Singapore Environment Council

Beyond BCRS: A Roadmap for Comprehensive Packaging Responsibility

Advancing Packaging Circularity

NOVEMBER 2026



Executive summary

Singapore's only landfill is projected to reach capacity by 2035 while packaging waste continues to account for about one-third of domestic waste generated. The Beverage Container Return Scheme (BCRS) provides a foundation and an opportunity to strengthen Singapore's approach to packaging waste management through a broader Extended Producer Responsibility (EPR) framework.

This report recommends an expanded packaging EPR scheme that: 1) covers all packaging materials, 2) utilises multi-pathway collection systems, 3) involves strong public-private partnerships, and 4) levies eco-modulated fees. These recommendations draw on an assessment of packaging EPR schemes in selected jurisdictions and Singapore's unique waste management context.

Central to the proposed scheme is a calibrated eco-modulated fee system that would fund scheme operations including collection and recycling infrastructure, innovation initiatives and stakeholder engagement. Over time, fees should reflect both the quantity of packaging placed on the market and its environmental performance, creating incentives for more sustainable packaging design and material selection.

Implementation should be phased. Before broader implementation, further studies and pilot initiatives over the next 1 to 3 years should evaluate key design parameters, including collection and recovery pathways, governance arrangements, cost allocation mechanisms and fee differentiation methodologies. This will help ensure that the EPR framework is effective, operationally feasible and suited to Singapore's waste management context. Subject to findings from studies and pilots, an equitable and evidence-based approach would enable Singapore to implement an EPR system in the next 3 to 5 years that balances environmental outcomes, economic considerations and operational feasibility while advancing a more resource-efficient and circular economy.

1. Introduction

1.1 Singapore's only landfill is expected to be full by 2035 with limited waste management options beyond that[1]. The amount of waste disposed in Singapore has increased by over 20% since 2000. Over the past decade, paper and cardboard recycling rates have fallen by 20 percentage points while plastic recycling remained low at 4% in 2025[2].Consequently, Singapore risks falling short of its Zero Waste Masterplan (ZWMP) targets to reduce waste-to-landfill per capita by 30% and achieve 70% overall recycling by 2030[3].

1.2 The ZWMP identified packaging waste, which accounts for about one-third of Singapore's total domestic waste[4], as a key waste stream to address[5]. To this end, the Beverage Container Return Scheme (BCRS), an Extended Producer Responsibility (EPR) scheme for plastic and metal beverage containers, was fully implemented in October 2026. However, there is scope to address packaging waste more comprehensively. Paper and glass account for approximately 30% and 10% of packaging waste respectively[6] but BCRS does not cover non-beverage packaging or beverage packaging made from other materials.

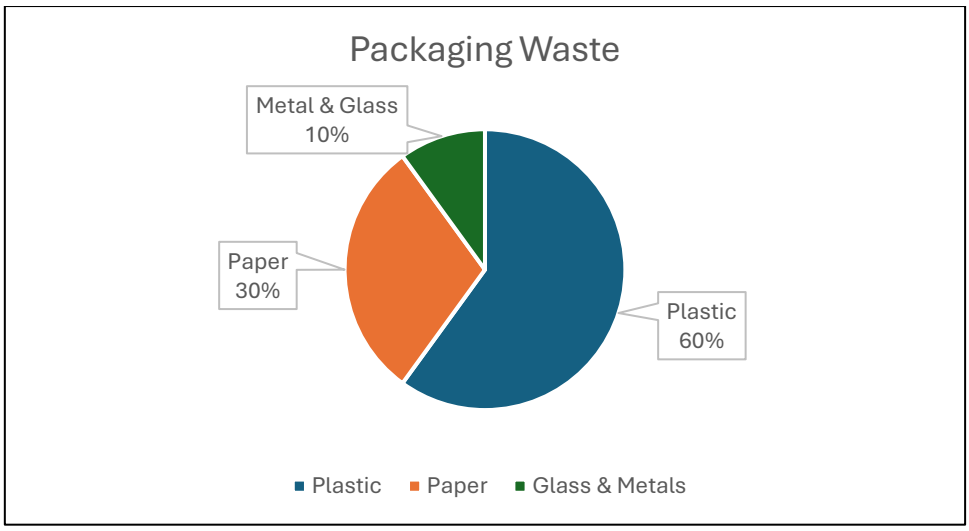


Figure 1: Percentage breakdown of packaging waste in Singapore in 2022

1.3 An analysis of EPR schemes in other jurisdictions found measurable improvements in managing packaging waste following their introduction. In South Korea the overall packaging recycling rate rose by 14 percentage points between the introduction of packaging EPR in 2003 and 2019, and the plastic packaging recycling rate exceeded 80%[7]. Taiwan's Waste Disposal Act of 1988 established a nation-wide recycling program. Since then, the overall recycling rate has risen more than tenfold from 5.8% in 1988[8] to 60% in 2025[9]. The European Union's (EU) 2018 Packaging and Packaging Waste Directive set packaging recycling targets, and the overall packaging recycling rate increased by 1.9 percentage points[10] by 2023. These examples suggest EPR schemes can meaningfully contribute to diverting packaging waste from landfill.

	Pre-EPR Packaging Recycling Rate	Latest Packaging Recycling Rate
South Korea	64% (2003)	78% (2019)
Taiwan (Only overall recycling rates available)	5.8% (1988)	60% (2025)
European Union	65.6% (2018)	67.5% (2023)

Table 1: Impact of EPR Schemes on Packaging Recycling

1.4 Given the ZWMP's adoption of an EPR for packaging waste, this report examines how an EPR scheme beyond BCRS could address Singapore's extensive packaging waste challenge and explores how such a scheme could be established. Through a review of various discrete and contextualised overseas EPR schemes and with consideration for Singapore's waste management context, this report provides recommendations on key parameters for the second phase of Singapore's packaging EPR. It also identifies where further study is needed, to determine the most suitable approach for Singapore's waste management system.

2. EPR Scheme Parameters

2.1 EPR schemes make producers responsible for the environmental impact of their product across its entire lifecycle, particularly at end-of-life. The OECD defines two broad types of EPR policies: Financial EPR and Operational EPR[11].

2.2 Financial EPR charges producers a fee for placing regulated products on the market. Fees can be based on the weight of products sold, the materials used or other environmental characteristics such as recyclability. The fees collected are often used to cover the cost of collecting and recycling regulated products. They may also fund initiatives such as public awareness campaigns, subsidising recycling or promoting environmentally friendly practices among producers covered by the scheme.

