor to marine plastic pollution,¹¹ generates mismanaged plastic waste with disproportionate impacts on the livelihoods of vulnerable coastal communities as well as the tourism, fishing and shipping industries.

As countries recognize the urgency to address the problems associated with increasing plastic consumption and mismanagement of plastic waste, they have begun the transition towards a circular economy. A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use and regenerating natural systems. This is different to the current economic system of a linear economy where material and fuel resources are used to make products, which are then consumed and thrown away (i.e. take-make-waste). The definition of circular economy used for this study is the one developed by the Ellen MacArthur Foundation and has been widely adopted by governments and major private sector organizations in the global plastics value chain.¹² Further elaboration of the definition of circular economy and definitions of other relevant terms can be found in Appendix 2.

"A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models."

8 [MPMA, White Paper on An Advanced Plastics Recycling Industry for Malaysia](#)

9 Ellen MacArthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)

10 [Jenna Jambeck, "Plastic waste inputs from land into the ocean"](#)

11 [Jenna Jambeck, "Plastic waste inputs from land into the ocean"](#)

12 Ellen MacArthur Foundation Global Commitment



A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems and, within this, business models.

The Malaysian government is leading work towards a circular economy in the region. To implement its sustainable plastic waste management goals, the government of Malaysia, in 2018, launched the national Roadmap Towards Zero Single-Use Plastics 2018-2030 and the Malaysia Sustainable Plastics Alliance (MaSPA) in 2019 (formerly known as Malaysia Plastic Pact (MPP)). The goals of MaSPA in Malaysia are:

1. Identify and eliminate five problematic or unnecessary single-use plastic items through redesign, innovation or alternative (reuse) delivery models by 2025
2. 100% of plastic packaging to be recyclable/ reusable/compostable by 2030
3. 25% of post-consumer plastic packaging effectively recycled or composted by 2025
4. 15% of average recycled content to be achieved across all plastic packaging by 2030

Malaysia is also developing a Circular Economy Roadmap which addresses plastic production, consumption, recycling and waste management and aims to keep plastic products and materials circulating in a high value state of use for as long as possible, while offering new ways to mitigate risks to allow the plastics industry to grow and diversify. The Roadmap will address economic, social and environmental aspects of plastic waste and ways to decouple economic and environmental growth.

Given that the private sector is well equipped to lead the transition to a circular economy for plastics through innovations in product design, business models, recycling technologies, experience of producer responsibility from other markets and project financing, the Malaysian government is targeting private sector participation.

The plastics value chain stakeholders in Malaysia have responded in various ways:

- The Malaysian Plastics Manufacturers Association (MPMA) and the Malaysian Plastics Recyclers Association (MPRA) laid out their strategy in a white paper published in 2019, titled "An Advanced Plastics Recycling Industry for Malaysia." The white paper marked an important step by the Malaysian plastic industry in putting forward the economic case for developing an advanced and modern industry with the commitment of all stakeholders across the whole plastic value chain.
- Petrochemical companies are exploring plastics circularity. For example, Petronas Chemicals Group Berhad (PCG), one of the major resin producers in Malaysia, joined the New Plastics Economy (NPE) initiative in 2019. Another local resin manufacturer is exploring the feasibility of setting up a recycling facility and substituting virgin plastics with recycled materials to respond to this new market demand from the FMCG industry. However, this company noted that enabling policies, such as recycled content targets, would be needed before being able to proceed with any large investment.
- Brand owners and packaging producers have responded by setting up the Malaysia Recycling Alliance (MAREA) as a voluntary and industry-led based Producer Responsibility Organization (PRO). MAREA will demonstrate Extended Producer Responsibility (EPR) implementation for packaging and will be formally incorporated in the near future.

1.2 PROJECT OBJECTIVES

The primary objectives of this study are to:

1. Engage with the private sector players in the Malaysian plastics value chain and understand the market drivers and challenges in scaling up circular economy approaches, especially focused on recycling.
 2. Define the current state-of-play for the local waste plastics recycling industry, including demand and supply volumes, market opportunity and growth drivers and constraints.
 3. Review local regulations and benchmark with applicable best practices to identify opportunities as well as gaps that could be limiting broader adoption of plastics circularity.
 4. Summarize key findings based on the private-sector focused plastics value chain and recycling market analysis and recommend priority actions.
1. What is plastics circularity in the context of Malaysia? This is addressed in Sections 1.5 and 1.6.
 2. What is the existing plastics value chain across production, collection, recycling, wastage, imports and exports in Malaysia? This is addressed in Section 2.
 3. What are the factors and barriers affecting plastics reuse, recovery or recycling across the value chains for different resins and the size of the addressable opportunity? This is addressed in Sections 2 and 3.
 4. What are the existing policies and regulatory environments impacting plastics circularity for packaging in Malaysia? This is addressed in Section 3.
 5. What are the policy and private sector interventions needed to enable plastics circularity in Malaysia and how much value can be unlocked through these interventions? This is addressed in Section 4.

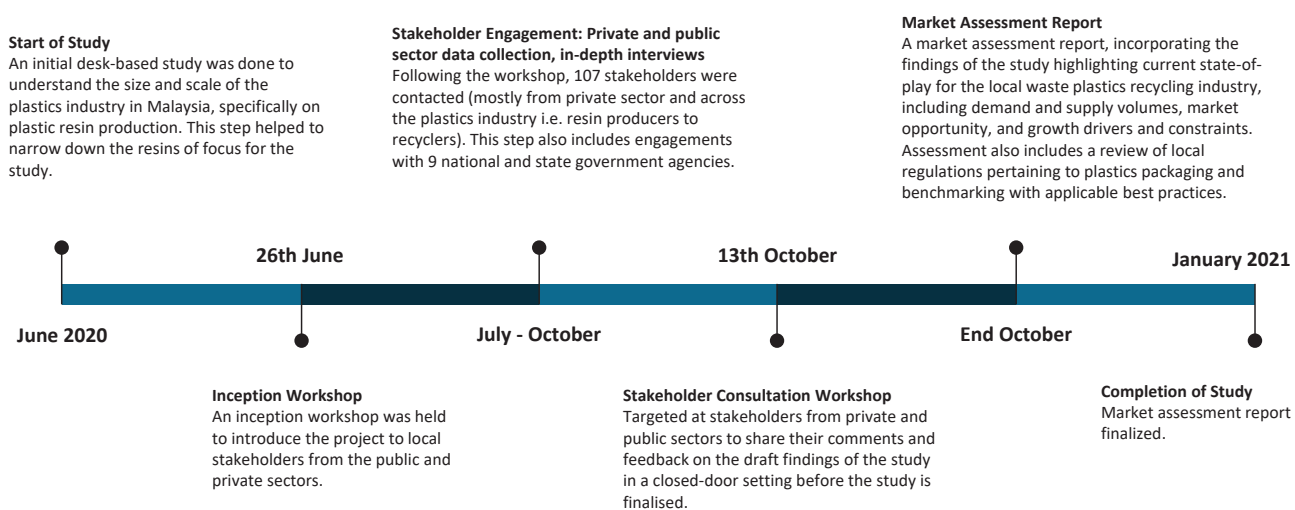
1.3 FRAMING THE OBJECTIVES

For the purposes of this study, the project objectives are framed into five main problem statements, each of which are explored in the following sections in this study:

1.4 METHODOLOGY OF STUDY

This study was conducted over the period of June 2020 to January 2021 and implemented in a systematic phased manner as per the timeline in Figure 3.

Figure 3.
STUDY TIMELINE, MILESTONES AND DELIVERABLES



Note: Timeline not to scale.

A desk-based study was initially done to understand the size and scale of the plastics industry in Malaysia, specifically on plastic resin production. This included reviewing publicly available reports and presentations by Malaysia Plastics Manufacturers' Association (MPMA), Malaysian Petrochemical Association (MPA), annual reports/sustainability reports of industry associations, major petrochemical and resin manufacturing companies and plastic converters in Malaysia. This step helped to narrow down the resins of focus for the study, as outlined in the inception report. Based on this, a detailed value chain of each selected resin was developed.

An online inception workshop was organized on 26 June 2020 by the World Bank Group and KASA to introduce the project to key stakeholders in the private and public sector. At this workshop, some examples of the material flow and material value loss analysis developed were presented along with the key stakeholders targeted for this study.

Following the workshop, a round of 34 in-depth interviews with representatives of various key private and public sector organizations was conducted. Through these interviews, key data points along the value chain from resin production, collected-for-recycling and recycled products were gathered. Additionally, perspectives on plastics circularity and the interventions needed to increase circularity were collected.

This study focuses on understanding the material value plastic recycling currently generates, the additional untapped material value that it could generate and the conditions needed to encourage the use of recycled plastics in the domestic market. In the context of solid waste management (SWM) in many countries in Southeast Asia, plastic waste management is seen as the responsibility of all stakeholders, not just that of the local government units or municipalities that manage waste.

In an optimal municipal SWM system, the infrastructure of SWM, its operational costs and the positive impact from the diversion of plastics for recycling would be connected, as experienced in countries such as Japan and those in the European Union. However, in Malaysia, much of the recycling happens separate from the SWM system via upstream diversion directly by the informal sector (e.g. waste pickers, collectors, junk shops and waste aggregators) leading to a parallel economy for recyclables collection. Any valuable plastics that remain in SWM stream are picked out (informally) at various points of SWM flow, such as



This study focuses on understanding the material value plastic recycling currently generates, the additional untapped material value that it could generate and the conditions needed to encourage the use of recycled plastics in the domestic market.

Photo: Warut Chinsai / Shutterstock

from trucks, transfer stations, and dumpsites. This study defines the current state-of-play for the local waste plastics recycling industry, including demand and supply volumes, market opportunity, and growth drivers and constraints.

With the data and insights gathered, an updated MFA was generated for each resin type studied. The methodology used to calculate the MFAs involves calculations using a mix of data gathered from private sector stakeholder interviews, government datasets and the public domain. Data for resin production, import/export of resin and semi-finished products was derived from various sources including the MPA, MPMA, MITI and UN Comtrade. For the collected for recycling (CFR) rates, data from the private sector stakeholders was used. The MFA for each resin, together with resin price data, was then used to analyze the economic impact of recycling in terms of value unlocked and the potential value that could be unlocked. A detailed explanation of both the tools—the MFA and the Material Value Loss Analysis—is provided in section 2.1 of this report.

This study was conducted after the COVID-19 pandemic began to take effect in Malaysia, causing disruptions across almost all the recycling value chain businesses that were engaged in the study. All production data used in the MFA as part of this study are for 2019, as it was the latest complete data set available. Therefore, due to this and the evolving nature and impact of the pandemic, the data and economic analyses do not reflect the significant changes in the recycling landscape due to COVID-19. However, insights regarding the impacts of COVID-19, particularly with regards to the economic downturn and low oil/virgin plastic prices now and projected into the future, have been included.

Once most interviews were completed and a first draft of MFA and material value analyses developed, a second stakeholder consultation workshop was conducted on 13 October 2020 via video conferencing. The 31 participants for this workshop represented private sector organizations across the value chain, government agencies and departments, and included participants with a deep domain expertise. The objective of this second workshop was to validate the key findings and interventions developed in the study and to gather insights to further refine the findings and recommendations.

A final round of stakeholder engagements was conducted with the remaining stakeholders as well as follow up engagements with stakeholders from the workshop who had further insights and comments regarding the analysis and recommendations. This report was then finalized based on the comments and insights from the stakeholder consultation workshop, and from follow-up engagements.

In summary, the study was developed with the below sources and tools:

- Publicly available reports and presentations by relevant private sector organizations and government departments/agencies
- In-depth interviews with 23 private sector stakeholders (refer to Appendix 1B for the full list and details)
- In-depth interviews with 11 public sector stakeholders, such as government and NGO stakeholders (refer to Appendix 1C for the full list and details)
- One in-depth stakeholder consultation workshop with a total of 31 participants from private, public and non-governmental sectors (refer to Appendix 1A for the full list and details)

- Material flow analyses and economic analyses of the major plastic resin types custom-developed for the purposes of this study and benchmarked against global examples of similar analyses
- Quantitative and qualitative data from various private sector stakeholders, government departments/agencies and global plastic resin market pricing providers

1.5 SCOPE OF STUDY

This study is a private sector focused market assessment of plastics value chains and the recycling market in Malaysia with the overall goal of identifying the opportunities and barriers for plastics recycling in the country. The focus is on the recycling aspect of the circular economy for plastics as a lever to divert plastic wastes away from landfills and the open environment and to increase the re-introduction of the plastics into the economy. Reduction at source and refill/reuse aspects of the circular economy for plastics are briefly reviewed as the primary focus is on identifying scalable private sector investment opportunities in Malaysia, which are primarily in plastic recycling. However, reduction at source and refill/reuse aspects of the circular economy are covered in a separate study by Deloitte for the World Bank and KASA to support the development of a Circular Economy Roadmap (CER). The CER will build on the findings of this plastic value chain study and address circular economy aspects more broadly to support the Malaysian government in driving implementation of a local circular economy for plastics.

The recommended interventions and actions to increase plastics recycling in Malaysia will support Malaysia's Roadmap towards Zero Single Use Plastics for 2018-2030 and the subsequent Circular Economy Roadmap. It can also help achieve the goals of MaSPA through providing a robust baseline for each resin and actionable recommendations for the private sector and government to implement.

This study balances the need for comprehensive coverage of the plastics sector and a focused review of the enabling policy environment, the opportunities and barriers for plastics circularity. Therefore, as outlined in the project inception report, the boundaries of the investigation are limited to four of the most commonly consumed resins in Malaysia.

1.5.1. Resin Selection

The four resins selected for this study are PP, PET (split into PET Packaging and PET Polyester), LDPE/LLDPE and HDPE based on 2019 data provided by the plastics industry. As shown in Figure 4, PP, LDPE/LLDPE, HDPE and PET are the most widely produced resins in Malaysia. These resins are also the most commonly recyclable.

PVC and PS are not included in this study. PVC is widely used in the building and construction industry, for making siding, window frames, flooring, roofing, insulation for electrical cables, and in water and sewage pipes. It has a long application lifetime (between 10-20 years) as compared to products made from HDPE, LDPE, PP and PET, which are primarily used for single-use packaging and thus have much shorter application lifetimes. Also, as usage of PVC plastic is largely confined to the building and construction industry, it is expected that PVC is treated as construction and demolition (C&D) waste, and therefore likely to be better managed than HDPE, LDPE, PP and PET—which are widely disposed of as part of municipal solid waste. PS products with single-use applications, such as styrofoam food boxes, are already slated to be replaced with food containers

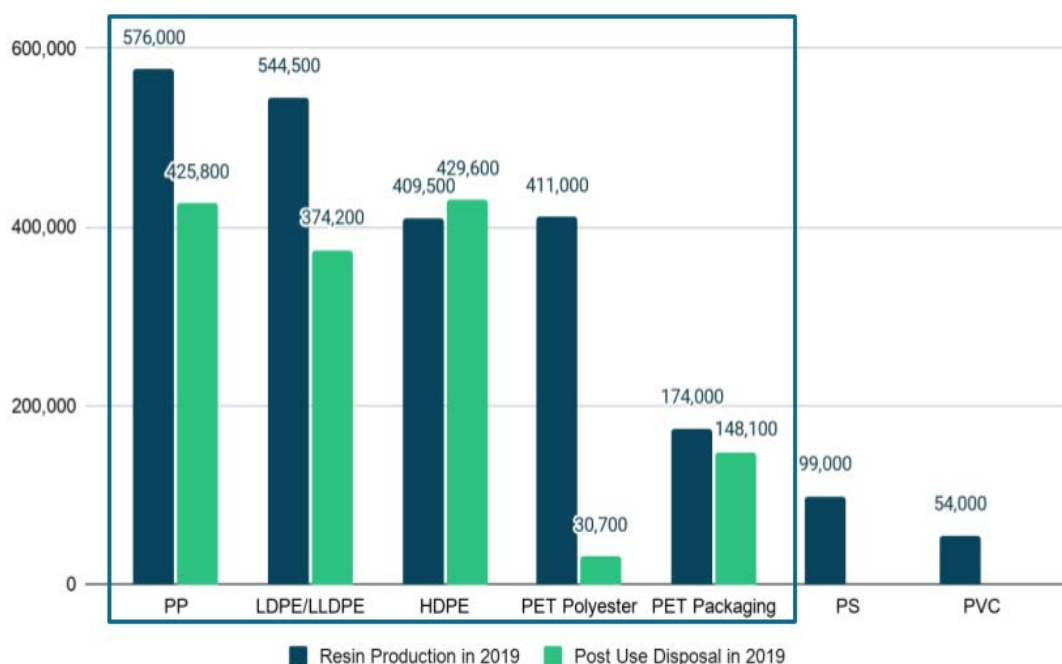
that comply with ECO001 and ECO009¹³ in Malaysia (as per the Roadmap Towards Zero Single-Use Plastics 2018-2030). Additionally, this study acknowledges that not all plastics are equal in terms of their recycling potential or the impact their recycling has on primary chemical demand. Recycling one unit of PET resins (excluding polyester fiber) results in 38% more primary chemical savings than for PVC as PET requires more units of aromatics (e.g. benzene, toluene and xylene) to be made. Please refer to Appendix 3 for more details on the explanation of the primary chemical savings.

1.5.2. Industry Applications

This study categorizes the plastic resins into either packaging or non-packaging applications. A breakdown of the different applications is required as the consumption behavior and collection factors of plastics are different. For example, plastics in packaging applications tend to be single layer or multi-material and disposed of in the MSW system, while plastics in

13 Biodegradable packaging with codes of ECO001 (2016 Degradable and Compostable Plastic Packaging) and ECO009 (2016 Biomass Based for Food Contact) is used to replace PS-made packaging in accordance with the implementation of Government Green Procurement (GGP) in Malaysia.

Figure 4. **BREAKDOWN OF RESIN PRODUCTION AND POST-USE DISPOSAL IN MALAYSIA (2019)**



Source: Resin producers, MPMA, MPA and GA Circular analysis

Note: Post-use disposal amounts consider the imports and exports of resins and semi-finished products.

automotive, building and construction applications are typically used as composites and collected as industrial waste. Regulations also differ between various industries and products, leading to different policy constraints that need to be considered. However, as the consumption behavior and post-use value chain for all non-packaging plastics are broadly similar, these plastics will be analyzed under a broad category of non-packaging plastics. Packaging makes up 48% of the total amount of resins consumed by revenue (Table 1), more than any other individual application type (light grey cells indicate breakdown of non-packaging applications), while non-packaging applications make up 52% of total plastics consumption.

1.6 CIRCULARITY COMMITMENTS OF MAJOR PLASTICS STAKEHOLDERS

Following a review of the number and nature of public commitments made by key stakeholders in Malaysia’s plastics value chain for sustainable management of plastics, circularity commitments can generally be classified as:

1. Increasing use of recycled plastics content
2. Increasing local plastics recycling capacity
3. Moving towards 100% reusable, recyclable, biodegradable or compostable plastics materials
4. Recycling rate (i.e. CFR rate) targets for plastics materials

While this review does not analyze the scale or efficacy of these commitments, it provides a useful indication of the direction the industry is heading and what each stakeholder has been communicating.

As shown in Figure 5, brand owners—the most consumer-facing stakeholders with the most incentives to win over consumers—made the highest proportion of commitments. Recyclers have the second highest proportion of commitments as recycling is their primary business focus. Commitment 3 (Moving towards 100% reusable, recyclable, biodegradable or compostable plastics materials) and 4 (Recycling rate targets for plastics materials) are not applicable in their industry and are not included in the breakdown of circularity commitments for recyclers. This review shows that for future private sector engagement efforts on plastics circularity in Malaysia, brand owners and recyclers are the most primed to affect change, followed by converters and resin producers. Meanwhile, resin producers play a key role (as they produce more than 2 million tonnes of virgin resins) and improving their plastics circularity commitments and investments will have a significant impact on plastics circularity in Malaysia.

1.7 STUDY LIMITATIONS AND OPPORTUNITIES FOR FUTURE WORK

This study has certain limitations due to availability of data and the specific scope and objectives. As shown in Table 2, however, these limitations, are also opportunities to build on this study for any future work.

Table 1.
BREAKDOWN OF PLASTICS END-USE INDUSTRIES IN MALAYSIA

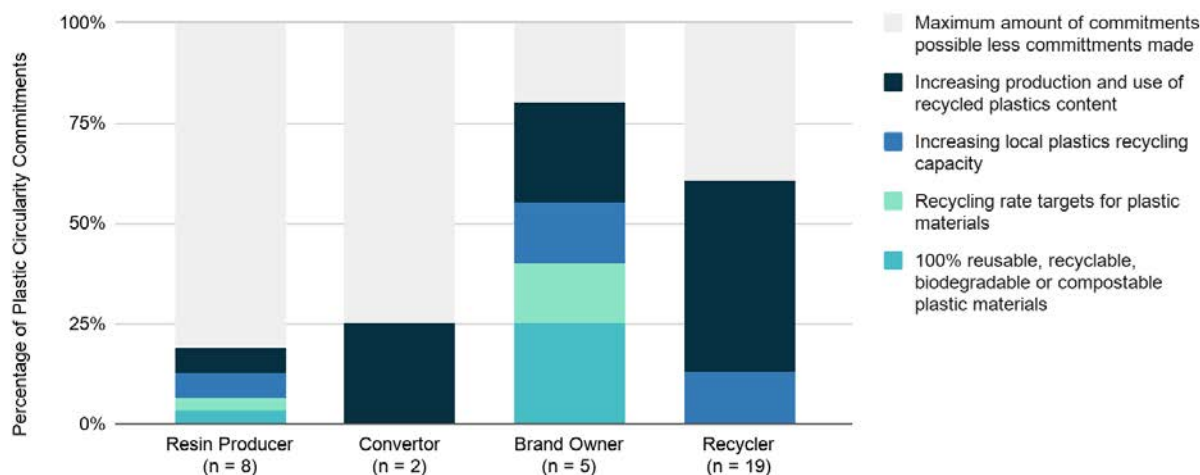
| End use industry | Breakdown based on revenue |
|--------------------------|----------------------------|
| Packaging | 48% |
| Non-Packaging | 52% |
| Electrical & Electronics | 27% |
| Automotive | 8% |
| Construction | 8% |
| Household | 3% |
| Agriculture | 3% |
| Others | 3% |
| Total | 100% |

Source: Malaysian Plastics Manufacturers’ Association (MPMA), “Yearly Production Statistics 2019.”

Note: Due to data limitations, industry was not able to provide the tonnage breakdown, but could share the breakdown based on revenue.

Figure 5.

PLASTICS CIRCULARITY COMMITMENTS BY STAKEHOLDER TYPE



Note: Stakeholders have been ordered from left to right following the plastics value chain.

Table 2.

LIMITATIONS AND OPPORTUNITIES FOR FUTURE WORK

| Limitation area | Details | Opportunities for future work |
|---|--|---|
| Resin focus and extent of breakdown in MFAs | <p>As outlined in section 1.5, the four resins chosen to be the focus for this study are PET, PP, LDPE/LLDPE and HDPE. Therefore, the MFAs have been conducted for these four key resins only. The objective of these MFAs is to provide a directional estimate of recycling rates for the resins of focus and they are not intended to account for every ton of plastic produced, consumed or recycled in Malaysia.</p> <p>This study focuses on the broad recycling pathways for the different resins and does not determine the breakdown between landfill, energy recovery and leakage. Similarly, detailed calorific value assessment of sachets and energy recovery pathways of flexibles were not undertaken.</p> | <p>An annual review of the MFAs for the four resins will provide the Malaysian plastics industry a thorough understanding of the progress towards circularity.</p> <p>Breakdown between landfill, energy recovery and leakage rates will provide an understanding of the extent of shift away from landfill and leakage.</p> |
| HS code data for imports/ exports of plastic products | Imports/exports of resins and semi-finished products are based on government data. They have been triangulated against industry data, UN Comtrade and other data sources. However, it must be noted that there are inherent challenges with the accuracy of data reported via the universal HS Codes. | Refer to action 24 under section 4.3 (F). |
| Imports/exports of finished products | Imports/exports of finished products made from PET, PP, HDPE, and LDPE/LLDPE are not accounted for due to unavailability of data as well as significant uncertainties in attempting to calculate the plastic weightage within finished products. This limitation of missing data on net imports/exports of finished plastic products affects the final post-use disposal figure (if there is a net export of finished products, the final amount for post-use disposal will be reduced). However, it is expected to have minimal impact (<10%). Despite this limitation, this study still provides a clear understanding of the current realities (e.g. minimum plastic consumption and disposal amounts, lack of recycled product demand, lack of recycling capacity) to implement policies/regulations, etc. | Further data collection of finished product consumption is not critical to develop effective policies/regulations. Any attempts by stakeholders to determine finished product consumption will be challenging as the data are highly confidential. Efforts to determine finished product consumption can be seen as a 5 to 10 year goal to be achieved through a mandatory plastic reporting framework (refer to action 22 in Section 4.3 (E)). |

| Limitation area | Details | Opportunities for future work |
|--|---|---|
| Lifespan of plastic products | Resin disposal in future/past years have been calculated according to the modeling that GA Circular have developed based on regional industry data sources for industry use applications and lifespan. | Future studies could develop lifespan modeling specific to Malaysian plastics industry, but this is expected to have only a minimal impact (<5%) on the final post-use disposal figure. |
| Profitability analysis for recycling of plastic resins | The material value analyses on plastics recycling carried out under this study are not meant to be a profitability analysis for recycling each type of resin. A profitability analysis on recycling each type of resin would shed light on additional benefits that activities or incentives in the plastics value chain would bring compared to the additional costs incurred by those same activities or incentives. Such profitability analysis would be also particularly relevant to address the low CFR rates, especially for non-PET, which would be the main driver for unlocking value, and from a business-case perspective, will show the net value taking into account costs and reasonable profit margin. Recyclers engaged during this study were reluctant to share price-sensitive information or detailed operational costs. Due to the different levels of upstream and downstream integration among recyclers, each recycling business unit is expected to have different margins depending on their business model, and this forbids modeling for estimations of profitability. | The study team recommends a profitability analysis to be done on a case-by-case basis as part of in-depth, pre-feasibility studies by investors in the waste management or recycling sectors. |
| Assessment of SWM costs | While a basic assessment of the SWM costs in Malaysia has been conducted, a systematic assessment of national-level SWM infrastructure, operational costs of SWM and identifying the linkages between informal sector and SWM, is not within the scope of this study. Where available, secondary research or past GA Circular work in Malaysia and other online sources on the informal sector was used to identify the role of the informal sector in recyclables collection and to address challenges to recognize and better integrate the informal sector. | A detailed evaluation of SWM infrastructure and its costs in the context of plastic circularity could be addressed in subsequent work as a follow-up to this market assessment. |

1.8 RELATION TO THE RECENT WWF MALAYSIA STUDY ON EPR SCHEME ASSESSMENT FOR PLASTIC PACKAGING WASTE

It is important to note that the WWF EPR study and the World Bank Group (WBG) plastic value chain study have differences in objectives and methodologies that lead to some variations in MFA outputs.

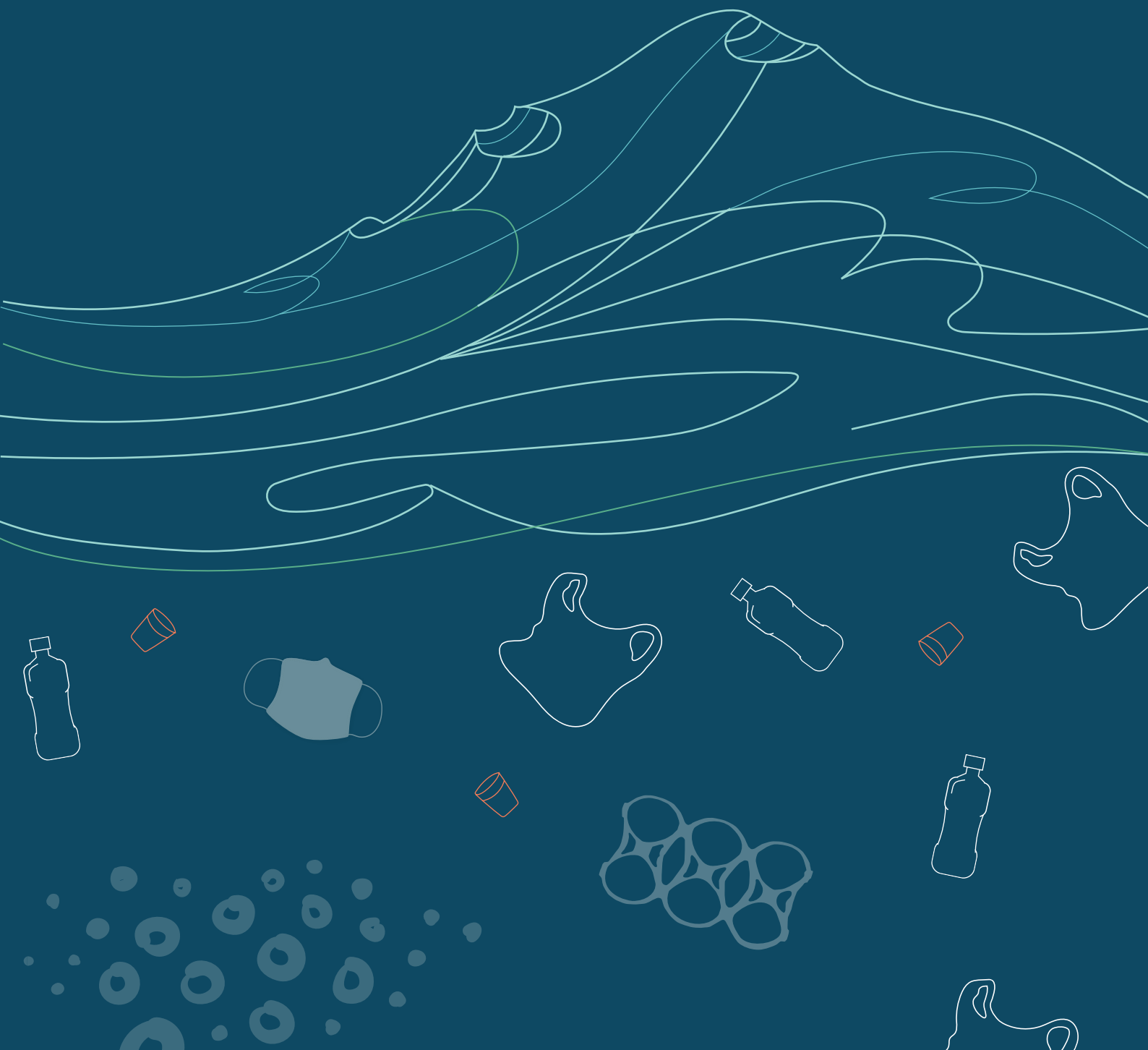
Both MFAs rely on interviews with recyclers and local stakeholders to estimate the CFR rates for PET, HDPE and PP. However, this study also includes analyses for LDPE/LLDPE and PET Polyester. This study builds

on WWF's MFA approach for Malaysia by including additional data regarding import and export of resins and semi-finished products, end markets for selected resins and lifespan of plastic products.

This higher level of detail in this MFA is needed to better understand local recycling markets for each resin type and opportunities and barriers for private sector investments, which are not necessarily needed for designing policy interventions such as EPR under the WWF work. Please see Appendix 5 for further information regarding the similarities and differences of both studies.

SECTION 2:

MALAYSIA LOSES 81% OF THE MATERIAL VALUE OF PET, PP, HDPE AND LDPE PLASTICS



SECTION 2:

MALAYSIA LOSES 81% OF THE MATERIAL VALUE OF PET, PP, HDPE AND LDPE PLASTICS

Section 2.1 introduces the two tools used to assess the current plastics circularity situation in Malaysia for each resin: material flow analysis (MFA) and material value loss analysis. Section 2.2 analyses each of the key resins in detail using the two tools. It also highlights the findings relevant to increasing circularity.

2.1 TOOLS USED TO ASSESS PLASTICS CIRCULARITY

2.1.1. Material Flow Analysis (MFA)

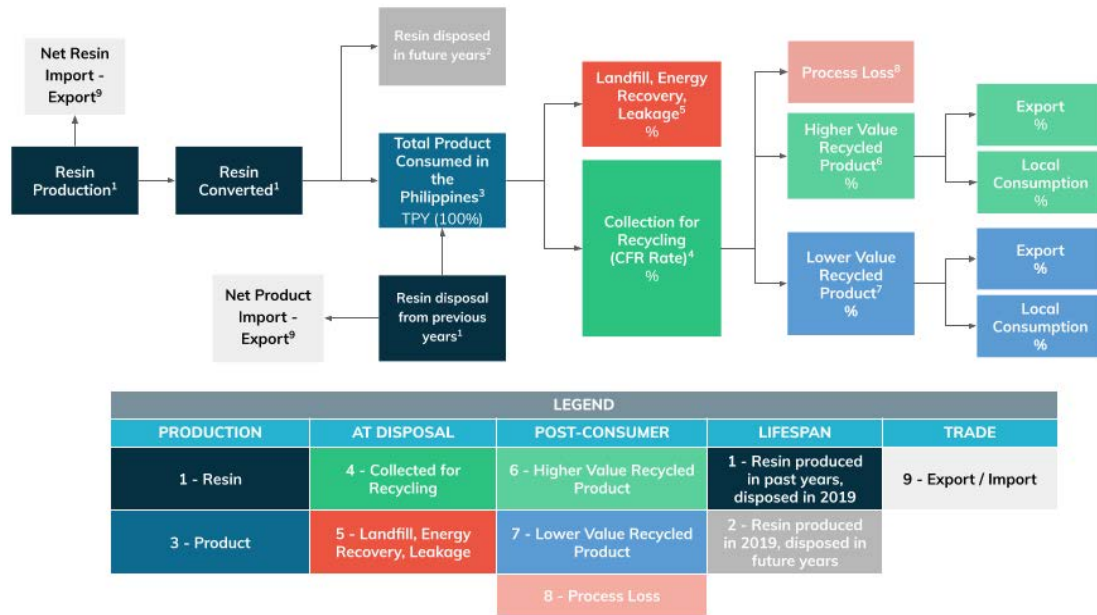
The MFA conducted for each resin as part of this study covers the amounts of resin traveling through each stage of the value chain from resin production to consumption, and finally to post-consumption destinations. Figure 6 helps to visualize how much of the resins flow across the stages and enables an understanding of factors affecting circularity at each stage.

