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Enablers for Effective EPR in the Asia-Pacific Region

# Lessons from developed and developing countries in the EU and Asia

# PAKISTAN

## Acknowledgement

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# ABBREVIATIONS

| | |
|---|---|
| **CDA** | Capital Development Authority |
| **D2D** | Door-to-Door (collection) |
| **EPR** | Extended Producer Responsibility |
| **EU** | European Union |
| **LWMC** | Lahore Waste Management Company |
| **MCI** | Metropolitan Corporation Islamabad |
| **MoCC&EC** | Ministry of Climate Change & Environmental Coordination (Pakistan) |
| **Mt** | Million tonnes |
| **Pak-EPA** | Pakistan Environmental Protection Agency |
| **PKR** | Pakistani Rupee |
| **PPP** | Purchasing Power Parity (in GDP context) |
| **PPPs** | Public-Private Partnerships |
| **PROs** | Producer Responsibility Organisation(s) |
| **RDF** | Refuse-Derived Fuel |
| **SDGs** | Sustainable Development Goals |

| | |
|---|---|
| **SMEs** | Small and Medium-sized Enterprises |
| **SSWMB** | Sindh Solid Waste Management Board |
| **SWM** | Solid Waste Management |
| **USD** | United States Dollar |
| **WMC** | Waste Management Company/Companies |

# 1. EXECUTIVE SUMMARY

Pakistan is facing an escalating waste crisis, primarily driven by rapid urbanisation, population growth, and increased consumption. With over 49 million tonnes of waste generated annually, including 433,000 tonnes of electronic waste and an estimated 55 billion plastic bags, Pakistan's existing waste management infrastructure is overwhelmed. The informal sector dominates recycling and waste collection, operating under unsafe and unregulated conditions, while the formal sector suffers from underinvestment, fragmented governance, and limited capacity.

This report, supported by the EU SWITCH-Asia Programme, critically analyses the enabling conditions for Extended Producer Responsibility (EPR) in Pakistan. EPR is a globally recognised policy tool that shifts the financial and operational burden of waste management from the public sector to producers, incentivising sustainable product design and recycling.

The study identifies substantial gaps in Pakistan's regulatory, institutional, and market landscape that hinder effective EPR implementation. Despite several provincial-level initiatives, such as Punjab's 2023 EPR regulations for plastics, Pakistan still lacks a cohesive national EPR framework. Municipalities remain burdened with high waste management costs, ranging from PKR 7,000 to PKR 23,000 per metric tonne, without corresponding investment in recycling infrastructure or formalised support for the informal waste sector.

Through comprehensive stakeholder consultations and field analysis, the report identifies multiple barriers to EPR adoption, including:

- Regulatory fragmentation and lack of enforcement.
- Absence of nationwide EPR targets and traceability systems.
- Weak integration of the informal sector.
- Limited market demand for recycled materials.
- Low public awareness and unsorted household waste.
- Producer resistance due to cost and logistical challenges.

Yet, Pakistan also has untapped potential. The informal sector diverts substantial recyclable material from landfills; start-ups and SMEs are innovating in upcycling and circular business models; and a growing interest from private industry and donors signals readiness for systemic transformation.

To leverage these opportunities, the report proposes a phased, multi-stakeholder EPR roadmap, aligned with international best practices. Key recommendations include:

- Establishing a National EPR Framework under the Ministry of Climate Change & Environmental Coordination.
- Setting up Producer Responsibility Organisations (PROs) with voluntary and later mandatory compliance.
- Introducing a plastic credit system and consumer incentives.
- Digitising traceability through a national waste audit portal.
- Formalising informal waste workers via cooperative models and social protections.
- Stimulating market demand for recyclates through regulatory mandates and green public procurement.
- Launching consumer awareness campaigns and industry capacity-building programmes.

If implemented effectively, EPR in Pakistan can reduce the financial burden on municipalities, mitigate environmental and public health risks, improve livelihoods in the informal sector, and contribute to a thriving circular economy. It also aligns with Pakistan's commitments under the Sustainable Development Goals and international climate agreements.

**Table 1. Summary of key activities, outputs, deliverables and timeframe**

| Activity | Outputs | Deliverables | Timeframe |
|---|---|---|---|
| **Project inception and stakeholder engagement** | Identification of key stakeholders, alignment of goals, project kick-off | Inception note, stakeholder map | Month 1 |
| **Literature review** | Review of global and national EPR practices, regulatory and institutional gaps | Annotated bibliography, background paper | Month 1–2 |
| **Stakeholder consultations (FGDs, KIIs, Webinars)** | Insights from government, industry, informal sector, and CSOs on EPR readiness | Consultation summary, transcripts | Months 2–4 |
| **Final Report** | Consolidated findings, challenges, and actionable policy recommendations | Final EPR Report for Pakistan | Month 5–6 |

# 2. INTRODUCTION

## 2.1. Background

Extended producer responsibility (EPR) is a policy approach that makes producers responsible for their goods throughout their entire product life cycle, including at the post-consumer stage.[1] Since the late 1980s, the concept of 'EPR' has become an established principle of environmental policy in an increasing range of countries. The EPR concept originated in a 1990 report presented to the Swedish Ministry of the Environment,[2] and its development reflects three key trends in environmental policy and law during that period: a focus on prevention rather than reactive solutions, the adoption of life-cycle perspectives, and a move away from rigid regulatory approaches toward more flexible tools like economic incentives and information-based strategies. These trends converge in the core principle of EPR, which aims to encourage producers to design environmentally friendly products by holding them accountable for the entire life cycle of their goods. This policy has gained traction globally, especially in the context of environmental sustainability and the circular economy. In Pakistan, the implementation of EPR could play a significant role in addressing mounting waste management challenges, particularly as regards plastic and electronic waste.

EPR is fundamentally designed to shift the financial and operational burden of waste management from municipalities to producers, thereby incentivising them to design products that are easier to recycle with a lower environmental impact.[3] The concept promotes a holistic product policy framework that compels stakeholders to assess the environmental consequences of products throughout their life cycle while urging them to adopt a more comprehensive view of environmental safety and sustainability, moving beyond the limited scope of factory operations to address broader ecological issues. The concept has been effectively implemented in several countries, particularly in Europe, where EPR regulations have led to substantial increases in recycling rates. For instance, in the European Union (EU), approximately 35% of electronic waste and 65% of packaging waste is recycled or reused, demonstrating the effectiveness of EPR in promoting a circular economy.[4] This success highlights the potential benefits of adopting similar frameworks in Pakistan, where waste management systems are often overwhelmed by the sheer volume of waste generated. To facilitate effective waste management and resource recovery, various EPR instruments can be employed, and they are designed to ensure that producers take responsibility for the entire life cycle of their products, from production to disposal. Table 2 outlines key types of EPR instruments and their respective mechanisms, each playing a vital role in enhancing sustainability.

1 OECD. (2016). *Extended producer responsibility: Guidance for efficient waste management*. Retrieved December 30, 2024, from https://www.oecd.org/en/topics/sub-issues/extended-producer-responsibility-and-economic-instruments.html

2 The definition was published in English for the first time in: Lindhqvist, Thomas, 1992 Extended Producer Responsibility, in Lindhqvist, T., Extended Producer Responsibility as a Strategy to Promote Cleaner Products (1–5). Lund: Department of Industrial Environmental Economics, Lund University. Cf. https://en.wikipedia.org/wiki/Extended_producer_responsibility

3 Gupta, D., & Dash, S. (2023). Challenges of implementing extended producer responsibility for plastic-waste management: lessons from India. Social Responsibility Journal, 19(9), 1595–1612.

4 Kunz, N., Mayers, K., & Van Wassenhove, L. N. (2018). Stakeholder views on extended producer responsibility and the circular economy. California Management Review, 60(3), 45–70.

**Table 2. Overview of key types of EPR instruments**

| Type of EPR Instrument | Mechanisms |
|---|---|
| Product take-back requirements | Producers must take back their products from consumers when they become waste; requirements often include mandatory or voluntary recycling and collection targets for specific products or materials |
| Economic and market-based instruments | Includes schemes such as:<br>***- Deposit refund schemes:*** Consumers pay a deposit when purchasing an item, which is refunded when they return the waste item<br>***- Advance disposal fees:*** Consumers pay a fee at the point of purchase, which is used to finance end-of-life management of the products |
| Regulations and performance standards | Included are product standards, such as requirements for minimum recycled content in products |
| Information-based instruments | These instruments provide information to consumers and/or producers to support the implementation of EPR, often used alongside other types of instruments |

While EPR has proven effective in developed economies, implementation in developing countries presents unique challenges because of infrastructural, economic, and regulatory gaps. Many low- and middle-income countries lack formal waste management policies, leading to an over-reliance on municipalities and the informal waste sector. Weak enforcement mechanisms, fragmented waste collection systems, and financial constraints further hinder EPR adoption. Additionally, technical barriers, such as the limited availability of secondary raw materials, inconsistencies in recycling outputs, and logistical inefficiencies, complicate efforts to integrate EPR into national waste management strategies.

In the context of Pakistan, the urgency of EPR implementation is particularly pronounced because of the country's escalating waste crisis. Rapid urbanisation, population growth, and increased consumption have led to an exponential rise in waste generation, especially in the plastics and electronic waste sectors. Furthermore, Pakistan lacks a national-level waste management policy, and municipal authorities are often overwhelmed by the sheer volume of waste, leading to inefficient collection and disposal mechanisms. The informal sector plays a dominant role in waste management, with scavengers and small-scale recyclers handling a significant portion of recyclable materials under unregulated and environmentally hazardous conditions. This fragmented and unregulated system results in poor resource recovery rates, environmental pollution, and missed economic opportunities in the recycling sector, and the country's 65% waste is mismanaged, often ending up in landfills, waterways, or open dumpsites.

A recent study conducted by Pak Mission Society in collaboration with GIZ Pakistan indicates that Pakistan generates approximately 433 kt of e-waste annually and ranks as the 26th largest producer of waste worldwide. Additionally, Pakistan imports significant amounts of e-waste, of which less than 2% is usable. The remaining waste is informally recycled by workers, including women and children, who lack proper safety measures and are thus exposed to hazardous conditions. However, a significant proportion of e-waste management in the country remains informal, with adverse consequences for both the environment and human health. Informal recycling methods, such as the burning of wires and the crude dismantling of devices, release toxic chemicals into the air, water, and soil, posing serious health risks including respiratory issues, skin diseases, and long-term illnesses.

Similarly, the country produces hospital waste at an average rate of 0.667 kg per hospital bed per day; of this, 10%–25% is classified as infectious and hazardous. As a result of inadequate sanitation practices, hazardous medical waste is often mixed with general waste, compounding waste management challenges. The convergence of poor handling of both e-waste and medical waste underscores broader systemic deficiencies in Pakistan's waste management infrastructure, posing serious environmental and public health risks.

The lack of an integrated waste management system combined with weak regulatory enforcement has thus resulted in severe environmental degradation, public health risks, and economic losses. One of the most pressing challenges for Pakistan is the sheer volume of waste that has overwhelmed the country's existing waste management infrastructure. The overall plastic waste recycling potential is around 18%, while actual recycling represents only some 7%–8% of all waste. Municipal authorities lack the financial and technical capacity to manage this crisis effectively. The implementation of EPR would shift waste collection and recycling responsibilities from the government to producers, ensuring a more structured and financially sustainable waste management mechanism. By obliging manufacturers and importers to manage the post-consumer life cycle of their products, EPR would lead to better waste segregation, improved recycling rates, and reduced environmental pollution.

Unregulated disposal and burning of waste have created significant environmental and health hazards. Releasing toxic pollutants into the air and contaminating water sources have led to severe public health consequences, including respiratory diseases, waterborne illnesses, and long-term exposure to hazardous chemicals. Without proper regulations, both industries and consumers continue to dispose of waste irresponsibly, exacerbating these problems. EPR can play a crucial role in addressing this issue by ensuring that hazardous and non-biodegradable waste is systematically collected and processed in an environmentally sound manner.

Pakistan's waste sector relies heavily on informal waste pickers and recyclers who work under precarious and unsafe conditions, without access to social protection or legal recognition. While integrating this workforce into a structured EPR system is essential for improving overall waste management efficiency and worker welfare, such systematisation may not be feasible or acceptable to many informal actors. Global experience shows that large informal waste sectors cannot be fully absorbed into formal employment structures without unintended social and economic disruptions.

The EPR framework in Pakistan should thus adopt a voluntary, incentive-based integration approach, offering informal workers opportunities to collaborate with producer responsibility organisations (PROs), access certified buy-back centres, receive health and safety training, and participate in waste collection programmes through cooperatives or aggregator schemes, without mandating formal employment status. A flexible model would respect the autonomy of informal workers while improving working conditions, material recovery rates, and environmental outcomes.

Beyond the environmental and social dimensions, EPR presents significant economic opportunities. The global waste management industry is valued at over USD 1 trillion, yet Pakistan's recycling sector remains largely untapped. With the right policies in place, the country could develop a thriving circular economy that could create green jobs, attract investment in recycling technologies, and promote local manufacturing of sustainable products. In addition, EPR would encourage industries to adopt eco-friendly product designs and sustainable packaging, reducing waste at the source and minimising the need for excessive raw material extraction.

Nevertheless, technical and operational bottlenecks complicate the implementation of EPR in Pakistan, including the following constraints:

- **Lack of formal recycling infrastructure:** The country has insufficient facilities for processing recyclable materials, leading to low recovery rates.
- **Supply chain uncertainties:** Fluctuations in material availability and inefficiencies in waste logistics create barriers to a stable recycling ecosystem.
- **Limited sectoral prioritisation:** A lack of targeted policies hinders the effective rollout of EPR in high-impact industries such as packaging, electronics, and automotive sectors.
- **Regulatory and institutional gaps:** The absence of an enabling legal framework prevents the establishment of standardised EPR mechanisms.

Given these challenges, the adoption of EPR in Pakistan presents a crucial opportunity for transitioning the country toward a circular economy. By shifting the financial and operational burden of waste management from municipalities to producers, EPR would incentivise sustainable product design, enhance recycling efficiency, and reduce environmental degradation. Finally, the introduction of EPR-compliant systems can

create economic incentives for investment in recycling infrastructure, generate green jobs, and support Pakistan's broader sustainability commitments under the United Nations Sustainable Development Goals (SDGs).

## 2.2. Objectives of this study

The objectives of this study are first, to identify the barriers and challenges specific to Pakistan's waste management system by analysing the gaps in current waste management practices; second, to propose actionable recommendations for an EPR policy framework tailored to Pakistan's socio-economic and environmental context; and third, to highlight opportunities for cross-sectoral collaboration and innovation in waste management.