2.3 Operational EPR makes producers responsible for collecting and recycling their products. This can range from a general obligation to take back products or more specific targets for collection, recycling or both. Such schemes typically cover specified materials and may also mandate particular collection pathways such as a Deposit Return Scheme (DRS). Producers are required to bear the associated operational costs. Governments may also require producers to join a Producer Responsibility Organisation (PRO) to fulfil their collection and recycling obligations.

2.4 In practice, EPR schemes often combine elements of both Financial and Operational EPR approaches. This report reviews the EPR schemes in France, Germany, South Korea, Norway and Taiwan to identify best practices that could be adapted to the Singapore context. A detailed review of these EPR schemes is presented in Annex A.

3. Singapore's Waste Management Context

3.1 Five features of Singapore's waste management context inform the recommendations that follow. First, there is strong government oversight over Singapore's waste ecosystem. The National Environment Agency (NEA) appoints vendors to manage public collection infrastructure, regulates waste infrastructure on private premises and manages Singapore's waste incineration and landfilling facilities[12]. The NEA also licenses refuse and recyclables collection service providers, and waste and recyclables processing facilities[13].

3.2 Second, Singapore has limited industrial land so it must be used judiciously, including for waste collection and treatment infrastructure. Any recyclables collection systems and large-scale recycling facilities that an extended EPR may require would need to be planned with these land constraints in mind.

3.3 Third, not all packaging materials can be recycled effectively or economically in Singapore. Singapore has a small domestic market. While total waste volumes are not trivial, some material streams may not be generated in sufficient volumes to support dedicated collection or local recycling infrastructure. Additionally, most recyclable packaging material is currently exported overseas for further processing and recycling. This arrangement is highly susceptible to external factors such as global material prices (see Annex B), other jurisdictions' import policies, and varying logistics, freight and energy costs.

3.4 Fourth, as a small import-dependent market, Singapore may have limited influence over upstream manufacturer's packaging design decisions. For example, international producers may not heed Singapore's suggestions to redesign packaging with reduced material use or improved recyclability to support local recycling

3.5 Fifth, the recent introduction of the BCRS on 1 April 2026 provides a reference point for assessing whether the EPR scheme could be expanded to cover other types of packaging waste. Practical insights on consumer participation, collection logistics, cost structures and system governance can inform the design and implementation of an expanded EPR covering other packaging materials.

4. Recommendation for the next phase of Packaging EPR

4.1 Guiding Principles

4.1.1 In addition to the waste management context described earlier, several principles guide the recommendations. First, the EPR scheme should align with national policy objectives of:

i. increasing packaging recovery rates and diverting packaging waste from disposal pathways, and
ii. steering the market towards environmentally preferred packaging materials as determined by science-based life cycle assessments.

This means the scheme should not focus solely on recycling outcomes. It should also reduce excessive packaging waste and encourage packaging choices that minimise environmental impact across the lifecycle.

4.1.2 Second, the EPR scheme should be comprehensive in scope with implementation requirements tailored to the characteristics of different packaging. The objective should be to address all packaging waste regardless of type or material rather than limit EPR to selected materials or sectors. However, packaging differs in its material characteristics, recycling requirements and recycling options. And so practical implementation parameters are needed to reflect these differences. Recycling all materials should not be the sole objective. Where recycling is technically or economically unsuitable, the EPR scheme's implementation requirements could instead focus on packaging design requirements that prevent waste and encourage the use of more recyclable or environmentally preferable packaging.

4.1.3 Third, the EPR scheme should be rolled out in phases. The experience of BCRS revealed the operational and administrative complexities in establishing a new EPR scheme even for a limited range of beverage containers. Similar challenges can be expected as the proposed EPR is extended to a broader range of packaging materials. A phased roll-out would introduce producer's obligations progressively. This would allow operational capacity, infrastructure and industry readiness to develop progressively, while enabling lessons from earlier phases to inform subsequent implementation.

4.2 Operationalisation – Multi-material framework across industries

4.2.1 This report recommends a packaging EPR scheme with a multi-material framework across industries. Recognising that all material types have an environmental impact and waste footprint, a multi-material framework would therefore bring single- and composite-material packaging of various forms under the EPR scheme, encouraging producers to use less packaging. The aim is not to recycle all materials which is not viable in Singapore's context, but to discourage the use of materials that cannot be recycled.

4.2.2 There are four further reasons for adopting a multi-material framework. First, it avoids excluding major packaging streams that may account for a substantial share of packaging waste. For example, an estimated one-third of beverage containers[1], primarily those made of paper or glass, are not captured by the BCRS' material-specific focus on plastic and metal beverage containers. While BCRS is structured in this way to account for material value, consumption rates and operationalisation considerations, it nevertheless represents a missed opportunity to address other materials and packaging from other industries that contribute to packaging waste.

[1] With 30% of all packaging constituting paper and less than 10% constituting glass, it is estimated that a similar proportion applies to beverage containers.

4.2.3 Second, a multi-material framework discourages producers from substituting to non-regulated materials. Using the example of BCRS, regulatory commitments could be avoided by switching to paper or glass. Such substitution risks making the EPR scheme less effective.

4.2.4 Third, implementation of a multi-material framework is likely to be more cost-effective in the long-term than adopting a single-material approach. Unlike a single-material scheme, a multi-material framework could enable economies of scale by leveraging shared collection networks, logistics, sorting facilities and administrative systems across different packaging materials and types. This reduces duplication of infrastructure and operational costs.

4.2.5 Fourth, a multi-material framework may be a faster route to achieving long-term waste reduction. It will still require a phase-in period to address operational complexities including producer registration and collection and recycling infrastructure. However, extending EPR to one material or sector at a time could take as long or longer. For example, BCRS which covers beverage containers of selected materials took almost four years to be implemented following its initial announcement in 2022[14]. Given the urgency for waste reduction, a comprehensive scope is therefore warranted.

4.2.6 In the **short-term (1 to 3 years)**, further studies can be conducted to assess the practical implementation of a multi-material EPR framework including the risks of packaging substitution, gaps in coverage and the readiness of recycling and administrative systems.

4.2.7 In the **medium-term (3 to 5 years)**, and subject to the outcome of these studies, the EPR framework can be expanded beyond BCRS to cover all packaging materials. All packaging materials should fall within the scope of the expanded framework from the outset but producer obligations may be phased to balance implementation efficiency with industry and infrastructure readiness.