The MFA can be analyzed in three sections from left to right. The three sections are:

- 1. Production:** On the left, the MFA starts with the amount of resin produced (box 1). Imports and exports of this resin (box 9) and the semi-finished products the resins are made into (box 3) are considered when calculating the total amount of plastic products consumed locally. The total amount of plastic products consumed locally represents 100% of what could be recycled for that resin.
- 2. At disposal:** After consumption, the plastic products are then collected for recycling (box 4) or disposed of at the landfill, used for energy recovery or leaked into the environment (box 5). The lifespan of the plastic products was also considered: calculations remove products produced in 2019 that would be disposed of in future years and include products that produced before 2019 and disposed of in 2019. This calculation uses the following steps.
 - a. First, determine the proportion of materials disposed of in year 0 (year of manufacture) until end of lifespan by understanding the typical lifespan of plastic products for each end-use application and the proportion of end-use applications for each resin (details in Appendix 4).
 - b. Second, using the normal distribution curve for the average lifespan (in Appendix 4) and estimated historical production numbers of the key resins in Malaysia¹⁴, calculate the amount of plastic products disposed of in 2019 but produced before 2019 by multiplying the amount of resin consumed in each year with the corresponding proportion of products that are estimated to be disposed of in 2019.

¹⁴ Estimated using growth rates calculated from the data gathered during a recent World Bank study and provided by the Plastics Institute of Thailand (PIT) as a proxy, as corresponding data was unavailable for Malaysia.

Figure 6.
THE MATERIAL FLOW ANALYSIS (MFA) APPROACH USED FOR EACH RESIN



For example, the amount of PET Polyester consumed in 2014 is multiplied by the proportion of PET Polyester that will be disposed of in 5 years. The figures for each year are then summed up for a final estimate of what will be disposed of in 2019.

- c. Third, remove the proportion of materials that was produced in 2019 but is estimated to be disposed of in future years (box 2) to arrive at a final figure for the total amount of resins disposed in 2019 as final products in Malaysia.

3. Post-Consumer: In this last section on the right, the CFR rate and subsequent products of recycling are shown.

- a. CFR: Denotes the tonnes or percentage of a particular resin collected through the informal and formal collection sectors within the country, which is then sold to Processors and/or Recyclers within the country or for export, as compared to the total consumption. The CFR rate already factors in removal of contaminants and other plastics and materials that are not the resin of focus. The term CFR is used for a few reasons:
 - > Given imports and exports of material for recycling, the CFR rate denotes local collection that is sold to processors/recyclers, not

necessarily within the country (e.g. a country can have a CFR rate of 75% even though none of the material is recycled locally due to the lack of a robust local recycling industry).

- > Because recycling yield does not equal 100% and varies across resin type (due to “process loss”), the CFR rate is not equal to the share of after-use plastics that are sold from the recycling process. While contamination (e.g. dirt, other plastics, metals, etc.) is removed during the sorting and cleaning process, it is not part of the mass balance MFA of each resin (e.g. for a PET MFA, the MFA inputs are PET, thus contamination is not added on). Thus, the CFR of PET is calculated after contaminants (dirts, metals, etc) and other plastics (sleeves and caps from other materials such as HDPE and PP) are removed.
- b. Process yield and loss affects the final quantity of recycled product output from the recycling process.
- c. The products of recycling can be of higher value (e.g. food-grade resin (box 6)) or a lower value (e.g. resin-used strapping (box 7)). These products are then exported or consumed locally again in domestic plastics production.



Photo: Yusnizam Yusof / Shutterstock

2.1.2. Material Value Loss Analysis

Analysis of the plastic **material value loss** assesses the value loss when the resins are not recycled into the Most Valuable Recycled Product (MVRP) under weighted average best circular scenario for that particular resin or when the resins are not recycled at all (e.g. when disposed of in a landfill). The analysis of this material value lost is informed by the MFA tool performed for each resin. It is shown using a graphical method indicating the current value unlocked from recycling the resin at a national level using two key values:

1. CFR Rate, represented by the X-axis
2. Value Yield (product of Volume Yield and Price Yield), represented by the Y-axis

The value unlocked through recycling is represented by the size of the green boxes. All areas outside of the green boxes represent the lost material value. Red arrows represent the pressures that lower the value unlocked (i.e. pressure through lower CFR Rate and pressure through lower Value Yield).

The graphical method in Figure 7 was benchmarked and developed based on the methodology from the Ellen MacArthur Foundation, assessing the material value lost from single-use plastic packaging applications globally. It was modified specifically for the purposes of this study and for the context in Malaysia.¹⁵

The World Bank is developing the tools to help countries identify the “Pathways out of Plastic Pollution”, which is expected to be completed in FY21. The scope of this work has been extended both geographically and technically to reflect high uptake within the WBG, which includes both the World Bank and IFC, and demand from countries. The model will be piloted in Indonesia, will follow a comprehensive approach to the valuation of damages from plastic and its alternatives, and will include five country case studies in the lifecycle valuation of plastics and alternatives, together with policy analysis in 10 countries. The material value analysis done in this study is expected to provide valuable inputs for the development of the “Pathways out of Plastic Pollution” in Malaysia.

15 Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)

Figure 7.
GRAPH OF HOW THE MATERIAL VALUE IS REPRESENTED

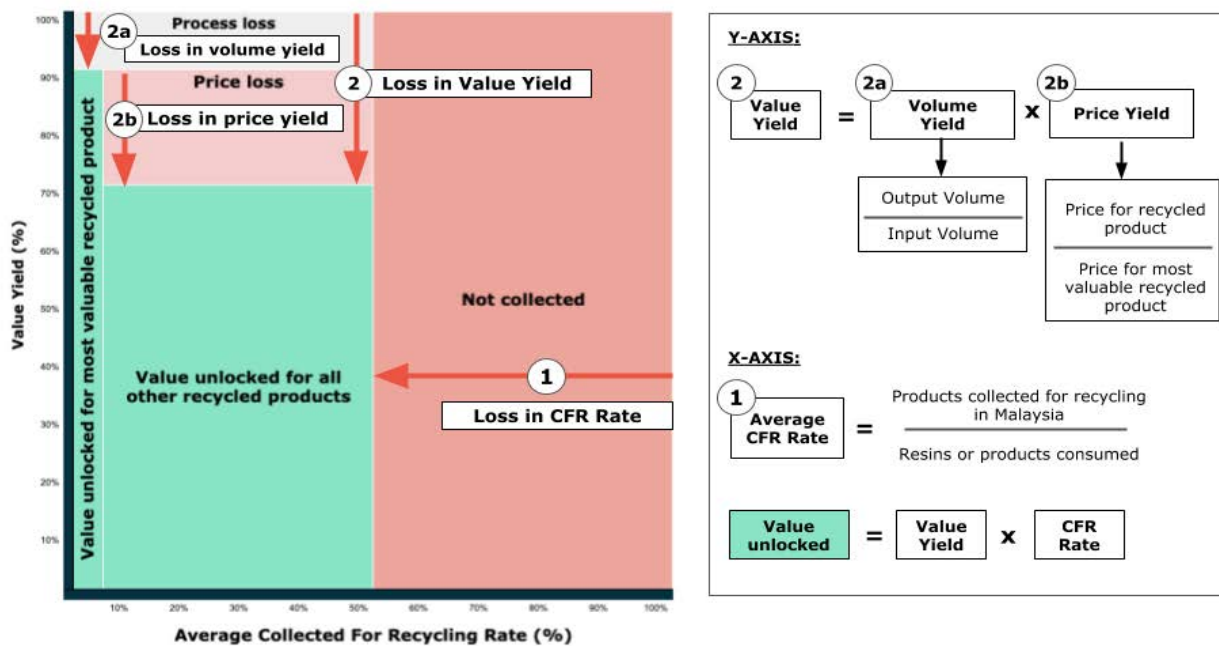


Figure 7 Notes:

- The material value analysis does not include:
 - The costs that could be saved from not having to collect and dispose of the non-recycled resins as waste under the MSW collection system.
 - The cost of setting up and operationalizing municipal SWM infrastructure to support the transition towards plastics circularity.

This analysis should be considered as providing the potential monetary benefits from plastics recycling and not the “net” financial opportunity. This is in line with the methodology used by the Ellen MacArthur Foundation which does not factor in upfront investment costs, operational costs for circular approaches towards solid waste management or cost savings through reduction in collection and disposal of plastic waste.

- 100% CFR rate and value yield was used in material value analysis across this study for illustrative purposes only as targets are typically set based on 100% of market inputs/material.
- Multilayer, multi-material flexibles form an important part of the packaging mix for consumer goods brands. However, unlike rigids and mono-material flexibles, they are not commercially collected or recycled at scale. Scalable private sector investment solutions for recycling these multilayer, multi-material flexibles have not yet been commercialized in the context of Malaysia or Southeast Asia. As a result, a breakdown of the key resins into multilayer, multi-material flexibles and a dedicated assessment of material value analysis for this category of flexibles was out of scope. It should be noted however, that there are some plans by private sector companies to set up pyrolysis processing for flexible packaging in Malaysia.
- The below criteria were used to ensure reliable and consistent prices for recycled products for 2019:
 - Prices need to be representative of the industry. Source of prices must be any of the following: (i) industry association, (ii) independent market pricing provider, (iii) from two or more independent recyclers.
 - Prices need to be available for various categories of end products (e.g. HDPE’s end products are rHDPE natural, rHDPE pipe grade, rHDPE injection mold black, rHDPE colored, rHDPE food grade, etc.).
 - Prices need to be available for a period of at least three months within 2019, so that the average of the three months can be used. This is to avoid price anomalies that often occur for just one month of pricing.

Currently there are no independent, industry-level price information sources available for recycled products in Malaysia. Therefore, local prices were used for recycled products where available from two independent recyclers and were benchmarked with global prices, as many recycled products compete in the global market, meaning global pricing provides an accurate picture of the market opportunity.

- The term MVRP for each resin refers to the recycled product that has the most value in the global recycled plastics market, out of all the possible options the resin can be recycled into. For this calculation, MVRP uses a weighted average of the various possible recycled products, with the proportions of each type of recycled product representing a best-case scenario of maximal value unlocked for the resin. It also recognizes it is not realistic to expect 100% of resins to be recycled into the recycled product which has the most value (e.g. food-grade PET for post-consumer PET packaging).
- A complete breakdown of the data sources and key assumptions for material value loss analysis calculations for each resin can be found in the Appendix 6.



2.2 RESINS IN FOCUS

2.2.1. PET

General Characteristics of PET

PET is clear, tough and has good gas and moisture barrier properties. It is widely used in:

- Plastic bottles for soft drinks, water, juice, sports drinks, etc.
- Food jars for peanut butter, sauces, condiments, etc.
- Ovenable film and microwavable food trays
- Textiles, monofilament, carpet, strapping, films and engineering moldings

Cleaned, recycled PET flakes and pellets are in high demand globally for use back into bottles as well as for spinning fiber for carpet yarns and textiles (see Figure 8). PET can be recycled into:

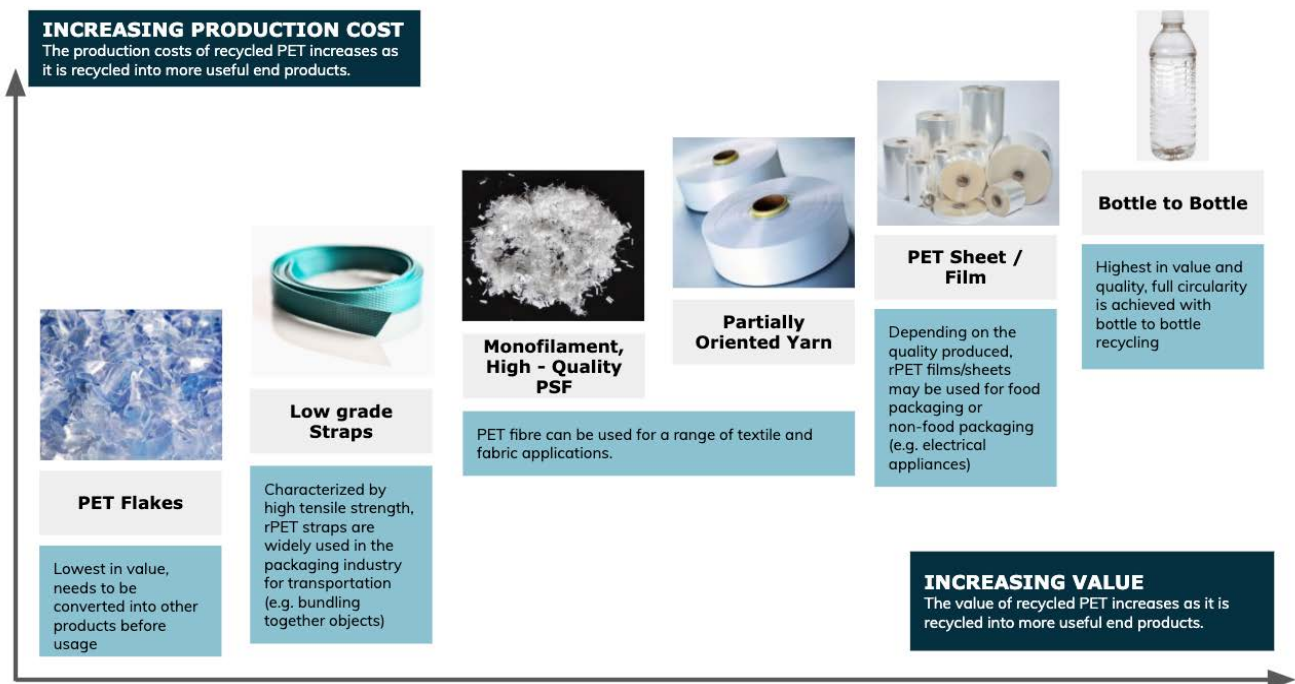
- rFiber: Fiber for carpet, fleece jackets, comforter fill, bags, etc. through rPSF (Recycled Polyester Staple Fiber) and rPOY (Recycled Partially Oriented Yarn)
- rPET (food-grade): Containers for food, beverages bottles
- rPET (non-food-grade): Films, sheets, strapping

Major PET Producers and Recyclers in Malaysia

Figure 9 shows the respective amounts of virgin PET production and recycled PET production for the major producers and large recyclers reviewed under this study.

Figure 8.

EXAMPLE OF BREAKDOWN OF THE VALUE OF RECYCLED PRODUCTS FROM PET



Note: Bottle to bottle rPET resin can be considered the most valuable recycled product.

Figure 9.

MAJOR PRIVATE SECTOR STAKEHOLDERS FOR PET RESIN PRODUCTION AND OVERALL PET RECYCLING CAPACITY (2019)

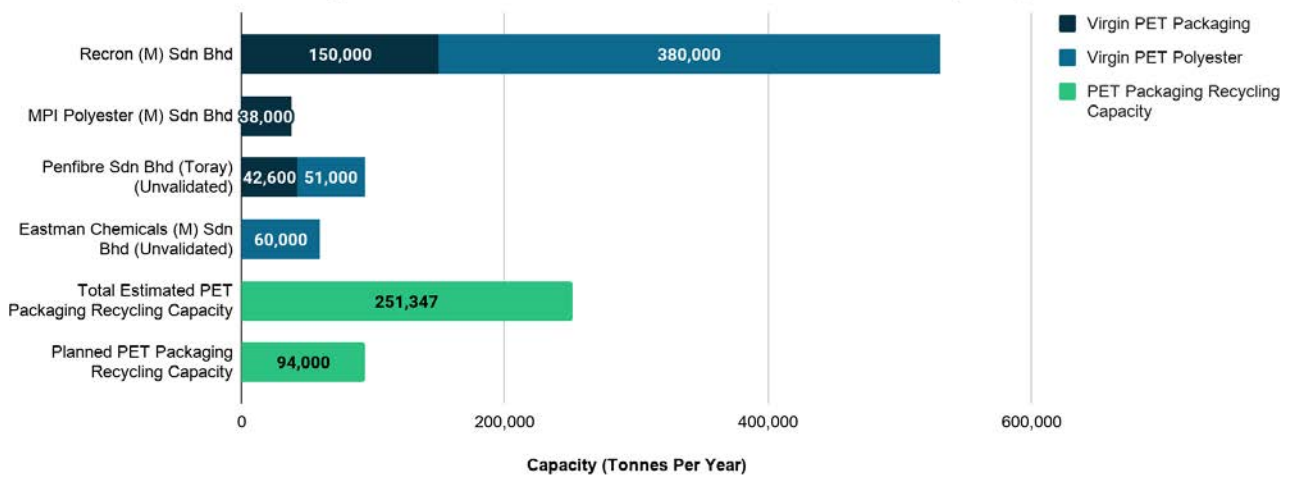


Figure 9 Notes:

- The capacity values stated are for 2019. The producer capacities and Estimated Recycling Capacity are based on 2019 values while the Planned Recycling Capacity is as of December 2019 (i.e. will become operational during 2020/2021).
- The producer capacity figures are based on publicly available information and where possible, through survey responses or interviews with private sector stakeholders.
 - Validated through industry sources:
 - Recron (M) Sdn Bhd: all PET packaging and PET polyester resin is produced locally. Publicly available documents state a total PET resin production capacity of 530,000 tonnes per year. Of note, Recron (M) Sdn Bhd is a member of the Reliance Group, which also owns upstream production of PTA (which is a building block for PET production) in Malaysia, with upstream PTA production capacity of 610,000 tonnes per year under RP Chemicals (Malaysia).
 - MPI Polyester (M) Sdn Bhd: virgin PET packaging resin is reported to be produced locally. Whilst MPI Polyester (M) Sdn also has capacity of 10,000 tonnes per year of virgin PET polyester capacity, however, it is reported to import this virgin resin and produce semi-finished products locally (e.g. spun yarn).
 - Not Validated:
 - Penfibre Sdn Bhd (under Toray Industries): capacity information displayed is based on publicly available information.¹⁶ Industry sources have stated that Penfibre produces PET film packaging from imported PET polyester resin, however this has not been validated with Penfibre, as they have not been able to respond to questionnaire/interview requests for this study.
 - Eastman Chemicals (M) Sdn Bhd: Eastman was reported to have 50,000 tonnes per year of polyester production capacity in the 2011 study conducted for JPSPN. Since then, it has been publicly reported that it has increased capacity by 20% of its copolyester PETG in 2018¹⁷ which would result in 60,000 tonnes per year of capacity. However, some industry sources believe that Eastman does not produce PET polyester, or at least, not all the polyester production is PET polyester.
- The recycling capacity figures are based on questionnaire responses/interviews for this study or other studies by GA Circular, or based on publicly available information or past conversations, which could not be validated as they have not been available for questionnaire responses/interviews for this study. Larger PET recyclers include Diyou Fibre (M) Sdn Bhd, Glowmore Express Sdn Bhd, Preference Megacycle Sdn Bhd, Xin Da Spinning Technology Sdn Bhd. Other PET recyclers include but are not limited to Dragon Alliance, Lim Seng Plastic Sdn Bhd, Gateweld Sdn Bhd.
- While key stakeholders are represented in the above, this is not an exhaustive list of all PET producers and recyclers in Malaysia¹⁸.

¹⁶ [Toray Industries INC: Production Capacity \(2020\)](#)

¹⁷ [PlastEurope.com: Eastman \(2017\)](#)

¹⁸ The data for PET production and recycling is representative as this study team has received inputs from at least 90% all PET resin producers (from MPA) and recyclers in Malaysia as part of this study and other recently conducted studies on PET by this study team.

Material Flow Analysis (MFA) for PET (2019)

There are **three key messages** from the MFA of PET in Malaysia, as shown in Figure 10:

1. The CFR rate for PET packaging (including PET bottles, sheets and films) varies widely between an estimated 28% to 45%. This wide range of recycling rate primarily results from several factors.
 - > The recycling rate varies significantly between applications. The recycling rate for PET beverage bottles is estimated to be 55%, but for other PET packaging applications (sheets, films, oil bottle applications, cosmetic applications, etc.) it is estimated to be much lower, at between 5–20%.
 - > Stakeholders, such as aggregators and recyclers, are responding to price fluctuations. As prices drop, aggregators and recyclers slow collection as it gets less profitable to do business. When prices rise, collection increases again as these stakeholders take advantage of the higher prices (the CFR rate also varies throughout the year).
 - > There is currently no production of food grade recycled PET due to the uncertainty with regards to the regulation regarding the Halal status of recycled materials.
2. None of the PET bottles collected is recycled into food grade materials. This is important as food-grade rPET has the highest value in the market and achieves greater circularity (i.e bottle-to-bottle recycling) than what is being achieved currently with recycling into non-food grade rPET. Furthermore, it is more resistant to drops in prices for virgin PET as demand for food-grade rPET is increasing due to sustainability commitments of global food and beverage brands. However, a major obstacle preventing the production of food-grade rPET is confusion regarding the use of recycled content in food grade applications and the current inability to obtain Halal certification for food contact rPET packaging content in Malaysia. Please see section 3.2.4 for more information.
3. Only a minimal amount of PET polyester used in textiles and fiber applications is estimated to be recycled (see Figure 11). One of the main reasons is due to the various blended products that polyester fiber gets turned into (for example blended with nylon or cotton) which makes it technically challenging to separate the polyester content during recycling. Technologies to recycle blended polyester products are still in the early stages of development globally and are not present in Malaysia.

Figure 10.

MATERIAL FLOW ANALYSIS OF PET PACKAGING RESIN IN MALAYSIA (TPY)

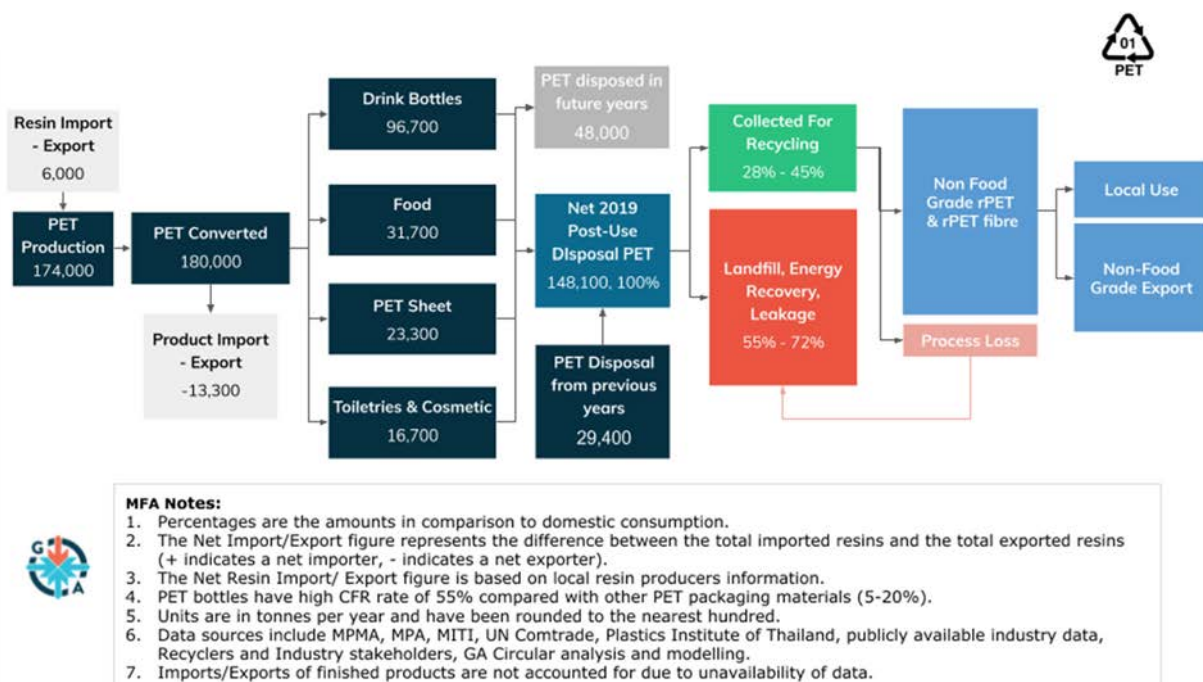


Figure 11.
MATERIAL FLOW ANALYSIS OF PET POLYESTER RESIN IN MALAYSIA (TPY)

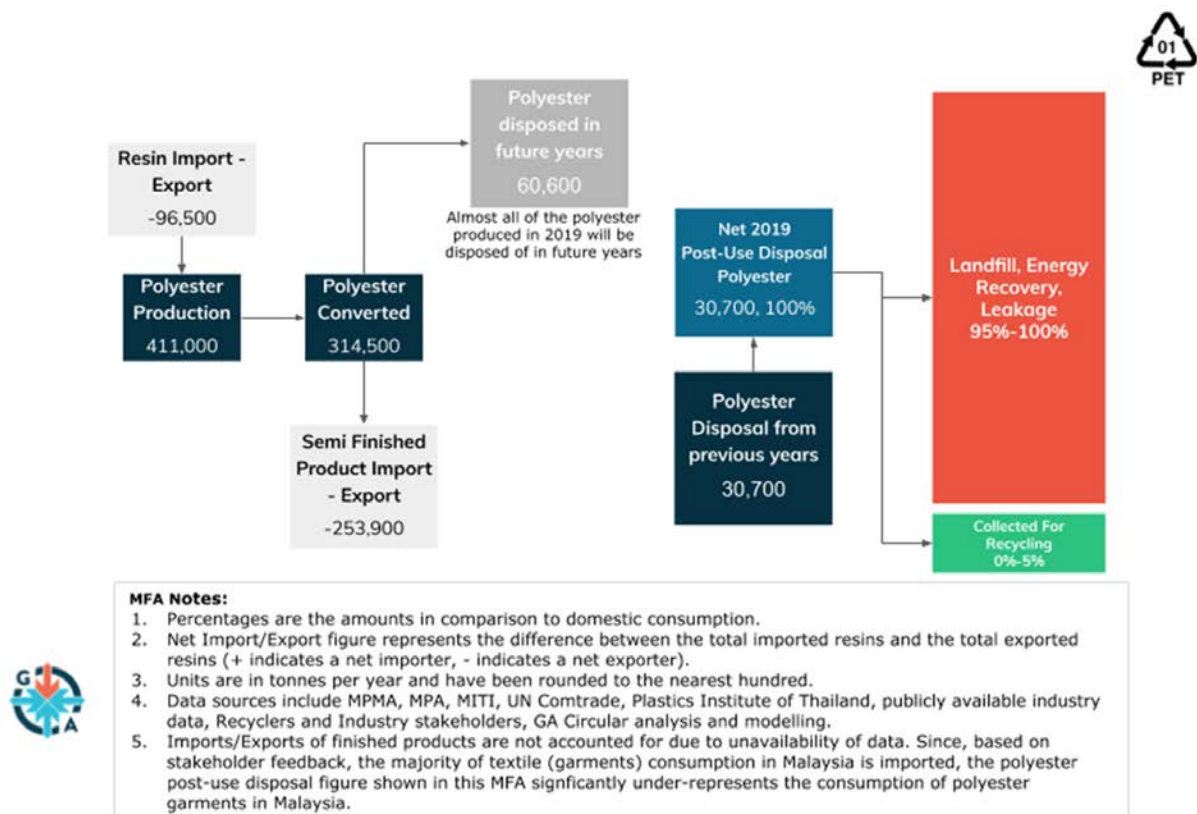


Figure 11 Notes:

1. Data sources for resin production, imports and exports, material accumulation in future years and disposal from previous years, consumption and CFR and its breakdown include: Malaysian Plastics Manufacturers Association (MPMA), Ministry of International Trade and Industry (MITI), UN Comtrade, publicly available industry data, recyclers and industry stakeholders including brand owners, industry associations and NGOs, GA Circular analysis and modeling.
2. Limitations:
 - The PET packaging MFA may not include all local PET packaging production, particularly PET film packaging production, as data was not obtainable from Penfibre Sdn Bhd (Toray Industries), despite attempts to contact the stakeholder. Thus, the PET resin post-use disposal amount may be underreported.
 - The PET polyester MFA is directional, as PET polyester virgin resin production data could not be validated for Penfibre Sdn Bhd (Toray Industries) or from Eastman Chemicals (M) Sdn Bhd despite attempts to contact the stakeholders. The MFA resin production of 411,000 is based on 360,000 TPY production by Recron and 51,000 by Penfibre Sdn Bhd (Toray Industries). Eastman has not been added to the resin production figure as industry sources have shared that they believe Eastman's production to be other polyesters, not just PET. Thus, the 411,000 figure could be over-reported (if Penfibre value used is too high) or underreported (if Eastman does produce PET polyester).
3. CFR rates for PET Polyester is estimated to be 0-5% as the study team observed through stakeholder interviews that there is almost no polyester recycling in Malaysia.
4. A significant amount of textile consumption in Malaysia is imported. Hence, due to the unavailability of data for finished products, the final post-use disposal figure above significantly underestimates polyester textiles consumption.
5. Most of these values have wide fluctuations. The values shown in this chart are our best average estimates of the realities.

Material Value Loss Analysis for PET

The material value loss for PET has been broken down into two parts: PET Packaging and PET Polyester.

Figure 12 represents the value unlocked for PET packaging based on the MFA for PET in Figure 10. The key findings are:

- Average CFR is 36.5% and Value Yield is 79%. This results in a material value unlocked of 29%. The CFR value includes all PET Packaging (e.g. bottles, films and sheets).
- Therefore, an average of 71% of the material value of PET packaging is lost. This is equivalent to USD 91–109 million of material value lost per year.

Figure 13 represents the value unlocked for PET polyester based on the MFA for PET in Figure 11. The key findings are:

- Average CFR is 2.5% (assuming some small-scale textile recycling, although industry sources and the study team are unaware of any PET polyester recycling) and Value Yield is 67%. This results in a material value unlocked of 2%.
- An average of 98% of the recycling value of PET polyester is lost. This is equivalent to about USD 26 million of material value lost per year.

Figure 12.

MATERIAL VALUE LOSS ANALYSIS FOR PET PACKAGING (BASED ON 2019 VOLUMES)

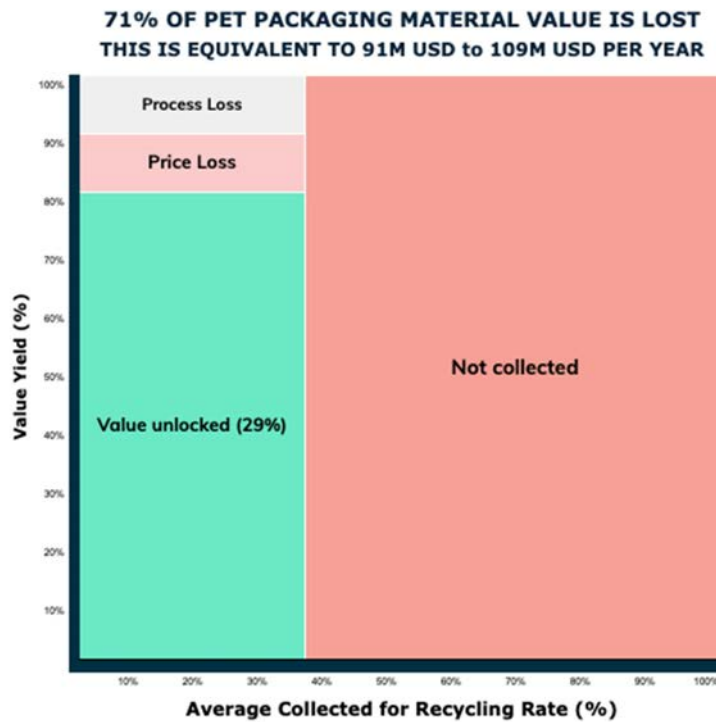


Figure 12 Notes:

1. Value yield = volume yield x price yield where volume yield = output volumes/input volumes, and price yield = weighted average USD per tonne of reprocessed PET/USD per tonne of most valuable recycled product from PET.
2. 100% CFR rate and value yield has been used in material value analysis across this study for illustrative purposes only as targets are typically set based on 100% of market inputs/material.
3. MVRP for PET packaging is a mix of food-grade rPET, rPET flakes, rPOY and rPSF used in apparel applications.
4. Current situation for PET packaging is an average of 92.5% volume yield (as process losses are approximately 5%–10%) and 85% price yield, thus giving a 79% value yield.
5. Total volume of PET packaging of 148,100 TPY, and Most Valuable Recycled Product under weighted average best circular scenario price of USD 948/ton.
6. CFR rate only includes PET packaging (not other contaminants).
7. Process losses only include PET packaging (not other contaminants).
8. All percentages used here are weighted average values.
9. Please see Appendix 6 for further information regarding the values and calculations.

Figure 13.

