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Enabling Effective Extended Producer Responsibility (EPR) Systems

EPR and Circular Economy Paper Series

Series Overview

This publication is a collection of short-paper series developed under the Technical Advisory on Strengthening EPR in Asia, with the objective of advancing the circular economy. Each paper focuses on a specific issue related to EPR and the circular economy—such as product design, cross-regional learnings, high-quality recycling, cost of EPR compliance, prioritization of sectors, collection channels, and the inclusion of the informal sector in EPR systems. The purpose of these papers is to provide policymakers and advocates with concise, actionable guidance that can serve as a starting point for more detailed analysis and in-depth exploration.

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Implementing EPR across continents: Importance of Contextualising General Principles

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Introduction

Extended Producer Responsibility (EPR) is a policy principle that originated in Sweden in 1990. EPR shifts the responsibility for waste management from municipalities to producers, integrating waste management costs into the product price. Since it was introduced in Europe, it has influenced environmental policies globally, for instance, in Japan, Korea, and Canada. For the discussion in this paper, EPR can be considered as a way of addressing the rising problems with waste and resource use.

New approaches were needed to address rising costs of waste management and to address the environmental and resource degradation, both directly resulting from rapidly increasing consumption. Similar problems were destined to happen globally as consumption levels were rising in many countries. EPR promised to be an essential part of the necessary development by moving the costs of waste management and recycling from the end-of-life to the introduction of products on the market. This would mean that instead of being a stand-alone cost, these costs would be an often-minor part of the purchasing costs.

The EPR principle became one of the topics for several international projects to support the environmental work in Asia and other continents. Experienced and knowledgeable European (as well as for instance Japanese) consultants were getting more and more involved in such projects in several different Asian countries.

However, as often when it comes to international cooperation, we must ask ourselves how to best transfer knowledge from our own countries to another country. So, a relevant issue is to identify some of the main features that can be expected to influence the introduction of EPR in the various Asian contexts.

As special focus of EPR is on waste management, we can start by outlining some of the differences and similarities between the continents on these issues. However, we may first start by saying that also the experiences from various European countries show to us that EPR often needs some national adaptation, and the implementation of the various European countries have several differences. This said, we can suspect that many experts build their knowledge on experiences from one or a limited number of countries, and there is sometimes in such international projects a tendency to present solutions you are used to as the best approach also in other countries and situations.

Very often the municipalities, or other authorities with limited geographical coverage, are the ones who have the formal responsibility for a well-functioning waste management from private households and in a similar way from some other minor waste producers with household-like waste. This is to be expected in Europe as well as in Asia. However, the economic situation of municipalities varies considerably. In many European countries, municipalities can raise income by taxes and fees paid

by the private households. So, citizens are typically paying for the waste management through fees paid directly to the municipality or as part of the rent by the tenants, and then as a municipal fee by the property owners. Municipalities do not want to raise taxes and fees, but may be necessitated to do so, when important tasks need more financing. EPR opened an opportunity of a new source of financing that would not influence the burden on citizens based on decisions by municipal politicians.

Political economy

In Asia it is common that the budgets of the municipalities are more restricted. We can assume that many taxes and fees are more of a national question and many incomes enter the national budget rather than the municipal. The local fees for waste management are often decided more by political considerations of affordability for the population, than the needs for cost coverage. They are typically also decided on a higher level, that is often decided nationally. Consequently, budgets for waste collection are often not enough to support a good coverage of waste collection and we frequently see that not the whole population is covered by any formal waste collection. This is especially true for rural populations and towns.

In addition, to collect waste-related fees is a problem that several European countries have met. When it comes to electricity, the responsible entity could cut of non-paying residents, while when it comes to waste collection, such a measure would lead to hygienic and environmental problems. Several European countries are therefore bundling waste fees with electricity or water bills. Similar and maybe even more drastic problems could be expected in many Asian countries.

When it comes to investments in for instance landfills or treatment facilities, the situation is typically that these investments can't be financed by local money but need grants from national sources or are financed by loans based on national endorsements. It is in such cases not surprising that many municipalities are not having landfills of reasonable standards and, even less, other waste treatment facilities.

EPR offers an opportunity for a different financing. Basically, instead of directly raising money for waste management, you are obliging citizens to pay extra when buying products for consumption. So, we are expecting citizens to cover the waste management costs as part of the purchasing costs. We must then ask ourselves if such costs paid by every consumer are politically acceptable in the country in question, or they will be regulated to a level where they do not cover the real costs for a reasonably well working system. This points to the political difference of making it possible for people to consume in the modern society, and to have money available for mitigating enough of the environmental challenges following a modern consumption level.

Informal sector

An issue that is much more met in the Asian context than in Europe is the presence of an informal sector, collecting and treating waste. In the absence of well-working municipal systems, the informal sectors play an important role in collecting waste. While there are examples of such informal collectors being paid by citizens to remove waste, the more typical scenario is that informal collectors live from profits derived from the waste. The economy for certain types of waste may be such that the last owner expects payment for his old product (often the case with metal and electronic items) before he lets the collector take them. In other cases, the informal sector will just collect products/materials that can give profit when sold. Such waste may then be sold to the informal recycling sector or sometimes to more formalised entities. Informal recycling operations are often of low environmental standards and not the most efficient when it comes to resource extraction.

The above discussed situation means that a typical discussion among experts in this area, is how you could benefit from an informal sector collecting waste in a low-cost way, and then secure that the further treatment and in particular the material recycling is made in safer and more efficient manners than are offered by informal recyclers.

It must also be remembered that the issues around the informal sectors are not only a question about environmental and resource conservation, but also a livelihood issues for poor and uneducated sections of the population. It is often spoken about formalising the informal sector, but less research shows how such formalisation would go beyond forming cooperatives and other measures that may not be able to compete with large waste management companies once financial resources are available to pay for such services.

Governance

Governance is a particular issue of big concern in waste management, as well as in many other areas of economic activities. The need for regulating and enforcing reasonable rules have been exemplified in Europe and are not less in other continents. Our modern level of consumption makes a reasonable waste management a challenge not the least when it comes to costs. We are today talking about considerable money that is needed to achieve a reasonably well-working waste management system, securing good environmental standards and sensible management of resources. While totally transparent systems are difficult to achieve, any EPR system must consider how to avoid negative consequences of bad governance.