4.3 Operationalisation – Multi-pathway collection

4.3.1 This report recommends that the packaging EPR scheme adopts a multi-pathway collection system that builds on existing recycling infrastructure. In addition to the existing system of over 80,000 blue recycling bins[15], occasional household recyclables collection drives and BCRS reverse vending machines, additional recycling collection pathways can be introduced where appropriate, subject to further studies on operational feasibility and cost-effectiveness.

4.3.2 There are two main reasons for this approach. First, Singapore's packaging is diverse and different packaging has different collection requirements depending on its size, disposal frequency and material type. For example, larger packaging may require specialised collection while different materials may need to be directed to appropriate facilities for specific recycling processes. A multi-pathway system can therefore better match collection and recycling requirements to the needs of each packaging stream, improving overall system performance and resilience. This approach is consistent with the overseas case studies reviewed.

4.3.3 Second, multiple collection pathways can reduce contamination and improve the quality of recovered materials. The blue recycling bin network collects recyclables co-mingled (mixed together in one bin). This provides convenient and broad coverage but contamination rates of 40%[16] are common. Contamination reduces the quantity and quality of materials available for recycling. Targeted collection pathways can complement co-mingled collection by providing cleaner streams for materials that are particularly susceptible to contamination, require basic pre-processing by consumers or need higher-quality feedstock for recycling.

4.3.4 However, implementing multiple collection pathways is resource-intensive, and it remains unclear which combination of existing and additional pathways would most effectively manage the diversity of packaging waste. Therefore, further studies and pilots are needed to assess operational feasibility and cost-effectiveness. This is particularly important because recovery routes that are

technically feasible may not be economically viable at scale with logistics, material volumes and processing capacity requiring time to develop.

4.3.5 In the **short-term (1 to 3 years)**, pilots can be conducted to explore operationalisation approaches covering methods to enable behavioural adaptations, collection methods, sorting configurations, transportation logistics and recycling pathways for various packaging materials. The pilots would also generate data on material flows, collection yields and processing costs. Insights obtained will guide the implementation of a comprehensive EPR framework.

4.3.6 In the **medium-term (3 to 5 years)**, operational capabilities and collection pathways are expected to mature. For recyclable packaging, viable collection and regional recycling pathways can then be established to support recycling at scale.

4.4 Operational governance – Public-Private partnership

4.4.1 Given Singapore's waste management context, the development and operation of a packaging EPR scheme will require a strong public-private partnership in which government and industry play complementary roles.

4.4.2 Government involvement is important given its central role in the waste ecosystem. First, it would ensure EPR operations are well-coordinated with Singapore's existing recyclables collection infrastructure. Leveraging existing infrastructure rather than establishing entirely separate systems is preferred as it would be more cost-efficient and potentially achieve higher packaging recycling rates. Public Waste Collectors appointed by NEA through open tenders already manage public waste collection. It would therefore be more practical and coherent for the state to integrate EPR-related collection operations, informed by industry perspectives.

4.4.3 Second, government involvement would speed up the development of recycling infrastructure. Given its role in land allocation, zoning and waste management planning, the Government is well-placed and will likely need to facilitate the allocation of industrial land to support additional recycling facilities.

4.4.4 Third, the government can promote alignment and transparency in trade policies and standards with countries that may accept and treat collected or processed packaging materials. Differences in requirements such as definitions of contaminated recyclables and permissible water content can hinder exports to overseas off takers (buyers of recovered materials). Greater alignment and transparent communication of acceptance criteria would facilitate cross-border trade and support alternative end-of-life pathways where domestic recycling is not viable. This would strengthen the resilience and long-term sustainability of the EPR system.

4.4.5 Simultaneously, industry involvement is necessary to ensure that EPR operations are informed by practical knowledge of packaging and recycling. Producers and recyclers possess technical knowledge of the packaging materials on the market, their recyclability constraints and end-of-life treatment options available. This expertise is critical to designing and optimising effective collection and recycling systems that are matched to the characteristics of different packaging streams.

4.4.6 The EPR scheme may include the establishment of a Producer Responsibility Organisation (PRO) to facilitate intra-industry and public-private collaboration. A PRO is typically an independent body that manages EPR compliance on behalf of producers. Depending on the eventual EPR framework it could organise and manage collection systems or carry out due diligence to check that producers comply. However, setting up PROs may require complex coordination across multiple stakeholders to ensure financial viability and transparency, and to manage potential implementation challenges.

4.4.7 However, the appropriate extent and division of responsibilities between government and industry will still need to be determined and should be further studied as the scheme is developed.

4.4.8 In the **short-term (1 to 3 years)**, these studies can be undertaken through existing industry-led platforms such as the Packaging Partnership Programme. They should focus on operational and cost efficiency, industry and infrastructure readiness and long-term sustainability. In particular, they should assess:

i. which functions are best performed by government, industry or a jointly governed entity while maintaining clear producer responsibility for packaging placed on the market.
ii. different approaches to allocating cost between the government and producers which may affect affordability and public acceptance of the scheme.

Such insights can help balance the polluter-pays principle with economic and social considerations and inform the preferred public-private partnership model.

4.5 EPR Mechanism – Eco-Modulated Fees

4.5.1 This report proposes eco-modulated fees as the primary EPR mechanism. The fee would be levied on packaging producers and importers that place packaging on the Singapore market, and only once for each unit of packaging. Once fully implemented, the fee would vary according to

i. put-to-market volume (calculated as packaging weight multiplied by quantity); and
ii. how sustainable the packaging is, subject to further study on the packaging's lifecycle environmental impact.

The fee would initially be uniform so that data can be collected and fees calibrated over time (see 4.5.6). Fee revenue can fund recycling infrastructure needs, research and innovation on sustainable packaging, and multi-stakeholder engagement for packaging waste reduction and material recovery.

4.5.2 Eco-modulated fees aim to reduce the volume of unnecessary packaging at source while mitigating the negative environmental impacts of necessary packaging. As a targeted approach to EPR, they work in two ways. First, the fee signals that packaging has an environmental cost and establishes producer responsibility for managing it. Because producers pay for the packaging they use and pay more when they use more, they have an incentive to right-size packaging and reduce unnecessary material use.

4.5.3 Second, the fee would vary according to how packaging performs against environmental criteria from life cycle assessment. This signals clear expectations for packaging design and material choice. When appropriately calibrated, the fee can encourage producers to adopt recyclable packaging materials and designs with lower environmental impact that are suited to Singapore's waste management context.

