

A clear plastic cup, partially filled with sand, is tilted on a sandy surface. The cup is covered in a layer of sand, and the background is a blurred, warm-toned landscape of sand and dunes.

STUDY ON EPR SCHEME ASSESSMENT FOR PACKAGING WASTE IN MALAYSIA

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EXECUTIVE SUMMARY

Plastic pollution has reached gigantic dimensions worldwide and has caused serious consequences to marine life and wellbeing of society. Approximately 4.8 to 12.7 million tonnes of plastics are entering the ocean yearly, of which the vast majority leaks into the Indian Ocean and Pacific where many coastal-lands and countries are located. Root cause is lack of a sound waste collection and treatment system. Especially low- and middle-income countries often face budget shortfalls for waste management [Jambeck et al., 2015].

Malaysia is not in the top of Southeast Asian countries with the overall plastic consumption, however the per capita consumption is one of highest [Jambeck et al., 2015]. Plastic holds the second largest share in Malaysia’s overall generated waste. At the same time its plastic recycling rate is relatively low at 20% [Based on the sum of the research interviews with final processors]. Waste management is constantly challenged by increasing waste generation and the limited resources and infrastructures in place. Whereas the collection of packaging waste is essential to building up reuse and recycling systems.

Policy makers, corporations and consumers worldwide show an increasing interest in transitioning from a linear to a circular economy to address plastic pollution. Extended producer responsibility (EPR) schemes have proven to be an effective measure on this pathway. Results of the report meant to inform the consortium of the circular economy road map and other policy makers. For Malaysia the identified situation and drafted EPR scheme recommendation looks as the following:

STATUS QUO: WASTE MANAGEMENT SYSTEM AND RECYCLING MARKET FOR PLASTIC PACKAGING WASTE IN MALAYSIA

Three significant characteristics shape the Malaysian context:

1. High-value recyclable packaging is already separated from household waste to a very relevant extent and transferred to recycling systems. This applies especially to rigid HDPE, PP and PET. Extraction is largely informal and the subsequent value chain is based on a functioning market. However, previously removed high-value recyclables reduce the value of the remaining material for formal collection, which results in underfunded collection and recycling operations for the remaining household waste.
2. Malaysia’s recycling capacities are sufficient for above-mentioned, locally generated, high-value recyclables. However, a huge number of recyclers and aggregators import and process imported

recyclables, occupying large capacities. So far, there is no fully traceable documentation of the imported material.

3. Low-value and non-recyclables (e.g. all kind of flexibles like films, sachets and composites) are mostly disposed of and collected together. So far, there is no systematic separation and recycling of the low-value recyclables. Depending on the locally prevailing collection and disposal system, all of these end up in sanitary landfills, dumpsites (unsanitary landfills) or are littered in the environment. The capacity of suitable disposal options via sanitary landfills is not sufficiently available across the country.

DEVELOPING A CUSTOMISED EPR SCHEME FOR MALAYSIA

Based on the undertaken analysis the following EPR scheme framework is proposed:

1. **Mandatory EPR scheme** provide a reliable financial basis for large-scale collection, sorting and recycling of packaging which is crucial for creating sufficient business cases along the value chains
2. **EPR scheme for all consumer packaging materials and non-packaging plastic products.** Covering all packaging materials (e.g. plastics, paper, metals, composites) from households and equivalent places of origination (e.g. service packaging), to create a financial and organisational basis for treating critical products and to avoid undesired substitution effects in packaging design
3. **One, non-profit Producer Responsibility Organisation (PRO)** to ensure a holistic, reliable and fair manner waste management in which the responsibility is collectively assumed through one, industry-led system operator, with members from all stages of the value chain
4. **Modulated fees** steered recycling market through application of reduced EPR fees for high-value recyclable packaging (bonus) and an increased EPR fee (malus) for low-value and non-recyclable packaging, to be paid by the obliged companies
5. **Strict monitoring and control systems** to avoid fraud, strict and enforced monitoring, controls and penalties are indispensable and shall be carried out by the Ministry of Environment and Water together with the Ministry of Housing and Local Government to ensure compliance of all actors, including the PRO.

COST-BENEFIT ANALYSIS OF MALAYSIA’S WASTE MANAGEMENT

The status quo has developed functioning market mechanisms that process high-value recyclables (achieving a recycling rate of approximately 20%). Some cost for abating negative environmental externalities are present, however environmental

monitoring and security is so far only done to a low extent.

Through the EPR scheme, current market mechanisms continue to apply. Additionally, the processing of low-value recyclables is enabled to a reordered, separated collection system and artificially stimulated through a modulated EPR fee system. A PRO ensures and subsidises necessary, adequate treatment operations (to achieve recycling rates above 50%). However, cost for transition and system administration occur.

IMPLEMENTATION PLAN FOR PROPOSED EPR SCHEME

Implementation requires three main steps:

1. **Establishing a legal framework of a mandatory EPR system and strengthening an institutional framework** to make the law practicable and effective, agreements and discussions between competent authorities and the private industry are required.
2. **Establishing a voluntary, pre-PRO basis facilitating the development of a mandatory EPR.** It is recommended to interim set up a voluntary PRO. Through such, voluntary companies and organisations cooperate and negotiate with the policy makers about the setup of the mandatory system regarding organisational and regulatory foundation as well as control mechanisms.
3. **Defining mechanism for continuous improvement and optimisation starting after the mandatory EPR system is launched.** After the mandatory EPR is in place, steps must be taken that ensure the EPR system and PRO are continuously being optimised and evolved.

In-depth analysis and recommendations are elaborated in this Study on EPR scheme assessment for Plastic Packaging Waste in Malaysia.



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ACRONYMS

ABS	ACRYLONITRILE BUTADIENE STYRENE
AP	APPROVED PERMIT
CAPEX	CAPITAL EXPENDITURE
CBA	COST BENEFIT ANALYSIS
CER	CIRCULAR ECONOMY ROADMAP
EPR	EXTENDED PRODUCER RESPONSIBILITY
FMCG	FAST MOVING CONSUMER GOODS
JPSPN	JABATAN PENGURUSAN SISA PEPEJAL NEGARA (NATIONAL SOLID WASTE MANAGEMENT DEPARTMENT)
KASA	KEMENTERIAN ALAM SEKITAR DAN AIR (MINISTRY OF ENVIRONMENT AND WATER (FORMERLY PART OF MESTECC UNTIL MARCH 2020)
KPDNDHEP	KEMENTERIAN PERDAGANGAN DOMESTIK DAN HAL- EHWAL PENGGUNA (MINISTRY OF DOMESTIC TRADE AND CONSUMER AFFAIRS)
KPKT	KEMENTERIAN PERUMAHAN DAN KERAJAAN TEMPATAN (MINISTRY OF HOUSING AND LOCAL GOVERNMENT)
MESTECC	MINISTRY OF ENERGY, SCIENCE, TECHNOLOGY, ENVIRONMENT AND CLIMATE CHANGE (AS OF MARCH 2020, MESTECC IS DEFUNCT AND HAS BEEN SPLIT INTO TWO SEPARATE MINISTRIES: THE MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION; AND THE MINISTRY OF ENVIRONMENT AND WATER.)
MPMA	MALAYSIAN PLASTICS MANUFACTURERS ASSOCIATION
MPRA	MALAYSIA PLASTIC RECYCLERS ASSOCIATION
MPA	MALAYSIAN PETROCHEMICALS ASSOCIATION
MRF	MATERIAL RECOVERY FACILITY
MSW	MUNICIPAL SOLID WASTE
MYR	MALAYSIAN RINGGIT
PBT	PIHAK BERKUASA TEMPATAN
PRO	PRODUCER RESPONSIBILITY ORGANISATION
MPP	MALAYSIA PLASTIC PACT

NGO	NON-GOVERNMENTAL ORGANISATION
R[POLYMER]	RECYCLED [POLYMER]
SAS	SEPARATION AT SOURCE
SME	SMALL AND MEDIUM ENTERPRISES
SUP	SINGLE-USE PLASTICS
SSM	SURUHANJAYA SYARIKAT MALAYSIA (COMPANIES COMMISSION OF MALAYSIA)
SWCORP	SOLID WASTE AND PUBLIC CLEANSING MANAGEMENT CORPORATION

1. INTRODUCTION

The plastic pollution has reached gigantic dimensions worldwide and has caused serious consequences to marine life and wellbeing of society. Approximately 4.8 - 12.7 million tonnes of plastics are entering the ocean yearly [Jambeck et al., 2015]. The root cause of plastic waste leakage into the environment is the lack of sound waste collection and treatment systems. The open dumping and littering of plastic waste do not only cause severe environmental and hygienic hazards but are also one of the main reasons for polluting terrestrial, waterways and oceans. In 2012, World Bank reported the global generation of 1.3 billion tonnes of solid waste in a year. With the rapid population growth and improvement of household income, the waste generation is expected to increase to 2.2 billion tonnes by the year of 2025 [Hoorweg and Bhadatata, 2012]. The annual cost of waste management is projected to rise from \$205 billion to \$375 billion, almost 83% of increase.

On a global scale, 32% of packaging waste leaks into the environment. In low-income countries, the costs for waste management comprises of, on average, 19% of the municipal budget, compared to only 4% in high-income countries [The World Bank, 2018]. Low- and middle-income countries often face budget shortfalls for waste management. The collection of packaging waste is essential for building up the reuse and recycling system towards a circular economy.

In Malaysia, the composition of plastic waste is the second highest in the overall generated waste [JPSPN, 2013]. Despite government's reveals on the shocking figures of waste generated each year, the recycling rate of post-consumption plastic packaging among Malaysians is still relatively low. MSW management is constantly challenged by increasing waste generation with limited resources and infrastructure in place. Some of the major challenges include inadequacy of waste facilities due to constraints in funding and manpower. Additionally, the recycling market is highly unregulated. According to the information released by WasteAtlas.com, the recycling rate of Malaysia was merely 17.5% in 2015.

Extended Producer Responsibility (EPR) aims to reduce the economic and environmental burdens of waste management by extending the responsibility of producers to the end-of-life of their products. EPR systems are one element out of various policy instruments that can – when applied in a well-designed bundle – reduce waste generation and improve collection, reuse, recycling. EPR has been widely implemented in European countries and draws positive results. The Polluter Pays principle, similar to EPR, is included in Malaysia's waste management system under the Environmental Quality Act 1974. However, the concept EPR only remains on paper as there are no relevant regulations to enable its enforcement, the existing practice of EPR in Malaysia is limited due to voluntary basis [Agamuthu and Victor, 2011].

Very often the economic concern over environmental benefits is raised when it comes to the implementation of environmental policy, whether the environmental gains from the scheme or policy are sufficient to justify the adoption of a new scheme and its cost of operation and administration. The same question is highlighted for EPR schemes. A study on practical experiences

of EPR schemes in other countries that draw on the effectiveness and gaps of EPR programmes implemented, can therefore make a key contribution to Malaysian policy makers to identify approaches that are practicable, reasonably comprehensive, and that will yield meaningful results.

The evaluation framework is built on a thorough analysis of the Malaysian waste management system and recycling market for plastic packaging waste, which serves as foundation for the proposed EPR scheme, which is triangulated from the contextual conditions and international experiences. To provide further depth, an evaluation and estimation of the costs that not only include economic cost, but also internalises externalities and social costs, and social and environmental benefits gain from EPR adoption provides a better understanding on the feasibility of the intervention. Ultimately, the finding from the proposed study shall provide reference and support to government on plastic initiatives on Malaysia's Roadmap towards Zero Single-Use Plastic 2018 - 2030, the drafting of Circular Economy Roadmap and developing of EPR framework.

2. STATUS QUO OF WASTE MANAGEMENT SYSTEM AND PLASTIC PACKAGING MATERIAL FLOWS IN MALAYSIA

Understanding the existing waste management system is important in order to apply the international learnings from existing EPR schemes (chapter 3) to the Malaysian situation and develop a tailored solution (chapter 4). Thus, this chapter provides a qualitative description of the existing government and industry structure as well as a high-level quantification of the overall post-consumer plastic waste volumes and material flows. The post-consumer waste volume estimates are based largely on government data, while the material flow analysis is based on extensive interviews with participants in the waste management and recycling industry as well as government and non-government organisations.

2.1 WASTE MANAGEMENT SYSTEM

2.1.1 GOVERNMENT SECTOR

Solid waste management, especially municipal solid waste management, is handled by the respective local government authorities, but under the purview of the Federal Ministry of Housing and Local Government. However, due to the unique political structure within Malaysia, the Federal Ministry of Housing and Local

**IN MALAYSIA
THE COMPOSITION OF PLASTIC
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ENVIRONMENTAL BURDENS
OF WASTE MANAGEMENT
BY EXTENDING THE
RESPONSIBILITY OF
PRODUCERS TO THE END-OF-
LIFE OF THEIR PRODUCTS**

Government only has jurisdiction over the Peninsular States (Local Government Act 1976). Known as ‘Ministry of Local Government and Housing’ in Sabah & Sarawak. The Borneo states of Sabah and Sarawak have their own Ministry of Housing and Local Government that tends to align their policies with those of the federal ministry, especially with sanitation and cleanliness being a Concurrent List item under the shared responsibility of the state and federal governments [Federal Constitution, 1963].

The key legislation for waste management in Malaysia is the Solid Waste and Public Cleansing Management Act 2007, also known as Act 672. This Act was created to provide for and regulate the management of solid waste and public cleansing, but only applies to the Peninsular states of Perlis, Kedah, Pahang, Negeri Sembilan, Malacca and Johor, and the Federal Territories of Kuala Lumpur and Putrajaya. These states are referred to in this report as the ‘Act States.’

The states of Penang, Perak, Selangor, Kelantan, Terengganu, Sabah and Sarawak, where Act 672 does not apply, is referred to as the ‘Non-Act States.’ Act 672 provides for the licensing of solid waste management, including recyclables separation, to concessionaires, resulting in three major players in the formal sector: Alam Flora Sdn Bhd, E-Idaman Sdn Bhd and SWM Environment Sdn Bhd. These concessionaires are overseen by the Solid Waste and Public Cleansing Management Corporation (SWCorp), which enforces Act 672 (see Figure 1).

However, despite Act States requiring to appoint concessionaires for municipal solid waste management services, some Non-Act States have engaged concessionaires to partly or fully run the solid waste management. These range from a geographically focused consortium (e.g. Solid Waste Management Penang which only operates on the Penang Island side, and not the mainland Seberang Perai side of Penang State), a state-wide concessionaire (e.g. KDEB Waste Management Sdn Bhd in Selangor), a region-specific concessionaire (Trienekens (Sarawak) Sdn Bhd operating in the three municipalities within Kuching Division and the Bintulu Development Authority area in Sarawak) and concessionaires partly covering a municipality (Kota Bharu City Council).

For the geographically focused consortium in Penang and concessionaire partly covering a municipality in Kota Bharu, the respective local authorities appointed a company or companies for the solid waste management services. Under the state-wide or region-specific concessionaire model, the respective state

governments of Selangor and Sarawak appointed a concessionaire to manage municipal solid waste.

In addition to this complexity of responsibilities in the formal sector, the informal sector is a diverse group within the recycling market. These range from faith-based groups that encourage environmental protection and cleaners working for building cleaning contractors, to street pickers and mobile collectors using tricycles or small trucks. This results in a waste management and recycling sector that is very dynamic but has complex relationships and tensions.



Figure 1: Map showing states with waste management concessions under Act 672 in Peninsular Malaysia

2.1.1.1 INSTITUTIONS

The governments’ involvement in the waste management sector in Malaysia reflects the federal political system within the country. This results in different jurisdictions, legal mechanisms and stakeholders from the national level down to the municipal level.

There are two key ministries with specialised departments that are involved in waste management and recycling activities in Malaysia (i.e. KPKT and KASA), under which are entities that have their own jurisdiction; and other ministries with no direct link to waste management and recycling but which will play a key role in EPR planning.

The adjacent Figure 2 has an overview of the relevant ministries and entities, while the below mentioned Table 1 provides more details regarding their importance within the waste management and recycling section:

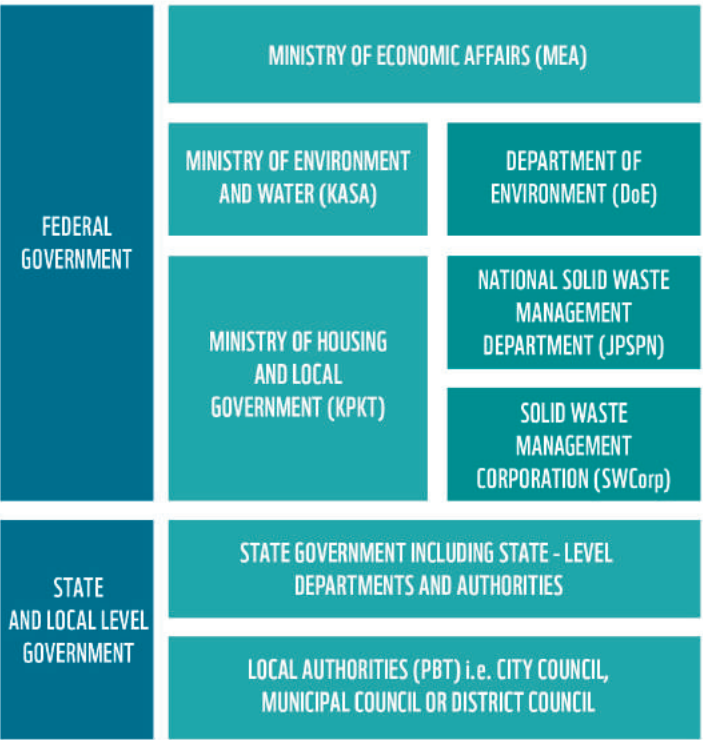


Figure 2: Overview of government institutions

Table 1: Ministries and entities involved in waste management and recycling

Ministry/Entity	Individual responsibility	Collective responsibility
Ministry of Housing and Local Government (<i>Kementerian Perumahan dan Kerajaan Tempatan - KPKT</i>)	Federal ministry is responsible for urban well-being, housing, local government, town and country planning; and solid waste management. Only has jurisdiction over Peninsular States. This ministry has jurisdiction over the federal National Solid Waste Management Department (JPSPN) and Solid Waste Management Corporation (SWCorp).	Responsible for the enforcement of local government legislation in Peninsular Malaysia, separation at source (SAS) policies and solid waste management, but only has jurisdiction over Act States. Works with KASA (Ministry of Environment and Water) and the Department of Environment to ensure recyclers comply with any environmental regulation and scheduled waste management.
National Solid Waste Management Department (<i>Jabatan Pengurusan Sisa Pepejal Negara - JPSPN</i>)	Federal department under the jurisdiction of KPKT. Coordinates between federal and state governments, and local authorities on the implementation of national solid waste management and public cleansing policies. Has jurisdiction over the issuance of Approved Permits (AP) for importing plastics for recycling nation-wide.	Enforces policies on solid waste management and public cleansing policies, under the direction of KPKT. Enforces national 3R (Reduce, Reuse, Recycle) policies with KPKT and SWCorp.
Solid Waste Management Corporation (<i>SWCorp</i>)	Federal agency set up under Act 673 (Solid Waste and Public Cleansing Management Corporation Act 2007) to enforce Act 672 and national policies on solid waste management and public cleanliness. Oversees operations and compliance of concessionaires in Act States that have signed-up to Act 672. Publishes annual compendium with data on solid waste management and calculates the national recycling rate.	Enforces policies on solid waste management and public cleansing policies, and compliance of concessionaires on municipal solid waste management in Act States only. Promotes national 3R campaigns and public awareness on SAS, together with KPKT and JPSPN.

Ministry/Entity	Individual responsibility	Collective responsibility
Ministry of Environment and Water (<i>Kementerian Alam Sekitar dan Air - KASA</i>)	<p>Part of the former Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC).</p> <p>Focuses on reducing pollution and reduction in plastic waste. KASA is responsible for implementation of the national ‘Roadmap Towards Zero Single-Use Plastics 2018 – 2030’ and drafting of the Circular Economy Roadmap for Plastic that was previously led by MESTECC.</p> <p>Has jurisdiction over the Department of Environment. The ministry also oversees the establishment of the Malaysia Plastics Pact (MPP), and works closely with state and local authorities in the implementation of Roadmap Towards Zero Single-Use Plastics 2018 – 2030.</p> <p>Previous roles that were assigned to MESTECC have been shifted to this new ministry, with possible future jurisdiction over other environmental matters.</p>	Works with KPKT, state governments and local authorities in the implementation of Malaysia’s Roadmap Towards Zero Single-Use Plastics 2018 – 2030 and Circular Economy Roadmap for Plastic.
Department of Environment	Oversees national policies on the environment. Under the jurisdiction of KASA. Oversees the implementation and enforcement of the Environmental Quality Act and thereby enforces regulations relating to environmental safety and operations on recyclable processors and enforces the management of scheduled wastes.	Works indirectly with KPKT-related entities within recycling industries nation-wide, but only in terms of approvals and enforcement for processing operations and scheduled waste. E.g. the Department conducts Environmental Quality Assessment (EQA) and has pollution control regulations that processors must adhere to. EQA are a prerequisite for trading and municipal licenses, and Approved Permits from municipal councils under KPKT and JPSPN respectively. The Department enforces environmental regulations concerning scheduled waste on processors, which are not under JPSPN and KPKT jurisdiction.
Ministry of Domestic Trade & Consumer Affairs (<i>Kementerian Perdagangan Dalam Negeri dan Hal Ehwal Pengguna - KPDNDHEP</i>)	Responsible for domestic trade and enforces the Consumer Protection Act 1999 and Price Control and Anti-Profiteering Act 2011. Tracks data on local FMCG input within the domestic market. Ministry has jurisdiction on setting price controls, especially for key consumer goods.	Not involved in waste management or plastic recycling. However, ministry has influences on any EPR scheme that involves a price-premium that will be passed on to consumers.
Economic Planning Unit (EPU) Prime Minister’s Department	Responsible to develop the overall plans for a comprehensive socioeconomic development towards sustainable and inclusive growth.	EPU develops the 12 th Malaysia Plan in coordination with other relevant ministries, which will include Circular Economy and EPR as a policy tool.

2.1.1.2 LEGAL FRAMEWORK

In addition to Act 672, the federal government has implemented numerous policies relating to waste management and recycling. Most of these policies are fairly recent, with the Malaysia’s Roadmap towards Zero Single Use Plastics and the National Cleanliness Policy being introduced in 2019.

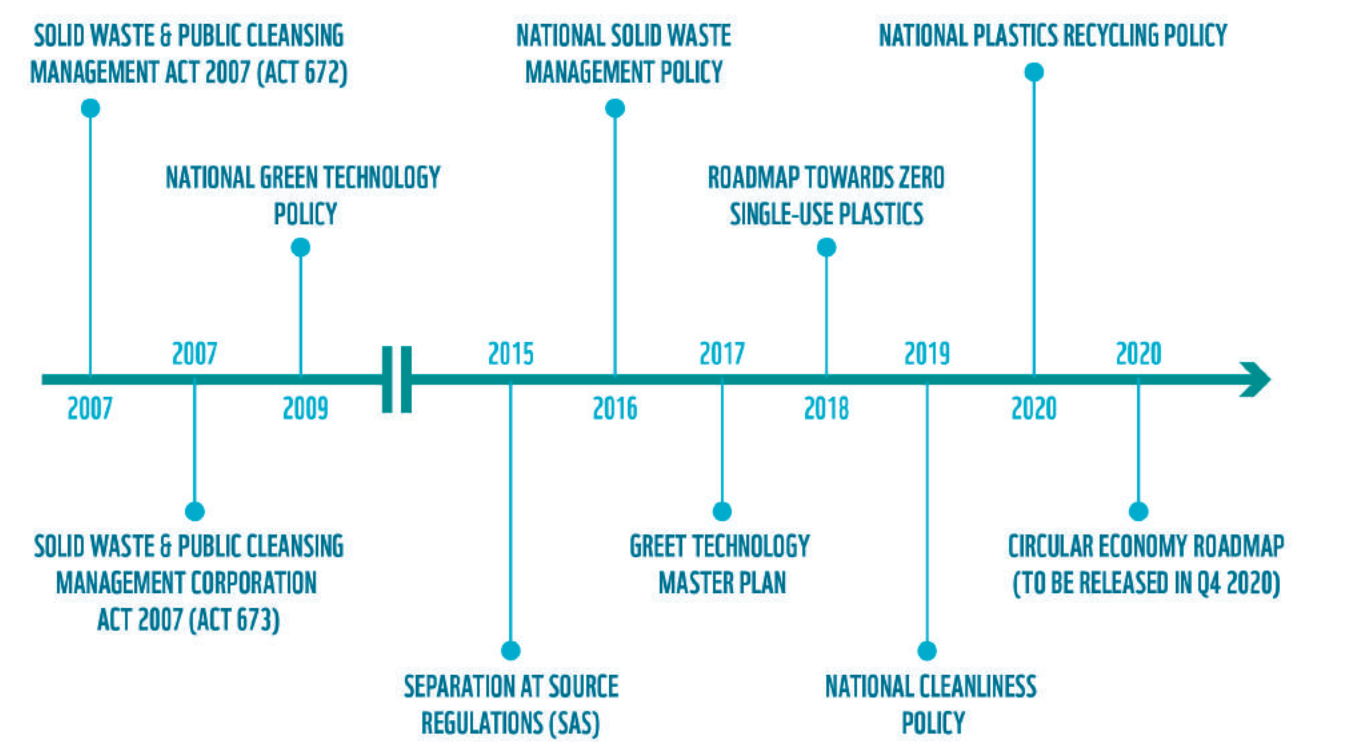


Figure 3: Timeline of laws, regulation and policies on waste management and recycling up to 2020

However, the early policies on Separation at Source in 2015 and the National Solid Waste Management Policy 2016 had limited traction. This is partly due to the fact that these policies are attached to Act 672, which can be directly implemented in Act states, but with Non-Act states having varying degrees of success in adhering to the national policies. In addition, societal habits and degrees of public awareness affect the effective implementation of the Separation at Source policy, which the National Cleanliness Policy 2019 seeks to address.

Table 2: National policies involving waste management and recycling

Policy	Target
National Green Technology Policy (2009)	Develop capacity within the green technology sector, including waste and waste management sectors. Specific goals include effective management and utilisation of water resources, waste water treatment and solid waste and sanitary landfill.
Separation at Source (2015)	Regulation under Act 672. In force in Act States. Requires households to separate their recyclables from residual waste to increase recycling rates.
National Solid Waste Management Policy (2016)	Develop a comprehensive and cost-effective solid waste management system based on the waste management hierarchy, with an emphasis on 3R. Objectives of the strategy include: <ul style="list-style-type: none"> Reduction in household, commercial, industrial and institutional waste Efficient and cost-effective waste management Strengthening laws and institutions around waste management

Policy	Target
Green Technology Master Plan (2017)	Master plan on mainstreaming green technology that includes developing the waste sector as a contributor for advancing the Malaysian green technology sector. Initiatives relate to measures in managing and monetising waste, including waste extraction and waste-to-energy conversion. Targets specific to waste management are: <ul style="list-style-type: none"> Recycling rates of 22% by 2020, 25% by 2025 and 28% by 2030 3 Waste-to-energy thermal plants by 2030 Resource recovery through 500 palm oil mills with biogas capture capacity
Malaysia's Roadmap Towards Zero Single-Use Plastics 2018 – 2030	The roadmap mainly focuses on a strategy for treating single-use plastic (SUP) items such as bags and straws to replace them with eco-friendly alternatives. Roadmap calls for collaborative effort involving key stakeholders and to provide policy direction to address packaging and SUP pollution in Malaysia.
National Cleanliness Policy (2019)	Policy aims to instil public awareness on the need for environmental cleanliness and reduce mismanaged waste disposal. Objectives and strategies of the policy include: <ul style="list-style-type: none"> Introduction of waste to money initiatives to develop a circular economy strengthening enforcement and oversight of solid waste management and public cleanliness Reduction in the use of plastic packaging Encourage 3Rs (Reduce, Reuse, Recycle) Encourage separation at source Encourage the development of circular economy industries Encourage the development of an EPR scheme
Upcoming National Plastics Recycling Policy [Ong, 2019]	National Plastics Recycling Policy to be released in 2020. Aims to improve the plastics waste management and contribute positively to the plastic recycling industry.
Upcoming Circular Economy Roadmap [MESTECC, 2020]	A holistic and detailed Circular Economy Roadmap for Plastic 2020-2030 for Malaysia including national KPIs, prioritised strategies, comprehensive action plans as well as details about the implementing agencies and timelines.

In addition, the Ministry of Environment and Water (formerly MESTECC) developed the Malaysia’s Roadmap Towards Zero Single Use Plastic 2018 – 2030. The initial focus for Phase 1 from 2018 to 2021 was on single-use plastic (SUP) items such as plastic bags and straws, how to avoid them or replace them with compostable, more eco-friendly alternatives in the future. The overall timeline of the Roadmap is shown in Figure 4.

Phase 2 of the Roadmap will include other plastic packaging items such as bottles, containers and flexibles or films, which will cover the time frame from 2022 to 2025 starting with the development of Circular Economy Roadmap (CER). The CER for plastic is expected to be launched by October 2020.

In addition to the Roadmap, the MESTECC announced on 10th September 2019 the setting up of “Malaysia Plastic Pact” (MPP) to drive efforts in developing the CER as outlined in the mentioned roadmap. The MPP is a multi-stakeholder platform for public and private stakeholders in the plastic value chain to commit to actions and goals to shape a circular plastics economy by building a national plastics collaboration network.

MPP lays out concrete actions to reach its targets by looking into improvement of plastic products design to make them more recyclable and increase recycled content, adoption of an effective plastic waste collection, sorting and recycling system and EPR schemes, and building a research and development agenda for circular plastics.

Thus, the MPP will become a key platform in regard to advancing the implementation of an EPR scheme and aligning the mandatory EPR scheme with other relevant legislation. In the course of its work, a working group for EPR has been established. WWF-Malaysia is co-leading the EPR working group of MPP.

Note: Once the EPR system is implemented, MPP can be used to onboard SMEs and do awareness creation/ outreach. Since its role could be subsided once PRO is fully operational, no more membership fees are intended or may be reduced.

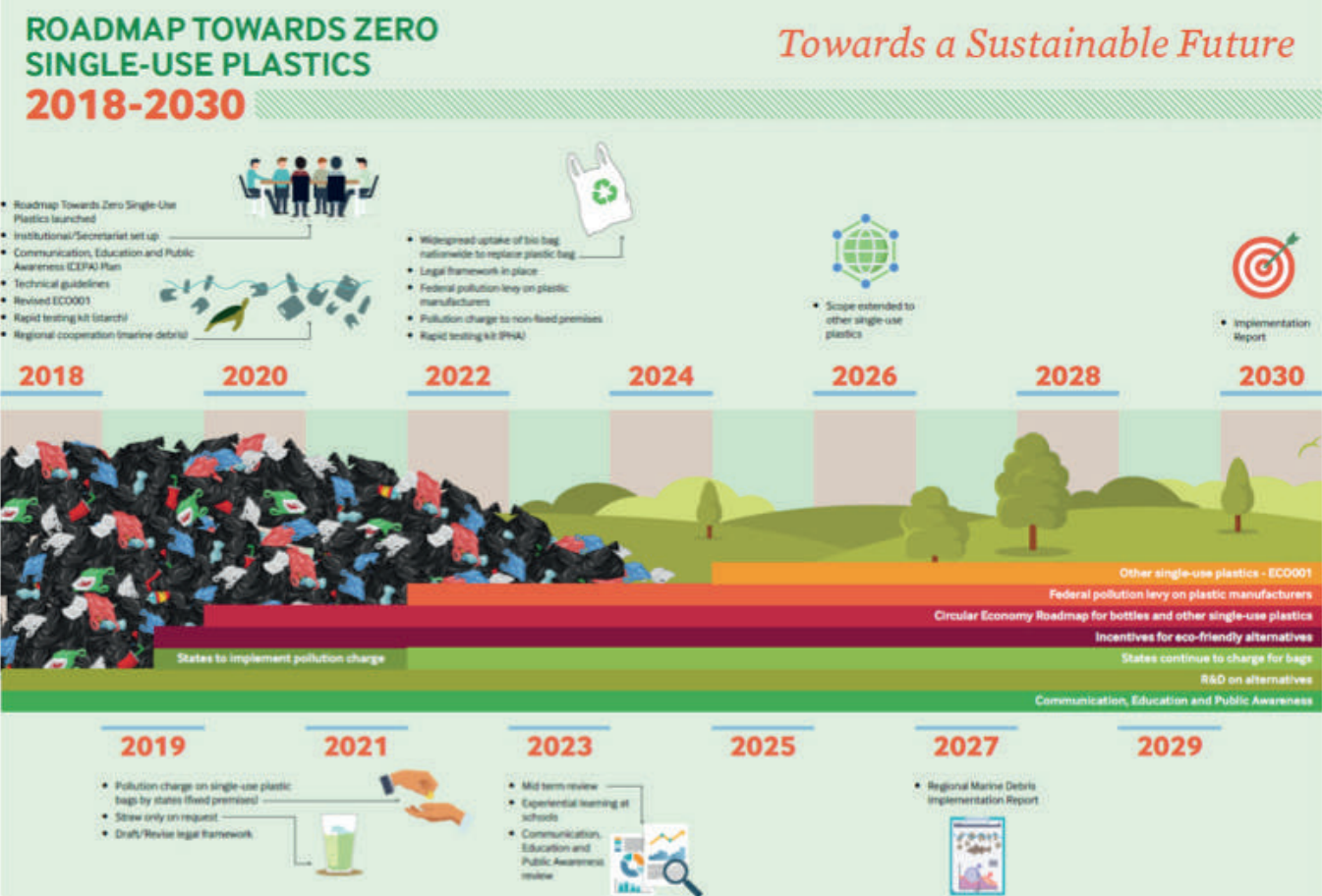


Figure 4: Roadmap towards zero single-use plastics [MESTECC, 2018]

2.1.1.3 MALAYSIA’S BAN ON ILLEGAL PLASTIC WASTE IMPORTS

In October 2018, the Malaysian Government banned the import of plastic scrap, after China banned the import of plastic scrap in January 2018 [Lee, Y. N., 2019]. The Malaysian Government also focused on targeting illegal recycler processors that process the imported plastic scrap. However, the Malaysian Government will continue to issue Approved Permits (APs) allowing the import of clean, quality plastic meant for recycling [Kaos, J., 2018].

The ban was meant to target illegal importers of plastic scrap, including holders of APs who imported scrap with the intention of onward trading to other, unlicensed plastic collectors and recyclers, or to illegal recycling factories and processors. One effect of the import ban and enforcement action was the closure of a number of illegal recycler factories and processors [Othman, A.F and Ariff, S.U., 2019]. However, legal recycler factories and processors have continued to operate, including receiving APs to import clean plastics.

MANY PROCESSORS
HAVE QUOTED THAT
BETWEEN 20% TO 40%
OF THEIR CAPACITY IS
CURRENTLY NOT BEING UTILISED

As a result of the reduction in legal and illegal imports the locally processed volume has declined, and many processors operate below their current capacity. While aggregated numbers are not available, many processors have quoted that between 20% to 40% of their capacity is currently not being utilised. Thus, any increase in local recycling volumes could be easily absorbed by the existing industry.



Figure 5: Illegal recycling site [Ismail, 2019]

2.1.2 PRIVATE SECTOR

The private sector includes several large-scale waste management companies but also a wide range of informal sector participants who participate in the collection, sorting and aggregation of recyclable items. These informal sector participants typically sell the recyclable items to junk yards or other aggregators.

While the majority of the informal sector participants are conducting the collection services for economic reasons (i.e. to sell the recyclable goods), not all of them have to pay for them. Malaysia has a significant group of NGOs who collect recyclable goods without payments to the household but use the proceeds of the recycling goods for their benevolent purposes.