MATERIAL VALUE LOSS ANALYSIS FOR PET POLYESTER (BASED ON 2019 VOLUMES)

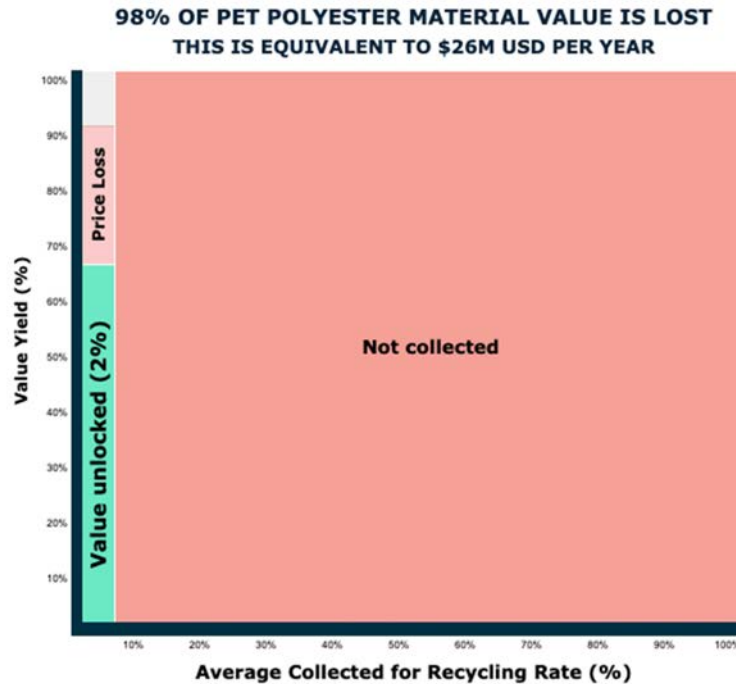


Figure 13 Notes:

1. Value yield = volume yield x price yield where volume yield = output volumes/input volumes, and price yield = weighted average USD per tonne of reprocessed PET/USD per tonne of most valuable recycled product from PET.
2. 100% CFR rate and value yield has been used in material value analysis across this study for illustrative purposes only as targets are typically set based on 100% of market inputs/material.
3. MVRP for PET polyester is a mix of rPOY and rPSF used in apparel applications.
4. As data is not available, the current estimated/assumed situation for PET polyester is an average of 92.5% volume yield (as process losses are approximately 5%–10%) and 73% price yield, thus giving a 67% value yield.
5. Total volume of PET polyester is 30,700 TPY, and Most Valuable Recycled Product under weighted average best circular scenario price of USD 859/ton.
6. CFR rate only includes PET polyester (not other contaminants).
7. Process losses only include PET polyester (not other contaminants).
8. All percentages used here are weighted average values.
9. Please see Appendix 6 for further information regarding the values and calculations.



2.2.2. PP

General Characteristics of PP

PP is a tough, rigid and crystalline thermoplastic produced from propene (or propylene) monomers. Its good barrier properties, high strength, good

surface finish and low cost make PP ideal for several packaging applications. PP is among the cheapest plastics available today and is widely used in:

- Packaging Applications: Used for both rigid and flexible packaging
- Automotive Applications: Battery cases and trays, bumpers, fender liners, interior trim, instrumental panels and door trims.

- Fibers and Fabrics: A large volume of PP utilized in strapping, filament and staple fibers

PP can be recycled into the following:

- rPP for packaging applications
- rPP for industrial application: automotive, electronics and furniture industries

Major PP Producers and Recyclers in Malaysia

Figure 14 shows the respective amounts of virgin PP production and recycled PP production for the major producers and large recyclers reviewed under this study.

Figure 14.

MAJOR PRIVATE SECTOR STAKEHOLDERS FOR PP RESIN PRODUCTION AND OVERALL PP RECYCLING CAPACITY (2019)

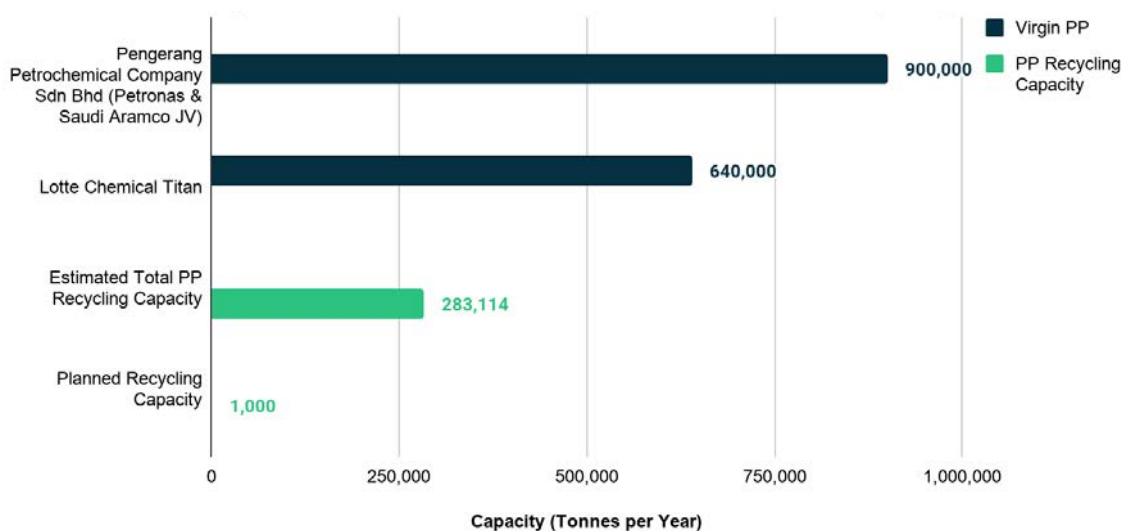


Figure 14 Notes:

1. The capacity values stated are for 2019. The Estimated Recycling Capacity is based on 2019 values while the Planned Recycling Capacity is as of December 2019 (will become operational during 2020/2021).
2. The producer capacity figures are based on publicly available information, which have been validated through survey responses or interviews with private sector stakeholders.
3. The recycling capacity figures are based on questionnaire responses/interviews for this study or other studies by GA Circular or based on publicly available information or past conversations, which could not have been validated as they have not been available for questionnaire responses/interviews for this study. Larger PP recyclers include Heng Hiap Industries Sdn Bhd, DCT Plastics, Enviro Polymer Sdn Bhd, Green Concept Technology Sdn Bhd, LTT Metal & Plastic Recycling Sdn Bhd, Preference Megacycle Sdn Bhd. Other PP recyclers include but are not limited to Dragon Alliance, FizLestari Plastic Sdn Bhd, MEP Enviro Technology Sdn Bhd, Lim Seng Plastic Sdn Bhd, Gateweld Sdn Bhd.
4. While key stakeholders are represented in the above, this is not an exhaustive list of all PP producers and recyclers in Malaysia.*

*The data for PP production is representative as this study team has received inputs from all PP resin producers from MPA. PP recycling is fragmented with a few large recyclers and many small (formal and informal) recyclers. The large recyclers have been interviewed and a best possible estimate of the smaller recyclers was calculated through interviews with some of the small recyclers and by compiling the lists of recyclers obtained from government stakeholders, desktop research and responses received from major PP recyclers.

Material Flow Analysis (MFA) for PP

There are three key messages from the MFA of PP in Malaysia, as shown in Figure 15:

1. PP has a CFR rate of about 25%–35%. This CFR range is estimated based on interviews with key local stakeholders.
2. A high proportion of PP is used in film packaging applications, which includes food packaging. These PP film products are contaminated or have prints on them which recyclers are unable to take out. Therefore, such PP products tend to have low value yields when recycled and therefore remain uncollected.
3. PP components that are non-recyclable are those used in composite products in industrial applications

(e.g. in electronics, automobiles). The composite nature of the products mean that an additional step of dismantling and separation is required before it can be collected for recycling. This requires dedicated facilities (e.g. dedicated car bumper recycling facilities), which currently do not exist.

Material Value Loss Analysis for PP

Figure 16 represents the value unlocked for PP based on the MFA for PP. The key findings are:

- Average CFR is 30% and Value Yield is 75%. This results in a material value unlocked of 22%.
- Therefore, an average of 78% of the material value of PP is lost. This is equivalent to USD 259–285 million of material value lost per year.

Figure 15.
MATERIAL FLOW ANALYSIS OF PP RESIN IN MALAYSIA (TPY)

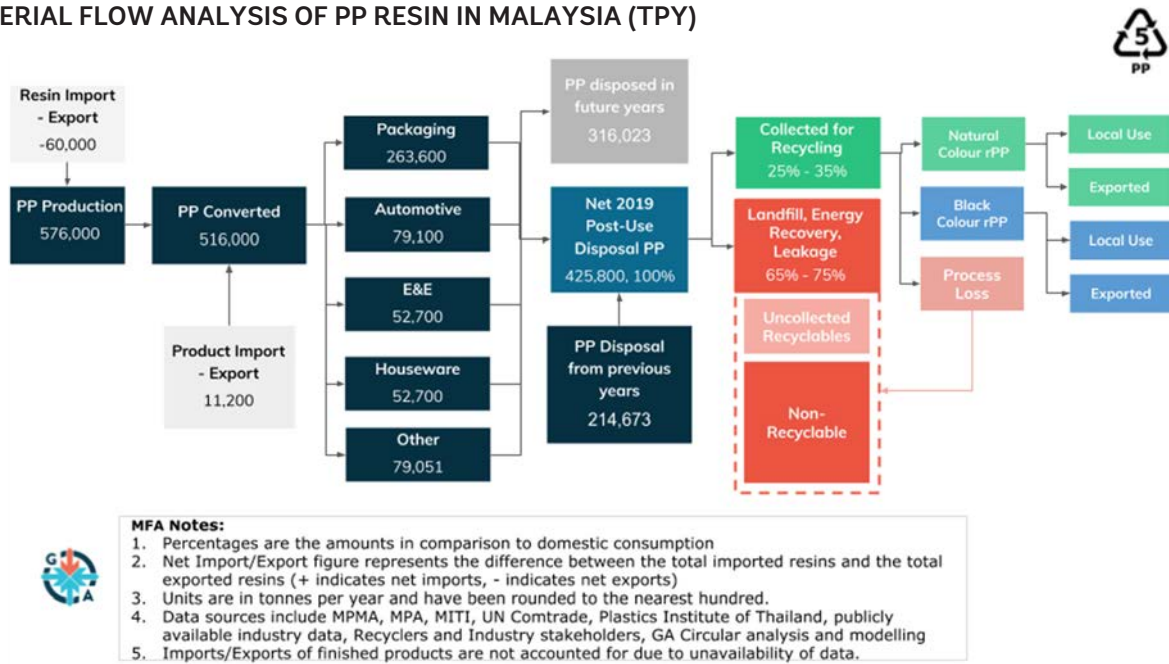


Figure 15 Notes:

1. Data sources for resin production, imports and exports, material accumulation in future years and disposal from previous years, consumption, and CFR and its breakdown include: Malaysian Plastics Manufacturers Association (MPMA), Ministry of International Trade and Industry (MITI), UN Comtrade, publicly available industry data, recyclers and industry stakeholders including brand owners, industry associations and NGOs, GA Circular analysis and modeling.
2. Most of these values have wide fluctuations. The values shown in this chart are our best average estimates of the realities.

Figure 16.
MATERIAL VALUE LOSS ANALYSIS FOR PP (BASED ON 2019 VOLUMES)

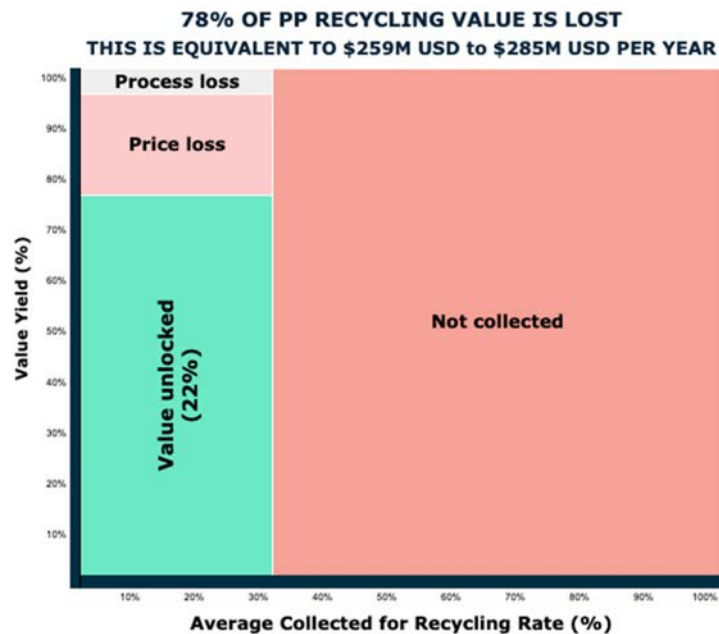


Figure 16 Notes:

1. Value yield = volume yield x price yield where volume yield = output volumes/input volumes, and price yield = weighted average USD per tonne of reprocessed PP/USD per tonne of most valuable recycled product from PP.
2. 100% CFR rate and value yield has been used in material value analysis across this study for illustrative purposes only as targets are typically set based on 100% of market inputs/material.

Figure 16 Notes continued:

3. MVRP for PP is rPP food-grade pellets, which are being manufactured in some countries but not yet in Malaysia. As only some of Malaysia's PP can be turned into rPP food-grade, a weighted average of the different products is used to calculate the MVRP price for rPP.
4. Current situation for PP is an average of 95% volume yield (as process losses are approximately 5%) and 78% price yield, thus giving a 75% value yield.
5. Total volume of PP is 425,800 TPY, and MVRP under weighted average best circular scenario price of USD 823/ton.
6. CFR rate only includes PP (not other contaminants).
7. Process losses only includes PP (not other contaminants).
8. All percentages used here are weighted average values.
9. Please see Appendix 6 for further information regarding the values and calculations.



2.2.3. HDPE

General Characteristics of HDPE

HDPE is a thermoplastic polymer produced from the monomer ethylene. It is known for its high strength to density ratio, making it suitable for a very wide variety of rigid plastic applications. While it can also be used for film packaging applications too (especially where a stronger film is needed), its opacity means that LDPE/LLDPE is preferred in most cases.

- Packaging Applications: Shampoo bottles, milk jugs, plastic shopping bags
- Automotive Applications: Fuel tanks, inner and outer protective covers

HDPE can be recycled into the following:

- rHDPE for packaging applications: Shampoo bottles, plastic bags
- rHDPE for industrial application: Automotive and electronics components

Major HDPE Producers and Recyclers in Malaysia

Figure 17 shows the respective amounts of virgin HDPE production and recycled HDPE production for the major producers and large recyclers reviewed under this study.

Material Flow Analysis (MFA) for HDPE

There are three key messages from the MFA of HDPE in Malaysia, as shown in Figure 18:

1. HDPE has a CFR rate of about 20%–35%. This CFR range is estimated based on interviews with key local stakeholders and past research conducted by GA Circular.
2. A high proportion of HDPE is used in film packaging applications, which includes food packaging. These HDPE products are contaminated and also therefore have low value yields and therefore remain uncollected.

Figure 17.

MAJOR PRIVATE SECTOR STAKEHOLDERS FOR HDPE RESIN PRODUCTION AND OVERALL RECYCLING CAPACITY (2019)

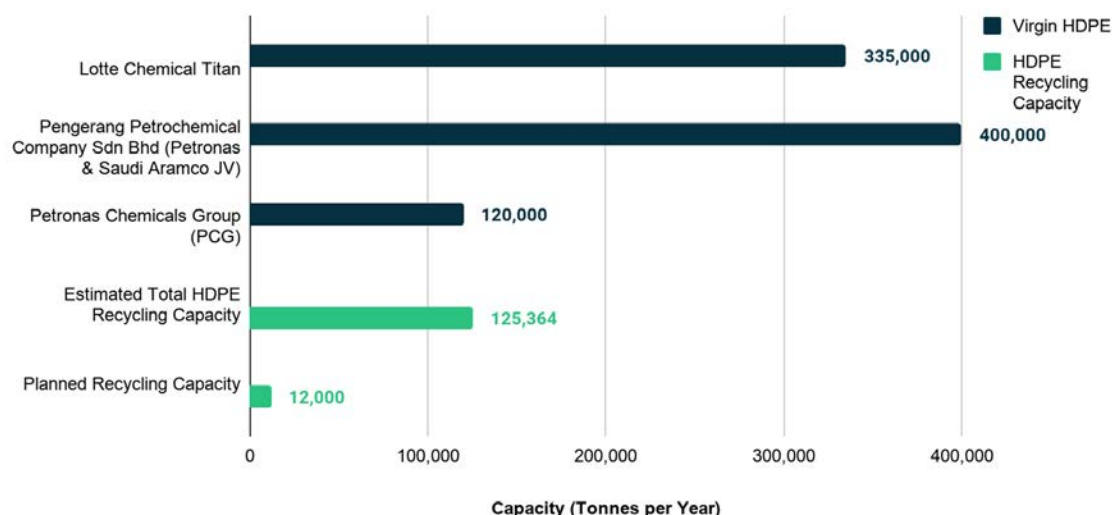


Figure 17 Notes:

1. The capacity values stated are for 2019. The producer capacities and Estimated Recycling Capacity are based on 2019 values while the Planned Recycling Capacity is as of December 2019 (will become operational during 2020/2021).
2. The producer capacity figures are based on publicly available information, which have been validated through survey responses or interviews with private sector stakeholders.
3. The recycling capacity figures are based on questionnaire responses/interviews for this study or other studies by GA Circular, or based on publicly available information or past conversations, which could not be validated as they have not been available for questionnaire responses/interviews for this study. Larger HDPE recyclers include EPD Plastic Industries Sdn Bhd, FizLestari Plastic Sdn Bhd, MJ Material Technology Sdn Bhd, Preference Megacycle Sdn Bhd. Other HDPE recyclers include but are not limited to DCT Plastics Sdn Bhd, Gold Mine Polymer (M) Sdn Bhd, Plasticycle Industries Sdn Bhd.
4. While key stakeholders are represented above, this is not an exhaustive list of all HDPE producers and recyclers in Malaysia.*

* The data for HDPE production is representative as this study team has received inputs from all HDPE resin producers from MPA. HDPE recycling is fragmented with a few large recyclers and many small (formal and informal) recyclers. The large recyclers have been interviewed and a best possible estimate of the smaller recyclers was calculated through interviews with some of the small recyclers and by compiling the lists of recyclers obtained from government stakeholders, desktop research and responses received from major HDPE recyclers.

Figure 18.

MATERIAL FLOW ANALYSIS OF HDPE RESIN IN MALAYSIA (TPY)

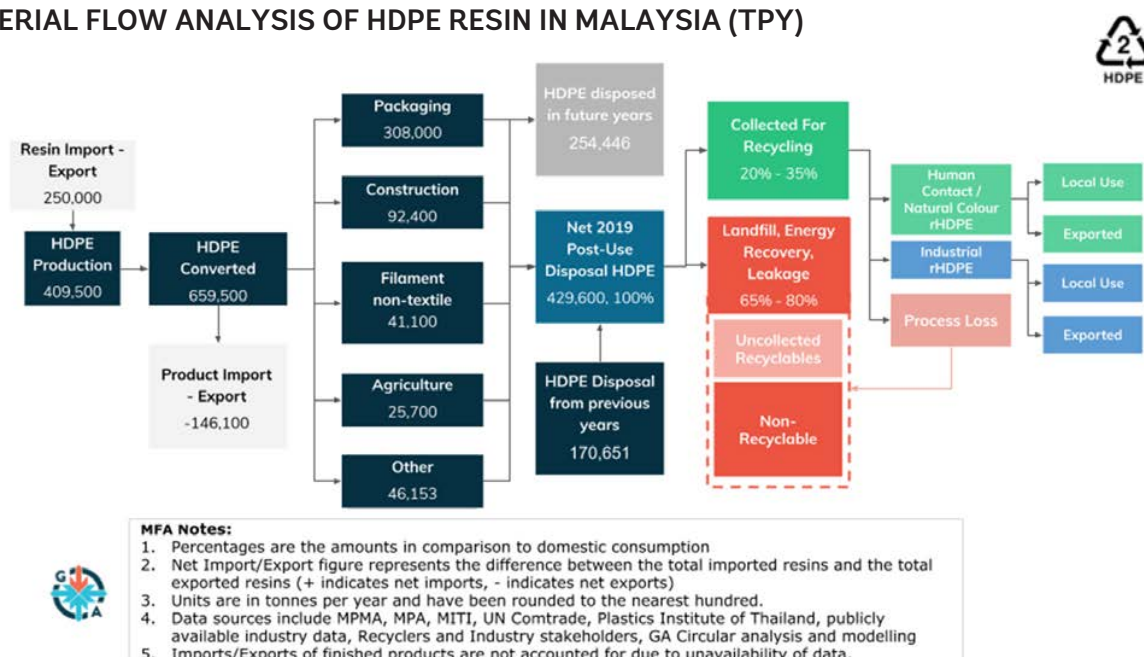


Figure 18 Notes:

1. Data sources for resin production, imports and exports, material accumulation in future years and disposal from previous years, consumption, and CFR and its breakdown include: Malaysian Plastics Manufacturers Association (MPMA), Ministry of International Trade and Industry (MITI), UN Comtrade, publicly available industry data, recyclers and industry stakeholders including brand owners, industry associations and NGOs, GA Circular analysis and modelling.
2. Most of these values have wide fluctuations. The values shown in this chart are our best average estimates of the realities.

3. HDPE components that are non-recyclable are those used in composite products in industrial applications (e.g. in electronics, automotives). The composite nature of the products mean that an additional step of dismantling and separation is required before it can be collected for recycling. This requires dedicated facilities which currently do not exist.

Material Value Loss Analysis for HDPE

Figure 19 represents the value unlocked for HDPE based on the MFA for HDPE. The key findings are:

- Average CFR is 28% and Value Yield is 74%. This results in a material value unlocked of 20%.
- Therefore, an average of 80% of the material value of HDPE is lost. This is equivalent to USD 327–376 million of material value lost per year.

Figure 19.

MATERIAL VALUE LOSS ANALYSIS FOR HDPE (BASED ON 2019 VOLUMES)

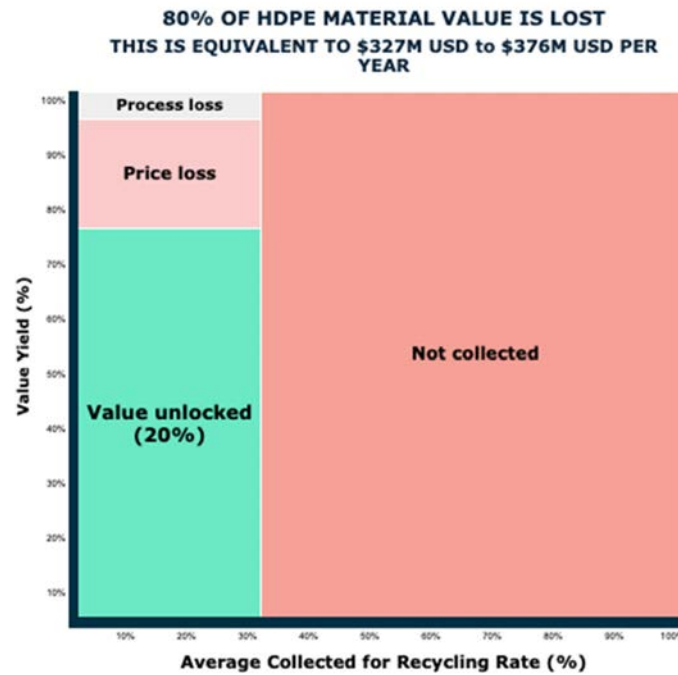
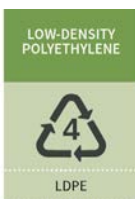


Figure 19 Notes:

1. Value yield = volume yield x price yield where volume yield = output volumes/input volumes, and price yield = weighted average USD per tonne of reprocessed HDPE/USD per tonne of most valuable recycled product from HDPE.
2. 100% CFR rate and value yield has been used in material value analysis across this study for illustrative purposes only as targets are typically set based on 100% of market inputs/material.
3. MVRP for HDPE is rHDPE food-grade pellets which are being manufactured in some countries but not yet in Malaysia. As only some of Malaysia's HDPE can be turned into rHDPE food-grade, a weighted average of the different products is used to calculate the MVRP price for rHDPE.
4. Current situation for HDPE is an average of 95% volume yield (as process losses are approximately 5%) and 78% price yield, thus giving a 74% value yield.
5. Total volume of HDPE is 429,600 TPY, and MVRP under weighted average best circular scenario price of USD 1,028/ton.
6. CFR rate only includes HDPE (not other contaminants).
7. Process losses only includes HDPE (not other contaminants).
8. All percentages used here are weighted average values.
9. Please see Appendix 6 for further information regarding the values and calculations.



2.2.4. LDPE/LLDPE

General Characteristics of LDPE

LDPE is a thermoplastic polymer produced from the monomer ethylene. While it has a slightly lower density, the ability to make it in transparent

form means that it is used mainly in film applications for both packaging and non-packaging applications. Some products that can be made from LDPE are:

- Meat and poultry wrapping
- Dairy products
- Snacks and sweets
- Frozen food bags
- Baked goods

LDPE can be recycled into the following:

- Plastic lumber, furniture
- Trash bags, sheeting, films (for agriculture)
- Flooring

Major LDPE Producers and Recyclers in Malaysia

Figure 20 shows the respective amounts of virgin LDPE/LLDPE production and recycled LDPE/LLDPE production for the major producers and large recyclers reviewed under this study.

Figure 20.

MAJOR PRIVATE SECTOR STAKEHOLDERS FOR LDPE/LLDPE RESIN PRODUCTION AND OVERALL RECYCLING CAPACITY (2019)

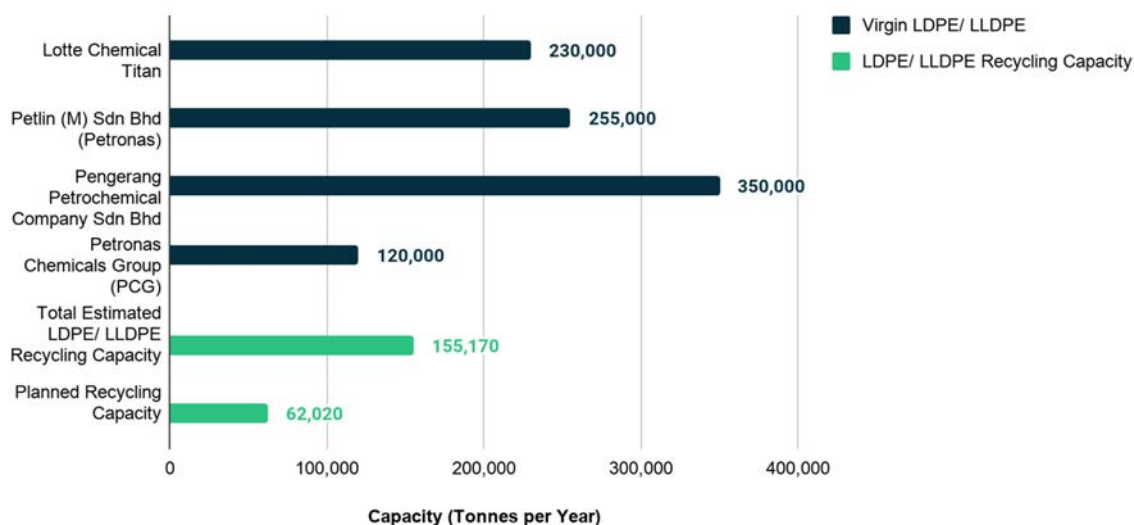


Figure 20 Notes:

1. The capacity values stated are for 2019. The producer capacities and Estimated Recycling Capacity are based on 2019 values while the Planned Recycling Capacity is as of December 2019 (will become operational during 2020/ 2021).
2. The producer capacity figures are based on publicly available information, which have been validated through survey responses or interviews with the stakeholders.
3. The recycling capacity figures are based on questionnaire responses/ interviews for this study or other studies by GA Circular, or based on publicly available information or past conversations, which could not have been validated as they have not been available for questionnaire responses/ interviews for this study. Larger LDPE/LLDPE recyclers include Danex Plast Sdn Bhd, EPD Plastic Industries Sdn Bhd, Plasticycle Industries Sdn Bhd, Preference Megacycle Sdn Bhd. Other LDPE/LLDPE recyclers include but are not limited to FizLestari Sdn Bhd, Gold Mine Polymer (M) Sdn Bhd, Ipoh S.Y. Recycle Plastic Sdn Bhd, KPT Packaging Sdn Bhd.
4. While key stakeholders are represented in the above, this is not an exhaustive list of all LDPE/LLDPE producers and recyclers in Malaysia.*

* The data for LDPE/LLDPE production is representative as this study team has received inputs from all LDPE/LLDPE resin producers from MPA. LDPE/LLDPE recycling is fragmented with a few large recyclers and many small (formal and informal) recyclers. The large recyclers have been interviewed and a best possible estimate of the smaller recyclers was calculated through interviews with some of the small recyclers and by compiling the lists of recyclers obtained from government stakeholders, desktop research and responses received from major LDPE/LLDPE recyclers.

Material Flow Analysis (MFA) for LDPE/LLDPE

There are three key messages from the MFA of LDPE/LLDPE, as shown in Figure 21:

1. LDPE has a CFR rate of about 5%–15%. This CFR range is estimated based on interviews with key local stakeholders and past research conducted by GA Circular.
2. A high proportion of LDPE is used in film packaging applications, which includes food packaging. These LDPE products are contaminated and therefore have low value yields and remain uncollected.
3. LDPE components that are non-recyclable are those used in composite products in industrial

applications (e.g. in electronics, automotives). The composite nature of the products mean that an additional step of dismantling and separation is required before it can be collected for recycling.

Material Value Loss Analysis for LDPE/LLDPE

Figure 22 represents the value unlocked for LDPE/LLDPE based on the MFA in Figure 21. The key findings are:

- Average CFR is 10% and Value Yield is 84%. This results in a material value unlocked of 8%.
- Therefore, an average of 92% of the material value of LDPE/LLDPE is lost. This is equivalent to USD 258–283 million of material value lost per year.

Figure 21.
MATERIAL FLOW ANALYSIS OF LDPE/LLDPE RESIN IN MALAYSIA (TPY)

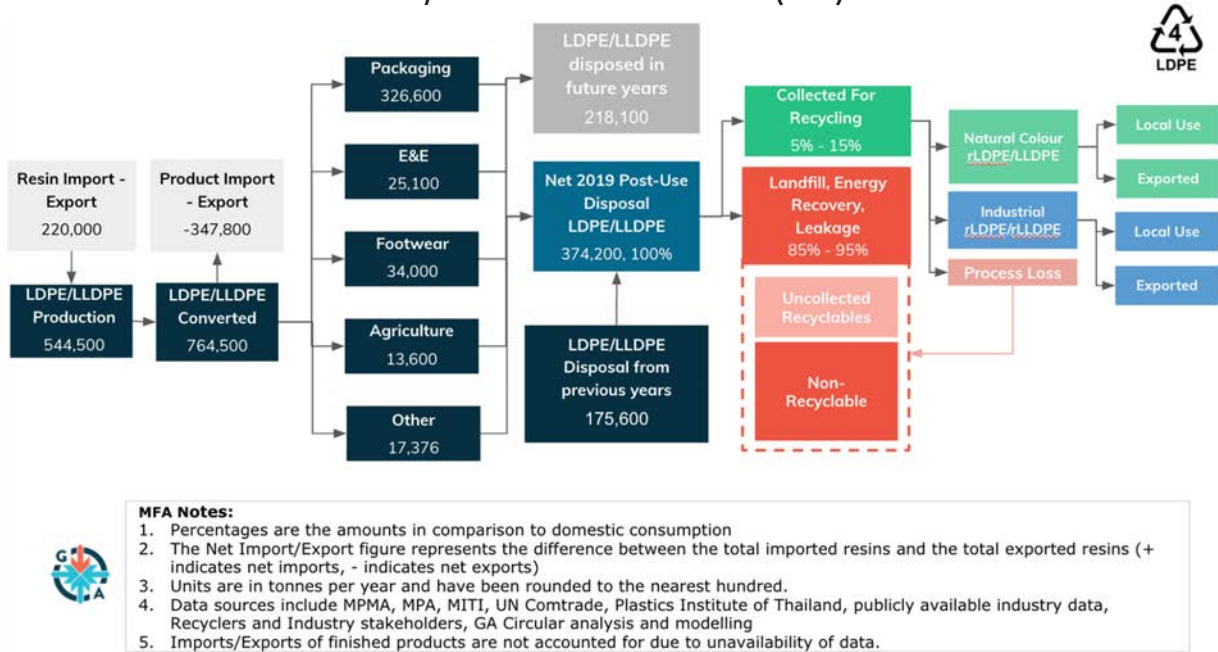


Figure 21 Notes:

1. Data sources for resin production, imports and exports, material accumulation in future years and disposal from previous years, consumption, and CFR and its breakdown include: Malaysian Plastics Manufacturers Association (MPMA), Ministry of International Trade and Industry (MITI), UN Comtrade, publicly available industry data, recyclers and industry stakeholders including brand owners, industry associations and NGOs, GA Circular analysis and modeling.
2. Most of these values have wide fluctuations. The values shown in this chart are our best average estimates of the realities.

Figure 22.
MATERIAL VALUE LOSS ANALYSIS FOR LDPE/LLDPE (BASED ON 2019 VOLUMES)

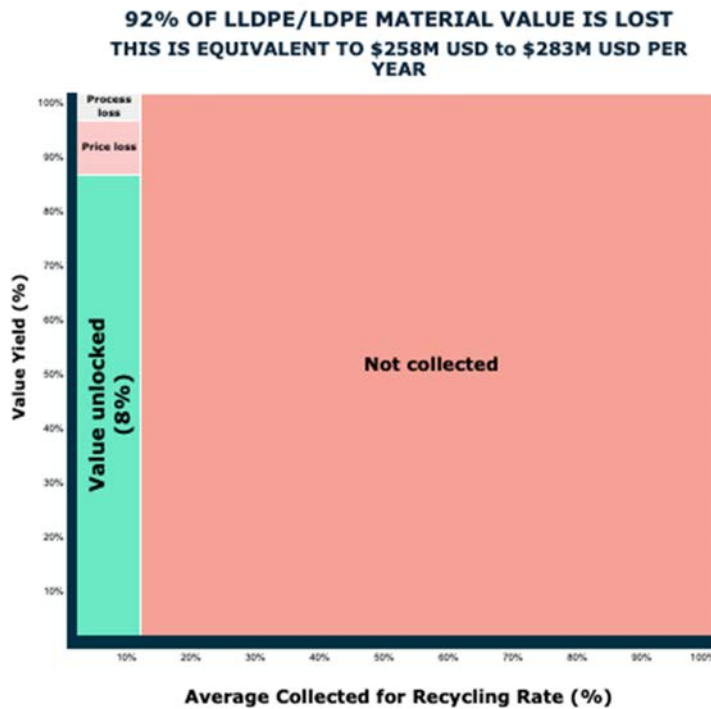


Figure 22 Notes:

1. Value yield = volume yield x price yield where volume yield = output volumes/input volumes, and price yield = weighted average USD per tonne of reprocessed LDPE or LLDPE/USD per tonne of most valuable recycled product from LDPE or LLDPE.
2. 100% CFR rate and value yield has been used in material value analysis across this study for illustrative purposes only as targets are typically set based on 100% of market inputs/material.
3. MVRP for LDPE or LLDPE is rLDPE natural pellets. As only some of Malaysia's LDPE/LLDPE can be turned into rLDPE natural pellets, a weighted average of the different products is used to calculate the MVRP price for rLDPE.
4. Current situation for LDPE or LLDPE is an average of 95% volume yield (as process losses are approximately 5%) and 88% price yield, thus giving a 84% value yield.
5. Total volume of LDPE or LLDPE is 374,200 TPY, and MVRP under weighted average best circular scenario price of USD 789/ton.
6. CFR rate only includes LDPE or LLDPE (not other contaminants).
7. Process losses only include LDPE or LLDPE (not other contaminants).
8. All percentages used here are weighted average values.
9. Please see Appendix 6 for further information regarding the values and calculations.