4.5.4 In the **short-term (1 to 3 years)**, the focus can be on developing a framework for eco-modulation. This requires data on packaging volumes and environmental performance which could be gathered in two ways. First, more extensive data on packaging in Singapore could be collected through Mandatory Packaging Reporting (MPR). The MPR currently obligates only producers with a turnover exceeding S$10 million to report on their packaging weight. This requirement could be expanded to other producers. Second, lifecycle assessments of various packaging materials and designs can be conducted to obtain data on environmental performance within Singapore's consumption and waste management context.

4.5.5 The framework for eco-modulation can be developed with technical experts, industry and policymakers to take into account:

i. the relative volumes of various materials and types of packaging in Singapore; and
ii. measurable life-cycle indicators for packaging such as recycled content, recyclability and carbon footprint.

This framework will provide the basis for calibrated and proportionate eco-modulated fees. For example, packaging comprising composite or biodegradable materials may be difficult to recycle at scale in Singapore. Therefore, the framework could charge a higher fee to reflect disposal costs and associated environmental externalities, discouraging the use of such packaging.

4.5.6 Building the baseline data for the eco-modulation framework may require several cycles of MPR and lifecycle assessments over multiple years. To not hold up the implementation of eco-modulated fees, one approach could be to implement a uniform fee structure across all packaging materials in the **medium-term (3 to 5 years)**. Once the scheme is running, better quality packaging data will be collected to support fee differentiation according to materials. The fee structure can then be progressively transitioned towards full eco-modulation as sufficient data become available.

5. Conclusion

5.1 This report recommends an expanded EPR scheme to address Singapore's extensive packaging waste challenge. The scheme should combine coverage of all packaging materials with uniform producer obligations, multi-pathway collection, strong public-private partnership and eco-modulated fees.

5.2 Given the diversity of packaging materials, market actors and recycling pathways, EPR should be designed as a structured framework with calibrated implementation options, rather than a single fixed model. This framework should be implemented in an equitable and phased way tailored to Singapore's waste management context and operational realities. Further study will be required to determine the appropriate phasing, combination of collection and recovery pathways, division of responsibilities between government and industry, and fee differentiation methodology.

5.3 Sustained multi-stakeholder engagement will be critical to the successful design and implementation of an EPR scheme, given it depends on whole-of-system participation across industry, consumers, civil society and government. While further studies are required to refine key implementation parameters, the direction of travel is clear: a phased and equitable EPR framework offers a credible pathway to strengthen packaging recovery, improve packaging circularity and reduce the environmental impacts of packaging waste. Implemented effectively, such a framework can become a cornerstone of Singapore's transition to a more resource-efficient and circular economy.

6. Annexes

Annex A: Review of overseas Packaging EPR models

A.1 Case Studies in Focus

A.1.1 France, Germany, South Korea, Norway and Taiwan offer unique lessons given their discrete approaches to packaging EPR schemes implemented.

A.1.2 **France** was one of the earliest adopters of a packaging EPR in 1992, covering household and certain commercial packaging made of various types of materials. The EPR was introduced to shift the financial burden of packaging waste management from municipalities to producers. A defining characteristic of the French system is its eco-modulated fee structure where producers pay different fees depending on the recyclability and environmental performance of their packaging.[17]

A.1.3 **Germany** was also one of the first countries globally to operationalise producer responsibility at scale, introducing the packaging EPR system in 1991. The system was established in response to rising packaging waste volumes and growing landfill constraints. Germany's approach is characterised by strong transparency and enforcement mechanisms. Packaging producers are required to register and report put-to-market packaging volumes on a public database with failure resulting in fines or even sales prohibitions.[18]

A.1.4 **South Korea** implemented an EPR system in 2003 for a wide range of packaging materials including plastics, glass, metals and cartons. The system was implemented to address increasing waste generation from rapid economic growth. South Korea's system is significant in how strongly state-led it is compared to many European models. Producers and importers of packaging materials are assigned mandatory recycling obligations with reporting and verification closely supervised by government authorities.[19]

A.1.5 **Norway** introduced packaging EPR in 1995 in response to rising waste volumes and increasing policy emphasis on resource efficiency, landfill diversion, and alignment with European environmental standards. Norway's model is widely regarded as a strong industry-led EPR system with flexible operational implementation mechanisms under industry, with regulatory oversight on collection and recycling targets and compliance monitoring.[20]

A.1.6 **Taiwan** was one of Asia's pioneers introducing producer financial responsibility for waste, including plastic, metal, paper and glass packaging waste, under its Waste Disposal Act in 1988. The policy was designed to build a stable funding mechanism for national recycling infrastructure. Taiwan's model is notable for its centralised Recycling Fund approach where fees are paid by producers to a fund administered by the government which is used to subsidise collection, sorting, and recycling activities across the country.[21]

A.1.7 Across these case studies, this section focuses on key EPR financial responsibilities, operational responsibilities and operations.

A.2 Financial Responsibilities

A.2.1 EPR schemes differ in how they assign financial responsibility to producers, particularly in **how producer fees are calculated** and the **extent to which producers are responsible for the costs of managing packaging at end-of-life**.

A.2.2 EPR schemes can charge producers flat-fees or eco-modulated fees. Flat fees are computed based on a fixed rate per packaging quantity and material type placed on the market. In contrast, eco-modulated fees involve variable charging depending on the recyclability and environmental impact of

the packaging material. The former is practiced in Norway where producers are charged based on the packaging material and weight. In contrast, comprehensive eco-modulated fees are charged in France and South Korea based on whether packaging is compatible with existing recycling streams and facilities, whether it consists of mono-materials or composite-material, whether disruptive additives are present and whether the packaging was manufactured using recycled materials. Germany and Taiwan are in transition. Shifting from a flat fee system, they are beginning to implement eco-modulated fees partially with fees calculated based on recyclability and environmental impact criteria for selected materials or packaging types.

	Flat vs Eco-Modulated Fee	Pros	Cons
Norway[22]	**Flat fee.** Fees for packaging charged by weight and material but beverage containers utilize a DRS system with a flat fee that accounts for quantity rather than the size or material of the container.	Simpler to administer with less detailed reporting and monitoring required.	Does not create incentives for eco-design, as environmentally sustainable and less sustainable packaging are charged the same rate. Slower progress towards circular economy goals.
France[23]	**Highly Eco-modulated.** France utilizes one of the most complex "bonus-malus" (reward-penalty) systems, where fees can be slashed by up to 50% for eco-design or increased for non-recyclable materials.	Differentiated charges based on environmental performance create direct financial incentives to improve product design. Faster progress towards circular economy goals.	Administratively complex due to assessments of recyclability and environmental impact. Challenging to determine appropriate eco-modulation criteria that is robust and generally agreed upon.
South Korea[24]	**Highly Eco-modulated.** Fees are calculated based on compatibility with existing recycling systems, use of mono- versus composite materials and presence of disruptive additives.		
Germany[25]	**Moving towards fully eco-modulated fees.** Fees are calculated based on weight and material type (plastic, paper, glass), with significant discounts for packaging designed for high recyclability.	-	-
Taiwan[26]	**Moving towards fully eco-modulated fees.** Beyond weight and material of packaging, Taiwan is moving towards charging "Green Design Fees" for packaging that is sustainably and recyclable.		