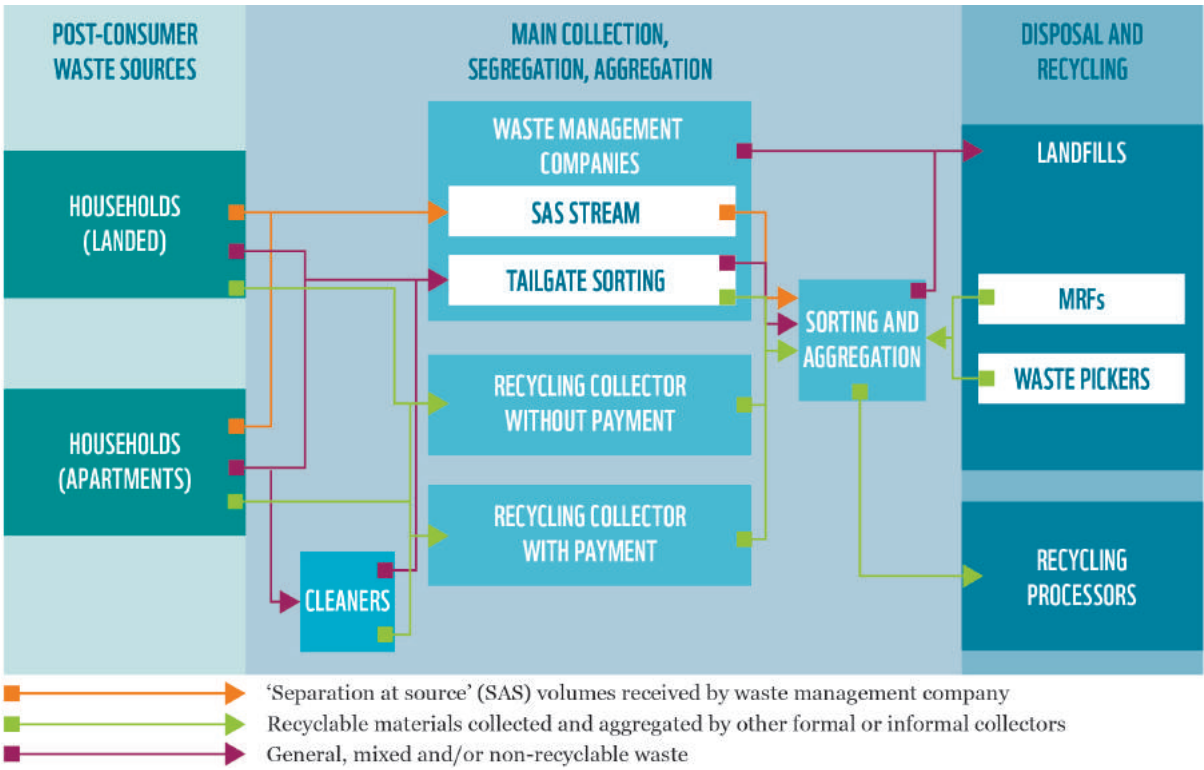


Figure 6: Simplified overview of the waste flow for post-consumer waste

2.1.2.1 FORMAL WASTE MANAGEMENT (SORTING, COLLECTION AND RECYCLING)

The formal sector in Malaysia is run by licensed waste management companies, either in the form of the concessionaires contracted under Act 672 by Act States or independently by Non-Act States, or contractors operating under the concessionaires or contracted by individual buildings. These companies are under the purview of both SWCorp and JPSPN, with SWCorp requiring reporting by the Act 672 concessionaires on the level of waste and recyclables collected, and JPSPN issuing licensing for contractors involved in waste management and public cleansing.

Table 3: Major concessionaires and waste management consortiums in Malaysia

Name	Area Served	Act 672 State?	Group Services Provided
Alam Flora Sdn Bhd	Federal Territories of Kuala Lumpur and Putrajaya, State of Pahang	Yes	Provides household waste and recyclables collection, and public cleansing services under Act 672 and SWCorp regulations in the central and Eastern region. Operates buy-back recycling drop-off points around Kuala Lumpur and Putrajaya. Through their subsidiary, DHES Sdn Bhd, they operate the main transfer and MRF facility for the Klang Valley at Taman Beringin Transfer Station.
E-Idaman Sdn Bhd	States of Perlis, Kedah and Perak	Yes	Provides household waste and recyclables collection, and public cleansing services under Act 672 and SWCorp regulations in the Northern region of Malaysia. Regional service centres operate as ‘One Stop Centre’ for recyclables, before transportation to their MRF in Alor Setar, Kedah. Engages in beach and island clean-up in Langkawi Island with SWCorp and Langkawi Municipal Council, on top of providing municipal services and additional rural area servicing.
KDEB Waste Management Sdn Bhd	State of Selangor	No	Concessionaire servicing all municipal councils in Selangor. Provides waste management and public cleansing services.
Solid Waste Management Penang Consortium (SWM Penang)	Penang Island only	No	Consortium of contractors appointed by Penang City Council (Majlis Bandaraya Pulau Pinang) to service all of Penang Island. The mainland area of Penang State is still serviced by the municipal council (Majlis Perbandaran Seberang Perai) and is not covered by the consortium.
SWM Environment Sdn Bhd	States of Johor, Malacca and Negeri Sembilan	Yes	Provides waste and recyclables collection, and public cleansing services under SWCorp regulations in the Southern region. Operates two sanitary landfills: Seelong Environmental Centre in Johor and Sg Udang Sanitary Landfill in Malacca.
Trienekens Sarawak Sdn Bhd	Kuching Division, Serian Sub-Division and Bintulu Development Authority Area Only	No	Concessionaire designated to service all municipal areas in the State of Sarawak. However, only a handful engaged their services, with all remaining municipal councils in Sarawak continuing to provide municipal cleaning services individually. They collect scheduled waste state-wide. Operates two Integrated Waste Management Parks: Kuching Integrated Waste Management Park and Integrated Waste Management System Bintulu.

In addition to the household waste collection services, the formal sector includes other approved waste management contractors who provide services to residential buildings not covered by municipal waste management services, as well as industrial, commercial and institutional buildings. These waste management contractors may have operations that include waste separation and management services, increasing the potential for recycling during their servicing.

In industrial, commercial and institutional buildings, the potential for recycling is high, as these premises would often have separated their wastes according to general and recyclable wastes. In addition, the quality of the recyclables is good (e.g. no contamination) and the volumes are high, resulting in high demand for collection from licensed recyclable collectors and processors. For commercial and institutional building, including retail malls, supermarkets and larger hotels, with the implementation of SAS, the recyclables would have been pre-sorted and of a reasonably high quality, that some recyclable collectors, contractors and processors would pay the commercial premises for collection, instead of the commercial premises paying for services.


However, in the case of post-consumer waste the volumes collected by the formal sector are small i.e. in the Act States the plastic volumes collected by the formal sector are far below 1% of the total post-consumer plastic waste. In the case of Act States, all concessionaries have tried to implement a separate collection of recyclables with the households having to carry out the SAS. SWCorp aggregates the volumes of recyclable materials collected by the three concessionaires. In 2018, the total recyclable volume collected across Act States amounted to only 2,013 tonnes including plastic volume accounting for 620 tonnes [SWCorp, 2019]. The vast majority of recyclables is collected by other actors and not the waste management companies.

2.1.2.2 INFORMAL WASTE MANAGEMENT (SORTING, COLLECTION AND RECYCLING)

The informal sector comprises a wide variety of participants ranging from individual material pickers who go from point to point covering a specific geographical area to well-organised faith-based groups that are present in multiple Malaysian states and encourage recycling and environmental protection. On the one hand, the participation of the informal sector is the backbone of the Malaysian recycling industry with the large majority of post-consumer recyclables being mobilised and aggregated by the informal participants. In addition, NGOs and faith-based organisations play an important role in educating consumers and creating awareness.

On the other hand, the strong role of the informal sector poses a challenge for the formal sector. Most informal sector participants focus on the high-value recyclable items including cans, tins, different paper grades and rigid plastic packaging while they do not collect the lower value recyclable materials. This ‘cherry-picking’ approach significantly reduces the potential value of the waste flow that the formal sector collects. By definition, recycling volumes and ‘market shares’ of the informal sector participants are difficult to quantify. Additionally, the informal sector may include those who are formally employed, such as waste collectors and maids, who separate and sell recyclables as supplementary income, on top of their formal employment. The most important group within the informal sector are listed below:

Table 4: Non-exhaustive list of informal sector recycling participants

Informal sector	Description
	<p>‘Tailgate sorting’</p> <p>Mainly in non-Act states and with concessionaries who have not enforced standard operating procedures for the truck crews forbidding this practice. Depending on the policy of the concessionaire or operating company, workers collecting municipal waste and recyclables are allowed to collect a proportion or all of the recyclables to be sold onwards. Distinguished by gunny sacks located at the back of the truck to sort tin, metals, plastic bottles and bulky plastics items. If cardboard is collected, they are usually located close to the undercarriage of the vehicle. If gunny sacks are full or if recyclables have been pre-sorted and bagged by premises, they are commonly seen on top of the vehicle. Highly effective separation close to source. Truck crews communicate with households and households ‘see’ that their recycled material is actually separated.</p>



Mobile collectors - Independent trucks (‘paper lama trucks’)

The expansion of local processing capacities for recycled paper grades in the early 2000s fostered the development of a large fleet of individual ‘Old Paper Trucks’. Recyclables commonly collected are paper, cans and other metals, with plastic being collected if there is sufficient volume and value. Commonly seen in landed residential properties and is distinguished by their catchy jingle to alert residents of their presence and intention to buy.



Mobile collectors – Independent tricycles

Similar to paper lama trucks focused on high value recyclable items that are easy to collect and aggregate i.e. paper, cardboard, cans and other metals as well as high value plastic. Materials delivered to nearby junk yard or buyback centres. Commonly seen in urban areas where they also pick up recycling materials that have been deposited outside the household for regular waste collection.



Material Pickers

Material pickers range from street pickers that collect from rubbish bins to landfill pickers. Street pickers in urban areas commonly collect cans, with some in residential areas picking cans, plastics and other recyclables. Landfill pickers are typically organised in groups and commonly collect any recyclables. They either work with a few collectors who visit the landfill regularly, or with one collector licensed by the landfill operator.



Building cleaners

Usually working with a company contracted by a building or premises to provide waste management services. Commonly seen in medium-/high-rise residential buildings and offices. Depending on company policy, building cleaners may be allowed to collect and separate recyclables while providing cleaning services to the buildings. Recyclables are either picked up on a regular basis by small trucks or sent after work to nearby junk yards or buy-back centres.



Part-time/full-time maids

Depending on the households, maids may be requested to separate recyclables during regular cleaning or are allowed to separate recyclables to be sold to collectors or drop-off centres. Some maids may only service one household, while part-time maids usually service multiple households.



Faith-based group e.g. ‘Tzu Chi’

Faith-based charity group that is very active in recycling and environmental preservation. One of the largest informal recyclable collectors in Malaysia. Operates nation-wide collection-points and public awareness drives to encourage recycling, including public awareness on what plastics can and cannot be recycled. Proceeds from the collection go to social and educational projects run by Tzu Chi.

Source: Tzu Chi Malaysia

While the informal sector plays a crucial part in ensuring recyclable materials are captured and collected, they are in friction with the formal sector. Especially the large concessionaries who have introduced a differentiated schedule that provides dedicated collection of recyclable items in addition to the normal household waste collection (see Figure 7). They see the informal sector as extracting value from their waste stream, especially pickers who collect recyclables before the concessionaires on designated ‘recyclable collection days’ when households put their recyclables out for collection. In addition, waste picking in landfills causes concerns due to the lack of health and safety precautions.

Despite the friction, overall, the informal sector complements the collection efforts from the formal sector, with recyclable collectors and junkyards in the formal sector being regular off-takers. Whenever the intrinsic value of the recyclable product is high enough the informal sector develops a robust supply-chain feeding into the formal recycling sector.



Figure 7: Recycling cages in a middle-class apartment complex by Alam Flora, a concessionaire in Kuala Lumpur

2.1.2.3 WASTE MANAGEMENT (DISPOSAL)

In Malaysia, a majority of the landfills are owned by the respective municipalities. Some landfills are owned or operated by third parties, such as KUB-Enviro Sdn Bhd, Worldwide Landfills Sdn Bhd and Trienekens (Sarawak) Sdn Bhd. In the Act-States of Kedah, Negeri Sembilan, Malacca and Johor where management of sanitary landfill falls under SWCorp instead of the municipalities, a third party is contracted for the operation of the landfills [SWCorp, 2019]. The third party mostly contracted by SWCorp are the major concessionaires, namely E-Idaman Sdn Bhd and SWM-Environment Sdn Bhd.

For Act-States, oversight and monitoring of landfills is under SWCorp, while for non-Act States, oversight and monitoring is done by the relevant local authority. While landfills that are operated by SWCorp or a third party have reasonable data collection on landfill usage, daily tonnage entering their facilities and waste composition, other municipal-run landfills do not have sufficient or accurate data beyond estimations. Conversations with municipalities in Langkawi and Kelantan, and with SWCorp reveal that some unsanitary landfills are highly utilised and are reaching maximum design capacity, with JPSPN and SWCorp pushing for more high capacity sanitary landfills in the country.

Table 5: Estimated disposal at landfill sites in Malaysia in tonnes/day [SWCorp, 2019]

Region	Sanitary Landfills		Unsanitary Landfills	
	Sites	Estimated disposal (tonnes / day)	Sites	Estimated disposal (tonnes / day)
Peninsular Malaysia	13	14,415	64	7,488
Sabah & Labuan	2	490	21	1,010
Sarawak	3	707	43	1,395
Total	18	15,612	128	9,893

2.1.2.4 RECYCLING VALUE CHAIN

At current, the recycling industry in Malaysia is fairly developed with a fully localised industry covering the entire value chain from collection and separation over multiple aggregation steps to a range of manufacturers who produce resin or end products from recycled material. Within Peninsular Malaysia there are three main industrial areas with a concentration of aggregators and processors i.e. in the North-West around Penang, in the Greater KL area including Klang and Nilai as well as in the South in Johor Bahru. The recycling industry is not as developed on the East Coast of Peninsular Malaysia and the Borneo states of Sabah and Sarawak, with feedstock from these regions being transported to the other main processing centres.

While the early stages of the value chain are highly fragmented with tens of thousands of individual collectors, the level of concentration increases along the value chain. The first step of aggregation and separation is typically done by mixed junk yards who buy and process multiple materials and require very limited investments. Mixed plastic is typically transported as loose items to nearby specialised aggregators who separate the plastic into the main types such as PET, HDPE, LDPE and PP. Some form of compaction happens at this stage in order to increase the bulk density e.g. baling of PET bottles and LDPE bags or shredding of PP and HDPE (see annex 8.1 for different plastic type classifications).

The following chart gives a high-level view of the value chain. Depending on the availability of local volumes and need to transport there can be several levels of aggregation before the raw material is sent to the actual processors who processes them into recycled resin or end products. Since both the washing (including water treatment) and processing (e.g. extrusion) require significantly higher capital investments, the industry structure of this processing step is more concentrated with few larger players.

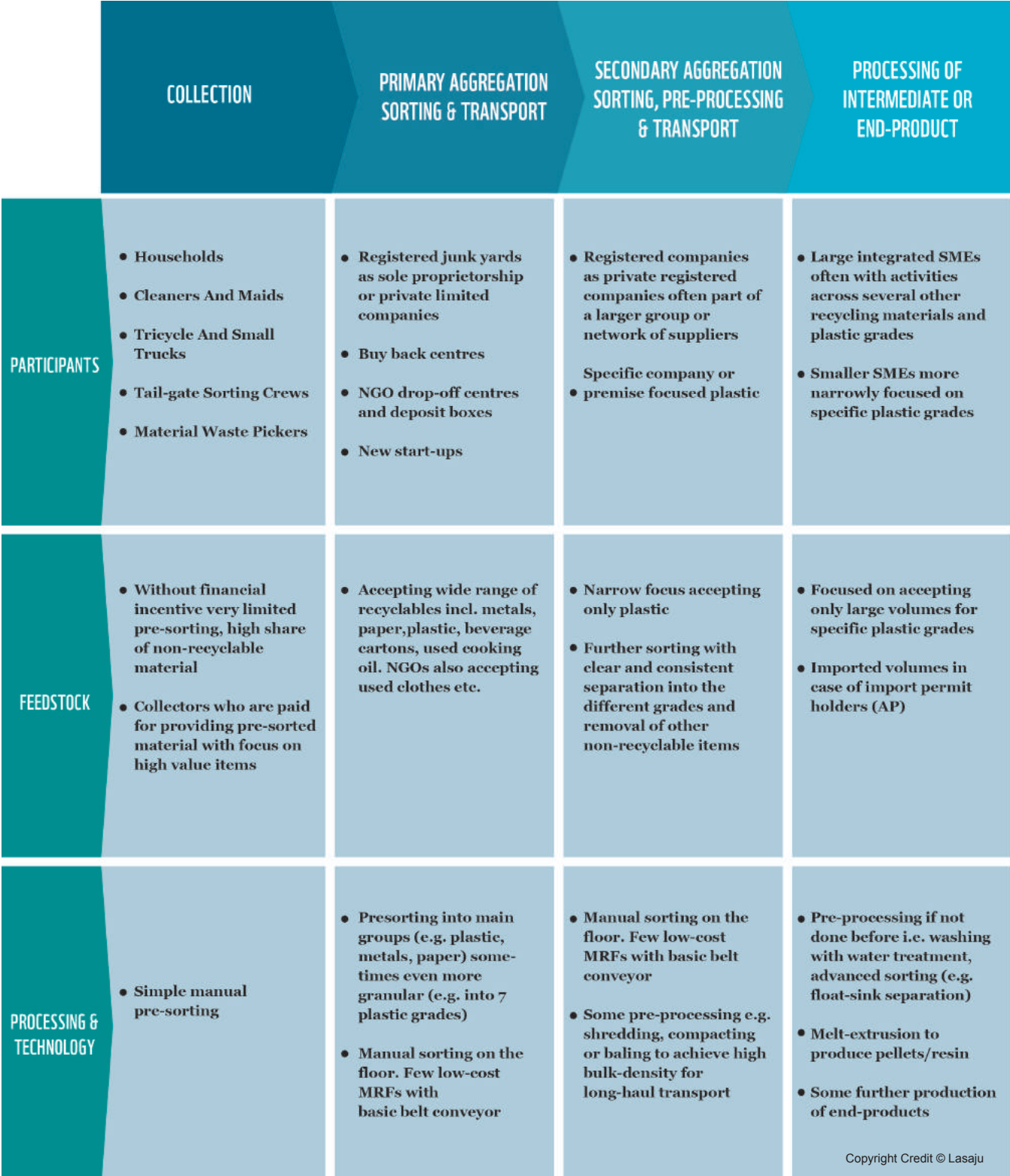


Figure 8: Overview of the Malaysian recycling industry in Kuala Lumpur

While the first processing steps require very limited initial investments, the processing of the recycling material into pellets or resin requires significant investments into equipment. Most of the processing capacity currently uses mechanical recycling except for one pyrolysis-based chemical recycling facility in Johor.

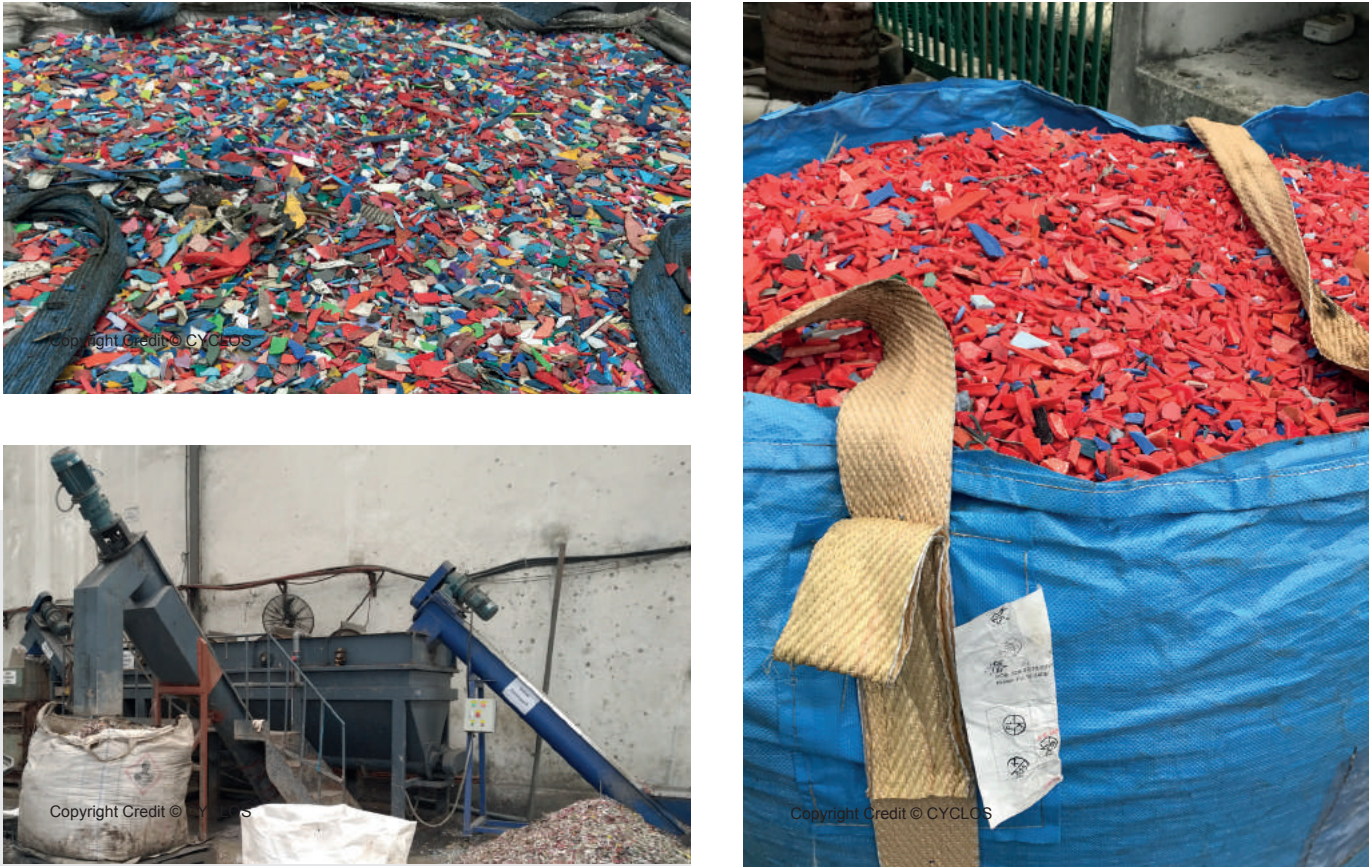


Figure 9: Shredded raw material (top left, right); float-sink-separation of shredded raw material (bottom left) at a processor (Green Concept Technology Sdn Bhd)



Figure 10: Washed flakes for shredded raw material (left); granulates produced from extrusion (right) at a processor (Green Concept Technology Sdn Bhd)

Technically, the minimum scale for a mechanical recycling plant is relatively low with individual line producing between 1 to 8 tonnes of pellets per day. However, for the operations to be commercially viable, multiple lines are needed to also justify the additional investment into the infrastructure such as washing and water treatment and advanced separation. In addition, the processor has much higher working capital requirements. Most of the recyclable material is sold on cash terms while recycled pellets are typically sold with longer terms of credit.

This is reflected in the current industry structure with the early collection and aggregation being highly fragmented with tens of thousands of participants, while the processing is more consolidated, with less than 100 producers. However, these larger companies also have the ability to invest into research and innovation.

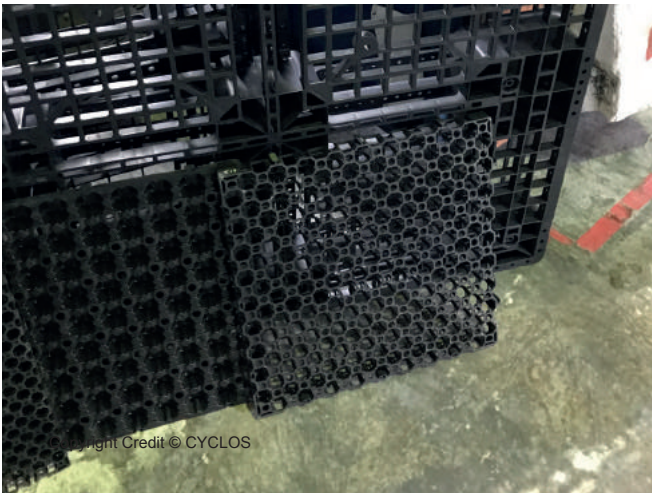


Figure 11: Products made out of recycling granulates at a processor (Green Concept Technology Sdn Bhd)

2.1.2.5 UPSTREAM - CONSUMER GOODS COMPANIES, PACKAGING COMPANIES, PLASTIC INDUSTRY

In parallel to the Malaysia Plastic Pact efforts, at least ten consumer goods and packaging companies are in the process of setting up the not-for-profit entity Packaging Recycling Organisation (PRO) Malaysia. These companies include both the global and local consumer goods companies i.e. Etika, F&N, Pepsi, Spritzer, Tetra Pak, Colgate, Dutch Lady, Coca-Cola, Nestle, Unilever.

PRO Malaysia, similar to PRO Vietnam, will be a voluntary industry-driven pre-competitive solution in tackling packaging waste issues. PRO Malaysia will act as the interface between industry, consumers, NGOs and government. The entity is planning to become the system operator of a voluntary EPR scheme and will hence collect voluntary levies/fees, which will then be used to increase collection and recycling rates by subsidising segregated waste recovery.

In addition, a joint white paper published in October 2019 by the Malaysian Plastics Manufacturers Association and Malaysian Plastic Recyclers Association, titled “An Advanced Plastics Recycling Industry For Malaysia”, promotes the introduction of EPR schemes as part of a drive to create a circular economy and spur smarter product designs [MPMA & MPRA, 2019]. Their efforts in promoting the introduction of EPR schemes are in tandem with their mission to build an ‘advanced plastic recycling industry’ that would require constant stakeholder engagement at all levels.

2.1.2.6 START-UPS AND NEW BUSINESS MODELS

Lastly, there is an increasing number of commercially focused start-up companies or new business models within the existing waste management companies that try to increase the recycling volumes at various stages of the value chain. Most of these ventures focus directly on the consumer directly at the household level, through drop-off points and bins or in schools and provide a small financial or non-monetary reward for the recycling goods. While it is too early to evaluate how successful these new business models will be, all of them have the significant benefit of creating more awareness for separation at source and the environmental impact of the plastic packaging.

2.1.3 CIVIL SOCIETY SECTOR

A wide range of NGOs has been active in Malaysia and across the waste management value chain. While most of the NGOs have a much broader environmental agenda, part of their work also addresses the enhancement of plastic waste collection and recycling. The spectrum is very wide ranging from NGOs (e.g. Trash Hero) or neighbourhood initiatives that focus on the impact of littering through regular beach and neighbourhood clean-ups all the way to global organisations like the World Wide Fund for Nature (WWF).

With its strong footprint in Malaysia and other Southeast Asian countries WWF is supporting the development of EPR schemes across the region. Within Malaysia, WWF-Malaysia is one of the founding members of the Malaysia Plastic Pact (MPP) and co-leads the EPR working group, which will inform the development of the Circular Economy Roadmap and potential additional EPR-related regulation. The second NGO participating in the MPP is Reef Check Malaysia. While Reef Check’s main purpose is the conservation of local coral reefs Reef Check is also a founding member of the MPP and co-leads MPP’s Circular Economy working group.

Last but not least, there is a wide range of NGOs running collection centres and mobile or temporary drop-off points as a way to generate revenue for their benevolent purposes. The largest of these NGOs is the Taiwan Buddhist Tzu-Chi Foundation Malaysia, which operates around 160 permanent recycling centres and 980 temporary recycling points across Malaysia.

2.2 MATERIAL FLOW ANALYSIS FOR POST-CONSUMER PLASTIC PACKAGING WASTE

Understanding the flows of the recyclable materials is crucial for the design and development of an EPR scheme tailored to the Malaysian situation. However, given the below mentioned limitations, the main focus of this chapter is to provide an approximate view of the volume flows as well as a holistic view of the relevant actors and the current industry structure.

In addition, multiple efforts are currently ongoing to substantiate both the total post-consumer plastic waste volume by plastic grade as well as the actual recycling volumes. The below mentioned computation aims to provide an improved estimate.

2.2.1 LIMITATIONS OF THE ANALYSIS

The below-mentioned analysis was based on the most recent available data and report and a large range of interviews, which generate a consistent understanding of the Malaysian waste management sector. However, it needs to be noted that the quantitative results are only estimates due to a range of limitations:

- **Data availability:** Historically, limited data has been collected about post-consumer waste and specifically plastic packaging waste. The situation is similar for recycling volumes, which have been estimated on a yearly basis by SWCorp for the overall recycling sector based on voluntary reporting. As a result, there is no comprehensive dataset available yet.
- **Informal sector participation:** In addition, the large amount of informal sector actors especially in the primary collection and aggregation creates addition complexity to obtain aggregated values.
- **Legal and illegal imports:** In the years 2017 and 2018 Malaysia recorded a sharp increase in the legal import of plastic waste [Ismail, 2019]. In parallel, the country also experienced an increase in illegal shipments of plastic waste to Malaysia without the required AP as well as the establishment of illegal sorting facilities, 155 of them being shut down by June 2019 [Ismail, 2019]. This resulted in a distortion of recycling volumes especially in the years 2017 and 2018. As a result, the reference year used for this analysis is 2016, which was still less impacted by import volumes.

Despite the above-mentioned limitations, it needs to be pointed out that Malaysia has a very well-developed recycling industry with a strong existing supply chain. All participants, being it formal or informal, have been very cooperative and transparent providing information and data to the best of their knowledge as well as verifying and confirming the below mentioned estimates.

2.2.2 POST-CONSUMER PLASTIC WASTE VOLUMES

Post-consumer plastic data was extrapolated based on estimated household incomes and district populations, resulting in district level estimations for waste and post-consumer plastic generation. Baseline figures for waste generation are from 2012 figures from the Survey on Solid Waste Composition, Characteristics & Existing Practices of Solid Waste in Malaysia commissioned by JPSPN [JPSPN, 2013]. This study is the second conducted throughout Malaysia, and the first to have a comprehensive breakdown by waste and plastic types. The data from the study is representative of six study regions (see Table 6). However, it is important to note that the waste stream does not only include plastic from packaging but also chemically identical non-packaging plastic waste such as toiletries (e.g. toothbrushes, combs), stationery (e.g. plastic pens, rules) and other small discarded plastic items.

In order to estimate the post-consumer plastic waste volume for all of Malaysia in 2016 we calculated the waste volumes at a district level based on the population of the district and the estimated per capita plastic waste volume of the district. Data from the 2013 Survey on Solid Waste Composition, Characteristics & Existing Practices of Solid Waste in Malaysia contained breakdowns by the seven plastic types (PET, HDPE, PVC, LDPE, Polypropylene (PP), Polystyrene (PS) and Other Plastics) on a per capita basis. For districts that were included in these regions the 2012

Table 6: Daily post-consumer plastic composition grams/per capita

Region	Plastics (grams / capita)						
	PET	HDPE	PVC	LDPE	Polypro-pylene (PP)	Polystyrene (PS)	Other Plastics
Northern	21.29	22.38	4.46	27.18	9.45	2.17	2.13
Southern	18.18	31.71	2.07	35.85	13.79	10.02	0.82
Klang Valley	19.11	33.35	3.44	32.13	11.13	10.39	0.00
East Coast	12.70	17.32	3.17	24.30	7.29	10.16	0.00
Sarawak	15.34	31.44	1.47	31.82	10.817	13.26	0.00
Sabah	19.17	28.23	3.23	27.84	5.95	15.68	0.48

Source: Survey on Solid Waste Composition, Characteristics & Existing Practice of Solid Waste Recycling in Malay-sia, Main Report (JPSPN)

study estimates were used as the per capita plastic waste volumes of the district. Districts that were not included in the 2012 study were categorised as ‘Urban’ or ‘Rural’ based on the presence of a municipal council or a district council, as municipal councils would tend to be predominantly urban in composition. In addition, the average per capita household income was calculated for these districts based on the Household Income & Basic Amenities Survey Report 2016 in order to estimate the average per capita plastic waste volume for these remaining districts. Lastly, the district-level populations were calculated based on population data made available from the Department of Statistics. Data from the Malaysia Census in 2000 and 2010 was used to estimate population for the districts in 2016. Based on the estimations above, an annual post-consumer plastic waste generation of 1,070,064 tonnes in 2016 was calculated.

Table 7: Post-consumer plastic waste generation in Malaysia, 2016 estimations

Region	Plastics (tonnes)							
	PET	HDPE	PVC	LDPE	PP	PS	Other Plastics	Total
Northern	36,241	52,467	6,399	58,317	20,884	20,600	1,919	196,788
Southern	26,683	45,383	3,722	49,774	18,508	14,906	922	159,898
Klang Valley	67,402	113,538	11,174	118,108	42123	37,720	1,300	391,365
East Coast	24,334	32,674	5,274	41,351	13,458	16,526	864	134,482
Sarawak	14,164	23,024	2,291	25,460	8,758	9,723	407	83,828
Sabah & Labuan	19,543	26,398	3,861	30,359	8,954	13,770	819	103,703
Total	188,366	293,485	32,721	323,370	112,645	113,245	6,231	1,070,064

Source: Lasaju Consulting

The above-mentioned table provides the details by the regions as defined in the 2012 JPSPN study, a detailed breakdown by States is available in annex 8.2. This volume is significantly higher than previous estimates that were published for post-consumer packaging waste only. Thus, it is very important to emphasise that not all estimates are directly comparable. The above-mentioned calculation includes both plastic packaging waste and chemically identical non-packaging waste (see chapter 2.2.2).

While there are no Malaysia-specific studies to quantify the difference in volumes, several countries have undertaken more detailed studies to quantify the different volumes differentiating between packaging and non-packaging plastic waste with the non-packaging portion amounting for a minimum of 28% and a maximum of 44%.

ON A PER CAPITA BASIS

ON AVERAGE EACH MALAYSIAN PRODUCES AROUND 34 KG OF POST-CONSUMER PLASTIC WASTE PER YEAR IN 2016 WITH APPROXIMATELY 22 KG PER CAPITA BEING POST-CONSUMER PLASTIC PACKAGING WASTE

On a per capita basis, the model estimates that on average each Malaysian produces around 34 kg of post-consumer plastic waste per year in 2016 with approximately 22 kg per capita being post-consumer plastic packaging waste. With this estimate, Malaysia is still below developed countries but ahead of many of its developing neighbour countries in Asia. This is consistent with the observation that the per capita waste generation of developing countries increases with the increase in per capita income [Kawai, K., Tasaki, T., 2016]. In addition to the per capita income there are a several other cultural and climatic factors that drive the high per capita plastic waste generation, which are often also present in neighbouring countries.

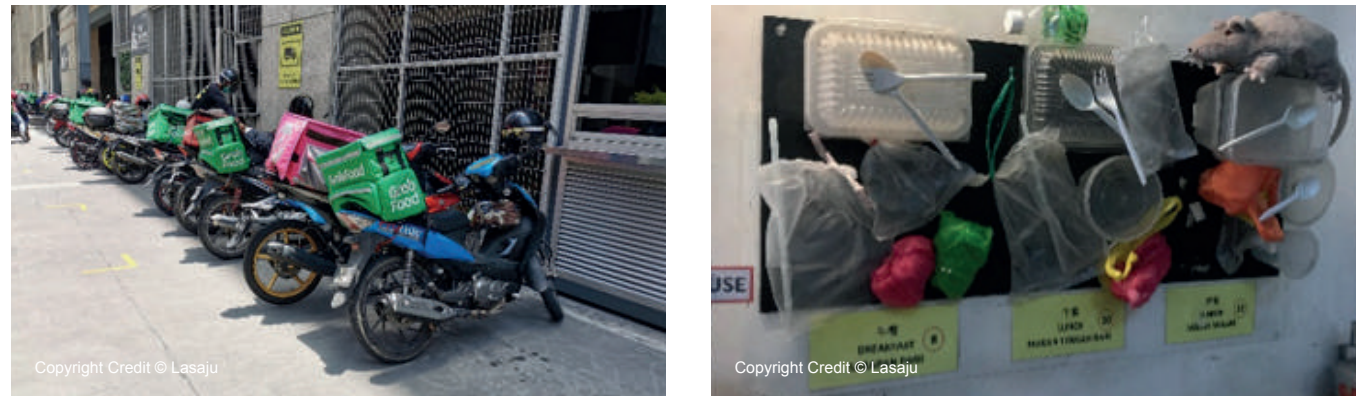


Figure 12: Motorbikes of delivery services (left); Food packaging for typical breakfast, lunch and dinner (right)

‘BUNGKUS’ OR ‘TA-PAU’ CULTURE OF TAKE-AWAY FOOD

With the ease and convenience of buying readily cooked food in Malaysia from hawker stalls and restaurants, many households commonly opt for take-away food. This culture of purchasing take-away food results in a high degree of plastic packaging to store and transport the food. For example, a simple meal of take-away noodles with soup would comprise up to six different single-use plastic items i.e. at least three layers of packaging: one plastic packaging for the noodles, one for the soup, and another to hold the two separate packaging that contains the noodles and soup, wooden chopsticks packed in plastic, a plastic spoon and potentially a separate small bag of a chili or sambal (see example in Figure 12). This trend has been exacerbated with the introduction of motorbike-based delivery services, that deliver take-away food not only from the typical fast-food outlets but also from small individual outlets and even hawker stalls. In addition, most bottled drinks readily available in Malaysia are in plastic bottle form, with glass bottles usually only seen for alcoholic beverages leading to a high per capita consumption of PET bottles and other containers.