Producer Responsibility Organisations (PROs)

To manage the EPR system we often see the formation of PROs (producer responsibility organisations). These should support the companies by taking the tasks of using the money received from the producers and use them to fulfil the legal requirements of the EPR system. While competition between PROs could spur efficiency, it is a challenge to secure a level playing field and achieve good quality results if governments can't allocate necessary resources for enforcing fairness and quality.

Conclusion

What is important to remember when working in countries in Asia, as well as abroad in general, is that your personal experiences of good approaches may not fit as well in other contexts. You should probably not prescribe solutions but rather transfer experiences that can be useful as input for local discussions. To the extent possible, there should be an attempt to educate and discuss various approaches and experiences, instead of prescribing solutions.

Importance of Design in making Extended Producer Responsibility (EPR) work for Circular Economy

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The Circular Economy brings forward the need for better use of various resources, including materials and energy. It prolongs product life cycles through durability, reuse, repairability, and the return of materials to new uses. Thus, the Circular Economy is much more than just recycling; it effectively secures secondary materials.

What role can Extended Producer Responsibility (EPR) play in facilitating such a shift to the Circular Economy?

Brief history of the principle of EPR

EPR was formulated as a strategy in 1990 and, some years later, defined as a policy principle that guides the development of policies and legislation. From the first set of documents and subsequent discussions, EPR was especially brought forward when elaborating measures to improve waste management, though it has also been discussed for other life cycle phases. EPR is implemented using the most appropriate policies and policy instruments, which are determined based on the types of products, local conditions, and experiences.

EPR proposes that special responsibility should be given to actors that have the greatest opportunity to make improvements. For a more circular society, products need to be collected and sorted at their end-of-life, and materials need to be recovered and recycled from there. To improve the possibilities of achieving this, product design needs to be enhanced, for example, to improve durability, allow repairability, and enhance recyclability.

EPR also aims to signal consumers about environmental management costs through the price of products. The price paid by consumers should be seen to include environmental costs arising from activities to return products and their materials to the technosphere for reuse.

Lessons from EPR implementation

When the EPR principle was used to form policies and laws, many actors expected that EPR would be implemented wherein producers would be responsible for the end-of-life costs of their own products. In other words, such costs would be added to product prices and therefore influence market competitiveness. This gave many companies clear incentives to develop design improvements for their products. This was evident in many articles in trade journals and other publications, where car manufacturers, electronics manufacturers, and packaging producers reported on various design improvements they had developed and included in their products, typically citing future EPR legislation as the main driver.

However, when EPR laws were put into practice, the implementation was largely through what came to be known as collective systems. End-of-life treatment was implemented by organisations, Producer Responsibility Organisations (PROs), that had producers as members. Governments steered the work by demanding collection and recycling levels but without defining high-quality recycling as a requirement. Producers paid fees that were equal for the same type of products, with products categorized based on use, size, and similar qualities. Specific environmental improvements were, by and large, not included in such fees, substantially lowering the costs of responsibility borne by producers.

Low fees paid to PROs provided no incentive to induce design improvements. Instead, such investments had to rely on market rewards, but reaching the market with the necessary information and achieving a good response was most often not possible. The proposed solution of individual responsibility was often unappealing for producers, as obtaining economic rewards was difficult under the existing legislation and the limits of requirements placed on the collective systems (which sometimes even included more or less clear prohibitions of individual EPR systems or similar constraints). Thus, EPR-induced product design improvements became less obvious and feasible, and the role of EPR as a rationale for product design improvements came into question.

In practice, the positive results from EPR were mainly related to the amount of selective collection, dismantling, and sorting of collected products. For instance, in the European Union (EU), it is evident that much more of the targeted products, particularly packaging, WEEE (Waste Electrical and Electronic Equipment) or e-waste, cars, and batteries are collected and treated in a responsible way. While much more is collected in an organised manner and largely in ways that could promote good further treatment, the sufficiency of results can be questioned from the perspective of the Circular Economy. The fact that substantial amounts of the collected materials are exported to markets without good control makes circularity even less realistic in today's systems.

What is collected and dismantled is generally sold to recyclers. The fact that much of the material can be sold means that only limited efforts are made to improve the quality of such materials before they are returned to the market. Such materials are generally downgraded compared to the original input used for the products from which the recycled materials originate. This means that new raw materials are not substituted for many purposes, as the quality of the recycled materials is not good enough. Better recycled materials would allow such use and enable more continuous cycles of use for future products.

Moreover, the price of primary raw materials is usually more competitive than recycled materials, even when the quality is comparable. The reverse supply chain, technology for processing recovered or recycled materials, logistics of procuring them, and the available quantities in desired qualities are less mature than those for primary raw materials, which contributes significantly to the price differential.

Each of these cost contributors requires measures that effectively change the price differential equation between primary and recycled materials and make product design improvements economically viable.

Approaches to make product design improvement viable

A way of promoting a market for high-quality recycled materials is to demand a certain percentage of recycled materials in new products. Legislation should then demand post-consumer recycled materials, that is, not just processing waste to promote the recycling of old products. Other approaches include various design requirements, such as specifying what materials are used (and not used) for manufacturing and ensuring materials are easier to dismantle. Such legislation is included in the Eco-design directive developed in the EU, which is continuously being improved.

Another approach is to adjust EPR fees paid to the PROs to reflect a set of standards. Products with desirable qualities would incur lower fees, while products with negative properties would face higher fees. This approach is often referred to as the modulation of EPR fees. However,

such fees are often a percentage of an already low EPR fee. This means that savings from lower fees may not cover the costs of implementing design changes.

A different approach, proposed by the IIIEE (Industrial Institute for Industrial Environmental Economics), is to create mandatory standards for the quality of recycled materials that must be achieved to avoid specific environmental fees. These fees would not be paid to the PROs but rather to the government or society, which is the entity responsible for a country's environmental status and which may need to address cleanup measures and manage the economic and social costs of lower environmental quality.

Implications for the EU and Asia

The EU and its member countries are likely more prepared to implement measures that ensure better and cleaner materials from recycling activities compared to other regions around the world. This also has significant implications for access to clean materials that support initiatives promoting local manufacturing in Europe. It underscores the fact that EPR plays a more central role in advancing the Circular Economy in Europe.

In Asian countries where EPR is still not implemented or is in its early developmental stages, the challenges faced in Europe will eventually be encountered. Therefore, it would be wise to develop understanding and capacities to address the limitations of a waste-management-focused EPR system that lacks the important driver for design change. A product design-oriented EPR system that includes requirements for the quality of waste and the recovery of materials should be considered.