2.3 SUMMARY

2.3.1. MFA for all Resins

Key insights after comparing the MFA of all resins:

1. As shown in Figure 23, PET Packaging has the highest CFR rates of all four resins because:
 - > The number of end-use applications that are used by PET packaging is limited compared to other materials, which simplifies the collection process. A majority of the usage of PET is for food and beverage packaging and collectors are able to easily identify them (e.g. PET plastic bottles). On the other hand, other resins can be used in a wide range of applications such as electronics, automotives and construction components, which complicates the process of collection.
 - > Existing PET recycling technologies have relatively high capacities for processing PET packaging into various applications and strong demand from global end-use markets for rPET, which give PET packaging recycling a head start compared to the recycling for other resins.
 - > The recycled products from PET such as rPSF and rPOY can be readily absorbed by the fiber industry in Malaysia, indicating rPET is well-integrated with the current industrial ecosystem.
 - > PET packaging has a much lower consumption amount than the other resins (about 148,100 TPY for PET packaging versus an estimated 425,800 TPY for PP packaging, 429,600 TPY for HDPE packaging and 374,200 TPY for LDPE/LLDPE packaging).
2. The recycling rates for PP and HDPE are much higher than for LDPE/LLDPE, and PP is estimated to be slightly higher than HDPE, as shown in Figure 24. This is due to several reasons:
 - > Firstly, film applications make up a much larger proportion of LDPE and LLDPE than either PP or HDPE. Because plastic films have a lower value due to the difficulty in collection (its light weight means that more pieces need to be collected per kg of material) and a high contamination rate, plastic films are collected in much lower amounts than rigids by the informal sector.
 - > Second, according to stakeholder interviews, PP has the highest demand out of all the polyolefins because it has the potential to be converted into the most amount of applications, indicating it has the broadest customer base out of the four resins studied. It has the highest value, which means that the informal sector has higher collection preference for PP.
3. The weighted average of the CFR rates of all the key resins is 24%. For context, the global CFR rate for PET is between 55%–57%¹⁹ (global CFR rates specifically for polyolefins are unavailable) while the Ellen MacArthur Foundation estimates the CFR rate for plastic packaging to be 14%.²⁰
4. 1.41 million TPY of the key resins are consumed in Malaysia. Of this, 334,000 TPY are recycled, while 1.07 million TPY are not recycled.

19 S&P Global Platts Petrochemicals Special Report (2019)

20 The New Plastics Economy: Catalyzing Action (2017)

Figure 23.
ESTIMATED CFR RATES FOR EACH RESIN (2019)

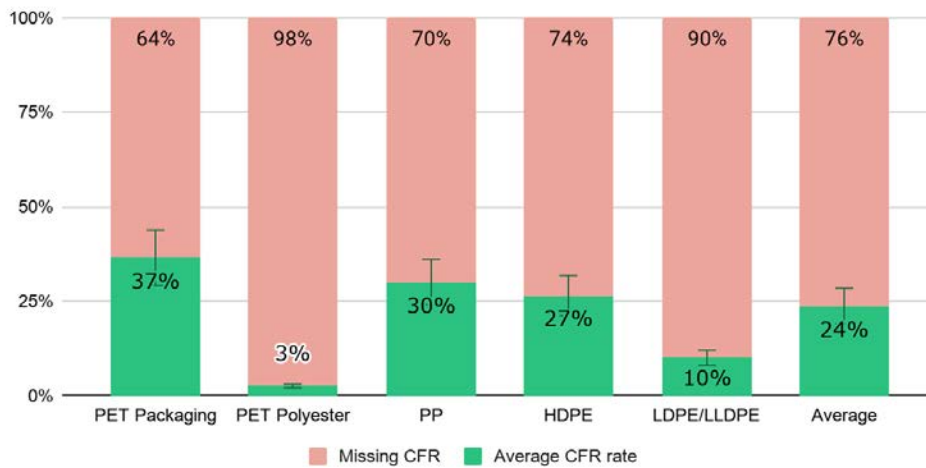
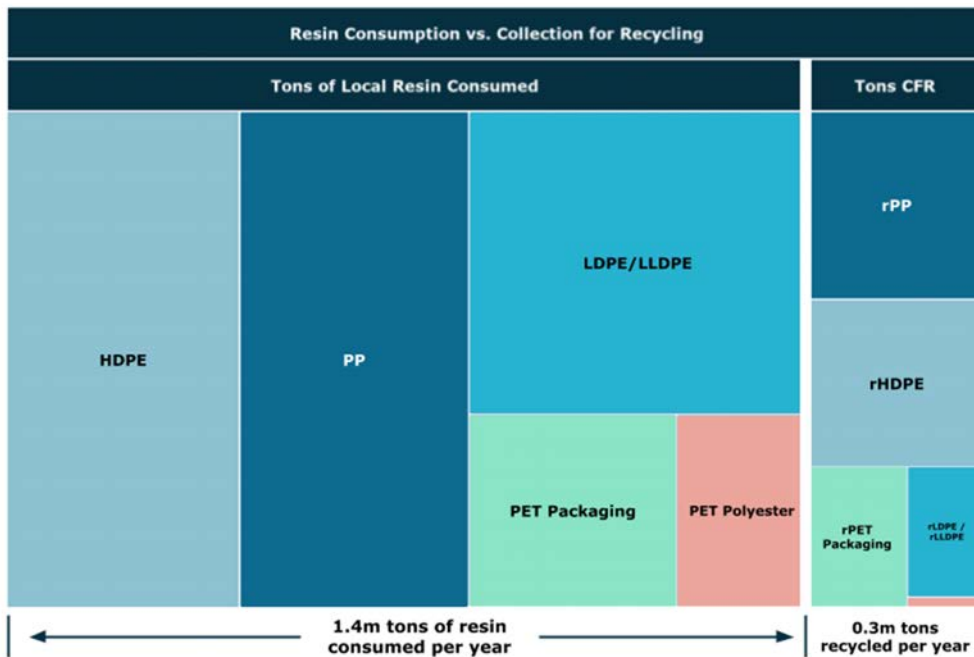


Figure 24.
ESTIMATED TOTAL COLLECTED FOR RECYCLING OUT OF TOTAL CONSUMPTION FOR EACH RESIN



2.3.2. Material Value Loss Analysis for all Resins

To support the sense of urgency needed to address this plastics circularity gap, Figure 25 summarizes the net material value lost each year in Malaysia due to this gap.

- Malaysia unlocks USD 234 million/year from recycling various plastic resins. This is a relatively sizable sub-sector of the petrochemical industry.
- Malaysia has the potential to unlock material value up to USD 1.3 billion/year from recycling various plastic resins.
- Currently, just 19% of the possible value from recycling is unlocked, leading to a loss of 81% of the value, as shown in Figure 26. This is equivalent to a loss of USD 1–1.1 billion/year and is the theoretical maximum addressable market opportunity for plastics circularity for Malaysia.

Figure 25.
ESTIMATED MATERIAL VALUE UNLOCKED VS. MATERIAL VALUE LOST

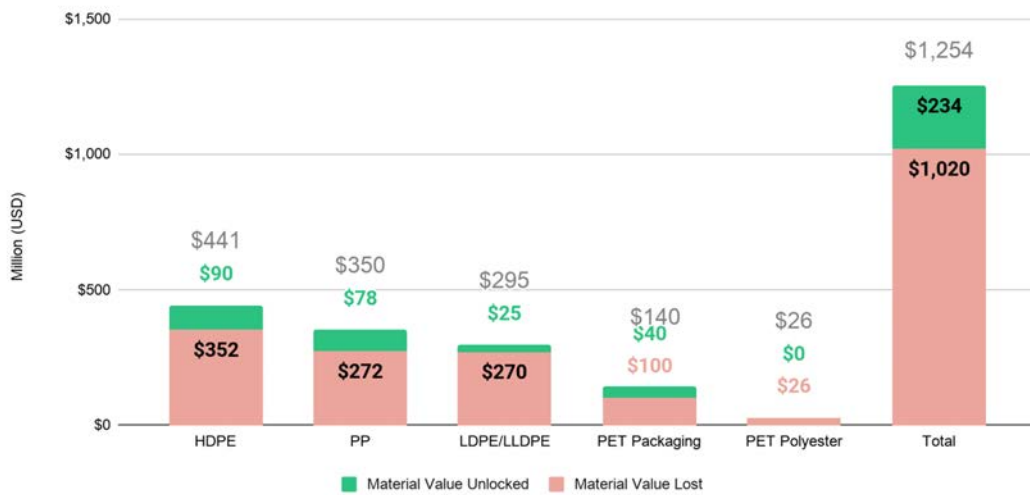


Figure 26.
MATERIAL VALUE LOSS ANALYSIS FOR ALL KEY RESINS (BASED ON 2019 VOLUMES)

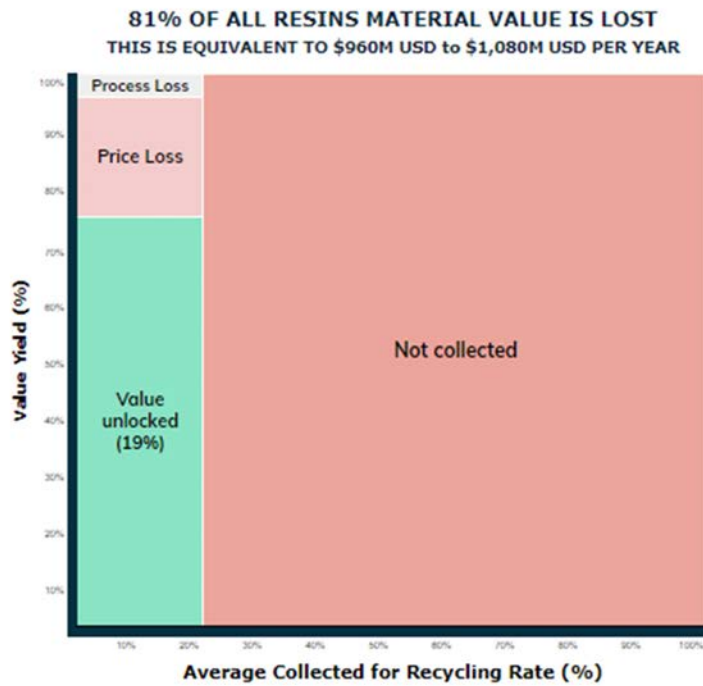
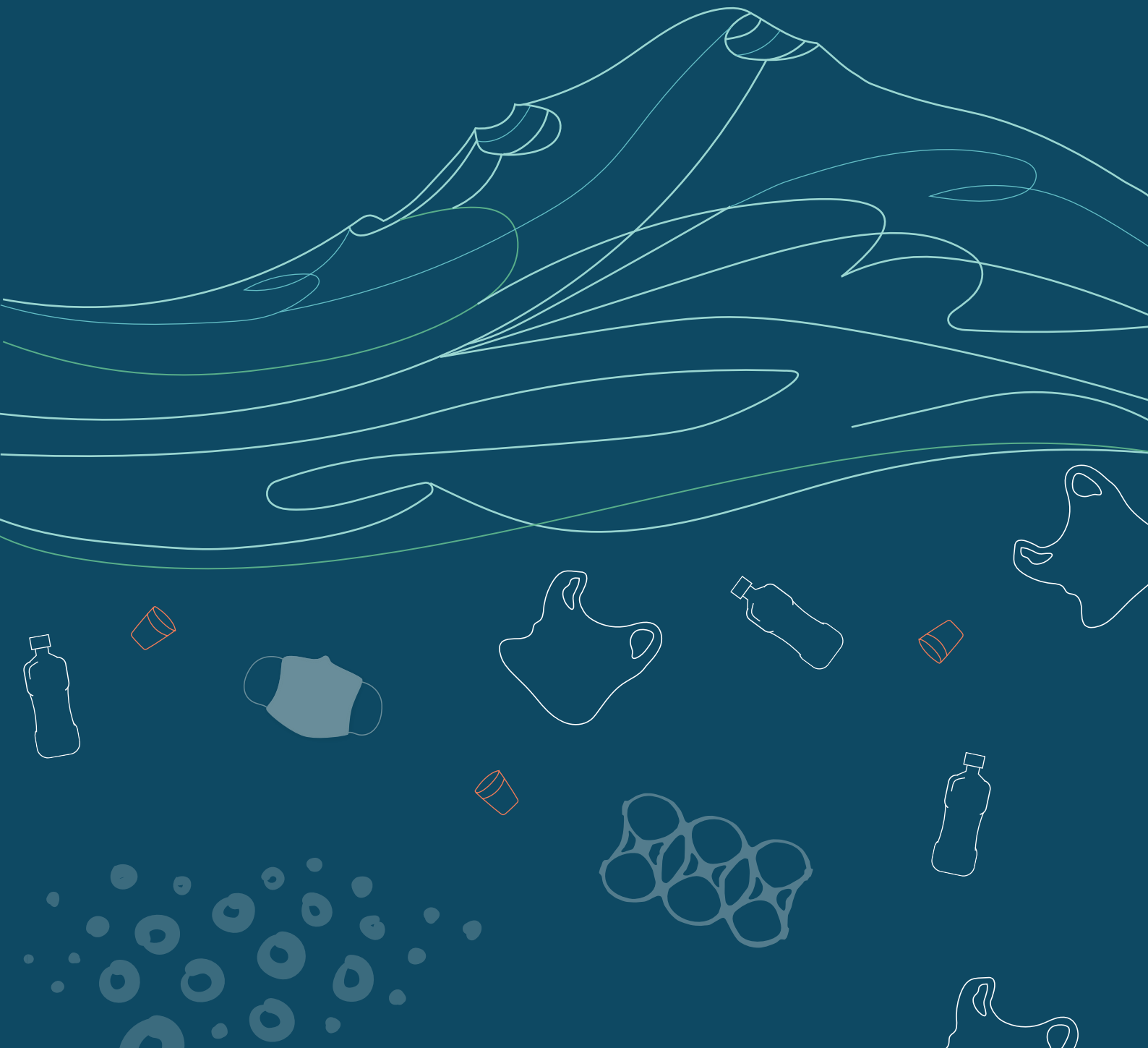




Photo: Rich Carey / Shutterstock

SECTION 3:

WHY 81% OF MATERIAL VALUE OF PLASTICS IS LOST



SECTION 3:

WHY 81% OF MATERIAL VALUE OF PLASTICS IS LOST

As seen in the previous section, 1.07 million tonnes of the four key plastic resins consumed in Malaysia is not recycled and in doing so 81% of the material value is lost. This section presents the two main categories of pressures that cause this material value loss: 1) Pressures that impact CFR (covered in section 3.1) and 2) Pressures that impact CFR Rate and Value Yield (covered in section 3.2).

While the CFR and Value Yield data used in this study is based on volumes from 2019, COVID-19 has had a significant negative impact on the health of the recycling industry impacting both CFR and Value Yield. The recent tightening of global regulations on scrap plastic and recycled plastic trading announced in 2020 have also had an impact on the demand and prices of recycled resins. These additional impacts of COVID-19 and the tightening global regulations are covered in sections 3.3 and 3.4 respectively. Lastly, bioplastics consumption is covered in section 3.5.

3.1 PRESSURES IMPACTING CFR RATE

3.1.1. Lack of Local Demand Requirements for Recycled Plastics across all Key Resins

The prices of recycled plastic are directly affected by changing prices of virgin plastic, which in turn is affected by global oil price volatility. Taken over the last 3-year period, most of the recycled resins have seen a steady drop in global prices since peaking around mid-2018²¹. Based on industry interviews in Southeast Asia, plastics recycling tends to be competitive when the oil prices are above USD 70/barrel which was last reached in September 2018. As at the end of April 2020, the oil prices are 76% lower at USD 17/barrel. When competing just on the basis of price, recyclers report that their recycled products need to be between 15–30% cheaper than virgin resin-based products in order to be competitive. When virgin resin prices fall to be just above or equal to recycled resin prices, manufacturers generally switch back to virgin resins. The only exception is that some recyclers in Malaysia have reported a continued demand for recycled resin from overseas markets that have commitments to incorporate more recycled content into their products.

As shown in Figure 27, recycled material struggled to compete in 2019 due to low and falling virgin prices in Malaysia. The gray shaded area indicates between a 0% to 30% reduction against virgin prices, within which recycled resins are challenged and below which recycled resins are competitive against virgin. Please see Appendix 8 for the price comparisons between virgin and recycled PP, PET and LDPE in Europe and in Malaysia.

21 See Appendix 8 for price charts showing virgin resins, recycled resins and oil prices for all key plastic resins.

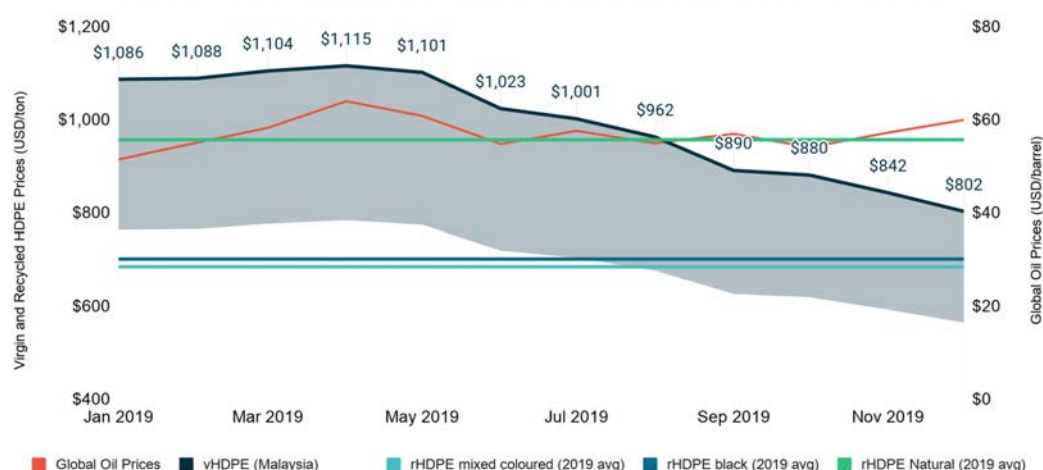
Based on industry sources for Malaysia, virgin prices need to be between USD 1,000 to USD 1,200 for formal recyclers (following all standards—e.g. EHS standards) to achieve break-even status. For recyclers to obtain 15% profit (a benchmark desired in any industry), the virgin prices would need to be between USD 1,200 to USD 1,400. As shown in Table 3, the virgin prices for 2019 are well below the levels required for the survival of the existing recycling industry. The 2019 situation was further exacerbated in 2020, as the COVID-19 induced economic downturn caused oil prices and virgin plastic prices to plummet, leading to

even greater pressure on recycled plastic prices. As a result of this economic downturn and high burn rates during COVID-19 lockdowns, 30-50% of recyclers in the Southeast Asia region are expected to continue operations with limited impact and 40-60% are at risk of permanent closure or bankruptcy.²² For the plastic recycling industry to recover and eventually achieve plastics circularity targets, policy interventions are critical.

22 [Safeguarding the Plastic Recycling Value Chain report \(2020\)](#).

Figure 27.

COMPARISON OF VIRGIN HDPE AND RECYCLED HDPE PRICES IN MALAYSIA AND GLOBAL OIL PRICES



Source: S&P Platts for Virgin Resin Prices (via MPA) and Recyclers for Recycled Resin prices

Figure 27 Notes:

1. The range of 0–30% reduction against virgin prices (the gray shaded area) can also be higher. For example, some recyclers have reported that they need to sell at 30% less than virgin prices to be competitive.
2. Some recyclers are also able to sell at/above virgin prices due to specific brand stories related to that recycled plastic (e.g. ocean bound plastics) or due to other unique selling propositions (USP) of the recycler, however this is the exception, not the rule.
3. Monthly recycled prices are not available and thus 2019 average recycled sales prices obtained from recyclers in Malaysia have been used for comparison.

Table 3.

VIRGIN PRICES IN MALAYSIA IN 2019 AND 2020 COMPARED TO PRICES REQUIRED FOR VIABILITY OF PLASTIC RECYCLING BUSINESSES

| | 2019 (USD/Ton) | 2020 (YTD June) (USD/Ton) | Virgin Price that enables Recyclers to Break-Even | Virgin Price that enables Recyclers to obtain 15% profit |
|------|----------------|---------------------------|---|--|
| PET | Unavailable | \$742 | | |
| HDPE | \$991 | \$787 | \$1,000 - \$1,200 | \$1,200 - \$1,400 |
| LDPE | \$1,019 | \$800 | | |
| PP | \$1,077 | \$859 | | |

Sources: S&P Platts for Virgin Resin Prices (via MPA) and Industry Sources for prices required for plastic recycling business viability.



The cost of recycling and all related costs (e.g. logistics) is often higher than the virgin or off-take price. The economics of recycling don't work out anymore.

Recycling Stakeholder

Decoupling Recycled Resins from Virgin Resins

Government and industrial interventions are critical in driving up demand for recycled plastics, as demonstrated by several efforts in the EU that accelerate the market value of recycled PET. In May 2018, the European Federation of Bottled Waters, an industry association of bottlers in Europe, pledged publicly to include at least 25% of rPET into the production of new bottles by 2025. The EU's Single Use Plastics Directive, implemented in July 2019, also mandates a target of 25% rPET usage in bottles by 2025 and 30% by 2030. As a direct result of these efforts, the price of food-grade resins such as food-grade rPET has begun a partial decoupling from virgin PET prices from August 2018 onwards (as shown in Figure 28).

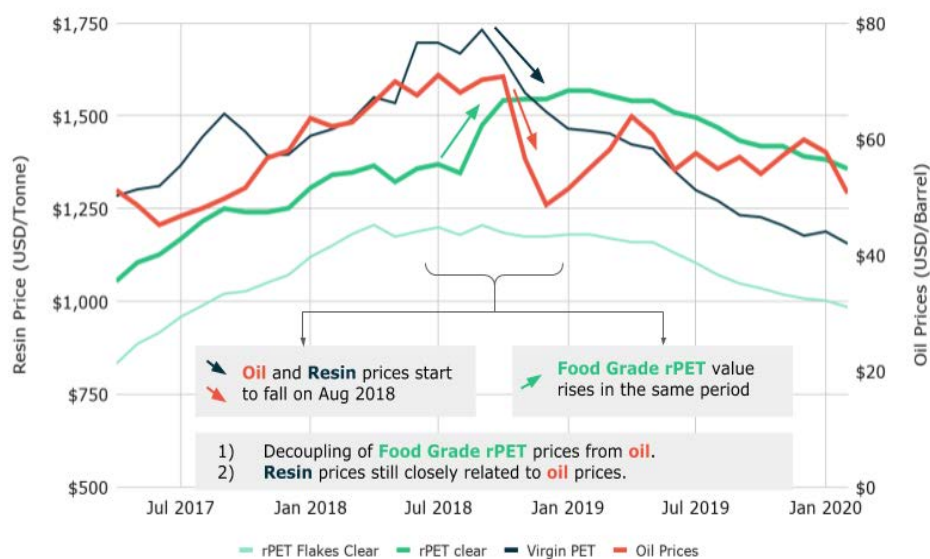
However, as no such specific recycled content targets exist for PP, HDPE or LDPE/LLDPE in the EU, the prices for these recycled resins have remained low in comparison to their virgin resin counterparts and have not seen a significant increase in prices as compared to rPET. Please see Appendix 8 for the

EU price comparisons between virgin and recycled material for PP, HDPE and LDPE resins.

Many global brands that use packaging have made voluntary commitments to use recycled content as part of the New Plastics Economy (NPE) commitments. While this is certainly a step in the right direction, industry-wide mandates are important for significant change. The voluntary commitments of the companies in the NPE account for 20% of global annual plastic packaging usage. Considering plastic packaging is about 40% of all plastic consumed globally, such commitments account for 8% of all plastic consumption. As recycled content targets are generally 25–50% under the NPE commitments, these commitments would only increase plastic circularity by about 2–4%.

Without intervention in Malaysia to stimulate local demand, recyclers will continue to remain fully exposed to global drops in oil and virgin plastics prices, thus reducing the CFR rate and putting growing numbers of recyclers at risk of bankruptcy.

Figure 28.
EU PRICE COMPARISON OF VIRGIN PET AND RECYCLED PET



Source: Industry data

Note: EU prices for virgin plastics and recycled plastics have been used as a proxy for global prices because it is the region which has the greatest price transparency/data availability for virgin prices and recycled prices.



We have considered investing in a recycling facility. But we cannot put a few million dollars on the table unless we have certainty that there will be demand. So that we have certainty we will get a return on investment. We need recycled content targets.

Resin Producer

Mandating Recycled Content Targets and Malaysia's Ability to Fulfill These Targets

Countries in the EU as well as the UK, India and several other countries have started to take steps to reduce the impact of the oil price volatility on their recycling industries by **mandating recycled content targets**. These mandated requirements acknowledge that voluntary initiatives by the industry can only thrive when supported by a credible prospect of government regulation if the industry does not deliver. Additionally, the virgin plastic market prices today do not factor in the environmental impact, the cost of waste management or other negative externalities that are currently borne by the government. The government is the only actor that can address this market failure. It must be noted that there are currently no recycled content requirements for plastics in Malaysia.

Increasing the usage of recycled content also limits the usage of virgin plastics and GHG emissions—a growing focus among consumer goods companies. For example, by sourcing a wider range of recycled food-grade plastics and by increasing the recycled content target in its water bottles to 50% by 2025, Nestle estimates that it will reduce its use of virgin plastics globally by one-third by 2025.²³ While switching to recycled content that substitutes virgin plastics may be technically feasible for specific applications, specific challenges need to be overcome.²⁴ Please refer to Appendix 9.1 for these challenges.

There is already sufficient recycling capacity in Malaysia to enable implementation of recycled content targets of at least 15-30%, as can be seen in Appendix 9.2. Malaysia should consider more ambitious targets than the current recycled content MaSPA target (15% average recycled content to be achieved across all plastic packaging by 2030), as such a target is well within reach by 2025. Malaysia should consider higher recycled content targets of 30% by 2030—and should

legislate the targets to provide certainty to enable investments in plastics circularity.

See Box 1 for examples of enabling policies for the packaging industry from benchmark countries (the European Union, Japan, India) that stimulate local demand while reducing recycling industry's exposure to price volatility. (Further details can be found in Appendix 14.2.)

Applying EPR tools, such as mandating recycled content targets, is key to decoupling recycled plastic demand from fluctuating virgin plastic prices. Such mandates are needed to create the enabling environment for investments into plastics circularity.

3.1.2. Gap in Recycling Capacities and Reliance on Higher Quality Imports

The current gap in recycling capacity in Malaysia is symptomatic of the low and fluctuating demand of recycled plastics from within the local market in Malaysia, as outlined in section 3.1.1. As shown in Figure 29, the gap between the estimated installed capacity and the total resins consumed (or the "missing capacity") is equivalent to 629,465 TPY or 45% of the total resins consumed. Other than PET packaging, whereby the installed capacity is greater than the resin consumed, the gap is smallest for PP (34% gap) and is most pronounced for PET polyester (95-100% gap), followed by HDPE (71% gap) and LDPE/LLDPE (59% gap). Based on data obtained during interviews with recyclers, the planned (upcoming) recycling capacity across all the key resins adds up to 169,000 TPY or 24% of the gap that needs to be overcome. This report acknowledges that the MPMA estimates about 1.5 million tonnes of recycling capacity,²⁵ which is much more than the 882,000 tonnes of total capacity estimated by this study. This is because the figure estimated by the MPMA includes all plastic resins, while this report only focuses on the four key resins.

23 [Nestle: What is Nestlé doing to tackle plastic packaging waste?](#)

24 [Digital Europe: Best Practices in Recycled Plastics \(2016\)](#)

25 [MPMA, White Paper on An Advanced Plastics Recycling Industry for Malaysia](#). 1.5 million tonnes is based on revenue estimate by MPMA of RM4.5 billion per year.

BOX 1.
POLICIES THAT STIMULATE LOCAL DEMAND



PACKAGING

The EU Single-Use Plastics Directive requires all PET plastic bottles to meet a 25% recycled content target by 2025 and 30% recycled content target by 2030.

The UK recently announced that the tax on plastic packaging containing less than 30% recycled content will come into force in April 2022, and will be set at £200/tonne.

Under the EU Strategy for Plastics in the Circular Economy, the European Commission calls on stakeholders to come forward with voluntary pledges to boost the uptake of recycled plastics. The objective is to ensure that by 2025, 10 million tonnes of recycled plastics find their way into new products on the EU market.



ALL INDUSTRIES

The EU has proposed a €0.80/kg tax covering every kg of non-recycled plastics produced in the EU. Under the EU Strategy for Plastics in the Circular Economy, the EU has outlined plans for future targeted sectoral interventions for uptake of recycled plastic content, such as in construction and automotive sectors.

Given China’s National Sword Policy and subsequent scrap plastic import bans in several countries that restrict key export routes for plastics waste collected for recycling, the EU recognizes the urgent need to develop a European market for recycled plastics. The EU pledged to work with the European Committee for Standardisation and with the industry to

develop quality standards for sorted plastic waste and recycled plastics.

The EU is integrating recycled content in Ecolabel and Green Public Procurement criteria. The French government initiative Objective to Recycle Plastics (ORPLAST) and Italy’s new rules on public procurement are two examples of what could be done at national level. The ORPLAST project of the Environment Agency (ADEME) in France supports 33 industry projects for the reincorporation of recycled plastics by helping manufacturers to study and invest in order to use recycled material, combined with a grant to fill the gap between the price of fossil plastics and the price of recycled ones.

Maharashtra state in India will soon require all manufacturers of industrial plastics to use 25% recycled content.

Figure 29.
ESTIMATED INSTALLED CAPACITY VS MISSING CAPACITY FOR RECYCLING OF MAJOR RESINS IN MALAYSIA

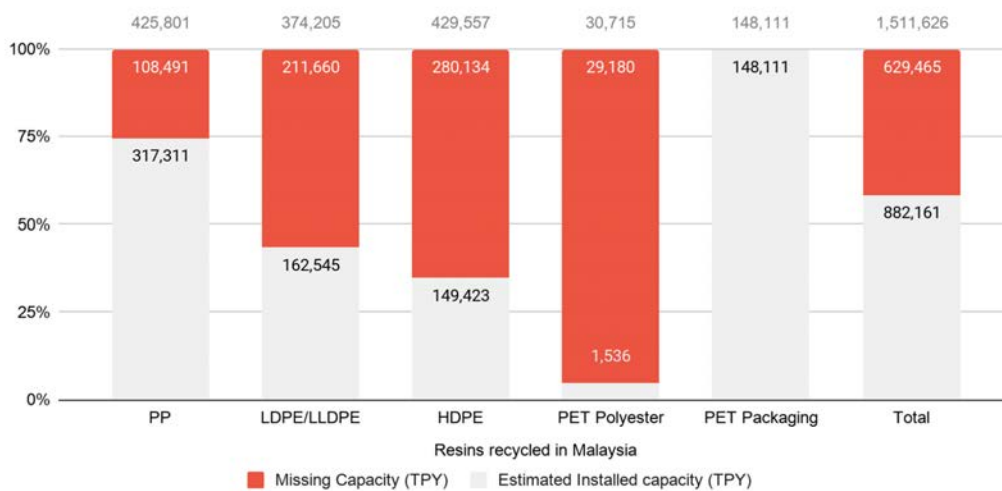


Figure 29 Notes:

1. Please refer to Appendix 10 for the calculations used to derive the recycling capacities.
2. Total estimated PET packaging recycling capacity is 251,300 TPY (more than PET packaging consumption in Malaysia). The “total” estimated installed capacity figure of 882,161 TPY includes the total PET packaging installed capacity of 251,300 TPY.



We import 60% of our feedstock for processing because the quality is much better than locally sourced feedstock and we can get consistent quantity.

Recycling Stakeholder

Lack of local demand for recycled plastics, especially for recycled plastics with high value end-use applications, leads to poor investment in recycling capacities and advanced facilities, financial value and margins, and results in lower **CFR rate**.

Reliance on Imports of Higher Quality Scrap Plastic

Plastic waste is a controlled item under the Solid Waste and Public Cleansing Management Act 2007 (Act 672). The importation of plastic waste under the HS Code 3915 is controlled under the Customs Order 2017 wherein the plastic scrap importer is required to have an approved permit (AP) from JPSPN. It is estimated that up to 70% of the existing installed recycling capacity in Malaysia is used for imported plastic scrap for plastic waste HS code 3915.

Due to the large increase in the import of plastic scrap into Malaysia as a direct result of the China’s National Sword Policy, KPKT announced a list of stringent conditions as criteria to recyclers/manufacturers to apply for AP on 26 October 2018, to curb the influx. This led to the import levels of plastic waste under HS Code 3915 falling by 62% from 872,531 tonnes in 2018 to 333,500 tonnes in 2019.²⁶ Assuming 70% of the imported plastic scrap in 2019 was PET, PE and PP (233,450 tonnes), 28% of the total estimated installed capacity of 825,000 tonnes in 2019 was used for recycled imported scrap plastics. The list of import conditions can be found in Appendix 11.