CLIMATIC CONDITIONS

Furthermore, the humid tropical climate in Malaysia makes additional plastic packaging for food and food items a necessity to prevent them from going bad or pests. Day-to-day grocery products such as flour, sugar or pasta are often packaged in paperboard in colder climate. However, in tropical climate these products typically require a different or additional form of packing with plastic. In addition, instant beverages, instant noodles and other snacks are often sold in individual portions which are packaged in multi-layer sachets. While the market share of these sachets is much higher in countries with a lower GDP per capita (e.g. Indonesia and the Philippines) these individually packaged portions have become an important part of the food packaging in Malaysia. Lastly, expensive and imported products such as fruits or chocolates, are often individually packed with additional plastic, while vegetables, leafy greens and meats are individually packaged to prevent them from bunching with other produce. Meat produce, including seafood, are commonly wrapped in multiple layers of plastic, on top of the PP packaging container, to prevent ‘leakage’.

2.2.3 PLASTIC WASTE FLOW ANALYSIS

As elaborated above, the 2012 JPSPN study provides a very good starting point for the calculation of the overall post-consumer plastic waste volumes. In order to obtain an updated estimate of the recycling volumes and flows the analysis has focused on interviews and/or site visits with more than 40 stakeholders from very different backgrounds. This list includes the formal sector (e.g. large concessionaries and multiple recycling centers) as well as the informal sector (e.g. landfill material pickers, apartment cleaners, small-scale collectors, truck-crews conducting tailgate sorting and junk yards), government entities at the local, state and federal level as well as and NGOs. In addition, the interviews and site visits were conducted in different states (i.e. Kuala Lumpur, Putrajaya, Selangor, Kedah and Kelantan) as well as a mix of urban and rural areas. Secondly, we have conducted extensive interviews and site visits with multiple recycling processors who process the aggregated recyclable materials into resin or end-products.

PET, HDPE AND PP RIGID MONO-MATERIALS

PET, HDPE and PP are the main plastic types collected, aggregated and recycled with a strong focus on rigid mono materials. Rigid plastic packaging such as bottles are easier to collect, have a higher weight per piece and are often less contaminated as opposed to flexible materials such as films. All three plastic grades have a strong existing market in Malaysia with a complete local supply chain for collection, aggregation and onward processing. As a result, these are the main materials to be picked by any collector as they allow to generate the highest hourly income. In addition, many of the mono materials only require further sorting by colour, crushing and washing before processing them into new resin.



Figure 13: Manual sorting of post-consumer plastic waste in junk yard (mainly rigid mono materials)

Multi-layered and mixed materials such as chips packages or instant drink sachets are not recycled. Since the local supply chain for recyclable materials is well established for the material flow, the same applies to the information flow. Non-recyclable materials are identified by the ultimate processor, who passes this information back to the aggregators, who in turn inform the initial collectors.



Figure 14: Display of packaging materials not accepted by a Tzu Chi Recycling Centre



Figure 15: Display of typical polyethylene materials accepted and sorted by a Tzu Chi Recycling Centre

Within the PET grade drinking bottles as well as clear bottles for cleaning and body care products are the vast majority of material recycled. Dark coloured PET bottles are currently not recycled in Malaysia. The same is true for flexible materials, PET trays and thin PET packaging such as egg cartons, which are not accepted by the recycling processors and thus end up in the general waste.

Within the HDPE grade bottles for detergent, personal care products, milk or lubricant oil form the biggest share of rigid mono-materials. Typically, the HDEP bottles are separated further into frosted white and coloured bottles. However, increasingly producers of HDPE packaging have started to mix HDPE with calcium carbonate thereby increasing the density of the material. This makes it difficult for processor to separate the HDPE from other materials such as ABS. As a result, also some rigid HDPE bottles are sorted out as non-recyclable due to their calcium carbonate content ending up on landfills.

Polypropylene has an even wider range of accepted materials for recycling including clear bottles of food and non-food items as well as many take-away food containers. In addition, there are wide range of coloured packaging and non-packaging items that are accepted for recycling.

FLEXIBLES / FILMS, LDPE AND OTHERS

For flexible material and LDPE packaging the situation is very different. While the local recycling sector has the processing capacity for LDPE and flexible materials the local feedstock comes predominantly from commercial and industrial packaging materials, which is available in large quantities and clean.

Many of the aggregators who focus on plastic also accept LDPE and flexible materials. However, as described above, the final processor will only accept materials that he can process and therefore setting the requirements in terms of contamination and cleanliness. As a result, the collection and aggregation of post-consumer flexible and LDPE materials are largely non-economical and insignificant at the moment.

The situation is similar for polystyrene. Again, there are local processors focused on processing of polystyrene, which are largely focused on supply from commercial and industrial suppliers.

Lastly, PV and other plastics (recycling type 7) are barely recycled. While consumers are often unclear about the recyclability of refill stand-up pouches, which are perceived as more environmentally friendly, these multi-layer materials are not accepted for recycling by local aggregators.



Figure 16: Display of typical polypropylene materials accepted and sorted by a Tzu Chi Recycling Centre



Figure 17: Typical LDPE feedstock from commercial customers (left); post-consumer plastic (right)

Based on the sum of the interviews with final processor we estimate the recycling rate for HDPE, PET and PP to be between 32% to 37% (see Figure 18) across different types of post-consumer plastic waste including rigids, flexibles and non-recyclable plastic volumes.

For the rigid portion of these three materials, most recycling processors estimated the recycling rate to be very high between 70% to 90% depending on local collection, sorting and aggregation infra-structures. However, as described above, even some of these rigid mono-materials are not recycled due to mix with other materials (HDPE) or property changes limiting the mechanical recycling (e.g. thing PET trays) like illustrated in Figure 19.

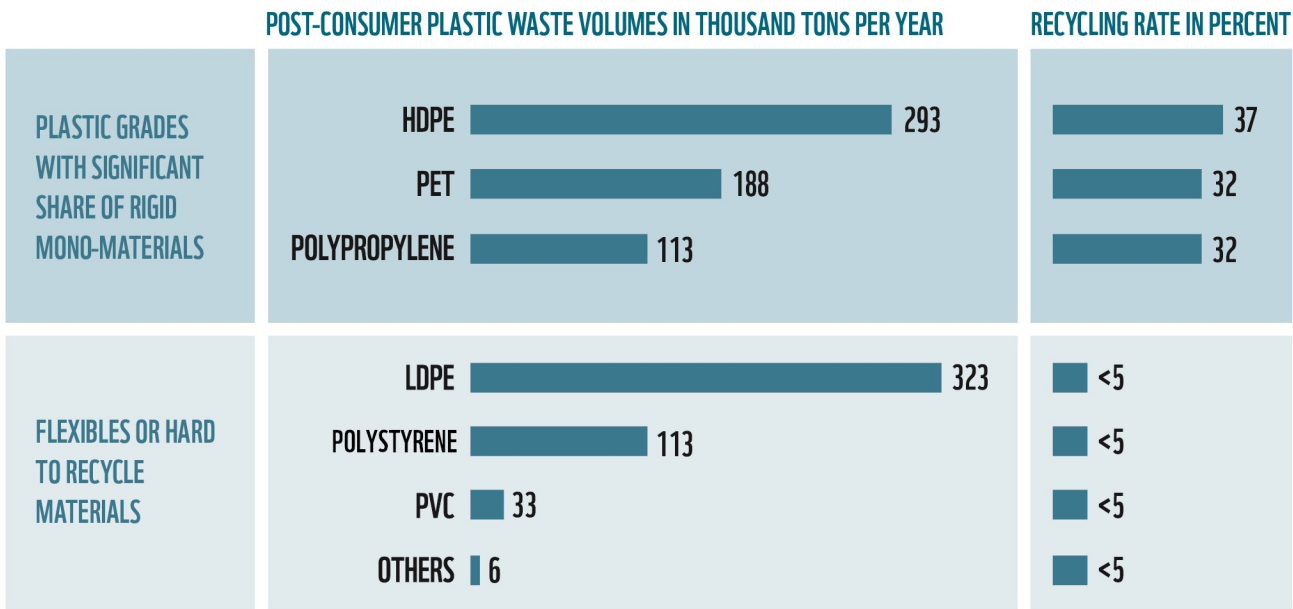


Figure 18: Estimated recycling volumes and rates (by plastic type)

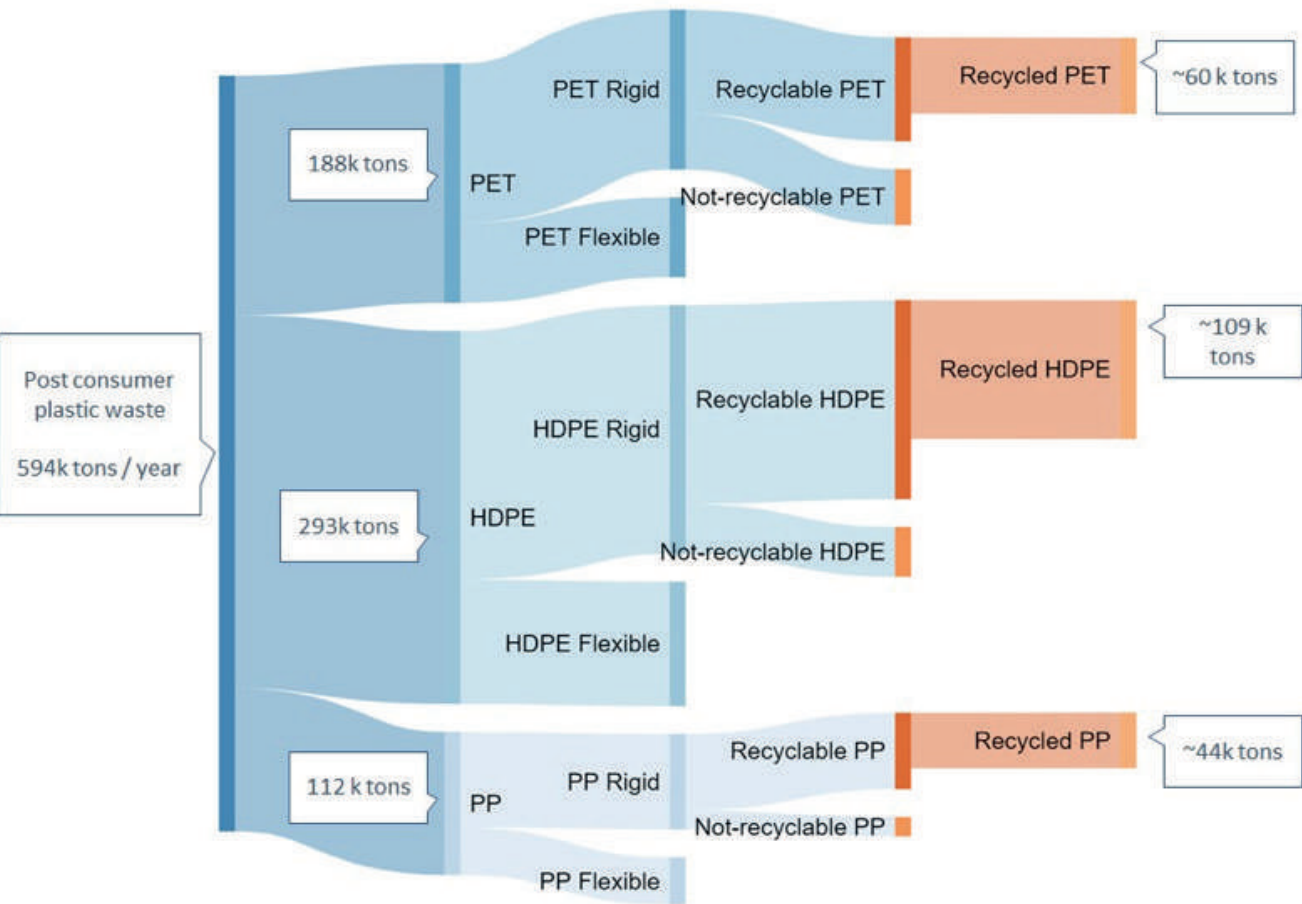


Figure 19: Waste flow for PET, HDPE and PP plastic grades

2.3 SUMMARY AND IMPLICATIONS FOR AN EPR SCHEME IN MALAYSIA

The Malaysian recycling industry is the most developed in ASEAN and driven by dynamic and entrEPRepreneurial participants at every step of the value chain. However, for an EPR scheme to be successful and to have the highest impact it needs to be tailored to the local situation, as some plastic grades are more readily recycled than others, and with local conditions affecting how effectively plastic packaging can be recovered.

ENSURE CLEAR RESPONSIBILITY WITHIN THE GOVERNMENT

As elaborated above, multiple ministries and departments at the federal, state and local level of the government are involved in the Malaysian waste management and recycling sector. As explained in the following chapters, a successful EPR scheme should be applied nation-wide and across different packaging types including plastic, paper and other packaging materials. Thus, it will be important to have a clear responsibility within the government for the implementation of such an EPR scheme.

INCLUDE THE INFORMAL SECTOR

As explained above, the informal sector is currently the backbone of the Malaysian recycling sector ensuring the primary collection and sorting. As a result, an EPR scheme should include the informal sector and provide the appropriate incentives to increase the collection and recycling rates, while improving the livelihood and working conditions. Neglecting the informal sector would most likely have a negative effect in the medium-term on the entire recycling sector and significantly reduce the amount of recyclable materials in the market. However, we also acknowledge that as of today, there are few examples of successfully including informal sector participants and most of them being project-based instead of country-wide. A similar approach would be needed in Malaysia to test out different models that work in Malaysia and even the different areas (e.g. Act vs non-Act States).

THE INFORMAL SECTOR IS CURRENTLY THE BACKBONE OF THE MALAYSIAN RECYCLING SECTOR ENSURING PRIMARY COLLECTION AND SORTING

INCLUDE PRIVATE SECTOR STAKEHOLDERS AND INITIATIVES

The private sector already has a fully functioning supply chain with the material, financial and information flows being in place i.e. with licensed aggregators and processors obtaining their feedstock from collectors and primary aggregators, who in turn obtain most of their recyclables from informal sector players such as material waste pickers, tailgate sorters and faith-based groups. In addition, consumer goods companies and other end-users have committed to an increasing share of recyclable packaging and recycled materials. Consumer good companies via the MPP are already taking the initiative to achieve these goals. These voluntary private sector initiatives will initially move much faster than the political decision-making process to establish an EPR scheme. The learnings and insights will be crucial to inform the political decision-making process.

INCLUDE CIVIL SOCIETY

Non-governmental organisations are currently providing physical collection and recycling services while creating awareness for improvements in the waste management and recycling sector. These experiences should be leveraged both in the current decision-making process as well as the design of a future EPR scheme.

SECONDARY AGGREGATORS AND PROCESSORS WITHIN MALAYSIA

REJECT MOST OF THESE MATERIALS DIRECTLY (E.G. SOILED PLASTIC BAGS FROM HOUSEHOLDS) WITH THE EXCEPTION OF CLEAN LDPE FILMS, WHICH ARE LARGELY PROVIDED BY INDUSTRIAL AND COMMERCIAL CUSTOMERS

ENSURE THAT A HIGHER SHARE OF RIGID PLASTIC PACKAGING IS RECYCLABLE

As mentioned above rigid plastics such as PET, HDPE and PP are readily collected, and rigid mono-materials have a high recycling rate. Observations in selected recycling and collection centres, high-rise residential properties and landfills in Malaysia confirm that rigid plastic materials are regularly collected and separated for recycling, especially as prices for these materials are high and there is a ready market. However, even within the rigid plastic packaging there is still a large amount of non-recyclable items. In some cases this is due to the properties of the material (e.g. thin PET trays) in other cases due to the mix with other materials (e.g. calcium carbonate). Many international consumer good companies have already committed to make all of their packaging materials recyclable within the next 5 to 10 years. However, an EPR scheme should support this trend through modulated fees that favour recyclable materials and discourage the use of mixed materials.

PROVIDE SUPPORT AND INCENTIVES FOR FLEXIBLE PACKAGING WHILE REDUCING NON-RECYCLABLE MATERIALS

While rigid plastics and its material flow stream are relatively well understood, flexible plastics and multi-layer materials have a very poor recycling rate. Secondary aggregators and processors within Malaysia reject most of these materials directly (e.g. soiled plastic bags from households) with the exception of clean LDPE films, which are largely provided by industrial and commercial customers. The Malaysian government has already taken significant steps to reduce single-use plastic items including (e.g. including flexible materials such as plastic bags). In addition, the focus on an EPR scheme needs to be on the appropriate incentives to recover and recycle flexible plastics while reducing the amount of non-recyclable materials.

IMPROVE TRACEABILITY AND MONITORING

Lastly, traceability of the collected recyclables will be very important. The developments from 2016 to 2018 have shown that imported feedstock volumes can increase rapidly and enter the domestic value chain. While it can be beneficial for the overall processing sector to have access to high quality imported plastic waste, there is a risk that the EPR scheme would subsidise not only the local collection and recycling but also imported plastics. As a result, an EPR scheme would have to be designed to ensure traceability of the plastics from the point of collection up to processing.

3. CHARACTERISTICS OF HIGH-IMPACT EPR SCHEMES

WWF has identified the Extended Producer Responsibility (EPR) scheme as a critical policy tool with a track record in holding manufacturers accountable for the end-of-life impacts of their plastic products and packaging, as well as encouraging holistic eco-design in the business sector. EPR schemes are increasingly recognised as effective policy approach to tackle insufficient waste management and littering around the globe. Extensive experience with EPR schemes for different waste types, including packaging waste, exists in European and other OECD countries (see Figure 20). Governments of several low and middle-income countries have also started to introduce or draft regulation in this regard. Furthermore, several companies and business associations have launched voluntary commitments and initiatives to accelerate the transition to sustainable waste management and circular economy by pushing for EPR schemes. As there is no ‘one size fits all’-scheme, it is essential to develop customised schemes for each country reflecting the local conditions.

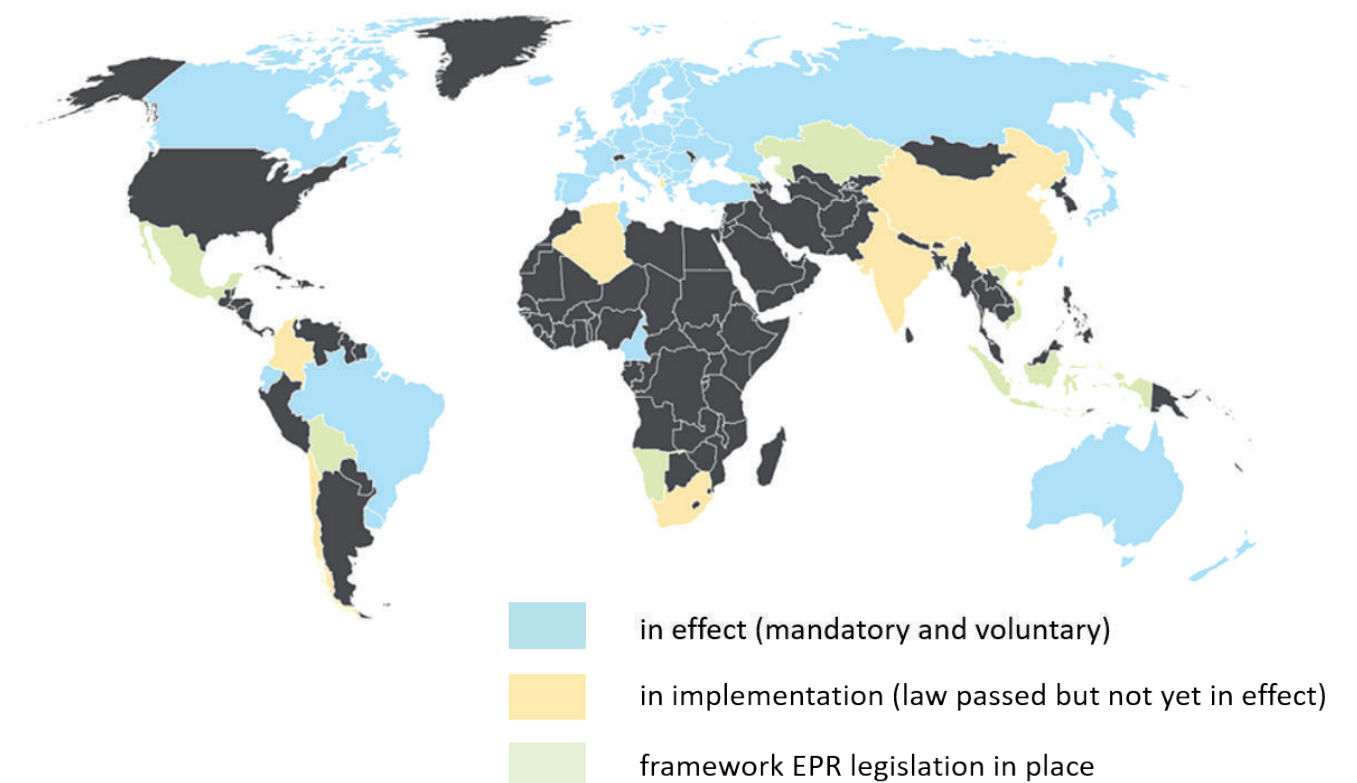


Figure 20: Data Sort: Worldwide expansion of packaging EPR [Resource Recycling, 2019]

IT IS CRUCIAL THAT EPR SCHEMES

REFLECT THE CHARACTERISTICS OF THEIR WASTE STREAM

3.1 SYSTEM ARCHITECTURE

Extended Producer Responsibility (EPR) is an environmental policy approach based on obliging producers to assume full responsibility for the products – not just during the in-use phase (e.g. through complying to certain health and safety standards) but also during the end-of-life phase once their products and packaging have become waste. EPR systems can be designed for different kinds of products. It is crucial that EPR schemes reflect the characteristics of their waste stream as, for instance, household packaging waste behaves very differently than waste from the construction sector or automobile sector. Thus, for an appropriate management of different waste streams, different EPR schemes should be designed.

3.1.1 OBLIGATIONS IN MANDATORY SYSTEMS

Translating EPR into practice thus means that the producers are responsible for all waste management related tasks such as for instance collection, sorting and recycling of their waste. As EPR is in most countries implemented on a national level, the ‘producers’ comprise both the domestic producers as well as the importers to ensure the level playing field between all companies regardless whether they are SMEs or MNCs. These companies are referred to as the obliged companies.

To assume their responsibility, the obliged companies can either carry out the waste management tasks themselves or through EPR fees. To determine which companies are obliged company and how much each obliged company has to pay a few key questions need to be answered:

- Which packaging is defined as system-relevant packaging?
- What fee applies to the different types of packaging material (e.g. depending on recyclability)?
- How much of each packaging materials is placed onto the market?

For determining the system-relevant packaging, it is necessary to distinguish between different types of packaging and their necessity and suitability to be covered by an EPR scheme. In many countries, there is already an existing system for collection and recycling of industrial and commercial packaging, which is why it is not necessarily needed to cover them in a collective EPR scheme. However, the situation is different for household packaging and equivalent points of origination (e.g. offices, canteens): A comprehensive and effective collection, sorting and recycling system for this packaging type is usually not existing or only to a very limited extent. Hence, this packaging should be covered by a collective EPR scheme.

To precisely determine the exact EPR fees that need to be paid by the obliged companies, it is necessary to define a clear interface in the packaging value chain at which it can be ascertained which packaged goods are put on the market and will eventually become waste in the respective country. The most suitable interface for this is when the packaged goods are firstly introduced on the market for consumption in the respective country (see Figure 21). To make the compliance of the obliged companies mandatory, a corresponding legal framework is needed. Otherwise, the system is a voluntary one.

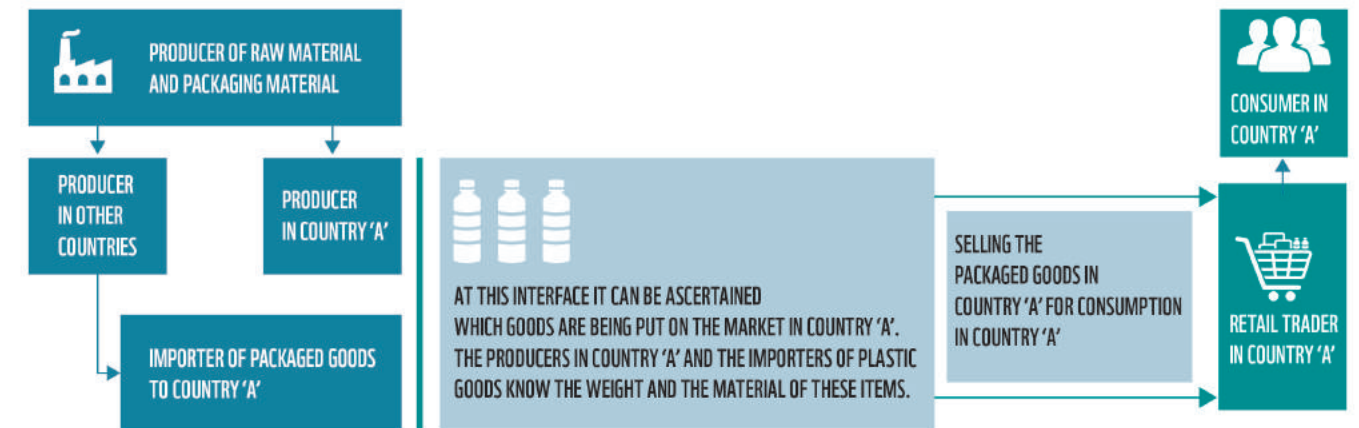


Figure 21: Interface for obliged companies

Due to choosing this interface, the fees are only paid at the level of the obliged companies. Raw material suppliers, resin producers, packaging material converters and other companies operating before the chosen interface do not pay any EPR fees.

It is also common to have a basic modulation in the fees for the different packaging materials, which the obliged companies have to pay. Generally, these fees for the different material fractions vary significantly across countries as the respective fees are always context-dependent on the prevailing waste management system, the targets and goals of the respective EPR system and other local conditions. Moreover, several European countries started to implement a modulation in their fees reflecting the recyclability of the packaging, i.e. the fees for a recyclable packaging are less compared to those of a non-recyclable packaging. Such a modulation requires a precise definition of criteria for assessing the recyclability and / or lists of product or products groups which are regarded as non-recyclable. Moreover to keep the level playing field, the fee modulation is not affected by whether the obliged company produces its packaged goods in Malaysia, fills them in Malaysia or imports it to Malaysia.

REGULATIONS AND CONTROLLING

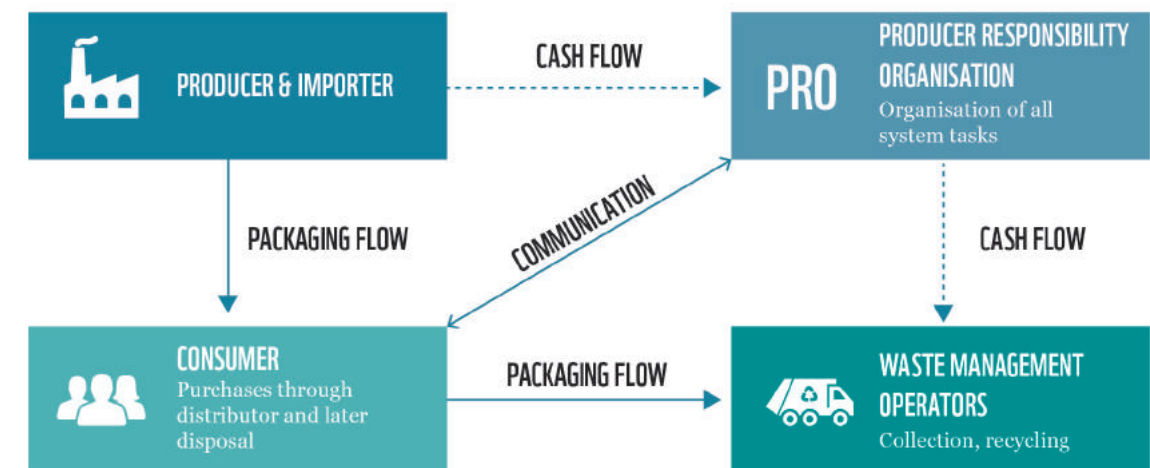


Figure 22: EPR based on a collective responsibility

**THE PRO
IS THE MOST IMPORTANT
ELEMENT FOR ESTABLISHING
AND OPERATING THE EPR
SYSTEM**

In global comparison, most effective EPR schemes are built upon a mandatory obligation for producers and importers. These schemes are based on collective responsibility, where a central organisation is taking over the take-back responsibilities of all producers and importers. This organisation is referred to as the Producer Responsibility Organisation (PRO) (Figure 22). Having a mandatory system in place requires enforcing a corresponding legal basis. For detailed information on the required legal basis, the comparison of mandatory and voluntary systems, please see annexes 8.3 and 8.4.

3.1.2 RESPONSIBILITIES AND SETUP OF THE PRO

In a collective EPR scheme, the obliged companies fulfil their responsibilities by paying a fee (the so-called EPR fees) to the PRO, which in turn collectively organises and finances all take-back and treatment of the waste on their behalf. Hence, the PRO is the most important element for establishing and operating the EPR system. Due to its central role for operating the system, the PRO is also regarded as the system operator. See annexes 8.5 and 8.6 for a comparison of an individual and a collective EPR scheme and details on PRO set ups.

In particular, the PRO is responsible for the following tasks in the EPR scheme:

- **Registration of all obliged companies** (in cooperation with the supervisory authorities): These are the companies introducing packaged goods onto the market, which are consumed in the country meaning that their packaging needs to be disposed of in that respective country
- **Collection and administration of all funds** from all obliged companies while ensuring fair costs and therefore not harming the competitiveness of a participating company
- **Tendering and contracting** for collection and recycling of packaging waste
- **Documentation of collection**, sorting and recycling of packaging waste
- **Informing and educating** all waste producers and consumers about the importance of an environmentally sound waste management, including aspects like separate collection
- **Controlling all services** that have been awarded to service providers, specifically services relating to the fulfilment of collection and recycling by waste management companies
- **Financing all tasks** with funds provided by the obliged companies
- **Documentation and verification** to the supervisory authorities: The PRO has to prove that it has completely fulfilled all its tasks and aims and used the paid fees of the obliged companies accordingly

Just as the exact EPR system setup varies across countries so does the PRO setup. As shown from the experiences gained in European countries, **there is no one single most successful setup**, but that the success is determined through an effective and efficient organisation, financing, administration and controlling of the system.

In most setups, the PRO is a private entity that is primarily distinguished as being set up for either a for-profit or non-profit organisation.. The number of PROs in an EPR system (single PRO with a monopoly vs. several PROs in competition) is determinant on the set-up as non-profit vs. for-profit. Practice has shown that PROs as non-profit organisations are operated most successfully when there is only one PRO (operative monopoly) while PROs set-up as for-profit corporations are operated most successfully when competing with other PROs.

Table 8: Comparing for-profit, competing PROs with and non-profit PROs with an operative monopoly

Criteria	Non-profit PRO	For-profit PRO
Financial aspects	The fees collected correspond to costs for implementing and operating the system, which are regularly adapted to the costs spent and revenues collected.	Competition leads to high price pressure. Thus, the PROs can make profits but also losses, which can lead in individual cases to the insolvency of a PRO.
Organisational aspects & practicability	No own economic interest, higher levels of transparency.	Less transparency as some information is not disclosed. Each PRO is organising itself.
Control	Controlling efforts comparably lower.	High controlling effort due the multiple, competing PROs and lower level of transparency.

Regardless of the specific setup, it is expedient if all stakeholders in the supply chain participate in the PRO and should become members in this organisation. Initiating an EPR scheme and especially a PRO is a complex process in which multiple stakeholders (e.g. local and international producer and importer, plastic resin importer, packaging producer, waste management actors, government, consumer rEPRepresentatives, etc.) need to be included. This process is highly dependent on the respective framework conditions. Existing legal requirements and voluntary initiatives should be generally included.

3.2 SYSTEM OPERATIONALISATION

3.2.1 INTEGRATE WASTE MANAGEMENT IN EPR SYSTEMS AND CORRESPONDING TARGETS




To close the loop, the packaging and other selected non-packaging items (the system-relevant waste) need to be collected, sorted and recycled, which is fulfilled by the waste management operators. Therefore, they receive funds from the EPR system. Depending on the specific EPR setup, the waste collection can be

- 1. Organisationally in hands of the public authorities (who potentially hire a private company) and is solely financed through the EPR fees paid by the obliged companies,
- 2. Both organisationally and financially in hands of the obliged industry (through the PRO) and exists in parallel to the local authority waste collection for the other waste streams not covered by the EPR scheme,
- 3. A model ‘in between’ through contracts with the respective public authorities.

As packaging waste comprises a very broad range of materials and their composites, sorting is an inevitable step before any recycling process; even in the case of one item-type being collected (e.g. only PET bottles or only metal cans) as there is always incorrectly sorted waste and it needs to be ensured that no contaminants remain. The collected packaging waste can either be manually or automatically sorted or a combination of both. After the sorting process, the separated waste fractions are sold to recycling companies. It is important that all collected packaging is recycled or recovered. Therefore, it is necessary to anchor this obligation in law. For instance, it needs to be determined if feedstock recycling or energy recovery are suitable possibilities. Furthermore, recycling and recovery targets need to be defined either through recycling quotas or absolute recycling quantities. There are three distinct types of targets (Table 9).

How to enforce and control an EPR-system and the set targets as well as relevant mechanisms like register are shown in chapter 3.3.1.

Table 9: Different EPR waste management target types

Types of targets		
Quotas (for collection quotas, recovery):  These are the most common targets used in established EPR systems. Prospectively, the inclusion of a quota is possible with further development of the EPR system.	Rate of access to system  This means that within a certain period of time, a certain proportion of the population should have access to a waste collection structure (for example, after 5 years, 20% of the population must be connected to an infrastructure).	Specific waste management measures  Measurable measures can be specified for the above-mentioned goals. They can be increased in the course of further developments. This has the advantage that the costs can be calculated more precisely (i.e. the financing requirements of the PRO), be better controlled and react more flexibly towards unexpected developments.

3.2.2 INTEGRATE THE INFORMAL SECTOR IN THE OPERATIONALISATION

The waste management sector is labour intensive with low initial business cost. Perceived as easy to set up, it attracts a lot of informal engagement to generate income [Alam, 2014]. In some places only informal operations take place in the sector, and very often they are the backbone of collection, separation, recycling and trading in developing countries.

However, it is difficult to assess the complete picture, as researchers are often avoided by informal workers and the numbers and activities usually fluctuate during seasons [GA circular, 2019]. In some parts of the world, like areas in Brazil, the informal sector is highly organised and efficient – generating a good living. While in other places people earn barely more than 2\$ a day [see Kenya, WIEGO, 2019]. The low value creation is driven by contamination due to a lack of source separation, and low developed end-markets to sell the material to.

Furthermore, the informal sector and its important contribution to public and environmental health is barely recognised by government and society, leading to low social status and lack of support to improve living and working conditions [WIEGO].