Some Asian countries already have Circular Economy strategies, roadmaps, or guidelines that emphasize the importance of material recovery and value retention in materials collected through EPR systems. This provides policy legitimacy for EPR principles but requires specific rules and regulations to ensure effective implementation.

The Total Cost of Compliance in Extended Producer Responsibility (EPR)

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Extended Producer Responsibility (EPR) frameworks place the financial and operational burden of managing end-of-life product waste on producers. This includes funding the collection, recycling, and disposal systems necessary to handle discarded products. The underlying principle is that producers, as the creators of these goods, are best positioned to internalize these costs into their pricing strategies and pass them on to consumers. For EPR systems to succeed, it is critical to establish fair and accurate cost structures for waste management. However, achieving this balance is often more challenging in practice than in theory.

EPR incentivizes producers to design products that are easier to recycle, free from toxic materials, and aligned with business models that minimize waste generation. Yet, many producers hesitate to fully embrace these responsibilities due to concerns about short-term profitability or uncertainties surrounding long-term cost implications. Compliance costs under EPR are not fixed; they fluctuate annually due to evolving regulatory frameworks, shifting market dynamics, and variations in recycling rates. This unpredictability complicates financial planning and pricing strategies for producers, making it difficult to forecast and incorporate these expenses effectively.

A significant challenge in EPR systems is the lack of clear guidance and standardised benchmarks for compliance costs at the product end-of-life stage. This gap often leads to a "**race to the bottom**," where ***producers opt for the cheapest—and often least effective—waste management solutions***. Such practices result in subpar collection and recycling systems, fostering malpractices like improper disposal, inadequate recycling, and environmental harm.

Accurately assessing the total costs of compliance is essential for several reasons. It ensures that producers allocate sufficient resources to meet their recycling and disposal obligations, prevents underfunding of waste management systems, and encourages innovations in product design that enhance circularity and sustainability. Moreover, it fosters accountability, transparency, and fairness within the system, ensuring that the responsibility for waste management is equitably distributed among all stakeholders. A well-structured EPR system eliminates malpractices, drives away free riders, and creates a level playing field for all participants.

However, determining these costs is a delicate balancing act. EPR fees must neither be excessively high, which could overburden producers, nor too low, which could undermine the effectiveness of waste management efforts. Striking this balance requires a thorough understanding of the financial dynamics involved in waste procurement, transportation, collection, recycling, and material recovery. It also necessitates careful consideration of the quality and quantity of waste being collected, and the costs or value of the recovered materials including Critical Raw Materials (CRMs).

To ensure the long-term viability of EPR systems, policies must create an environment where producers can seamlessly pass compliance costs on to consumers, including bulk buyers. This requires a nuanced understanding of the interconnected factors that influence the cost structure.

Factors Influencing Compliance Costs

1. **Geographical Spread of Collection Systems:** Wider coverage areas increase logistics and transportation costs, particularly in rural or remote regions where waste collection and transportation require additional resources.
2. **Types of Collection Channels:** The methods used such as door-to-door services, bulk consumer programs, repair centres, or aggregators directly impact costs. Efficient channels can reduce operational expenses but may require significant upfront investments.
3. **Collection Facilities Size:** Larger facilities may benefit from economies of scale but also incur higher maintenance and operational costs.
4. **Collection Channel Operating Costs:** Expenses related to running collection facilities, awareness campaigns, waste procurement, logistics, staffing, and training significantly influence overall costs.
5. **Consumer Participation and Asks:** The willingness of consumers to return products for recycling is crucial. In emerging markets, consumers often expect compensation exceeding the material value of the waste, creating a disconnect between expectations and reality. For example, while the material value of a discarded mobile phone might be $0.3-0.5, consumers in emerging markets demand $5-10 or more to surrender it for recycling.
6. **Volume of Waste:** Higher volumes increase transportation and processing costs but may justify economies of scale in sorting and recycling.
7. **Dismantling Efforts:** Certain waste types, particularly e-waste, require labour-intensive dismantling before recycling, adding substantial costs to the process.
8. **Recycling Technology:** Advanced recycling technologies improve efficiency and reduce costs but often require substantial investment, particularly in less developed regions.
9. **Value of Recyclable Fractions:** The market value of recyclable materials, such as aluminium, copper, or paper, can partially offset recycling costs, though price fluctuations impact economic viability.
10. **Recovery of Critical Raw Materials:** Efforts now need to be made to recover rare earths and other CRMs from the components such as permanent magnets, capacitors, solders, batteries, connectors etc. Valuable materials like rare earth metals or precious metals in electronics can offset some recycling costs, but the complexity and technology required for their recovery vary significantly.
11. **Hazardous Waste Management:** Waste containing hazardous materials, such as e-waste plastics with persistent organic pollutants (POPs) or cartridges, CFCs, and polyurethanes, requires specialized handling, increasing storage, transportation, and treatment costs.
12. **Non-Recyclable Waste Management:** Some waste fractions, such as flat monitor screens, cannot be recycled with current technology and must be stored to recover CRMs as and when technology becomes commercially viable.
13. **Risk Management:** Regulatory changes, market shifts, or operational failures can introduce unexpected costs that must be accounted for.

Given the complexity of these factors, market forces alone may not ensure the efficiency and fairness of EPR systems. Authorities can play a pivotal role by commissioning baseline cost studies to assess the total costs of compliance. These studies can serve as benchmarks for determining fair pricing within the EPR framework, preventing undervaluation in the market, and ensuring effective waste collection and recycling.

Cost of Monitoring Compliance: Who bears this cost?

An often-overlooked element in the total cost of compliance under Extended Producer Responsibility schemes is the expenditure incurred by regulators and local authorities in monitoring and enforcing compliance. These costs include staffing for audits and inspections, maintaining reporting systems, data verification, and managing non-compliance cases.

While producers are responsible for financing the collection and recycling of the products that they introduced on market, the cost of monitoring/audits is borne by the regulators. Much of the funding for compliance monitoring comes from general taxation rather than fees levied on producers. This creates a hidden subsidy, effectively shifting part of the financial burden from producers to taxpayers.

Unless these regulatory costs are internalised within the EPR framework, the system risks underestimating the true economic and administrative impact of compliance and may weaken the incentive for producers to invest in more efficient and transparent waste management practices.