# 3. STUDY AREA

The study area for solid waste management and extended producer responsibility (EPR) implementation is Pakistan, a developing country with a total area of almost 882,000 km², consisting of provinces that include over 205,300 km² in Punjab, almost 141,000 km² in Sindh, nearly 101,750 km² in Khyber Pakhtunkhwa, almost 347,200 km² in Balochistan, and 906 km² in Islamabad. Pakistan has a population of 241.49 million people (2023 Census), with a predominantly Muslim demographic (95%); the remainder consists of other ethnic groups.[5]

Geographically, Pakistan, located in South Asia, shares borders with India to the east (2,912 km), Iran to the west (909 km), Afghanistan to the northwest (2,430 km), and China to the northeast (523 km). The country has a coastline of 1,046 km along the Arabian Sea to the south.[6] The Indus River, the primary waterway in Pakistan, flows from China through most provinces except Balochistan, fed by the Chenab, Jhelum, and Ravi rivers which provide vital water supply for agriculture and hydroelectric power. Northern and western Pakistan are mountainous, with areas like Kashmir featuring some of the world's highest peaks, including K-2. The northern regions receive the most rainfall and are endowed with preserved temperate forests, while the southern areas, including the Cholistan and Thal deserts, are drier. The fertile plains of Punjab and parts of Sindh are crucial for the country's agriculture.[7] The varied geography, including deserts, mountains, and plains, presents unique challenges for solid waste management and the effective implementation of EPR.

Currently, according to the International Trade Administration, Pakistan generates approximately 49.6 Mt of solid waste annually with plastics accounting for 9% of this total,[8,9] a situation which has led to significant environmental challenges. Most municipal waste is either burned, dumped, or buried in open spaces, posing serious risks to public health and safety. Government estimates indicate that Pakistan produces approximately 87,000 t of solid waste daily, with a significant portion coming from major metropolitan areas. Karachi, the country's largest city, generates over 13,000 t of municipal waste per day.[10]

The country's economy, ranked 24th in the world by GDP by purchasing power parity (PPP), is driven by agriculture, industry, and services. However, with a per capita income ranked 161st globally, waste management systems often face resource constraints,[11] making the implementation of EPR particularly vital in addressing the growing waste generation and improving waste management practices.

5 Consulate General of Pakistan (Los Angeles). https://pakconsulatela.org/about-pakistan/
6 Ibid.
7 Id.
8 Iqbal, A., Abdullah, Y., Nisami, A.S., Sultan, I.A. and Sharif, F., 2022. Assessment of solid waste management system in Pakistan and sustainable model from environmental and economic perspective. *Sustainability*, 14(19), p.12680.
9 Mukheed, M. and Kahn, Alisha. 2020. Plastic pollution in Pakistan: Environmental and Health Implications. *J. Pollut. Effects Contr*, 4, pp.251-258.
10 Pakistan Country Commercial Guide, 2024. https://www.trade.gov/country-commercial-guides/pakistan-waste-management
11 International Monetary Fund. (2024, April). World Economic Outlook database: April 2024. Retrieved May 11, 2024, from https://www.imf.org

**Table 3. Waste generation, collection, treatment, and disposal estimates in Pakistan**

| Settlement area | Waste quantity generated | Collected (%) | Transported (%) | Treated (%) | Disposed of (%) |
|---|---|---|---|---|---|
| **Large cities (11)** | 0.55 kg/capita/day (9.44 MMt/year) | 80% | 80% | 20% | 80–100% |
| **Medium & small cities** | 0.42 kg/capita/day (4.44 MMt/year) | 50–70% | 50–70% | 10% | 90–100% |
| **Rural communities** | 0.33 kg/capita/day (13.72 MMt/year) | 20% | 20% | 20% | 80–100% |
| **Total (Pakistan)** | | | **27. 58 MMt/year** | | |

**Notes**:
- Large cities include 52 million people (as of 2017).
- Medium & small cities account for 32 million people, with some cities like Bahawalpur and Sialkot achieving collection rates over 80%.
- Rural areas, with 126 million people, typically have waste scattered or burned on village outskirts.
- Disposal mainly occurs in uncontrolled dumpsites in urban areas.

# 4. COST OF WASTE MANAGEMENT IN THE URBAN AREAS OF PAKISTAN

## 4.1. Overview of waste management costs

Managing solid waste in urban areas of Pakistan is a complex and resource-intensive process, with costs varying significantly across cities. The cost per metric tonne of waste management depends on multiple factors, including population size, waste generation rates, collection efficiency, and the disposal methods employed. Major cities such as Karachi and Lahore incur the highest waste-management costs due to their large populations and high waste generation rates. Smaller cities like Quetta and Islamabad also face substantial costs, partly because of the need for more advanced waste-management infrastructure. Waste management in urban Pakistan is a costly yet essential service, with costs ranging from PKR 7,000 to PKR 23,000 per metric tonne, depending on the city and waste management practices. Efficient waste management typically benefits from a combination of municipal oversight, selective private sector participation, and appropriate engagement with the informal recycling sector. While municipal bodies play a central regulatory and operational role, private sector involvement can introduce efficiency, innovation, and capital investment, particularly in terms of waste collection logistics, recycling infrastructure, and processing technologies. Similarly, recognition of the informal recycling sector does not necessarily imply full formalisation, but may involve acknowledging existing contributions, providing occupational health and safety support, and facilitating linkages with formal systems where feasible. The extent of engagement with both the private and informal sectors should be context-specific, based on local governance capacity, existing waste infrastructure, and socio-economic dynamics.

Table 4 provides an estimate of solid waste management costs in major Pakistani cities, considering the cost of collection, transportation, intermediate treatment, and final disposal.

**Table 4. Estimated solid waste management costs in major Pakistani cities**

| City | Population (Million) | Daily waste generation (kg per capita) | Annual waste generation (million t) | Collection & transport cost (PKR/t) | Intermediate treatment cost (PKR/t) | Disposal cost (PKR/t) | Total SWM cost (PKR/t) | Total SWM cost (USD/t) |
|---|---|---|---|---|---|---|---|---|
| **Karachi** | 14.0 | 0.65 | 3.32 | 5,000–8,000 | 6,000–10,000 | 3,000–5,000 | 14,000–23,000 | 50–82 |
| **Lahore** | 11.1 | 0.65 | 2.63 | 4,500–7,000 | 5,000–8,000 | 2,500–4,500 | 12,000–19,500 | 43–70 |
| **Faisalabad** | 3.2 | 0.55 | 0.64 | 3,500–5,500 | 4,000–6,500 | 2,000–3,500 | 9,500–15,500 | 34–55 |
| **Rawalpindi** | 2.1 | 0.50 | 0.38 | 3,000–5,000 | 3,500–5,500 | 1,800–3,000 | 8,300–13,500 | 30–48 |
| **Multan** | 1.9 | 0.50 | 0.35 | 2,800–4,500 | 3,000–5,000 | 1,500–2,800 | 7,300–12,300 | 26–44 |
| **Peshawar** | 1.7 | 0.55 | 0.34 | 3,000–4,800 | 3,500–5,500 | 1,800–3,000 | 8,300–13,300 | 30–47 |
| **Quetta** | 1.1 | 0.50 | 0.20 | 2,500–4,000 | 3,000–4,800 | 1,500–2,500 | 7,000–11,300 | 25–40 |
| **Islamabad** | 1.0 | 0.55 | 0.20 | 3,500–5,500 | 4,000–6,500 | 2,000–3,500 | 9,500–15,500 | 34–55 |

## 4.2. Factors determining waste management costs

The cost of waste management in Pakistan is determined by several factors.

**1. Waste generation rates and composition**

Cities with larger populations and higher per capita waste generation require more financial resources for collection, transportation, and disposal. The composition of waste also plays a significant role: organic waste requires composting, while plastic and hazardous waste need specialised treatment.

**2. Collection and transportation costs**

Collection and transportation form the largest portion of SWM costs. Inadequate infrastructure, inefficiencies in fleet management, and the need for fuel-intensive operations contribute to rising expenses. Mechanised collection systems, as seen in Lahore and Islamabad, increase operational costs but they also improve efficiency.

**3. Intermediate treatment and disposal**

Treatment methods such as recycling, composting, and incineration significantly affect waste management costs. In some cities, waste treatment is handled by private companies, such as Lahore Compost Pvt. Ltd., reducing costs for municipal authorities. Sanitary landfills require high investment and maintenance costs compared to open dumping, which remains a cheaper but environmentally harmful alternative.

**4. Public-private partnerships in waste management**

Several cities in Pakistan have integrated public-private partnerships (PPPs) to improve waste management efficiency. The Lahore Waste Management Company (LWMC) and Sindh Solid Waste Management Board (SSWMB) have engaged international contractors for waste collection and disposal services. Private sector participation in these cases can help alleviate the financial and operational burden on municipal bodies by introducing specialised equipment, operational efficiencies, and investment in waste logistics and processing infrastructure. While some advanced services provided by private firms may incur higher per-unit costs compared to conventional municipal services, they often deliver improved service quality, greater collection coverage, and long-term public health and environmental benefits. However, financial constraints and governance issues frequently hinder the sustainability and scalability of these partnerships.

## 4.3. Governance structure of waste management in Pakistan

Urban waste management in Pakistan follows a multi-tiered governance structure, involving public entities, private sector firms, and informal workers.

**1. Municipal waste management companies**

Cities have dedicated waste management companies (WMCs) responsible for overseeing waste collection and disposal. Examples include:

- Lahore Waste Management Company (LWMC)
- Sindh Solid Waste Management Board (SSWMB)
- Rawalpindi Waste Management Company (RWMC)

These entities collaborate with local governments and international contractors to manage urban waste effectively.

**2. Private sector participation**

Private companies, such as Albayrak and Ozpak (Turkey-based firms in Lahore) and Dera Ghazi Khan Cement Co. Pvt. Ltd. (for refuse-derived fuel [RDF] production), provide specialised services, reducing the financial burden on municipal bodies.

**3. Informal waste collectors and the recycling sector**

The informal sector plays a crucial role in waste management, particularly in recycling. Waste pickers, often from marginalised communities, recover recyclable materials such as plastics, paper, and metals, reducing the volume of waste requiring formal disposal. However, their role is often unrecognised in official waste management policies.

**4. Waste pickers and community-based initiatives**

At the lowest tier, waste pickers contribute significantly to waste reduction and material recovery. Many communities have also developed self-managed waste collection initiatives, where local organisations handle neighbourhood-level waste management.

# 5. REVIEW OF ENABLING FACTORS FOR EPR IN PAKISTAN

## 5.1. Baseline waste management situation

### *5.1.1. Existing waste management system*

According to the International Trade Administration, Pakistan generates approximately 49.6 million tonnes of solid waste annually, with major cities like Karachi and Lahore contributing significantly. A significant portion, around 32.6 million tonnes, is municipal solid waste. The per capita waste generation ranges from 0.24 to 0.65 kg per day and is increasing at an annual rate of 2.4%.[12, 13] The country lacks a unified waste management system, with local authorities and the informal sector primarily handling collection and separation. Limited material recovery facilities and sustainable treatment options result in widespread open dumping and burning. Official estimates place national daily solid waste generation at 87,000 tonnes, though alternative figures challenge this number. Karachi, the largest city, produces 9,000–13,500 tonnes of waste daily, but has one of the weakest management infrastructures.[14]

The waste collection value chain in Pakistan is highly informal and fragmented, with dry recyclables mostly collected informally in larger cities, while much of the waste ends up in landfills or open dumping sites. Waste pickers contribute to direct-to-door (D2D) collection with approximately 45%–60% of waste sent to landfills or designated open dumpsites. Around 30% of waste in Pakistan remains uncollected, and thousands of scavengers, many of whom are child labourers, work unsupervised in an unregulated environment to collect and sort waste. Figure 1 shows the informal estimates of the waste collection value chain in Pakistan.

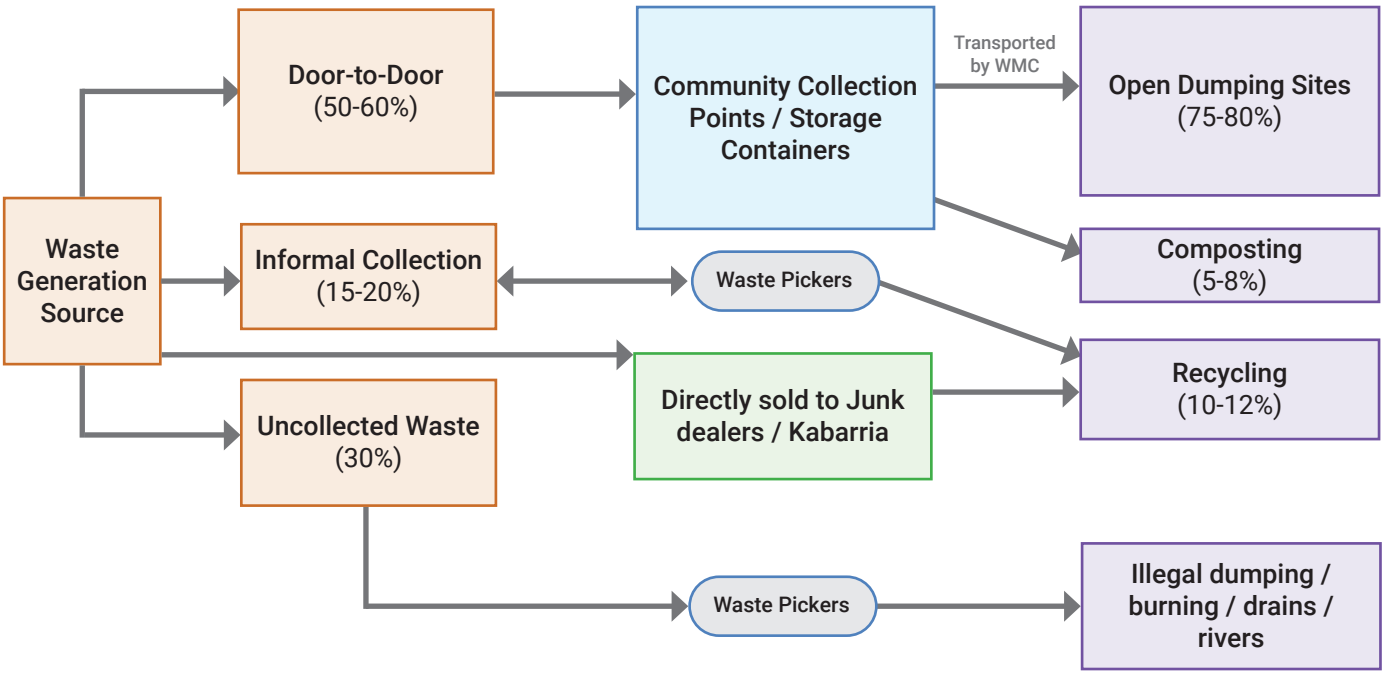


**Figure 1. Informal estimates of the waste collection value chain in Pakistan.**

12 Ghauri, W. U. (2018). Waste to energy potential in Pakistan. Expert Group Meeting on Sustainable Application of Waste-to-Energy in the Asian Region, Busan, Republic of Korea. United Nations. https://sustainabledevelopment.un.org/content/unosd/documents/37697.Waste%20to%20Energy%20Potential%20in%20Pakistan.pdf

13 Khan, I.U., Waseer, W.A., Ullah, S., & Khan, S. A. (2019). 'Wasteaware' indicators: An assessment of the current solid waste management system in Lahore, Pakistan. Asia Pacific Journal of Energy and Environment, 6(2), 49–58. https://doi.org/10.18034/apjee.v6i2.264

14 International Trade Administration. (n.d.). Waste management. https://www.trade.gov/knowledgeproduct/

Despite moderate collection rates of 60%–70%, the waste management system remains plagued by inefficiencies, environmental hazards, and health concerns. The following challenges illustrate the dire state of waste management in this country.