Taking such circumstances into account, **an EPR scheme must consider the integration of the formal and informal sector, that supports the efficiency and profitability of all actors.** Because many mechanisms, like buy-back schemes, damage the income of the informal sector, leading to a potential threat of disruption by the latter. A possible approach is the case of Pune, India, where waste pickers have been integrated into the city’s door-to-door collection and segregation process [UNESCAPE, no date].

Furthermore, the collection system setup through the EPR system should particularly focus on low- or no-value plastics that are left by the informal activities, due to the low developed end-markets that make those unprofitable to collect:

A study from GA Circular [2019] revealed a negative correlation between GDP growth and the contribution level of the informal sector to the recycling quota.

The researchers argue, that with rising GDP the informal sector will also seek for formal employment in different areas, instead of continuing to pick waste. Hence, with rising consumption and waste generation the collection- and recycling quota is expected to deteriorate.

For this reason, it is important to establish a comprehensive, reliable and formal EPR system, because one cannot rely on the continuation of the current situation, which relies heavily on the work of the informal sector [GA Circular, 2019].

Professional informal companies and semi-professional companies possess very good expert knowledge on the market, the processes, the recycling, the recovery options and the stakeholders who are important along the recycling chain.

This widely also applies for so called street pickers and informals working on dumpsites. The competence of these informal stakeholders is essential for the development of collection and recycling structures within the framework of an EPR system.

Especially for labour-intensive collection and sorting, informal waste pickers can be integrated. This can be done giving the informal contracts e.g. with the PRO or a company which the PRO assigned for providing services for collection and sorting. A second solution is the integration of informals as business partners of independent/self-employed entrEPReneurs.

The PRO and its co-contractors then also agree on including companies which to date have only been active in the informal sector. Possible operational areas for independent/self-employed entrEPReneurs are e.g. collection services, providing storage capacities, sorting, marketing and recycling.

See annex 8.7 for further information on integrating the informal sector (incl. examples from other countries).

3.2.3 KEY ELEMENTS TO OPERATIONALISE AN EPR SYSTEM

Combing the roles and responsibilities of the involved stakeholders, the principles of an EPR schemes and the potential legal frame, the following key elements to consider and their potential variations can be summarised (see Table 10) [modified after IEEP, 2019]:

Table 10: Key elements to consider for an EPR scheme

Key element	Description	Note / Variations
System-relevant products	Products need to be clearly identifiable and possibly assigned to their original ‘producer’ to oblige them to pay.	Typical products covered under an EPR scheme: packaging, electronical and electrical equipment, batteries, vehicles. Current discussions to also cover specific non-packaging items under EPR scheme in the EU as part of their SUP Directive (e.g. cigarette butts).
Mandatory or voluntary scheme	EPR systems can be either voluntary or mandatory .	Voluntary systems can be used as a preliminary EPR system to gain firsthand experiences while the legal basis for a mandatory system is prepared. When the law enters into force, the EPR systems become mandatory .
Obligated companies	Equal treatment of domestic producers and importers (i.e. companies putting the packaged products on the Malaysian market for consumption in Malaysia) to ensure level playing field .	Possibility to define a minimum threshold of packaging out on the market in order to be obliged to pay to release small companies.
PRO	Organisation that collectively takes on the responsibility of all of its members, thereby becomes responsible for operating the system. Different setup possibilities.	Decision for PRO setup should be based on the effectiveness and efficiency as well as the possibility to control the system (see chapter 3.3.1)
Waste management responsibilities	Closing the loop through collecting, sorting and recycling the packaging waste. Receive funds for their services.	‘Simple’ financial: obligation only to finance existing waste management Financial with municipal contracts: PRO set up waste management, organised through contracts with municipalities Financial and partial organisational: e.g. municipalities still responsible for waste collection but with financial support from PRO, PRO responsible for other activities (e.g. sorting, secondary material sales) Financial and full organisational: PRO has direct contracts with waste operators, or may own (parts of) the waste infrastructure.
Defining targets and responsibilities	Targets needs to be defined in law (in the case of mandatory system). Needs to be clear and unambiguous. Targets should also consider technical and economic feasibility, existing/ needed infrastructure, geographic and demographic characteristics and the overall state of art of the waste management system.	Different types of targets (recycling/ recovery quotas, access rate to system, specific waste management measures); appropriateness of targets depending on state of art of waste management system.
Informal sector	Need to integrate the informal actors in the waste management.	Integration is dependent on which step in the waste management the informal actor operates and if they work as an informal company or single worker.

3.3 SYSTEM ENFORCEMENT AND CONTROL

Registration is a central aspect within an EPR system. At least a register for producer and importers and a register for waste management actors are needed. Generally, reporting is meant as an additional layer of reporting to ensure smooth collaboration of all stakeholders towards the goals of setting up an effective and efficient EPR system. This applies both to Act as well as Non-Act States. Furthermore, there are two levels of control required within an EPR system: control by the PRO and control by governmental agencies.

3.3.1 EPR SCHEME REGISTER

In a mandatory EPR-scheme identification, steering and controlling of obliged companies as well as the waste management operators are crucial. If strict enforcement is not achieved, there is a high risk of free-riding, corruption or finances not being used effectively or accordingly. Therefore, publicly available and properly maintained “registers provide an EPR with the means to compile information needed to set fees and to identify free riders. Accreditation provides means to ensure that PROs meet specified performance criteria with its finance and to monitor activities” [OECD, 2016].

At least two different registers are needed:

1. Register for producer and importer to be able to calculate and allocate the EPR fees.
2. Register for waste management actors that serves to ensure a desired standard of disposal.

The registers can be run by one or by different bodies. A register can be run by a government agency or privately organised, that can also be the PRO. In the latter case the PRO should be obliged to report data to the competent authority. The following Table 11 shows main aspects of a register run by a government agency and a register run by obliged companies/PRO

Table 11: Comparing register run by government agencies or obliged companies/PRO

Criteria	Run by government agency	Run by obliged companies/PRO
Finance	Financed by registration fees or general budget Governmental structures often less flexible; adjustments may result in delays; therefore, finance must be reliably secured	Founded, financed by obliged companies/PRO Financial risk with obliged companies, thus, they shall also participate in finance
Organisation	Effective register: adequate staff in terms of numbers and qualifications Authority, producer, importer, all relevant stakeholders involved in setting the rules for EPR to ensure a reference to practice Data confidentiality ensured by authority not involved in competition	Ensure confidential handling of competition-sensitive data Operational activities not carried out by obliged companies themselves
Control	Neutral position of government agency No overlap: persons acting in the register and obliged companies Low risk of potential conflict of interests Agency may be under supervision of competent ministry (e.g. Ministry of the Environment)	Effective control by a supervisory authority required, incl. rights of inspection, information, rule-making process participation Supervisory laid down in regulation So be regulated if register is responsible for enforcement or whether this is carried out by government authorities

Regarding a register’s transparency and data availability, it has to contain all necessary data and also be designed in a way that no confidential market information is shared.

REGISTER FOR PRODUCERS AND IMPORTERS

This register has to collect, store and process data of companies that put packaging on the market. The data enables the entity in charge of the register to:

- Identify the producers and importers
- Conduct data reporting
- Monitor and control operations of the EPR scheme and the obliged companies

All producers and importers that are obliged by regulation, have to register. In principle, it should be possible to register and submit reports on a web-based basis.

In the further processing, the registered companies have to report data on the quantities and types of packaging placed on the market. According to the size of the obliged company and/or the amount of packaging put on the market, there can be different levels of reporting. However, the data to be reported by an obliged producer or importer should contain at minimum the following information:

- Weight of the packaging
- Defined material group per tonne
- Number of units

The reporting period can be annual or monthly. Revealed material types and quantities are evaluated to define customised EPR fees. The structure and organisation of the register must guarantee the confidentiality of the data. Only highly aggregated data shall be made public. Publicly available data enables third parties to check compliance of obliged companies and the register offers a tool to report non-compliance. In other cases, it has been proven successful to publish the registered obliged companies (e.g. via website). This way, free riders can be identified by the authorised controlling body and also by competitors.

As payment of waste management services in EPR schemes should only be made for system-relevant packaging and products, the register for the obliged companies to report on the products for which they have to pay EPR fees is a crucial tool to ensure that fees are not paid for imported waste.

REGISTER FOR WASTE MANAGEMENT ACTORS

The fulfilment of waste management tasks in the EPR system must be linked to certain standards. This also includes compliance with environmental and work safety standards which will be triggered and steered via EPR financing mechanisms.

A registration obligation for actors performing waste management tasks (collection, sorting, recovery) creates transparency and a more reliable basis for the selection and finance of recognised measures and monitor of PRO spending. **The registration must also include a classification of suitability.** This classification can be done e.g. by certificates. The registration must at least contain information on:

- Company (name, address)
- Activity
- Technology (type of processing or recovery operation)

The operator of the register should grant the right to check this data and the possibility to remove the companies from the register in case of violation. An obligation to register is also an important step towards formalising these activities for companies or persons from the informal sector.

With the register the operator is enabled and has to ensure:

1. Identify waste management companies within the epr scheme
2. Accredited for certain tasks/certification
3. Monitor and control

3.3.2 CONTROL BY THE PRO

The controlling by the PRO focuses on three dimensions:

- 1. Fulfilling the operational services of the PRO:** The PRO structure and its operations need to be transparent. This enables visibility on potential misconduct of single deciders within the organisation and allows for the structures to be adapted accordingly (particularly important in the initial phase).
- 2. Prevention of free riders among the obliged companies:** An effective measure is to register all obliged companies to report their amounts of packaging, service packaging and optional additional non-packaging plastic items covered by the ERP system (see chapter 3.3.1). Since the PRO is industry-led, there is a self-interest by the obliged companies to focus on the prevention of free riders.
- 3. Fulfilment of operational performance by waste management operators:** It is important that all waste management operators providing services to the PRO are paid correspondingly and are also registered and licensed (see chapter 3.3.1). This also includes a general suitability assessment. As an additional key element, the mass flows of the system-relevant waste, which are handled by them as part of their operative business, need to be documented.

In case of existing, government-run registers and identification codes, it should be examined whether it is suitable to use them when implementing these control mechanisms of the PRO. These registers and identification numbers might need to be adapted accordingly. It is also possible that the companies, which need to register (both obliged companies and waste management operators), use the verification of the respective registers as proof to the PRO.

3.3.3 CONTROL BY GOVERNMENTAL AGENCIES

Monitoring and controlling the EPR system (determined in the law), which is the responsibility of the PRO, is in hands of a suitable government-affiliated body or responsible ministry / public agency. As means to carry out this role, a report must be submitted on an at least annual basis in which measurable and comprehensible financial flows, qualities and implemented infrastructural measures and activities are verifiably documented. Local authorities are particularly important system participants for checking the system implementation at regional level.

The responsible controlling agency has to be explicitly named in the law and needs to be staffed with knowledge and finances. In most cases, a new section in the Ministry is created which is only responsible for the EPR act. They control and validate the reporting done by the PRO regarding its performance.

Particular emphasis needs to be on controlling the fulfilment of the operative task of the PRO in regard to achieving the targeted goals (e.g. collection and recycling). This can be done through both random on-site controls of the respective waste management facilities as well as through monitoring the reports of the PRO in terms of the fulfilment of the targets.

As long as the EPR system is voluntarily operated, the respective control mechanisms (and the requirements to use them) need to be developed and set up so that they are in place once the EPR system becomes mandatory.

Deviations can be expected, especially in the beginning. Therefore, it must be clarified in advance which penalties will be enforced if the obliged party does not fulfil their legal or contractual obligations.

- If contractual agreements (e.g. between PRO and waste management operators) are not adhered to, the PRO as contractor should have already provided for appropriate measures and penalties in the contracts. A prerequisite is an unambiguous description of services with appropriate evidence and deadlines.
- If statutory requirements / obligations are not met (e.g. no system participation by obliged companies or insufficient fulfilment of the obligations of the PRO), the regulatory authority must provide penalties. Also, for this case an unambiguous description of the responsible parties, the obligations (including providing evidence) and deadlines are imperative.

A moderate transition period should be determined to ensure the practicability of the system.

4. PROPOSAL OF A CUSTOMISED EPR SCHEME FOR MALAYSIA

In light of the Malaysian context see chapter 2.1 to 2.3 and annex 8.8 (summary framework conditions taken from [WWF, cyclos, 2019]), the following EPR scheme is proposed

4.1 SYSTEM ARCHITECTURE RECOMMENDED FOR MALAYSIA

4.1.1 OBLIGATIONS AND FEES

MANDATORY EPR SCHEME

The recommended EPR scheme is a mandatory one. In contrast, voluntary initiatives are usually limited to companies' Corporate Social Responsibility budgets and/or projects for specific types of materials with a sufficient material market value. **Mandatory schemes provide a reliable financial basis for large-scale collection, sorting and recycling of packaging which is crucial for creating sufficient business cases along the value chains.**

Since all companies, that bring system-relevant packaging and product onto the market are obliged to pay for the EPR system, **the system does not distort competition.** The rules apply equally to all obliged companies and therefore the level playing field is kept. The compliance with legal requirements can be precisely controlled.

To become mandatory EPR firstly needs to be implemented in an existing overarching legislation (e.g. the KPKT laws or the EQA) or established as a new overarching law before the details are later specified in a separate detailed regulation on EPR. Given the complexity of the partial adoption of Act 672 it seems more likely that EPR should be initiated through a new national legislation.

See annex 8.9 to learn about effects of further economic instruments in comparison to EPR systems (incl. examples of different countries).

INCLUSION OF SYSTEM-RELEVANT PACKAGING, PRODUCTS AND OBLIGED COMPANIES

The system-relevant products are **all packaging materials (e.g. plastic, paper, metals, composites) from households and equivalent places of origination** (to avoid undesired substitution effects in packaging design), **service packaging and other specified, non-packaging plastic items.** The choice was made as the

current waste management faces challenges and is partly inadequate for the non-valuable packaging and plastic items, as for instance sachets, films and mixed plastics. Thus, a scheme including these products is recommended to create a financial and organisational basis for the critical products.

The obliged **companies paying fees to the PRO are the companies putting the goods packaged with the system-relevant packaging as well as the specified non-packaging items on the Malaysian market for consumption.** Contrary to that, the **obliged companies for service packaging** are those selling the empty service packaging to restaurants, street vendors, and other forms of food and beverage outlets where it is filled and purchased by consumers. All obliged companies **need to register** (see chapter 4.3.1) with the amounts and material types to determine how much they are obliged to pay and enable verification of their compliance. This register is run by the PRO. Non-compliance or false reporting of data has to be strictly penalised.

See annex 8.10 for lessons learned about scope of packaging included in an EPR system.

MODULATED FEES

To incentivise recyclable design and reduce the amount of non-recyclable packaging and products, modulated fees are proposed: Packaging, which is well recyclable such as rigid PE and PP as well as transparent PET bottles (see chapter 2.2.3), is priced with a reduced EPR fee paid by the obliged company (bonus). Respectively, it is also possible that a malus is given to particular packaging, which cannot be recycled, such as multilayer packaging and sachets, i.e. is priced with an increased EPR fee. Thereby, the modulated fees provide a monetary steering function on the packaging and product design towards more recyclable products in Malaysia where possible. At the same time, the malus EPR fee enables building of necessary systems that can recover so far non- or less-recyclables. As EPR fees are paid for any packaging as well as system-relevant non-packaging items, the fee modulation impacts all system-relevant packaging and items regardless whether they have been produced in, filled in or imported to Malaysia (level playing field).

See annex 8.11 for an example, how EPR fees look like. Furthermore, see annex 8.12 for recommendations on compostable packaging.

4.1.2 SETUP OF THE PRO

ONE, NON-PROFIT PRO

To establish said basis in a reliable and fair manner, a mandatory EPR scheme is required to ensure a holistic waste management in which the responsibility is collectively assumed through one, non-profit PRO (system operator), which will manage the EPR fees. This PRO should be industry-led with members from all steps of the supply chain to carry out aligned action and operation of the waste management of the respective system-relevant packaging and products. Moreover, this organisation can act as a platform to connect and facilitate exchange between companies active at the different steps of the supply chain, for instance to develop guidelines on recyclability and recyclable design of packaging in the Malaysian context.

There are different groups of members within the industry-led PRO:

1. Obligated companies that pay EPR fees proportionate to the amount of system-relevant packaging and products placed in the market by them. This applies for SMEs as well as MNCs.
2. Other members, which are companies that are part of the plastics supply chain but do not belong to the obliged companies. This includes raw material suppliers, plastic packaging and product converters, designers, manufacturers, retailers and traders, and waste management operators for collection and recovery, especially recycling. These companies should pay a membership fee to the PRO for the operation of the PRO.
3. Affiliated members that form the advisory board: This includes rEPRepresentatives of the ministries and

governmental agencies (for instance KPKT, KASA, SW Corp, JPSPN, Malaysia Green Technology and Climate Change Centre), municipalities, research and academic institutions, NGOs (e.g. Reefcheck, WWF), and business member associations like MPMA, MPRA and MPA. None of the affiliated members have to pay a membership fee. These institutions and organisations influence the PRO work as an advisory board and therefore need to be informed about recent developments and innovations, as well as similar updates.

The PRO is managed by employees and an executive board. It does the operative work, financial spending and controlling. This management consists of one or several persons which can be either chosen by the members or externally appointed. The PRO usually starts with a small team of experts that grow with the establishment of different departments, that are responsible for all PRO tasks (details see 3.1.2), ranging from:

1. Funds collection and administration
2. Tendering and contracting for collection and recycling
3. Documenting waste management operations
4. Informing and educating
5. Controlling
6. Financing
7. Documentation and verification to the supervisory authorities

It is estimated that around 60 persons work for the PRO once the EPR system has been fully established and is successfully operating. Please note that this number is an estimation based on experiences in other countries. To ensure the compliance and control needed to successfully operate the scheme and keep fraud low, it is recommended to sufficiently staff the PRO. A more detailed PRO setup is outlined in WWF’s PRO Guidelines.

This specific PRO setup is chosen as one single (operative monopoly) non-profit PRO and allows for – in comparison to a system with multiple, competing PROs – **significantly greater level of transparency**. Critical information is disclosed and publicly available such as the EPR fees and the registered obliged companies, which is a crucial element for avoiding free riders. In turn, **lower efforts of controlling and monitoring** the system and the operative fulfilment of the PRO are needed (done by public authorities). Furthermore, **modulated EPR fees can be more effectively implemented** due to disclosed prices which apply equally to all obliged companies.

Comparing to a government-led PRO, an industry-led PRO has the advantage that the **EPR fees cannot be used as contribution to the general budget** and are, thus, exclusively spent on the respective waste management tasks. Moreover, the PRO setup remains unaffected in case of changes in ministries (e.g. dividing or merging ministries). Lastly, it is significantly more difficult to control a government-led PRO as there is no independent, external party to enforce controls.

As a mandatory system requires a respective legal basis, which will take time to develop and come into force, **a voluntarily operating PRO is recommended to be set up initially to carry out and coordinate pilot projects and other voluntary action**. Once the EPR system becomes mandatory, the PRO should become mandatory as well.

4.2 SYSTEM OPERATIONALISATION RECOMMENDED FOR MALAYSIA

To implement an appropriate and practicable system, it is crucial to regard the existing operative waste management structures in the setup. In particular, there are three significant characteristics shaping the Malaysian context:

1. Valuable packaging is already separated from household waste to a very relevant extent and transferred to the next steps in waste management (mostly sold). This applies especially to rigid HDPE and PP containers, transparent PET bottles (see chapter 2.2.3), and other recyclables such as paper, cardboard and metals. The removal from household waste is largely informal (e.g. through street pickers, maids, truck crew, or waste pickers) or by household itself. The subsequent supply chain via further aggregators to, eventually, the recycler is largely self-financed for these materials, however, this removal of valuable waste significantly reduces the value of the remaining household waste. On each step of this described chain, the value is added, and the market price increased, for instance through aggregation and greater sorting depth.
2. Malaysia has large recycling capacities that are sufficient for domestic waste (see chapter 2.2.3) for the above-mentioned recyclables. However, a large number of recyclers import, and process imported recyclable materials, which means that these capacities are largely occupied. Also, at the aggregator level, recyclables are imported and sold to domestic recycling companies. So far, there is no fully traceable documentation where the imported material is introduced in the waste management supply chain.
3. Non-valuable packaging (e.g. films from households, sachets, composite packaging) is mostly collected and disposed of with the residual household waste – so far, there is no systematic separation and recycling. Depending on the locally prevailing collection and disposal system, the waste ends up in sanitary landfills, dumpsites or littered in the environment. The capacity of suitable disposal options via sanitary landfills is not sufficiently available across the country (see chapter 2.1.2.3).

These characteristics are long-established structures that need to be integrated into the proposed EPR scheme in the best possible way. Thus, the setup for operationalising the EPR scheme is as follows.

4.2.1 WASTE COLLECTION IN THE PROPOSED EPR SCHEME

SEPARATE COLLECTION SYSTEM FOR ALL SYSTEM-RELEVANT WASTE

All system-relevant packaging and products of any value are collected through a separate collection system (e.g. plastic, paper, metal packaging and their composites), for instance a separate bin, container or bag, which is a crucial prerequisite for high-quality recycling as it enables economies of scale. Separation at source from contaminants (e.g. diapers, organic waste) is crucial for the subsequent steps processes like sorting and recycling. Comparable collection systems can be found all across the world. Having packaging separately collected also enables separate documenting of this waste stream which is necessary to evaluate and recap the efficiency of this proposed collection system.

This dry packaging waste mixture (including both valuable and non-valuable packaging) is sorted in sorting facilities and baled for storage and transport purposes to eventually forwarded to recycling, other

treatment processes (for example combustion in cement kilns or in waste-to-energy facilities) or even sanitary landfills if the other two treatment options are not possible (see Figure 23 below).

In the initial phase, it is expected that most high-value recyclables will still be extracted from the value chain. As previously explained, these materials are diverted by various informal actors. It is assumed that existing structures and channels will continue to operate next to the EPR system. Nevertheless, over time measurements should be developed to formally integrate these structures in the market. Through formalisation and integration of the informal actors, more high-value material stays in the collection system and can contribute to the system revenue. It is necessary to develop a system for all system-relevant waste regardless of the market price to establish a system

which is not determined by fluctuations of the market price and enables the establishment of high-quality treatment processes for all system-relevant waste. Wherever separate bins for recyclables are already in place, they can be used for the separate collection of the system-relevant waste.

TASKS OF THE PRO FOR OPERATIONALISING THE COLLECTION AND SORTING SYSTEM

The PRO register tenders the collection services to waste management operators and determines the sorting and fees (see Figure 23). The separate collection of all system-relevant packaging products enables a direct access and the possibility to clearly determine and trace all system-relevant waste. This offers the advantage that the PRO can explicitly tender (if applicable, depending on the regional structures) and pay for the collection services for the system-relevant packaging and products. Furthermore, this system makes it easier to document through separate mass flow.

The PRO implements and coordinates the subsequent sorting services. To fulfil this responsibility, the PRO is not running the sorting facilities itself but organises

that contracted waste management operators sort the collected, segregated waste according to the PRO’s requirements. As there are currently no significant sorting capacities in place, it is the task of the PRO to incentivise the build-up new sites and support the integration of existing structures, such as aggregators and MRFs. Furthermore, sorting facilities need to charge a mass-based gate fee and document origin of received waste and further treatment of sorted output. Imported waste is not supposed to be sorted in these sorting facilities. The legally imported waste is already sorted into very specific material types. Sorting of illegal, mixed waste has to be penalised. The documentation obligations end with the final recipient. The extensiveness of the PRO makes it more difficult to control and operate.

Education, information, communication and awareness raising are also important tasks of the PRO. This includes both sufficient information and communication to all involved stakeholders and their roles and responsibilities within the system. Efforts should also be put on enhancing segregation at source (SAS) empowering the residents and consumers to participate in the new system as SAS remains a challenge in Malaysia.

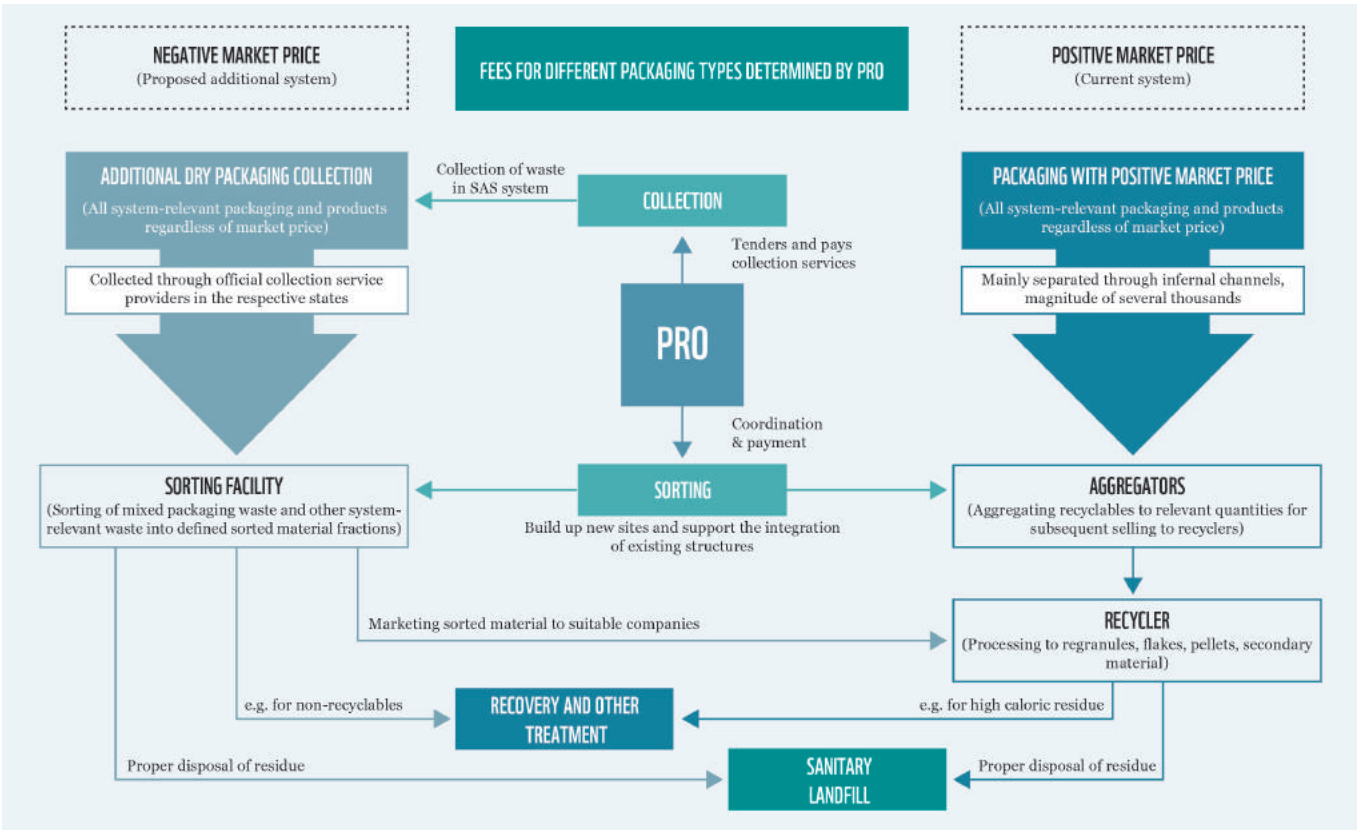


Figure 23: Tasks of the PRO for operationalising the waste management

IMPLEMENTING AND ORGANISING THE COLLECTION, WASTE INFRASTRUCTURE WITH INCREASED TREATMENT CAPACITIES

To operationalise the system, new sorting facilities must be constructed as well as existing facilities optimised (such as MRFs, aggregators or sorting at landfills) that also implement the required technology and capacities in order to become officially registered sorting facilities. Sorting facility operators need to be registered and are obliged to sort the packaging waste according to defined criteria and standards. For instance, this includes the sorted fractions that must meet certain minimum quality standards (specifications) corresponding to the subsequent recycling and recovery processes as well as the secured disposal of the residues.

The sorted material can either be marketed by (i) the sorting facility itself, (ii) by the PRO directly or (iii) handed over to a consortium, a so-called guarantor. In the first two cases, the sorting company or PRO respectively is responsible for the final treatment of the waste, whereby the sorting facility is obliged to provide the corresponding proof. The latter offers the advantage that a consortium (guarantor) must take over the material for a certain agreed price and ensure that this material is forwarded to a systematic final treatment – if recycling is not possible, the material can also be forwarded to other high-quality processes such as combustion in cement kilns, waste-to-energy or sanitary landfilling. Due to this obligation, relevant

capacities for treatment capacities for low-valuable and non-valuable packaging waste are established. In case of material with a negative market price and products, the guarantor can take over the waste at low or even zero cost. The guarantor can be any company, independent from the PRO. Typically a consortium that is interested in a specific material type and buys this material from the PRO, for example an energy supplier.

It is recommended that in the first step the PRO has the material ownership and markets the sorted material. Because the PRO accumulates significant quantities and benefits from economies of scale, for instance when selling it to a guarantor. In case sorting facilities would market the material directly, they would face significant difficulties in marketing the comparably smaller quantities of predominantly low- and non-valuable material.

The establishment of guarantors is incentivised but not obligatory: In case such a third entity would be founded, they can contractually agree with the PRO on taking over certain material types for a low or no price at all. As the PRO markets all sorted material, it is possible to provide significant amounts needed for economies of scale especially for the plastic recycling sector in Malaysia. It is also possible that the PRO creates an own organisation exclusively set up for marketing the sorted materials for recycling, recovery and disposal of residues. A possible setup is described in WWF’s PRO Guidelines.

4.2.2 FINANCIAL FLOWS, FORMALISATION AND ENFORCEMENT

REVENUES AND EXPENDITURES NEED TO BE BALANCED

The obliged companies register with their packaging quantities according to material and type of packaging, **using a fee modulation. The respective criteria and definitions need to be defined according to the Malaysian recycling structures.** Sorting systems must also document evidence of input and the quantity transferred.

There are revenues and expenditures in the system, which need to be balanced due to the PRO being set up as a non-profit organisation (see Figure 24 below). Thus, all potentially generated surpluses from the previous year have to be used as revenues for the following year and no bonus payments to any staff, company or organisation. Other sources for **revenues** are the fees paid by the obliged companies (usually biggest contribution), and revenues from the commercialisation of the recyclables. **On the side of the expenditures,** there are cost for operationalising the waste management through (i) collection, sorting and recycling/forwarding to other treatment processes as well as (ii) administrative costs and (iii) costs for communication, education, information and awareness campaigns. **All expenditures of the EPR system should be covered by the revenues of the system - no additional financing of other involved stakeholders is required.** Other, non-system-relevant waste is not financed by the EPR scheme.

The costs for collecting and sorting are not dependent on the market price of the collected waste, i.e. there is no cost difference if only low-value waste or non-valuable waste is collected and sorted compared to a mixture of high and low-value waste (which would be the case if no waste would be removed from the separate collection system). However, the sales revenues of the sorted material are highly dependent on it - the higher the content of recyclable waste with a positive market price, the more revenues will be generated and the EPR fees paid by the obliged companies are reduced. **Thus, it is expected that the system will be capital intensive in the initial phase when the material with a positive market price are removed through the various channels from the separate collection system.**

The exact amount of fees cannot be determined at this point as they shaped by a multitude of contextual factors, such as the type of collection system, the waste composition, the recovery and disposal infrastructure, and the costs of litter removal. However, as general guideline, there will be **low fees** for rigid PE and PP as well as transparent PET bottles and paper and cardboard, metals while the fees for sachets, composites, beverage cartons and other plastics will be **high**.

The financing of the system should be anchored in the legal basis of the mandatory EPR scheme.

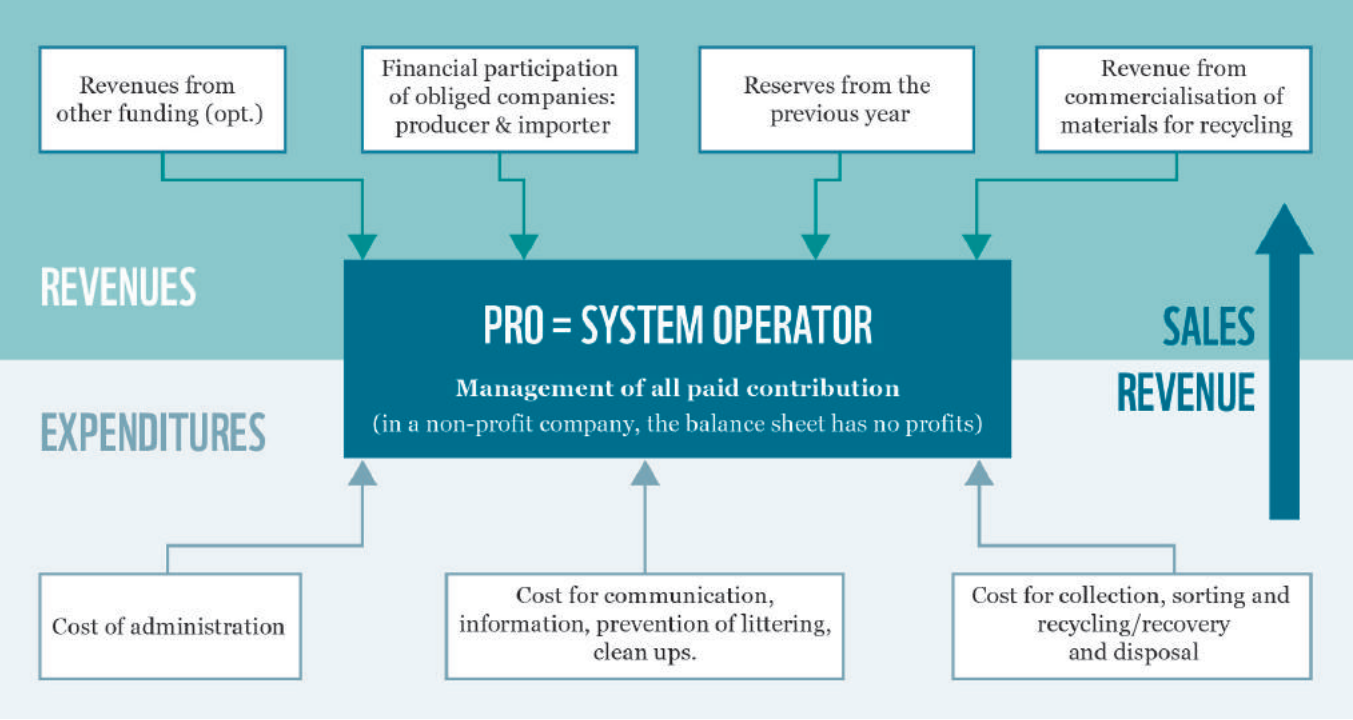


Figure 24: Revenues and expenditures of the system

FORMALISATION OF THE INFORMAL SECTOR FROM THE AGGREGATOR LEVEL STAGE AND DOWNSTREAM

Formalisation of the informal actors and their integration into the EPR scheme is crucial yet challenging. The underlying reason is that the high degree of informality at all stages of the waste treatment and the sheer number of people. **The most appropriate interface to integrate the informal sector is the level of the aggregators (see Figure 23) and sorting facilities. Reasons for this are their controllable, few numbers of facilities and the possibility to measure input and output of relevant quantities at the facilities.** Therefore, aggregators and sorting facilities are given the opportunity to formally register, increase their operation standards to sorting facilities, register the quantities processed and receive funds from the EPR scheme as remuneration.