Achieving a Balanced and Sustainable EPR Framework Through Accurate Cost Assessment and Equitable Responsibility

The total cost of compliance in EPR systems is a multifaceted challenge that requires a nuanced understanding of financial, operational, and environmental dynamics. Producers, as primary stakeholders, bear the responsibility of financing waste management systems, but this must be balanced against the need to maintain profitability, ensure fair pricing, and promote sustainable practices.

A well-functioning EPR system hinges on accurate cost assessments for waste collection, transportation, recycling, and disposal. Without clear benchmarks and standardized guidance, producers may resort to cost-cutting measures that compromise waste management quality, leading to environmental harm and inefficiencies. To address these challenges, a transparent and equitable framework is essential. Key steps include:

1. **Conducting Baseline Cost Studies:** Authorities should assess total compliance costs, considering factors like geographical spread, collection channels, waste volume, hazardous material management, and recycling technology.
2. **Promoting Consumer Participation:** Encouraging consumers to return waste through awareness campaigns, incentivization schemes, or regulatory measures is critical.
3. **Investing in Advanced Recycling Technologies:** Adopting innovative technologies can improve efficiency and material recovery but requires significant investment, especially in underdeveloped regions.
4. **Ensuring Equitable Cost Distribution:** EPR policies should enable producers to pass compliance costs to consumers fairly and transparently, ensuring shared financial responsibility.
5. **Addressing Market Fluctuations:** EPR systems must accommodate variations in recyclable material values and recycling costs to remain viable in volatile markets.
6. **Managing Risks and Uncertainties:** Robust risk management strategies are essential to mitigate regulatory changes, operational failures, and unforeseen events.

Conclusion

The success of EPR systems depends on collaboration among producers, consumers, regulators, and waste management operators. By accurately assessing compliance costs and creating a balanced framework, EPR systems can achieve their dual objectives of environmental sustainability and economic viability. This not only ensures responsible waste management but also drives innovation in product design, encourages circularity, and contributes to a more sustainable future.

In conclusion, the total cost of compliance in EPR is not merely a financial calculation but a multifaceted challenge that requires careful consideration of economic, environmental, and social factors. By addressing these complexities and fostering accountability and transparency, EPR systems can fulfil their potential as a cornerstone of sustainable waste management and resource conservation.

Toward a Circular Economy: Strengthening Extended Producer Responsibility (EPR) through High-quality Recycling

Author: Pranshu Singhal, Expert for the SWITCH-Asia Policy Support Component; Contributor: Vindhya Kaushal

Extended Producer Responsibility (EPR) has emerged as one of the preferred policy instruments for addressing the environmental challenges caused by unsustainable resource consumption and inefficient waste management. EPR shifts responsibility for a product's environmental impact from consumers and governments to producers. This promotes a transition away from the traditional linear economy of "take, make, dispose" toward a circular economy, where resource use is reduced and reused, recycled, and reintegrated into production cycles. By holding producers accountable for the lifecycle of their products, EPR incentivises sustainable practices such as using recycled materials instead of virgin resources in manufacturing.

While EPR has achieved notable success in improving waste collection rates, it has fallen short in catalysing the use of recycled or secondary raw materials in manufacturing. This gap reveals systemic barriers that must be addressed to fully realise the potential of a circular economy.

Key barriers to the use of recycled materials

The limited uptake of recycled materials in manufacturing stems from several interconnected challenges:

1. **Fragmented EPR Systems:** Differences in collection systems, recycling standards, and regulations across jurisdictions complicate the integration of recycled materials into global supply chains.
2. **Inadequate High-Quality Recycling Infrastructure:** Many regions lack the facilities needed to process diverse and complex waste streams at scale that is also financially viable.
3. **Lack of Harmonised Standards:** The lack of uniform standards for dismantling, recycling, and material specifications means lot of recycled material may not meet technical material requirements, which hinders the adoption of recycled content
4. **Variability in Recycling Inputs:** Recycling plants process a wide mix of products, brands, and models, resulting in variability that hinders consistent output quality.
5. **Technical Limitations of Recycled Materials:** Manufacturing processes often require raw materials with precise. Recycled materials often fail to meet technical specifications required in manufacturing processes leading to their lower-grade (downcycling) applications.
6. **Unpredictable Supply of Secondary Materials:** The supply of high-quality secondary materials is inconsistent, deterring manufacturers from relying on recycled inputs, often unfavourably impacting their costs.
7. **Low Market Demand:** Manufacturers often perceive recycled materials due as inferior, and consumer demand for products with recycled content remains limited.
8. **Missing Purchase Agreements:** Manufacturers rarely enter long-term purchase agreements for recycled materials, creating uncertainty in the supply-chain and discouraging investment in recycling infrastructure.

Solutions to enable high-quality recycling

For EPR to succeed in closing the material loop, significant improvements in recycling infrastructure and practices are essential. High-quality recycling requires coordinated action on multiple fronts:

a) Invest in Advanced Recycling Infrastructure

High-quality recycling requires significant investment in advanced technologies, processing capacity, and skilled labour. Governments and industry should collaborate to support these investments through subsidies, tax incentives, and public-private partnerships. Ensuring operational viability is critical, plants must process large volumes to be cost-effective and sustainable.

b) Stimulate Market Demand for Recycled Content

Introduce requirements for recycled content alongside raising public awareness and introducing eco-labelling that can help consumers make informed choices and generate demand for sustainable products, encouraging manufacturers to prioritise recycled materials.

c) Secure Consistent Feedstock Supply

Recycling is inherently collection dependent. This requires the establishment of robust collection systems, supported by public or private sector initiatives, to ensure a reliable flow of feedstock. EPR is crucial in organising and financing these collection systems.

d) Standardise Recycling Processes

Harmonised protocols for collection, sorting, de-pollution, and processing improve the quality and predictability of recycled outputs. International standards and certification systems can increase trust in recycled materials.

e) Promote Technological Innovations for Complex Materials

Advanced technologies, such as AI-powered sorting systems and chemical recycling, are essential to recover high-value materials like rare earths and composite plastics. Ongoing R&D is vital for improving material recovery from complex waste streams.

f) Remove Toxic Constituents Safely

E-waste and other waste types often contain hazardous substances like lead, mercury, and brominated flame retardants. Recycling systems must include effective decontamination processes to ensure recovered materials are safe and compliant with health and environmental regulations.

g) Reform Government Disposal Practices and Procurement Policies

Public institutions often auction off waste to the highest bidder, which can lead to environmentally unsound recycling practices in the informal sector. Governments should commit to sending waste exclusively to certified, high-quality recyclers. Public sector manufacturing units should also sign offtake agreements with recycling facilities, helping to establish a stable market for secondary materials and attract private investment.