**1. Lack of a structured waste management system**

Waste management in Pakistan is fragmented, with uncoordinated efforts from local authorities. Cities like Karachi, daily generating 9,000–13,500 tonnes of waste, suffer from inadequate facilities and poor planning.[15,16] Most collected waste is stored or left in open spaces, posing health risks. Urban sprawl and inefficiencies exacerbate the issue.

**2. High levels of plastic, e-waste, and packaging waste**

Pakistan generates significant quantities of plastic, e-waste, and packaging waste, leading to substantial pollution issues. The country produces around 55 billion plastic bags annually, worsening the plastic waste crisis (Mukheed & Khan, 2020). E-waste generation rose by 43.8%, from 301 kt in 2016 to 433 kt in 2019, making Pakistan the 20th largest global producer of e-waste (Forti et al., 2020). E-waste is processed informally, leading to environmental contamination (Iqbal et al., 2017; Hameed et al., 2020; Kazim et al., 2024; Shakil et al., 2023).

**3. Limited recycling infrastructure and informal sector dominance**

Recycling infrastructure is basic and reliant on the informal sector. Waste pickers work without formal recognition or proper safety. Material recovery facilities are limited, and recycling rates are low (SWITCH-Asia, 2022). Waste management focuses on collection and disposal, without proper segregation or recovery (Khan et al., 2015).

**4. Environmental degradation and public health concerns**

Open dumping and burning waste release toxic pollutants, damaging ecosystems and public health, and these practices spread diseases and contaminate water. Plastics production emitted 1.78 Gt of $CO_2$-eq in 2015, which is projected to rise to 6.5 Gt $CO_2$-eq by 2050 (Zhao et al., 2017; Mukheed & Khan, 2020; Waring, Harris & Mitchell, 2018; Zheng & Suh, 2019).

**5. Policy and regulatory gaps**

Weak regulatory oversight and poor enforcement hinder effective waste management. Bags without degradable additives (D2W) are still widely used, and regulations fail to incentivise recycling (Rehman et al., 2022; Kumar, Singh & Dwivedi, 2020). While initiatives like Lahore's Waste Management Company show progress, other cities have had only limited success (SWITCH-Asia, 2022). Stronger policies are needed to encourage recycling and private investment.

Lahore was the first city to develop a formalised system through the Lahore Waste Management Company (LWMC) in 2011. Covering 274 Union Councils, LWMC employs 58 internal staff and 10,000 field workers. Waste collection and transportation are subcontracted to the Turkish firms OzPak and Albayrak, although city-wide coverage remains incomplete. Services provided include manual and mechanical sweeping, washing, and door-to-door waste collection.

Initially, Lahore relied on a single dumpsite at Mahmood Booti, which closed in 2016 after reaching capacity, having received 13.14 million tonnes of waste with a biodegradable fraction of 55%–60%. To address this situation, LWMC developed Pakistan's first scientific landfill at Lakhodhair, with a daily processing capacity of 2000–2500 tonnes of waste.[17] Despite these advancements, open dumping and burning persist, and formal recycling remains minimal. Informal scavengers recover about 27% of dry recyclables.[18]

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15 SWITCH-Asia. (2022). *Waste Management in Pakistan: Status, Best Practices, Recommendations*. Retrieved from https://www.switch-asia.eu/site/assets/files/3378/waste_management_in_pakistan_final.pdf

16 Daily Times. (2019). The issue of solid waste of Karachi. Retrieved August 6, 2020, from https://dailytimes.com.pk/459399/the-issue-of-solid-waste-of-karachi/

17 Lahore Waste Management Company. (n.d.). Sanitary landfill site. Retrieved February 2, 2025, from https://www.lwmc.com.pk/lwmc-sanitary-landfill.php

18 BioEnergy Consult. (2020). Solid waste management in Pakistan. Retrieved February 2, 2025, from https://www.bioenergyconsult.com/solid-waste-management-in-pakistan/

Feasibility studies for a waste-to-energy plant in Lahore estimated processing 1,035 tonnes of waste daily to generate 5.5 MW.[19] Additional LWMC initiatives include gas collection at Mahmood Booti, waste-to-energy conversion during Eid ul Azha in 2018, and a composting plant in partnership with Lahore Compost. In 2011, LWMC partnered with DG Khan Cement to process 1,000 tonnes of municipal waste into refuse-derived fuel (RDF).[20] In 2018, NEPRA approved a 25-year tariff for waste-based power generation, leading to an agreement with a Chinese consortium for the development of a 40 MW waste-to-energy plant in Lahore.[21] The project is being developed by Lahore Xingzhong Renewable Energy and Satarem Enterprises, with current ownership held by Chengdu Xingrong Environment and China Enfi Engineering. Construction is expected to commence in 2026, with commercial operations anticipated in 2027. The plant will use municipal solid waste as feedstock, adopting a combustion process to recover energy.[22]

Waste collection in Lahore follows a mix of formal and informal approaches. Primary collection is conducted by municipal contractors and informal collectors, while secondary collection involves temporary dumpsites. Formal collection covers about 68% of the waste generated. Per capita waste generation is estimated at 0.5–0.65 kg daily, although precise measurements are lacking.

Gujranwala, Pakistan's fifth-largest city with a population of over 2 million (2017), follows a similar model under the Gujranwala Waste Management Company. A study by Punjab University found that over 80% of its waste is organic, with generation ranging from 0.3 to almost 0.5 kg per capita per day. It further reported that restaurant waste generation in Gujranwala ranged up to nearly 11 kg per day per establishment in certain cases, although actual quantities typically vary widely based on restaurant size and operating hours.[23]

In Karachi, a 2012 UNESCAP study estimated daily waste generation at 9,000 tonnes, with projections reaching 16,000–18,000 tonnes because of rapid population growth.[24] Per capita waste generation in the year of the study stood at 0.6 kg, increasing annually by 3.5%. Household waste generation varied between about 0.2 and 0.8 kg per capita per day, while fruit and vegetable markets produced considerably higher amounts of organic waste per shop, averaging some 1.8 kg per day for fruit shops and almost 12 kg per day for vegetable shops. The substantial amounts of perishable goods handled in these markets is reflected in these volumes, contributing to a distinct and concentrated organic waste stream requiring targeted management solutions.[25] Until 2014, waste collection was handled by the City District Government Karachi (CDGK) and Karachi Metropolitan Corporation, with 80% of waste managed by these entities. However, only half of the waste generated in Karachi reaches designated landfill sites, with the remainder accumulating in drains and streets.

Karachi's waste management was transferred to the Sindh Solid Waste Management Board (SSWMB) in 2014, shifting oversight from municipal to provincial control. This transition led to competing interests, as SSWMB manages waste across the entire province rather than focusing solely on Karachi. Additionally, land ownership disputes among various agencies have further complicated holistic waste management.

Waste management in Islamabad was initially handled by the Capital Development Authority (CDA) but was transferred to the Metropolitan Corporation Islamabad (MCI) in 2015. UNESCAP estimates per capita waste generation at 0.4–0.5 kg/day, with total daily waste rising from 500–600 tonnes in 2004 to 800–1,000 tonnes by 2011. Around 60%–65% of waste is organic, while 20%–30% is recyclable.[26] Islamabad lacks a formal landfill, relying on a Sector I-12 dumpsite. An informal waste-picking sector scavenges recyclable materials, earning up to USD 1.50/day. In 2017, MCI launched a modern waste management system, introducing mechanical sweeping, waste bins, and organised disposal. In April 2019, the Senate approved

19 Ibid.
20 Climate and Clean Air Coalition. (n.d.). Solid waste management city profile - Lahore city. Retrieved February 2, 2025, from https://www.waste.ccacoalition.org/sites/default/files/files/lahore_city_profile.pdf
21 The News. (July 02, 2025). Lahore to get 40MW waste-to-energy plant in 22 months. Retrieved from https://www.thenews.com.pk/print/397605-lahore-to-get-40mw-waste-to-energy-plant-in-22-months
22 https://www.power-technology.com/data-insights/power-plant-profile-lahore-waste-to-energy-plant-pakistan/?cf-view
23 Ilyas, H., Ilyas, S., Ahmad, S. R., & Ch, M. N. (2017). Waste generation rate and composition analysis of solid waste in Gujranwala city, Pakistan. International Journal of Waste Resources, 7(3). https://doi.org/10.4172/2252-5211.1000297
24 Ebrahim, Z. T. (2018, April 3). A portrait of Karachi's garbage crisis. The Third Pole. Retrieved February 2, 2025, from https://www.thethirdpole.net/2018/04/03/a-portrait-of-karachis-garbage-crisis/
25 https://www.switch-asia.eu/site/assets/files/3378/waste_management_in_pakistan_final.pdf
26 UN ESCAP. (n.d.). Islamabad city profile. Retrieved February 2, 2025, from https://www.unescap.org/sites/default/files/4.%20Islamabad.pdf

a landfill site in Sangjani to address long-term waste disposal.[27]

### *5.1.2. Existing solid waste management (SWM) regulations, acts and policies*

In April 2023 Punjab introduced an extended producer responsibility (EPR) framework to address plastic waste management. Under this framework, producers are required to set up collection systems and incorporate at least 20% recycled content into their products. They are made financially and physically responsible for recycling and required to submit annual reports to ensure compliance. Consumers, collectors, and recyclers have been assigned specific roles in waste segregation and disposal to promote a circular economy. Following the setting up of the framework, the Production and Consumption of Single-Use Plastic Products Regulations, 2023,[28] mandated online registration for producers, consumers, and recyclers, with penalties for non-compliance and regular monitoring to enforce the EPR guidelines. Table 5 outlines a range of policies, acts, and regulations implemented across Pakistan to address environmental concerns, particularly those focusing on waste management and sanitation.

**Table 5. Key policy frameworks and regulations related to SWM in Pakistan**

| No. | Policy/Act/Initiative | Regulatory Authority | Key Provisions/Description |
|---|---|---|---|
| 1 | Punjab Prohibition Ordinance on Polythene Bags, 2002[29] | Government of Punjab | • Prohibits manufacture, sale, use, and import of black polythene bags<br>• Bans bags with wall thickness below 15 microns to reduce environmental harm |
| 2 | National Sanitation Policy, 2006[30] | Federal Government | • Aims to provide adequate sanitation coverage<br>• Improves the quality of life<br>• Ensures a healthy physical environment for residents |
| 3 | The Sindh Prohibition of Non-degradable Plastic Products Rules, 2014[31] | Sindh Environmental Protection Agency (Sindh-EPA) | • Ban on non-degradable plastic products<br>• Regulation of oxo-biodegradable plastic products<br>• Registration of manufacturers, wholesalers, and retailers<br>• Marking recycled plastic products as unsafe for food contact |
| 4 | Khyber Pakhtunkhwa Prohibition of Non-Biodegradable Plastic Products and Regulation of Oxo-Biodegradable Plastic Products Rules, 2017[32] | Khyber Pakhtunkhwa Environmental Protection Agency (KP-EPA) | • Ban on non-biodegradable plastic carrier bags<br>• Ban on plastic bags with wall thickness below 50 microns<br>• Requires labelling with essential information<br>• Prohibits the use of hazardous raw materials |
| 5 | Ban on Polythene Bags Regulations, 2019[33] | Islamabad Capital Territory Authority (ICTA) | • Prohibits the unauthorised manufacture, import, sale, purchase, storage, and use of polythene bags in Islamabad Capital Territory |

27 Capital Development Authority. (n.d.). Modern solid waste management system to be introduced in the Federal Capital. Retrieved February 2, 2025, from http://www.cda.gov.pk/resource_center/news-releases/news-item.asp?var=1276
28 https://punjablaws.punjab.gov.pk/uploads/articles/punjab-environmental-protection-production-and-consumption-of-single-use-plastic-product-regulations-2023-95-of-2023-pdf.pdf
29 https://punjabcode.punjab.gov.pk/uploads/articles/the-punjab-prohibition-on-manufacture-sale-use-and-import-of-polythene-bags-black-or-any-other-polythene-bag-below-fifteen-micron-thickness-ordinance-2002-pdf.pdf
30 https://mocc.gov.pk/PolicyDetail/OTYyZjg5ODktYjE2ZS00NmZiLWI3YTktMjJmMDgwMTdjMjU2
31 http://sindhlaws.gov.pk/setup/publications_SindhCode/PUB-15-000259.pdf
32 http://kpcode.kp.gov.pk/uploads/Prohibition_of_Non-Biodegradable_Plastic_Products_and_Regulation_of_Oxo-Biodegradable_Plastic_Products_Rules_2017.pdf
33 https://environment.gov.pk/SiteImage/Misc/files/Regulations/PlasticBan2019.pdf

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|---|---|---|---|
| 6 | National Climate Change Policy, 2021[34] | Federal Government | • Builds resilience to climate change through adaptation measures<br>• Reduces emissions and promotes renewable energy<br>• Focuses on afforestation and climate action |
| 7 | National Hazardous Waste Management Policy, 2022[35] | Federal Government | • Framework for managing hazardous waste<br>• Covers licensing, handling, storage, and transportation under PEPA Act, 1997 |
| 8 | World Economic Forum's National Plastic Action Partnership (NPAP) programme, 2022[36] | Federal Government | • Focuses on reducing plastic waste through a circular economy<br>• Phases out single-use plastics<br>• Promotes industry-wide sustainable practices |
| 9 | Single-use Plastics (Prohibition) Regulations, 2023[37] | Pakistan Environmental Protection Agency (Pak-EPA) | • Ban on single-use plastic bags, crockery, cutlery, food containers, stirrers<br>• Ban on single-use plastic straws (effective by August 2025)<br>• Beverage containers to be made of 50% recycled plastic by 2028<br>• Mandatory Extended Producer Responsibility (EPR) for producers |
| 10 | Production and Consumption of Single-Use Plastic Products Regulations, 2023[38] | Environmental Protection and Climate Change Department, Government of Punjab | • Ban on single-use plastics such as disposable utensils, cutlery, food boxes, plastic flags<br>• Ban on PVC banners with thickness below 80 microns<br>• Registration of manufacturers, consumers, collectors, and recyclers<br>• Mandatory EPR for plastic products |
| 11 | Extended Producer Responsibility (EPR) in the Single-Use Plastic Regulations, 2023[39] | Federal Government | • Requires producers, importers, and beverage manufacturers to create plans for plastic waste collection and recycling<br>• Plans are subject to federal approval |
| 12 | The Plastic Management Strategy, Punjab, 2023[40] | Environmental Protection and Climate Change Department, Government of Punjab | • Bans production, sale, and use of certain single-use plastic products<br>• Penalties for non-compliance<br>• Development of EPR regulations<br>• Public education and infrastructure for recycling<br>• Support for eco-friendly alternatives<br>• Financial incentives for biodegradable and compostable plastics |