Moreover, the integration of individual informal workers, such as waste pickers, should be important to incentivise them to not take away their source of income and share the benefits of an EPR system, for instance through reduced health risk and improved income security. There are generally two forms to achieve this: **integration as employees and integration as business partners as independent / self-employed entrepreneurs.**

Table 12: Formalisation through two different possibilities

Criteria	Integration as employees	Integration as business partners
Formalisation of tasks in the EPR scheme	Especially for labour-intensive collection and sorting, informal waste pickers can be employed.	This group comprises of professional and semi-professional companies. Thus, possible operational areas for independent / self-employed entrepreneurs are e.g. collection services, providing storage capacities, sorting, marketing and recycling.
Requirements for formalisation	The PRO sets contractual framework conditions leading to an increased recruitment of former informal collectors. The employment contracts can be made directly between the employee and the PRO, or between an employee and a company, which the PRO commissions to provide services for the collection and sorting. Upon contracting, the company or PRO must guarantee to ensure health standards for their employees. Through the establishment of co-operatives, the informal sector can be supported in the formalisation. Fixed working hours could be tied to a formalisation, which could be a disadvantage for some waste pickers that prefer flexibility. It is important that the integration of the informal sector into formalised structures allows for flexible solutions.	The company must register with the PRO. This includes providing the company with a clear identification with an address, a location, a contact person, email address as well as a concrete portrayal of possible services. Upon integrating, the company must also guarantee to ensure health standards for their employees.
Advantages for informal workers	Regular income, improvement of well-being, minimising of health risks, reliable business practices, access to social security systems.	Fixed service agreements, reliable acceptance of recyclables, improvement of employee's well-being, safety- and health risk minimisation, controlled business practices

See annexe 8.7 for lessons learned and more input regarding integration of the informal sector. More approaches on integrating the informal sector workers are also included in WWF's PRO Guidelines.

ENFORCEMENT AND CONTROL

In order to document all system-relevant packaging and products being collected, sorted, recycled or treated in any other form, it is important to register all aggregators, sorting facilities and recyclers including specific documentation obligations. Both formal and informal actors in the waste collection should be able to sell the system-relevant waste to sorting facilities. It is also possible that aggregators, MRFs, concessionaires and other, new third-party service providers can become sorting facilities that only receive funds from the EPR fees if properly registered (more information are given in chapter 4.3).

4.2.3 IMPLEMENTATION OF THE SYSTEMSTEP-BY-STEP IMPLEMENTATION BASED ON ACCESS TO WASTE SEGREGATION

As the already existing waste management system differs significantly across Malaysia, it is recommended to **gradually implement proposed waste collection and sorting** starting in the easily accessible and well-developed regions and **expand to all parts of the country within a defined period of time** (e.g. within 5 years). This gives time to create appropriate solutions for remote and less developed parts while evaluating the system and potentially adapting it to the lessons learned from regions, where it has been already implemented. **Corresponding goals and targets have to be set to measure relevant success.**

As the system is based on a SAS system for all packaging waste, **the number of households having access to this**

new collection system (in percent) would be suitable and relevant target to measure the success.

Once all households in Malaysia have access to this collection system and a reliable control and monitoring system has been established, recycling and recovery quota can be set to measure the success of the system. It is not reasonable to define quotas from the very beginning as they can only be assessed in case of reliable data from all across Malaysia.

OPERATIONALISATION OF THE INTERIM, VOLUNTARY SYSTEM AS “EPR LIGHT” SYSTEM

One suggestion as one of the steps in the integration is an **“EPR light” system**, in which the existing collection and recycling structures for valuable packaging are largely kept. Organisationally, the obliged companies register with their packaging quantities according to material and type of packaging, whereby packaging with a positive market value is priced with very low EPR fees– since a positive market has been established for this packaging stream no further financial support is required.

Consequently, the obliged companies only pay significant fees for their non-valuable packaging. **The collected fees are collected by a voluntary non-profit PRO (as a pre-organisation of the later mandatory PRO) and spent on education, awareness and information as well as on increasing the capacities of sanitary landfills, remediation and development of existing dumpsites and litter clean-ups.**

Moreover, the **gate fees at sanitary landfills and incineration plants should be reimbursed by the PRO corresponding to the amount of system-relevant waste** to incentivise the systemic collection of the non-valuable packaging and products.

While offering potentials to improve the littering situation of non-valuable packaging, this system does not provide for incentives to establish any recycling or recovery possibility of such packaging. Additionally, the assessment of ‘valuable’ packaging or not, which determines if a packaging is collected and processed by the existing structures, is strongly dependent on the current global recycling economy and subject to its fluctuations. i.e. if the prices of virgin material is low, the price of recyclates will also drop and consequently also the price for the buy-back of valuable packaging at collection level, which is why it can become unattractive to segregate the valuables in comparison with the price of primary material.

In such a scenario, also the valuables will remain in the residual waste, which would deteriorate any recycling possibility. In light of a circular economy and its focus to close the loop by re-circulating resources, a separate container, bin or bag for waste segregation at the household level regardless of the value of the packaging remains a crucial prerequisite.

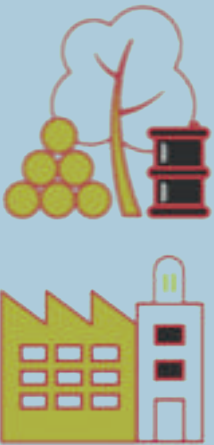




This system could be operated until the mandatory system comes into force. To become mandatory EPR firstly needs to be implemented in an existing overarching legislation such as the KPKT laws or EQA and then be later specified in a separate detailed regulation on EPR.

For more detailed information see transition in WWF’s PRO Guidelines.

NEW ROLES AND RESPONSIBILITIES IN THE PROPOSED EPR SCHEME

To operationalise the scheme, **all involved stakeholders in the packaging supply chain need to assume specific roles and responsibilities.** In the outlined EPR scheme, these would be as follows.

Table 13: Roles and responsibilities

Stakeholder	Roles & responsibility in the proposed EPR system	
	Raw materials suppliers, manufacturers and converters of packaging material	Provide packaging material for domestic producers and importers – either from virgin material or secondary resources (recyclates). Their packaging design is a crucial determinant for the reusability and recyclability of the packaging waste. Through using recyclates, they ‘close the loop’ as part of the circular economy. Can form guarantors , taking over sorted material fractions.
	Producers, and importers of packaged goods, service packaging and specific non-packaging items (obliged companies)	They put the system-relevant goods on the market by selling imported products or locally produced goods in packaging to retailers (comprises of both SMEs as well as MNCs). Responsible for their packaging waste to be properly collected, sorted and recycled. Forward their responsibility for taking-back their packaging to the PRO, by paying the EPR fees. Need to register their system relevant packaging and products with the PRO.
	Distributors, food outlets & retailers of packaged goods	They rEPResent the interface between the private sector and end consumers of packaged products. Furthermore, they need to contribute to informing their customers about environmentally sound packaging waste handling.
	Consumers	Correctly dispose of packaging and products through waste separation at source to ensure high-quality recycling. Have to be informed and educated about strategies for waste reduction, opt for unpackaged goods and products and reuse packaging as often as possible.
	Waste management operators	Receive funds for their services in collecting, sorting and processing the packaging waste. Crucial prerequisite is registration with the competent authority. Should recycle packaging according to the highest standards possible to ensure high quality recycling; includes the informal sector.
Local authorities / municipalities	Linkages between consumers and waste management operators, main responsibilities for implementation of EPR on the local level through organising the collection (<i>in case waste collection is a local responsibility</i>).	
Government and other public authorities	Legislation & supervision of the EPR system.	

4.3 SYSTEM ENFORCEMENT AND CONTROL RECOMMENDED FOR MALAYSIA

4.3.1 MALAYSIA’S EPR REGISTER

In a mandatory EPR-scheme identification, steering and controlling of obliged companies as well as the waste management operators are crucial. Therefore, two different registers are needed: One register for producer and importer to be able to calculate and allocate the EPR fees. And a second register for waste management actors that serves to ensure a desired standard of disposal. Following the recommendations for design and implementing necessary EPR registers in Malaysia.

4.3.1.1 MALAYSIA’S REGISTER FOR PRODUCER AND IMPORTER RUN BY THE PRO

It is recommended that Malaysia’s register for producer and importers is run by a privately organised entity – the PRO. The tasks, powers, committee setting, and supervision of the registry shall be clearly stated in the respective regulations.

All producers and importers that are obliged by regulations, have to register. The following data should at least be part of the basic registration:

- Company Registration Number or Business Registration Number, e.g. SSM number ¹
- Name and address of the company
- Person responsible for the registration in the company with contact data
- Brand or categories of products put on the market (e.g. groceries, electronics)

With the first registration, the company will be informed of its registration number. The registration number is a mandatory number in company documents (e.g. invoices) and enables the trade to list only registered products. It is recommended that, according to the size of the obliged company and/or the amount of packaging put on the market, there can be different levels of reporting. Reporting should be easy and more detailed for a higher amount of packaging (the threshold values have to be clearly defined). The reporting period can be annual or monthly. Registration and submitting of reports should be on a web-basis. Revealed material types and quantities are on evaluation basis to define customised EPR fees. The structure and organisation of the register must guarantee the confidentiality of the data.

PUBLIC ONLINE REGISTER AVAILABLE TO EVERYONE

Additionally, there should be public online register where third parties can check compliance of obliged companies and the register offers a tool to report non-compliance. Only highly aggregated data is allowed to be published, such as the data used to calculate quotas. This way, free riders can be identified by the authorised controlling body and also by competitors. Furthermore, with the published data it is possible to roughly validate plastic amounts by gaining knowledge about the sector and revenues of the single companies.

MONITORING BY GOVERNMENT AGENCY

The register itself is run by the PRO. To ensure that that the PRO sufficiently fulfils all its task in regards to running the system, a government agency has to monitor the system (see Figure 25). A proposed suitable agency is the Malaysian Green Technology and Climate Change Centre (MGTC), a government agency under the purview of Ministry of Environment and Water mandated to lead the nation in the areas of Green Growth, Climate Change Mitigation and Climate Resilience and Adaptation. The MGTC could enhance their capacity and leveraging in existing division.

1. All companies and businesses, whether private limited or sole proprietor, must be registered under SSM (Suruhanjaya Syarikat Malaysia/Companies Commission) and will be issued a number. This is their unique identify number. Even if they are exempted from paying taxes, the companies and businesses must all submit annual report filings to SSM

4.3.1.2 MALAYSIA’S REGISTER FOR WASTE MANAGEMENT ACTORS RUN BY SWCORP

Complementing the register for the obliged companies, there is also register companies and actors performing waste management task to treat the system-relevant waste to create transparency and reliable basis for the selection and finance of recognised measures and monitor of PRO spending. It is recommended that Malaysia’s register for Waste Management Actors is run by the government authority SWCorp. SWCorp holds ready knowledge about operating waste management companies and is accepted by and receives reporting from the industry. The following figure shows a register run by SWCorp with a direct report by the waste management actors. As EPR systems are vulnerable to fraud, strict, regular and enforced monitoring, controls and, if needed, penalties are indispensable and carried out by the public authorities to ensure compliance of all actors, including the PRO. In the context of Malaysia, this responsibility is assumed to be at the ministerial level (assumable KASA together with the KPKT).

The dominant tools for monitoring and control are on-site audits and mass flow verifications of the system-relevant packaging and products to validate the money flow of the EPR fees from the obliged companies to, eventually, the waste management operators. Due to Malaysia’s significant waste imports from other countries, it is particularly important to ensure that payments are only made for processing domestic waste. Therefore, it is crucial to collect data of the waste quantities at all steps of waste treatment to triangulate the mass flow. The penalties for fraud, for instance, when reporting imported waste or industrial waste as domestic household waste quantities, must be very high to dis-incentivise such actions.

It is important that the enforcement is regularly controlled by the PRO in regard to:

- Fulfilling the operational services of the PRO
- Prevention of free riders among the obliged companies:
- Fulfilment of operational performance by waste management operators

The PRO can also contract third, external parties to carry out the controlling of the system (for instance certified experts, auditors).

4.3.2 CONTROL BY PUBLIC AUTHORITIES

Complementarily, the control of the PRO and the fulfilment of its responsibilities and targets are in hands of the public authorities. JPSPN, which has jurisdiction on solid waste management, and influences policies in both Act and non-Act states, and SWCorp within its existing system of monitoring providers in Act States, can work within KPKT as the home ministry to control and monitor the EPR system. As means to carry out this role, a report must be submitted on an at least annual basis in which measurable and comprehensible financial flows, qualities and implemented infrastructural measures and activities are verifiably documented. Deviations can be expected, especially in the beginning. Therefore, it must be clarified in advance which penalties will be enforced if the obliged party does not fulfil its legal or contractual obligations. Moderate transition period should be determined to ensure the practicability of the system.

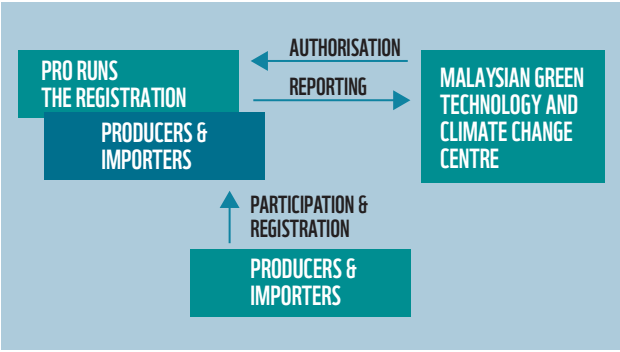


Figure 25: Register run by the PRO

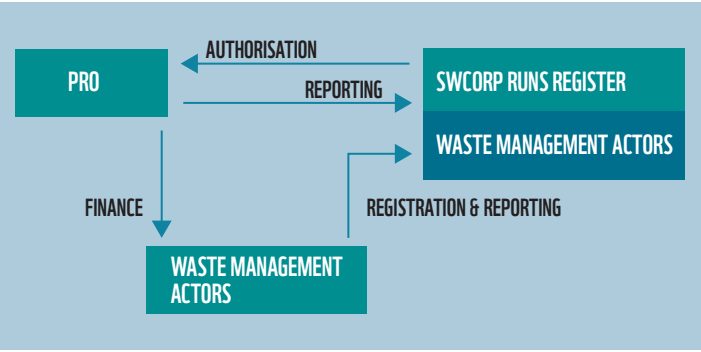


Figure 26 Register of waste management operators

4.4 LOCAL CONTEXT CONSIDERATIONS

The appropriate consideration is crucial for the success of an EPR and in any case it should be adjusted to the local context, built upon the existing system and designed to complement present economic instruments. In that respect, three areas are identified as important determinants for Malaysia’s EPR system: geography, policy and socio-economic conditions. Those need to be especially considered to develop an appropriate EPR system for Malaysia.

4.4.1 IMPACT OF GEOGRAPHY

ISLANDS, COASTAL AREAS AND MOUNTAINOUS MAINLAND

Malaysia consists of a mainland peninsula (Peninsular Malaysia) and most of the northern half of Borneo Island (Borneo States of Sabah and Sarawak), both exposed to the sea with coastal lowlands but also with mountainous regions. Furthermore, more than 1,000 islands belong to Malaysia. Some of them are sparsely populated, while others, like the Penang island are highly developed and industrialised [WWF, cyclos, 2019]. Islands can be a challenge for EPR schemes, however, if inhabited only insignificantly the impact of possible inadequate waste management is neglectable.

On small developed islands like Perhentian, Redang and Tioman, the normal practice of collection and transport to the mainland can be incorporated into an EPR system. Such would promote segregation at source and transporting the materials no longer to landfills but to off takers for recovery. Industrialised islands like Penang and Langkawi generate enough waste to establish local MRF through the EPR, that improve the current practice of landfilling. To start the operation of an EPR scheme a necessary precondition is the transparency regarding which products (before consumption) are brought where. It is crucial to identify the obliged companies and their respective quantities to define their levy share in an EPR. However, a large number of small islands and remote mountainous regions make it difficult to register and control the product flow of packaged goods.

The variety of Malaysia’s countryside is also highly attractive for tourism. As a tourism destination, the waste management system faces even greater challenges of increased vulnerability from massive pollution and the pressure to uphold the tourism dominated economy.

CLIMATE, SEASONS

Seasonal climate and changes in the patterns of rain can influence waste management. Especially as the region is characterised by heavy monsoon rains, which negatively impact the operations and conditions on landfills. Floods discharge pollutant and high value materials and make the processes in stocks difficult. Furthermore, natural hazards stemming from the activities of the pacific rim make the region vulnerable to tsunamis, cyclonic storms, and landslides. Those lead to extra waste occurrence from destroyed areas and extra challenges to uphold a waste management system in disrupted infrastructure. An EPR has to provide extra measures and emergency equipment for such crisis situations [WWF, cyclos, 2019]. Furthermore, inadequate waste management potentially also negatively reinforces the impacts of natural hazards: e.g. littered sachet packaging can clog the water runoff systems thereby being a main contributor to flooding events.

URBAN DEVELOPMENT

Malaysia transitioned to a knowledge-based industry with innovative technology and a digital economy. The change came along with employment creation, income growth and strong urbanisation. More than 70% of the population lives in the urban areas – more than one fifth lives in the greater area of the country’s capital Kuala Lumpur [WWF, cyclos, 2019]. Urbanisation raises consumption level and therefore the amount of waste generation per capita. Also, the composition of waste differs with usually a higher share of plastic packaging compared to rural areas. However, besides urban settlements’ tendency to be densely populated, waste management services is often easier to access. It stems from better road infrastructure and a low proximity of recycling businesses. Those factors also feature recycling activities: Recycler necessary input quantities are ensured, and waste collection operations connect generators and recyclers effectively. However,

non-effectively implemented separation at source still results in mixed municipal waste streams that limit value creation and profitable recycling.

Hence, an EPR should create and focus on direct incentives, awareness campaigns and education measures to encourage households, businesses and institutions to improve their performance in waste separation and general reduction, reuse and recycling. Through this, the challenges from mixed municipal waste could be dealt promisingly. As population cumulates in the urban areas, where the collection efficacy is already presentable the EPR measures would have a strong impact on overall improvement. The differences in urban and rural settlements need to be considered for the EPR design.

4.4.2 IMPACT OF POLICY

BANS, PLANS, STRATEGIES

To effectively establish an EPR that fits to a country, any government strategies, laws and plans have to take the existing infrastructure and waste management systems into account. Dismantling the given system to build another one might adversely affect the progress. The focus of any strategy should be improvement and standardisation, followed by multiplying it over the country. Any long-term political action should be in line with the EPR targets [UNESCAPE, Pune, India Case, no date].

A well-designed bundle of various policy instruments, in which EPR is one out of several, complementary tools, can create effective incentives for increasing waste reduction, reuse and recycling. Besides providing necessary enforcement capacity, without the provision of environmental and economic alternatives, however, undesired substitutes may enter the market. Those can have similar effects or even be worse than the original products. As an example, fine material, almost woven like, PP bags entered the market in Kenya after PE plastic bags got banned from the consumer market. Those lifetimes are insignificantly longer and the environmental effects similar to the banned PE bags. In Bangladesh a ban imposed in 2002 on plastic bags was repealed in 2010 after introducing jute bags as non-viable alternatives due to the high costs [UNESCAPE, no date]. In that respect, frequently adopted bans for single-use plastic items and packaging should be assessed carefully.

It might be sometimes necessary to relax or change certain policies to align with the new EPR direction. For example, in Thailand, it is currently not possible to use recycled plastic packaging for food items, which does not encourage the use of “second-life” plastic material (UNESPACE, no date). A different policy option would be setting quality standards for food packaging, that also allows the use of high quality recycled plastic.

CENTRALISATION VS. DECENTRALISATION – POWER SPLIT

Decentralisation of waste management responsibilities helps systems to establish, as specific duties are taken up and pushed by different parties. However, overlaps and ambiguities potentially slow down the progress or even lead to contradicting activities, especially if budgets are involved. For example, Indonesia’s waste management is a municipal task and should be paid by the regional budget. However, the national budget has the power to override and re-direct the cashflow of the municipalities, which is why anything budgeted on the municipal side is not reliable. So, if different levels do not work well together (as in the case of Indonesia) things might become very difficult, especially when there is money like EPR fees involved. That’s why in any case, high levels of commitment and cooperative attitude from all stakeholders are required [Azahar, 2014].

In Malaysia, since the responsibility of waste management is shared among different parties (see 2.1.1.1), the EPR should allocate responsibilities to the most adequate party and built upon the given system.

CONSTITUTION & INSTITUTIONS – CAPACITY & CORRUPTION

If political will exists, authoritarian regimes are characterised by short implementation time, an advantage for establishing new systems. However, especially in terms of effective running waste management system, community involvement during policy formation is crucial as it creates a sense of belonging fostering participation [Alam, 2019]. Lagging monitoring, registration, certification and controlling mechanisms will hinder the successful EPR implementation [WWF, cyclos, 2019].

Corruption and nepotism undermine a sound EPR in its establishment and running phase. The independence of PRO is especially crucial to run the system. Inculcating a culture of integrity among appointed staff and

executive at all levels and among other stakeholders will build a successful EPR. To further feature the run of an EPR scheme, capacity building and key performances indicators (KPIs) are pre-requisites. As much as recruiting local expertise is highly desirable, it can prove to be difficult if skills are not available and corruption is present in a weak enforcement environment. Malaysia already has some monitoring mechanisms and KPIs place, though enforcement capacity can be further improved (see 2.1.1) [WWF, cyclos, 2019; UNDP, 2008].

DATA

Data are a pre-requisite to implement an adequate EPR. If those are not available or have a low quality it becomes impossible to evaluate and design a best system, to control and ensure that there is no fraud [WWF, cyclos, 2019]. Missing expertise might define quotas without thorough calculation. Decentralisation of responsibilities and weak institutional and constitutional capacities lead often to insufficient data management practices: no aligned data system, obsolete data, complications in data handover, and missing supporting facilities are the result [WWF, cyclos, 2019].

To gather data, government actors may be seen as the primary source of data, but this can be challenging, given the multiplicity of actors in the sector and limitations in data collection. Waste services are partially managed by the municipality, they collect data on quantities of waste collected or sent to landfill for the purposes of managing their services. And also waste management that is outsourced to the private sector may be limited regarding what data are collected. Similarly, scrap dealers may not systematically keep data on how much they collect and what type. Where the informal sector is involved, they may have challenges in collecting and storing data, and if the informal waste pickers are not organised, data may not be available in any centralised form. Finally, given the multiplicity of plastic manufacturers, it can be very challenging to keep a record of the amount and types of plastic being introduced into an economy.

In the case of Malaysia, there is no overall regulation in place regarding the collection, storing and sharing of waste management data. Hence, all above scenarios might be applicable. An EPR has to install necessary interfaces, collection points and responsibilities to ensure relevant data collection.

4.4.3 SOCIO-ECONOMIC CONDITIONS

WASTE BANKS

Waste banks are widespread in East-Asia and function as buy-back centres from the consumer side. These are commonly run by local authorities, concessionaires, NGOs or private organisations, with waste retailers on the other side of the transaction. Those who sell to recycling factories or further intermediate buyers, that may export the material [WWF, cyclos, 2019].

The experiences with Waste Banks differ: In Thailand the implementation of Waste Banks resulted in efficiency in waste segregation, as they handle waste by buying back waste in terms of a deposit. The system was initiated in 1999 by a company which saw poor students selling recycled waste and depositing the earnings in the bank. In order to help the students, waste banks were set up as pilot project in schools. Leaflets with a list of prices were distributed, which led the students to progressively realise the unexpected value of waste. They had become eager to sort the waste and deposited it directly in the waste bank [WWF, cyclos, 2019].

Indonesia has adopted the waste bank system, managed by the community, to collect and educate people to segregate waste at the source. The banks are located across Indonesia for communities to deposit waste and receive a sum of money for their contribution. There are more than 4,000 waste banks in Indonesia currently, run by a variety of operators, from schools to local communities, who sell the collected material to waste dealers [WWF, cyclos, 2019; UNESCAPE, no date].

In other cases, waste banks have not been successful, for example in India. This is largely due to the robust informal

sector, which perceives waste banks as direct competitors, thus, undermining the system [UNESCAPE, no date].

As much as waste banks initiate and foster separation at source, it also creates an attitude of receiving a reward for waste segregation at source instead of paying a fee for adequate waste management, contradicting the development of creating a feeling of civic responsibility to sort, treat and reduce waste [Alam, 2014], which is often perceived as a problem by public authorities responsible for the municipal waste management.

Since waste banks are oftentimes strongly established and widely accepted by the civic society and in many cases also significantly improve the waste situation (compared to the status without waste banks), an EPR system needs to integrate waste banks complemented with a strategy to advocate for a civic responsibility to participate in waste management to eventually change the behaviour among the general population.

WASTE IMPORT

After the Chinese import ban on plastic waste, Malaysia has become the leading import nation for globally generated plastic waste [WWF, cyclos, 2019].

Because of the additional material inflow, an EPR system must be designed in a way that it can be clearly distinguished which waste has been imported and which waste has been locally generated in Malaysia and that the collected EPR fees are only spent on the Malaysian plastic waste.

Chinas waste import ban also influences the dynamics on the other end of the value chain: for example, countries like Thailand that pursued quality limited recycling, are now forced to produce high quality secondary material as China no longer provides end-market for low quality or semi-recycled plastic material [UNESCAPE, Sai Mai District, Bangkok Case].

WASTE COMPOSITION & PACKAGING SIZE

Waste in Asia’s low and middle-income countries composes of 30% recyclables solid and 50% organic waste, usually mixed. Such is difficult to recover or recycle due to the high moistures that leads to contamination and decreases the value [Alam, 2014]. Also, the design of the packaging hinders value creation.

In Malaysia, the size of the packaging is rather small, and a significant share is made of sachet packaging and service packaging for take-away consumption.

Moreover, the distribution structures comprise many steps which need to be regarded when discussing EPR system participation and infrastructure. The anonymity in urban areas and informal vendors add another challenge [WWF, cyclos, 2019].

All these factors lead to recycled material being more expensive than the use of virgin material. There are no incentives by regular market mechanisms to facilitate voluntary behaviour change [GA Circular, 2019]. To a certain extent Malaysia’s waste gets separated and is comparably uncontaminated.

Therefore, the above mentioned is not as severe as in countries with less developed packaging waste management. However, regarding packaging type and distribution chain the situation is depicted appropriately.

An EPR has to provide incentives to also recover such comparatively difficult and low-value plastics [UNESCAPE, Pune, India Case].

Further relevant information on the proposed EPR scheme for Malaysia is provided in the respective annexes 8.3 to 8.12.

5. COST-BENEFIT ANALYSIS OF MALAYSIA’S WASTE MANAGEMENT

The objective of the cost-benefit analysis (CBA) of Malaysia’s current waste management system versus a potential EPR implementation is to conduct an analysis and comparison of the economic and environmental benefits.

5.1 SCOPE

CBA has been commonly applied in the waste management to assess a particular treatment system before a final decision has been made by an authority. In this study, the CBA analyses material- and cashflow of two scenarios – (i) business-as-usual and (ii) a changed packaging waste management with the implementation of a proposed EPR system. The second scenario with EPR system, the management of all material type post-consumer packaging, service packaging and single use plastics items are included. Industrial and commercial packaging is out of scope, as its management is predominantly organised by the industry themselves and usually properly recycled.

It was decided to conduct through the CBA the following comparison:

- Financial impacts of changed material- and cashflows
- Economic effects of environmental benefits
- Transition

5.2 METHODOLOGY

The CBA core entails a comparative overview of the main changes in the waste management system, comparing the status quo with an EPR system scenario. Financial and other environmental and socio-economic impacts are highlighted.

The overview is followed by a detailed a qualitative description of both scenarios’ plastic waste material- and cashflows, highlighting the stakeholders and value addition. First systems’ material flows are based on chapter 2.1.2 and not described again. The description is chronologically ordered according to the packaging’s route from generation to segregation, collection, aggregation to recycling and disposal, conversion.

As already explained in previous chapters, Malaysia’s waste management landscape differs tremendously, as it is subject to legislation and area characteristics. Therefore, example fees for urban door-to-door collection are applied. To account for the differences, initial infrastructure investment needs, to transit to an EPR, are depicted in a table, in which each state is classified from a spectrum of very high to very low investment need. The data were gathered by local and international experts through field and desktop research, including focus group discussions, stakeholder roundtables and an intensive literature review.

5.3 COMPARATIVE OVERVIEW

The following table gives an overview of the main changes in the waste management system, comparing the status quo with an EPR system scenario. The table is designed according to the packaging’s route and ends with accompanying processes, like education. In column four and five the impacts are listed. The focus is on the achievements brought by enhanced recycling, possible through a separated household collection of any recyclables.

Table 14: Impacts of a change from the status quo to an EPR system

	Status Quo	EPR System	Financial impact	Other impact (e.g. environmental, social)
Generation	Bulk production and consumption of any consumer good packaging, service packaging and SUPs.	Reduced production and consumption of low-value recyclables. Bulk production and consumption of high-value consumer good packaging, service packaging and SUPs.	(+) Budgets to rethink packaging	(+) Incentives for innovations, e.g. reducing virgin plastic by substituting and/or raising amount of recyclates used
	Mixed disposal of high value-, low value- and non-recyclables.	Disposal of low- and high-value recyclables in a packaging bin, separated from all other (non-recyclable) waste.	Provision of different household’s disposal tonnes/ facilities (-) More complexity in tendering	(+) Incentives for separation at source through equipped households (+) Active engagement of private waste generator (+) Raised awareness through conscious contribution of consumer
	Property pays assessment rate (tax), which includes all kind of waste management services.	Producer, importer pay levy to PRO for packaging put onto the market. (-) Cost probably added to consumer prices.	(+) Waste management finance matches waste management expenditure Top down calculation	(+) Producer, importer hold responsible for end-of-life: incentives for design for recyclability and reduced packaging amount, etc.
Collection & segregation	Formal mixed collection of low value- and non-recyclables; minimal collection of recyclables.	Formal separated collection of any value recyclables (packaging bin) and non-recyclables.	(+) Cost effective, aggregated collection of low-value recyclables (-) Cost for separated collection services	(+) Low-value recyclables included in the collection system, less littered (+) Cleaning instead of picking
	Informal dEPRivation of high value recyclables.	In initial phase informal dEPRivation of high value recyclables.	(-) Lowers valuable content in official system until transition complete	(+) No hard, unwanted impacts on informal workers in initial phase
	Formal and informal sorting, aggregating and transport of high-value recyclables.	Formal and informal sorting, aggregating and transport of high- and low-value recyclables.	(-) Cost effective transport and sorting through segregated, aggregated low-value recyclables (-) Extra cost for running effective sorting plants	(+) Formal and informal processing of any-value recyclables is enabled
	Government financed collection and sorting.	PRO subsidised formal collection and sorting.	(+) Market mechanism to align demand and supply of waste and recycling sector	(+) Eased government budget (+) Independence from government and institutional capacity
	Trading high-value recyclables between collector, aggregator/MRF and recycler.	Trading better quality and aggregated high-value recyclables between collector, sorter, recycler.	(+) Slight increased revenue stream	(+) Job solidification, extra budget for safety and other measures
	Minimal to no trading of low-value recyclables between collector, aggregator/MRF and recycler.	Trading better quality and aggregated low-value recyclables between collector, sorter, recycler and alternative high-quality processors.	(+) Established revenue stream	(+) Job creation in collection and sorting business

Recycling	Recycling of high value recyclables into middle-low quality recycled granules.	Recycling of high value recyclables into good quality recycled granules.	(+) Increased recycling revenue from local converters and export	(+) Malaysia’s recycling sector becomes international more competitive
	Little- to no recycling of low-value recyclables.	Recycling and alternative high-quality processing of low-value recyclables.	(+) Recycling revenue from marketable bulk of low-value recyclables (+) EPR fee subsidies processing	(+) Job creation in recycling business
	Mainly recyclate export	Shared recyclate export and local convertors.	(+) Revenue from locally marketable recyclates (+) Additional profits enable infrastructure, machinery investment	(+) Increased national income (+) Strengthening of Malaysia’s recycling sector
Conversion	Conversion with mainly internationally sourced recycled granules.	Increased conversion of locally recycled granulates due to better quality.	(+) Lower cost sourcing of local recyclate granules	(+) Increased national income (+) Strengthening of Malaysia’s recycling and plastic sector
Disposal	Low-value and non-recyclables disposed of at sanitary and unsanitary landfills/ incinerated.	Reduced quantity of low-value recyclables is disposed/ incinerated	(+) Reduced landfill operation and environmental abatement cost (e.g. monitor, secure for leakage)	(+) Reduced landfill mass relieves landfill management and surrounding environment (e.g. lower methane/CO ₂ emissions)
	Small share of high value recyclables disposed/incinerated.	Minimised quantity of high-value recyclables is disposed/ incinerated	(+) Minimised landfill operation and environmental abatement cost (e.g. monitor, secure for leakage)	(+) Minimised landfill mass relieves landfill management and surrounding environment (e.g. lower methane/CO ₂ emissions)
	Gate fees paid to the operators	Reduced gate fees paid to the operators	(+) Collectors, recyclers, sorters, aggregators save expenditures	
Islands	Langkawi landfill needs a new solution	Langkawi enrolls premium EPR system pilot.	Incorporating into national EPR fee and finance structure	Island relief (-) Complex waste management system (+) Establish joint responsibility
	Penang organises own waste management	Penang to be included in EPR similar to other areas.	Incorporating into national EPR fee and finance structure	(-) Complex waste management system (+) Establish joint responsibility
	Issue of island to mainland transport cost surpassing recycling revenue	Cost balanced with area foreign recycling revenue.	(+) Waste management cross financed by national EPR system.	(-) More complex system

Education & Promotion	Not given	PRO ensures awareness and engagement is built among the consumers.	(+) PRO finances campaigns	(+) Risen consumer awareness, drive for behaviour change
Transition	Not applicable	Build sufficient waste management infrastructure (e.g. separated collection sorting facilities)	(+) Infrastructure investment to build sufficient waste management system	(+) Job creation (+) Knowledge accumulation
		Set up PRO administration	(-) Cost to establish PRO	(+) Job creation (+) Knowledge accumulation (+) effective data reporting
		Set up competent government authority (“EPR agency”)	(-) Cost to establish government authority	(+) Job creation (+) Knowledge accumulation
		EPR law making, law alignment	(-) Cost to establish regulatory framework.	(+) Knowledge accumulation
Administration	Semi-state-owned waste management business (e.g. SWCorp)	PRO operation and government authority	(-) Operating cost for PRO and responsible government authority (“EPR-Agency”).	(+) Knowledge accumulation (+) mandatory data reporting

Each value chain step in the status quo and EPR system is described in detail in the following subchapters.

5.4 STATUS QUO: WASTE- AND CASHFLOWS

The following table summarises the value addition in form of per kg trading prices between the different waste management stages, hence the entailed cost and margins borne by the actors.

Table 15: Price overview Status Quo

MYR/kg	1 st Collection	2 nd Collection, Aggregator	Recycler	Convertor	Landfill cost [RM]
PET	0.70	1.32	2.63	6.50	sanitary
HDPE		1.20	2.40	3.80	50-100/tonne
PP		1.90	3.60	NA ²	unsanitary
Mixed	0.58	-	-	-	15/tonne
	+ government subsidy (tax-financed)	+ government subsidy (tax-financed)			+ government subsidy (tax-financed)

The depicted values are qualitatively explained in detail below, based on the identified system described in chapter 2. Explanations cover the material- and cashflows according to the value chain of the status quo.

WASTE GENERATION

In Malaysia, consumers receive packaging material through grocery shopping (consumer goods packaging and self-filled packaging) and to-go consumption (service packaging). Additionally, single use plastic items (SUPs) are used as service and consumption goods. After utilising the goods, SUPs and the packaging purpose is served, all are thrown in either the residential waste or littering bins or illegally littered. By law segregation at source is compulsory, however necessary facilities are sometimes not provided or used appropriately.