Conclusion

High-quality recycling is both an environmental necessity and an economic opportunity. Recycled materials that meet technical standards can be reliable and cost-effective for manufacturers. Advanced technologies can recover critical materials, while effective detoxification can safeguard health and the environment.

Significant investments are required in recycling technology and infrastructure. Governments should lead with supportive policies including standards for recycling and use of recycled content, and necessary investment in infrastructure and innovation. Governments should also steward EPR frameworks, and coordinate industry and consumers that can drive circular practices and uptake of recycled materials. Industries should adopt circular practices and increase the use of recycled materials. Consumers should demand eco-friendly products and participate actively in recycling programs.

Only through coordinated and cross-sectoral action can EPR achieve its long-term goals of enabling material circularity, reducing environmental impacts, and fostering a sustainable future.

Extended Producer Responsibility (EPR) and Sector Identification:
A Strategic Approach to Waste Management

Author: Pranshu Singhal, Expert for the SWITCH-Asia Policy Support Component; Contributor: Vindhya Kaushal

Extended Producer Responsibility (EPR) has emerged as a pivotal policy tool in addressing the global waste management crisis. By holding producers accountable for the entire lifecycle of their products, EPR incentivises sustainable design, efficient resource use, and effective waste recovery. Today, EPR is being implemented across diverse sectors worldwide, tailored to the unique environmental and economic contexts of each region. However, the successful adoption of EPR requires careful planning, stakeholder collaboration, and strategic sector prioritisation. This paper explores the global application of EPR, the factors influencing its implementation, and the key considerations for policymakers when identifying sectors for EPR rollout.

Global Application of EPR Across Sectors

EPR has gained significant traction in Europe, where countries like France, Germany, and Sweden have pioneered its application across multiple sectors. France, for instance, has implemented EPR in over 30 sectors, including electronics (WEEE) and textiles, while Germany's Green Dot system has become a global benchmark for packaging waste recycling. In North America, Canada has introduced EPR programs for electronics and batteries in several provinces, and individual U.S. states are gradually adopting similar frameworks. Latin American nations, such as Brazil and Chile, are also embracing EPR, focusing on sectors like electronics, packaging, and batteries. In Asia, countries like India, Japan, Korea, China are leveraging EPR to tackle waste from electronics, plastic packaging, batteries, end-of-life vehicles etc. These examples underscore the adaptability of EPR as a policy tool, capable of addressing diverse waste streams while aligning with national environmental and economic goals.

The Need for Strategic Sector Prioritisation

While EPR holds immense potential, its implementation is not a one-size-fits-all solution. For countries embarking on EPR adoption, it is imperative to prioritise sectors strategically to ensure long-term success. Policymakers must consider a range of factors, including environmental impact, sector readiness, infrastructure availability, and economic relevance. Effective EPR implementation requires coordinated efforts from governments, producers, consumers, and waste management organisations, supported by robust regulatory frameworks, financial incentives, and public awareness campaigns.

Key Considerations for Sector Prioritisation

To maximise the effectiveness of EPR, policymakers must evaluate sectors based on the following criteria:

a) Environmental Impact of the Sector

The primary driver for EPR adoption should be the environmental harm caused by a sector. Sectors that generate significant waste, contribute to pollution, or deplete natural resources must be prioritised. For example, electronics and plastics are often high-priority sectors due to their substantial environmental footprint and the challenges associated with their disposal.

b) Ease or Complexity of Solving the Problem Using EPR

Not all sectors are equally amenable to EPR solutions. The complexity of establishing an effective EPR system depends on factors such as product design, material recovery rates, and the potential for creating a circular economy. Sectors with simpler product lifecycles or easily recyclable materials, like glass or paper, may be more straightforward to address. In contrast, complex sectors like electronics or mixed-material packaging may require innovative approaches or complementary policies to achieve meaningful results.

c) Readiness of the Sector to Uptake EPR Implementation

A sector's preparedness for EPR depends on industry willingness, existing regulatory frameworks, and the availability of infrastructure. Sectors with proactive industry associations, established recycling practices, and supportive policies are more likely to succeed in EPR implementation. For instance, the automotive industry in many countries has demonstrated readiness by adopting take-back schemes and recycling initiatives.

d) Presence of Allied Systems for Collection and Recycling

EPR systems thrive when supported by efficient collection and recycling infrastructure. Sectors that already have established recycling networks, such as packaging or metals, can integrate EPR more seamlessly. In contrast, sectors lacking such infrastructure may require significant investments to build the necessary systems.

e) Economic and Health Benefits of EPR Implementation

Evaluating the potential economic and health benefits is crucial for sector prioritisation. EPR can create jobs in the recycling and waste management industries, reduce healthcare costs associated with pollution, and generate long-term economic gains through material reuse. For example, recycling plastics can reduce the environmental and health impacts of plastic pollution while creating economic opportunities in the recycling sector.

f) Public Participation and Perception of the Sector

Public awareness, engagement, and willingness to participate in recycling initiatives are critical to the success of EPR. Sectors perceived as environmentally harmful, such as single-use plastics or e-waste, often garner stronger public support for EPR measures. Greater public acceptance can drive stricter compliance, transparency, and higher recycling rates.

g) Presence of Manufacturing Units for Uptake of Recycled Content

The availability of manufacturing facilities that utilise recycled materials strengthens the case for EPR implementation. For instance, industries that use recycled plastics in packaging or metals from electronics create a demand for recovered materials, fostering a circular economy. This alignment between EPR and industrial demand ensures the sustainability of recycling efforts.

h) Relevance of the Sector to the National Economy

Sectors that are critical to a nation's economy or have a significant presence, such as automotive, electronics, or textiles, should be prioritised for EPR implementation. These sectors often generate large volumes of waste and possess the resources and capacity to meet EPR obligations. Early inclusion of such sectors in EPR policies can yield substantial environmental and economic benefits.