Based on a comparison of Malaysia’s scrap plastic imports and exports between 2017, 2018 and 2019 (Appendix 12), Malaysia is a net importer of plastic

scraps. Plastic recyclers rely on imports of clean scrap plastic because:

- Imported material is often cheaper (eg. of Q4 2019, HDPE local material was 17% more expensive than imported material, and PET local material was up to 20% more expensive).
- Local material is of poorer quality due to lack of “design-for-recycling” (eg. contamination through PVC in case of PET; contamination through calcium carbonate in case of HDPE) and local material has higher amounts of contamination (e.g. dirt, other materials/waste). Countries from which the scraps are imported have typically good source separation or bottle deposit systems in place, which often enable very clean material.
- Imports provide a steady guaranteed tonnage, whereas in the local market, a steady flow is not guaranteed.

Box 2 provides examples of enabling policies for packaging industry from benchmark countries that support increase in recycling capacity and the implementation of EPR—which mandates recycled content targets, recycling targets and coverage of the costs of post-consumer collection of plastics. (Further details can be found in Appendix 14.2.)

3.1.3. Investments in Plastic Recycling Industry Remain Small Compared to Recycling Capacity Needs, Targeted Incentives Remain Lacking

Based on data from Malaysian Investment Development Authority (MIDA), as of 2018, a total of 55 plastic recycling projects were in operation with cumulative total investments of RM713.9 million from past years.

²⁶ UN Comtrade Malaysia imports of plastic waste under HS Code 3915



We applied for the government help, but it did not help us as we realized that it was only on tax relief.

Recycling Stakeholder

Note: Many recyclers are currently not profitable and tax incentives have limited efficacy.

In 2019, there was a 33% increase in investments into the plastic products manufacturing industry, from RM 1.9 billion (2018) to RM 2.48 billion (2019). In 2019, of the 87 approved investments, 75 of the approved investments were in the virgin plastic products manufacturing industry while 12 were recycling projects with investments in 2019 amounting to RM815.5 million. These projects were approved based on their commitment to completely obtain their raw materials from local sources.²⁷

While these investments in plastic recycling are growing, in 2019, the investments in plastic recycling are still comparatively small against the recycling capacity needs. Table 4 shows the breakdown in investments for plastic recycling projects and the percentage of plastic recycling project investments out of total investments into the plastics industry. The approved investments in plastic recycling as a percentage of the plastics industry from 2018 to 2019 grew from 18% to 33%.

27 [Malaysia Investment Performance Report 2019](#)

While still a small proportion of total investment in the plastic industry, the amount of approved investments in 2019 (RM 815.5 million) is a sharp increase from the amount of approved investments for recycling in the past with the total cumulative amount invested from 1980 to 2018 in plastic recycling being RM 713.9 million.

In order to move towards higher plastic CFR rates, the investments into plastic recycling needs to be on par or higher than the virgin plastics industry. Currently, the plastics manufacturing industry can apply for two main categories of incentives available for the manufacturing industry:²⁸

1. **Pioneer Status (PS)** with income tax exemption of 70% or 100% of statutory income for 5 or 10 years. Unabsorbed capital allowances incurred during the pioneer period can be carried forward and deducted from the post pioneer income of the company.

28 [MIDA, "FAQs - \(C\) Incentives for Investment"](#)

BOX 2.

POLICIES SUPPORTING INCREASED RECYCLING CAPACITY AND IMPLEMENTATION OF EPR



PACKAGING

The EU's Single Use Plastics Directive requires all EU member states to recycle at least 55% of all plastics packaging by 2030. Single-use plastic drink bottles specifically have an even higher targeted CFR rate of 77% by 2025 and 90% by 2029.

Understanding that setting targets alone is not enough, the EU Single Use Plastics Directive also requires EU member states to implement EPR schemes covering the costs of collection, transport and treatment, cleanup litter and awareness-raising measures for food containers, packets and wrappers, cups for beverages, beverage containers with a capacity of up to three liters, lightweight plastic carrier bags and fishing gear by 31 December 2024.

India's draft 2019 National Resource Efficiency Policy sets targets for packaging recycling including 100% recycling rate for PET packaging by 2025 and 75% recycling and reuse rate for other plastics by 2030. Additionally, the Uniform Framework for EPR in India 2020 outlines options for producers of packaging in India to set up EPR via either a fee-based model or a Producer Responsibility Organization (PRO) model.

Table 4.

BREAKDOWN OF APPROVED INVESTMENTS UNDER PLASTIC RECYCLING PROJECTS AND TOTAL APPROVED INVESTMENTS FOR PLASTICS INDUSTRY

| Year | Approved Investments under Plastic Recycling Projects Category | Total Approved Investments under Plastics Products Industry | Plastic Recycling projects as a % of the Plastics Industry |
|------|--|---|--|
| 2018 | RM 0.33 billion | RM 1.86 billion | 18% |
| 2019 | RM 0.82 billion | RM 2.48 billion | 33% |

Sources: MIDA

2. **Investment Tax Allowance (ITA)** of 60% or 100% of qualifying capital expenditure incurred within a period of 5 years. The allowance can be offset against 70% or 100% of statutory income in the year of assessment. Unutilized allowances can be carried forward to subsequent years until fully utilized.

However, beyond these two categories of broad manufacturing industry incentives and another set of broad waste management industry incentives (Waste Eco Park), incentives for the plastic recycling industry are limited to tax incentives for companies with Manufacturing License (ML), whereby they are only allowed to recycle local waste, including from Free Industrial Zone (FIZ)/Licensed Manufacturing Warehouse (LMW). While tax incentives are a step in the right direction, they have limited effectiveness because they do not provide existing recyclers with the financial resources to grow their businesses, especially given the cash economy of the informal sector. Lack of targeted incentives and subsidies supporting plastic recycling puts negative pressure on the CFR rate.

In response to the influx of plastic scrap to Malaysia, as discussed in section 3.1.2, MITI and MIDA have

exercised more stringent evaluation in the approval of the ML and tax incentives. For example, companies have to provide evidence of local sourcing of plastic waste materials and meet the no-import condition. As of October 2020, MITI is reviewing the policy for plastic recycling activities, including the control mechanism for these activities. As a result, applications related to plastic recycling activities for the ML and tax incentives have been put on hold.

As with renewable energy, the idea behind subsidies for recycled or reused materials would be to encourage innovation leading to a stable market. Once the market is established and secondary materials can compete on cost grounds with virgin material, incentives and/or subsidies could decrease or disappear.²⁹ This is especially relevant at a time when the recycled plastics industry is under intense competition from virgin plastics owing to low oil prices.

Box 3 provides examples of enabling policies that support the recycling industry (further details can be found in Appendix 14.2).

29 [Green Alliance: Completing the Circle, Creating Effective UK Markets for Recovered Resources \(2018\)](#)

BOX 3.

POLICIES AND INVESTMENTS SUPPORTING A STRONG RECYCLING INDUSTRY



INVESTMENTS

Under the EU Strategy for Plastics in the Circular Economy, more than €5.5 billion has been allocated to improve waste management across Europe. This is expected to create 5.8 million TPY of additional waste recycling capacity. An example of this is the over €1.5 million to support the Walloon Region of Belgium for the ERDF Technopoly Recyclage project implementing an innovative process for recycling rigid plastic waste at the landfill itself.

Under the EU's Horizon 2020 funding, more than €250 million for research and development linked to plastics in the

circular economy has been allocated. An additional €100 million by 2020 has been devoted to financing priority actions, including the development of smarter and more recyclable plastics materials, more efficient recycling processes and the removal of hazardous substances and contaminants from recycled plastics.

Under the European Fund for Strategic Investments, a €7.5 million loan was given to GreenFiber International SA to finance a recycling and circular economy project. 280 full-time jobs will be created and over 50,000 tonnes of waste collected and processed per year.

California's Plastic Market Development program, which pays up to US\$150/ton to plastics reprocessors and manufacturers using recycled plastics, has been credited with increasing in-state plastic reprocessing by 3,000%.



FINANCING POLICIES

Japan follows a policy of the mainstreaming of Environmental, Social and Governance (ESG)/Sustainable Development Goal (SDG) financing. Under this policy, which covers not only circular economy but also climate change, a number of guidelines have been developed (e.g. company assessment and information disclosure). A high-level panel on ESG finance consisting of top business leaders has also been set up.



Investors desire clear regulatory and investment frameworks, which provide assurance that the recycling industry has a long-term future and economic viability.

MPMA, MPRA

Source: [MPMA, White Paper on An Advanced Plastics Recycling Industry for Malaysia.](#)

With increased investments in better technology, infrastructure and upgraded capacity, MPMA and MPRA note that the plastic recycling industry could potentially grow its contributions to the Malaysian economy by three to four times, from RM 4.5 billion in 2019 to RM15-20 billion annually.³⁰

3.1.4. Lack of Market Data (Price and Trade Volume Data) in the Recycling Value Chain and Detailed Production Data for Packaging

The three leading industry associations in plastics are Malaysian Petrochemical Association (MPA), Malaysian Plastics Manufacturers Association (MPMA) and the Malaysian Plastics Recyclers Association (MPRA). The MPA and MPMA, via their members, and together with the Department of Statistics maintain data sets on production, exports and imports of virgin resins in Malaysia. Industry-led efforts to consolidate plastic data across the plastics value chain from resin production to recycling have only begun since the start of 2020. However, these efforts combine all plastic resins together and are not done on at a resin level. Additionally, these data sets collected do not show the amount of plastic in final products imported/exported.

Even though packaging is a significant end-use industry for all the major plastic types, a detailed breakdown of the amounts of packaging producers placed in the market each year is not available in Malaysia. Specifically, for recycled plastics, Malaysia lacks independent and authoritative sources of up-to-date price and market information, especially at the processor and recycler

stages of the value chain. The volumes (tonnage) and prices of post-consumer resins moving through the value chain are unclear, hindering market liquidity and investments into recycling capacity. This puts negative pressure on the **CFR rate**, making it challenging for recycled products to be sold without causing a significant movement in the price, and with minimum loss of value. This lack of market data also poses an obstacle for new players looking to enter the recycling market or for existing recyclers to grow their capacities as it makes it harder to build their business cases or to predict the cycles of the volatile trading market for recycled products.

Through engagement with MIDA in Oct 2020 for this study, MIDA shared that they are embarking on a survey of plastic recyclers to understand their capacities and other aspects of their business to inform future investment policies on plastic recycling. This could be a good resource for stakeholders to draw from in the future with respect to data on plastic recycling capacity in Malaysia. Separately, SWCorp collects data from recyclers for its yearly recycling rate survey.

Box 4 provides examples of enabling policies from benchmark countries that support market data for recycled products and detailed production data for packaging (further details can be found in Appendix 14.2).

As EPR frameworks were implemented and demand for recycled plastics started to grow, market intelligence firms such as IHS Markit, ICIS, S&P Platts, and Wood Mackenzie started offering market data services for recycled products in regions such as Europe and North America.

³⁰ [MPMA, White Paper on An Advanced Plastics Recycling Industry for Malaysia.](#)



It will be good if we have a data center to collect data and track all the plastics within Malaysia.

Government Stakeholder

BOX 4.
POLICIES SUPPORTING MARKET DATA FOR RECYCLED PRODUCTS



PACKAGING

Countries in the EU as well as Japan and Singapore have all mandated producers of packaging and packaged products to

collect data on the types and amounts of packaging they place on the market each year and report the packaging data to either a relevant industry-led producer responsibility organization or to the government as the first step towards more sustainable packaging waste management. This reporting lays the foundation of an Extended Producer Responsibility (EPR) framework for managing packaging waste.

3.1.5. Falling and Inconsistent Supply from Informal Sector—and Competition from Informal Recyclers

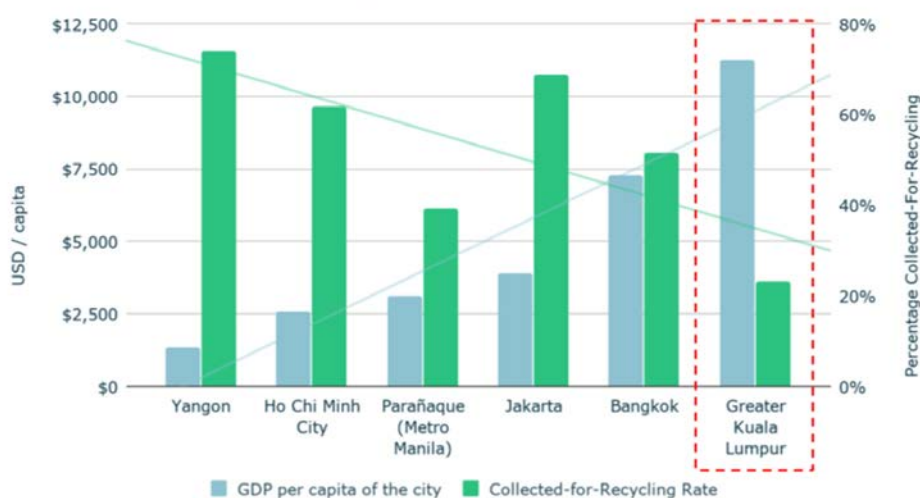
The reliance on the informal sector as a collection method means that CFR rates are heavily dependent on prices of recycled resins. Hence, supply of the materials from the MSW stream are typically inconsistent, as informal collectors only collect when prices of recycled materials are high. Furthermore, as countries develop, costs of living increase. This means that the low (and falling) income that collection of recyclable materials provides will become untenable in the future.

Previous studies in Malaysia and other Southeast Asian countries, conducted by this study team in 2017 and 2018, discovered that falling prices of recyclables

coupled with increasing costs of living have made collecting recyclables challenging for the informal workers.³¹ If recyclables collection was prioritized and done by the formal waste collection system, the CFR rates would be expected to increase as more resources would be available for recyclables collection as cities develop. However, this is not the case across Southeast Asia. As a result, CFR rates are typically lower in more developed cities (see Figure 30). Therefore, it can be expected that in Malaysia a continued reliance on the informal sector will result in drops in **CFR rate** as GDP per capita grows.

31 Full Circle: Accelerating the Circular Economy For Post-consumer PET Bottles In Southeast Asia (2019)

Figure 30.
CORRELATION BETWEEN GDP PER CAPITA AND CFR RATES SUGGESTS THE HEAVY RELIANCE ON INFORMAL SECTOR



Source: GA Circular Full Circle: Accelerating the Circular Economy for Post-consumer PET Bottles In Southeast Asia (2019)

In the absence of EPR regulations, the informal sector is highly selective in terms of which plastics to collect for recycling. Rigid, high-value plastics are preferred over low value flexible plastics, as they are easier to collect and can be sold at higher prices. This is shown in Figure 31, where a high percentage of the informal sector collected and sold PET, HDPE and PP, but low value plastics such as plastic bags, multi-layer flexible sachets and multi-layer standup pouches were not collected.

They also lack the financial resources to purchase equipment to increase their capacities and productivity.

Competition from Informal Recyclers

The informal sector collectors are also more inclined to sell their material to illegal or unlicensed recyclers. As expressed by formal recyclers in the engagements conducted for this study, illegal/unlicensed recyclers consistently undercut the market both in terms of price

and volume due to non-compliance of regulations by (e.g. lack of wastewater treatment, poor working conditions for workers, etc.). The Malaysian government has recognized the environmental impact of unlicensed recyclers and, since early 2019, has closed 140 illegal plastic recycling plants that violated the country’s Environmental Quality Act 1974.³² In Penang State, the Seberang Perai City Council (MBSP) has a committee to legalize the illegal plastic recycling factories if they comply with the standards and conditions set by the MBSP. The illegal recyclers are given a temporary license to operate before eventually being legalized.

Box 5 provides examples of enabling policies from benchmark countries that support recognition and integration of the informal sector (further details can be found in Appendix 14.2).

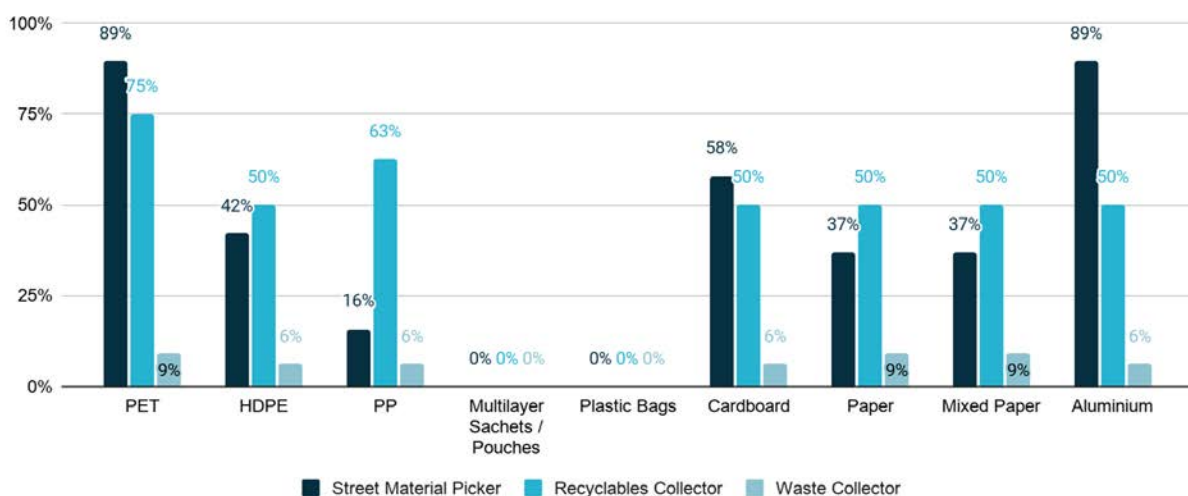
32 [Recycling Today, “Malaysia closes illegal plastic recycling facilities”](#)



The informal collectors lack finances to increase their volume. They need funding to buy hydraulic presses and balers. Without this funding, they can only sell to aggregators and not to recyclers directly.

Recycling Stakeholder

Figure 31. **PERCENTAGE OF INFORMAL COLLECTORS COLLECTING AND SELLING POST-CONSUMER RECYCLABLE MATERIALS IN 2019**



Source: GA Circular 2019 research

BOX 5.

POLICIES SUPPORTING RECOGNITION AND INTEGRATION OF THE INFORMAL SECTOR



INFORMAL SECTOR AND EPR

Uniform Framework for Extended Producers Responsibility in India 2020, under Plastic Waste Management Rules 2016

The guiding principles promote the increased circularity of plastics through incentivizing source separation recycling programs. This includes directly and indirectly supporting improvements in the working

conditions and incomes of informal recyclers.

The principles call for any informal sector stakeholders (such as waste pickers, junk shops and aggregators) to be formalized and further strengthened for proper functioning of the EPR model.

Under the guidelines, waste management agencies are required to engage informal waste pickers and create the opportunity for them to participate in the formalized waste management systems having:

- Adequate environmental, health and safe working conditions
- Occupational recognition, respect and dignity
- Appropriate and fair business models
- Auditing waste management operations;
- Communication, education and inclusion initiatives for waste workers
- Other activities involving integration of the informal sector into the formal sector

3.2 PRESSURES IMPACTING CFR RATE AND VALUE YIELD

3.2.1. Recyclables are of Low Quality Due to Lack of Design for Recycling

Recyclers interviewed for this study reported a contamination rate of up to 30% of the feedstock they receive from within Malaysia. This includes contaminants due to poor segregation practices and also due to poor packaging design. Figure 32 shows examples of products with poor design for recycling that PET, PP and HDPE recyclers in Malaysia receive.

Some examples of problems highlighted by recyclers in Malaysia, stemming from the design of the products, are outlined in Table 5.

There are few significant examples of companies redesigning their products to mitigate these issues. One example is the switch from colored PET bottles to clear PET bottles for Coca Cola's Sprite bottles (in Malaysia and globally). Instead, companies are choosing to focus on elimination of some plastics and are using paper instead (e.g. switching plastic straws for paper straws).

Box 6 provides examples of enabling policies for the packaging industry from benchmark countries that support design for recycling (further details can be found in Appendix 14.2).

BOX 6.

POLICIES SUPPORTING DESIGN FOR RECYCLING

The EU Strategy for Plastics in the Circular Economy requires all plastics packaging placed on the EU market to be reusable or recyclable by 2030.

The EU Commission is also initiating work on new harmonized rules to ensure that all plastics packaging placed on the EU market can be reused or recycled in a cost-effective manner by 2030.

Figure 32.

EXAMPLES OF PRODUCTS WITH POOR DESIGN FOR RECYCLING IN MALAYSIA



Source: GA Circular. Brand logos are blank intentionally.

Note: Left to right: PET bottles with PVC labels; Printed PET cups; PP cups with PET caps; Printed HDPE body with aluminum top; Colored bottles with full body labels and pumps with metal springs

Table 5.

DESIGN FOR RECYCLING PROBLEMS EXPERIENCED BY RECYCLERS IN MALAYSIA

| Problem | Description | Impact on Recycling |
|--|---|---|
| Colored Plastics | When plastics are colored, it affects the value of the recycled products as the color of these plastics cannot be reverted back to their "natural" color. | <p>Recyclers either keep the same color or turn it black depending on what customers require. Both of these choices mean that some value is lost as colored recycled resins are less valuable than naturally colored resins. Hence, this reduces the value yield of recycling.</p> <p>In some cases, colored plastics are not able to be recycled at all (e.g. colored PET bottles cannot be recycled into rPSF). Therefore, in this case, it reduces the CFR rates as colored plastics act as a contaminant.</p> |
| Calcium Carbonate (CaCO ₃) | <p>Fillers/additives, such as CaCO₃ to HDPE, increase the contamination of post-consumer HDPE bottles as it changes the density of the HDPE flakes. HDPE flakes, which become denser due to CaCO₃, sink during the float-sink separation step at the start of the HDPE recycling process meant to separate other contaminants.</p> <p>Furthermore, even if HDPE flakes with altered densities make it through the float-sink separation process, the inconsistent amounts of CaCO₃ content mean that the characteristics of the recycled resin produced (e.g. intrinsic viscosity, color) are more difficult to control.</p> | <p>The contamination losses during the float-sink separation processes increase from a normal 5% to up to 20%. Hence, this reduces the CFR rate for HDPE.</p> <p>As the physical characteristics are harder to control, the quality of the end product falls which reduces its value yield.</p> |

| Problem | Description | Impact on Recycling |
|-----------------------------------|--|---|
| PVC Labels | When PVC labels enter the recycling process, hydrogen chloride is produced. Not only is it a harmful gas, but it also corrodes the internals of the recycling equipment. Therefore, recyclers have to invest in sorting equipment to ensure that PVC labels do not make it into their recycling operations. | This reduces the CFR rate as labels increase the contamination of the post-consumer materials. |
| Composite or multilayer materials | Recycling equipment is only able to recycle a specific resin type at a time. For example, a PET recycler is only able to process feedstock which only includes PET. Even for polyolefin recycling, recyclers need to adjust the settings for different resins (e.g. PP vs HDPE) depending on which resin is being processed. However, because there is an abundance of composite or multilayer materials (e.g. electronic waste, multilayer flexibles), which are not easily disassembled or separated, these products cannot be recycled. | This limits the CFR rate as it reduces the amount of materials that can be collected for recycling. |

3.2.2. MSW System Prioritizes Collection and Disposal over Recycling

The MSW system in Malaysia is split according to states which are under Act 672 and those that are not. Effective September 2015, the federal government made a mandatory regulation to enforce separation at source. This implementation is pursuant to regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672) enforced in the 8 states and Federal Territories (called Act 672 states). All households in the Act 672 states are required to implement separation at source and the separated waste is then required to be collected by waste collection concessionaires according to schedule and frequency. Act 672 covers 8 of 15 states/territories, but a minority of the Malaysian population (39%). Detailed information on Act 672 coverage for each of the states/territories in Malaysia is shown in Appendix 13.1.

All States Prioritize Collection and Disposal over Recycling

The existing MSW systems for both Act 672 states and non-Act 672 states in Malaysia are designed to collect and dispose of waste into landfills or dumpsites, not for recycling (see Figure 33). Please see Appendix 13.2 for MSW and recycling statistics from SWCorp, along with key limitations identified for these data points.

SWCorp has a target to achieve a 40% recycling rate in the eight Act 672 states under its supervision by 2025. However, this is not a mandatory target and does not cover the remaining 63% of the population under non-Act 672 states.

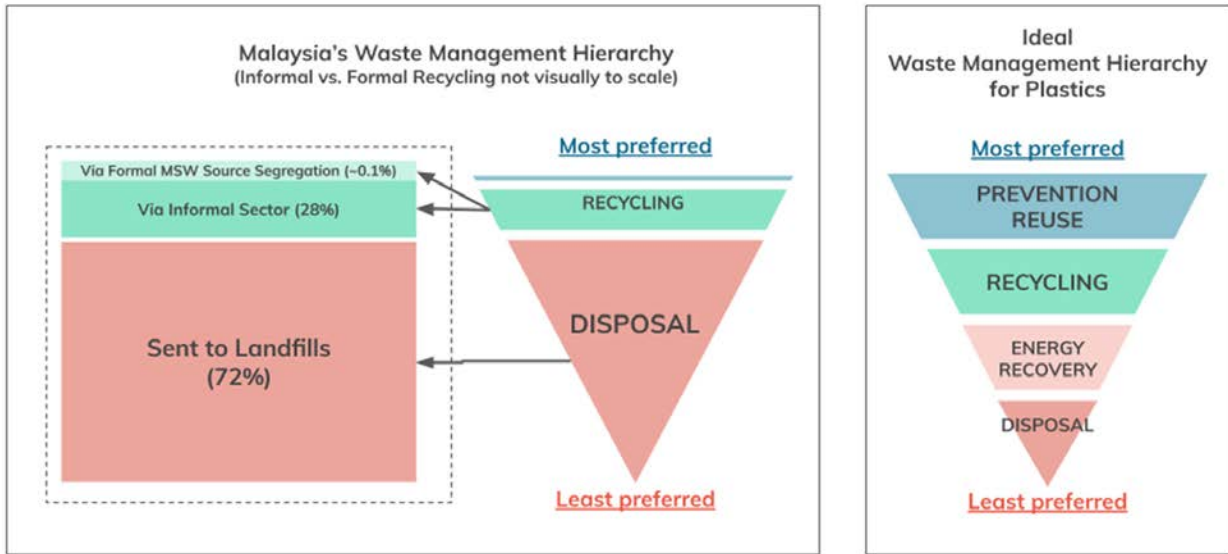


To increase the value of output, we need to improve Homogeneity and Cleanliness. Homogeneity refers to the same type of plastic scraps, so we get better purity. Cleanliness refers to post-consumer scraps that should not be contaminated with soil, organic and other types of contaminants—so that they become a clean material. Most of the time using washing to remove contaminants is very expensive and it will also degrade the quality.

Recycling Stakeholder

Figure 33.

MALAYSIA'S WASTE MANAGEMENT HIERARCHY (LEFT); IDEAL WASTE AND PLASTICS MANAGEMENT HIERARCHY (RIGHT)



Waste collection is mostly privatized in Malaysia, which encourages the prioritization of service quality in terms of punctuality and thorough waste collection instead of performing recycling, making the majority of the recyclables end up in the landfills. Although mixed waste collection is the primary role of the formal waste collectors in all states, additional collection of recyclables is being carried out on the spot by formal waste collectors via “tailgate recycling” as a secondary income stream, as seen in Figure 34. Nevertheless, plastic collection from tailgate recycling remains low compared to collection by the informal sector.

Despite the government’s comprehensive policies and initiatives towards integrated plastic waste management including Act 672, the volume of recyclable materials collected and sent for recycling via formal source segregation programs remains low. For example, the amount of plastics collected and sent for recycling via the formal household source segregation program within Act 672 states was just 644 tonnes in 2019. Assuming the same segregation levels for the remainder of the population, the total plastic sent for recycling via formal household source segregation programs nationally would be just 1,786 tonnes. This makes the contribution of formally source segregated plastics to the nationally reported plastic recycling volume in 2019 at just 0.1% (1,786 tonnes out of the SWCorp reported

1.56 million tonnes). This suggests that the remainder (99.9%) is collected for recycling by the informal sector. Details of the volumes of plastic recyclables collected as compared to plastic consumption can be found in Appendix 13.3.

Figure 34.
FORMAL WASTE COLLECTORS AT THE BACK OF A WASTE COLLECTION TRUCK IN MALAYSIA



Photo: GA Circular



To increase CFR rate, we need a better recyclables collection system from households carried out by municipalities.

Recycling Stakeholder

Challenges with Source Segregation

While the amount of recyclables collected has increased nation-wide, recyclables as a proportion of municipal solid waste still remain very small. The below challenges have been reported by the National Solid Waste Management Department (JPSPN), under the Ministry of Housing and Local Government (KPKT), as being experienced by concessionaires in the 8 states and federal territories in carrying out the separation-at-source policy:

- Lack of awareness among the public and facilities
- Recyclable bins not being provided at every household or premise
- Lack of incentives for residents to practice separation-at-source
- Lack of behavior change initiatives to enable residents to understand the importance of separation-at-source at home

JPSPN has highlighted that they continue to prioritize the strengthening of the enforcement of separation-at-source for households and to increase public awareness and responsibility to practice separation-at-source and recycling activities. For the remainder of the states (non-Act 672 states, which cover 63% of the population), source segregation and recycling is conducted under the prerogative of the state or the local government. For example, the source separation policies in three non-Act 672 states are as follows (details of Penang's and Sabah's MSW can be found in Appendix 13.4):

- The Majlis Bandaraya Petaling Jaya (in Selangor) runs the Green Assessment Tax Rebate Scheme for House Owners to incentivize waste separation in Petaling Jaya.³³ The source segregation rate in Petaling Jaya as of 2018/2019 is 7% of households and the target for 2030 is 30%.³⁴ As of 2018, the volume of recyclables via source segregation was a relatively small volume of 1,682 tonnes.

- Penang's Separation at Source Policy requires residents to separate their waste into waste and mixed recyclables. The current participation rate in 2019 is at 68%, and the volume of recyclables collected reached 707,500 tonnes (21,226 tonnes of plastic) in 2019.
- Sabah's Uniform (Segregation and Disposal of Organic Waste) By-Laws 2016 mainly focus on segregation of organic waste.

Contamination due to poor source segregation lowers both the volume yield and price yield, and thus lowers **the value yield**.

Low Landfill Tipping Fees

For the public sector, whose main remit with respect to waste management is public cleanliness, the cost of landfill fees ranges from RM 0/ton, for states where the majority of waste is disposed of at open dumpsites, to RM 122/ton. This translates to about 2% to 7% of the annual waste management budget for the entire country.³⁵ The tipping fees at sanitary landfills in Malaysia are considered to be among the lowest in Asia. In comparison, landfill tipping fees in China (RM 60-75/ton), Australia (RM 200-250/ton), Singapore (RM 235-250/ton) and Germany (RM 1,000-1,400/ton) are more prohibitive.

The low landfill tipping fees, coupled with long-term contracts signed between municipal councils and waste collectors in landfills, lie at the root of the reliance on landfills, especially since these contracts can last decades. One of the states engaged for this study reported a 20-year concession for landfill management, with the current landfill tipping fee at RM 22/ton and the prices revisited only once every 5 years in the contract.

From a waste management budget perspective, there is little incentive for federal, state and local governments in Malaysia to move away from cheap landfill disposal as it currently makes up a small amount for the budget.

33 [Petaling Jaya City Council: Assessment Tax Rebate Scheme for Eco-friendly House Owners in Petaling Jaya](#)

34 Based on interview with Majlis Bandaraya Petaling Jaya in 2019

35 [The Sun Daily. "RM2b spent annually on waste separation, public cleaning, says Rahman Dahlan"](#)

This lack of an integrated solid waste management system, which prioritizes the waste management hierarchy, is a major obstacle to achieving plastics circularity. It results in lower amounts of plastics being separated and sent for recycling, thus reducing **CFR rate**. It also results in recyclers spending more time and resources to process the current feedstock, thus reducing both **volume yield** and **price yield**, therefore the **value yield**.

Box 7 provides examples of enabling policies impacting packaging from benchmark countries that support the transition to a circular MSW system further details can be found in Appendix 14.2.

3.2.3. Inability to Capitalize on Growing Global Demand for Recycled Content in Packaging

A global 2020 petrochemicals industry assessment by S&P Global Platts shows that, despite unfavorable economics, global recycled plastics volumes reached nearly 20 million tonnes in 2020, or 8% of total virgin demand.³⁶ This is up from just under 18 million tonnes in 2019, or 7% of total virgin demand. By 2030, up to almost one-third of plastics demand could be covered by production based on previously used plastics rather than from “virgin” oil and gas feedstocks. This estimate

36 [S&P Global Platts - Global Petrochemical Trends H1 2020](#)

BOX 7. POLICIES SUPPORTING THE TRANSITION TO A CIRCULAR MSW SYSTEM



LANDFILLS

The EU’s First Circular Economy Action Plan (2018) sets a common EU target for recycling 65% of municipal waste by 2035; a binding landfill target to reduce landfill to maximum of 10% of municipal waste by 2035; a ban on the landfilling of separately collected waste; separate collection obligations are strengthened beyond recyclables and extended to hazardous household waste (by end 2022), bio-waste (by end 2023), textiles (by end 2025). The action plan recognizes that if the waste segregation is not done at source, it would be difficult to expect producers to implement EPR, especially for low-value plastics.

The EU Landfill Directive aims to phase out landfilling for recyclable material by 2025. The EU Strategy for Plastics in the Circular Economy encourages EU member states as well as regional and local authorities in the EU to internalize the environmental costs of landfilling and incineration through high or gradually rising fee, taxes or other economic instruments.

In the EU, organics recycling is driven primarily by the Landfill Directive (1999/31/EC), which obliges Member States to reduce the amount of biodegradable municipal waste that they landfill, and by the Waste Framework Directive (WFD,

2008/98/EC), which mandates Member States to take measures to encourage the separate collection of bio-waste with a view to composting and digestion in a way that ensures a high level of environmental protection. As plastic residues remaining in compost threaten the quality of the product, thereby reducing its effectiveness to be applied to soils, separation of organics from plastics gets automatically incentivized.