34 https://mocc.gov.pk/SiteImage/Policy/NCCP%20Report.pdf
35 https://mocc.gov.pk/SiteImage/Misc/files/National%20Hazardous%20Waste%20Management%20Policy%202022.pdf
36 https://www.globalplasticaction.org/pakistan-partners-with-world-economic-forum-to-fight-plastic-pollution
37 https://www.mocc.gov.pk/PublicationDetail/Mzk2ZmQ1ZTAtMzA2Ny00NjFlLWFlOWYtMGU1MDI1MmQ4YWUy
38 https://punjablaws.punjab.gov.pk/uploads/articles/punjab-environmental-protection-production-and-consumption-of-single-use-plastic-product-regulations-2023-95-of-2023-pdf.pdf
39 https://resolutions.unep.org/resolutions/uploads/pakistan_16112023_extended_producer_responsibility.pdf
40 https://punjablaws.punjab.gov.pk/uploads/articles/the-plastic-management-strategy-punjab-pdf1.pdf

| | | | |
|---|---|---|---|
| 13 | Punjab Environmental Policy, 2015[41] | Government of Punjab | • Provides a framework for addressing environmental issues, focusing on pollution of water bodies, air pollution, lack of proper waste management, and climate change |
| 14 | Punjab Hospital Waste Management Rules, 2014[42] | Government of Punjab | • States that every hospital, public and private, is responsible for the proper management of waste generated until its final disposal |
| 15 | The Balochistan Use of Plastic Shopping and Flat Bags Act, 2023[43] | Balochistan Environmental Protection Agency (Balochistan-EPA) | • Ban on plastic carrier bags with thickness below 50 microns<br>• Exemption for biodegradable, compostable bags, industrial packing, and hazardous waste<br>• Development of solid waste management plans |
| 16 | The Collect and Recycle (CoRe) Alliance[44] | Producer-led Initiative | • Focuses on testing and implementing solutions for plastic packaging and recycling<br>• Primarily targets downstream recycling solutions |
| 17 | Plastic Road Initiatives[45] | Federal and Provincial Governments | • Uses plastic waste in road construction<br>• Aims to protect the environment and improve infrastructure in both rural and urban areas |

However, while these are important initiatives, they have not been properly implemented at the national level, and Pakistan still lacks a comprehensive national EPR policy. To effectively tackle the growing issue of plastic waste, Pakistan needs a robust EPR policy framework tailored to its unique challenges and opportunities. This proposed national framework will integrate international best practices while addressing local needs, aiming to reduce environmental pollution, promote sustainable practices, and enhance collaboration among various stakeholders across the country.

### *5.1.3. Existing institutional setup and capacity for solid waste management (SWM)*

The responsibility for overseeing, monitoring, and enforcing waste management policies in Pakistan is spread across various federal, provincial, and local government bodies. Key organisations include the Ministry of Climate Change & Environmental Coordination Pakistan (MoCC&EC), the Environmental Protection Agency (Pak-EPA) and provincial EPAs. These agencies are tasked with implementing waste management regulations, such as those related to single-use plastics.

Following the 18th Amendment, the responsibility for waste management was transferred from the federal to provincial governments. Provinces including Punjab, Sindh, Khyber Pakhtunkhwa (KP), and the regions of Balochistan, Azad Jammu & Kashmir, and Gilgit Baltistan now handle their own waste management systems. However, there is no longer a provincial-level waste management board; instead, responsibilities have been delegated to various provincial departments, municipalities, or local authorities.

In Punjab, under the Local Development and Community Development Department (LD&CD), six solid waste management companies have been established in Faisalabad, Gujranwala, Sialkot, Rawalpindi, Multan, and Bahawalpur, following the pattern of the Lahore Waste Management Company.

The Sindh Solid Waste Management Board (SSWMB) was created to manage the waste of Karachi and other urban centres in Sindh.

In KP and Balochistan, waste is mostly managed by the Environmental Protection Agencies; however, in GB and AJ&K, municipal authorities manage the waste of different cities.

41 https://epd.punjab.gov.pk/system/files/Draft%20Punjab%20Environment%20Policy%202015_0.pdf
42 https://epd.punjab.gov.pk/system/files/Punjab%20Hospital%20Waste%20Management%20Rules%2C%202014_0.pdf
43 https://balochistancode.gob.pk/Document.aspx?wise=opendoc&docid=224&docc=204
44 https://weforum.ent.box.com/s/ktt9gdte1ldo4pwtaa9lbyxrushils3q
45 https://www.coca-cola.com/pk/en/sustainability/pakistans-first-plastic-road-inauguration#:~:text=Chiefly%2C%20the%20objective%20of%20the%20project%20is,the%20strategic%20leadership%20of%20the%20National%20Incubation

However, these agencies often face challenges in terms of capacity, resources, and coordination. Local authorities responsible for day-to-day waste collection and disposal lack adequate infrastructure, leading to inefficient waste management. Waste management practices in urban areas are further hampered by issues such as urban sprawl and limited technical expertise. There is also a lack of financial resources to implement comprehensive waste management systems, limiting the effectiveness of existing policies.

While the EPR framework is yet to be developed and made functional, the lack of formalised coordination between different levels of government and the informal waste sector is hindered in overall effectiveness. The capacity of agencies responsible for waste management needs to be strengthened, particularly in terms of human resources, technical knowledge, and financial investments.

The informal sector plays a huge role in waste management in Pakistan, particularly in recycling and resource recovery. Kabaars (recyclers or scrap collectors) are a crucial part of this network. They are responsible for collecting recyclable materials such as paper, plastics, metals, and glass from households, markets, and streets; the Kabaars sort and sell recyclables to various small-scale recycling units.

The informal sector's contribution to waste diversion from landfills is immense. However, it operates in an unorganised and often unsafe manner, with little regulation or recognition of its work, and faces challenges such as lack of formal training, poor working conditions, and health hazards.

### Private sector and informal sector engagement

The relationship between the formal private sector (companies, waste management firms) and the informal sector (Kabaars) is becoming more integrated, though it is still largely unregulated. The private sector, especially the larger plastic producer organisations and some recyclers, engages the informal sector to improve waste collection and recycling efforts.

- **Waste Collection & Sorting**: In many cases, private companies, especially those involved in large-scale collection, may rely on informal waste pickers to supplement waste sorting efforts. For example, companies work with Kabaars to retrieve recyclables like PET, and metal.
- **Recycling:** The informal sector often contributes to the initial stages of recycling by collecting and segregating waste. Some private companies buy back material from Kabaars for further processing. Over time, formal waste management and recycling companies have begun recognising the value of informal networks and incorporating them into more organised recycling processes.

## 5.2. CoRe Alliance

CoRe (Collection and Recycling) Alliance[46] is a private-sector initiative in Pakistan focused on collection, recycling, and circular economy practices. It brings together multiple stakeholders, including corporates, waste management companies, and think tanks to improve the recycling infrastructure and manage post-consumer packaging waste in a more sustainable manner.

Furthermore, many SMEs and startups in Pakistan have been actively partnering with multinational corporations (MNCs) like PepsiCo, Unilever, and others in the realm of waste management, particularly focusing on plastic recycling, material recovery, and developing value-added products from recovered plastic waste as part of broader circular economy initiatives. These collaborations are not just theoretical; they are happening now and making an impact.

## 5.3. The economic burden of ineffective waste management in Pakistan

Pakistan's current waste management model places an unsustainable financial burden on municipalities and taxpayers, leading to significant economic, environmental, and health-related costs. By implementing EPR, the country can reduce waste management expenses, cut healthcare and environmental costs, and unlock billions in economic benefits.

EPR is not merely a regulatory policy: it is a financially sound strategy that ensures that polluters pay, incentivises

46 https://corealliance.org.pk/

sustainable production, and creates new revenue streams. Moving towards EPR will transform waste management from an economic liability into a driver of economic growth. Without EPR, waste management costs are borne solely by municipal authorities and taxpayers, leading to financial strain, inefficiencies, and severe economic externalities. And the estimated total cost of solid waste management in major cities alone is USD 343–559 million per year. Since these data exclude smaller cities and rural areas, the national waste management cost is likely to exceed USD 800 million annually.

### Indirect costs of poor waste management

Beyond direct waste management expenses, poor waste handling leads to significant economic losses, including:

- **Health Costs:** Open dumping, burning, and contaminated water supplies cause respiratory diseases, cancers, and waterborne illnesses. Estimated annual healthcare costs: USD 1.1 billion.
- **Environmental Degradation:** Landfills release methane, a potent greenhouse gas. Climate-related damages linked to waste mismanagement cost USD 2.5 billion annually.
- **Lost Economic Potential:** Less than 10% of plastics are recycled, leading to a USD 1.2 billion loss in potential revenue from recyclable materials. This loss has been calculated by the author by performing a cost benefit analysis, which has estimated that around 2.67 million tonnes of the 4.46 million tonnes of plastic waste generated annually are technically recyclable. By multiplying this volume with an average market value of around USD 450 per tonne, the potential revenue loss can be calculated. While this estimate doesn't include detailed operational costs like collection, sorting, or processing, it serves as a high-level indicator of the economic opportunity lost due to inadequate recycling systems and infrastructure.

The total economic loss from poor waste management is equal to some USD 5.6 billion per year.

#### *5.3.1. Existing perceptions regarding waste minimisation by stakeholders*

Waste minimisation is a critical component of EPR implementation in Pakistan. However, its effectiveness depends on how different stakeholders – consumers, producers, retailers, government bodies, and informal waste managers – perceive and engage with waste reduction strategies. Understanding these perceptions is key to designing targeted interventions that align with local behaviours, economic realities, and regulatory frameworks. The targeted waste streams under EPR in Pakistan primarily need to include plastic packaging, electronic waste (e-waste), textiles, paper & cardboard, hazardous waste (e.g. batteries, chemicals), and glass packaging. Understanding how different stakeholders perceive waste minimisation within these categories will be critical for designing policies and interventions that will drive meaningful change.

### 1. Consumer perceptions and behaviours

Consumers are the primary generators of waste in the EPR-targeted categories, particularly plastic packaging, e-waste, and paper waste. However, waste minimisation is not yet a priority for many households because of affordability concerns, convenience-driven consumption, and limited awareness.

***Key observations***

- **Plastic packaging dominance:** Single-use plastic remains the most used packaging material due to its affordability and widespread availability. Consumers show minimal interest in alternatives such as biodegradable or reusable packaging.
- **E-waste disposal negligence:** Many households either discard old electronic devices (e.g. mobile phones, chargers, batteries) in regular waste streams or hoard them at home because of the lack of of convenient, accessible, or well-publicised take-back programmes. This behaviour leads to delayed recovery of valuable materials and increased environmental risks when electronic devices are eventually disposed of informally.
- **Limited waste sorting practices:** Households do not actively separate recyclables such as paper, cardboard, or glass from general waste, making collection and recycling more expensive and inefficient.
- **Urban youth and high-income consumers show higher awareness:** A growing number of environmentally

conscious consumers, especially in major cities, prefer eco-friendly packaging, paper straws, and reusable bags. However, these preferences remain a niche trend.

***Challenges and barriers***

- Lack of consumer incentives for sorting plastic, paper, and e-waste at source
- Absence of accessible take-back schemes for electronics and batteries
- Limited availability of refill or bulk purchase options for minimising packaging waste

## 2. Producer perceptions and industry challenges

Producers, especially in the FMCG, electronics, and packaging industries, recognise the importance of waste minimisation but remain concerned about the financial and logistical costs of compliance with EPR obligations.

***Key observations***

- **Plastic packaging use remains high:** Most producers rely on cheap, non-recyclable plastic packaging due to cost concerns and the lack of strict regulations enforcing alternative materials.
- **Limited e-waste recycling infrastructure:** Electronics manufacturers have not developed formal take-back or recycling programmes, leaving most e-waste to be handled informally.
- **Underutilised recycled paper and cardboard:** The paper industry has the potential to incorporate higher recycled content, but the supply chain remains underdeveloped.
- **Greenwashing without systemic change:** Some companies market 'biodegradable' or 'recyclable' packaging without investing in collection and processing infrastructure.

***Challenges and barriers***

- Cost and availability of sustainable packaging alternatives
- Weak government enforcement of EPR mandates
- Lack of infrastructure for e-waste collection and processing

## 3. Retailer perceptions and market dynamics

Retailers influence packaging trends and consumer behaviour, particularly in the plastic packaging and paper waste categories. However, waste minimisation efforts remain limited due to cost pressures and weak enforcement.

***Key observations***

- **Plastic bags and single-use packaging still dominant:** Despite government bans, retailers continue to distribute single-use plastics, citing consumer demand and affordability.
- **Slow adoption of paper and refillable packaging:** Some supermarkets and high-end retailers have introduced paper packaging and refill stations, but these are not yet mainstream.
- **Resistance to reducing packaging waste in e-commerce:** Online retailers contribute significantly to cardboard and plastic waste but have not adopted sustainable packaging strategies at scale.

***Challenges and barriers***

- No financial incentives for retailers to minimise waste
- Weak enforcement of bans on single-use plastics
- Consumers' preference for cheap and disposable packaging

### 4. Government perceptions and regulatory responses

The government has introduced various regulations on plastic waste management, electronic waste disposal, and hazardous waste handling, but enforcement remains weak.

***Key observations***

- **Inconsistent policy implementation:** While bans exist on plastic bags and directives have been issued for e-waste management, compliance remains low.
- **Lack of nationwide EPR framework:** Some provinces have initiated EPR policies for plastics, but there is no comprehensive, legally binding framework at the national level.
- **Funding gaps for recycling and waste minimisation initiatives:** Municipal waste management agencies struggle with budget constraints, limiting their ability to promote waste reduction.

***Challenges and barriers***

- No unified EPR policy covering all waste categories
- Poor enforcement of single use plastic bans and e-waste regulations
- Lack of investment in waste collection and recycling infrastructure

### 5. Role of the informal sector in waste minimisation

The informal sector plays a significant role in the recycling and processing of plastic, paper, and electronic waste. However, people in this sector operate under poor working conditions with little regulatory support.

***Key observations***

- **Primary actors in plastic and paper waste recycling:** Informal waste pickers collect a large share of plastic bottles, cardboard, and scrap paper, supplying materials to small-scale recycling units.
- **Minimal role in e-waste processing:** The informal sector extracts valuable metals from discarded electronics, but hazardous components are improperly disposed of, causing environmental harm.
- **Vulnerability and economic exploitation:** Waste pickers receive minimal financial returns and work in unsafe conditions.

***Challenges and barriers***

- Lack of recognition and integration into formal waste management systems
- No safety protocols for handling hazardous e-waste components
- Increasing competition from large-scale recycling plants

## 5.4. Actionable recommendations for strengthening waste minimisation

To address stakeholder perceptions and enhance EPR implementation, the following targeted interventions are recommended.