Table 2: Producer Fees

A.2.3 A second distinction is who is financially responsible for the costs associated with packaging at end-of-life. Under a **full industry cost responsibility model**, producers, importers and other obligated entities bear the financial obligations assigned to the EPR scheme including applicable costs of collection, sorting, recycling and system administration. This is seen in Germany, Norway and Taiwan where producers, importers and retailers finance the net costs of collection, sorting, recycling, and public communication, with administrative overheads borne by industry. These fees could be paid to a PRO as in Germany and France, or to a government body as in Taiwan. Driven primarily by fiscal pressure, France which traditionally adopted a shared cost model has also progressively shifted towards stronger full cost responsibility in line with EU requirements for producers to cover the "net costs" of waste management.

A.2.4 Under a **shared-responsibility model** producers contribute through EPR fees while government or other public entities continue to finance specified functions such as collection infrastructure or system oversight. A shared cost model is practiced in South Korea. While producers contribute through EPR fees linked to recycling obligations, public financing supports certain aspects of infrastructure and oversight.

	Full Industry Cost vs Shared Cost	Pros	Cons
Germany[27]	**Full Cost.** Producers/Importers are responsible for financing the "Dual System," which operates entirely separate from municipal tax-funded waste.	Strong polluter-pays principle. Producers incentivised to reduce packaging volumes and improve recyclability to lower their compliance costs	Higher costs for businesses due to compliance fees. Producers may pass costs on to consumers Industry resistance during the early stages of policy implementation.
Norway[28]	**Full Cost**. The industry funds 100% of the system to avoid a high government environmental tax.		
Taiwan[29]	**Full Cost.** Industry provides funds which are used for packaging waste collection, sorting and recycling.		
France[30]	**Moving to Full Cost.** Historically a shared model (~75-80% industry funded), France is aggressively shifting to 100% responsibility under the AGEC Law, now including costs for litter cleanup and public bins.		
South Korea[31]	**Shared Cost.** Industry funds the recycling operations and processing, while local governments (taxpayers) often bear the cost of household collection logistics and providing infrastructure/land.	Lowers financial burden on producers as costs are distributed across stakeholders. Stability of public financing enables long-term system investments. Lower likelihood of immediate price pass-through to consumers.	May weaken the polluter-pays principle. Less pressure on producers to adopt packaging reduction measures or eco-design improvements.

Table 3: Cost Allocation

A.2.5 The full industry cost model has the key benefit of implementing a strong polluter-pays principle. By placing the full financial responsibility for collection efforts on producers, it creates strong incentives for eco-design and waste reduction. When companies must bear the full cost of managing packaging at end-of-life, they are encouraged to reduce packaging volumes and improve recyclability to lower their compliance costs. Additionally, this model may also reduce the need for government to directly fund and manage day-to-day waste operations. However, a full cost model can result in higher costs for businesses as compliance fees may be significant.[32] Higher financial obligations may lead to industry resistance particularly during the early stages of policy implementation as businesses may be concerned about increased operational costs and potential impacts on competitiveness.

A.2.6 For the shared cost model, the key advantage is that it lowers the financial burden on producers as the costs of waste management are distributed across producers and governments. Also, public funding provides a degree of stability in financing and enables long-term system investments. However, a shared model may weaken the polluter-pays principle as producers are not fully accountable for the environmental impacts of the packaging they place on the market especially if other producer accountability measures are not implemented. As a result, the pressure on producers to adopt packaging reduction measures may be less pronounced compared to systems where the full cost of waste management is internalised by industry.

A.3 Operational Responsibilities

A.3.1 Packaging EPR schemes vary widely in how day-to-day collection, sorting, and recycling logistics are organized and executed. While all schemes aim to manage waste effectively, systems assign operational execution such as running collection networks, managing sorting facilities, and processing materials differently across industry actors, government bodies, and private service providers

A.3.2 In most industry-led frameworks, these operational responsibilities are managed directly by producers through Producer Responsibility Organizations (PROs). In France, Germany, and Norway, PROs directly coordinate waste logistics by contracting with private waste management companies and municipal collectors. However, South Korea utilizes a state-run operational framework. The Korea Resource Circulation Service Agency (KORA) under the Ministry of Environment directly manages and coordinates physical recycling and infrastructure. In this model, PROs play a comparatively minor role by handling administrative fees and compiling production, import and recycling data.

A.3.3 Taiwan represents a unique case. While collection is overseen by the government, it also encourages informal collection by community groups and residents through the "4-in-1 Recycling Programme". Further, recycling is neither handled directly by the government nor PROs. Instead, Environmental Protection Administration (EPA)-licensed recyclers are incentivised to recycle through reimbursements or subsidies from the Recycling Fund Management Board under the EPA.

	Operations	Pros	Cons
South Korea[33]	**State-led** Korea Resource Circulation Service Agency (KORA) oversees and coordinates recycling	Rapid policy implementation with operations responsive to emerging environmental priorities. Enables more effective policymaking, monitoring, and long-term planning. Consistent implementation and practices across industries. *For Taiwan Specifically:* Improved recycling performance and capacity through incentivising private sector.	Heavy dependence on government administration requiring sustained public sector capacity to manage. Reduces incentives for innovation in waste management solutions. *For Taiwan Specifically:* Overreliance on public subsidies rather than market-driven efficiency and innovation.
Taiwan[34]	**State-led** Hybrid collection by government and informal sector. Recycling by licensed recyclers incentivised through reimbursement and funding by Recycling Fund Management Board.		
Germany[35]	**Industry-led** Competitive "Dual Systems" (e.g., Duales System Deutschland) manage collection.	Operational and cost efficiency due to technical expertise and ability to adjust quickly to circumstances. Align producer incentives to reduce packaging use and improve recyclability. Clear demarcation of roles between producers and government.	Administrative complexity when there are multiple PROs to engage. PROs may prioritise cost efficiency and industry interests over intended policy outcomes. Competition could limit PROs' ability to achieve economies of scale.
France[36]	**Industry-led** Industry-owned PROs work with municipalities to fund and organize local collection.		
Norway[37]	**Industry-led** Industry-owned PROs coordinate with private and municipal collectors.		