Households do not pay directly for the collection and waste management services. Instead, residential waste collection, public cleansing, general municipal maintenance and services are financed by property tax/local council assessment rates (the same, name depends on the jurisdiction). Besides waste management services, the rates cover also other services like street lightening, general maintenance, municipal services and beautification measures. Rate values and rate applied vary between local authorities, but the rate calculation is common (Rate calculation from Kuching North City Hall, see Figure 27, Sarawak: a non-Act state):

2. Prices for rPP are assumed to be higher than rPET, based on the price linearity along the chain.

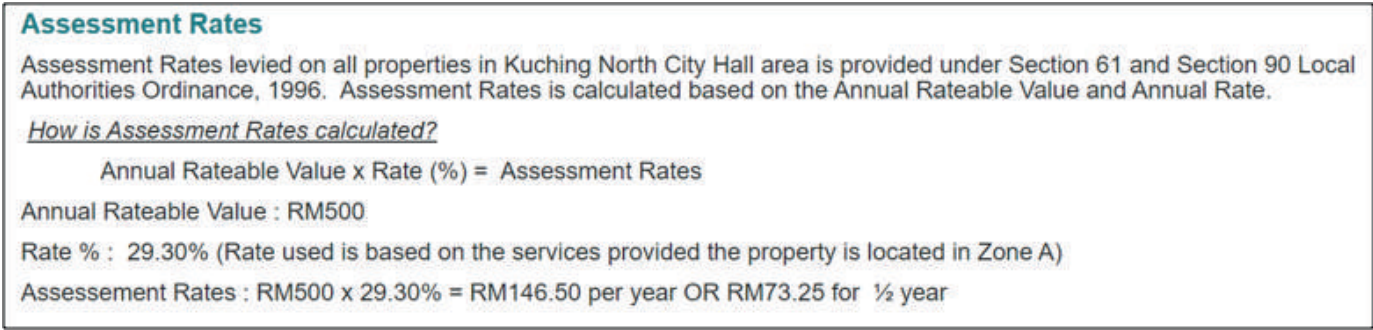


Figure 27: Assessment rate calculation, example Kuching North; source: Kuching North City Hall (2019)

This rate calculation is similarly applied in other municipalities, with the percentage varying from jurisdiction to jurisdiction. Factors such as rental value, property value and services provided affect the calculation. Thus, rural/village areas would be charged lower than urban/housing estates. As an example, rural or village-type dwelling's annual assessment rates can be MYR 70 per household per annum, whereas for urban or higher rated properties such as serviced apartments, this would be based on the percentage of market value for urban households and location within the city and services provided, with some reaching up to RM1,500 per household per annum.

3 HOW MUCH IS THE PERCENTAGE RATE OF ASSESSMENT RATE?

The prescribed percentage rates are as follows:

No	Property Type	Within 36 square miles (%)	Beyond 36 square miles (%)
1	Commercial Buildings	10	8
2	Service Apartments	7	5
3	Residential Buildings	4	4
4	Low Cost Flats	2	2
5	Commercial Vacant Land	7	5
6	Residential Vacant Land	5	5
7	Buildings in Villages	2	2
8	Vacant land in villages	1	1
9	Kampung Baru, Kampung Melayu Segambut and Sungai Penchala (Buildings and vacant land)	1	1

Figure 28: Assessment rate percentage, example Kuala Lumpur; source: Kuala Lumpur City Hall (2019)

WASTE COLLECTION

In both Act and non-Act states formal collectors receive two cash flows: one from the local or national government in return for collection services and one from the aggregators/ material recovery facilities (MRFs) for dropped recyclables. Most of the collected mixed waste that is not taken by any sorting and aggregation facility is disposed of at a landfill/incineration plant for a gate fee, cost borne by the ones dropping. Furthermore, formal concessionaires have to pay 10 % of their revenue to the government. A minor share is dumped openly,

However, residential waste collection is not dependent on actual tax payment. The latter one might be done in full, discounted or not at all. The set tax rate is subject to quite a few variables and rules set by the local government authorities/ministries overseeing the local governments. Commonly, if a house has been 'assessed' based on land prices and proximity to urban areas/ location within a housing estate, it is automatically included in the calculation for assessment rates/ property tax. This is subject to revision at least every five years. The revision includes changes in rates and 'expansion' of the 'territory' for coverage (outside the automatic inclusion of housing estates/new townships). However, if the 'territory' covers villages, and the residents are assessed to be of a lower socio-economic position, then they will be taxed a lower rate. Factors giving them a lower rate include:

- Access to municipal services,
- Road width (which affects what municipal services vehicles can access the areas),
- Access to septic tanks/centralized sewerage systems
- Distance from major thoroughfares.

with negative environmental and for the government economic implications, if measures for abatement get implemented.

Municipal solid waste collection rates vary between Act/Non-Act states and rural/urban areas. Most urban areas are 80% covered while rural areas are subject to access, hence, collection type and schedule (Langkawi Municipal, DBKU, Sarawak Enterprise, State Economic Planning Unit Kelantan/UPEN Kelantan). Three collection types are distinguishable:

- Door-to-door collection: Door-to-door collection is financed by government and remuneration in return for dropped recyclables, formally as well as informally.
- Communal roadside/skip collection: It is estimated that truck crews extract on average 500kg of recyclable goods, which are informally sold to aggregators before reaching official MRFs. The formal collection service is financed by the government but also provided if properties pay a reduced tax rate or not at all. Besides government finance, all collectors sell recyclables at MRFs³ or aggregators and receive revenue for valuable material. Often, informal actors dePRive recyclables from the skips and sell those to aggregators or intermediate collectors.
- Drop off collection: Besides the stationary centres, there exist small-scale mobile collectors. Money is channelled to the individuals dropping recyclables from mobile or stationary collectors. Those purchase mixed plastic material for MYR 0.58/kg and sorted PET, PP, HDPE for MYR 0.7/kg (average values). NGO-led drop off centre, like the Buddhist centre Tzu Chi. In this case no cash flow reflects the material stream (see chapter 2.1.2.2).

As described, the informal collection interferes throughout all stages of waste collection services. Especially roadside collection in form of accessible bins, skips and yards are subject to informal waste pickers, who dePRive recyclables before official collection takes place. Also truck crews of formal collection services pre-sort and extract all kind of recyclables for sale before reaching MRFs and landfills. In regard to plastics, these activities result in the collection of rigid mono materials being completely dominated by the informal sector, while only residual low-value mixed waste remains with the formal sector. Hence, revenue streams received by the formal sector from aggregators remain low.

WASTE SEGREGATION & AGGREGATION

Any formal or informal collection and drop-off point sells recyclables to formal material recovery facilities (MRFs) or informal aggregators. Essential difference between MRFs and aggregators is the legal status. MRFs operate formal and aggregators are informal, similarly distinguishable is the material inflow. While MRFs source predominantly from the concessionaires and private contractors, aggregators receive material from any informal source and few materials from small-scale formal collectors. Any material is sourced in return for financial remuneration, dependent on its value.

On average aggregators and MRFs purchase pre-sorted PET for MYR 1.32/kg, HDPE for MYR 1.20/kg and PP for MYR 1.90/kg, fluctuations are subject to state, facility, quality and any kind of potential form (e.g. pressed, baled, loose) (based on stakeholder interviews conducted for the research).

The aggregators and MRFs pursue a small value addition by sorting the waste further, sometimes shredding or baling. However, major activity is aggregation enabling the sale of largely one material type bulks to respective recyclers, through which a value addition of approximately 50% is achieved (see below).

WASTE RECYCLING

Waste recyclers are usually specialised in material types like metal, plastics or paper. They purchase sorted bulk material from MRFs and aggregators. On average recyclers purchase PET for MYR 2.63/kg, HDPE for MYR 2.40/kg and PP for MYR 3.6/kg, fluctuations are subject to quality and any kind of potential form (e.g. pressed, baled, loose). Recyclers wash, process to flakes and possibly granulate the recyclables into different quality grades. The product is either sold for local conversion or traded internationally – the ratio is assessed as 50:50. The high export share is explained with higher price for exported material compared to selling to the domestic market. The domestic market is subject to more stringent quality requirements and the quality of imported recyclables is assessed as better than domestic recyclables (based on stakeholder interviews conducted for the research).

CONVERSION

Local conversion is partially established and only for certain plastic fractions. Most conversion material is sourced from outside the country, due to low quality requirements. Domestic converters buy rPET for MYR 6.50 kg and rHDPE for MYR 3.80/kg (average values, fluctuations are subject to quality and form, (based on stakeholder interviews conducted for the research). Prices for rPP are assumed to be higher than rPET, based on the price linearity along the chain. Currently local market price for recycled plastic resins and virgin resins are close to each other. However, as virgin material is subject to strong price fluctuations there is a risk that virgin material can become cheaper than recycled material. The risk stems from virgin resin being highly dependent on oil price (present low oil prices cut virgin resins prices as well), while the lower price of the recycled material is limited by the cost of the upstream chain and the respective value adding (see Table 15).

WASTE DISPOSAL

Mixed residual waste is disposed of at landfills, of which only an estimate of 35% are operated sanitary. As it is estimated that only 18% of commercial plastic waste gets recycled, the remaining share is landfilled. It consists mainly of flexibles like sachets, film and other low-valuable packaging and rigids as well as contaminated material. Majority of material is disposed of by the concessionaires and private contractors, as they are obliged to collect all waste, while any other collectors operate by profit and pick recyclables only. Aggregators and recycling facilities dispose residual non-recyclable waste at landfills, after sorting at processing the valuable material. In any case, disposal is charged via a gate fee, ranging from MYR 50-100/ton for sanitary landfills and MYR 15/ton for dumpsites. The fees differ for industrial/commercial/institutional waste: Gate fees are subject to extra tipping fees which tend to be ~35% of the gate fee, all paid per-entry basis. In most states, SWCorp pays the gate fees for disposal directly to the concessionaires. Exceptions are made in Kelantan and Sarawak, where gate fees are paid on a monthly basis directly to the landfill operators. Landfills operated by SWCorp pay 10% of the revenue back to the government. In concession states present waste management infrastructure is assessed as fairly advanced. In non-concession and rather rural states it tends to be insufficient, reason are mainly financial constraints.

WASTE MANAGEMENT ON ISLANDS

Malaysia’s major and economically developed islands Penang and Langkawi generate relevant amounts of post-consumer waste. Generation is seasonal due to the fluctuating tourism streams. Both islands have active local waste management and follow Act 672. While Langkawi has a landfill, waste from Penang is collected at an MRF and transported to the mainland. SWCorp aims to improve waste management services on the islands, developing a solution to extract more value out of the waste, because so far cost of transport is higher than the value of the waste volume and the capacity of the landfill is reached.

5.5 EPR SYSTEM SCENARIO: WASTE- AND CASHFLOWS

The following table summarises the EPR finance allocation between the different waste management stages, to enable holistic recycling of low- and high-value recyclables, through monetary incentives and cross-finance. The depicted values are qualitatively explained in detail below, based on the proposed EPR system described in chapter 4. Explanations cover the material- and cashflows according to the implemented EPR scheme value chain.

Table 16: Overview EPR finances

Material		Producer/ Importer	Collection	Aggregation, sorting	Recycler	Converter	Landfill Cost (RM)
Cash flow		Paid EPR fee	PRO financed	PRO subsidy	PRO subsidy	Pay	Sanitary 50-100/tonne Unsanitary 15/tonne
Recyclables bin	PET	Low	Yes	Low	Low	Price below virgin resin price	
	HDPE	Low		Low	Low		
	PP	Low		Low	Low		
	LDPE	High		High	High		
	Others/ Mixed	High		High	High		
Non- recyclables bin	Organic	No	No	No	No	NA	+ PRO subsidy
PRO finances administration, education measures, initial infrastructure							

WASTE GENERATION

Modulated EPR fees stimulate the reduction of packaging and design for recyclability on producer side through monetary incentives. Producer and importer of packaged consumer goods and service packaging are obliged to pay a levy, which is corresponding to the weight of the system-relevant packaging and products. The modulation additionally takes the material type into account, which makes it financially more attractive to use recyclable packaging design. This financial flow generated through the EPR fees enables the comprehensive, separate collection of all packaging waste regardless of value and financing recycling of so far non-valuable material.

Accelerated through the modulated fees, the application patterns of packaging and SUP will lead to reduced waste generation of that kind and enable the remaining to be recycled in a best case. Consumers will pay indirectly for waste management services, similarly to the status quo system. However, payment is no longer channelled through property rates but the grocery expenditures, which is directly proportional to the packaging and SUPs that they consume. The packaging levy transferred to the consumer price is very little, therefore it is estimated, that the household will not be constrained in their consumption. Property assessment rates might be subject to adjustments based on the waste management services partially being organised differently. Furthermore, segregation at generation source is compulsory and enhanced through separated collection service. Consumers get provided with two different bins, one for recyclables and one for residual non-recyclable and organic waste.

WASTE COLLECTION

Collection services is separated in recyclable and non-recyclable bins. In the beginning, most valuable recyclables will continue to be removed from the recyclable bin system through the various informal channels. It is expected that the remaining formally collected material stream from the recyclable bin consists of mainly low-value recyclables like sachets, films, SUPs and service packaging, however, with lower contamination due to the separated from the non-recyclables and therefore higher value compared to the former system. Any waste collection receives revenue from selling materials to sorting facilities, formal collection is additionally subsidised

by the EPR system. The revenue stream from any recyclables is strengthened compared to the old system through reduced contamination levels due to the segregation at source, which will lead to higher quality which consequently increases the profits. Additionally, revenues are less volatile, because fees are fixed by the EPR. A continuity passed along the value chain.

Crucial is also the integration of the informal sector into the collection service. Through the formalisation, their contribution gets acknowledged and remunerated through salary, social security and personal safety equipment. With the integration of the informal sector, the share of high-value recyclables that can be recovered from the waste is estimated to increase significantly, which directly increases formal recycling revenue.

WASTE-BASED SEGREGATION & AGGREGATION

In the EPR system collected material from the recycling bins is sold to sorting facilities. These facilities are either newly established by the EPR or transformed aggregators/MRFs. Sorting facilities buy deprived high-value recyclables (formerly low/no-valuable recyclables) which are value increased through the EPR fees.. Additionally, any material received that is less contaminated due to the separated collection is therefore of higher value. The improved material supply reduces the off-take prices from sorting facilities (former MRFs/aggregators) and their margins increase due to the cost-effectiveness. The sorting facility is in charge of extracting the values from all kind of plastic recyclables. Value is added through sorting followed by processing in form of baling, storing and transporting. Sorting facilities consist of machines and manpower, potentially also provided through integration of the informal sector.

In bulk the sorted and processes material is sold to recyclers, alternative high-quality processing (e.g. combustion into cement kilns, waste-to-energy) or sanitary landfilling. While recyclers and potential alternative processing plants pay for the material, the latter one and sanitary landfills are remunerated by a PRO set artificial price.

Sorting facilities receive extra finance through PRO subsidies, that enable the sorting and processing of recyclables with any value. Without the EPR fees, only the sorting of high-value material is economically sustainable and pursued.

Tracking is embedded at the interface of collection and sorting. The sorting facility has to report the material flow, which is crucial for operating and monitoring an EPR system.

WASTE RECYCLING

The benefit from separation into recyclables and non-recyclables at source, passes along the value chain: Recyclers purchase greater bulks of better-quality material. It is estimated, that through the interventions the collection and therefore recycling rate of all material types gradually increase by an average of 5% annually. The increased supply leads to lower off-take prices from the sorting facilities and possibly informal collection. The cost-effectiveness also influences the margins and leaves recyclers with extra funds to invest into further processing. Through this nationwide high-quality grade pelletising can get achieved, which positions Malaysia globally as a premium supplier of secondary raw material.

Additionally, residing contaminated, multilayer or low value plastics like sachets or films are recovered in alternative high-quality processes that at least end-of-live/extension-of-life options are provided. Possible and partially adopted options are the already mentioned combustion into cement kilns, conversion into bricks, roads, public park benches or energy recovery. Such solutions shall be established and promoted through finance and organisation by the PRO, but certainly only as an interim solution until higher quality solutions can be found even for difficult recyclable material.

CONVERSION

The increase of locally produced high-quality recycled granules fosters on ground conversion through lower prices compared to former resin imports. As the conversion of local rResins expands, the market is stimulated and brings growth that eventually promotes the complete value chain and strengthens Malaysia’s recycling market.

WASTE DISPOSAL

Through the separated collection, a maximum of recyclables is extracted. Also, low value recyclables are processed and taken by alternative processors or sanitary landfills, for a fixed price. On one hand the material stream for landfilling is reduced and therefore gate fees saved and on the other hand through the fixed prices the further processing is ensured and through the PRO subsidised.

It is estimated that the subsidised processing of low-/no-value recyclables potentially decreases the landfilled mass by up to 370,000 tonnes, hence MYR 3.7 million could be saved on gate fees (assumed same share of sanitary-unsanitary landfills and gate fees). Whereby the government income from former landfill operations, that stems from gate fee collection is reduced, the separation also increases the quality of organic material in the residual waste. Organic material enables composting, an operation that can provide an alternative income source for the landfill operations.

WASTE MANAGEMENT ON ISLANDS

Penang is in close proximity to the mainland and material can be transported via road connections. Therefore, it is under the umbrella of the national EPR system in regard to material and cashflow.

Langkawi however is further apart, and an all-inclusive, sufficient waste management has to operate. Due to its character of a duty-free island, it is assumed that registration of products brought to the island is already established. Hence, a very good ground to roll-out the EPR system with its registries. Through the system, an effective collection of fees is expected as well as sufficient allocation of necessary finance and an eased monitoring system due to Langkawi’s geographical and stakeholder limitation.

EDUCATION AND PROMOTION

In the EPR system education and the promotion of waste management services and waste minimisation are pursued. Associated costs and the organisation of the actions are borne by the PRO through a percentage share.

ADMINISTRATION

To fully run a nationwide EPR system, experts advise that 60, highly-qualified people need to be employed by the PRO. Ten people required by in the authorities to fulfil the tasks due. The total cost for the administration includes the salaries plus overheads that cover operating costs of equipment, space etc.

Table 17: PRO Administration Cost Overview Source: Department of Statistics Malaysia (2019): Salaries & Wages Survey Report, 2018

Cost centre	Cost (annual)	
PRO staff salary	MYR 3,278,160	60 PRO employees
Authority staff salary	MYR 546,360	20 government employees
= Sub-Total	MYR 3,824,520	
+ 25 % Overheads	MYR 764,904	
= Total administrative cost	MYR 4,589,424	~ MYR 4.6 million

5.6 ECONOMIC EFFECTS OF ENVIRONMENTAL BENEFITS

Landfilling bears a potential threat of human health and environmental damage, through groundwater contamination even years after burial, contamination of surface water supply, leakage of toxic and hazardous air/-water borne pollution, acid deposition and greenhouse gas emissions [Qian Burrit, 2007, ref. to Gandy, 1994 and EPA NSW, 1996]. Through applying sanitary measures, the risks get mitigated. Cost for environmental monitoring and management measures of sanitary landfill (e.g. control, structural nature) are carried out by staff on site, along with associated expert advice, interpretation, record keeping and reporting, and external costs. Measures account for:

- Stormwater
- Groundwater
- Leachate
- Landfill gas
- Local ecology
- Waste analysis surveys
- Landfill topographic surveys to determine volume of refuse in place

Cost are estimated to be MYR 15,000/ha annually for monitoring measures, assuming they are already in place (Ministry of Environment, New Zealand, no date). By reducing the material flow that enters the landfill, costs are saved, necessary to maintain sanitary standards with minimised negative environmental externalities. It is estimated, that through introduction of a mandatory EPR scheme up to 370,000 tonnes could be saved from landfilling annually. The amount translates to 14 ha, hence more than MYR 215,500 saved expenditures⁴. As only 35% of in Malaysia’s landfills operate sanitarily, the actual cost to uphold hygienic standards are estimated to be a multiple of the above mentioned, in any scenario.

If high standards are not applied, recycling may also entail negative environmental externalities, especially for the location of the operating facility and from the transport of material. Possible externalities could be unfiltered emissions of the regranulating process or wastewater from the washing process, residing waste and melt that seeps into the ground. Therefore, recycling must not only be considered from an economic point of view, but also from an ecological one. The EPR system should set standards for the recyclers - and those who do not comply should not obtain any material from the EPR system [Alexander, 1993; Boerner and Chilton, 1994]. All in all, examples of substantial aggregate environmental advantages usually outweigh micro perspective doubts [Gandy, 1994; Craighill and Powell, 1996]. Showcase can be found in the estimated CO2 savings per tonne, or in Germany’s economic factsheet on recycling achievements.

Table 18: CO2 Savings per tonne recycling compared to tonne landfill (U.K.); source: Defra (2012), England Carbon Metric in OECD (2018), Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses

Plastic type	Kg CO ₂ /tonne saved by recycling compared to landfill
PET	1,705
PS	1,240
Mixed plastics	1,215
Mixed Plastic Bottles	1,156
HDPE	1,161
LDPE	1,098
PP	948
PVC	888
Other plastics	688

4. Please note that the assumption is based on already established monitoring measures and data from Bukit Tagar Sanitary Landfill.

Germany’s plastic PRO “Der Grüne Punkt” stated in their annual sustainability report 2018 the collection, recovery and recycling of 1.608 million tonnes of waste that were looped back into the economy as secondary raw materials. The activities saved 277,000 tonnes of virgin crude oil equivalents and 38 billion megajoule primary energy, which equals the annual capacity of more than 1,000 wind power stations.

5.7 TRANSITION

During the transition from the status quo into an EPR system, extra costs occur to build the initial system. Costs arise for infrastructure, formalisation of the informal sector and to build the administrative body. Non-financial costs are provision of time and resources to put the regulatory framework in place.

INFRASTRUCTURE CAPEX

The need for initial capital expenditure (CAPEX) to ensure nationwide sufficient waste management infrastructure differs among Malaysia’s states. The development degree of present infrastructure was determined by population density, urbanisation and the adoption of Act 672. Following table summarises the determinants, status and gives an estimate on needed investment efforts:

Table 19: Waste Management investment needs according to Malaysia’s states; Source: Lasaju and cyclos expert judgement, 2020

State	Pop Density	Urban/Rural	Act/Non-Act	Inv. Need
Penang	very high	urban	non-Act	very low
Kuala Lumpur	very high	urban	Act	very low
Johor South	middle	urban	Act	very low
Perlis	low	rural	Act	low
Kedah (excl. Langkawi)	low	rural/ sub-urban	Act	low
Kinta Valley	middle	urban	non-Act	low
Selangor	high	urban	non-Act	low
Pahang	low	rural	Act	low
Negeri Sembilan	middle	urban	Act	low
Melaka	middle	urban	Act	low
Johor (excl. South)	middle	sub-urban	Act	low
Putrajaya	very high	urban	Act	low
Langkawi	low	rural	Act	middle
Kuching	high	urban	non-Act	middle
Kota Kinabalu	high	urban	non-Act	middle
Perak (excl. Kinta Valley)	middle	rural	non-Act	high
Kelantan	low	rural	non-Act	high
Terengganu	low	rural	non-Act	high
Sarawak (excl. Kuching)	very low	rural	non-Act	very high
Sabah	very low	rural	non-Act	very high

The above given estimates are solely based on the expansion of the current infrastructure. Further investment depends on quotas, targets, aims (for instance the proximity of MRFs) that will be set by the PRO at some point as

the EPR system needs to be constantly evaluated and adapted, to scale up the system to the next level. The initial investments are for orientation and must be achieved through finance provided by the PRO and potentially extra governments subsidies. In detail it is a task of the PRO to solve the necessary finance within the EPR scheme. Crucial for a successful EPR is investment into a functioning tracing system. Packaging has to be traced and accounted for in the PRO to set the levy height and define the contribution of the members.

ADMINISTRATION

Setting up the EPR system in administrative terms includes the PRO and a staff unit in the government. Costs incurred are for recruiting, training and equipping 60 PRO and ten employees at the authority. Additionally, planning costs relating to short- and long-term system planning will be incurred which are not included in setting up the administration. These costs refer to research and external experts, necessary for building an appropriate system. It is estimated that 10 additional external experts are needed to build the system, which will come at a cost of MYR 5 million annually.

REGULATORY PROCESS

To frame a mandatory EPR system, the government has to pursue a policy making process that covers the developing and enacting of a legal framework, enforcement and reporting mechanisms and the forming of a committee in charge. The process requires time and human resources.

6. IMPLEMENTATION PLAN FOR THE PROPOSED EPR SCHEME FOR MALAYSIA

To establish a robust EPR system, it is essential to include all stakeholders in the supply chain and assign clear responsibilities to each of them, designate unambiguous rules to the obliged companies and guarantee a level playing field. To implement the proposed EPR system customised for Malaysia (see chapter 4), it is crucial that all involved government entities and private sector have an aligned understanding of the proposed concept and work closely together throughout the complex implementation process.

Building upon above, the implementation of a mandatory EPR scheme requires three main fields:

1. Establishing a legal framework of a mandatory EPR system (see Table 20): The law-making process leading to a high-impact EPR system in Malaysia should be started as early as possible. To make the law practicable and effective, agreements and discussions between competent authorities and the private industry are required. Best-practices from other countries show that the implementation of high-impact EPR schemes is best accompanied by, first, including the intention to introduce EPR in high-level strategic documents (e.g. Circular Economy Roadmap), second, passing a framework law describing the pathway towards EPR, and third, passing additional laws detailing out EPR system characteristics (e.g. roles, responsibilities, targets, measures).
2. Establishing a voluntary, pre-PRO basis, facilitating the development of a mandatory EPR (see Table 21): Adapting and passing a legal basis is a process which takes time. Thus, it is recommended to temporarily set up a voluntary PRO. Through such, companies (it is essential to include both SMEs as well as MNCs) and organisations can cooperate and negotiate with the decision makers about the setup of the mandatory system regarding organisational and regulatory foundations as well as control mechanisms. All activities should exclusively focus on the outcome to create a proper, well-prepared mandatory PRO to achieve the targets of the EPR framework. For the voluntary formation, pro-active communication and discussions should be done with companies and organisations that had already formed for a similar purpose in Malaysia (e.g. PRO Malaysia, MPP).
3. Improving and optimising mechanism when the mandatory EPR system comes into force (see Table 22: Even after a legal framework has been established, a mandatory EPR system is in place and the voluntary PRO transformed into a mandatory legal entity, steps must be taken that ensure the EPR system and PRO are continuously optimised and can evolve.

The areas are described in detail and broken down into steps with respective time frame⁵ in following proposed implementation plan tables, which is also visualised in Figure 29:

5. Short term measures (within 1 year) describe actions that can be taken immediately, given a political consensus. They entail, with respect to the legislative framework, enacting bans and other orders. They also include measures put into place by the private sector, possible within the current framework of policies and laws, e.g. changing behaviours and business practices. Starting projects, discussions and initiatives that enable medium and long term measures are also part of this category.

Medium term measures (within 3 years) describe actions that need preparatory time in order to fulfil their functions. The set-up of a new institution with its tasks, its organisational structure and its role in the given regulatory framework is included here. It also refers to processes of coordination that determine how to share tasks and responsibilities in between different organisations and institutions.

Long term measures (within 5 years) build on discussions started as short term measures and on institutional and organisational set-ups initiated as medium term measures. In addition to the aforementioned, experiences have to be built in order to achieve incremental change and improve structures and processes.

Table 20: Proposed steps to establish the legal framework of a mandatory EPR system

Step	Objective	Activities	Target	Actor	Time frame
1	Capacity building on EPR in order to prepare for legal framework	Present and discuss outcomes of proposed EPR scheme for Malaysia with relevant private sector stakeholders (e.g. PRO Malaysia, MPP, waste management operators, obliged companies (SMEs and MNCs)) Share information	Align understanding of the proposed EPR scheme and its mechanisms and entities across all relevant parties involved (focus on private sector and waste management operators)	NGOs (e.g. WWF) in collaboration with other partners	Within 1 year until 06/2021 (immediate start)
2	Capacity building on EPR in order to prepare for legal framework	Present and discuss outcomes of proposed EPR scheme with national and local authorities Share information especially with Circular Economy Roadmap engaged ministries (see chapter 2.1.1.2)	Align understanding of the proposed EPR scheme and its mechanisms and entities across all relevant parties involved (ministries, agencies, local authorities), highlight common goals and interest with Circular Economy Roadmap (see chapter 2.1.1.2)	NGOs (e.g. WWF) in collaboration with other partners (e.g. KASA, KPKT, SWCorp)	Within 1 year 06/2021 (immediate start)
3	Prepare for legal framework	Implement EPR as financing mechanism in umbrella framework, e.g. in National Solid Waste Management Policy (2016)	First step and legitimation to implement EPR in legal framework	KASA, KPKT, other national authority in coordination with initiating private sector	Within 1 year 06/2021 (after capacity building)
4	Prepare adaptation of legal framework	Set up competent government body (e.g. “EPR agency”) to monitor and enforce objectives of mandatory EPR, PRO membership and registers	Prepare for EPR being put into force by a national government/ lawmaker	KASA, KPKT, other national authority in coordination with initiating private sector	Within 3 years until 06/2023 (parallel to 5)
5	Prepare adaptation of legal framework	Set up binding timeframe for establishing legal framework, for example mandatory EPR system by 2025	Fixed horizon until law amendments and passes	KASA, KPKT, other national authority in coordination with initiating private sector	Within 3 years 06/2023 (parallel to 4)
6	Build executing and guiding body of legal framework	Establish knowledge, human and structural resources of the competent government body	Prepare for EPR being put into force by a government body	KASA, KPKT, other national authority in coordination with initiating private sector	Within 3 years 06/2023 (following 4, 5)
7	Tailor EPR framework to Malaysian conditions	Define <ul style="list-style-type: none">Responsibilities and obliged companiesPlastics to be coveredTargetsControl mechanisms by competent bodyExemptionsScope, design, disclosure of registers	Create a mandatory EPR scheme that is practical, clearly defined, substantial and measurable	Competent body in cooperation with private industry	Within 3 years 06/2023 (following 6)
8	Tailor EPR framework to Malaysian conditions	Coordinate with parallel legislation to for example avoid double payment of obliged companies And also harmonise existing law that impairs the EPR legislation Use existing laws for licensing/ registration Align/ create laws to support recycling and waste reduction (e.g. landfill tax, exemptions)	Create mandatory EPR system that doesn’t conflict with but is ideally supported by laws	Competent body and other affected ministries	Within 3 years 06/2023 (parallel to 7)
9	Tailor EPR framework to Malaysian conditions	Evaluate drafted legal framework and its impact on the private sector	Insights on benefits, upcoming issues and potential future consequences for the private sector in order to observe these after implementation and act accordingly	Competent body also drawing from private sector conclusions about measures	Within 3 years 06/2023
10	Roll out legal EPR framework	Put developed framework into force Develop register	Mandatory EPR system	National government/ law makers	Within 5 years until 06/2025

Table 21: Proposed steps to establish a voluntary, pre-PRO as a basis and facilitating the development of a mandatory EPR

Step	Objective	Activities	Target	Actor	Time frame
1	Present and discuss idea of voluntary pre-PRO	Present and discuss outcomes of proposed EPR scheme Malaysia with relevant stakeholders of plastic supply chain (resin importer, packaging producer, packaging user, etc.) Connect to work of MPP stakeholders and CER (see chapter 2.1.1.2)	Align understanding of proposed EPR, PRO, responsibilities across all relevant parties involved (private industry)	NGOs (e.g. WWF) in collaboration with other partners	Within 1 year 06/2021 (immediate start)
2	Present and discuss idea of voluntary pre-PRO	Present and discuss outcomes of proposed EPR scheme Malaysia with already established similar organisations (e.g. formation PRO Malaysia, MPP) Discuss their potential role	Align understanding of proposed EPR, PRO, responsibilities	NGOs (e.g. WWF) in collaboration with other partners	Within 1 year 06/2021 (immediate start)
3	Identify participants for voluntary pre-PRO	Identify, connect and combine relevant stakeholders and obliged companies that are willing to participate (applies for both SMEs and MNCs) Establish parameters for a pre-PRO	Create an organisation that participates actively in the development of a legal framework (see Table 20)	WWF (moderating) together with brand owners and affected associations	Within 1 year 06/2021 (parallel to 4)
4	Define setup of pre-PRO on voluntary basis	Allocate and define Responsibilities Targets and aims Membership Membership fees Advisory board Reporting	Prepare a pre-organisation that is meant to become the mandatory PROS	WWF (moderating) together with brand owners and affected associations	Within 1 year 06/2021 (parallel to 3)
5	Build expertise and competence of pre-PRO	Establish knowledge, human and structural resources of the competent body	Prepare a pre-organisation that eventually becomes the mandatory PRO	Initiating private industry stakeholders (First movers in voluntary PRO)	Within 3 years 06/2023 (after 4)
6	Advertise and strengthen member base of pre-PRO	Public relations work and acquisition of members	All companies and organisations along the plastic supply chain can become member in the voluntary PRO, not just the future obliged companies. Developing a tailored system should be done by all companies and organisations along the plastic supply chain.	Initiating private industry stakeholders (First movers in voluntary PRO)	Within 3 years 06/2023 (after 5)
7	Kick off pre-PRO operations and engagement as driving force for mandatory EPR	Roll out pre-PRO activities and organisation	Implement an organisation that participates actively in the development of a legal framework (see Table 20).	Initiating private industry stakeholders (First movers in voluntary PRO)	Within 3 years 06/2023
8	Run pre-organisation	Run measures and pilot projects in order to develop an entire and proper plastic collection and recycling and waste data gathering, evaluation of insights	Create a waste management structure in accordance to outlined operationalisation of the proposed EPR scheme (see 4) that can be scaled up through a multi-step approach and be the basis for a national implementation	Pre-PRO together with partners of supply chain (local authorities and municipalities as well as waste management operators and further stakeholders)	Within 3 years 06/2023

9	Run pre-organisation	Run measures and pilot projects in order to develop a sound mandatory PRO. This would include: registering obliged companies calculating their fees and establishing a controlling system to avoid free riders or false reporting measures for mass flow validation raising awareness integrating informal sector reporting to measure goal progress	Create necessary mechanisms to prepare for transition to a mandatory PRO. Interacting with and informing national authorities.	Pre-PRO together with partners of supply chain	Within 3 years 06/2023
10	Start mandatory PRO	Transition from a voluntary pre-organisation to a mandatory PRO	Create a proper, well-prepared mandatory PRO to achieve aims of the EPR framework	Pre-PRO	Within 5 years until 06/2025

Table 22: Proposed steps for improving and optimising mechanism when the mandatory EPR system comes into force

Step	Objective	Activities	Target	Actor	Time frame
1	Run mandatory PRO	Collect fees Run registration system Run and tender waste management practices by using fees Run controls Report regularly Raise awareness	Fulfil requirements of legal framework	Mandatory PRO	Within 5 years until 06/2025 (after EPR framework is in place)
2	Control and enforce mandatory EPR scheme	Check and confirm PRO's reporting and control Test and check register reporting	Control the fulfilling of the legal framework	Competent body on base of (annual) reporting of the PRO, might use third independent parties	Within 5 years until 06/2025 (after EPR framework is in place)
3	Optimise mandatory PRO	Use and amend modulated fees to give financial incentives to strengthen recycling	Fulfil requirements of legal framework, optimising recycling amounts	Mandatory PRO	Within 5 years until 06/2025 (after EPR framework is in place)
4	Optimise mandatory PRO	Raise the demand for recycled materials by giving incentives (financial and/or quota/ amount)	Fulfil requirements of legal framework, optimising recycling amounts	Mandatory PRO	Within 5 years until 06/2025 (after EPR framework is in place)
5	Optimise mandatory PRO	Harmonise and formalise collection schemes for Malaysia	Fulfil requirements of legal framework, optimising collection amounts	Mandatory PRO	Within 5 years until 06/2025 (after EPR framework is in place)
6	Optimise mandatory PRO	Optimise internal control mechanism Optimise external control mechanism Permanent check-up in terms of necessary amendments from conclusions of the running system, incl. registers	Close financial and organisational gaps	Mandatory PRO	Within 5 years until 06/2025 (after EPR framework is in place)

IMPLEMENTATION PLAN

- Steps to establish the legal framework of a mandatory EPR system
- Steps to establish a voluntary pre-PRO as a basis and facilitating the development of a mandatory EPR
- Steps for improving and optimising mechanism when the mandatory EPR system comes into force

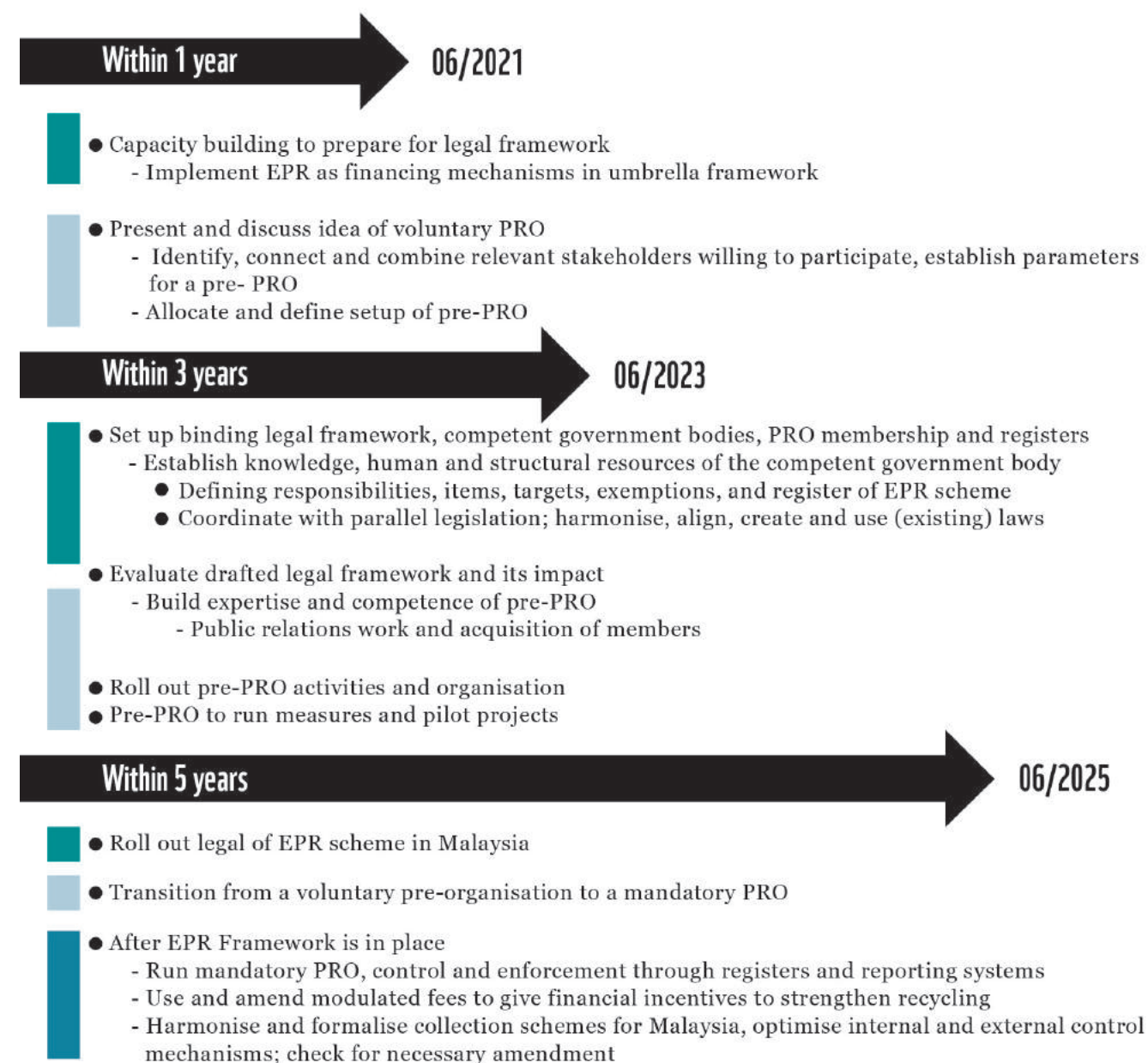


Figure 29: Implementation plan and timeframe

7. CONCLUSION

An intensive research of Malaysia’s waste management system was undertaken, that focused on post-consumer plastic waste generation and management, revealing that

1. Packaging is already separated from household waste to a very relevant extent and transferred to recycling systems. This applies especially to rigid HDPE, PP and PET. Extraction is largely informal and the subsequent value chain is based on a functioning market. However, dEPRived high-value recyclables reduce the value of formally collected material, which deals with the remaining household waste.
2. Malaysia has large recycling capacities in place, that in theory are sufficient to process the above-mentioned local generated recyclables. However, a huge number of recyclers and aggregators import, and process imported recyclables, which means that capacities are largely occupied with such. So far, there is no fully traceable documentation of the imported material.
3. Low-value and non-recyclables (e.g. all kind of flexibles like films, sachets and composites) are mostly disposed of and collected together. So far, there is no systematic separation and recycling of the low-value recyclables. Depending on the locally prevailing collection and disposal system, all of these end up in sanitary landfills, dumpsites (unsanitary landfills) or are littered in the environment. The capacity of suitable disposal options via sanitary landfills is not sufficiently available across the country.
4. To successfully implement an appropriate and practicable EPR system, it is crucial to regard the existing operative waste management structures and initiatives like the circular economy roadmap. Therefore, based on the undertaken analysis, the following EPR scheme framework is proposed:

- **MANDATORY EPR SCHEME**

Provide a reliable financial basis for large-scale collection, sorting and recycling of packaging which is crucial for creating sufficient business cases along the value chains

- **EPR SCHEME FOR ALL CONSUMER PACKAGING MATERIALS AND NON-PACKAGING PLASTIC PRODUCTS**

All such materials (e.g. plastics, paper, metals, composites) from households and equivalent places of origination (e.g. service packaging), to create a financial and organisational basis for treating critical products and to avoid undesired substitution effects in packaging design

- **ONE, NON-PROFIT PRO**

To ensure a holistic, reliable and fair manner waste management in which the responsibility is collectively assumed through one, industry-led system operator, with members from all steps of the value chain

- **MODULATED FEES**

Steered recycling market through application of reduced EPR fees for high-value recyclable packaging (bonus) and an increased EPR fee (malus) for low-value and non-recyclable packaging, to be paid by the obliged companies

- **STRICT MONITORING AND CONTROL SYSTEMS**

To avoid fraud, strict and enforced monitoring, controls and penalties are indispensable and shall be carried out by the Ministry of Environment and Water together with the Ministry of Housing and Local Government to ensure compliance of all actors, including the PRO.