Conclusion

EPR is a powerful policy tool for addressing waste management challenges and advancing sustainability goals. However, its success hinges on strategic sector prioritisation and the careful consideration of environmental, economic, and social factors. By focusing on sectors with the highest environmental impact, readiness for EPR, and potential for economic and health benefits, policymakers can design effective EPR systems that drive meaningful change. Furthermore, fostering collaboration among stakeholders, investing in infrastructure, and raising public awareness are essential for ensuring the long-term success of EPR initiatives. As countries worldwide continue to adopt and refine EPR frameworks, a tailored and strategic approach will be key to achieving sustainable waste management and a circular economy.

Dynamics of the Informal Sector in Waste Value Chains Under Extended Producer Responsibility (EPR)

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In the context of emerging markets, the informal sector plays a central yet often understated role in waste management. It is estimated by many authors that majority of the waste is handled and managed by the informal channels- for example in India, the informal sector manages a large percentage of recyclables, often cited as **95% for e-waste, around 70 to 80% for plastics**, and other waste materials including metals, and paper. However, for those informal sector players or stakeholders working in this space, waste collection and processing are not environmental services, they are economic lifelines. In most scenarios, this occupation is not by choice but due to economic compulsions.

The informal waste economy operates less as a system of environmental management and more as a complex livelihood mechanism for hundreds of thousands of people, especially in the Global South. While informal sector exists outside the boundaries of formal regulations and legal protections, its reach is in most cases unmatched by a public waste management system. At its core, this sector is driven by economic opportunity, that is, a survival-based economy structured around material value.

The informal waste sector is a complex and multilayered pyramid of actors that differ by function, scale, and social positions. Each layer adds value and redistributes material through informal supply chains that span cities and sometimes even borders. Here is how the structure typically looks:

Composition: A Pyramid of Value Creation

The informal sector operates in a stratified hierarchy, each layer specialising in different aspects of waste collection, sorting, and resale:

- **Top Layer:**
  - ***Informal Dismantlers and Recyclers:*** Using crude methods to extract various types of materials like Aluminium, Zinc, Lead, Iron, Copper, Plastic Granules, and components for selling.
  - ***Informal Refiners:*** Extract various types of precious metals like Gold and Silver from e-waste using crude methods.
  - ***Component, Refurbished Product Sellers:*** Sell manually scavenged components, and products post-repairing.
- **Middle Layers:**
  - ***Large Multi-Stream Aggregators:*** Focused on procurement and sales of multiple streams of products like Keyboards, TVs, Monitors, Printers, HDPE, PET, Paper, Batteries, etc. They many operate at a National or State level.
  - ***Large Aggregators:*** Focused on single-material streams e.g. one of the above-mentioned streams. They many operate at a national or sub-national level.

- ***Medium Aggregators:*** Handle moderate quantities of waste for sales to large aggregators. They operate at a state or a city level.
- ***Small Aggregators:*** Handle small quantities of waste for sales to large or medium size aggregators.

- **Bottom Layer:**
  - ***Independent Collectors:***
    - Those who operate on foot or with carts, collecting directly from households, residential colonies.
    - Those collecting from repair, retail shops, households, offices, etc. and sell it to small aggregators who operate in their vicinity.
    - Ragpickers- who are manually scavenging from landfill sites.

Waste Procurement in the Informal Sector

Procurement within the informal waste sector is highly decentralised and opportunistic, driven by personal networks, local access, and survival needs. Materials are typically sourced from a variety of locations, including individual households, repair shops, electronics retailers, office complexes, formal recyclers, government institutions and even landfill sites. Aggregators and collectors often operate door-to-door, forging relationships with sources that allow them regular access to discarded products. In many cases, these interactions are undocumented and rely heavily on trust, familiarity, or neighbourhood ties. The procurement chain is not limited to physical materials alone; it also includes knowledge: where and when to find the most valuable waste, and whom to sell it to.

What makes this system even more complex is the diversity in payment mechanisms. Transactions do not always involve cash. In many lower layers of the pyramid, particularly among independent collectors, barter and in-kind exchanges are common. People may trade waste for daily necessities such as food, temporary shelter, or even illicit substances especially among vulnerable and homeless populations. Such exchanges often expose individuals to cycles of exploitation, substance abuse, and extreme poverty. Between different layers of the sector, for instance, from small aggregators to large ones, trade may occur in bulk and involve daily or weekly cash payments, but without any formal invoices or tax records.

This unregulated nature of procurement contributes to the difficulty in tracking material flows and integrating these actors into formal EPR systems.

Challenges in Regulating & Integrating the Informal Sector

The informal waste sector presents several pressing challenges, particularly for policymakers aiming to build transparent and sustainable EPR systems.

Foremost among these is **absence of environmental, health, and labour standards**. Many informal workers handle toxic materials such as lead, mercury, and plastic residues without any protective gear or knowledge of the risks. Informal refiners, especially those recovering metals from e-waste, often use hazardous chemical processes like acid baths, which can contaminate the environment and endanger community health.

Moreover, the workers in the informal sector operate in extreme conditions with zero social protections. This includes **child labour**, which remains alarmingly common in some regions. These children are often out of school, working long hours in dangerous conditions for minimal pay.

Another major challenge is the issue of **tax evasion**. Because most transactions are undocumented, the government loses substantial revenue, and producers are unable to trace material flows for compliance with EPR mandates.

Additionally, this lack of accountability fosters an environment where **illicit activities** including the handling of stolen goods, drug trade, and illegal imports can be hidden within the sector's operations. These risks make formal actors hesitant to partner with informal ones, fearing reputational and legal exposure.

The absence of formal oversight and the drive for economic gain within the informal sector, coupled with lack of enforcement can lead to the creation and **use of fraudulent documentation**. This includes falsified records of material origin, quantities handled, and recycling processes, hindering accurate tracking of waste streams mandated by EPR. A general lack of awareness or willful disregard for government frameworks and reporting requirements contributes to **widespread non-compliance**. This undermines the transparency and accountability that EPR aims to establish.

Another critical challenge is the **lack of credible data** on the informal sector. Reliable figures on the number of workers, volumes of waste handled, or material recovery practices are either unavailable or highly fragmented. This data gap significantly hampers the ability to propose realistic EPR targets, establish baselines, or design effective verification mechanisms. Without such efforts, policymaking will remain speculative and disconnected from on-the-ground realities.

Pathways for Integrating Informal Sector Actors into EPR Systems

While many informal workers are experienced and could transition into formal roles with the right support, others operate in deeply informal contexts that are difficult to legitimise.