Table 4: Governance models

A.3.4 These case studies show the diversity of approaches to governance of a packaging EPR system. From extensive government involvement as in the example of South Korea to the more industry-directed strategy of Norway, a variety of approaches have been effective and robust in their contexts, considering the significant improvements in recycling rates after the EPR system was established in all five countries.

A.4 Operationalisation

A.4.1 To operationalise a packaging EPR scheme, different approaches can be taken from the **type of materials** which are collected (e.g. plastic, glass, paper, metal) to the **collection pathways** offered.

A.4.2 The scope of EPR mandates may include **single-material packaging (i.e. packaging made of only one type of material) or multi-material packaging (i.e. packaging made of different types of material and even composite materials).** The packaging EPR schemes in France, Germany, Norway, South Korea and Taiwan are multi-material schemes which cover a broad set of packaging materials (e.g. paper/cardboards, plastics, glass, metals, composite packaging). Despite expansive scopes, Germany and Norway also place additional focus on collecting beverage containers. They incentivise upfront sorting and collection via a Deposit Return Scheme coupled with reverse vending machines as the collection method. This ensures higher collection rates and lower contamination levels for PET bottles and aluminium cans, which are higher value recyclables compared to mixed plastic packaging bottles and tin-plated steel cans. Across these countries, a multi-material scope was implemented due to the significant packaging waste challenge. Packaging waste constituted a significant proportion of waste for these countries standing at 30% to 40% of municipal and household waste for France,

Germany and South Korea, and 25% to 30% of municipal and household waste for Norway. While Taiwan does not explicitly consider packaging waste as a core category among its recyclables, it is established that plastics and paper contribute significantly to their municipal waste stream due to high e-commerce activity in the country. Implementing a multi-material EPR has arguably been effective in these case studies with high collection rates following implementation as in the table below.

	Pre-EPR Recovery Rate of Packaging Materials	Post-EPR Recovery Rate of Packaging Materials	Top performing stream
Norway	No official data (1990s)	58.3% (2021)[38]	Beverage containers at ~92% (2023)[39]
Germany[40]	37.3% (1991)	94.3% (2017)	PET containers at ~98% (2023)[41]
South Korea[42]	64% (2003)	78% (2019)	PET containers at 80% (2019)[43]
France	No official data (1990s)	69% (2024)[44]	Glass at 84%[45]
Taiwan* *Only overall recycle rate available	5.8% (1988) *	60% (2025) *	Paper tableware at ~89% (2021)[46]

Table 5: Packaging Recycling Rates

A.4.3 The five case studies demonstrate that multi-material EPR can be introduced **either concurrently or through phased expansion**. France[47] and Germany[48] adopted broad multi-material packaging coverage from the outset with subsequent increases in recycling targets and development of collection and recycling infrastructure. Norway[49] similarly established EPR arrangements for several packaging materials within 1995 although individual material agreements were introduced at different points during the year. South Korea[50] adopted a more phased approach, initially covering four packaging categories in 2003 - metal cans, glass bottles, paper packs and plastic packaging - before adding film packaging in 2004 and other products subsequently. Taiwan[51] similarly developed its multi-material system progressively, evolving from earlier material-specific recycling requirements to broader coverage. These approaches suggest that phasing was primarily used to allow time for infrastructure and system capacity to develop while concurrent approaches provided comprehensive coverage and avoided gaps or substitution between materials.

A.4.4 All case studies examined operate a **multi-pathway collection system**. These pathways typically include bring-in or drop-off schemes (where consumers return waste to centralised collection points such as redemption centres), household or kerbside collection (where waste is collected directly from residential premises or designated recycling bins), and deposit return schemes for specific packaging types, which involve take-back through reverse vending machines or manual return systems.

A.4.5 The choice of collection pathways often takes into consideration the nature of the packaging waste including the frequency of collection needed and need for processing such as washing of packaging. For example, packaging waste that is generated more frequently and in higher volumes might require more frequent collections resulting in household collection being offered. Otherwise, households may not be incentivised to bring the waste to communal collection points or store them for long. Additionally, packaging waste that cannot be recycled if contaminated are likely more suited to bring-in schemes where consumers can be rewarded for taking the necessary processing steps. Beyond these practicalities, other factors considered include cost, the level of public participation desired, convenience to the public and the operating context of the collection system (e.g. population density). Ultimately, the wide variety and nature of packaging waste have often resulted in countries adopting multi-pathway collection systems and it would seem any packaging EPR scheme that wishes to be effective would need to do the same while considering the unique local landscape.

Country	Bring in schemes	Household Collection	Others (e.g. Take Back)
Norway	Reverse Vending Machines (RVMs) in retail stores for all plastic and aluminium beverage containers. Communal bins for glass and metal provided in certain neighbourhoods. Otherwise, recyclables are dropped off at local recycling points.	Household bins for paper/cardboard and plastic films (often collected bi-weekly or monthly). Household bins for glass and metal are municipal-dependent.	Separate systems for industrial and commercial waste.
South Korea		Mandatory on-site sorting in apartments where residents sort by 7+ specific material streams, including the common packaging materials like paper, plastics.	Mandatory take back systems for large electronics and appliances, and the packaging from these appliances.
Germany	Centralized communal containers for glass (separated by White, Green, and Brown color). RVMs for beverage bottles.	"Yellow Bag" or bin for all lightweight packaging (plastics, metals, and composites) collected directly from homes.	Separate systems for industrial and commercial waste.
France	Communal bins for glass, paper, and textiles. Supermarkets often provide "Bring-in" bins for small electronics/batteries.	National household collection for all recyclables.	Separate systems for industrial and commercial waste.
Taiwan	Community drop-off points and scheduled collection by recycling organisations. E-waste and other non-typical waste have designated collection points.	Mandatory sorting of waste (e.g. paper, plastics, glass, metals, and food waste) by households before handing directly to recycling trucks. Pay-as-you-throw official bags available for general waste.	Separate systems for industrial and commercial waste.

Table 6: Collection Pathways

Annex B: Material-specific Operational and Economic Differences

B.1 Different materials require distinct pre-processing and recycling methods. Their recycling viability also varies depending on market conditions. An overview of the key concerns of different materials is tabled below.