Implementing the mandatory EPR system will take time, as it involves all stakeholders to fulfil their roles and responsibilities, the respective legal basis needs to be developed and new entities need to be set up. Thus, this proposed EPR scheme is built on a step by step-approach, including a voluntary operating scheme until the system becomes mandatory and a gradual implementation of the physical infrastructure.

As the system is based on a segregation at source system for all packaging waste, the number of households having access to this collection system (in percent) is recommended as a suitable and relevant target to measure the success at the beginning. Once all households in Malaysia have access to this collection system and a reliable control and monitoring system has been established, recycling and recovery quota are recommended to be set, to measure the success of the system.

One suggestion as one of the steps in the integration is a temporary “EPR light” system, in which the existing collection and recycling structures for valuable packaging are largely kept. Organisationally, the obliged companies register with their packaging quantities according to material and type of packaging, whereby packaging with a positive market value is priced with very low EPR fee. Consequently, the obliged companies only pay significant fees for their non-valuable packaging. The collected fees are spent on education, awareness and information as well as on increasing the capacities of sanitary landfills, remediation and development of existing dumpsites and litter clean-ups. Moreover, the gate fees at sanitary landfills and incineration plants should be reimbursed corresponding to the amount of system-relevant waste to incentivise the systemic collection of the non-valuable packaging and products. This system could be operated until the mandatory system comes into force.

A mandatory EPR system would significantly contribute to a circular economy, in which plastic recycling is recognised as a key concept. EPR engages all actors along the plastics value chain, products are designed for enhanced recycling, recycling infrastructure is well developed, end-of-life options as well as waste segregation are in place. Moreover, when complemented with other policy instruments on waste management, the transition to a circular economy would be accelerated. As a result, material is looped back into the value chain. Linear disposed material is reduced and in best case demand for virgin materials deteriorates. Therefore, results of the report meant to inform the consortium of the circular economy road map and other policy makers.

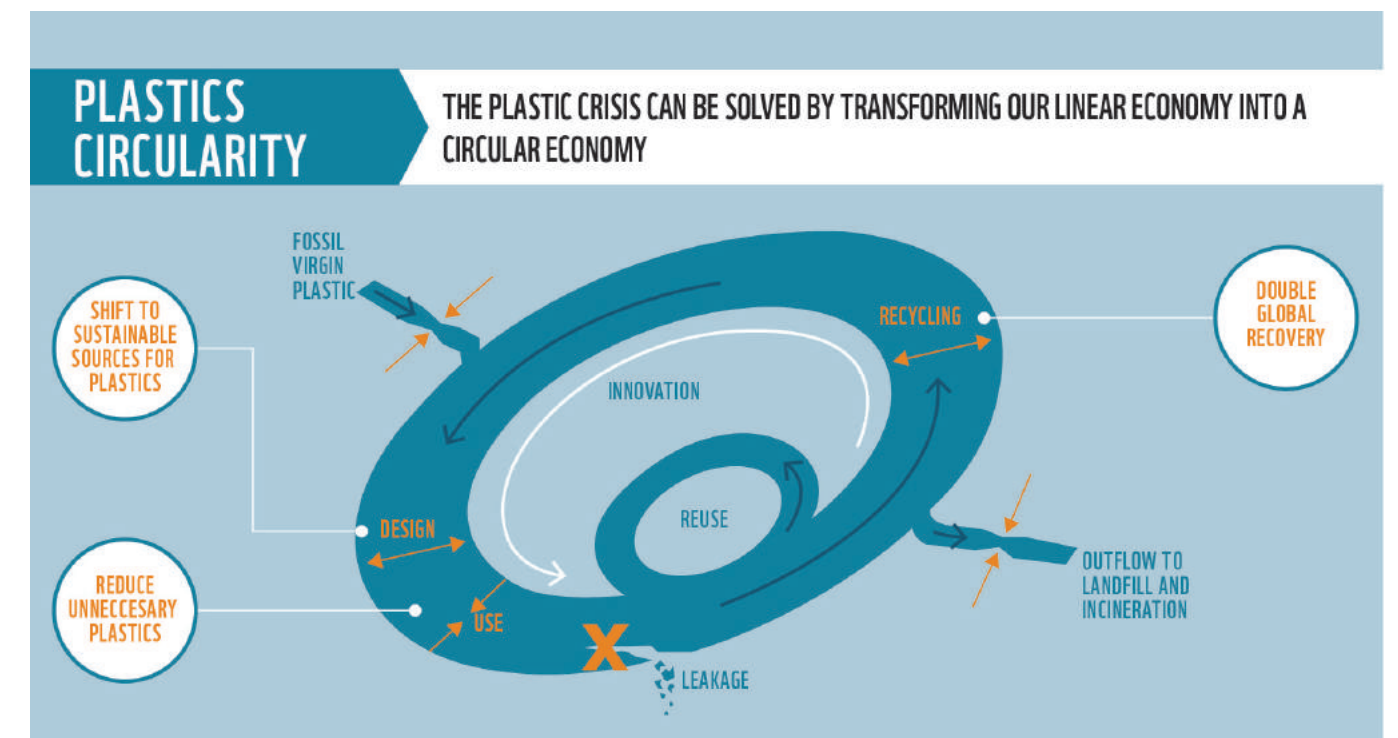
















Figure 30: Circular economy conceptualisation

8. ANNEXES

8.1 PLASTIC TYPE CLASSIFICATION

The Society of the Plastics Industry (SPI) established a classification system in 1998 to allow consumers and recyclers to identify different types of plastic. This code is commonly placed on each plastic product. The table below gives an overview of the different plastic types and their common end-use.

Table 23: Plastic type classification

Plastic Type	Common Name	Chemical Name	Main end-use	
1  PET PETE	PET	Polyethylene Terephthalate	Used primarily for food and drink packaging.	
2  HDPE	HDPE	High-density Polyethylene	Commonly used for milk and juice containers, shampoo bottles and medicine bottles.	
3  PVC	PVC	Polyvinyl Chloride	Commonly used for toys, blister wraps, cling-wraps, detergent bottles and household pipes.	
4  LDPE	LDPE	Low-density Polyethylene	Grocery bags, dry cleaning bags, plastic wraps.	
5  PP	PP	Polypropylene	Hot food containers, vehicle parts, bottle caps.	
6  PS	PS	Polystyrene	Food containers and packaging.	
7  Other OTHER	Others	Commonly a layer or mix of multiple plastic types	Baby bottles, multi-layer individual packaging sachets, CDs.	

8.2 POST-CONSUMER PLASTIC WASTE GENERATION IN MALAYSIA OVERVIEW BY STATES IN 2016

Data from the 2013 Survey on Solid Waste Composition, Characteristics & Existing Practices of Solid Waste in Malaysia contained breakdowns by the seven plastic types (PET, HDPE, PVC, LDPE, Polypropylene (PP), Polystyrene (PS) and Other Plastics) on a per capita basis, thereby providing a detailed overview of the daily post-consumer plastic waste per capita. In addition, this survey provides the above details for six different regions in Malaysia. For districts that were included in these regions the 2012 study estimates were used as the per capita plastic waste volumes of the district.

Districts that were not included in the 2012 study were categorised as ‘Urban’ or ‘Rural’ based on the presence of a municipal council or a district council, as municipal councils would tend to be predominantly urban in composition. In addition, the average per capita household income was calculated for these districts based on the Household Income & Basic Amenities Survey Report 2016 in order to estimate the average per capita plastic waste volume for these remaining districts.

Lastly, the district-level populations were calculated based on population data made available from the Department of Statistics. Data from the Malaysia Census in 2000 and 2010 was used to estimate population for the districts in 2016.

Total post-consumer plastic waste for Malaysia

=

Total number of districts

$$\sum_{\text{By district} = 1}$$

Average per capita plastic waste volume by district

x

Population by district

Since the calculation was done at a district level, the volumes can also be aggregated by individual states as shown in the following table.

Table 24: Post-Consumer plastic waste generation in Malaysia by states in 2016

State/ Federal Territory	Plastics (tonnes)							Total (tonnes)	%
	PET	HDPE	PVC	LDPE	PP	PS	Other Plastics		
Selangor	50,379	83,831	8,182	89,170	32,016	28,457	1,251	293,286	27.4
Johor	16,593	28,187	2,217	31,386	11,771	9,289	645	100,089	9.4
Sabah	18,884	25,249	3,765	29,156	8,512	13,410	804	99,779	9.3
F.T. Kuala Lumpur	14,860	25,933	2,675	24,984	8,655	8,079	-	85,185	8.0
Sarawak	14,164	23,024	2,291	25,460	8,758	9,723	407	83,828	7.8
Pulau Pinang	12,260	16,154	2,272	18,248	6,513	6,894	863	63,203	5.9
Perak	10,824	17,593	1,737	18,945	6,856	6,085	359	62,399	5.8
Kedah	10,743	16,183	1,885	18,041	6,403	6,241	456	59,952	5.6
Pahang	10,368	13,616	2,304	17,544	5,646	7,155	374	57,008	5.3
Kelantan	8,625	10,696	2,016	14,330	4,507	6,120	341	46,635	4.4
Melaka	5,067	8,841	716	9,381	3,473	2,777	134	30,389	2.8
Terengganu	5,341	8,362	954	9,478	3,306	3,250	148	30,839	2.9
Negeri Sembilan	5,022	8,355	789	9,008	3,264	2,840	143	29,420	2.7
F.T. Putrajaya	2,163	3,774	317	3,954	1,452	1,184	49	12,894	1.2
Perlis	2,414	2,538	506	3,082	1,072	1,380	242	11,234	1.0
F.T. Labuan	658	1,149	97	1,204	442	360	15	3,925	0.4
Total	188,366	293,485	32,721	323,370	112,645	113,245	6,231	1,070,064	100.0

8.3 REQUIREMENTS FOR MANDATORY EPR SCHEMES

EPR systems, and hence also the PROs, can be both voluntary as well as mandatory. However, EPR systems can be operated on a voluntary basis only to a limited extent (see Table 25). Thus, mandatory EPR systems are the preferred choice in light of effectiveness and efficiency to transition to a sustainable waste management and circular economy. Such mandatory EPR systems require a corresponding legal frame.

Table 25: Comparing mandatory and voluntary EPR schemes

Criteria	Mandatory EPR Systems	Voluntary Initiatives
Financial aspects	Since the obliged companies are precisely defined, a reliable basis for the permanent coverage of running costs is established.	Since there is no obligation, each company decides for itself whether and how much it voluntarily wants to invest in a project. On the basis of voluntary initiatives, there is no long-term security to cover the running costs. The financial contribution of each company is low compared to the contribution companies have to pay in an EPR scheme.
Competition	Since all companies bringing packaging onto the market are obliged to pay for the EPR system, the system does not distort competition. The rules apply equally to all obliged companies and the level playing field is kept.	Only a few companies participate in voluntary measures while free-riders enjoy financial benefits.
National solutions	On a legal basis, nation-wide solutions (or other, clearly distinct-able economic areas) can be implemented.	It is not possible to establish an entire, nation-wide collection system based on voluntary measures.
Control	The compliance with legal requirements can be precisely controlled.	Aside self-disclosures and self-declarations, there are no official controlling systems, whether the voluntary initiatives fulfil set targets. There is no reliable planning capability.

Examples from many countries with existing EPR legislation show that there is no such thing as a universally applicable, ideal template for a law to be written as each EPR law is different, positioned in the context of national frameworks and national strategies. Despite these differences, the criteria that must be considered and reflected in a law are comparable in all countries.

The following regulatory areas are of fundamental importance and must be (at least) included in an EPR regulation (law, ordinance or other form of binding legal basis) for packaging and other selected non-packaging items:

- Definitions,
- Mandatory pro / system operator,
- Financing (who has to pay),
- System-relevant packaging,
- Common requirements for financing,
- Collection system,
- Sorting and recycling targets,
- Role of the municipalities,
- How to engage informal sector, responsibilities and controlling

8.4 VOLUNTARY VS. MANDATORY SCHEMES

In many countries, industry-led initiatives, single projects and structures (particularly from manufacturers, producers and importers) are being implemented. Such voluntary initiatives are a great means to gather individual experiences through pilot projects, however, they are usually limited to their Corporate Social Responsibility budgets and/or projects for specific types of materials with a sufficient material market value. Ensuring large-scale collection, sorting and recycling of packaging requires bigger volumes if financial flows to create sufficient business cases along the value chains. EPR usually creates such additional financial flows by obliging all relevant companies, thereby maintaining a level-playing field (between the companies). The current financial flows from public budgets or waste management fees are usually too low to finance environmentally and socially sound collection, sorting and recycling. Since a system for collecting and recycling household packaging always requires significant additional payments voluntary initiatives cannot fulfil these tasks.

Mandatory EPR systems require a specific legal basis. In the field of packaging, this means that the objectives and all measures for achieving the goals have to be listed in a complete, concrete and unambiguous manner in a (packaging) law, ordinance or regulation. In addition, this also includes controls and penalties/fines in correspondence with the general context of environmental law enforcement in the respective country, in case the obliged companies do not fulfil their responsibilities as defined in the legal basis. The following table compares some important aspects of mandatory EPR systems and all-inclusive initiatives.

Table 26: Comparing voluntary and mandatory schemes

Criteria	Mandatory EPR systems	Voluntary initiatives
Financial aspects and sustainability	Since the obliged companies are precisely defined, a reliable basis for the permanent coverage of running costs is established. This is a very important aspect for investors and for the future.	Since there is no obligation, each company decides for itself whether and how much it voluntarily wants to invest in a project. On the basis of voluntary initiatives, there is no long-term security to cover the running costs. The financial contribution of each company is low compared to the contribution companies have to pay in an EPR scheme.
Competition	Since all companies bringing packaging onto the market are obliged to pay for the EPR system, the system does not distort competition. The rules apply equally to all obliged companies and the level playing field is kept.	Only a few companies participate in voluntary measures while free-riders enjoy financial benefits.
National solutions	On a legal basis, nation-wide solutions (or other, clearly distinct-able economic areas) can be implemented.	It is not possible to establish an entire, nation-wide collection system based on voluntary measures.
Control	The compliance with legal requirements can be precisely controlled.	Aside self-disclosures and self-declarations, there are no official controlling systems, whether the voluntary initiatives fulfil set targets. There is no reliable planning capability.
Results	It is possible to build up a sustainable waste management system: <ul style="list-style-type: none">• Comprehensive collection system• Implementing a recycling infrastructure• Recycling at a high-quality, profitable level• Environmentally friendly disposal• Performance obligations by the market participants• Education/ information/ communication	The results are very limited. A voluntary initiative is no reliable element for a sustainable waste management as it cannot be demanded / claimed. This means that projects are often not continued after the project has been finished or the funding period is over.

8.5 COMPARING INDIVIDUAL AND COLLECTIVE RESPONSIBILITY SYSTEM

In its simplest form, EPR is rooted in an individual responsibility through a direct interaction between the producers and importers and the source of waste generation; meaning that they will either directly collect the waste or pay a waste management operator to collect their waste and take it back. However, this model is only practically applicable to a very limited extent due to logistical challenges (see Table 27). Thus, a different, more feasible model is required in most cases: a collective responsibility.

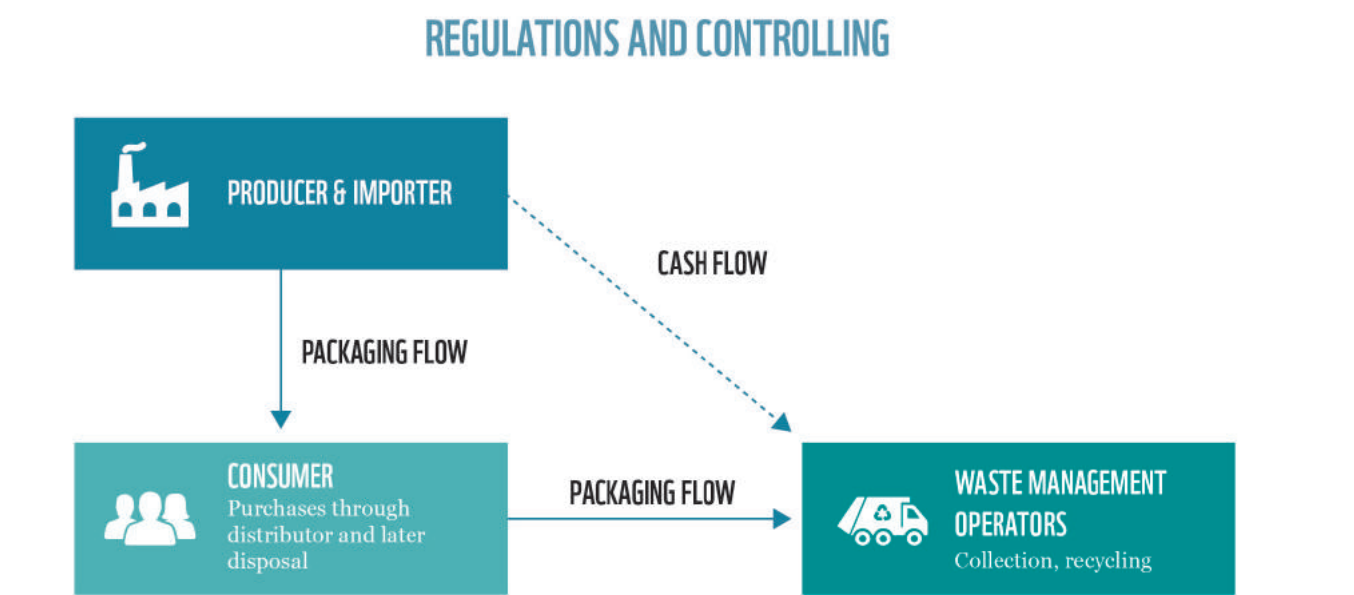


Figure 31: Individual responsibility

As implied by the name, a collective responsibility is built upon a third, central organisation collectively taking over the take-back responsibilities of the producers and importers. This organisation is referred to as the Producer Responsibility Organisation or sometimes as system operator. This organisation enables the obliged companies to assume responsibility by combining their efforts and jointly managing the arising waste (see Figure 22).

Comparing these two systems in regards to their financial and organisational aspects as the controlling of systems (see Table 27) reveal that for comprehensive, nation-wide sustainable waste management systems (which is the overall target), a collective EPR system is more suitable.

Table 27: Comparing individual and collective EPR schemes

Criteria	Individual responsibility	Collective responsibility
Financial aspects	Producers, and importers directly pay for the waste collection and treatment of their packaging waste.	Producers and importers pay their fees for the waste collection to the PRO, which will pay the waste management operators for waste collection and treatment.
Organisational aspects & practicability	Producers and importers must precisely know about the exact distribution of their packaging and how to access it; logistical challenges when products are distributed in small quantities, still requiring similar logistical infrastructure and attributed costs as applicable with bigger volumes.	The PRO is carrying out the operational tasks of the system on behalf of the producers and importers resulting in significantly reduced costs and logistical challenges.
Control	Public agency is responsible for supervising that all task and responsibilities of all producers and importers are fulfilled.	As the compliance of the PRO with all its tasks and responsibilities is necessary, a third party, like a public agency, is responsible for supervising the PRO in this regard.

8.6 DIFFERENT POSSIBILITIES TO SET UP PRO

Fulfilling the tasks of a PRO can be achieved through different options. The main differences concerning the setup are based on

- whether the PRO is a State-led vs. Industry-led,
- whether the PRO is a Non-profit vs. For-profit,
- whether the PRO is a Single-PRO vs. Multiple PROs
- whether the PRO covers All packaging vs. Specific packaging

Experiences in European countries have shown that there is no singular successful setup, but that the success is determined through an effective and efficient organisation, financing, administration and controlling of the system. Following the basic principles of the EPR, the PRO is usually an organisation established by the private industry. Nevertheless, it is also possible that the PRO is part of a public authority.

- **Industry-led PRO:** The PRO has been established by companies, associations or other organisations from the private industry. These PROs are supervised by public authorities to ensure their fulfilment of their roles and responsibilities. However, the operationalisation of the EPR system is not directly connected to any public authority. Most PROs are industry-led.
- **State-led PRO:** The PRO is operationalised by a public authority, for instance in form of being a department within a ministry. An example for such a PRO is ANGEd (of Eco-Lef system) in Tunisia or the Waste Recycling Management Fund in Taiwan.

Table 28: Comparison industry-led vs. state-led PRO

Criteria	Industry-led PRO	State-led PRO
Financial aspects	EPR fees are not connected to public funds and correspond to the arising costs of fulfilling the tasks of the PRO. Transparency and traceability of funds (both internally as well as externally for controlling) is highly needed	Need to be ensured that the fees are only used for the EPR system. If this is not regulated, the fees could be used as part of the general budget and spent on other, non-related aspects (similar to taxes)
Organisational aspects & practicability	Higher organisational efforts in terms of interacting with private stakeholders as well as public authorities	Direct, comparably lower organisational effort as public authority is empowered to implement the needed structures. However, the respective ministries / authorities lack the required capacities to do so in many countries
Free rider issue	Own interest to avoid free rider to keep level playing field	Prone to corruption (particularly in countries with high rates of corruption)
Control	Control by third party like public agencies	Difficult, no independent, external party to enforce controls

In case of an industry-led PRO, the most distinguishing characteristic is whether the PRO is set up as a for-profit or non-profit organisation.

- **PRO as non-profit organisation:** Such PROs are in the hands of the obliged producers and industry, as for instance in Belgium, the Czech Republic, Ireland, Italy, France, the Netherlands, Norway, Portugal and Spain. The obliged industry creates one common non-profit entity that collects the necessary funding.
- **PRO as for-profit corporation:** The legal framework can require direct competition between several PROs instead of having a single monopolistic PRO. Such models exist e.g. in Germany and Austria where the EPR systems have evolved from having a single PRO to competition between several PROs due to anti-trust ruling.

The number of PROs in an EPR system (single PRO with a monopoly vs. several PROs in competition) is determinant on the set-up as non-profit vs. for-profit: Practice has shown that PROs as non-profit organisations are operated most successfully when there is only one PRO (operative monopoly) while PROs set-up as for-profit corporations are operated most successfully when competing with other PRO.

Table 29: Comparison non-profit vs. for-profit PRO

Criteria	Non-profit PRO	For-profit PRO
Financial aspects	The fees collected correspond to costs for implementing and operating the system, which are regularly adapted to the costs spent and revenues collected.	Competition leads to high price pressure. Thus, the PROs can make profits but also losses, which can lead in individual cases to the insolvency of a PRO.
Organisational aspects & practicability	No own, economic interest, higher levels of transparency.	Less transparency as information is not always disclosed. Each PRO is organising itself.
Free rider issue	As there is only one PRO, it can be easier identified if obliged company pays EPR fees to the PRO	More difficult to control that every obliged company pays EPR fees to the PRO. Different register is needed
Control	Controlling efforts comparably lower.	High controlling necessary due the multiple, competing PROs and lower level of transparency.

Lastly, it needs to be determined whether a PRO is responsible for all packaging materials and types or whether it is also possible to cover selected material fractions and types:

- PRO for all packaging: the PRO is responsible for setting up and operationalising the system for all packaging materials (plastics, paper & cartons, metals, glass, and all composites and beverage cartons) and types. For instance, in the Netherlands, it is required that the PRO covers all packaging materials and types.
- PRO for specific packaging: In case it is possible to separately collect specific, clearly identifiable packaging streams (e.g. glass, paper and carton, industrial and transport packaging), it is possible to set up a PRO solely responsible for these specific packaging streams. For instance, in Spain there are two PROs – Ecovidrio for glass and EcoEmbes for the other packaging materials, while in Belgium, there is Valipac as PRO for industrial and transport packaging and FostPlus as PRO for household packaging.

Table 30: Comparing PRO for all packaging material vs. PRO for specific packaging

Criteria	PRO for all packaging	PRO for specific packaging
Financial aspects	Less dependent on external developments due to several materials. Prices for materials can cross-subsidise internally.	Highly dependent on external developments of material price.
Organisational aspects & practicability	Obliged companies can register all packaging materials with one PRO.	Obliged companies with several packaging materials need to register with two PRO leading administrative efforts. The fees for the different materials need to be balanced out to avoid any undesired shifts in packaging material usage.
Free rider issue	No difference between these two options	
Control	Specific and detailed control is lower on the company level	More efforts to control, but greater depth of control

8.7 INTEGRATING THE INFORMAL SECTOR

Informal collectors and recyclers are increasingly recognised for creating value for their cities and countries. They contribute in form of lowering waste quantities, conserving resources, lowering CO2 emissions and especially supplying the local value chain with recyclable material.

Informal means that they have no contract, no regular income, rather simple equipment to work with, little recognition and high vulnerability. It is estimated that up to 2 % of the urban population in low and middle-income countries work in the informal waste sector. The informal sector is a driving force for recycling management.

From a waste management perspective, a mainly informal system is inefficient as

- Only valuables will be collected, while invaluable materials remain uncollected (waste picking, no cleaning service),
- Collection occurs only in areas with demand for recyclables (in proximity to the facility and/ or trading point),
- Formal collection of remaining waste will become more expensive (because valuables are already removed),
- Informal collection and separation often contribute to littering.



Regarding the first bullet point, it needs to be analysed which fractions in particular are collected by the informal sector prior to establishing an EPR system.

The following Table 31 provides a first overview of packaging and material types that are collected by the informal sector and which not.

Generally, all packaging and material types are collected which have a positive market value, i.e. revenues (e.g. per kg) can be generated with.

Moreover, this also depends on the proximity of recycling structures or other places to sell the waste (e.g. waste banks, aggregators or brokers).

Also, in the case that a specific fee is paid for a packaging type listed in Table 31 or a deposit is paid, it can be assumed that this type of packaging is collected in a relevant proportion by informal collectors (see also Ghana example).



Figure 32: Informal collection of valuables

Table 31: Collection of Packaging and material types from household waste through the informal sector

Packaging type and material (from households)	Collection through informal sector	Comments
PET-bottles	In many cases	Usually a positive market value, easy to collect, in many cases there is a recycling and /or recovery structure existing
Ferrous metals packaging (like cans)	In many cases	Positive market value; main share of waste is generated as part of industrial waste (thus not from households); in most cases regional recycling structures available
Non-ferrous metal packaging (like cans)	In many cases	Positive market value; main share of waste is generated as part of industrial waste (thus not from households); in most cases regional recycling structures and/or marketing possibilities available
Paper	In many cases	Collection of paper waste predominantly from industrial / commercial sources, in most cases regional recycling structures and/or marketing possibilities available
HDPE (rigid plastics like bottles)	In some cases	Positive market value, depending on the regional recycling structures
PP/PS (rigid plastics like cups)	In some cases	Positive market value, depending on the regional recycling structures
LDPE (film)	In few cases	Positive market value for mono-sorts, which usually only applies for industrial waste; depending on regional recycling structures
Liquid packaging board (like tetra)	In few cases	No positive market value as there are usually no regional marketing possibilities nor suitable recycling structures. In case of a producer paid collection, it is possible to incentive collection (artificial market)
Glass	In few cases	Market value strongly dependent on local recycling structures, effort-intense collection (due to high, specific weight)
PS	Not collected	Only small share of household packaging waste, thus, effort-intense, non-profitable collection
Other PET packaging (e. g. trays)	Not collected	No positive market value; no established recycling process
PVC	Not collected	Only very small share of household packaging, thus effort-intense, non-profitable collection. In few cases, collection of non-packaging items, such as PVC pipes, in case a recycling structure is existent
Composites (flexible and rigid) and other plastics	Not collected	No market value, effort-intense collection particularly for flexible packaging due to low, specific weight



EXCURSUS: GHANA - SEPARATE COLLECTION OF PET-BOTTLES

Opposing to many other low- and middle-income countries, there has been no established collection and recycling structure of PET bottles in the Greater Accra Area leading to high levels of littering of PET bottles.

Through implementing collection centres operated by Environment360 (non-profit), PET bottles collected through the informal sector, predominantly women, have been remunerated according to weight.

As a consequence, there was a visible reduction of PET bottle littering within a very short period of time. The operators of the non-profit collection centres are able to pay this remuneration to the collectors, as they are able to market larger quantities to newly established customers (sorting, marketing abroad).

A transition from value material picking to cleanliness as service is crucial. This is why informal workers should be integrated or formalised in waste management practices, especially EPR systems. From a social sustainability perspective, it is necessary that the involved persons keep their source of income.

Furthermore, these workers are experienced regarding the value of recyclables, possibilities to market the recyclables as well as challenges and problems and are thus well-qualified for formalised companies that need employees for collection, sorting and/ or recycling.

There are different possible scenarios to implement the informal sector when it comes to EPR:

- Independent entrEPReneurs/self-employed: no significant change in the form of operating but with some level of increased control and monitoring (e.g. provided with personal protective equipment, registration, certification) and increased support (e.g. buy-back centres, access to recyclables through source separation)
- Formalisation: The informal sector is pushed/supported to be formalised through establishment of co-operatives and SMEs.
- Employment: Especially for labour-intense collection and sorting informal waste pickers can be employed.



EXCURSUS: CHILE - FORMALISATION OF INFORMAL WASTE PICKERS

Chile is currently creating a mandatory EPR scheme and passed the draft EPR legislation for packaging in June 2019. In order to formalise informal waste pickers in Article 52, it states:

“The waste pickers who are registered in the national register (RETC or PRTR) will be able to participate in the waste management for the fulfilment of the goals established in the decree. For these purposes, they must be certified within the framework of the National System of Certification of Labour Competences established in Law No. 20 267

The Producer Responsibility Organisation must make the bidding rules under which they will contract the collection and recovery services available to the waste pickers free of charge.

In addition, the Inclusion Plan of the PRO (article 13) must indicate the mechanisms and tools for training, financing and formalisation, aimed at enabling the full integration of waste pickers.”

It needs to be secured that the informal sector is not misusing the collection of recyclables: In Tunis e.g., several containers for separate waste collection of plastic packaging have been set up in different districts across the city.

These containers are built in such a way that the collected plastic packaging is highly visible for everyone and can also be removed by everyone, which is particularly interesting for the informal sector. As a consequence, all valuable plastic packaging (like PET bottles) is removed from the containers and only the valueless, non-marketable plastic packaging remains inside the containers.

At the same time, the collection done by the informal sector also crucially complements the municipal waste collection, which is often inadequate. For Macedonia, the costs saved as a result as well as the costs of formalising the informal sector were estimated.



EXCURSUS: MACEDONIA - THE FINANCIAL CONTRIBUTION OF WASTE COLLECTION BY THE INFORMAL SECTOR

Waste from packaging in Macedonia has high economic value, and it accounts for 15 % to 22 % of the total municipal waste quantities.

It is estimated, that citizens on average generate about 50 kg per capita at annual level of packaging waste or about 115,000 tonnes (Ivanovski et. al, 2016).

The informal sector plays a crucial role in regards to waste collection in Macedonia as 80% of the packaging waste being recycled in Macedonia is collected and selected by the informal waste pickers (Roma community).