***Strengthening consumer awareness and incentives***

- Introduce deposit-return schemes for plastic bottles and explore incentive-based collection or buy-back programmes for e-waste
- Enforce mandatory waste sorting at household levels through incentive programmes
- Launch consumer education campaigns on sustainable consumption and recycling

***Driving industry compliance with EPR obligations***

- Establish clear EPR targets for plastic, e-waste, and packaging
- Provide tax incentives for sustainable packaging and recycling investments
- Enforce mandatory take-back programmes for electronics and hazardous waste

***Enhancing retailer engagement***

- Penalise retailers for non-compliance with plastic bans
- Incentivise bulk-selling and refillable packaging models
- Require e-commerce platforms to use recyclable packaging
- Engage startups and SMEs for the scalability of those platforms that encourage eco-friendly alternatives

***Strengthening governance and enforcement***

- Develop a unified national EPR framework with strict compliance measures
- Invest in municipal waste segregation and recycling facilities
- Establish public-private partnerships for waste collection and processing

***Integrating and formalising the informal sector***

- Acknowledge informal waste pickers and recyclers as essential contributors to Pakistan's resource recovery economy
- Offer voluntary health, safety, and occupational training programmes, with protective equipment provision through PRO-supported initiatives
- Develop fair, transparent pricing mechanisms at buy-back centres and recycling hubs to ensure equitable compensation for collected materials
- Facilitate informal-sector access to certified waste aggregation points operated by municipalities or PROs
- Establish informal sector-inclusive PRO partnerships and aggregator models, where groups of informal collectors can voluntarily register to access financial incentives and cooperative schemes

## 5.5. The existing market for secondary resource materials

The market for secondary resource materials in Pakistan is evolving, but it remains largely informal and underdeveloped due to fragmented supply chains, lack of policy enforcement, and minimal industry integration. Various sectors, including plastics, metals, paper, e-waste, glass, and textiles contribute to the recycling economy, but challenges such as quality inconsistencies, limited infrastructure, and weak regulatory frameworks prevent full optimisation of secondary material use. The informal sector plays a dominant role in collecting, sorting, and processing waste, yet remains unrecognised and unsupported by formal governance structures.

### Plastic recycling and reprocessed material demand

Plastic waste recycling is one of the most active segments in Pakistan's secondary resource market. PET bottles, HDPE containers, and PP plastics are collected, processed, and converted into recycled pellets for use in packaging, textile fibres, and low-grade plastic products. However, most industries in Pakistan continue to prefer virgin plastic over recycled alternatives due to a combination of factors, including price stability, consistent material quality, reliable supply chains, and limited availability of high-grade recycled plastics. While the absence of standardised EPR requirements contributes to the underutilisation of recycled content, this is but one of several challenges affecting market uptake. The informal sector, comprising waste pickers and small-scale recyclers, dominates the supply chain, leading to inconsistent quality control and environmental hazards resulting from improper processing techniques.

## Metal recycling and the secondary metal market

Pakistan has a well-established scrap metal recycling industry, particularly for aluminium and steel. Large-scale steel rerolling mills and smelting units operate in major urban centres such as Lahore, Karachi, and Faisalabad. Scrap metal is sourced from construction waste, discarded machinery, and e-waste dismantling units. However, despite demand from the construction and manufacturing sectors, metal recycling is hindered by volatile scrap prices, poor collection mechanisms, and the lack of incentives for industrial-scale recovery.

## Paper and cardboard recycling challenges

The paper recycling industry in Pakistan is relatively mature, with recovered materials being used for corrugated boxes, packaging, and writing paper. However, inefficient sorting mechanisms and contaminated waste streams reduce recovery rates. The availability of cheap imported recycled pulp further limits local market competitiveness. Additionally, multi-layered and laminated paper products are rarely recycled, contributing to significant waste accumulation.

## E-waste recovery and secondary electronics market

The e-waste recycling sector in Pakistan is poorly regulated and dominated by informal dismantlers. Valuable components such as copper, aluminium, and circuit board materials are extracted, while hazardous materials – including lead, mercury, and cadmium – are often improperly discarded, causing severe environmental and health risks. The absence of EPR-driven collection schemes and formalised e-waste processing facilities leads to low recovery rates and inefficient resource utilisation.

## Glass recycling and its limited market presence

Glass recycling remains one of the least developed secondary material markets in Pakistan. While beverage bottles and glass containers are sometimes reused, the broader recycling of broken glass, windowpanes, and other glass waste is minimal due to high transportation costs, limited market demand, and lack of processing infrastructure. As a result, most glass waste ends up in landfills, further straining urban waste management systems.

## Informal textile recycling market

Pakistan has a thriving but highly informal textile recycling sector. Used clothing, fabric scraps, and defective textile products are collected from local markets, industrial waste, and household donations for resale, repurposing, or downcycling into rags, insulation materials, and low-cost garments. The second-hand clothing market, known locally as *Landa Bazaar*, plays a significant role in extending the life cycle of textile products. However, challenges such as lack of industrial-scale textile waste processing, minimal investment in fibre-to-fibre recycling technology, and limited demand for recycled textiles in formal manufacturing hinder the sector's growth.

## The role of startups and SMEs in resource recovery

Startups and small and medium enterprises (SMEs) have emerged as key players in Pakistan's recycling economy. These entities focus on waste collection, processing, and upcycling discarded materials into value-added products. Many startups have adopted digital platforms and innovative business models to formalise waste collection, connect consumers with recyclers, and introduce sustainable alternatives in manufacturing.

## How startups and SMEs contribute to the secondary resource market

- **Tech-driven waste collection platforms**: Digital startups have launched apps that connect waste generators (households, businesses, industries) with recycling units and waste pickers, ensuring more efficient waste recovery.
- **Upcycling businesses**: SMEs are repurposing textile scraps, discarded plastics, and electronic waste into fashion products, home décor, furniture, and industrial raw materials.

- **Social enterprises and community-driven initiatives**: Some startups work with waste-picking communities, offering fair wages and formalising waste collection systems to improve working conditions.
- **Material recovery and resale**: SMEs process recovered waste into secondary raw materials like recycled PET flakes, reprocessed metals, and fibre-based materials, which are then sold to industries at a lower cost than virgin materials.
- **Eco-friendly packaging solutions**: Several companies have entered the market by producing biodegradable and recycled-content packaging to meet growing corporate sustainability demands.

### Barriers to market growth

Despite the growing demand for secondary resource materials, several interlinked barriers continue to limit market expansion in Pakistan. Based on market observations and stakeholder consultations, the following factors have been identified and ranked according to their significance:

- The absence of a national EPR framework mandating producers to incorporate a minimum percentage of recycled content in products is the single most critical barrier. Without regulatory pressure, industries face no obligation to transition away from virgin materials.
- Rather than volatility, the persistent availability of low-cost virgin plastics and other primary materials makes recycled alternatives less competitive. Price fluctuations in global resin markets occasionally occur, but are typically not severe enough to favour recyclates. This price gap discourages investment in secondary material processing and use.
- Even where policies exist at provincial levels, inconsistent implementation and monitoring result in unreliable supply and demand dynamics for recycled materials. Without predictable demand, recycling businesses remain small-scale and undercapitalised.
- A lack of subsidies, tax incentives, or preferential procurement policies for recycled-content products further discourages industries from shifting toward circular production models.
- Insufficient investment in modern waste collection and sorting facilities prevents the recovery of high-quality recyclables, reducing the supply of the consistent, clean material streams needed for secondary production.
- Perceptions that recycled materials are inferior in quality and reliability persist among both producers and consumers, and these are exacerbated by inconsistent quality control in the informal recycling sector.

### Recommendations for strengthening the secondary resource market

- Establishing national-level EPR legislation requiring manufacturers to incorporate minimum percentages of recycled materials in plastics, metals, paper, and textiles would be the most essential step to create predictable market demand for recycled content.
- Introducing fiscal incentives such as tax rebates, subsidies, or reduced import duties on recycling equipment would encourage businesses to integrate recycled content into their supply chains.
- Investing in modern, mechanised sorting, recovery, and processing infrastructure would ensure a steady, high-quality supply of secondary raw materials for industries.
- Creating nationally accepted quality benchmarks for recycled plastics, paper, textiles, and metals would reduce industry reluctance and promote confidence in the consistency of secondary materials.

### Supporting measures

- Promote circular economy initiatives that encourage fibre-to-fibre recycling in textiles and high-value material recovery
- Encourage public-private partnerships (PPPs) for investment in advanced recycling plants for plastics, textiles, and e-waste
- Implement structured take-back systems for electronics, packaging, and textiles

- Support informal recyclers through capacity-building, formalisation programmes, and financial incentives
- Launch nationwide consumer-awareness campaigns to increase demand for recycled products
- Regulate imports of virgin materials where feasible to level the playing field for domestic recycled content

## 5.6. Baseline EPR implementation in Pakistan

### *5.6.1. Proposed policy framework relevant to EPR implementation*

Extended producer responsibility (EPR) in Pakistan should strategically prioritise waste streams such as e-waste and plastic packaging waste along with other packaging materials, with provisions for gradual expansion into additional sectors. These categories contribute significantly to environmental degradation, and they will require robust regulatory frameworks to transition towards a circular economy. Examples from successful EPR models in Europe, India, Japan, and Brazil can provide insights into effective implementation strategies. While India and Brazil have introduced EPR frameworks and achieved notable progress in certain areas, their systems continue to face challenges related to enforcement, informal sector integration, and operational consistency, providing valuable lessons on the importance of phased implementation and strong institutional oversight.

#### Regulatory framework

A well-defined regulatory framework must establish clear responsibilities for producers, importers, and brand owners regarding waste management, alongside mandatory registration with regulatory authorities. To ensure practical and phased implementation, the following actions are recommended, with priority areas emphasised based on their immediate relevance and feasibility in Pakistan's current context.

#### Top priority measures

- Establish accountability mechanisms across the value chain to address inefficiencies and clarify the obligations of producers, recyclers, and waste management firms
- Mandate waste segregation at source for plastics, paper, metals, and organic waste, starting in urban commercial zones and expanding to residential areas over time; this can be modelled on South Korea's volume-based waste fee system, but tailored for local capacity.
- Introduce penalties for non-compliance with waste management and reporting requirements, drawing lessons from Germany's Packaging Act, while ensuring penalty structures are economically appropriate

#### Supporting medium-term measures

- Implement annual reduction targets for plastic packaging waste, taking inspiration from Japan's phased reduction model, starting with large producers and retailers
- Require waste management companies to adopt digital waste audit systems, beginning with pilot programmes in major cities, modelled after India's tracking system
- Set measurable durability, repairability, and recycling targets for priority product categories once basic EPR implementation and monitoring systems are functional

#### Coverage and targets

The policy should implement phased recycling targets.

- **Years 1–2:** 5%–8% collection and recycling of specified materials, similar to Brazil's early-stage EPR rollout
- **Years 3–4:** 8%–10% collection and recycling, following India's increasing phased targets under its Plastic Waste Management Rules

- **Years 5+:** 10% and above collection and recycling, aligning with the EU's long-term recycling commitments

Material-specific recycling requirements should focus on easily recyclable materials and maximising efficiency, following Sweden's model of categorising waste for streamlined processing.

## Implementation mechanisms

- **Producer responsibility organisations (PROs):** PROs are an industry cooperation organisation that manages member EPR obligations by overseeing waste management, including financing, collection, transportation, and control systems. Industry-led PROs will play a central role in coordinating, financing, and overseeing waste management operations to fulfil their members' EPR obligations. However, PROs are not expected to directly build or own all of the infrastructure in every case. Internationally, PROs typically partner with existing licensed waste management companies, recycling operators, and municipalities to deliver collection, sorting, and recycling services. In Pakistan, a flexible model is recommended where PROs may:
  - invest directly in collection and sorting infrastructure where service gaps exist, especially in underserved urban areas
  - subcontract licensed private or municipal waste management firms for operational services
  - co-finance shared infrastructure projects (e.g. material recovery facilities) through public-private partnerships (PPPs)
  - integrate informal sector groups through certified buy-back centres or PRO-led aggregator systems.

This collaborative, hybrid approach ensures operational scalability while leveraging existing waste sector capabilities, minimising the capital burden on PROs, and supporting the formalisation of informal recyclers.

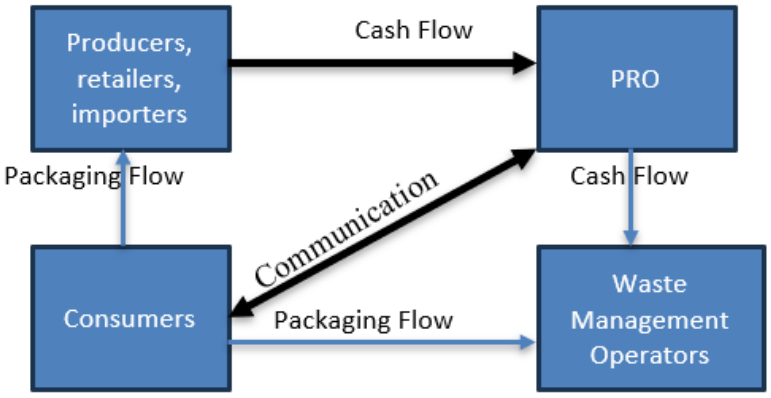


**Figure 2. PRO-based EPR**

## Types of PROs

- **Not-for-profit PROs.** These organisations operate on a non-profit basis, focusing on the collective management of waste and recycling efforts without profit generation (Figure 3). They are common in countries like Belgium, where the focus is on sustainability and environmental responsibility.

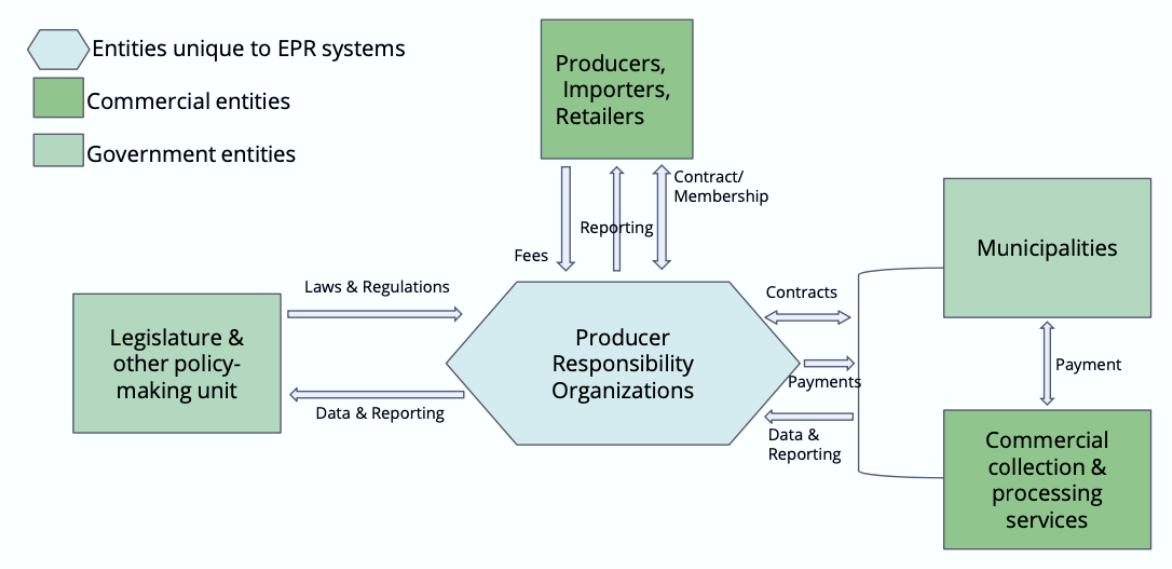


**Figure 3. Non-profit-led PRO**

- **For-profit PROs.** These entities are business-driven organisations that manage recycling and waste responsibility with the goal of generating profits (Figure 4). Examples include Germany, where private companies take the lead in managing waste systems and achieving recycling targets.