	Pre-Processing		Recycling requirements		Market Considerations* **Impacted by oil and freight price volatility, along with structural factors affecting price and margins of recyclable materials*	
	Household/ Community Engagement	**Industry /PRO /External Services**	**Contamination**	**Facilities**	**Market Value**	**Demand**
Paper	Easy to sort into different categories (e.g., cardboard, mixed paper, newspapers) by residents without safety tools requirement Drop-off recyclables at kerbsides or municipal recycling areas	Recycling trucks can collect at designated points regularly	**Susceptibility Level:** High **Causes:** Moisture, Food contamination (e.g. milk cartons, pizza boxes)	Additional or special processing for stained or coated paper materials	**Level:** Medium **Reason:** Quality sorting and grading required to optimise value	**Level:** High **Reason:** Widely applicable in various uses, including straw production and tissues
Plastic	Easy to compile for collection at kerbside bins and municipal recycling areas	Deposit Return Scheme for bottles Complex sorting due to separation by polymer type (PET, HDPE, PP, etc.), which requires recycling organisation's expertise Recycling trucks can collect at designated points regularly	**Susceptibility Level:** High **Causes:** Food residues, Multi-layer materials, Mixed plastics	Sorting technology may not be advanced enough to correctly sort according to types	**Level:** Low-Medium **Reason**: PET, PE and clean plastics are more valuable and sought after compared to other plastic polymers	**Level:** Low-Medium **Reasons**: PET and PE (Medium) Other plastics (Low) Sorting errors may affect quality of recycle outcomes, reducing price.
Glass	Easy to sort by color (e.g. clear, green, brown) by residents without expert supervision Drop off at kerbside bins and municipal recycling areas	DRS for containers Recycling trucks will collect at designated points regularly	**Susceptibility Level:** Low **Causes:** Broken glass may get mixed with other materials, Color mixing reduces quality and limits reuse	Technology may not be efficient at sorting recyclable glass from broken or contaminated glass	**Level:** Low **Reason:** Typically given away for free or recyclers impose a fee for recycling	**Level:** Low-Medium **Reasons:** Beverage containers (Medium), Other glasses (Low) Payment required for glass to be recycled
Metal	Easy and safe for residents to compile Drop off at kerbside bins and municipal recycling areas	Complex sorting due to separation by metal type (e.g. steel, aluminium, etc) Recycling trucks will collect at designated points regularly	**Susceptibility Level:** Medium **Causes:** Food residue may lead to corrosion	Technology may not be readily available, as it requires magnetic separation for steel and eddy current separation for aluminium	**Level:** High **Reason:** Metals are globally traded commodities	**Level:** High **Reason:** Aluminium and steels widely reused in beverage cans, packaging, and construction

Table 7: Materials Pre-Processing, Recyclability and Market Considerations

7. References

[1] National Archives of Singapore, *Masterplan sets target to reduce waste sent to Semakau Landfill by 30% by 2030, to help extend Semakau's life-span beyond 2035*. Retrieved from https://www.nas.gov.sg/archivesonline/data/pdfdoc/MSE_20190830001.pdf

[2] National Environment Agency, *Waste Statistics and Overall Recycling*. Retrieved from https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling

[3] Ministry of the Environment and Water Resources, *Zero Waste Masterplan Singapore*. Retrieved from https://isomer-user-content.by.gov.sg/23/795cfb86-73c7-40e8-b6c5-2ec97bc4325f/zero-waste-masterplan.pdf

[4] National Environment Agency, *Mandatory Packaging Reporting*. Retrieved from https://www.nea.gov.sg/our-services/waste-management/mandatory-packaging-reporting

[5] Ministry of Sustainability and the Environment, *Waste Management*. Retrieved from https://www.mse.gov.sg/policies/waste-management/

[6] Ministry of Sustainability and the Environment, *Singapore Packaging Star Awards Ceremony 2024 – Dr Amy Khor*. Retrieved from https://www.mse.gov.sg/latest-news/singapore-packaging-star-awards-ceremony/

[7] Korea Resource Circulation Service Agency (KORA), *Packaging Recycling Statistics*. Retrieved from http://www.kora.or.kr/eng/products/packingRecyclingTotal.do

[8] Circular Taiwan Network, *Development of circular economy in Taiwan*. Retrieved from https://circular-taiwan.org/en/city/taiwan/

[9] Environmental Management Administration (Taiwan), *4-in-1 Recycling Program Infographics*. Retrieved from https://www.ema.gov.tw/en/information-service/infographics/4084.html

[10]Eurostat, *Packaging waste statistics*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics

[11] OECD, *Extended Producer Responsibility Reports*. Retrieved from https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/04/extended-producer-responsibility_4274765d/67587b0b-en.pdf

[12] National Environment Agency, *Waste Management Overview*. Retrieved from https://www.nea.gov.sg/our-services/waste-management/overview

[13] National Environment Agency, *General Waste Disposal Facility*. Retrieved from https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/refuse-disposal-facility/waste-disposal/general-waste-disposal-facility

[14] National Environment Agency, *NEA Invites Views and Suggestions On The Beverage Container Return Scheme*. Retrieved from https://www.nea.gov.sg/media/news/news/index/nea-invites-views-and-suggestions-on-the-beverage-container-return-scheme

[15] Channel NewsAsia, *The Big Read: Recycling blue bins - better habits, less waste*. Retrieved from https://www.channelnewsasia.com/today/big-read/recycling-blue-bins-better-habits-less-waste-6244671

[16] Ministry of Sustainability and the Environment, *Written Reply to Parliamentary Question on Contamination of Recyclables in Blue Bins*. Retrieved from https://www.mse.gov.sg/latest-news/written-reply-to-parliamentary-question-on-contamination-of-recyclables-in-blue-bins/

[17] 4Pack, *Extended Producer Responsibility in France: What is the State of Play in 2025*. Retrieved from https://4-pack.com/knowledge-centre/extended-producer-responsibility-in-france/

[18] Prevent Waste Alliance, *How Germany's EPR system for packaging waste went from a single PRO to multiple PROs with a register*. Retrieved from https://prevent-waste.net/wp-content/uploads/2023/06/Germany.pdf

[19] Prevent Waste Alliance, *The Republic of Korea's EPR system for packaging: an Asian role model*. Retrieved from https://prevent-waste.net/wp-content/uploads/2023/06/Republic-of-Korea.pdf