This equals around 12,840 tonnes or about 1.82% of the overall municipal waste quantities in Macedonia and mainly accounts for PET packaging, iron and paper. On average, 3000 persons are engaged with informal picking daily.

In the existing work conditions, it was estimated, that the informal sector has saved, for the local authorities alone, about 1,045,033 Euros per year (because utilities do not have to collect, transport and dispose waste, which is a service they have already charged to the citizens).

Savings are generated for transport, depending on the part of the process in which the material is collected from the informal pickers [Sapuric et al., n.y.].



Figure 34: Containers to collect plastic bottles in Tunis

8.8 SUMMARY FRAMEWORK CONDITIONS FOR EPR IN MALAYSIA

Influencing criteria	Good	Mediocre	Not good	Explanations
Political situation	X			Overall, relatively stable despite current tensions
Legal and regulatory framework		X		Has been significantly improved in the past year through more stability and long-term planning
Income level and GDP	X			One of the emerging economies in SE Asia, diversified
Corruption		X		Not very significant issue
Education and living standards	X			Increasing in past years, low poverty rates
Geographical situation		X		Country spreads over Malay peninsula and several islands including parts of Borneo; natural hazards not too significant
General waste management structure		X		Partly federalisation, mandatory waste separation; waste banks
Financing of waste management			X	Budgetary deficits
Recycling of packaging waste		X		Only ~20 % of household waste recycled; several recycling plants, incl. one EUCertPlast one; receives illegally imported plastic waste from around the globe; informal sector and Waste Banks
Technical competences			X	Often insufficient due to budgetary deficits
Public awareness			X	Overall low despite numerous campaigns and initiatives to raise awareness
Controlling and monitoring systems			X	Limited capacity and inadequately skilled staff to ensure effective and extensive monitoring
Importance of the informal sector	X			
Experiences and data availability			X	Insufficient data; often on case-by-case basis; sometimes conflicting data
EPR laws for packaging			X	Non-existent
EPR laws for other fractions			X	Non-existent
Initiatives from the industry			X	Only few initiatives regarding WEEE, nothing for packaging
Initiatives of the government		X		EPR is mentioned in several other plans but no specific measures to introduce yet
Support through external experts			X	Not known

Results taken from WWF, cyclos [2019].

8.9 EFFECT OF ECONOMIC INSTRUMENTS (OTHER THAN EPR) COMPARED TO EPR

Economic instruments are crucial to establish a sound financial and organisational basis for sustainable waste management and recycling. Generally, there are three different types of economic instruments:

- **Revenue-raising instruments** which create a direct income from the industry and/or households through taxation or charges, as for instance a landfill tax, or municipal waste fees
- **Revenue providing instruments** which create an indirect income for industry and/or households through reduction of charges or subsidies, like tax rebates or variable VAT rates
- **Non-revenue instruments** which do not create revenues but motivate the industry and/or households to improve their individual waste performance, as it is done for example through EPR.

Ideally, instruments from all three categories are implemented in a complementary fashion to establish a sound waste management of all waste stream (not limited to packaging).

Generally, both EPR fees and green taxes can have a steering function. Green taxes can steer raw materials, materials and goods which are newly introduced onto the market. These environmental taxes or import duties are charged e.g. on raw materials and goods. In these cases, most of the funds usually flow into the general public budget (upstream impact).

The steering function of EPR fees also covers the part when raw materials, materials and good are newly introduced onto the market, but expands beyond this as EPR fees also impact the establishment of an operative system, meaning EPR can finance, amongst other things, infrastructure, communication, campaigns against littering and especially the design of covered products like packaging (up- and downstream impact).

The following Table 32 compares the fees paid within an EPR system by the obliged companies with green taxes and environmental charges.

Table 32: EPR fees and green taxes in comparison

EPR fees for packaging	Green taxes / environmental charges
The fees are determined by the PRO or – in case of for-profit corporations – negotiated with the obliged companies.	The tax is defined by law or through other public regulations and acts.
The PRO receives the fee.	The responsible public agencies receive the tax.
EPR describes extending the producer responsibility: Those who introduce certain goods onto a market, are also responsible for the subsequent waste management and disposal of the arising packaging waste.	Eco-taxes can be charged without being directly related to a specific responsibility of a producer. The duty is fulfilled through payments.
The fees are precisely related to the products covered by the EPR scheme, which are introduced on the market of the respective country in which they will also turn into waste.	Eco-taxes do not have to be related to the consumption in the respective country. For instance, they can also be related to raw materials or imports.
There is a direct relation between the EPR fee and the quantities of arising waste in the respective country.	There is no relation to the arising packaging waste quantities in the respective country.
The EPR fees are meant to be exclusively used for collection, sorting and recycling of the waste. This also includes a corresponding communication and public awareness work.	Eco-taxes usually contribute into the general public budget, so there is no ‘polluter pays’-principle in the sense of an EPR system.



EXCURSUS: LANDFILL CHARGES / LANDFILL BAN (EUROPE)

Landfill charges a levy charged by public authorities (usually on a national, but also on a regional or municipal level). Landfill charges are a key driver for diverting waste from landfills, nevertheless, are often too weak to provide effective incentives for increasing recycling.

From a long-term perspective, legislative regulations such as landfill restrictions or bans may be more effective in redirecting waste into a recycling process. This requires waste segregation at source and a corresponding collection system. In Europe, many countries have introduced such landfill bans meaning that all generated waste needs to be treated according to the waste hierarchy (waste segregation and collection, recycling and incineration of the residuals) before the incineration residues are forwarded for the final disposal at landfills.

EXCURSUS: DENMARK – NEW WAYS OF MANAGING PLASTICS

Denmark has so far not enforced a product responsibility scheme but has a privately organised collection system for industrial and commercial packaging waste as well as communal collection for household packaging waste which is financed through taxation. Thereby, it is the only EU Member State that has opted for the internalisation of packaging waste management costs rather than setting up an industry-run funding system like EPR. (Plastic) Packaging and the costs for its management are included in budget of local authorities, to the exception of glass. The management of household and commercial packaging waste falls under the responsibility of private operators (recycling) and local authorities (treatment, energetic recovery). In parallel, Denmark runs a deposit-return system operates for one-way beverage container packaging and refillable bottles [PRO Europe, n.y.].

However, in light of the existing regulations and infrastructure leading to incineration as predominant treatment of plastic waste, the Danish Plastic Action Plan has been created to transition to a sustainable management of plastic waste. In 2016, only 36 % of the 340,000 tonnes of plastic waste generated from both industrial and commercial sources as well as households and equivalent points of origination while 63 % has been incinerated. Thus, the Danish Plastic Action Plan is particularly focussing on increasing recycling [MEFD, 2018]. Measures for achieving this include:

- Expanding the deposit-refund scheme (DRS) for bottles containing fruit juices and fruit concentrates starting January 2020,
- Implementing an EPR scheme for packaging starting 2025 to promote the environmentally benign design of packaging, incl. Plastic packaging and ensure reuse and recycling. [Jensen, 2019].



EXCURSUS: TUNISIA – INSUFFICIENT ECO-TAX LEADS TO SIGNIFICANT DECREASING PERFORMANCE IN A RUNNING SYSTEM FOR MANAGING PLASTIC WASTE

In 2004, Tunisia set up several systems for the collection, treatment and valorisation of certain categories of waste, such as ECO-Lef. To foster the development of the sector, the Tunisian government encouraged the creation of microenterprises by awarding contracts together with the municipalities. The system was financed by an eco-tax, although it was labelled as an EPR system. A fee of 5% on the net added value has to be paid for imported plastic, including empty packaging and raw materials. For the import of already packaged goods, no tax needed to be paid.

The funds collected via the eco-taxes were (partially) used to

- Finance the ECO-Lef system,
- Cover part of the operational fees of the municipal and hazardous waste infrastructures, and
- Cover part of the functional costs of the National Agency for Waste Management.

ECO-Lef is a public system for the recovery and recycling of packaging waste, implemented in partnership with local authorities. It includes the collection of packaging waste and recycling of plastic waste according to the conditions set by the National Agency for Waste Management. The Eco-Lef system covers only specific packaging types, namely PET bottles, milk bottles made of HDPE, plastic films and bags made of PP as well as metal cans – cardboard packaging is excluded.

After an initial success, which peaked in 2008 with collection of 15,700 mt of packaging, collection and recycling gradually but significantly decreased to 5,400 mt of collected packaging waste in 2017. The reason of this significant decline was rooted in the mismatch between funds generated from the eco-taxes and the actual packaging waste quantities and the lack of adequate steering function of taxes on the actual collection and recycling infrastructure. This was exacerbated by further structural weaknesses, as the decrease of the profitability of certain parts of the system was diminished due to the decrease in collection activity. Further causes for the poor outcomes include a lack proper control, complaints over the quality of the recyclers and proliferation of non-approved recycling companies, long transport distances connected to relatively high costs, and, last but not least, limited domestic recycling value chains. To improve their system, the National Agency for Waste Management is currently revising transform it into an actual EPR system.

EXCURSUS: GHANA – NON-DIRECTED LEVY ON PLASTIC RESIN BURDENS IMPLEMENTATION OF AN EPR SYSTEM

Ghana is adding a surcharge on imported resins since approx. 2017. This money is part of the general budget and should be spent on waste management purposes. However, this has currently not been done yet. Against this background, the private sector is sceptical about the efforts to introduce an EPR system which also includes surcharges.



8.10 SCOPE OF PACKAGING (ACROSS THE EU)

The types of system-relevant packaging covered by the PRO depend on the respective EPR scheme setup and legal framework. Within the EU, there are three distinct categories (Table 33):

- 1. Only household packaging and packaging from equivalent places of origination
- 2. Commercial and industrial packaging only
- 3. Both commercial and industrial as well as household packaging and equivalent places of origination

It is not necessary to establish an EPR scheme if the packaging collection and recycling is already well-established and running as it is often the case for commercial and industrial packaging.

Table 33: Categories of packaging covered by EU EPR schemes Table modified after IEEP (2017).

Household (H) / equivalent places of origination only	Commercial (C) / industrial (I) packaging only	H and C / I packaging
Belgium: Fost-Plus	Belgium: Valipak	Austria: ARA
France: Citeo		Bulgaria: Ecopak
Spain: Ecoembes (will collect commercial/industrial under voluntary agreement if local entities collect it)		Cyprus: Grrren Dot Cyprus
Germany: Der Grüne Punkt		Czech Republic: EKO-KOM
		Estonia: ETO
		Finland: Finnish Packaging Recycling RINKI Ltd
		Greece: Hellenic Recovery Recycling Corporation
		Hungary: ÖKO-Pannon
		Ireland: Repak
		Italy: CONAI
		Latvia: Latvijas Zalais punkts
		Lithuania: Žaliasis taškas
		Luxembourg: Valorlux
		Malta: Greenpak
		Netherlands: Avfalfonds Verpakkingen
		Poland: Rekopol
		Portugal: Sociedade Ponto Verde
		Romania: ECO - ROM AMBALAJE
		Slovakia: ENVI-PAK
		Slovenia: Slopak
		Sweden: FTI

8.11 EPR FEES FOR DIFFERENT PACKAGING MATERIALS

Recycling market is steered through application of reduced EPR fees for high-value recyclable packaging (bonus) and an increased EPR fee (malus) for low-value and non-recyclable packaging, to be paid by the obliged companies. The prices of the examples are per tonne and based on the prices of Citeo (France) in 2020. The actual EPR fee paid per item reflects both the fee per kilogram as well as the packaging weight of the item.

Table 34: Example: EPR fees for different packaging types

Material	PET and HDPE from bottles	Other recyclable materials	Other non-recyclable materials	Glass	Beverage cartons	PET bottle
EPR fee per kilogram	30.92 € ct. (~ 1.4 MYR)	30.92 € ct. (~ 1.4 MYR)	48.57 € ct. (~ 2.2 MYR)	01.35 € ct. (~ 0.06 MYR)	24.98 € ct. (~ 1.13 MYR)	28.88 € ct. (~ 1.3 MYR)
Description	0.5 l PET bottle	0.5 l, LDPE stand-up pouches	0.5 l, multilayer PET/PE stand-up pouches	0.5 l, glass bottle	0.5 l, beverage carton	0.5 l; PET bottle
Weight of the packaging	26.63 g	11.59 g	11.50 g	380.05 g	16.06 g	17.00 g
EPR fee paid (price per packaging)	0.82 € ct. (~ 0.037 MYR)	0.36 € ct. (~ 0.016 MYR)	0.56 € ct. (~ 0.025 MYR)	0.51 € ct. (~ 0.023 MYR)	0.40 € ct. (~ 0.018 MYR)	0.49 € ct. (~ 0.022 MYR)
Picture of examined packaging	 	 	 	 	 	 
Picture of comparable Malaysian packaging	 		 	 	 	 

8.12 RECOMMENDATION ON COMPOSTABLE PACKAGING

Biodegradable plastics are characterised by their ability to be degraded by microorganisms into water, carbon dioxide (or methane) and biomass under specified conditions. Biodegradable plastics can be manufactured from both fossil as well as renewable sources. The term is oftentimes also (incorrectly) used in reference to bio-based plastics. However, bio-based plastics are derived from renewable sources such as sugar cane and processed into plastic polymers like polyethylene. Bio-based plastics can be recycled just like conventional plastics or can be degradable – depending on their how they are manufactured. But they are not biodegradable by default. [PlasticsEurope, 2018]

Biodegradable plastics are used for a wide range of applications, such as organic waste collection (e.g. as kitchen waste bags), and agricultural purposes (e.g. as films). They can be foamed into packing materials, extruded, and injection-moulded in modified conventional machines. Different types of fillers can be used with the system, such as wood flour, lime, clay, or wastepaper. Most of the applications for which they are used have a short or very short in-use phase. For instance, there are drinking straws and coffee capsules made of biodegradable plastics available. [PlasticsEurope, 2017].

To ensure that biological treatment, such as composting, is a sustainable waste management option, both the biodegradability and compostability as well as the resulting compost and digestate have to also comply with the appropriate standards.

In many countries the usage of bioplastics is currently considered (e.g. in Kenya or in Malaysia based on the assumption that the degradability of the plastics will be a solution to the issue of littered plastic waste). Looking to the current experiences, there are numerous problems associated to biodegradable plastics, there are several aspects to be considered:

Table 35: Aspects to consider upon using biodegradable plastics

Phase	Critical issue
Production	If biodegradable plastics are made from renewable raw materials, it must be regarded that the resulting land use is not available for other, sometimes higher value uses such as food cultivation.
Application	Biodegradable plastics are not generally suitable for any application as for instance the packaged goods need to be protected from external influences (such as oxygen, moisture, microorganisms) or material properties have to be preserved and biodegradability is therefore not desirable in many cases.
Collection and separation	If biodegradable plastics are not collected together with organic waste for composting but with other recyclables in countries with waste segregation and an associated sorting and recycling infra-structure, they need to be sorted out to prevent a contamination of the various recyclable fractions that are separated in the sorting process. However, this is very difficult as it is very difficult as bio-degradable plastics are neither removed in manual sorting process as they are visually nor properly detected by the various NIR scanners in automated sorting processes. Furthermore, inaccurate claims over the compostability of biodegradable plastics might confuse consumers or even trick them into thinking that littering these plastics is not harmful to the environment as they are degraded; which is not the case: As recently shown in research by the University of Plymouth, biodegradable plastics bags were able to hold shopping items even after three years of being buried in the soil or the sea [Williams, 2019]. Thus, these inaccurate claims can be a source to littering.
Recycling and recovery	Biodegradation has to be achieved under the current forms of waste management. The critical side to biodegradable plastics is that these plastics can only be degraded under certain temperatures, oxygen availability and humidity, and in the presence of certain microorganisms. These conditions cannot be guaranteed either during conventional composting (in countries with well-developed waste management systems) or at landfills (in countries without well-developed waste management). Since most industrial composters are not able to create the specified environmental conditions, i.e. biodegradable plastics will not be degraded in them and will instead become a contaminant in the compost. Even in cases of full degradation, the quality of degraded biodegradable plastics does not fulfil the requirements for compost quality (e.g. European standard EN 13432) leading to contamination. In countries without an evolved waste management system in which landfilling is the predominant form of disposal, biodegradable plastics can contribute just as much to littering and the existing waste problem as conventional plastics; as long as there is no proper collection, sorting, and recycling or composting infrastructure.

As indicated by current research, even in countries with an evolved waste management system – usually including EPR schemes – biodegradable plastics have not yet proven to support the circular economy goals. Biodegradable plastics usually need optimal conditions to dissolve into harmless fractions; conditions that normally cannot be found in the natural environment, but only in specific composting facilities as biodegradable plastics require certain temperatures, oxygen content and humidity which would be difficult to achieve in conventional composting and in no way possible to create on landfills. A functioning waste management system therefore remains a prerequisite in order to use biodegradable plastics. However, this is not given in most middle and low-income countries as well as a few high-income countries.

The usage of biodegradable plastics does not pose an advantage over conventional plastics, particularly in comparison to sturdy and long-lasting materials such or thick plastics suitable for reuse which have more advantages. Repeated usage of the material through recycling and even incineration [DUH, 2018] is often more environmentally friendly than the loss of the material through degradation.

RECOMMENDATION ON BIODEGRADABLE, BIO-BASED AND OXO-FRAGMENTABLE PLASTICS:

The usage of biodegradable plastics is seen as problematic and is only recommended for limited application purposes including those which are in a direct connection with organic application sectors (e.g. agricultural foils remaining in the environment). It is crucial to ensure that these biodegradable plastics are degraded under the given climatic conditions within a short timeframe. For all other applications, the biodegradable plastics are not regarded as suitable, as they can only be degraded effectively under laboratory conditions.

The usage of bio-based plastics is not affected by this. However, it is important to note that farming the raw materials for manufacturing these bio-based plastics competes with farming of food. Hence, responsible sourcing of feedstock for bio-based plastics is key to maximising potential benefits and mitigating risk (e.g. land and water stewardship, non-food grade etc.). Moreover, they need to equal fossil-based plastics in the sense that they are not obstacles to recycling them.

Oxo-fragmentable plastics are plastics which can be characterised by the fast fragmentation after usage – however, they are not compostable i.e. the fragmented plastic particles in the environment remain as microplastics litter and contribute to environmental degradation. Thus, it is highly recommended not to use these plastics for any application; or even to ban them.

BIBLIOGRAPHY

Agamuthu, P., Victor D. (2011). Policy trends of extended producer responsibility in Malaysia. Waste management & research: the journal of the International Solid Waste Management Waste and Public Cleansing Association, 29 (9), 945 – 953.

Alam, M., Siwar, C., Innocent, A. (2014). Waste Recycling in Malaysia Transition from Developing to Developed Country. Institute for Environment and Development (LESTARI), National University of Malaysia (UKM), Indian Journal of Education and Information Management, Vol 4 (1), October 2015.

Alexander, J. (1993). In Defense of Garbage. Connecticut, Praege.

Australian Bureau of Statistics. (2019). 4602.0.55.055 – Waste Account, Australia, Experimental Estimates, 2016 – 17. Available at: <https://www.abs.gov.au/ausstats/abs@.nsf/mf/4602.0.55.005>

Azahar Abas, M., Ta Wee, S. (2014). Municipal Solid Waste Management in Malaysia an Insight Towards Sustainability. Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia (UTHM). Conference Paper, 4th International Conference on Human Habitat & Environment, 2014.

Boerner, C., Chilton, K. (1994). False Economy: The Folly of Demand-Side Recycling. Environment 36(1), 6–15.

Craighill, A.L., Powell, J.C (1996). Lifecycle Assessment and Economic Evaluation of Recycling: A Case Study. Resources, Conservation & Recycling 17, 75–96.

Defra (2012) & England Carbon Metric in OECD (2018). Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses.

Department of Environment, Food & Rural Affairs (2020). UK Statistics on Waste. [pdf] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/874265/UK_Statistics_on_Waste_statistical_notice_March_2020_accessible_FINAL_rev_vo.5.pdf

DUH (2018). Bioplastik – Mythen und Fakten. [pdf] Köln: Deutsche Umwelthilfe e.V.. Available at: https://www.duh.de/fileadmin/user_upload/download/Projektinformation/Kreislaufwirtschaft/Verpackungen/180220_DUH_Infopapier_Bioplastik_de_eng.pdf.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2018). Waste Management in Germany: Facts, data, diagrams. [pdf] Available at: https://www.bmu.de/fileadmin/Daten_BMU/Pool/Broschueren/abfallwirtschaft_2018_en_bf.pdf.

GA Circular (2019). Full Circle. Accelerating the Circular Economy for Post-Consumer PET bottles in Southeast Asia. [pdf] Available at: <https://www.gacircular.com/full-circle/>.

Gandy, M. (1994). Recycling and the Politics of Urban Waste. St. Martin’s Press, New York.

Green Growth (2014). EU special: Achieving a circular economy. [online] Available at: <https://www.green-growth.org.uk/article/eu-special-achieving-circular-economy>; accessed 30 January 2018.

Hoornweg, D., Bhada-Tata, P. (2012). What a Waste. A Global Review on Solid Waste Management. [pdf] Available at: https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf.

IEEP (2017). EPR in the EU Plastics Strategy and the Circular Economy: A focus on plastic packaging. [pdf] Available at: <https://ieep.eu/uploads/articles/attachments/95369718-a733-473b-aa6b-153c1341f581/EPR%20and%20plastics%20report%20IEEP%209%20Nov%202017%20final.pdf?v=63677462324>.

IEEP (2019). How to implement extended producer responsibility (EPR). A briefing for governments and businesses. [pdf] IEEP commissioned by WWF.

Ismail, N. (2019) Importation of Plastic Waste To Malaysia. [pdf] Presentation Nurazaitul Aida Ismail (Ministry of Energy, Science, Technology, Environment and Climate Change), IMPEL Waste and TFS Conference October 16 – 17th 2019. Available at <https://static.rasset.ie/documents/news/2020/02/3-importation-of-plastic-waste-to-malaysia.pdf>, last access 24 March 2020.

Ivanovski, F., Sapuric, Z. and Dimitrovski, D. (2016). Functionality of Packaging Management in Macedonia. Journal of Environmental Protection and Ecology, 17(3), p. 1029 – 1036.

Jambeck, J.R., Geyer, R., Wilcox, C., Siegler, T.R., Perryman, M., Andrady, A., Narayan, R., Law, K.L. (2015). Plastic waste inputs from land into the ocean. Science, 768-771.

Jensen, F. (2019). The Danish government’s plastics action plan – and bioplastic. [pdf] Presentation Frank Jensen (Ministry of Environment and Food of Denmark), Bioplastic Conference February 6th 2019. Available at https://plast.dk/wp-content/uploads/2019/02/Perspectives-on-biobased-and-biodegradable-plastics-in-relation-to-the-Danish-Plastic-Strategy_Frank_Jensen.pdf, last access 16 January 2020.

JPSPN (2013). Survey on Solid Waste Composition, Characteristics & Existing Practice of Solid Waste Recycling in Malaysia.

Kaos, J. (2018). “Import of plastic waste banned.” The Star. October 27, 2018. Available at <https://www.thestar.com.my/news/nation/2018/10/27/import-of-plastic-waste-banned-permanent-prohibition-in-place-after-realising-msia-is-top-dumping-gr/>, last access 3 February 2019.

Kawai, K., Tasaki, T. (2016), Revisiting estimates of municipal solid waste generation per capita and their reliability. J Mater Cycles Waste Manag 18, 1–13 (2016)

Kuching North City Hall (2019). Assessment Rates. <https://dbku.sarawak.gov.my/page-292-298-268-Assessment-Rates.html>, last access 24 March 2020.

Kuala Lumpur City Hall (2019). Assessment Rates: Frequently Asked Questions. [pdf] Kuala Lumpur City Hall. Available at: http://www.dbkl.gov.my/images/articles/media_dbkl/pengumuman/2019/Mac/cukai-taksiran-flyers-EN.pdf

Lee, Y. N. (2019). “Malaysia, following in China’s footsteps, bans imports of plastic waste. CNBC. January 25, 2019. Available at <https://www.cnbc.com/2019/01/25/climate-change-malaysia-following-china-bans-plastic-waste-imports.html>, last access 3 February 2019.

MESTECC (2018). Malaysia’s Roadmap towards zero single-use plastics 2018-2030 - towards a sustainable future. Published 2018. [pdf] Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC). Available at: <https://www.mestecc.gov.my/web/wp-content/uploads/2019/03/Malaysia-Roadmap-Towards-Zero-Single-Use-Plastics-2018-20302.pdf>, last access 16 January 2020.

MESTECC (2020). Call for consultants to develop the Malaysian Circular Economy Roadmap for Plastic 2020-2030. Published 2020. [pdf] Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC). Available at: <https://www.mestecc.gov.my/web/wp-content/uploads/2020/02/Call-for-Consultant-Malaysia-Circular-Economy-Roadmap-for-Plastic-2020-2030-dwi-bahasa-1.pdf>

MEFD (2018). Plastik uden spild – Regeringens plastikhandlingsplan (Danish Plastic Action Plan). [pdf] Ministry of Environment and Food of Denmark (MEFD). Available at: https://mfvm.dk/fileadmin/user_upload/MFVM/Miljoe/Plastikhandlingsplan/Regeringens_plastikhandlingsplan_web_FINAL.pdf, last access 16 January 2020.

Ministry of Environment, New Zealand (no date). Landfill Full Cost Accounting Guide for New Zealand. <https://www.mfe.govt.nz/publications/waste/landfill-full-cost-accounting-guide-new-zealand/8-expanding-model-other->

waste, accessed 03.03.2020.

MPMA and MPRA (2019). An Advanced Plastics Recycling Industry For Malaysia. [pdf] Malaysian Plastic Manufacturers Association (MPMA) and Malaysian Plastic Recyclers Association (MPRA). Available at: <http://mpma.org.my/v4/wp-content/uploads/2019/09/White-Paper-FINALR.pdf>

OECD (2016). Extended Producer Responsibility: Updated Guidance for Efficient Waste Management.

Ong, S (2019). “New plastic recycling policy to boost economy.” The Malaysian Reserve. October 2, 2019. Available at: <https://themalaysianreserve.com/2019/10/02/new-plastic-recycling-policy-to-boost-economy/>, last access 24 March 2020.

Othman, A. F. and Ariff, S.U. (2019). “Yeo: Plastic dumped here to be shipped back today.” The New Straits Times. May 28, 2019. Available at: <https://www.nst.com.my/news/nation/2019/05/491970/yeo-plastic-dumped-here-be-shipped-back-today>, last access 3 February 2020.

PlasticsEurope (2017). View Paper On biodegradable plastics. [pdf] Brussels: Plastics Europe. Available at: https://www.plasticseurope.org/application/files/9915/1708/0417/20170824-view_paper_on_biodegradable_plastics_18_july_2017.pdf

PlasticsEurope (2018). Plastics – the Facts 2018. An analysis of European palstic production, demand and waste data. [pdf] Brussels: Plastics Europe. Available at: https://www.plasticseurope.org/application/files/6315/4510/9658/Plastics_the_facts_2018_AF_web.pdf

PRO Europe (n.y.). Packaging waste legislation in Denmark. Available at <https://www.pro-e.org/Denmark>, last access 16 January 2020.

Quach, P.; Milne, G. (2019). Plastics, A Growing Concern: A Vietnam Perspective. [pdf] Available at: https://www.ipsos.com/sites/default/files/2019-09/vn_plastic_waste_deck_-_final_-_eurocham_-_en.pdf

Resource Recycling (2019). Data Sort: Worldwide expansion of packaging EPR. <https://resource-recycling.com/recycling/2019/02/11/data-sort-worldwide-expansion-of-packaging-EPR/>, last accessed 21 June 2019.

The World Bank (2018). What a Waste 2.0 - A Global Snapshot of Solid Waste Management to 2050 [pdf]. Available at: <https://openknowledge.worldbank.org/handle/10986/30317>.

Sapuric, Z.; Shkrijelj, S.; Josifovski, B. (n.y.). Informal sector inclusion in the sustainable waste management system as an opportunity for employment and social inclusion of vulnerable groups. [pdf] Founded by UK Government. Available at: http://www.financethink.mk/wp-content/uploads/2018/01/InformalSector_Waste_Final_EN.pdf, last access 16 January 2020.

SWCorp (2019). Kompendium Pengurusan Sisa Pepejal Malaysia 2019.

UNESCAP (no date). Closing the Loop, Regional Policy Guideline.

UNEP (2019). Development of guidelines for environmentally sound management.

WIEGO (no date). Waste Pickers. <https://www.wiego.org/informal-economy/occupational-groups/waste-pickers>, accessed 14.02.2020.

Williams, A. (2019). Biodegradable bags can hold a full load of shopping three years after being discarded in the environment. [online] Available at: <https://www.plymouth.ac.uk/news/biodegradable-bags-can-hold-a-full-load-of-shopping-three-years-after-being-discarded-in-the-environment>.

WWF, cyclos (2019). Legal Framework Study of Extended Producer Responsibility. August 2019 Final Draft. [pdf] cyclos GmbH commissioned by WWF Germany. Available at: https://d2ouvy59podg6k.cloudfront.net/downloads/framework_study_EPR_cyclos____final.pdf, last access 16 January 2020.

GLOSSARY

Aggregators	Informal or formally registered businesses involved in buying materials from junk shops and material pickers, aggregating and compacting larger quantities, and selling to processors and/or recycler.
Approved Permit (AP)	An Approved Permit (AP) is an import and export license issued by the Permit Issuing Agencies (PIAs) under the Malaysian Customs Act 1967. For plastic import and exports, the Approved Permits are issued by the National Solid Waste Management Department (JPSPN) as the Permit Issuing Agency.
Bio-Based Plastics	Plastics which are manufactured from renewable sources; for instance, sugar cane (as opposed to fossil-based plastics, which are derived from fossil fuels). The term bio-based doesn’t necessarily imply bio-degradability.
Biodegradable Plastics	Plastics which can be degraded or composted by microorganisms under specific, environmental conditions. Biodegradable plastics can be made both of bio-based as well as fossil-based plastics.
Circular Economy	The circular economy is defined as an economic model in which resources like plastics are used more efficiently through the three guiding principles of “reduce, reuse and recycle” to close the loop. Shifting to such a system has economic as well as social and environmental benefits through reduced import dependency, employment creation, reduced littering, less resource extraction as well as improved human health conditions
Deposit-Refund System (DRS)	A system in which a surcharge is added to the product price on certain products and containers. When consumers return these containers or products after they have become waste, the surcharge is refunded.
Disposal	Refers to any waste management operation which is not defined as recovery; this also applies if the operation later results in a secondary treatment for the reclamation of substances or energy.
Energy Recovery	A process in which energy (heat, electricity, fuel) is generated from the primary treatment of waste. The most common implementation is incineration. Energy recovery is not a form of recycling.
Extended Producer Responsibility (EPR)	An environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle, i.e. when a packaging turns into waste in an EPR scheme for packaging. Thus, already when putting their packaged products on the market, producers and importers are responsible for the later treatment of their packaging waste. Therefore, producers / importers pay a fee upfront when their packed goods are placed on the market. The fee is used for collecting, recycling and disposing of the packaging waste and other costs arising from maintaining the system. It is not used as a contribution to the general public budget of a state.
Feedstock recycling	The process of breaking down the polymer structure of plastics into monomers and other basic chemical elements. These monomers can be used as virgin material alternatives in manufacturing new polymers. Particularly interesting for plastics which are difficult to recycle – due to their low quality, composite nature or low economic value.
Free riders	Producers and importers that enjoy the benefits of the EPR system without paying the corresponding fees, including those that under-declare their volumes.
High-rise residential	Non-landed residential buildings that include flats, apartments and condominium blocks.
Informal Sector	Individuals engaged in services with the primary objective of generating employment and income to the individual concerned, and typically operate with a low level of organisation without formal contractual arrangements. May include individuals who are formally employed but engage in side activities to supplement income on top of formal employment.
Material pickers	Individuals who pick up recyclable materials from the open environment. They may do some buying, but are primarily picking. Can be divided in to street material pickers (who operate primarily in urban environments) and landfill material pickers (who operate primarily in landfills). Are part of the informal sector.
Material recycling	Refers to recycling processes in which waste materials are mechanically rEPRocessed into products, materials or substances with equivalent properties – also referred to as closed-loop recycling – or a product which requires lower properties.
Manufacturer / Converter	Companies which produce packaging material by converting raw material.
Mono material	Consists of only one material chemical composition, with one basic material used to create the plastic packaging. Usually easy to recycle and are rigid in nature.

GLOSSARY

Multi material	Consists of more than one material chemical composition to create the plastic packaging. Usually not easy to recycle and are flexible in nature.
Landfill	A location where municipal solid waste is disposed. Sanitary landfills include proper ecological precautionary measures like wastewater treatment or landfill sealing. If this is not given, the landfill is considered as an unsanitary landfill or dumpsite.
Obligated companies	Companies which are obliged to pay a fee within a running EPR system. To ensure the level playing field, these are domestic producers and importers putting packaged products on the market.
Oxo-fragmentable Plastics	Plastics which quickly fragment into micro-particles in the presence of warmth, light and oxygen but do not degrade in the environment, thereby becoming a source of environmental pollution in the form of microplastic.
Polluter Pays Principle	The waste producer or owner is the potential polluter and carries responsibility (including financially). The “polluter pays” principle creates the necessary incentives for environmentally-friendly conduct and the required investment.
Processor	Informal or formally registered businesses engaged in the process of aggregating and converting recycables into flakes before selling them onwards to a recycler.
Producer	Companies that use packaging for their products when placed on the market.
Waste Prevention	Measures taken before a substance, material or product has become waste, which reduces quantities of waste and also includes re-use of products and the extension of the lifespan of products. Also reduces amounts of hazardous substances being used and the adverse impacts of the generated waste on the environment and human health.
Producer Responsibility Organisation (PRO)	The central element for the organisation of all tasks associated with the EPR system. Allows producers and importers to assume responsibility by combining their efforts and jointly managing the arising waste through collective responsibility. The PRO is the most important stakeholder (organisation) and is responsible for setting up, developing and maintaining the system as well as the take-back obligations of the obliged companies. The PRO is also referred to as system operator
Recovery	Describes any operation in which waste serves a useful purpose by replacing other materials or using its material properties (includes preparation for reuse, recycling as material or feedstock recycling and energy recovery).
Recyclables	Materials that still have useful physical or chemical properties after serving their original purpose and therefore can be re-manufactured. Some are of positive economic value as well (e.g. rigid PE, PP or PET bottles).
Recyclates	A product which has passed through a life cycle and subsequently a recycling process, which means it is made from used materials (e.g. plastic regranules).
Recycler	Companies that recycle pre-processed waste streams (e.g. sorted rigid PE plastics) by washing, flaking, agglomerating and regranulating. With these actions, an economically marketable output product is reached.
Reducing	The practice of using less material and energy to minimise quantities of generated waste and preserve natural resources. Includes ways to prevent materials from becoming waste before they reach the recycling state. Also includes re-using products.
Re-use	The repeated use of a product in the same form for the same or a different purpose. In this case, the product does not become waste.
Roadside collection	Formal, informal or individuals who go from door-to-door to collect recyclables from households or residential buildings. Usually operate out of trucks if they are a larger operation or converted tricycles / motorcycles with a side-car if they are a smaller operation. They primarily collect newspapers, cardboard and bulky high value plastics, but may collect plastic packaging if there is sufficient volume.
Single-use Plastics Products	Single-use plastic product refers to a product that is made wholly or partly from plastic and that is not conceived, designed or placed on the market to accomplish, within its life span, multiple trips or rotations by being returned to a producer for refill or re-used for the same purpose for which it was conceived.
Solid Waste Management (SWM)	The storage, collection, transportation and disposal of solid wastes. Also describes a practice by which several waste management techniques are used to manage and dispose of specific components of solid waste. Waste management techniques include avoidance, reduction, reuse, recycling, recovery and disposal.

Source Separation	The segregation of specific materials at the source for separate collection. Source separation is not considered to be part of recycling.
System operator	<i>see PRO</i>
Tailgate sorting	Recycables sorting conducted at the back-end of garbage collection trucks or compactor trucks.
Waste Hierarchy	A tool ranking waste management options according to their environmental impact. It gives top priority to waste prevention. If waste is generated, the priorities are from most to least preferred as follows preparing for re-use, recycling, then recovery and lastly final disposal.



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