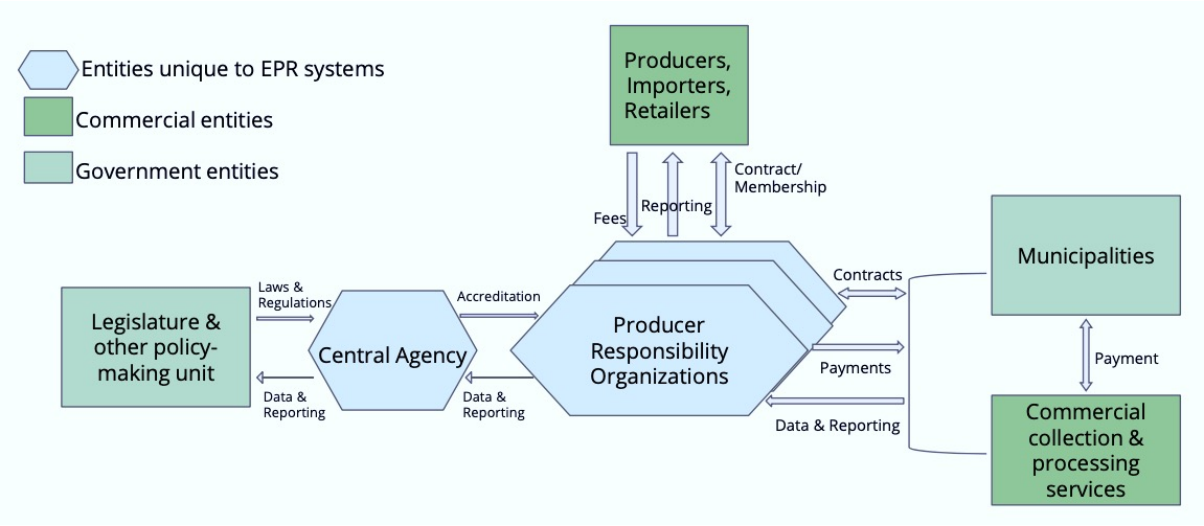


**Figure 4. For-profit PRO scheme**

- **Government-run PROs.** Some countries, like Thailand and China, operate PROs through government agencies. These organisations are typically funded and managed by the state to ensure compliance with national waste management and recycling laws, ensuring public accountability and regulation (Figure 5).

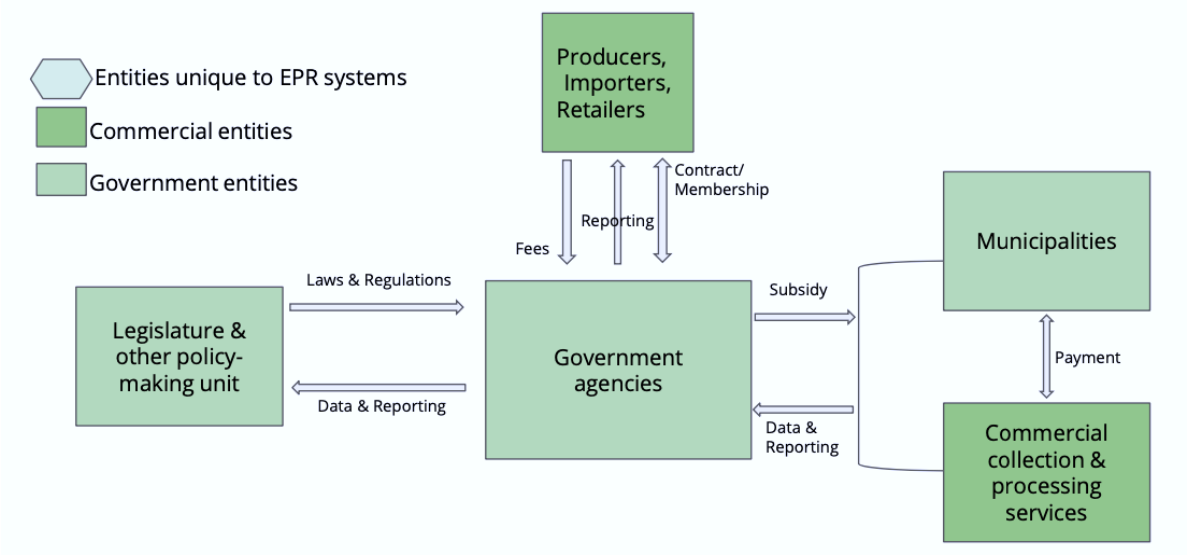


**Figure 5. Government-led PRO scheme**

- **Plastic Credit System**: In Pakistan, there is potential for establishing a market-based plastic credit system to incentivise compliance. The key features of such a system include credits generated from certified recycling efforts, a minimum price floor to stabilise the market, and annual compliance audits to verify recycling achievements. These systems will facilitate sustainable practices and reduce environmental contamination from improper disposal and informal recycling.
- **Integration of the informal sector**: There is a need to develop municipality cooperatives by engaging non-governmental organisations (NGOs)/ community based organisations (CBOs), small and medium-sized enterprises (SMEs) and private sector producer firms. These cooperatives can help the informal sector in getting their ID cards registered and also by providing social safety nets such as personal protective equipment (PPEs), upskilling programmes etc. Each municipality cooperative should be registered with the PRO.
- **Public-Private Partnerships (PPPs)**: Public-private partnerships drive infrastructure development through the allocation of government land for recycling facilities, and private sector investments in advanced processing technologies. Shared collection centres and joint public awareness campaigns can further enhance waste management efforts, and this will help mitigate environmental pollution and health risks by improving waste processing and disposal.
- **A waste audit portal** must be developed where waste management companies should be trained to report the quantity of waste collected and dumped, as well as the segregated data on plastic waste and organic waste. This portal can be developed by a PPP or by engaging development partners, and this is also a step towards digitisation and enhanced data collection on waste crisis.
- **Additionally, discounts must be allocated** for consumers who report their plastic waste on the waste audit portal, at restaurants, malls, bars, etc. This will encourage consumers to report their waste.
- **Financial mechanisms**: The government could support the framework by providing seed funding for recycling infrastructure, offering tax incentives for recycling initiatives, subsidising eco-friendly packaging alternatives, and enforcing green procurement policies across public and private sectors. Government incentives, including tax breaks and subsidies, should be provided for sustainable packaging and waste processing technologies, modelled after France's eco-design incentives.
- **Extended producer contributions** could fund recycling infrastructure, as mandated in Canada's EPR policies.
- **Green procurement policies** could be enforced for both public and private sectors, based on South Korea's Green Purchasing Law.

## Stakeholder engagement

Active engagement with all stakeholders is a cornerstone of the proposed EPR policy. Producers, recyclers, and the government must collaborate to ensure smooth policy implementation and adherence. Community participation is equally vital, as public awareness and behavioural change are critical for reducing plastic waste.

- *Awareness campaigns* should educate citizens on the importance of waste segregation, recycling, and supporting sustainable practices, along with industry consultations for regulatory compliance as practiced in the EU's Green Deal consultations.
- *Community awareness campaigns* should be carried out on waste segregation and recycling, following India's Swachh Bharat Mission.
- Capacity-building programmes for municipal authorities and informal waste workers could be modelled on Brazil's National Solid Waste Policy.

## Monitoring and enforcement

**Institutional framework**: A dedicated EPR unit within the MoCC&EC may oversee policy implementation, including maintaining an online portal for registration and compliance reporting, conducting audits, and ensuring third-party verification. For instance, in India, the Central Pollution Control Board (CPCB) enforces EPR through mandatory registration, annual reporting, and penalties for non-compliance. An online portal streamlines monitoring, and show-cause notices are issued to unregistered entities to ensure adherence. Requiring third-party verification for waste data accuracy, as is done in Canada's EPR reporting system, should be developed.

**Data management**: A comprehensive data management system can be rolled out to track material flows and performance indicators, ensuring transparency and accountability through public reporting requirements. For instance, India's system uses a centralised portal for real-time tracking, and a plastic credit system allows companies to offset shortfalls, enhancing accountability. A national waste-data management system should track material flows and recycling rates, following global best practices, such as for example:

- India's digital compliance and tracking system, which requires registered entities to disclose waste collection, processing, and disposal data
- The EU's Circular Economy Monitoring Framework, which establishes standardised metrics for assessing progress towards recycling and waste reduction goals
- Japan's Material Flow Analysis Model, which monitors waste generation trends to inform policy adjustments

## Development and implementation timeline

The EPR framework should be rolled out in phases, starting with pilot projects in selected urban areas to test the efficacy of the system. Based on the outcomes, the programme can be scaled up to include rural regions and additional stakeholders. Pakistan's informal waste collection sector plays a significant role in managing plastic waste, and the proposed policy should integrate these workers into the formal framework by offering training, financial support, and formal recognition of their contributions. This inclusion will enhance the efficiency of waste collection and recycling processes while addressing social equity.

The following phases have been proposed under EPR.

## Phase 1: Initiation & system design (Years 1–3, 2025–2027)

*Establishing the foundation for EPR and enabling voluntary compliance mechanisms*

### Key Features

- **Voluntary targets**
  - Producers declare and report minimum 10% plastic collection and recycling targets
  - Annual, transparent declarations build baseline responsibility and promote early adoption
- **Government incentives**
  - Green certification for compliant producers
  - Fast-track product approvals for eco-designed or recyclable products
- **Formation of National PRO (producer responsibility organisation)**
  - Housed under the Ministry of Climate Change & Environmental Coordination (MoCC&EC)
  - Multi-stakeholder governing board (producers, recyclers, informal sector)
  - Advisory committee for technical guidance and strategic oversight
- **Funding Mechanism**
  - A **Consumer Recycling Fee** collected via POS (point-of-sale) sales tax on virgin plastic products, or
  - A part of a waste recycling fee can be collected via **general electricity bills (PTV Fee model)** in major urban centres
  - **CSR contributions** by large producers to fund PRO-administered waste infrastructure and consumer awareness programmes

## Phase 2: Registration, reporting & infrastructure setup (Years 1–3, 2025–2027)

*Laying the digital and regulatory backbone for traceability and participation*

- **Mandatory registration**

  All actors across the plastic value chain must register with the PRO, including:
  - Plastic producers (large and small-scale)
  - Importers of plastics or packaged goods
  - Recycling companies
  - Waste collection contractors and startups

- **National reporting & traceability portal**

  Developed and operated by the PRO to log:
  - Plastic production, imports, and sales volumes
  - Collection, processing, and recycling metrics
  - Voluntary target declarations and compliance status

## Phase 3: Mandatory targets & enforcement (Years 4–13, 2028–2037)

*Transitioning from voluntary compliance to enforceable obligations*

- **Years 4–8 (2028-2032)**
  - Introduce mandatory collection and recycling targets starting at 20% for key plastic types (e.g. PET, HDPE, LDPE, PP, PS)
  - Introduce environmental fines for non-compliance

- **Years 9–13 (2033-2037)**
  - Targets rise to 35% for all registered producers
  - Penalties for non-compliance include loss of tax incentives, public naming, or licensing restrictions

### Phase 4: Long-term maturity & circular innovation (Years 14–23)

*Institutionalising a circular plastics economy with traceable and inclusive systems*

- **Years 14–18 (2038–2042)**
  - Compliance threshold raised to 40% across all product categories
- **Years 19–23 (2043–2047)**
  - Final national target: 45% plastic collection and recycling
  - Integrate life-cycle assessments (LCAs) and eco-design compliance for all large producers

**Table 6. Phased EPR framework for plastics in Pakistan.**

| Phase | Timeline | Objective | Key Actions | Expected Outcomes |
|---|---|---|---|---|
| **Phase 1: Initiation & system design** | Years 1–3 | Establish institutional and financial foundation for EPR | • Voluntary recycling targets (min. 10%) by producers<br>• Launch of Producer Responsibility Organisation (PRO)<br>• Government incentives (tax rebates, green certifications)<br>• Consumer recycling fee via POS/ Monthly electricity bill<br>• CSR allocation (0.5–1%) to plastic waste fund | • Early compliance by producers<br>• Operational PRO with multi-stakeholder governance<br>• Initial funding for waste collection and awareness<br>• Increased public-private cooperation |
| **Phase 2: Registration & infrastructure setup**<br><br>*(Parallel to Phase 1)* | Years 1–3 | Build reporting, regulatory and traceability infrastructure | • Mandatory registration of producers, recyclers, importers<br>• Launch of national reporting portal under PRO<br>• Mass balance accounting and traceability system<br>• Integration of informal sector entities | • Transparent data collection<br>• Traceable plastic flows<br>• Enhanced producer accountability<br>• Inclusive engagement of small-scale actors |
| **Phase 3: Enforcement & scaling** | Years 4–13 | Transition to legally binding targets and compliance enforcement | **Years 4–8**<br>• Mandatory 20% collection/ recycling targets for key plastic types<br>• Begin enforcement and fines<br>**Years 9–13**<br>• Targets rise to 35%<br>• Penalties for non-compliance (loss of incentives, license suspension) | • Institutionalised compliance<br>• Scaled-up recovery systems<br>• Improved plastic recycling rates<br>• Reduced plastic leakage into environment |

| | | | | |
|---|---|---|---|---|
| **Phase 4: Long-term maturity & circular innovation** | Years 14–23 | Institutionalise circular systems and drive innovation | **Years 14–18**<br>• Raise recycling target to 40%<br>• Expand EPR scope to include complex plastics<br>**Years 19–23**<br>• Reach 45% national target<br>• Align with international best practices (OECD, UNEP)<br>• Incentivise eco-design and life-cycle accountability | • Mature circular economy system<br>• Widespread producer compliance<br>• Integration with global plastic governance norms<br>• Reduced plastic footprint and increased resource efficiency |

This phased model ensures that EPR principles are embedded from the start, with the scale and enforceability increasing as institutional capacity, infrastructure, and market readiness improve, maintaining both operational realism and policy credibility. Another proposal for the corporate sector to transition towards voluntary EPR is presented in figure 6.