ORGANIC WASTE

Biological treatment of organic waste techniques may be either aerobic (such as composting) or anaerobic (such as anaerobic digestion) or mechanical:

- *Composting*: Composting of separately collected feedstock represents (in EU member states, the USA and Canada) the most widely applied recycling process for separately collected organic waste, both in terms of the number of plants and annual capacity.
- *Anaerobic digestion*: The use of anaerobic digestion to treat biowaste both from separate collection schemes and from mechanical treatment of mixed municipal solid waste is growing.

The digestion process produces biogas, a renewable source of energy, a digestate which can be composted or applied to soils directly as a biofertilizer.

- *Mechanical Biological Treatment (MBT)*: This represents an effective technique for treating unsorted wastes to reduce its biodegradable content. It therefore prevents or reduces biodegradable organics being landfilled, which would otherwise generate methane emissions and leachate.



WASTE-TO-ENERGY

In India, the draft 2019 National Resource Efficiency Policy sets targets for a ban on disposal of recyclable waste including plastics to landfills by 2025. India’s Plastic Waste Management Rules 2016 encourage urban local bodies to recover energy from low grade plastics through cement kilns, waste-to-energy plants or waste-to-oil plants. In response, the cement industry in India has targeted increasing the substitution of coal to Refuse Derived Fuel (RDF) containing plastics with a goal to reach a Thermal Substitution Rate of coal to RDF of 25% by 2025 and 30% by 2030.



The major challenges to incorporate recycled resins in plastics products are: (i) Costs of recycled plastic resins is an important factor that inflates total cost of goods vis-a-vis supply-demand situation, and (ii) Limited number of local recyclers with capability of producing quality recycled plastic resins... Government policies on plastics recycling and environmental protection [are important for] allowing recycling resins to be competitive with virgin resins.

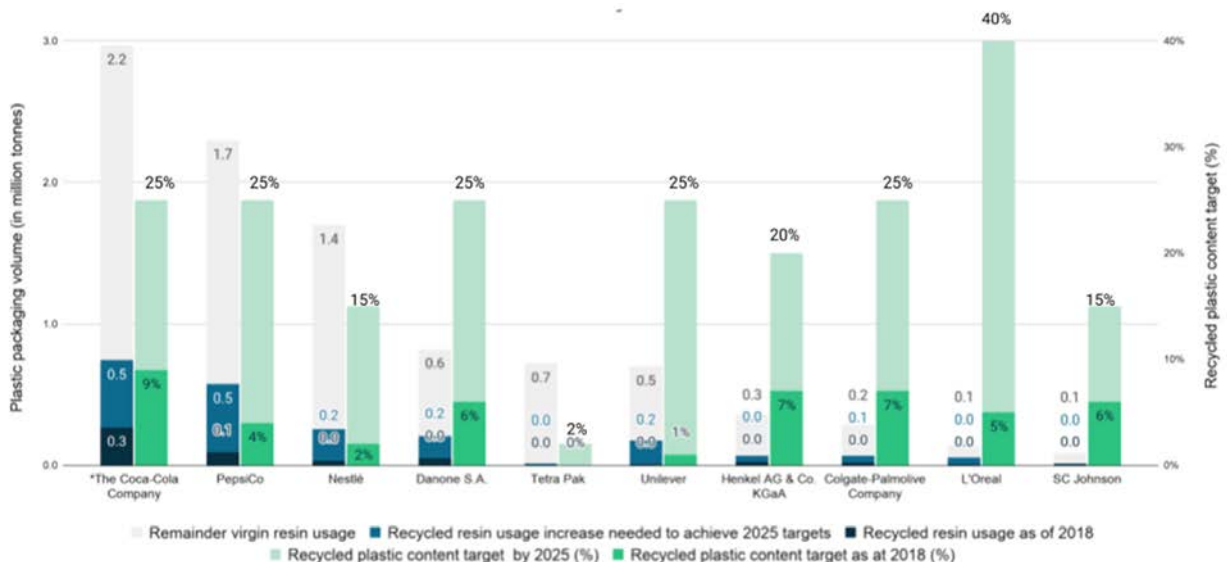
Brand Owner

is based on a high-adoption scenario of recycled plastics, a substantial increase in mechanical recycling volumes, a wider adoption of pyrolysis technology and oil prices at around \$75 per barrel.³⁷ Given that packaging is the largest end-use industry, global commitments by leading brand owners to increase recycled content usage in their packaging is slowly spurring demand for food-grade recycled resins, which command higher margins amongst recycled products.

Figure 35 shows the 2025 recycled plastic content targets for the top 10 plastic consumers among the companies that have a presence in Malaysia and are participating in the New Plastics Economy Global Commitment led by the Ellen Macarthur Foundation. The total plastic packaging volume used by the 10 companies globally amounted to about 10.1 million tonnes in 2018, out of which just about 0.5 million tonnes was recycled content, based on their recycled plastic content usage as of 2018. In order to meet the total 2025 recycled plastic content targets for these 10 companies, the global recycled resin usage by

37 [McKinsey & Company - How plastics waste recycling could transform the chemical industry](#)

Figure 35. **2025 RECYCLED PLASTIC CONTENT TARGET FOR TOP 10 PLASTIC CONSUMERS AMONG COMPANIES PARTICIPATING IN NEW PLASTICS ECONOMY GLOBAL COMMITMENT**



Source: [Ellen Macarthur Foundation New Plastics Economy Global Commitment 2019 Progress Report](#)

Figure 35 Notes:

- *The Coca-Cola Company does not have a 2025 target for recycled content usage, but instead has a 2030 target which is 50%. For the purposes of the analysis, a recycled plastic content target for 2025 of 25% is assumed.
- These figures assume no growth in overall plastic usage and depict just the top 10 global plastic consuming companies that have a presence in Malaysia.

these companies collectively would have to increase by another 1.7 million tonnes, 230% higher than the volume of recycled resin usage as of 2018.

Food contact packaging applications require the highest quality of post-consumer resin and producing them incurs more operational costs per ton. For example, the production of food-grade rPET involves processes such as Solid State Polymerisation, which increases the intrinsic viscosity of waste PET back to virgin levels. To enable this, large CAPEX investments are required. In contrast, recycling of waste PET into rPET fiber through extrusion lowers the intrinsic viscosity of the resin, which results in a lower quality material. Based on interviews with a leading recycler in Malaysia who is expanding/building new food-grade rPET, rPE and rPP recycling capacities, a consistent growing demand from brand owners in the packaging industry is a major factor to proceed with CAPEX investment decisions.

Challenges Impeding Malaysia Stakeholders from Capitalizing on the Growing Global Demand

Despite this backdrop of growing global demand, most suppliers of recycled resins in Malaysia are small to medium enterprises who are challenged by a lack of scale, management systems, process technologies to produce food-grade quality products and informal supply networks that work on cash terms and are not integrated. For example, recyclers in Malaysia reported that one of the reasons they are unable to take on orders to supply large brands is they cannot match the payment terms of buyers (30-60 days) against the cash-on-delivery supply terms of the local informal sector. Additionally, competition from the low cost of virgin plastics, contaminated feedstock and lack of design for recycling standards prevents recyclers from capitalizing on the global demand and maximizing their margins. As a result, local CFR rate remains low and recyclers' value yield is reduced. This, in turn, locks in smaller scale recyclers from making CAPEX investments such as into advanced recycling technologies required for high quality, food-contact recycled plastic.

Brands also state that the lack of clarity around the process of getting Halal standards for products with recycled plastics is hindering their increase in the use of recycled content in Malaysia. The efforts currently underway from the government to clarify these Halal standards are highlighted in section 3.2.4.

Linked to the lack of local demand for recycled plastics is the fact that Malaysia is still in the process of developing an EPR policy framework that clarifies the responsibilities of all key stakeholders in the value chain for different plastic consuming industries, sets binding targets for collection, recycling or recovery and prescribes a framework for operationalizing the EPR through economic tools. Currently, the main drivers of the development of an EPR framework are two industry-led efforts, Malaysian Sustainable Plastics Alliance (MaSPA) and Malaysia Recycling Alliance (MAREA). MaSPA acts as an umbrella group related to plastic circularity, while MAREA aims to implement programs that actively increase the plastic collected for recycling in Malaysia. Further details on MaSPA and MAREA can be found in Appendix 15.1.

Well-designed EPR schemes can play a critical role in providing the necessary funding for collection of plastics. In some countries with high recycling rates, for example, most separate collection and treatment costs for packaging waste are financed through contributions paid by the producers.³⁸ Without an EPR policy in place, industries that use plastics such as packaging or electronics are not obliged or incentivized to increase the CFR rate or increase their use of recycled content.

3.2.4. Lack of Clarity on the Use of Recycled Content for Food-Grade Applications

In Malaysia, reuse of food packaging materials is regulated under the Food Act of 1983. Under this act, reuse of packaging materials previously used for specific non-Halal products is not allowed.³⁹ However in terms of recycling, general health and safety concerns around recycling technologies and processes used to produce recycled content and quality of the recycled materials are further complicated in Malaysia when other certifications such as Halal standards must also be met.⁴⁰ Based on the interviews conducted with several recyclers and brand owners in Malaysia, there are three main considerations when including recycled plastic content in food packaging: (a) food safety; (b) communicating the use of recycled plastic content; and (c) Halal certification for the recycled plastic content.

38 EU Strategy for Plastics in the Circular Economy 2018

39 Rijk & Veraart, "Global Legislation for Food Packaging Materials"

40 [UNEP, "The Role of Packaging Regulations and Standards in Driving the Circular Economy"](#)

a) Food Safety for Recycled Plastic used in Food Contact Applications

Based on discussions with the Ministry of Health (MOH) Food Safety and Quality Division (FSQD), at present, there is no specific regulation on the use of recycled materials for food contact under Food Regulations 1985. Currently, all food contact materials are self-regulated under Regulation 27, Food Regulation 1985 which stipulates that, “No person shall import or manufacture any appliance, container, or vessel which yields or could yield to its contents, any toxic, injurious or tainting substances, or which contributes to the deterioration of the food.”

Therefore, the manufacturer is responsible for ensuring that the food packaging, including recycled materials to be used in contact with food, comply with Regulation 27. In other words, recycled content may be used for food contact applications provided it complies with Regulation 27 of the Food Regulations 1985. MOH has advised that this regulation is self-regulated by the industry and plastic value chain stakeholders, such as brand owners, do not need to apply to MOH or other ministries/departments in order to use recycled plastic content.

The MOH FSQD department has created a checklist (in Appendix 16) based on European Food Safety Authority (EFSA) to help guide industry players in terms of selecting safe recycling technologies. (Note: The checklist is a guiding document only and not an approval or license for product sales).

b) Communicating the use of Recycled Plastic Content in Food Contact Applications

According to MOH FSQD department, brand owners may choose to communicate that their food packaging is



No person shall import or manufacture any appliance, container, or vessel which yields or could yield to its contents, any toxic, injurious or tainting substances, or which contributes to the deterioration of the food.

Regulation 27, Food Regulation 1985

made using recycled content as long as it complies with Regulation 27. One of the brand owners interviewed for this study mentioned that they are using PET preforms with 10% of recycled content, which are imported from overseas. However, due to various considerations, the company chooses not to publicly acknowledge recycled content usage in their product label.

c) Halal Certification for the Recycled Plastic Content in Food Contact Applications

Halal certification for any product, including packaging products with recycled plastic content used in food contact applications, comes under the purview of the Department of Islamic Development Malaysia (JAKIM)—the agency responsible for the Islamic affairs in Malaysia. The existing standards for halal packaging fall under MS 2565:2014 Halal Packaging—General Guidelines. Under MS2565:2014 section 3.2(d), for packaging that is made “for direct food contact application it shall not be made from recycled material.” Thus, under this standard, it is clear that food-grade recycled content cannot be used for halal food contact packaging. Through stakeholder interviews, it is understood that government stakeholders such as KASA and JAKIM are looking into reviewing this standard to allow recycled content in Halal food contact packaging. However, no decision has yet been made and this standard may or may not be revised.

In the view of one of the brand owners in Malaysia, Halal certification of recycled plastics used in food contact will “open the gates” for the industry to capitalize their production capacities in producing Halal-certified recycled materials.

Summary of Considerations in Including Recycled Plastic Content in Food Packaging

Regarding points (a) and (b), this study team shared with the MOH FSQD that there is a need for MOH and KASA to communicate these considerations with plastics value chain stakeholders (e.g. Federation of Malaysian Manufacturers (FMM), Malaysian Plastics Recyclers Association (MPRA), Malaysian Plastics Manufacturers Association (MPMA), Malaysian Sustainable Plastics Alliance (MaSPA) formerly known as the Malaysian Plastics Pact, MAREA, etc.). Based on interviews with stakeholders in Malaysia, there is significant confusion amongst brands, plastic converters and recyclers regarding the use of recycled plastic content in food applications in Malaysia. Given that food applications are key users of plastic packaging and plastics in

general, resolving this confusion with clear guidance will be key to enabling a circular economy for plastics in Malaysia.

In the EU, the safety of recycling processes for recycled plastics used in food contact materials (FCM) is evaluated by the EFSA. Criteria on restrictions and limitations imposed include concentration of residues from previous use, contaminants from misuse and contaminants from non-authorized substances, reinforcing the need for special requirements for recycled plastics used in food contact materials.

Providing clear policies and certification with regards to use of food-contact recycled material for Malaysia will drive demand for recycled material locally and thus support increases in the **CFR rate** and **value yield**.

3.2.5. Lack of Organic Waste Treatment Facilities to Incentivize Source Separation and Diversion

While the main focus of this study is on plastics, organic waste is also a key issue as organics are the main contaminant for plastic recyclables that enter the MSW stream. Properly treating organic waste will help to increase the **value yield** and **CFR rate** of plastics recycling by reducing the amount of contamination and making higher amounts of recyclables available. Furthermore, the shift towards bioplastics, outlined in the Roadmap towards Zero Single-Use Plastics 2018-2030, indicates that industrial composting infrastructure needs to be established to properly treat compostable bioplastics. Of the 13.8 million tons of municipal solid waste generated in Malaysia in 2018, 6.1 million tons is food/organic waste—almost all of which is currently sent to dumpsites or landfills.

Based on the insights provided by KASA, Malaysia does not currently have a large-scale industrial composting or other organic waste treatment infrastructure network for organic materials from municipal or commercial waste, and the use of biodegradable and compostable plastics is relatively small compared to conventional plastics. Commercial producers of compost in Malaysia cite difficulty in sourcing raw material for production as among the main challenges in expanding production.⁴¹

While there is a lack of organic waste segregation or industrial composting infrastructure in Malaysia, some states have started implementing regulations targeted at segregation of organic waste. Sabah, for

example, has the Uniform (Segregation and Disposal of Organic Waste) By-Laws 2016, which encourage the segregation of organic wastes from the MSW stream. This, however, is still in a testing stage as the local authorities in Sabah are piloting food waste processing machines earmarked for this initiative.

Examples of enabling policies impacting packaging from benchmark countries that support source separation and organics recycling can be found in section 3.2.2.

3.2.6. Inability to Comply with Global Environmental, Health and Safety (EHS) Standards

Based on publicly available data of a sample of 19 medium to large recyclers that represent a total of 586,000 TPY of installed and planned recycling capacity (53% of total expected recycling capacity in Malaysia), the majority of large recyclers in Malaysia (58%) comply with global environmental standards and nearly half of them (47%) meet global quality standards, as measured by ISO:14001 and ISO:9001. However, as shown in Figure 36, just 16% have Global Recycle Standards (GRS) for their recycled plastics produced and an even fewer (5%) meet global occupational health and safety standards.

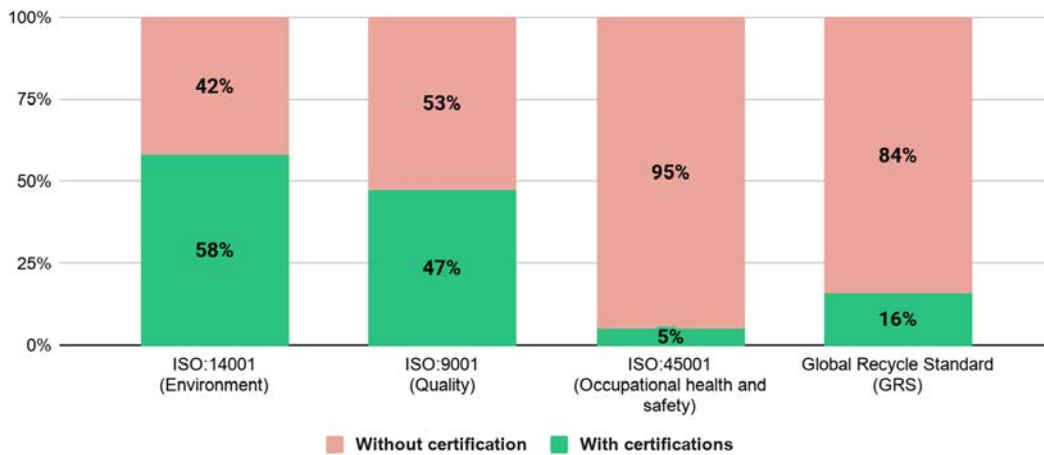
Stakeholders in the recycling industry report that implementing all the necessary global EHS standards is an expensive investment (particularly when considered against the backdrop of falling virgin prices and low demand for recycled content) and it is often not prioritized.

Increasingly, consumer goods companies that have set commitments to include recycled plastics are looking for suppliers of recycled products to meet third-party certified standards for recycled content, chain of custody, social and environmental practices and chemical restriction. This requires recyclers to go beyond quality certifications (i.e. to go beyond ISO:9001) and have third-party certifications that verify the recycled content of their products (both finished and intermediate), and to verify responsible social, environmental and chemical practices in their production. The objectives of these Chain of Custody (CoC) standards and certifications are to define requirements to ensure accurate content claims, good working conditions, no child labor, recognition of the workers' rights to collective bargaining and that harmful

41 [The Edge Markets: Green Business: The difficulties with composting \(2020\)](#)

Figure 36.

ENVIRONMENTAL, HEALTH AND SAFETY (ESH) STANDARDS CERTIFICATIONS OF A SAMPLE OF MEDIUM TO LARGE RECYCLERS



environmental and chemical impacts are minimized in the value chain and production process.⁴²

The relatively high proportion of the medium to large recyclers in Malaysia that do not have all of the ISO:14001, ISO:45001 and GRS standards means that the situation is likely bleaker for smaller recyclers. Recyclers are therefore unable to maximize the price yields and thus the **value yields**.

3.3 ADDITIONAL IMPACTS OF COVID-19

While an assessment of the impacts of COVID-19 on recycled plastics was not part of the scope of work for this study, initial insights were gained during the course of this study on the short-term and expected longer-term impact of the pandemic on the recycling industry in Malaysia.

3.3.1. Significant Reductions in Demand due to Low Oil Prices and Economic Slowdown

Oil prices were last at sustainable levels (USD 70 to 80 per barrel) for the recycling industry in September 2018. Virgin prices in Malaysia saw reductions in 2019 due to reductions in global oil prices and the economic situation in 2019. In mid-2019, HDPE and LDPE fell significantly, while PP experienced lesser declines until December 2019 and January 2020, where it experienced steep declines. These reductions increased from March

to May 2020 as the oil prices hit their lowest point of USD 18/barrel, the lowest oil price seen for more than 15 years.

As of April/May 2020, the virgin resin prices in Malaysia were 35% lower than the same period in the previous year (see Figure 37). These falling virgin prices put significant downward pressure on recycler sales prices and have led to manufacturers changing from recycled plastics to virgin plastics. Recyclers across five countries in Asia (Thailand, Vietnam, Indonesia, Philippines and India) reported an average of 50% drop in demand for their products, 21% drop in sales prices, and many recyclers and businesses across the plastics value chain are at the risk of insolvency.⁴³ A table indicating Malaysia virgin price comparison in the period of April and May for the years 2019 and 2020 is shown in Appendix 8.

The lockdowns, continued restrictions and poor economic outlook induced by COVID-19 have further reduced recycle demand. The difference in pricing between virgin and recycled resins is mainly due to the cost needed for collection, sorting and cleaning of material sent for recycling, as well as the cost of energy and equipment required in producing recycled resins—which is unconnected to the cost of virgin resins. COVID-19 will be a crucial moment for the brand owners and retailers when it comes to resisting the low prices of virgin material and continuing to use recycled content.

42 CoC certification management system certifies an unbroken chain of organizations legally owning the material throughout the supply chain, from the certified recycler output into the final product.

43 [GA Circular, "Safeguarding the Plastic Recycling Value Chain: Insights from COVID-19 impact in South and Southeast Asia" \(2020\)](#)

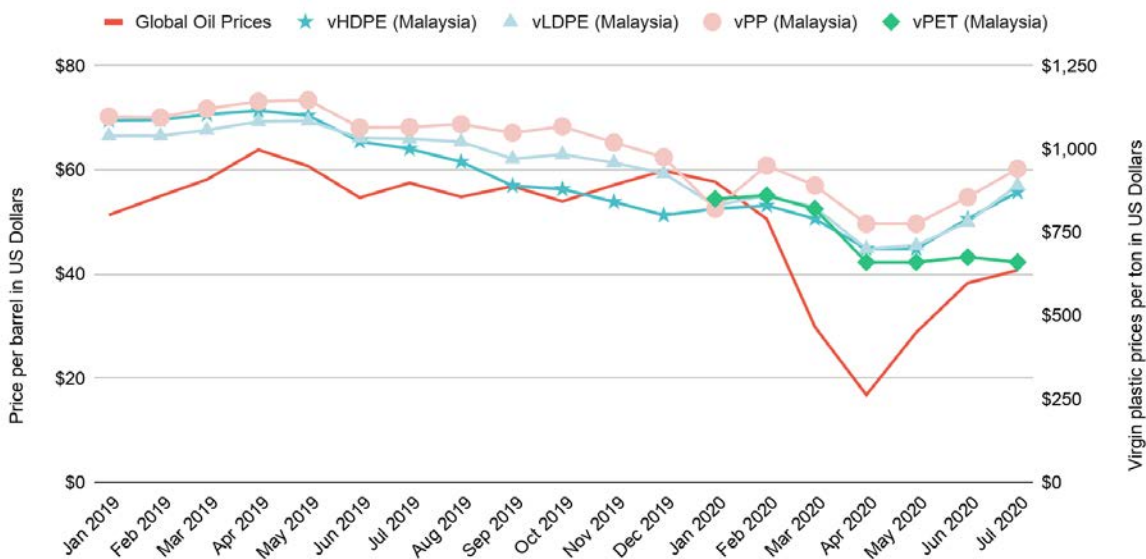


A converter used to buy HDPE extrusion grade recycled black pellets at \$700 per ton for Malaysia before the Chinese New Year, now he can only pay \$550 as virgin price and off-grade price are below \$650. Although the recycler (supplier) has thousands of tons of recycled materials, they refused to sell at \$550 because their cost is \$650 per ton—which would be \$100 per ton loss. Since Malaysia is still under lockdown, the recycler would rather lose money on overheads and shut down the factory until the lockdown is lifted.

Recycling Stakeholder

Figure 37.

COMPARISON BETWEEN GLOBAL CRUDE OIL PRICE AND VIRGIN PLASTICS PRICE



Sources: International Monetary Fund and U.S. Energy Information Administration (Global Crude Oil Prices), Malaysian Petrochemicals Association (Virgin resin prices)

Of the virgin resins studied, PET is the worst performing resin with regards to prices due to over capacity of PET production in the global market⁴⁴, coupled with the weak demand brought on by COVID-19. As a result, PET prices are struggling in the range of USD 650 to USD 700 per tonne since the early of year 2020.⁴⁵ A knock-on effect is that the prices of recycled resins have fallen to record low, with the price of PET and LDPE black recycled pellets falling to USD 400 per tonne at one point, the lowest record for prices of recycled pellets in the market.

44 This is also the case in Malaysia, see section 3.1.2.
 45 Steve Wong (2020), "Market Updates for the prime, recycled, and scrap plastics".

3.3.2. Reductions in Feedstock Supply and Demand for Recycled Plastic Due to Changes in Consumption Patterns Due to COVID-19

The COVID-19 pandemic has changed consumption patterns of consumers. Countrywide lockdowns led to a reduction in the supplies of post-consumer feedstock and demand for recycled plastics as the preferences of consumers shift toward virgin materials.

Reductions in Feedstock Supply

Post-consumer feedstock supply has been declining as consumption patterns shift due to COVID-19. The consumption streams, which have traditionally provided comparatively cleaner feedstock (such as food service, hotel channels and office buildings), were closed during



There are a lot of recyclers closing down their operations or going bankrupt in Malaysia, Hong Kong (China), Thailand, Indonesia and Vietnam due to lack of liquidity, shortage of supplies, and negative profit. It is estimated that the situation would not improve in the foreseeable future.

Recycling Stakeholder

the lockdown period in Malaysia (mid of March 2020 until early June 2020). Meanwhile, more consumption has shifted to households, which generally have low levels of segregation, making collection and trading of material significantly more challenging for recyclables collectors, street material pickers and junk shops.

At the household level, according to the Waste Management Association of Malaysia (WMAM), household waste generation increased by 20–30% since the implementation of the Movement Control Order (MCO).⁴⁶ COVID-19 and the MCO have also driven growth in the usage of food delivery platforms in Malaysia, like Dahmakan and Grab. For example, a 25% increase in online revenue was reported by merchant partners of GrabFood during the MCO.⁴⁷ This growth has fueled increases in plastic waste generation in households. Although there is no data for the increase in plastic waste generated by packaging during the lockdown period, the MPRA estimates a surge of plastics packaging consumption.⁴⁸ Even though the rise in plastic packaging consumption suggests that there may be more feedstock available, stakeholders report that contaminated items, from takeaway bags to containers, bottles and cups, made up more than 80% of the plastic waste, as waste segregation is still not actively practiced by most households in Malaysia. One brand owner interviewed for this study also shared that, during the MCO, their sales of small bottled beverages dropped as consumers shifted to work from home, preferring to buy bottled beverages in bulk and contributing further to the feedstock supply reductions.

Reductions in Demand for Recycled Plastics

Demand for recycled plastics has also been affected by a shift in consumers' perceptions of recycled plastics. In China, which is a major consumer of recycled plastic

products, consumers of plastic have begun opting for virgin materials instead of recycled materials for the quality and appearance, despite higher prices of virgin materials—for household items such as chairs, tables, buckets, bags and other single-use plastics.⁴⁹ The shift in consumer preference for virgin plastic products is linked to pride, social and economic status associated with virgin plastic materials, and the lack of consensus in accepting products with recycled content, which has been further exacerbated by health concerns on the risks of transmission through recycled materials during this COVID-19 pandemic.

3.3.3. A Significant Proportion of the Recycling Industry is at Risk of Closures or Operating at Low Capacities

During the MCO, only essential services were allowed to operate. While solid waste, public cleansing management and sewerage were considered essential services in Malaysia, the plastics recycling value chain was not. As recycling operations need manpower for collecting, sorting, baling, transporting and processing the plastic materials, the significant movement restrictions and closures hinder the recycling industry from operating, with reportedly 15 to 25% of informal recyclers shutting down their operations. The pandemic also disrupted the economics of the recycling industry with little or no sales, and lack of demand and supply in the market.

Based on the interviews with Malaysian recyclers, their sales revenues and orders experienced a sharp reduction of 30–40% (or more) due to this pandemic. Buyers also negotiated lower prices and longer payment period for the recycled materials. Most of the recyclers, including the larger recyclers, are still plagued by cash-flow issues and several reported plans to temporarily or permanently close down their business operations.

46 [The Star \(2020\). Managing surge in pandemic solid waste.](#)

47 [Lydia N. \(2020\) - Food delivery's trajectory continues post-MCO](#)

48 [Tashny S \(2020\). Plastic pollution plagues Southeast Asia amid COVID-19 lockdowns.](#)

49 Steve Wong (2020), "Market Updates for the prime, recycled, and scrap plastics".

As highlighted in a recent report by GA Circular and Circulate Capital on the impact of COVID-19 on plastic recycling value chains, recyclers need to get to about 70% operating capacity for recycling to make sense.⁵⁰ However, only 30% of the recyclers in all the Asian countries were operating during the lockdown and of these, at only 50% of their capacity.⁵¹ According to the recyclers interviewed as part of the study, some of the major recyclers in Malaysia are operating at less than half of their capacity during the period of June to August (after the end of the MCO). Industry sources estimate that at least 30% of recyclers in Malaysia are at risk of bankruptcy as of October 2020, and that many have already gone bankrupt or chosen to close due to the poor outlook for the plastics recycling industry.

3.3.4. There is Lack of Confidence for a Smooth Recovery due to Low Oil Price Projections for the Foreseeable Future

Restrictions on businesses and citizens only bring short to medium term impacts across the sector. The projections of a low crude oil price for the next 18

50 [GA Circular: Safeguarding the Plastic Recycling Value Chain: Insights from COVID-19 impact in South and Southeast Asia \(Aug 2020\)](#)

51 Steve Wong (2020), "Market Update for the prime, recycled, and scrap plastics"

months would be their major concern and the reason for the lack of confidence.

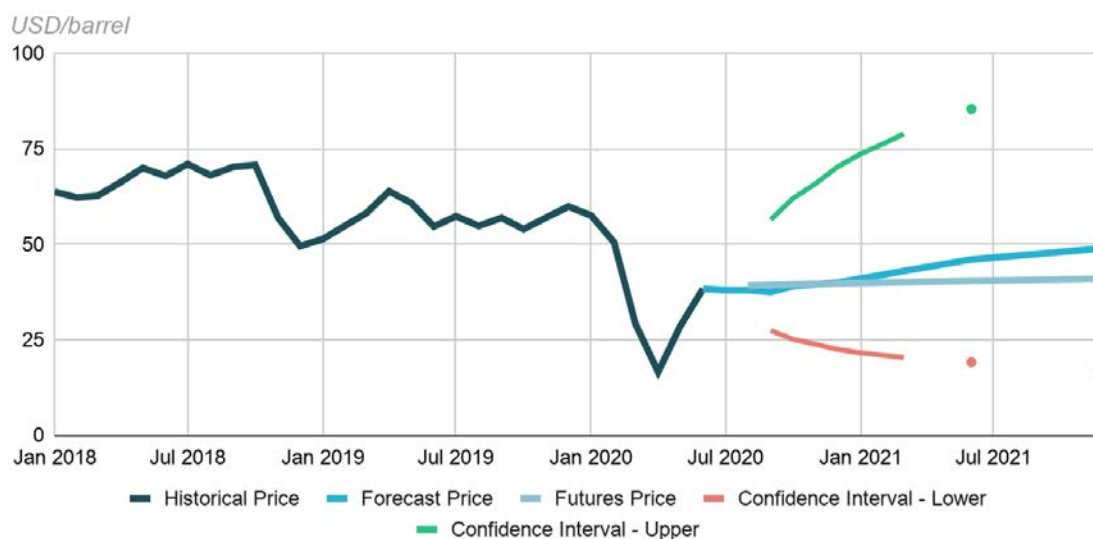
Recyclers are cash strapped and struggling as of Q3 2020, due to cash burn during the lockdown, unprofitable prices and lack of demand. In addition to this, they are facing the prospect of low oil prices for the next 18 months or longer. By January 2022, prices are projected to be only 50 USD/barrel. Oil prices may never recover to be above 70 USD/barrel. As of July to Sept 2020, the price has hovered between 40-42 USD/barrel (see Figure 38).

3.4 ADDITIONAL IMPACTS OF TIGHTENING GLOBAL REGULATIONS ON SCRAP PLASTIC AND RECYCLED PLASTIC TRADING

With the increased spotlight on plastic waste as an issue in the region, new developments with regards to regulations on the import of recycled and scrap plastics have emerged in 2020. Two key developments, in particular, have already affected the demand and prices of recycled resins.

Firstly, in addition to the National Sword Policy of 2018 banning the import of waste plastics, China, a major consumer of recycled plastics, has been tightening the enforcement of existing regulations regarding imports

Figure 38. **HISTORICAL AND FORECASTED CRUDE OIL PRICES (AND FUTURE PRICE AND 95% CONFIDENCE INTERVALS), BASED ON THE BEST CASE OF WEST TEXAS INTERMEDIATE (WTI) PRICES BY US ENERGY INFORMATION ADMINISTRATION (EIA)**



Source: [GA Circular: Safeguarding the Plastic Recycling Value Chain: Insights from COVID-19 impact in South and Southeast Asia \(Aug 2020\)](#)

of recycled plastics pellets.⁵² The stricter regulations, which came into force from 1 September 2020, specify that imports of recycled plastic pellets need to be in “uniform color, size and packaging.” It is understood that this means that pellets cannot be mixed together when imported to China, however, many stakeholders are still trying to understand what this requirement means. Violations of this rule will result in a fine of more than RMB 500,000 (about USD 74,500). Due to the hefty fines related to this new regulation, recyclers have reduced the amount of exports to China as they wait to observe how the Chinese authorities implement this regulation.

Secondly, the Basel Convention, a near-universal treaty which regulates the transboundary movements of hazardous wastes and other wastes and of which Malaysia is a signatory, has adopted amendments to Annexes II, VIII and IX to the Convention which deal with the transboundary movement of plastic waste that will come into force on the 1st of January 2021.⁵³ These amendments aim to make global trade in plastic waste more transparent and better regulated⁵⁴. Thus far, only Hong Kong, China has updated its guidelines to comply with the Basel Convention Plastic Waste Amendments. Under the new controls in Hong Kong, China, certain types of plastic waste listed in the Waste Disposal Ordinance of Hong Kong, China and Basel Convention will not require import permits if it is almost free from contaminants (not more than 0.5%) and is destined for recycling in an environmentally sound manner. Those not listed will be subject to the control of permit/consent and will require a notification for trans-shipment. Further details of the Basel Convention Plastic Waste Amendments and the updated Hong Kong, China guidelines can be found in Appendix 17.