[20] Hanssen OJ, Olsen A, Moller H, and Rubach S (2003), *National indicators for material efficiency and waste minimization for the Norwegian packaging sector 1995-2001*. Retrieved from https://doi.org/10.1016/S0921-3449(02)00104-0

[21] Rapid Transition Alliance, *Taiwan's Transition – from Garbage Island to Recycling Leader*. Retrieved from https://rapidtransition.org/stories/taiwans-transition-from-garbage-island-to-recycling-leader/

[22] Packa, *EPR Fees in different European countries*. Retrieved from https://cdn.prod.website-files.com/672b67fe04692d33d8e89d98/692431854d056327be77104e_EPR%20Fees%20Guide_Packa.pdf

[23] Packa, *EPR Fees in different European countries*. Retrieved from https://cdn.prod.website-files.com/672b67fe04692d33d8e89d98/692431854d056327be77104e_EPR%20Fees%20Guide_Packa.pdf

[24] U-ASEAN Business Council, *From Waste to Wealth – Advancing ASEAN's Circular Economy through EPR Alignment*. Retrieved from https://eu-asean.eu/wp-content/uploads/2025/07/EU-ABC-EPR-Report-2025.pdf

[25] Lizenzero, *Eco-fee modulations – What lies behind EU subsidies for packaging*. Retrieved from https://www.lizenzero.de/en/blog/eco-fee-modulation-what-lies-behind-eu-subsidies-for-packaging/

[26] Science and Technology Innovation Centre, *Recycled Plastic Container Materials Enjoy Preferential Rates Starting January 1 2025*. Retrieved from https://www.ti-stic.org/post/recycled-plastic-container-materials-enjoy-preferential-rates-starting-january-1-2025

[27] EPR Compliance, *German Packaging Act*. Retrieved from https://www.epr-compliance.com/en/german-packaging-act

[28] Net Zero Compare, *Norway Packaging Extended Producer Responsibility*. Retrieved from https://netzerocompare.com/policies/norway-packaging-extended-producer-responsibilitynorway-packaging-epr

[29] US Environmental Protection Agency, *Recycling Regulations in Taiwan and the 4-in-1 Recycling Program*. Retrieved from https://www.epa.gov/sites/default/files/2014-05/documents/handout-1a-regulations.pdf

[30] Certivo, *France Packaging EPR 2026: Citeo IDU Authorized Rep Guide*. Retrieved from https://www.certivo.com/blog-details/france-packaging-epr-2026-citeo-idu-authorized-rep-guide

[31] Korea Resource Circulation Service Agency (KORA), *EPR Implementation*. Retrieved from http://www.kora.or.kr/eng/coreBusiness/eprImplementation.do

[32] Switch Asia, *The Total Cost of Compliance in Extended Producer Responsibility (EPR)*. Retrieved from https://www.switch-asia.eu/site/assets/files/4504/total_cost_of_compliance_in_epr.pdf

[33] Korea Resource Circulation Service Agency (KORA), *EPR Policies*. Retrieved from http://www.kora.or.kr/eng/coreBusiness/eprPolicies.do

[34] US Environmental Protection Agency, *Recycling Regulations in Taiwan and the 4-in-1 Recycling Program*. Retrieved from https://www.epa.gov/sites/default/files/2014-05/documents/handout-1a-regulations.pdf

[35] 4Pack, *Key Aspects of Extended Producer Responsibility in Germany*. Retrieved from https://4-pack.com/knowledge-centre/key-aspects-of-extended-producer-responsibility-in-germany/

[36] 4Pack, *Introduction to Extended Producer Responsibility in France*. Retrieved from https://4-pack.com/knowledge-centre/extended-producer-responsibility-in-france/

[37] Norwegian Environment Agency, *Extended Producer Responsibility in Norway*. Retrieved from https://www.environmentagency.no/areas-of-activity/waste/extended-producer-responsibility/

[38] TOMRA, *Norway's deposit return scheme is world's recycling role model*. Retrieved from https://www.tomra.com/reverse-vending/media-center/feature-articles/norway-deposit-return-scheme

[39] TOMRA, *Norway's deposit return scheme is world's recycling role model*. Retrieved from https://www.tomra.com/reverse-vending/media-center/feature-articles/norway-deposit-return-scheme

[40] Prevent Waste Alliance, *How Germany's EPR system for packaging waste went from a single PRO to multiple PROs with a register*. Retrieved from https://prevent-waste.net/wp-content/uploads/2023/06/Germany.pdf

[41] Adelphi, *Efficiency and Performance of Packaging EPR Systems in the EU: A Comparative Analysis of Different Countries and Market structures*. Retrieved from https://adelphi.de/system/files/document/epr_study_0411.pdf

[42] Korea Resource Circulation Service Agency, *Packaging Recycling Statistics*. Retrieved from http://www.kora.or.kr/eng/products/packingRecyclingTotal.do

[43] Korea Resource Circulation Service Agency, *Packaging Recycling Statistics*. Retrieved from http://www.kora.or.kr/eng/products/packingRecyclingTotal.do

[44] Citeo, *Recycling Figures in France*. Retrieved from https://www.citeo.com/le-mag/les-chiffres-du-recyclage-en-france/

[45] Citeo, *Recycling Figures in France*. Retrieved from https://www.citeo.com/le-mag/les-chiffres-du-recyclage-en-france/

[46] Ministry of Environment (Taiwan), *2020 Waste Paper Tableware Amount Hit a Record High Nearly 90%*. Retrieved from https://www.moenv.gov.tw/en/news/press-releases/13276.html

[47] Official Journal of the European Communities, *Commission Communication on Environmental Agreements*. Retrieved from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ%3AC%3A2000%3A227%3A0006%3A0014%3AEN%3APDF

[48] Prevent Waste Alliance, *EPR Toolbox*. Retrieved from https://circulareconomy.europa.eu/platform/sites/default/files/prevent-toolbox-interactivepdf_2020lowres.pdf

[49] OECD Environment Directorate, *Economic Aspects of Extended Producer Responsibility*. Retrieved from https://one.oecd.org/document/ENV/EPOC/WPNEP%282003%2910/PART1/FINAL/en/pdf

[50]Ministry of Climate, Energy and Environment (South Korea), *Resource Circulation Board*. Retrieved from https://www.mcee.go.kr/home/web/board/read.do?boardCategoryId=&boardId=83426

[51] ScienceDirect & ResearchGate, *MSW management for waste minimization in Taiwan: The last two decades*. Retrieved from https://www.researchgate.net/publication/7431518_MSW_management_for_waste_minimization_in_Taiwan_The_last_two_decades