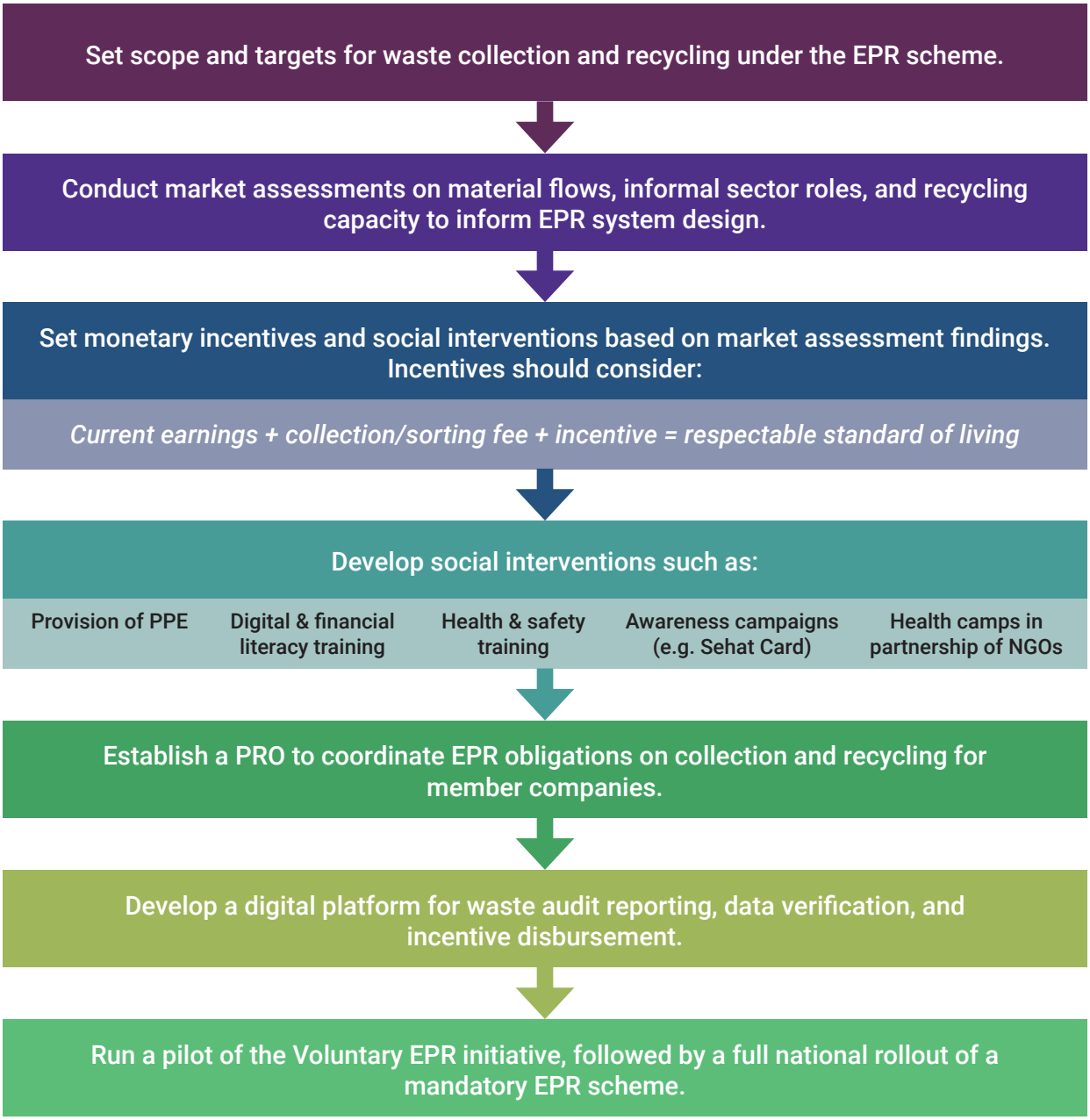


**Figure 6. Voluntary EPR proposal**

The success of Pakistan's EPR framework will depend on strong political commitment, clearly defined institutional responsibilities, sufficient enforcement capacity, active industry participation, public awareness campaigns, and financial sustainability for long-term implementation.

**Table 7. Key stakeholders to be involved in EPR**

| Stakeholder | Role(s) |
|---|---|
| **National Government**<br>Ministry of Climate Change and Environmental Coordination | • Setting the policy and legislative framework, including defining the producers and products concerned<br>• Setting the responsibilities for producers, such as targets for take-back, collection, and recycling of waste<br>• Defining roles for other actors, e.g. local municipalities and informal waste sector<br>• Accrediting/approving and monitoring EPR schemes to ensure effective functioning and enforce compliance<br>• Combatting illegal imports of packaging or packaging waste |
| **Local Municipalities**<br>Local provincial departments and waste management companies | • Taking responsibility for waste collection from households and businesses<br>• Providing accessible infrastructure and information to the public |
| **Producers/Businesses**<br>(only if they are producing) | • Taking responsibility for meeting the targets set by the government, including waste take-back, collection, and recycling |
| **Manufacturers, Importers, Consumer Goods Companies, Retailers/Distributors** | • Creation and administration of EPR schemes, including setting up producer responsibility organisations (PROs) for collective schemes<br>• Administering EPR schemes, such as collecting fees, reporting recycling rates, and possibly taking back waste packaging<br>• Paying fees to EPR schemes based on the packaging material they place on the market<br>• Providing information to consumers on how to participate in EPR schemes and avoid littering |
| **Waste management companies** | • Taking responsibility for the collection and management of waste, often through contracts with municipalities, PROs, or individual producers<br>• Receiving funds from EPR schemes for handling packaging waste |
| **Informal sector** | • Any informal sector actors should have the opportunity to participate in EPR schemes, particularly for contributing to the collection of recyclable waste |
| **Consumers/Citizens/ Households** | • Returning waste products at the end of their useful life, using the infrastructure provided by municipalities or EPR schemes |
| **Legislators** | • Shaping and passing legislation related to EPR frameworks<br>• Advocating for policies that prioritise waste management and circular economy practices<br>• Ensuring that laws align with sustainable development goals and climate commitments |

| | |
|---|---|
| **Media** | • Raising public awareness about the importance of EPR<br>• Highlighting successful EPR models and educating citizens about waste management responsibilities<br>• Holding stakeholders accountable by reporting on policy implementation and outcomes |
| **Advocacy groups** | • Supporting the development and implementation of EPR policies<br>• Advocating for environmental protection, waste reduction, and responsible consumption<br>• Ensuring that vulnerable groups, such as the informal sector, are integrated into the EPR system and benefit from it |

To operationalise these requirements, the following mechanisms are proposed.

- Establishing a National EPR Council under the Ministry of Climate Change & Environmental Coordination (MoCC&EC) to coordinate policy direction, stakeholder roles, and inter-agency collaboration
- Legally formalising the roles and obligations of each actor (producers, PROs, municipalities, informal sector) through EPR regulations with enforceable provisions and compliance reporting structures
- Developing public-private partnerships (PPPs) to jointly invest in collection, sorting, and recycling infrastructure, supported by fiscal incentives like tax rebates and subsidised loans
- Creating formal participation pathways for informal sector workers via certified aggregators, buy-back centres, and informal sector cooperatives, with linked incentive schemes and training programmes
- Implementing coordinated public awareness campaigns led by media, advocacy groups, and PROs to shift consumer behaviour, supported by waste segregation and recycling incentive schemes
- Launching pilot EPR schemes in major urban centres, led by selected PROs in partnership with local governments and informal sector operators, with results used to inform national rollout plans
- Monitoring progress through a centralised digital reporting platform to track producer compliance, collection rates, recycling data, and informal sector participation

This multi-tiered strategy will ensure operational alignment, build institutional capacity, and progressively scale EPR implementation across Pakistan.

### *EPR Model: Shifting responsibility for economic and environmental gains*

EPR shifts financial responsibilities from **municipal governments and the taxpayers to producers**, ensuring that companies cover the end-of-life costs of their products. This model **reduces waste management costs, enhances recycling, and unlocks economic value**. Based on life-cycle impact assessment and cost benefit analysis model, the following cost savings have been projected.

### Cost Savings Under EPR

With EPR policies, waste collection, treatment, and recycling would be funded partially or fully by producers, reducing the financial burden on local governments. The following cost-benefit analysis estimates potential cost savings if EPR is implemented.

**Municipal cost reduction:** Shifting 70% of collection and treatment costs to producers saves $560 million per year. Cost savings = Total municipal waste management cost × percentage shifted to producers

- **Calculation**: Assumed total annual cost for municipal waste management: $800 million, EPR shifts 70% of cost to producers, **Cost savings = 800 million × 0.70 = 560 million USD**

**Lower healthcare costs**: By minimising air and water pollution, healthcare expenses drop by $700 million per year. Healthcare cost savings = population exposed × reduction in disease incidence × average treatment cost

This estimate aggregates:

- The percentage reduction in diseases due to better waste handling (e.g. 30%–40% reduction in respiratory and waterborne diseases)
- Average cost of treatment per case (from health economic studies)
- Productivity loss avoided due to better public health

If, for instance: 10 million people are impacted by waste-related diseases, 30% reduction in cases due to EPR, $250 average treatment + lost productivity cost per case, **Savings = 10,000,000 × 0.30 × 250 = 750 million USD Rounded estimate: $700 million**

**Greenhouse gas reduction:** Waste sector emissions fall, saving $1.5 billion in climate-related economic damages. GHG cost savings = emissions reduced ($tCO_2$-eq) × social cost of carbon (USD/$tCO_2$-eq)

Assumptions: Emissions reduced through improved waste management: ~15 million tonnes $CO_2$-equivalent/year, Social cost of carbon: $100 per tonne (range often cited between USD 50–100), Savings = 15,000,000 × 100 = 1.5 billion USD, **Total Estimated Cost Savings under EPR: $2.76 billion per year**

## Revenue Generation Under EPR

EPR policies promote **higher recycling rates, formalising the waste sector, and reducing reliance on virgin plastic imports**, leading to additional economic benefits:

- **Increase in recycled plastic market value**: Raising the recycling rate from 9% to 50% could generate $2 billion annually.
- **Foreign exchange savings from reduced virgin plastic imports**: $640 million per year.
- **Growth in waste management and recycling industries**: New businesses and jobs boost GDP by **$1.5 billion per year**.

# 6. COST AND REVENUE BENEFITS UNDER EPR

Extended Producer Responsibility (EPR) policies can substantially reduce public expenditure, improve health outcomes, mitigate climate-related damages, and stimulate economic activity in recycling and waste management sectors. The following estimates are based on a cost–benefit analysis conducted by the author using national expenditure data, international benchmarks, and sector-specific studies. All figures are **illustrative ranges** grounded in credible data sources.

## Cost Savings

### a. Municipal Waste Management Cost Reduction

Pakistan's municipal authorities collectively spend an estimated **USD 800 million/year** on waste collection, transportation, and disposal (*Pakistan Economic Survey 2022–23*; Government of Pakistan, 2023). OECD case studies show that well-designed EPR schemes can shift **50–80%** of these costs to producers (OECD, 2016; OECD, 2022). Using a mid-range assumption of **70%**:

800 million×0.70=USD 560 million/year800million×0.70=USD560million/year

**Result: USD 560 million/year** in direct fiscal relief for municipalities, freeing resources for infrastructure and public service upgrades.

### b. Reduced Healthcare Expenditure

Improper waste handling contributes to respiratory diseases, diarrhoea, dengue, and other waste-related illnesses. WHO data indicate that **~10 million Pakistanis/year** are affected by such diseases (WHO, 2023). UNEP and WHO studies suggest that improved waste management can reduce incidence rates by **30–40%** (WHO, 2018; UNEP, 2021). Using a **30% reduction**, and applying an average cost of **USD 250 per case** (treatment + productivity loss, based on World Bank, 2020; Khan et al., 2022):

10,000,000×0.30×250=USD 750 million/year10,000,000×0.30×250=USD750million/year

Rounded conservatively: **USD 700 million/year** in avoided healthcare and productivity losses.

### c. Avoided Climate-Related Damages

The waste sector is a notable methane emitter from landfills and open dumping. Pakistan's National GHG Inventory (2021) estimates **~15 million $tCO_2$-eq/year** can be avoided through EPR-led diversion of waste to recycling, composting, or anaerobic digestion. Using a **Social Cost of Carbon (SCC) of USD 100/$tCO_2$-eq** (high-end value from US EPA, 2023; World Bank, 2022 to reflect methane's high global warming potential):

15,000,000×100=USD 1.5 billion/year15,000,000×100=USD1.5billion/year

**Result:** Annual climate-related economic damage avoidance of **USD 1.5 billion**.

**Total Estimated Annual Cost Savings under EPR:** ≈USD2.76billion/year

## Revenue Generation Potential

In addition to cost savings, EPR policies can stimulate **domestic recycling markets, reduce import dependency**, and create jobs in waste valorisation sectors.

### a. Growth in Recycled Plastic Market Value

Pakistan's current plastic recycling rate is approximately **9%** (WWF Pakistan, 2021). Increasing this to **50%** under EPR could generate an additional **USD 2 billion/year** in market value for recycled materials (based on global recycled plastic price averages from Plastics Europe, 2022).

**b. Foreign Exchange Savings from Reduced Virgin Plastic Imports**

Pakistan imports significant quantities of virgin plastics, costing an estimated **USD 1.28 billion/year** (*Pakistan Bureau of Statistics*, 2023). By replacing half of these imports with domestically recycled plastics, annual foreign exchange savings could reach **USD 640 million**.

**c. Waste Sector Industrial Growth and Job Creation**

Formalising and expanding recycling, repair, and remanufacturing industries under EPR could add **USD 1.5 billion/year**to GDP through new enterprises, technology adoption, and export opportunities (World Bank, 2020; Ellen MacArthur Foundation, 2019). This transition is expected to create thousands of jobs across collection, sorting, processing, and manufacturing.

### *6.1.1. Existing initiatives and implementation related to EPR*

In Pakistan, various government policies, private-sector initiatives, academic contributions, and startup-led innovations are driving the implementation of EPR. Notable efforts include Punjab's Plastic Waste Management Strategy 2023, PepsiCo's rPET packaging initiative, Nestlé and Coca-Cola's Gilgit plastic waste collection project, and the emergence of plastic upcycling research and waste management startups. These initiatives are focused on reducing plastic waste, promoting recycling, and establishing sustainable waste management mechanisms. However, gaps remain in enforcement, financial sustainability, and scaling up waste collection and recycling infrastructure. Section 5.6.2 provides a detailed analysis of existing EPR initiatives in Pakistan.

### Leadership: government, private, academic, and startup initiatives

**Government-led initiatives**. The **Punjab Plastic Waste Management Strategy 2023** is a major government-driven initiative focused on regulating plastic production, promoting waste segregation, and enhancing recycling infrastructure. A Plastic Cell has been established within the Punjab Environment Protection Department (EPD) to oversee plastic waste management policies, the implementation of EPR frameworks, and coordination among stakeholders.