These two developments in international movement of scrap plastic and recycled plastics mean that, for the time-being, overseas demand of recycled plastics to Malaysia will be depressed as recyclers observe how the new regulations come into play and as certain terms like “almost free from contamination” are defined.

3.5 BIOPLASTICS CONSUMPTION IN MALAYSIA REMAINS INSIGNIFICANT

In terms of local bioplastics resin production, Malaysia today has an installed capacity of up to 12,000 tons per year led by Australian firm SECOS Group and SIRIM. It is estimated that only between 10–20% of the bioplastics resin produced in Malaysia is used domestically within the country. The rest of the resin is exported to markets around the world including the United States, the EU, Japan, Korea and China.

In Malaysia, bioplastics are primarily used in single use applications for packaging and/or food contact applications such as beverage cups, straws, cutlery, tea bags, and carry bags. Bioplastics are typically not suitable for more durable applications such as automotive parts because of the nature of the end product’s long-term use and lifespan. Bioplastics are also entering the non-woven fabric market such as face masks, however these applications are still limited. More information on bioplastics and its categories can be found in Appendix 18.

SIRIM, the Standard and Industrial Research Institute of Malaysia, in 2018, revised the eco-labeling criteria for biodegradable and compostable plastic and bioplastic packaging materials (ECO 001:2018), while ECO 009:2016 criteria are applicable to biodegradable and compostable biomass-based products used for food contact application.⁵⁵ These documents establish environmental requirements for environmentally degradable and compostable plastic packaging materials. The degradation test is intended to provide an indication of the potential of plastic to persist in the environment. The criteria can be applied to all plastic sheets and films irrespective of colors, in the form of bags or packaging materials. In order to ensure residuals left at the end of the degradation will not cause harm to the environment, the plastic materials will also be evaluated for toxic metals. The degradation mechanisms relevant to the decomposition of the plastic materials are now classified as: a) biodegradation and b) compostable. Photodegradation and oxo-biodegradation were removed from the eco-labeling criteria in the 2018 revision.

However several challenges remain prohibiting the wide-spread use of bioplastics including confusion in differentiating between the eco-packaging terms (e.g. biodegradable, compostable, and oxo-degradable), a

52 [Resource Recycling Report: China Clamps down on Recycled Pellet Imports](#)

53 [Secretariat of the Basel Convention, “Basel Convention Plastic Waste Amendments”](#)

54 [Business Times \(2019\): Malaysia flooded with plastic waste to send back home scrap to source.](#)

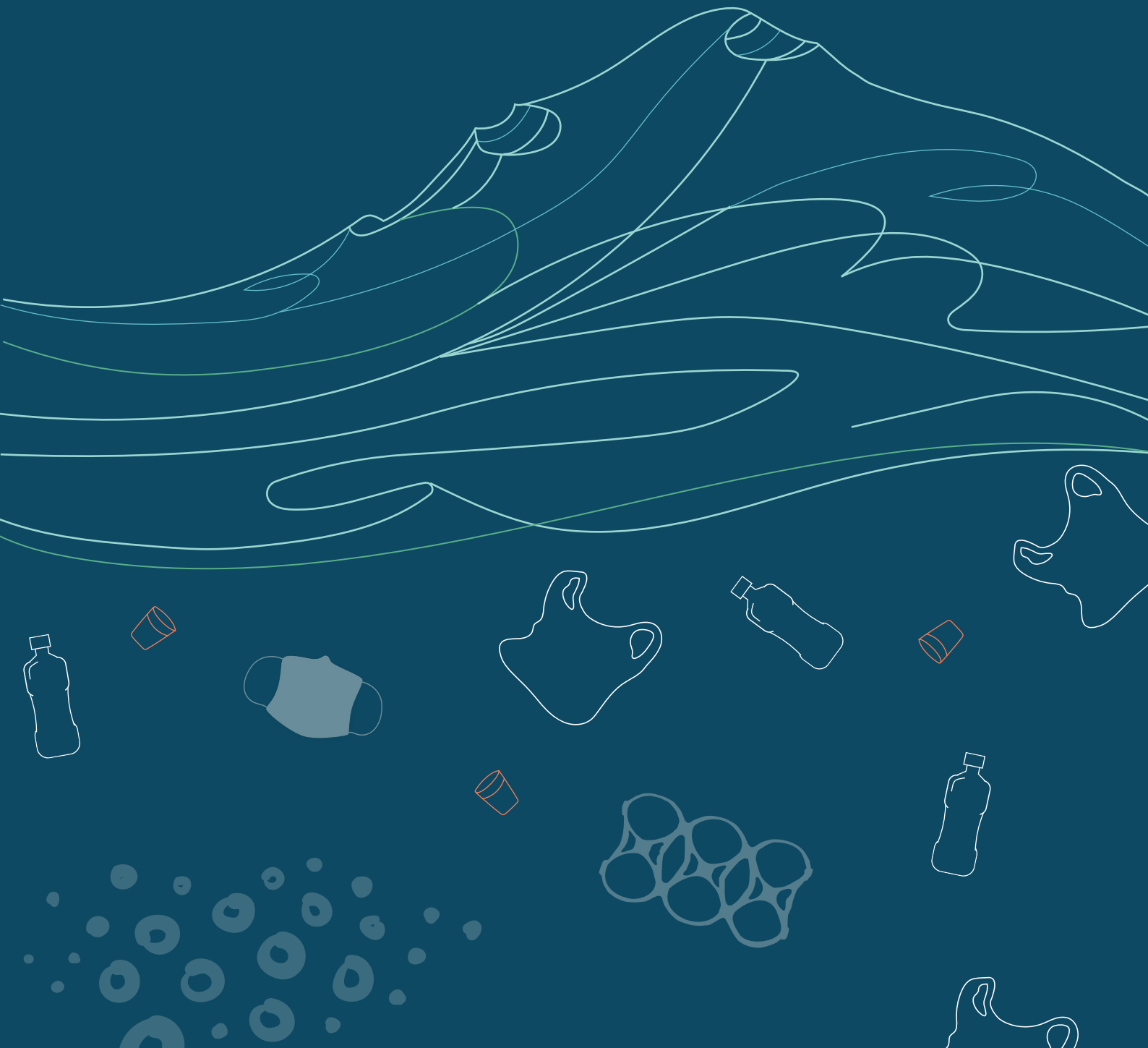
55 [The Sun Daily, “Eco-labelling scheme for bio-based plastics, packaging products launched” \(2017\)](#)

lack of a HS product code for oxo-degradable plastics preventing the import of oxo-degradable plastics into Malaysia (the use of oxo-degradable plastics have been banned or restricted in countries around the world due to concerns around microplastics production), missing standards on plastic bag production that enable plastic bag manufacturers to use oxo-degradable plastics, and the absence of industrial-scale organic waste treatment infrastructure network. Further details on the two main criteria that need to be fulfilled for bioplastics to be a viable and sustainable alternative to plastics derived from fossil resources are in Appendix 18.

Malaysia currently does not have a specific bioplastics roadmap and government support to grow the domestic demand for bioplastics is unclear. While bioplastics are likely to have a more important role in sustainable packaging sourcing decisions for major brand owners in the future, even if all the necessary supporting policies and standards were in place in Malaysia, bioplastics can only realistically be used as an alternative for single-use applications only when source-segregation and separate collection of municipal and commercial waste is done combined with industrial treatment of organic waste.

SECTION 4:

INTERVENTIONS TO UNLOCK ADDITIONAL MATERIAL VALUE



SECTION 4:

INTERVENTIONS TO UNLOCK ADDITIONAL MATERIAL VALUE

This section provides a broad set of recommended interventions to first stem this loss by laying a strong foundation for the recycling industry, strengthen the demand for recycled products and transform Malaysia's plastics recycling industry into a globally competitive and resilient industry.

Section 4.1 provides an overview of how the interventions proposed in this study are aimed at solving the demand, quality and supply issues described in the previous section. Sections 4.2 and 4.3 outline the intervention according to government and private sector stakeholders, respectively. Section 4.4 summarizes the interventions and actions in terms of their potential to unlock material value and lays a roadmap of the priority actions that need to be taken.

4.1 OVERVIEW

As shown in Figure 39, there are two categories of interventions needed to increase the material value unlocked via the circularity of plastics in Malaysia:

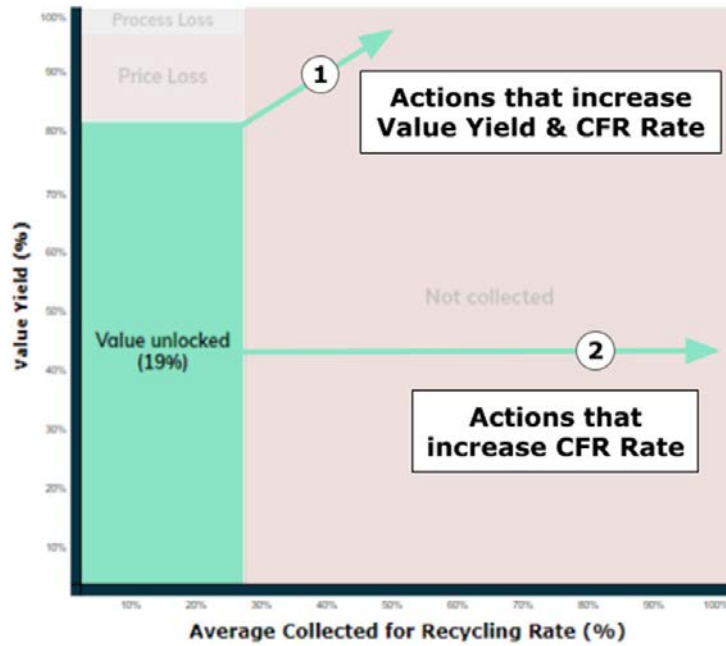
- 1. Interventions that increase Value Yield and CFR rate:** Each of these interventions contain actions that release pressure both horizontally and vertically. They enable the area of value unlocked to increase diagonally to the top right. Any actions that increase Value Yield are primarily driven by economics and value creation. It is important to prioritize these actions first as it creates the incentive for increased recycling to occur. Enabling the value chain stakeholders to understand and realize the value of recycling is a foundational step towards improving circularity.
- 2. Interventions that increase CFR Rate:** Each of these interventions contain actions that release pressure on the horizontal axis. They enable the area of value unlocked to increase horizontally to the right. These actions are longer term in nature and more systemic across the waste management and recycling value chains.

Notes:

- All the recommended actions have implications in increasing both CFR Rate or CFR Rate and Value Yield to a small or large extent. Most of the actions are interdependent on each other. However, for the purposes of this study, they have been isolated and classified into these two categories.
- Many of the recommended interventions and actions require cost estimation of infrastructure needs along with barriers but these estimations are out of scope as the key objective of this study is to define the addressable market size of the private sector plastics circularity opportunity. Therefore, once the recommendations of this study are taken forwards, a future action should be to conduct a CAPEX and OPEX cost estimation of infrastructure needs along with barriers for each of the prioritized actions.

Figure 39.

SUMMARY OF TWO CATEGORIES OF ACTION TO INCREASE THE MATERIAL VALUE UNLOCKED BY PLASTICS CIRCULARITY



To assist with prioritization of the actions on the basis of timing, each of the actions under the interventions have been classified under three clusters:

1. **Lay the Foundation:** Actions under this cluster create the necessary foundation for plastics circularity in Malaysia. Suggested timing to implement actions in this cluster: 1–2 years.
2. **Strengthen the Demand (for recycled products):** Actions under this cluster are high-impact actions that strengthen the demand for recycled products by strengthening CFR Rate and Value Yield. Suggested timing to implement actions in this cluster: 3–5 years.
3. **Maximize the Value:** Actions under this cluster help to unlock the maximum possible value from plastics recycling and help build a resilient recycling industry. Suggested timing to implement actions in this cluster: beyond 5 years.

4.2 INTERVENTIONS THAT INCREASE VALUE YIELD AND CFR RATE

A. Increase Waste Collection and Sorting Efficiency of Post-Consumer Plastics

With a net CFR rate of only 24% across all the four key plastics resins (of focus for this study) in Malaysia and considering this is likely overstated (as described in section 1.7), sorting efficiency needs to increase across the post-consumer plastics value chain including the stages of waste disposal, separate collection and transport and sorting materials from mixed sources. The actions outlined in Table 6 are key strategies for implementing an Integrated Solid Waste Management (ISWM) system.

Table 6.

ACTIONS TO INCREASE WASTE COLLECTION AND SORTING EFFICIENCY OF POST-CONSUMER PLASTICS

| Cluster & Timing | Action | Rationale |
|-----------------------------------|---|---|
| Lay the Foundation (1-2 years) | 1 Harmonize and enforce source-segregation and separate collection standards and targets | <p>Plastics converters in Malaysia have consistently reported having challenges sourcing for food-grade recycled plastics due to high contamination rates. At a bare minimum, segregating MSW between wet (organic) and dry (inorganic) waste will significantly reduce contamination as organic waste is the main contaminant of recyclables recovered from the MSW system. Separate collection also ensures higher operational efficiencies for waste collectors.</p> <p>Harmonized, nationwide standards and targets for source-segregation and separate collection (whether the states are covered under Act 672 or not) reduce the cost of collection for recyclers and increase yield. While it may not be feasible to expand Act 672 entirely due to the reasons stated in Appendix 13.1, there is still a large opportunity for Act 672 states and non-Act 672 states to cooperate in terms of data, knowledge and resource sharing with regards to source separation.</p> <p>A key aspect of this action would be to develop a harmonized data reporting system to get waste management and recycling data from every state. Based on the interviews by this study team with two non-Act 672 states and data received from SWCorp, it appears that non-Act 672 states are not part of the national reporting system on waste management to SWCorp. This is evidenced by the fact that the data shared to this study team by SWCorp, JPSPN and KPKT included detailed data only on Act 672 states while data on non-Act 672 states was limited to waste generation which was extrapolated based on assumed per capita waste generation for the country. Source segregation or recycling data on non-Act 672 states were not available from the federal agencies.</p> <p>Additionally, based on responses received from three states (Pahang, Penang and Sabah), the state of Penang is the best example for implementation of the Waste Segregation at Source policy, a mandatory policy where households are required to segregate their waste into two streams; general waste and mixed recyclables. The volume of plastic recyclables collected through this mandatory policy in Penang amounted to 21,226 tonnes in 2019, which gives an estimated formally collected plastic CFR rate of 13.5% (out of the amount of plastics estimated to be consumed via Penang's MSW stream). This CFR rate is much higher than the plastic recyclables collected across all the Act 672 states which amounted to 644 tonnes in 2019 (which gives a formally collected plastic CFR rate of 0.1%). The calculation of these estimated CFR rates is explained in the table in Appendix 13.3. The effective implementation of the Waste Segregation at Source policy was coupled with the positive response of the public with 67.77% participation rate of the households in both Penang Island and Seberang Perai.</p> <p>Therefore, the study team recommends that the Penang model be assessed further and considered for state-wide implementation of source-segregation. As part of this assessment, it is also recommended to assess Penang's state-level SWM infrastructure, operational costs of SWM and identifying the linkages between informal sector and SWM. Such a SWM assessment can enable a better understanding of the SWM infrastructure requirements and gaps to be addressed to make source-segregation successful.</p> |
| | 2 Establish dedicated materials recovery facilities (MRFs) as part of the waste collection system | <p>Any formal sorting of recyclables in Malaysia today happens via segregation at each collection site and at transfer stations and is neither efficient nor effective. MRFs provide economies of scale to sort and segregate dry waste in their respective categories which can then be sent to their respective recyclers. MRFs also provide secure jobs for workers from the informal collection sector and can be operated as micro-enterprises. Additionally, MRFs improve productivity and quality by integrating technologies such as optical sorting systems (especially in times like COVID-19 when worker numbers fall).</p> |

| | | | |
|--------------------------------------|---|---|--|
| Lay the Foundation (1-2 years) | 2 | (continued) | <p>One example of a public-private partnership approach for operationalizing and decentralizing MRFs is the Dry Waste Collection Centers (DWCCs) model in Bangalore, India. The physical infrastructure of the DWCCs were set up by the city municipality and licensed to NGOs or for-profit aggregators to be run to facilitate the streamlining of waste management in the city by concentrating exclusively on dry waste.</p> <p>The DWCCs are equipped with appropriate infrastructure capable of purchasing, collecting, aggregating and processing both high value and low value dry waste such as plastics, paper, glass, beverage cartons, etc. collected by formal waste collectors. In 2012 the city planned for one DWCC for each of the 198 wards in the city and till date has built 189 DWCCs. The capacity of these centers varies from one up to 4.5 tons per day. The principles on which the DWCC were based include:⁵⁶</p> <ul style="list-style-type: none"> • Zero subsidy in operations by Municipality, and implementation of segregation at source by Municipality. • Operations based on business principles. • Ensuring recovery of all possible recyclables through buy-back/take-back or drop off schemes. • Preventing landfilling of recyclable and other non-biodegradable material which can be processed alternatively. • Integrating informal waste workers through employment opportunities in the DWCCs. • Engaging citizens of a particular locality in recycling by serving as a dissemination point for segregation information etc. • Creating an interface for engagement with industry to enable them to discharge their extended producers' responsibility. • Providing the facility of warehousing and economies of scale and back-end integration. |
| Strengthen the Demand (3-5 years) | 3 | Develop awareness and behavior change campaigns | <p>Awareness and behavior change campaigns that focus on litter prevention, source segregation (e.g. dry vs wet waste) and recycling are critical for the success of plastics circularity.</p> <p>Voluntary EPR systems (e.g. PRO) and other companies from consumer-facing industries which use plastics can partner with the government to identify behaviors to be addressed, levers for changing the behaviors and to ensure consistent messaging and communication. The communications should be backed up with infrastructure that enables citizens to participate in the solutions.</p> <p>For example, the Indian government launched Swachhata App—a mobile application for consumers to post their complaints about their city's waste management. The app has more than 8 million downloads and is used in over 2,750 cities. In one city, Mysore, up to 90% of consumer waste management complaints through the app are resolved by the city.⁵⁷</p> |

56 [Working Observation on the Dry Waste Collection Centers in Bangalore](#)

57 Ocean Conservancy: Plastics Policy Playbook

| | | |
|-----------------------------------|--|---|
| Strengthen the Demand (3-5 years) | 4 Provide opportunities for informal sector inclusion | <p>The vast majority of collection of post-consumer resins in Malaysia are collected by the informal sector. This is due to the absence of any scalable formal avenues of collection of resins for recycling (e.g. source segregation of recyclables). Given Malaysia's continued reliance on the informal sector, CFR rate for plastics is projected to drop as GDP per capita grows.</p> <p>The informal sector can be included through any of the five best case practices for informal sector inclusion identified by The Ocean Conservancy: (a) NGO-supported microenterprises; (b) Cooperatives and collectives; (c) Franchisee development; (d) Supplier development; (e) Independent waste banks.⁵⁸</p> <p>Voluntary EPR models developed by industry should also ensure they integrate the informal sector and where possible avoid models that divert recyclables from the informal sector.</p> <p>Strengthen support for the informal waste management sector by registering informal waste workers officially, providing them with ID cards and investing in capacity building to strengthen their ability to collect waste more efficiently. The establishment of cooperatives should be supported, potentially by government subcontractors who collect and transport waste. An example of such a co-op is SWaCH, India's first wholly owned cooperative of self-employed waste collectors and other urban poor. It is an autonomous enterprise that provides front-end waste management services to the citizens of Pune in India. The cooperative covers over 70% of the city ensuring daily segregated waste collection from citizens' doorsteps while generating sustainable livelihoods for one of the poorest and most marginalized sections of society.⁵⁹</p> <p>Promote the welfare and living standards of informal waste pickers – perks and initiatives could include annual health check-ups, life insurance and annual bonuses for collecting more than a certain amount. Consider using health as an entry point for engaging with the informal sector by establishing health initiatives to informal workers as a platform for further engagement and capacity building. Encourage the private companies managing transfer stations to meet with the informal waste pickers who work in their premises to discuss solutions for improving the working conditions and how to enable them to divert waste more effectively from landfills, thereby also reducing landfill fees for the private companies and saving them money.⁶⁰ An example of this is Hasiru Dala Innovations, a private waste collection company in Bengaluru, India. The organization works actively with 3,000 waste-pickers in the city to provide benefits such as social security, health insurance, access to microfinance, etc. to empower them to raise their standard of living.</p> <p>Develop positive financial incentives to encourage the households and bulk waste generators to recycle more, through pay-as-you-throw (PAYT) programs and curbside reward schemes. It must be noted that PAYT is not a fine or negative incentive, instead a positive incentive to encourage source-separation and recycling behavior. Hasiru Dala Innovations in Bengaluru, India provides a first of its kind pricing model for waste collection services comprising of a fixed component and a variable based on the weight of each waste stream—clients (such as apartment complexes, districts, corporate campuses, etc.) pay only as much as they generate and how well they segregate.</p> |
|-----------------------------------|--|---|

58 Ocean Conservancy: Plastics Policy Playbook

59 SWaCH - Website

60 UNESCAP, "Closing the Loop" Sai Mai District, Bangkok Case Study, 2018

| | | | |
|---|----------|---|---|
| <p>Strengthen the Demand (3-5 years)</p> | <p>5</p> | <p>Invest in treatment of organic waste</p> | <p>Plastic recycling will be more successful if investments are also made in organic waste treatment through industrial-scale composting, anaerobic digestion or mechanical biological treatment (MBT) to create value from organic waste. It does so by reducing the amount of contamination of plastics recyclables collected from the MSW stream. Additionally, it incentivizes the implementation of a well-managed source segregation system. These organic waste treatment facilities will also enable the growth of bioplastics usage.</p> <p>One example where this is done effectively is Taiwan where food waste is segregated from MSW using compostable plastic bags which are then composted in an industrial composting facility. Similarly, in the EU, one of the main uses of compostable plastics has been for bio waste bags which are used to make collection of food waste more user-friendly, thereby maximizing participation and capture. Compostable bags for collection of source-separated food waste are largely used in Norway, Italy, Spain, the UK and Ireland. The compostable bags are designed to enter an industrial composting facility together with the food waste.⁶¹ Italy and France have banned ultra-thin fossil fuel-based plastic bags and mandated the use of bio-based compostable bags instead. Italy has combined it with waste goals, improved separation and higher quality compost.⁶²</p> |
| <p>Maximize the Value (Beyond 5 years)</p> | <p>6</p> | <p>Digitalize recyclables collection</p> | <p>Demand for ethically sourced recyclables is expected to increase as brands increase their commitments to use recycled content. This requires increased transparency of the plastics value chain in Malaysia by tracing the flow of materials through the informal collectors, junk shops, aggregators and recyclers via digital tools and thereby increasing the value of plastics. This also enables more efficient routing of transport logistics for aggregators and recyclers.</p> |
| <p>Maximize the Value (Beyond 5 years)</p> | <p>7</p> | <p>Implement Pay-as-you-throw (PAYT) waste collection model</p> | <p>PAYT is a usage-pricing model in which users are charged based on how much waste they throw away. This gives incentives to individual households to reduce the amount of waste disposed of. Faced with a direct form of unit pricing for the waste they produced, households are motivated to source-segregate or recycle as much of their waste so that they are able to save from paying the fees associated with the PAYT system. In this way, waste disposal resembles other utilities more closely, where the customer pays the amount for the services provided.</p> <p>Three key components need to be in place for effective implementation of a PAYT/ Save As You Recycle (SAYR) scheme: (a) user identification system; (b) measuring the volume of waste generated; (c) provision of a publicly acceptable charging scheme.⁶³</p> |

61 [Relevance of biodegradable and compostable consumer plastic products and packaging in a circular economy \(March 2020\)](#)

62 [BioPlastics News](#)

63 [Singapore Solid Waste Management Technology Roadmap, National Climate Change Secretariat](#)

An important additional benefit of increasing sorting efficiency is also the reduction in total waste collection costs (OPEX costs) for local governments. Using the waste collection fees for households in the Act 672 states, Figure 40 indicates the shortfall in funding per household due to the current linear system. According to JPSPN, the current collection service fees per household is RM14.80 per household for landed residential properties, and RM10.87 per household for non-landed residential properties, which amounts to a weighted average of RM13.82 household in Act 672 states. While JPSPN had allocated RM1,536 million (or RM45 per household per month) to SWCorp for solid waste management, public cleansing and facility operations in 2019, the waste collection fees collected from households in the Act 672 states only amounted to RM472 million, or about 31% of the cost.

Increasing sorting efficiency can reduce the total waste collection costs (OPEX costs) in the Act 672 states by up to 30%.⁶⁴ This is primarily due to:

- Reduced landfill tipping fee costs due to diversion
- Increased efficiency of transport logistics (fuel, routing) and reduced manpower costs due to diversion of trucks going into landfills

This increased sorting efficiency reduces the shortfall for JPSPN by RM 14 per month for each household,

64 Modeling by GA Circular

thus saving JPSPN a total of RM461 million/year (USD 111 million/year).⁶⁵

B. Set Recycled Content Targets across all Major End-Use Applications

With only 334,000 TPY out of 1.4 million TPY of plastics resins consumed getting recycled, Malaysia lacks a strong secondary market for recycled plastics. Additionally, Malaysia’s reliance on export markets for demand has exposed the recycling industry to the full brunt of the global price volatility inherent in the recycling industry. Setting recycled content targets enables the growth of a strong domestic market for recycled through increasing the demand for post-consumer resin. Therefore, increased demand will lead to increased prices of post-consumer plastics which will motivate an increased amount of collection to capitalize on the better prices.

Recycled content targets should be complemented with longer-term measures to discourage the use of 100% virgin plastics in industries where recycled plastics can technically replace virgin plastics without any impact on product performance (e.g. in applications that use rigid PET and HDPE packaging). Table 7 presents key strategies to set recycled content targets across all major end-use applications.

65 Modeling by GA Circular

Figure 40. **IMPACT OF SORTING EFFICIENCIES IN COST MODEL FOR MALAYSIA’S ACT 672 STATES’ MSW (BASED ON COST PER HOUSEHOLD)**

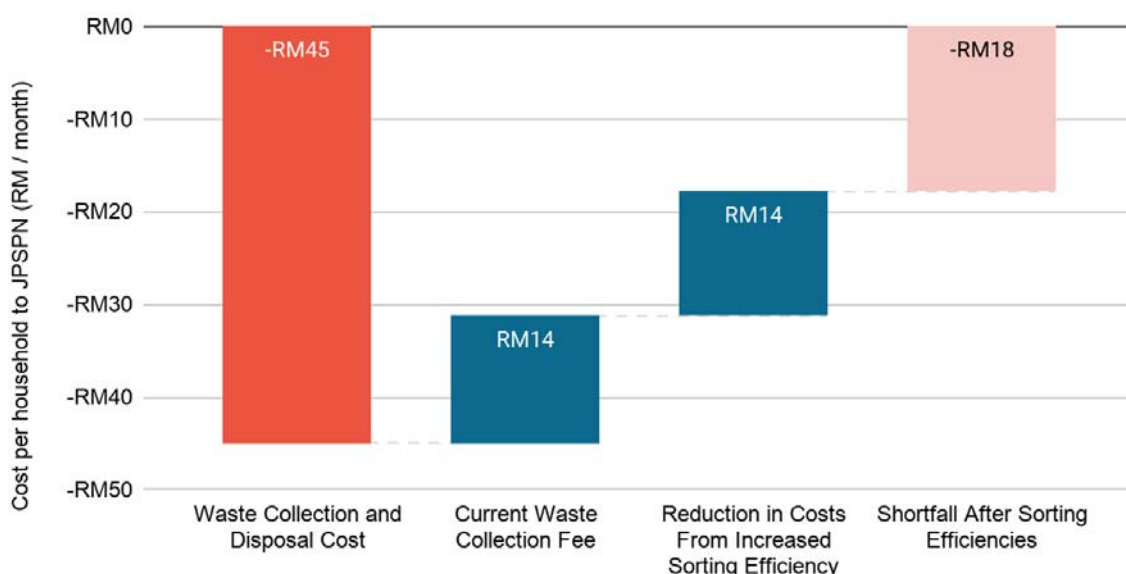


Table 7.

ACTIONS TO SET RECYCLED CONTENT TARGETS ACROSS ALL MAJOR END-USE APPLICATIONS

| Cluster & Timing | Action | Rationale |
|--------------------------------|---|---|
| Lay the Foundation (1-2 years) | 8 Communicate the approved usage of recycled content for food-contact applications & finalize decision on Halal labeling/certification | <p>Food-grade recycled plastics command the highest margins across all the major grades of recycled products from PET, HDPE, LDPE and PP resins. Additionally, major multinational companies have set targets for using up to 50% recycled resin in their packaging and demand for food-grade resins is growing in Malaysia in PET, HDPE and is expected to grow soon in PP. The potential for a large domestic market for recycled plastics in food-contact applications is currently untapped.</p> <p>This is because brand owners are currently unclear as to the permissibility of recycled content in food grade packaging. As discussed in section 3.2.4, with regards to safety, recycled content in food grade content is self-regulated under Regulation 27 of the Food Regulations 1985. Packaging with recycled content is not allowed to be marketed as a 'Halal packaging' as the current Malaysian standard for Halal packaging, MS2565:2014, currently disallows the use of recycled material. In essence, this means that the usage of recycled content in food packaging is allowed if it complies with self-regulation under Regulation 27 of the Food Regulations 1985 but brands are not able to market it as being 'Halal' as of now.</p> <p>Therefore, a revision of MS2565:2014 to allow recycled content in Halal packaging should be conducted to allow companies to be confident that their products will be accepted in the Malaysian market. There is already precedent in the region on the approval of recycled content for Halal food packaging. For e.g. in Indonesia, Bango, a sweet soy sauce brand from Unilever, became the first product with packaging having recycled content (100% rPET) to be approved to be Halal by Indonesia's National Food & Drug Agency (BPOM).⁶⁶ This comes under regulation 20/2019 of the BPOM which, as stated in sections 2 and 10 of the regulation, treats food packaging made from recycled materials similar to other food packaging in terms of compliance with the relevant laws on food packaging in Indonesia.⁶⁷ The ability of companies to certify and market packaging materials with recycled content as Halal will allow them to be confident that their products will be accepted by the majority Muslim Malaysian market.</p> <p>If the ongoing review of the existing regulation successfully allows recycled content in food packaging, it would be the responsibility of the Government, through ministries and departments such as KASA, MOH and JAKIM, to make food-grade recycled content usage and requirements clear to the packaging industry and to consumers.</p> |
| Lay the Foundation (1-2 years) | 9 Set recycled content targets & standards for major plastic use industries (i.e. packaging, construction, electronics, filament sectors) | <p>Recycled content targets enable the gradual, partial decoupling of recycled and virgin plastic prices. They guarantee a domestic demand and encourage investments into the plastics recycling industry. Packaging, electronics, filament applications use a large proportion of mono-material plastics that do not have high structural performance requirements of automotive and construction applications and therefore plastics used in these applications should be targeted for recycled content targets.</p> <p>Setting mandatory recycled content targets is critical not only for consumer-facing industries, such as consumer goods packaging, but also for industries where the end application is not customer-facing and where the buyer is indifferent to the use of virgin or recycled (e.g., agriculture, filament industries). This is because in such applications, pricing is the buyers' only decision-making criteria and, currently, recycled plastics in Malaysia are sold at a discount to virgin plastics. Based on recycling industry sources, more than 80% of the plastic waste would fall into the category of such applications and, if plastic circularity is to be accelerated in Malaysia, this should be a particularly important focus area.</p> |

⁶⁶ Bango launches 100% recycled and recyclable bottle in Indonesia

⁶⁷ BPOM Regulation 20/2019

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|-----------------------------------|----|---|--|
| Lay the Foundation (1-2 years) | 9 | <i>(continued)</i> | <p>Implementing national standards for recycled products can also promote acceptance of recycled products as consumers feel confident about product performance and safety.</p> <p>While work still needs to be done to clarify the usage of recycled content in food packaging as mentioned in action 7, other plastic applications are ripe for recycled content to be included. For example, PET bottles can be recycled into yarns such as rFDY and rPOY for textiles. Also, HDPE and PP can be used to produce construction parts, with one recycler saying that the construction parts can be up to 100% made from recycled content. Hence, while there are still some challenges facing the highest value recycling (i.e. food grade recycling), there is still significant opportunities for recycled content usage for all other industry applications of plastics, including for the textile industry, construction industry, electronics, automotive industries, etc. to quickly increase the usage of recycled content.</p> <p>It is recommended that any recycled content rate targets are set at a resin-level or at an end-use application level—e.g. recycled content target rate for PET bottles could be made higher as several consumer goods companies are already aiming for 25–50% recycled content rate targets for PET bottles by 2030 and the CFR rate for PET Packaging is higher than that of other applications of PET. Recycled content targets can be as effective as the CFR rate targets (Action 21) as they stimulate the local secondary market for recycled products.</p> |
| Strengthen the Demand (3-5 years) | 10 | Develop & launch incentives for using recycled content e.g. reducing Sales and Services Tax (SST) | <p>The government can stimulate demand while mitigating some of the infrastructural costs of incorporating post-consumer resin (PCR) into plastic products through introducing tax benefits for plastic products which contain PCR content above a certain percentage (e.g. above 30% PCR). Therefore, brand owners and the rest of the value chain stakeholders will be encouraged to include PCR content in their products.</p> <p>For example, in the UK, the Treasury offers lower Value Added Tax (VAT) for products or businesses that incorporate a minimum proportion of recycled, reused or remanufactured material. Reducing VAT for recycled content or reuse and repair activities is in line with previous select committee recommendations. In 2014, the government's Environmental Audit Committee recommended that the government should "introduce differential VAT rates based on lifecycle analysis of the environmental impact or recycled content of products, and tax allowances for businesses that repair goods or promote reuse".⁶⁸</p> <p>Sweden has also shown it is possible to reduce VAT for repairing goods within the EU and the European Commission recently proposed that member states should have more flexibility in changing VAT rates.⁶⁹</p> |
| Strengthen the Demand (3-5 years) | 11 | Implement green public procurement of recycled plastic products | <p>Although the 11th Malaysian Plan stated the target for 20% Government Green Procurement (GGP) by 2020, 50% by 2025 and 100% by 2030, the implementation of GGP only focuses on the 30 selected groups of products and services, with no requirement which specifies the need for the inclusion of recycled content.⁷⁰</p> <p>The government can have a large impact on demand through consuming recycled resins. For example, as outlined in the EU's "Green Public Procurement Manual on Plastic Waste Prevention", governments may specify packaging bought or used by the government must contain at least 75% recycled content. This increases the demand for packaging which meets that criteria.</p> |

68 [Completing the Circle, Green Alliance \(2018\)](#)

69 [Completing the Circle, Green Alliance \(2018\)](#)

70 [EPU, The National SCP Blueprint 2016-2030 \(2016\)](#)

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|-------------------------------------|--|--|
| Maximize the Value (Beyond 5 years) | 12 Tax plastic applications without minimum recycled content | <p>Once recycled content targets are set, and other actions under “Lay the Foundation” cluster in this table have been implemented, virgin material taxes should be levied on plastic products which do not clear the recycled content target. This helps to stabilize demand and ensure that the entire industry is progressively increasing recycled content usage.</p> <p>For example, the UK’s plastic packaging tax will result in an additional tax of £200/tonne for plastic products which do not have at least 30% PCR content when it comes into force in 2022. Similarly, to encourage production and demand for recycled plastics from within the EU, the European Commission has proposed a €0.80/kg tax for all non-recycled plastic produced in the EU,⁷¹ generating an estimated €5.9 billion/year for the EU budget.</p> <p>These taxes could be targeted first for products where the inclusion of recycled content is already established or where there are less barriers to accomplish it. For example, textiles and construction parts can already be targeted for recycled content usage as mentioned in Action 8 whereas more time might be needed for recycled content in food packaging as mentioned in Action 7.</p> |
|-------------------------------------|--|--|

C. Mandate “Design for Recycling” Standards for all Plastics, especially for Packaging

Packaging constitutes 48% of the revenue of all plastics consumed in Malaysia. Without fundamental redesign and innovation, about 30% of plastic packaging will never be reused or recycled.⁷² This amounts to at least 210,200 TPY of plastic packaging in Malaysia that will remain locked away from any possible reuse or recycling. The packaging segment in Malaysia includes small-format packaging, such as sachets, tear-offs, lids and sweet wrappers; multi-material packaging made of several materials stuck together to enhance packaging functionality; uncommon plastic packaging materials of which only relatively low volumes are put on the packaging market, such as polyvinyl chloride (PVC), polystyrene (PS) and expanded polystyrene (EPS) and highly nutrient-contaminated packaging, such as fast-food packaging.⁷³

Table 8 presents key strategies to set design for recycling standards for all plastics, especially packaging.