Consequently, EPR systems face the critical challenge of **identifying** informal actors for integration and vulnerable individuals such as children or those with addiction or mental health needs who require alternative social support to shield them from the informal sector's adversities. Developing effective pathways for integration without displacing entire communities is a delicate balance that requires thoughtful policy design, stakeholder engagement, and long-term commitment.

Level of Informal Pyramid	Who Can Be Included	Possible Way of Integration into the Formal Sector
Top – Informal Refiners and Recyclers	Only the workers	Enforce strict regulations leading to the closure of these hazardous operations. Provide pathways for workers within these operations (excluding the heads/owners) to access alternative livelihoods and integration into formalised system through training and support.
Dismantlers, Component and Refurbished Product Sellers	Only the workers	Implement regulations requiring formal registration and adherence to environmental and safety standards for refurbishment and component recovery businesses. Offer support and incentivise for the workers to transition to formal sector under compliant frameworks, potentially focusing on repair and reuse within authorised EPR schemes. Workers can be integrated into these formalised entities.
Large Aggregators	Aggregators with material handling capacity and existing business structures	Register as formal intermediaries within EPR systems, provide access to digital tracking tools for material flow monitoring, and offer bulk procurement contracts directly from Producer Responsibility Organisations, producers, or formal recycling facilities, ensuring fair pricing and transparent transactions, contingent on adherence to environmental and social standards.

Level of Informal Pyramid	Who Can Be Included	Possible Way of Integration into the Formal Sector
Medium Aggregators	Local dealers handling moderate volumes	Create simplified registration programs tailored to their scale, provide access to microfinance and training in logistics, sorting techniques, environmental compliance, and basic business management, including record keeping facilitating their transition into more formal roles within the supply chain, with emphasis on safe handling and storage practices.
Small Aggregators	Informal community-run or household businesses	Support the formation of cooperatives or associations to enhance their collective bargaining power and access to resources, offer safety training and basic compliance kits, and establish contractual linkages with larger formal aggregators under fair and transparent terms, ensuring a stable demand for their collected materials and promoting safe collection practices.
Independent Collectors and Ragpickers	Street-level waste pickers or freelance collectors	Provide official identification cards and recognition within municipal waste management plans, ensure access to essential protective equipment and basic health support, and explore options for integrating them into formal collection systems, potentially through community-based collection schemes or by linking them to registered aggregators, emphasising safe collection and handling protocols.
Children Involved in Waste Collection and Recycling processes	None – children should not be working in waste management	Strictly prohibit children inclusion in any waste management activities; prioritise their immediate removal from labour through access to education, comprehensive child protection services, and family support programs aimed at addressing the root causes of their involvement in waste work.

Formalising the Informal Sector

Formalising the informal waste sector in emerging markets presents a multifaceted opportunity to enhance economic growth, improve social equity, and strengthen environmental governance within the framework of Extended Producer Responsibility.

Transitioning informal operations towards recognised company structures, such as proprietorships or limited partnerships, lays the foundation for legal recognition and access to formal business support. Integrating all trading activities under established tax regimes not only broadens the national revenue base but also inculcates a sense of shared responsibility and enables the provision of public services.

Developing cooperatives or associations for informal waste sector workers such as the Saleng and Recycle Trader Association (SRTA) or community-driven “garbage bank” initiatives in Thailand can ease the administrative burden on governments and Producer Responsibility Organizations (PROs) by reducing the need to engage with individuals directly. These collective structures enhance workers’ bargaining power, enable fairer compensation, and create stronger negotiating positions for win-win outcomes in waste management systems

The SWaCH cooperative in Pune, India, offers a successful model of such integration. Formed as a worker-owned cooperative of waste pickers, SWaCH (Solid Waste Collection and Handling) works in collaboration with the Pune Municipal Corporation to provide door-to-door waste collection services. By giving waste pickers formal recognition, identity cards, and legal status, the initiative has improved income stability, working conditions, and access to social protection, while simultaneously reducing municipal waste management costs. This example demonstrates how formalisation through community-based structures can institutionalise the role of informal workers, aligning social inclusion with environmental objectives.

In Pakistan, GarbageCAN in Karachi exemplifies a modern approach to integrating informal waste collectors, known locally as "kabaris," into formal recycling systems. As Pakistan's first Materials Recovery Facility (MRF), GarbageCAN collaborates with kabaris by providing incentives and infrastructure to enhance recycling rates.

It is also important to have establishment of open bank accounts and the routing of transactions through traceable financial channels introduces transparency. This can reduce the risk of illicit financial flows, and facilitates access to formal financial services like credit and insurance for these enterprises. Crucially, making operational data visible on government portals enhances monitoring, accountability, and evidence-based policymaking, allowing for better integration of the sector's contributions into national economic and environmental strategies.

This structured formalisation, while requiring tailored approaches to address the specific contexts of emerging markets, can offer a pathway towards a more inclusive, regulated, and ultimately more sustainable waste management ecosystem under EPR.

Conclusion

Integration of the informal waste sector into Extended Producer Responsibility frameworks in emerging markets necessitates a strategic and differentiated approach.

A practical pathway for integrating the informal sector into EPR systems could follow a phased integration model. First phase could focus on the mapping and registration of informal actors, generating critical baseline data to inform targeted engagement strategies. The next phase may involve the rollout of municipality-aligned pilot programs, led by Producer Responsibility Organisations, to test inclusive collaboration frameworks under real-world conditions. The last phase could then support the scaling and institutionalisation of proven models through enabling legislation at the state and national levels. This progressive approach allows for a context-sensitive transition that balances operational continuity with regulatory alignment, enhancing traceability, social protection, and environmental performance.

Within this broader framework, a differentiated treatment of the informal sector's tiers becomes essential. While acknowledging the sector's pivotal role in material recovery and income generation, the inherent environmental and safety risks particularly at the upper tiers involving informal refining and hazardous dismantling necessitate their **regulated phase-out**. In contrast, the significant value addition and scale of participation at the aggregator and collector levels warrant **focused formalisation efforts**. Facilitating their transition into legally recognised entities with transparent financial operations, tax compliance, and data visibility enables EPR schemes to leverage existing efficiencies while systematically improving conditions. Supported by robust social safety nets and alternative livelihood opportunities for those displaced from high-risk activities, this calibrated integration offers the most viable pathway toward a **sustainable, equitable, and accountable EPR-driven waste management ecosystem** in the Global South.