Key objectives of Punjab's Plastic Waste Strategy include:

- Banning non-recyclable multi-layer packaging by 2030
- Phasing out single-use plastics in multiple sectors
- Encouraging the use of 50% recycled content in packaging by 2030
- Developing policy incentives to promote biodegradable and alternative materials

At the federal level, the Ministry of Climate Change and Environmental Coordination (MoCC&EC) is working towards a national-level EPR framework, including regulations on plastic waste management and corporate responsibility.

- **Private sector initiatives.** Several private-sector players are actively involved in plastic waste reduction, collection, and recycling.
- **PepsiCo Pakistan** has launched its rPET (recycled PET) packaging initiative, collecting and recycling 16,000+ tons of plastic waste in 2021. The company has introduced Reverse Vending Machines (RVMs) to encourage consumer participation in plastic waste collection.
- **Coca-Cola İçecek Pakistan** has introduced 100% recycled PET (rPET) bottles in Sindh, aligning with its global commitment to make all packaging recyclable by 2030 and also incorporate at least 50% recycled materials by 2030.
- **Nestlé Pakistan**, a founding member of the CoRe (Collect & Recycle) Alliance, is driving industry collaboration to formalise plastic waste collection, develop recycling infrastructure, and advocate for policy reforms.
- **The CoRe Alliance** is an industry-led initiative involving Nestlé, PepsiCo, Coca-Cola, and Unilever to promote EPR, enhance waste collection, and develop a circular economy model.

**Academic initiatives.** Pakistani universities and research institutions are actively working on plastic upcycling, biodegradable alternatives, and waste management innovations. Academic collaborations with industry players are supporting evidence-based policymaking and new recycling technologies.

**Startup-led innovations.** Many startups like Concept Loop, Bigger Brick, Eco Gen, Irverde, and Davaam, to name just a few, are engaged with multinational companies (MNCs) and producer organisations, and the informal sector as well, in collecting, sorting and upcycling plastic waste.

### *6.1.2. Existing perceptions towards EPR implementation by stakeholders*

EPR is a transformative policy mechanism that places the onus of waste management on producers, ensuring that they bear the environmental costs of the products they manufacture. However, implementing this approach in Pakistan has been met with mixed reactions from key stakeholders, including consumers, producers, retailers, and government authorities. The perceptions surrounding EPR are shaped by regulatory gaps, enforcement challenges, lack of incentives, and limited availability of sustainable alternatives.

The Punjab Plastic Waste Management Strategy 2023 and the Islamabad Capital Territory (ICT) Regulations on Plastic Cutlery Ban are two major policy interventions that have influenced stakeholders' views on EPR. While the government aims to curb single-use plastics (SUPs) and promote recyclability on the one hand, on the other hand consumers, businesses, and retailers face practical challenges that hinder effective compliance.

#### Consumers: limited access to eco-friendly alternatives and a black market for single-use plastics (SUPs)

One of the key perceptions among consumers is that eco-friendly alternatives to plastics are either unavailable, unaffordable, or impractical for daily use. The ban on plastic cutlery and other SUPs in ICT, for example, has led to a black market for plastic products, where vendors continue to sell banned items discreetly. Many consumers acknowledge the need for sustainable practices but struggle to find cost-effective, durable, and widely available substitutes.

Key concerns from consumers include:

- **Higher cost of alternatives**: Biodegradable or compostable cutlery and packaging are priced significantly higher than SUPs, making them less attractive for low- and middle-income groups.
- **Limited availability**: Eco-friendly materials like bagasse-based or bamboo cutlery are not widely available in local markets, leading consumers to resort to plastic sold illegally.
- **Lack of awareness**: Many consumers remain unaware of EPR policies and their role in responsible waste disposal, leading to low participation in recycling programmes.

Despite the ban on certain plastic products, consumers continue to purchase SUPs through informal markets, highlighting the weak enforcement of EPR regulations and the lack of consumer-centric policy interventions.

#### Producers and the private sector: Limited incentives and lack of inclusion in policymaking

Those in the private sector, particularly packaging companies, fast-moving consumer goods (FMCG) brands, and plastic manufacturers, have expressed concerns over the lack of consultation in EPR policymaking and insufficient financial incentives to transition towards sustainable packaging. While companies like PepsiCo, Coca-Cola, and Nestlé have voluntarily adopted rPET (recycled polyethylene terephthalate) and plastic waste collection mechanisms, they argue that EPR regulations must be implemented in collaboration with industry leaders, rather than imposed top-down.

Key perceptions from producers include:

- **No financial support for the transition**: Shifting to recyclable and biodegradable materials requires investment in new technology, supply chains, and production processes, but government incentives, tax breaks, or subsidies are minimal.

- **Lack of policy stability**: Businesses often face inconsistent enforcement of plastic regulations. For instance, in Punjab, some forms of multi-layer packaging (MLP) are still in use despite regulatory targets to phase them out. This creates uncertainty for manufacturers.
- **EPR compliance burden**: Companies must manage the collection, sorting, and recycling of post-consumer plastic waste without government-supported infrastructure, making compliance costly and difficult.
- **Unfair targeting of the formal sector**: Large corporations are under pressure to comply with plastic bans and recycling targets, while small-scale and informal producers continue to operate with minimal oversight.

The private sector acknowledges the importance of EPR, but calls for an enabling environment, including tax benefits, investment in recycling infrastructure, and stricter regulation of informal plastic production units.

### Retailers: Compliance challenges and resistance to change

Retailers, particularly small businesses, food vendors, and supermarkets, find themselves caught between consumer demand for SUPs and government enforcement of EPR laws. While large retail chains like Carrefour and Metro Cash & Carry have introduced biodegradable shopping bags, smaller vendors struggle to shift away from less-expensive plastic alternatives.

Key concerns from retailers include:

- **High cost of alternatives**: Retailers are forced to purchase biodegradable or paper-based bags at a higher price, which eats into their profit margins. Many resort to selling plastic bags illegally.
- **Customer resistance**: Many customers refuse to pay extra for paper or cloth bags, forcing retailers to continue providing plastic options under the table.
- **Weak enforcement and loopholes**: Retailers argue that while inspections take place in major cities like Lahore and Islamabad, enforcement in peri-urban and rural areas is almost non-existent. Many vendors store plastic bags inside their shops and provide them upon request.
- **Need for structured transition**: Retailers support the idea of reducing plastic waste but demand a phased approach, with subsidies for alternatives and clear guidelines on compliance.

The retail sector perceives EPR regulations as a burden rather than an opportunity, primarily because of the financial constraints and weak consumer demand for sustainable packaging.

### Government authorities: Policy intentions vs. on-the-ground realities

From the government's perspective, EPR is an essential tool to tackle plastic pollution. The Punjab Plastic Waste Management Strategy 2023 and the ICT ban on plastic cutlery are seen as significant policy steps toward reducing plastic dependency. However, government authorities acknowledge that there are major implementation challenges.

Key government perceptions include:

- **Lack of enforcement resources**: Monitoring compliance across thousands of businesses and informal markets requires manpower, funding, and coordination, all of which remain insufficient.
- **Resistance from the private sector**: Policymakers recognise that many businesses resist change due to cost concerns, but argue that industry must take the responsibility for waste management.
- **Need for public awareness campaigns**: Government officials believe consumers need greater awareness and behavioural nudges to shift towards sustainable consumption habits.
- **Funding gaps**: Establishing EPR frameworks, waste collection systems, and recycling plants requires public-private investment, which is still lacking.

While the government remains committed to EPR, there is growing recognition that successful implementation will require stronger industry collaboration, better consumer education, and significant investment in waste management infrastructure.

# 7. NATIONAL CONSULTATIONS AND STAKEHOLDER ENGAGEMENTS

A national consultation was conducted online on 2nd May 2025 with key stakeholders from Pakistan and the SWITCH Asia team.

### Policy commitment and national framework

- The government is committed to moving from fragmented pilot actions toward a national EPR regime with enforceable recovery targets and Producer Responsibility Organisations (PROs)
- EPR must be supported by legislation, financing models, infrastructure, and behavioural change to be effective
- There is a need for alignment with international sustainability commitments and preparedness for trade-related mechanisms, such as the Carbon Border Adjustment Mechanism (CBAM)

### Technical and regional lessons learned

- EPR must be viewed as a system, connecting product design, recycling quality, and local context
- Mandating recycled content and building markets for secondary materials are essential actions
- Regional implementation should draw from but not replicate European models – success depends on contextualised policy design, especially considering Asia's governance and informal waste dynamics

### Way forward

- Develop and enforce a national EPR law with clear targets, timelines, and governance structures
- Establish a PRO under the Ministry of Climate Change with cross-sector representation and independent oversight
- Embed circularity principles in product design, manufacturing, and post-consumer recovery
- Institutionalise informal sector roles through social protection and contractual inclusion
- Ensure that financing, data systems, and public awareness mechanisms are in place to support implementation
- Position EPR and circular plastic solutions as both an environmental necessity and a competitive strategy in global markets

# 8. THE WAY FORWARD FOR EPR IN PAKISTAN

The implementation of EPR in Pakistan is not just an environmental necessity but an economic imperative. With waste generation growing at 2.4%, Pakistan faces a critical juncture in its waste management journey. The proposed EPR framework, drawing from successful international models and tailored to Pakistan's context, offers a comprehensive solution to address these mounting challenges.

A successful transition to EPR requires immediate, coordinated action from all stakeholders. Policymakers must prioritise the development of robust national legislation and enforcement mechanisms. Producers need to embrace eco-design principles and invest in recycling infrastructure, while the informal sector requires integration into the formal waste management system. Through collaborative effort and sustained commitment to EPR implementation, Pakistan can transform its waste management challenges into opportunities for environmental sustainability, economic growth, and progress toward multiple UN Sustainable Development Goals.

To effectively address plastic waste management and promote a circular economy, the following policy recommendations are proposed for the implementation of an Extended Producer Responsibility (EPR) framework in Pakistan.

## Key policy recommendations for EPR implementation in Pakistan

### *1. Develop a national EPR framework with defined recycling targets*

To ensure clarity, accountability, and enforceability, Pakistan must integrate a structured EPR framework into its National Circular Economy Policy. This framework should do the following.

- Define the roles and responsibilities of producers, waste collectors, recyclers, and regulatory bodies
- Set phased recycling targets for plastic packaging, e-waste, and batteries (e.g. 60% recovery by 2030).
- Mandate a deposit-refund system for PET bottles, aluminium cans, and glass packaging to boost collection rates
- Introduce modulated EPR fees, where eco-friendly and recyclable products pay lower fees, while high-pollution products bear higher financial responsibility

### *2. Introduce a consumer-paid recycling fee to ensure cost sharing*

Pakistan should introduce a Consumer-Paid Recycling Fee (CPRF), a cost-sharing mechanism that partially shifts waste management expenses to end-users.

- Consumers pay a nominal fee on plastic-packaged products, which funds collection, sorting, and recycling programmes
- Revenue from CPRF is reinvested in waste management infrastructure, informal waste collector integration, and awareness campaigns
- Retailers display recycling costs transparently, encouraging consumers to opt for low-waste or recyclable alternatives

This market-driven model has been successfully implemented in countries like Germany, South Korea, and Japan, where consumers actively contribute to circular economy initiatives.

### *3. Mandate producer registration and compliance reporting*

To ensure traceability and transparency, Pakistan must establish a centralised EPR compliance authority, requiring all producers, brand owners, and importers to comply with these regulations.

- Register under a national EPR database and report annual plastic usage

- Submit Extended Producer Responsibility (EPR) action plans, including strategies for collection, processing, and recyclability improvement
- Publicly disclose their packaging sustainability progress through an annual waste management report
- Producers who exceed their recycling targets should receive tax credits, while non-compliant entities face financial penalties

### *4. Incentivise sustainable production and recycled content usage*

To accelerate Pakistan's transition to a circular economy, producers should be required to incorporate recycled materials into their products. A progressive target-based approach could be adopted.

- 20% recycled content in Year 1
- 35% by Year 3
- 60% by Year 5

Governments should provide:

- Tax exemptions for businesses using over 50% recycled content in packaging
- Subsidies for local recyclers to improve processing capabilities
- R&D funding to support biodegradable packaging innovations

PepsiCo's rPET initiative and Nestlé and Coca-Cola's circular economy projects in Gilgit offer positive industry case studies that should be scaled and replicated.

### *5. Foster public-private partnerships (PPPs) for waste collection and recycling*

- Strong public-private partnerships (PPPs) are needed to expand Pakistan's waste collection network and build local recycling infrastructure
- Co-financed material recovery facilities (MRFs) should be established in urban centres and industrial zones to improve waste sorting efficiency
- Government–private-sector collaborations should finance local startups working on plastic upcycling and alternative materials
- Waste collection partnerships with informal recyclers should be formalised through incentives and certification programmes

A PPP-based model would distribute the financial burden, optimise waste flows, and improve regulatory enforcement.

### *6. Integrate the informal waste sector into EPR implementation*

Pakistan's informal waste sector plays a crucial role in collecting and sorting plastic waste, but remains marginalised and unrecognised. A structured integration programme should offer actions such as the following.

- Register informal waste pickers and provide ID cards for formal recognition
- Offer training on proper sorting, hazardous waste handling, and safety protocols
- Form cooperatives that allow waste collectors to negotiate fair wages and health benefits
- Ensure formal inclusion in EPR schemes through buyback agreements with producers

Countries like India and Brazil have successfully integrated informal recyclers into national waste management programmes, leading to higher collection rates and improved social security for workers.

### *7. Strengthen enforcement with clear regulations and penalties*

To ensure compliance, Pakistan must implement a strict enforcement mechanism with real-time monitoring of EPR obligations but initially voluntary target setting should be encouraged through pacts or vision planning with producer companies.

- Non-compliant businesses will face progressive penalties, including fines, license suspensions, and import restrictions
- Producers that meet or exceed EPR targets will receive Green Compliance Certification, improving brand reputation and investor confidence
- Plastic manufacturers must submit annual EPR reports to ensure accountability in material recovery and waste management efforts

### *8. Launch nationwide consumer awareness and behaviour change campaigns*

To drive consumer participation in waste reduction and recycling, the government and private sector must jointly invest in behavioural change campaigns, such as the following.

- 'Sort & Save Pakistan' – A nationwide initiative to educate consumers on waste sorting and recycling practices
- Smart bins with digital incentives – Consumers earn discounts or loyalty points for depositing recyclable materials
- Social media engagement & influencer advocacy to promote sustainable habits

Behavioural change must accompany EPR regulation to ensure sustained consumer participation and waste reduction efforts.

By implementing these recommendations, Pakistan can create a sustainable waste management system that would reduce pollution, conserve resources, and contribute to achieving national and global sustainability goals. *The time for action is now*. Delays in implementing EPR will only compound existing environmental and public health challenges, whereas swift and decisive action can position Pakistan as a regional leader in sustainable waste management practices.

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