Photo: Izlan Somai / Shutterstock

71 [ICIS - EU Commission proposing €0.80/kg tax on production of all non-recycled plastics](#)

72 [Ellen MacArthur Foundation New Plastics Economy: Catalyzing Action](#)

73 [Ellen MacArthur Foundation, “New Plastics Economy: Catalyzing Action”](#)

Table 8.
ACTIONS TO SET “DESIGN FOR RECYCLING” STANDARDS FOR ALL PLASTICS, ESPECIALLY FOR PACKAGING

| Cluster & Timing | Action | Rationale |
|-----------------------------------|--|---|
| Lay the Foundation (1-2 years) | 13 Align industries on “design-for-recycling” standards | <p>Aggregators and collectors have consistently reported that several non-packaging plastic products are locked away from ever getting recycled due to product design (e.g. use of adhesives instead of screws in industrial plastic products). These stakeholders often reach out to producers requesting design changes but have not been successful because within Malaysia there are no guidelines or requirements for reparability/availability of spare parts, modular design, ease-of-disassembly/design for recycling, or for declaration of substances that are a problem for recycling. If value is to be unlocked from non-packaging plastic applications, “design-for-recycling” will need to be mandated at some level.</p> <p>In Malaysia, the key stakeholders to drive the development of design-for-recycling standards should come from industry (through industry groups such as MPMA, FMM, MaSPA, MAREA) and government (through bodies such as SIRIM).</p> |
| Lay the Foundation (1-2 years) | 14 Voluntarily adopt “design for recycling” standards for all plastic products | <p>Recyclers interviewed have reported a contamination rate of up to 30% of the rigid plastics feedstock they receive from Malaysia. This includes contaminants due to poor segregation practices and also due to poor packaging design. One example of a design for recycling standard would be the phase out of the use of PVC labels for PET bottles.</p> <p>This action can start with voluntary standards adopted by plastics producers and brand owners (e.g. producers of packaging). Especially in the case of multi-layer, multi-material flexible packaging, voluntary steps and standards are needed towards adopting mono-material replacements for multi-material packaging and to increase the separability of multi-material films. Stakeholders from the flexible packaging industry in Southeast Asia reported that multilayer films in the market are composed of different materials e.g. PET, Nylon, CPP (cast polypropylene), LDPE, LLDPE, aluminum foil and that collection, sorting and recycling of wastes from such multi-layer, multi-material films is still very rare. The recently developed Biaxially-oriented Polyethylene (BOPE), for instance, allows for stronger mono-material PE flexible packaging, reducing the need for combination with other polymers or materials.⁷⁴</p> |
| Strengthen the Demand (3-5 years) | 15 Mandate national “design for recycling” standards for packaging plastics | <p>National mandates for industrial design standards for high-volume plastic applications such as packaging plastics will eventually create a level-playing field wherein investments and changes towards design for recycling become mainstream and there are no free riders.</p> |

74 [Flexible Films Market in Europe, State of Play 2020 by Plastics Recyclers Europe](#)

4.3 INTERVENTIONS THAT INCREASE CFR RATE

D. Encourage Increase in Recycling Capacities (Mechanical and Chemical)

It will not be possible to increase the CFR rate in Malaysia without adding recycling capacity. This requires a number of actions which are interlinked with each other. Table 9 presents key strategies to encourage increases in recycling capacities, both mechanical and chemical.

Table 9.

ACTIONS TO ENCOURAGE INCREASE IN RECYCLING CAPACITIES (MECHANICAL AND CHEMICAL)

| Cluster & Timing | Actions | Rationale |
|--------------------------------|--|---|
| Lay the Foundation (1-2 years) | 16 Incentivize increase in recycling capacities for polyolefins (PP, PE) | <p>Resins with wide ranging single-use applications such as PP, HDPE and LDPE/LLDPE have wide gaps for recycling capacity. PP (34% gap), HDPE (71% gap) and LDPE/LLDPE (59% gap). Thus PP, HDPE and LDPE/LLDPE must be prioritized for investments.</p> <p>Short term incentives and/or subsidies to commercialize innovation and enable Malaysian plastics recycling industry to scale-up are critical. This can be done through a series of incentives that encourage increase in recycling capacities. These suggested incentives include:</p> <ul style="list-style-type: none"> • Increased MIDA support to all recyclers. For example, a Plastic Market Development program, which pays a pre-arranged value per ton to plastics reprocessors and manufacturers using recycled plastics. • Extending the 100% tax exemption for plastics recyclers to beyond 10 years (as recyclers note a payback period of at least 10–12 years on their CAPEX) • Specific MIDA and Ministry of Finance support for growing mechanical recycling capacities for PP, HDPE and LDPE/LLDPE—for example, reducing or canceling SST for imports of machinery for recycling high-quality plastics • Requiring all recipients of MIDA incentives to have necessary environmental, health and safety (ESH) practices and standards in place such as wastewater treatment • Expanding the scope of incentives to specifically include incentives for material washing process, an important but expensive process in recycling to extract the most value • While considering incentives, it is also important that plastic recycling projects that add the most value to the final product and that meet environmental, health and safety (EHS) standards (e.g. solid state polymerization or adding a hot-wash or cold-wash line) are prioritized over those projects that do not add value or meet EHS standards. For example, if the washing step of plastic recycling does not receive specific incentives, it is as good as not promoting recycling as the washing step is a key cost and operational component of any recycling process. |
| Lay the Foundation (1-2 years) | 17 Incentivize PET recycling to higher-end recycled products | <p>While >100% recycling capacity exists for PET in Malaysia, less than 5,000 TPY of this capacity can be used to produce food-grade rPET. Also, the majority of bales of post-consumer PET available from within Malaysia are unable to meet the quality standards to end up in higher-end use applications such as POY or food-grade bottles.</p> |

| | | | |
|-----------------------------------|----|--|--|
| Strengthen the Demand (3-5 years) | 18 | Provide market pricing and volume data for virgin and recycled plastics | <p>Market data on pricing and volumes for recycled products encourages market liquidity and gives confidence for new recyclers to enter the market, for current recyclers to grow their capacities and for global plastics producers to buy recycled products from Malaysia. Market data also makes it easier to better anticipate the volatile pricing cycles for recycled products. Market intelligence firms such as IHS Markit, ICIS, S&P Platts, Wood Mackenzie already offer market data services for recycled products in regions such as Europe and North America.</p> <p>A good market pricing and volume data service for recycled products should include:</p> <ul style="list-style-type: none"> • Graphs and tables showing historical weekly price moves for long-term perspective for both virgin and various grades of recycled products (bales, flakes, pellets) • Monthly import and export data on plastics scrap, virgin resins and recycled products • Recent spot deals including commodity, price, location, volume • Plant data including production and capacity, plant maintenance and shutdowns • Weekly market overview/outlook including a brief commentary on the other regional markets • Supply and demand analysis of domestic and international supply and demand • News on force majeure and other plant disruptions, closures, openings and expansions |
| Strengthen the Demand (3-5 years) | 19 | Invest in chemical recycling (plastic-to-plastic) for low-value plastics | <p>Chemical recycling converts waste plastics into cracker feedstocks that could displace naphtha or natural gas liquids (NGL) demand. This type of recycling treats mixed polymer streams that mechanical recycling technologies cannot handle. Outputs of chemical recycling are more resilient to lower oil prices, remaining profitable down to \$50/barrel⁷⁵ as compared to mechanical recycling (the economics of mechanical recycling begin to break down at below \$70-\$80/barrel).</p> <p>Technologies that convert plastics back into secondary raw materials or fuels can be considered to fall under two broad categories: (a)plastic-to-plastic (via naphtha or monomer recycling); (b)plastic-to-fuel (PTF).⁷⁶ Such technologies are still largely at the pre-commercial stage and the scalability, financial viability, environmental impact assessments and other risks of chemical recycling have not yet been fully demonstrated, especially in a Southeast Asian context. These technologies are generating interest as a replacement for unsustainable feedstock sources.⁷⁷</p> <p>While harmonized definitions for chemical recycling are still to be developed, even in the EU which leads in the development of these technologies, plastic-to-fuel technologies are considered by the chemical recycling industry to be energy recovery, not recycling; only plastic-to-plastic technologies (such as those that produce naphtha or monomers directly) are considered to fall under existing EU definition of recycling in the EU Waste Framework Directive.⁷⁸</p> <p>Chemical recycling technologies are already beginning to enter Southeast Asian countries such as Indonesia and Malaysia.⁷⁹ Chemical recycling (plastic-to-plastic) is especially relevant for PE and PP flexible films in Malaysia and should be encouraged to complement mechanical recycling. One example of a potential chemical recycling solution that can be replicated in Malaysia is Multicycle,⁸⁰ an EU project which uses the CreaSolv technology to identify potential chemical recycling solutions for plastics in mixed waste.</p> <p>Currently a chemical recycling technology firm (Plastic Energy) is jointly performing a feasibility study with Petronas to establish a facility in Malaysia to convert plastic waste into thermal anaerobic conversion (TAC) Oil, an alternative to naphtha, to create virgin-quality plastics from low quality, mixed plastic waste otherwise destined for incineration or landfill.</p> <p>Recycling capacity investment in facilities that produce plastic-to-fuel (e.g. plastic-to-diesel) as a primary output should not be prioritized as this is not considered circular.</p> |

75 [McKinsey, "Recycling and the future of the plastics industry"](#)

76 [A Circular Solution to Plastic Waste by BCG](#)

77 [Flexible Films Market in Europe, State of Play 2020 by Plastics Recyclers Europe](#)

78 [Chemical Recycling Europe](#)

79 [Plastics Energy Press Release on Malaysia; Plastics Energy Press Release on Indonesia](#)

80 [Multicycle](#)

E. Create Industry-Specific Requirements to Increase Plastic Waste Collection and Recycling Rates

One of the main challenges to plastics circularity in Malaysia is the lack of industry-specific collection/take-back requirements for the major end-use industries. This results in CFR rate being completely left to

market forces. The prices for recycled products are thus always under constant cost pressure from virgin plastics providing little incentive to increase the CFR rates. Thus, CFR rate needs to be decoupled from this cost pressure on recycled plastics. Table 10 presents key strategies to create industry-specific requirements to collect post-use products.

Table 10.

ACTIONS TO CREATE INDUSTRY-SPECIFIC REQUIREMENTS TO INCREASE PLASTIC WASTE COLLECTION AND RECYCLING RATES

| Cluster & Timing | Actions | Rationale |
|--------------------------------|---|---|
| Lay the Foundation (1-2 years) | 20 Setup voluntary extended producer responsibility system for all major end-use application industries for plastics (e.g. PRO for not only packaging but also for electronics) | <p>The obligated industries should on a voluntary basis increase the CFR and/or recycling of products/packaging which uses plastic. Private sector companies, especially in the packaging and electronics sectors, have decades of experience in several countries and regions in operating PROs. Industry-led pre-competitive PROs provide the private sector with the flexibility to implement various economic tools to increase CFR while ensuring that the funds collected are directed towards collection systems.</p> <p>As discussed in section 3.2.3, MAREA is a voluntary industry-led PRO (consisting of 10 fast-moving consumer goods and packaging companies) that is under development. Once officially launched, MAREA will mainly focus on increasing the CFR rate of packaging products. While MAREA will focus on packaging, PROs are also needed for other types of products such as electronics and automobiles to ensure that the collection for recycling of all plastics can be supported.</p> |
| Lay the Foundation (1-2 years) | 21 Mandate collection targets specifically for packaging and electronics industries | <p>Packaging and electronics account for 48% and 27% of the end-use industries in Malaysia (based on revenues) and their products are generally of a 1 to 5 year lifespan (i.e. shorter lifespan compared to construction, automotive and filament industries). Collection targets also minimize the challenge of free-riders and require the entire obliged industry to participate in increasing CFR. The targets should be calibrated based on how recyclable the resins and products are and how developed the recycling infrastructure is. These collection targets will, in effect, mandate EPR.</p> <p>When mandating collection targets, it is important to ensure the design and implementation of specific economic models of the EPR system is not prescriptive and instead is left to the respective industry. This ensures the funds collected from the industry remain in the hands of the respective industry to make the necessary interventions. Also, the targets must encourage eco-modulation within the economic model of the EPR to accelerate progress. For example, in developing the economic model for the EPR system industry must be required to pay a higher fee for lower-value, non-recyclable plastics (such as multi-material, multi-layer flexible packaging) as compared to higher value, recyclable plastics (such as rigid PET, HDPE and PP bottles and containers).</p> <p>Starting with a voluntary EPR system (Action 20) can be an excellent testing ground for designing and implementing the appropriate EPR economic model at a national-level.</p> <p>A feasibility study to evaluate and recommend specific CFR targets (and recycled content targets as per Action 9) and milestones in order to assess local SWM infrastructure, policy options, sensitivity analysis on oil and virgin plastic prices and cost-benefit analysis of these targets is recommended. Such a feasibility study and modeling would need to be done before any CFR targets and recycled content targets are suggested or set.</p> |

| | | | |
|---|-----------|---|---|
| <p>Strengthen the Demand (3-5 years)</p> | <p>22</p> | <p>Mandate reporting framework for plastic products</p> | <p>There is a need for product level data where producers and retailers declare the amount of plastic products (e.g. packaging) they introduce into the market by polymer used, tonnage and end-use sector. This allows for an accurate understanding of plastic products entering the country each year, instead of using elaborate models.</p> <p>For example, Singapore will require all companies putting packaging into the country to declare the plastic resin type and tonnage from 2021 onwards.</p> <p>It must be noted that Action 22 on mandatory reporting framework does not necessarily need to come before other actions that form part of the EPR framework (such as Actions 9,12,15,21,22,23). Setting targets first (e.g. Actions 9 and 21) has the benefit of stimulating much needed action by the different industries/stakeholders. Additionally, there is sufficient directional data available along with benchmarking against other countries that can be done by the government, that the government can set targets before creating a robust reporting framework.</p> <p>Putting in place the mandatory reporting framework first may provide all stakeholders with a greater degree of assurance when setting targets, however it could result in delays in implementing the targets (which are key actions to create an enabling environment for plastics circularity).</p> |
| <p>Maximize the Value (Beyond 5 years)</p> | <p>23</p> | <p>Mandate a compliance scheme to meet obligations</p> | <p>PROs may not be a one-size-fits-all solution for all companies to fulfill their obligations (for e.g. small to medium consumer goods companies may struggle to participate meaningfully via PROs).</p> <p>Companies may choose to join a PRO entity to fulfill their obligations for collection targets or choose to do so in other ways—for e.g. directly engaging with recyclers to meet their collection obligations.</p> <p>Therefore, a compliance scheme, which lists various options that companies have to fulfill their obligations and necessary certification processes, must be mandated to ensure the targets can be enforced.</p> |

F. Restrict Disposal of Plastics into Landfills and Dumpsites

A large majority of the plastic resins studied which are not recycled in Malaysia (76%) ends up in sanitary landfills, dump sites or worse, leaks into the environment across the country. One of the first steps towards

becoming a resource efficient society should be to eradicate the landfilling of any waste which can be used as a resource. This requires a phase-out of recyclable and other recoverable waste from landfills (see Table 11).

Table 11.

ACTIONS TO RESTRICT DISPOSAL OF PLASTICS INTO LANDFILLS AND DUMPSITES

| | | Actions | Rationale |
|-----------------------------------|----|---|---|
| Lay the Foundation (1-2 years) | 24 | Improve reporting and tracking of plastics (against HS codes reporting for import/ export of plastic resins, semi-finished products and scrap plastics) | <p>Import/export data based on 6 to 8 character HS codes enable an accurate breakdown of the trade of resins and products, thus ensuring that consumption data can be more accurately recorded, and therefore more realistic and accurate EPR targets can be set for the industry. This will also help to make trade in plastic resins and products more transparent and better regulated.</p> <p>The World Bank states that “for a given country, imports are usually recorded with more accuracy than exports because imports generally generate tariff revenues while exports don’t.”⁸¹</p> <p>When analyzing and determining import/export figures for virgin resins and semi-finished products, this study team found significant differences in import/export values between various data points based on HS Code data sources (MITI and UN Comtrade) and based on industry reported data (MPA). For example, for imports and exports of primary form Polyolefins (PP, HDPE, LDPE/LLDPE) in 2019, MITI HS Code data provides a net export of 118,000, whilst UN Comtrade data (where Malaysia was selected as the reporting country for imports, but the world was selected as the reporting country for imports from Malaysia (i.e. Malaysia’s exports)) provided net imports of Polyolefins of 2.2 million tonnes and MPA reports estimated net imports of 410,000 tonnes. Thus, there is a difference of 2.3 million tonnes between MITI and UN Comtrade (both using HS Codes) and a difference of 528,000 tonnes between MITI and MPA data. The values from the various sources are listed in Appendix 7.</p> <p>Separately, there is a challenge regarding where recycled products are accounted for as there is no separate HS Code to account for these products (i.e. recycled PP pellets), so exports and imports may be accounting for them as part of virgin resin or any other number of categories.</p> |
| Lay the Foundation (1-2 years) | 25 | Assess feasibility of regional scrap plastics trade | <p>A well-managed regional scrap plastics trade could be a key factor for recycling firms to access feedstock and to invest in larger capacity if consistent quantity and quality of raw materials could be secured (e.g. well sorted and cleaner plastic waste that follow environmental, health and safety standards). Such a regional scrap plastics trade of high quality, recyclable plastics will provide recyclers with much-needed flexibility to optimize their feedstock.</p> <p>Zero dumping of scrap plastics can be ensured by strengthening the monitoring mechanism on pollution norms for all recycling companies and awarding necessary licenses or permits only to companies that have setup necessary systems to follow pollution norms.</p> |
| Strengthen the Demand (3-5 years) | 26 | Mandate targets to lower landfill disposal rates for plastics | Setting reduction targets for landfill disposal rate encourages local governments to support alternative treatment options, including recycling and energy recovery. |

81 [Imports, Exports and Mirror Data with UN Comtrade](#)

| | | | |
|-----------------------------------|----|--|--|
| Strengthen the Demand (3-5 years) | 27 | Increase landfill tipping fees | <p>The landfill tipping fee in Malaysia remains low when compared to other benchmarked countries. Landfilling thus remains economically attractive for waste collectors and local governments which lowers the incentive for investing in processes to divert plastics to energy recovery or recycling.</p> <p>Increases in the landfill tipping fee need to be considered on a state-by-state basis, as some states with lower budgets are reliant on open dumpsites thus increasing landfill tipping fees for such states may increase the occurrence of illegal dumping for example.</p> |
| Strengthen the Demand (3-5 years) | 28 | Reduce unfair competition from illegal recyclers | <p>Illegal or unlicensed plastic recyclers put formal recyclers at a disadvantage by not complying to EHS standards which allows them to avoid the costs associated with ensuring compliance with the relevant EHS standards. Hence, this gives them more resources to buy recycled plastics at higher prices than small to mid-sized formal recyclers. This forces these small to mid-sized formal/licensed recyclers to increase their buying prices or risk not having enough supply of post-consumer plastics—i.e. unlicensed recyclers jeopardize the business of formal recyclers.</p> <p>Malaysia has already taken significant action on this front, closing down 140 of such illegal recyclers since 2019 as discussed in section 3.1.5. However, based on the latest insights from recycling stakeholders interviewed as part of this study, they are still facing stiff competition from these illegal/unlicensed recyclers who are not complying with the EHS regulations.</p> <p>Hence, there are two methods to mitigate this issue. Firstly, providing a pathway to formalization for illegal recyclers (through technical assistance) will help provide an incentive for these recyclers to come out of the informal space and hence be better managed through the formal system. In Penang State, the MBSP provides temporary licenses to illegal recyclers who are able to comply with the set standards and conditions for them to operate before eventually being licensed. Secondly, continuing and increasing the actions to close down recyclers who do not comply with the relevant EHS regulations is vital towards ensuring a level playing field.</p> |

4.4 SUMMARY OF INTERVENTIONS

Based on the model developed by this study team, the increases in CFR rate and Value Yields shown in Figure 41 are possible by implementing the above-mentioned interventions. Please see Appendix 19 for modeling assumptions, and Appendix 20 for a summary of all recommended interventions and actions.

4.4.1. Each Intervention has the Potential to Additionally Unlock between USD 256 million to USD 731 million/year

Each of the interventions taken by itself has the potential to increase the recycling value unlocked by between USD 256 million to USD 731 million/year. However, these interventions can overlap so the combined unlocked value would be lower than the sum of the single intervention values. This analysis only shows the *potential* benefit of each intervention to unlock material value because a detailed cost-benefit analysis for each intervention has not been performed. Figure 41

and Table 12 summarize the various interventions and their effect on increasing CFR rate and value yields.

The figures in Table 12 represent the total possible impact through the various interventions. For example, increasing recycling capacities to 100% of consumed plastics means that the recycling rate is not limited to 24% and can increase from 24% to towards 100%. However, only increasing recycling capacity will not achieve a 76% increase in plastics recycling—it must be done in synergy with implementation of the other five interventions, particularly interventions which create a demand pull for recycled plastics, for example, intervention B (recycled content targets), interventions E (industry-specific requirements to collect post-use products) and intervention F (Restrict disposal of plastics into landfills and dumpsites) and which enable increased volumes of plastic to be available for recycling (e.g. intervention A (increased sorting efficiency) and intervention C (design-for-recycling)). Please see Appendix 19 for the detailed assumptions and calculations of the interventions.

Figure 41.

SUMMARY OF RECOMMENDED INTERVENTIONS AND THEIR IMPACT ON INCREASING CFR RATE AND VALUE YIELDS

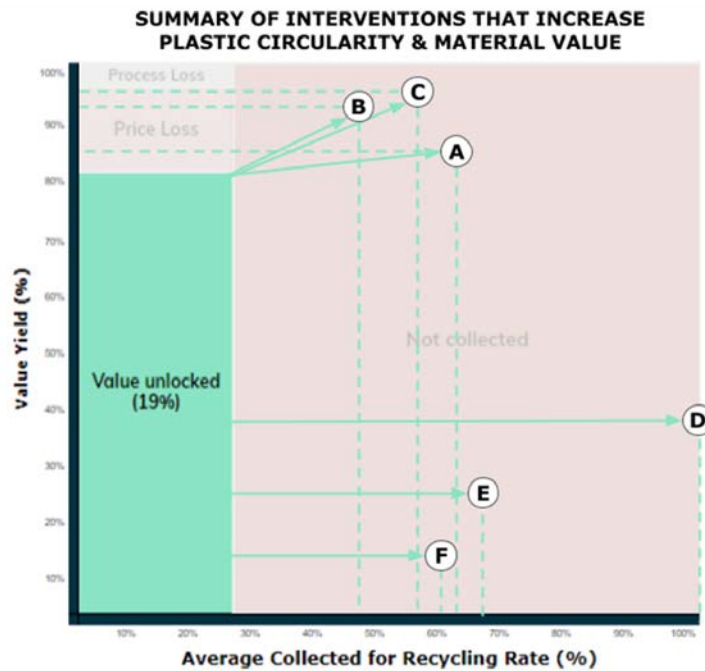


Table 12.

SUMMARY OF RECOMMENDED INTERVENTIONS AND THEIR TOTAL POSSIBLE IMPACT ON INCREASING CFR RATE AND VALUE YIELDS

| Summary of Interventions | Increase in CFR Rate | Increase in Value Yield | Potential Additional Material Value Unlocked |
|---|----------------------|-------------------------|--|
| 1. Interventions that increase in CFR Rate and Value Yield | | | |
| Increase sorting efficiency of post-consumer collection of plastics | 38% | 8% | USD 424 million |
| Set recycled content targets across all major end-use applications | 20% | 12% | USD 256 million |
| Mandate “design for recycling” standards for plastics, especially for packaging | 30% | 16% | USD 396 million |
| 2. Interventions that increase in CFR Rate | | | |
| Encourage increase in recycling capacities (mechanical and chemical) | 76% | - | USD 731 million |
| Create industry-specific requirements to collect post-use products | 43% | - | USD 409 million |
| Restrict disposal of plastics into landfills and dumpsites | 38% | - | USD 365 million |

4.5 NEXT STEPS

Figure 42 summarizes all the recommended actions by intervention and cluster. It also highlights who (i.e. government or private sector or both) is mainly responsible for undertaking each of the actions.

4.5.1. Ten Priority Actions towards Unlocking Material Value

Based on analysis by the study team and stakeholder feedback in terms of practicality of implementation in the next 1-5 years, potential to support growth of plastics recycling and unlock material value, the priority actions in Table 13 (from among the 28 actions) have been identified. These 10 actions can be most effective in enabling Malaysia to achieve its outcomes towards plastics circularity.

It must be noted that some of these actions may require a further feasibility study (i.e. policy analysis, cost-benefit-analysis and sensitivity analysis) to evaluate and recommend specific approaches to implement

these actions and help guide specific policies, targets, directives.

4.5.2. Summary of Private Sector Financing and/or Investment Opportunities

Table 14 presents the key private sector financing and/or investment opportunities based on the current market situation (i.e. growing demand for food-grade and high quality non-food grade recycled content by large brands, particularly in the packaging sector) and the current policies in place in Malaysia.

Note that investments into plastic-to-plastic chemical recycling is not yet considered as a private sector investment opportunity as technologies for this type of recycling are not yet commercialized. Whereas, plastic-to-fuel can be considered as an investment opportunity, however, the enabling environment needs to be created, especially with the backdrop of oil prices being below \$50 USD/barrel for the foreseeable future (which is below the level required for profitability). See action 19 for further insights.

Figure 42.

SUMMARY OF INTERVENTIONS AND ASSOCIATED ACTIONS PER CLUSTER TIMELINE AND HIGHLIGHTING ACTIONS OF HIGHEST IMPACT

| Interventions | Lay Foundation: Actions that create the necessary foundation for plastics circularity 1-2 years | | Strengthen Demand: High-impact actions to strengthen CFR Rate & Value Yield 3-5 years | | | Maximise Value: Actions to unlock maximum possible value; build resilient recycling industry >5 years | |
|--|---|---|---|--|--|---|--|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| A Increase waste collection and sorting efficiency of post-consumer plastics | 1 Harmonise & enforce source-segregation & separate collection standards & targets | 2 Establish dedicated MRFs as part of the waste collection system | 3 Develop awareness & behavior change campaigns | 4 Provide opportunities for informal sector inclusion | 5 Invest in treatment of organic waste | 6 Digitalise recyclables collection | 7 Implement Pay-as-you-throw waste collection model |
| B Set recycled content targets across all major end-use applications | 8 Communicate approved usage of food-contact recycled material & finalise Halal labelling decision | 9 Set recycled content targets & standards for major plastic use industries | 10 Develop & launch incentives for using recycled content usage | 11 Implement green public procurement of recycled plastic products | 12 Tax plastic applications without minimum recycled content | | |
| C Mandate "design for recycling" standards for plastics | 13 Align industries on "design for recycling" standards | 14 Voluntarily adopt "design for recycling" standards for all plastic products | 15 Mandate national "design for recycling" standards for packaging plastics | | | | |
| D Encourage increase in recycling capacities (mechanical & chemical) | 16 Incentivise increase in recycling capacities for polyolefins | 17 Incentivise PET recycling to higher-end recycled products | 18 Provide market pricing & volume data for virgin & recycled plastics | 19 Invest in chemical recycling (plastic-to-plastic) for low-value plastics | | | |
| E Create industry-specific requirements to increase plastic waste collection and recycling rates | 20 Setup voluntary EPR systems (e.g. PRO) and implement actions | 21 Mandate collection targets for plastic using industries | 22 Mandate reporting framework for plastic products | | | 23 Mandate a compliance scheme to meet obligations | |
| F Restrict disposal of plastics into landfills and dumpsites | 24 Improve HS code tracking for import / export of plastic resins & products | 25 Assess feasibility of regional scrap plastics trade | 26 Mandate targets to lower landfill disposal rates for plastics | 27 Increase landfill tipping fees | 28 Reduce amount of unfair competition from illegal recyclers | | |

Legend: ■ Government ■ Private Sector Highest Impact (based on stakeholder feedback & analysis by study team)

If the Malaysian government were to implement the actions recommended in this report, more private sector financing and investment opportunities would become available. For example:

- If modulated fees were charged for unrecyclable plastics and lower fees charged for plastics with recycled content (actions 10 and 12), investments into recyclers would be stimulated further.

- If industry specific targets and setting up EPR were to be mandated for all major end-use plastic application industries (actions 20 and 21), investments into recyclers would be stimulated further.

Table 13.

SUMMARY OF THE 10 PRIORITY ACTIONS UNDER THIS STUDY BASED ON STAKEHOLDER FEEDBACK

| Action # | Priority Actions Based on Stakeholder Feedback | Lead Stakeholder |
|----------|--|------------------|
| 1 | Mandate and harmonize source-segregation and separate collection standards and targets | Government |
| 8 | Communicate the approved usage of food-contact recycled plastic & finalize Halal labeling decision | |
| 9 | Set recycled content targets & standards for major plastic use industries | |
| 11 | Implement green public procurement of recycled plastic products | |
| 15 | Mandate national "design for recycling" standards for packaging plastics | |
| 16 | Incentivize increase in recycling capacities for polyolefins | |
| 21 | Mandate collection targets for plastic using industries | Private Sector |
| 13 | Align industries on "design for recycling" standards | |
| 14 | Voluntarily adopt "design for recycling" standards for all plastic products | |
| 20 | Setup voluntary EPR systems (e.g. PRO) and implement actions | |

Table 14.

SUMMARY OF PRIVATE SECTOR FINANCING AND/OR INVESTMENT OPPORTUNITIES

| Horizon | Private Sector Financing/Investment Opportunities |
|---------------------------|--|
| Short-term (1-2 years) | PET bottle to bottle recycling facilities for food-grade applications (either new facilities or upgrades to existing PET recyclers). Given that the standards to allow recycled content in Halal food contact packaging in Malaysia may or may not be revised by the relevant government agencies, this opportunity is specifically applicable for PET used in non-Halal certified applications locally and food-grade recycled PET made for export purposes. |
| | Equipment upgrades/advancements for existing HDPE, LDPE and PP recyclers to produce higher quality output (non-food grade) |
| | Food-grade recycling facilities for HDPE, LDPE and PP <i>(Note: This is on a slightly longer horizon than food-grade PET, as setting up the policies and standards for food-grade HDPE, LDPE and PP will take slightly longer than for PET policies due to much of the feedstock from HDPE, LDPE and PP being from non-food grade applications).</i> |

4.5.3. Incorporation of Recommendations into the Circular Economy Roadmap

This objective of this study has been to define the current state-of-play for the local waste plastics recycling industry, including demand and supply volumes, market opportunity, and growth drivers and constraints, and identifying the major private sector players in the Malaysian plastics value chain.

Through its framework of 6 key interventions and 28 actions to unlock increased plastic value via recycling, the study has also recommended ways to mitigate the growing environmental challenges of mismanaged plastic waste and unlock new economic growth opportunities for Malaysia.

It is recommended that all 28 actions should be thoroughly considered for inclusion in the Circular Economy Roadmap (CER), and at minimum, the 10 priority actions highlighted in Table 13 are incorporated, as these are the actions deemed to create the highest impact based on this study team's assessment and on stakeholder consultations. Specifically, on actions pertaining to the private sector, it is recommended for actions 13 and 14 to be brought up in the upcoming agenda for MaSPA while the government works towards the complementary action 15. Action 20 has been initiated by the packaging industry in recent months and is expected to play an important role in the packaging industry's response to the CER.



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