Development of Waste Collection Channels in Extended Producer Responsibility (EPR)

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Introduction

Extended Producer Responsibility (EPR) has emerged as a transformative policy tool adopted by numerous countries to address the escalating challenges of waste management. At its core, EPR shifts the responsibility of managing a product's end-of-life from municipalities and taxpayers back to the producers and consumers. While EPR has shown promise in increasing waste collection and promoting recycling, its success largely depends on the development of efficient and scalable waste collection channels. Without these channels, the vision of a circular economy—where waste is reintegrated into the production cycle—remains unattainable.

The Current State of Waste Management

Traditionally, waste management has been approached as a means of mitigating the visible problem of littering and improper disposal. The primary goal has been to remove waste from urban and rural landscapes by transporting it to landfills, incinerators, or recycling facilities (or worse improper dumpsites and open burning). However, this approach fails to address the systemic issue of waste generation and its long-term environmental impact.

Unlike product distribution networks, which are designed to maximise convenience, efficiency, and profitability, waste collection systems remain underdeveloped or non-existent in many regions. Modern product distribution networks, both online and offline, are highly sophisticated, leveraging extensive marketing campaigns, branding efforts, and consumer engagement strategies. In contrast, the reverse logistics required for collecting and processing end-of-life products lack similar infrastructure and incentives. Without formalised channels to encourage the return of discarded products, waste management remains an afterthought, leaving municipal systems or informal scrap collectors to shoulder the burden.

The Disconnect Between Product Distribution and Waste Collection

The disparity between product distribution and waste collection is stark. Producers invest heavily in ensuring their products reach every corner of the market, including remote areas, yet little effort is made to retrieve these products once they reach the end of their life cycle. In many emerging markets, the informal sector—comprising scrap merchants and waste pickers—plays a critical role in waste collection. However, these systems remain fragmented, unregulated, and often exploitative. Consumers either dispose of waste through municipal systems, sell it to scrap dealers, or, in rare cases, return it to retailers in exchange for discounts on new purchases. The lack of standardised collection infrastructure is the first thing that the EPR systems have to address in creating a circular economy.

Challenges in Establishing Waste Collection Channels

Several factors contribute to the absence of robust waste collection channels:

1. **Lack of Producer Commitment:** Even in regions with EPR regulations, many producers treat compliance as a checkbox exercise. Rather than investing in sustainable waste management solutions, they opt for minimal compliance by outsourcing responsibilities to Producer Responsibility Organisations (PROs) or recyclers, often resulting in ineffective systems.
2. **Limited Economic Incentives:** The financial value of waste materials is often negligible compared to the cost of new products. As a result, businesses have little motivation to invest in collection infrastructure. Without viable economic incentives, formal collection channels remain stagnant.
3. **Unrealistic Price Expectations:** Many governments, enterprises, and households correlate the value of waste materials with new product pricing, sometimes mandating that waste cannot be sold below a specific percentage of the new product's price. This unrealistic expectation discourages the development of efficient collection systems.

Potential Waste Collection Channels

To bridge the gap between product distribution and waste collection, a multi-channel approach is essential. Potential waste collection channels include:

- **Formalising the Informal Sector:** Governments and producers can integrate waste pickers and scrap merchants into formal EPR frameworks, providing them with financial incentives, safety measures, and legal recognition.
- **Retailer Take-Back Programs:** Encouraging retailers to implement buy-back schemes or drop-off points where consumers can return end-of-life products in exchange for discounts or other benefits such as in trade-in sales.
- **NGO and Community Engagement:** Partnering with nonprofit organisations to raise awareness and facilitate community-based waste collection initiatives.
- **Bulk Collection from Institutions:** Establishing waste collection systems for offices, schools, and industries that generate significant volumes of waste.
- **Direct-to-Consumer Models:** Developing doorstep collection services or subscription-based waste collection programs that mirror the efficiency of modern product delivery systems.

Financing Waste Collection Systems

Just as product distribution networks require significant investment, waste collection channels demand dedicated financial resources. The cost of building and maintaining these systems varies based on product type and geographic location. Sustainable financing models could include:

- **EPR Fees and Levies:** Governments can mandate that producers contribute a fixed percentage of sales revenue to waste collection initiatives.
- **Public-Private Partnerships:** Collaborations between governments, businesses, and environmental organisations can fund waste management infrastructure.
- **Consumer Incentives:** Reward-based collection programs can encourage consumers to return used products by offering discounts, cashback, or loyalty points.
- **Extended Distribution Network Investment:** Similar to financing product distribution, businesses can allocate part of their logistics and supply chain budget to reverse logistics, ensuring that waste collection is integrated into existing transportation networks.

- **Corporate Sponsorships and Branding:** Just as companies invest in brand visibility through retail presence, they can sponsor collection initiatives that align with their sustainability commitments, creating consumer goodwill and brand recognition.
- **Digital Platform Integration:** Leveraging e-commerce and digital payment systems to introduce waste collection as a service, allowing consumers to schedule pickups with minimal friction and ensuring traceability of collected waste.
- **Reinvestment from Recycling Profits:** Profits generated from the sale of recyclable materials can be reinvested into the collection infrastructure, creating a self-sustaining model.
- **Micro-Financing for Local Collectors:** Providing financial support to small-scale waste collectors, cooperatives, and recycling start-ups through low-interest loans or grants to enhance collection capacity.

Conclusion

EPR represents a powerful policy tool for addressing waste management challenges and advancing sustainability goals. However, its effectiveness hinges on the establishment of efficient and scalable waste collection channels. Without these channels, the vision of a circular economy remains elusive. To overcome existing barriers, producers must move beyond token compliance, greenwashing, and invest in meaningful solutions. Governments, too, play a critical role in creating an enabling environment through supportive policies, infrastructure development, and public awareness campaigns.

By prioritising sectors with the highest environmental impact, fostering collaboration among stakeholders, and addressing the economic and social dimensions of waste management, EPR can drive meaningful change. The journey toward a circular economy is complex, but with strategic planning, innovation, and collective effort, it is achievable. As countries worldwide continue to refine their EPR frameworks, the development of robust waste collection systems will be key to unlocking the full potential of this transformative policy tool. Only then can we ensure a sustainable future where waste is not an endpoint but a new beginning.

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