

A study on Extended Producer Responsibility (EPR) on Corporate Performance

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Abstract: Extended producer responsibility (EPR) is an environmental policy that was implemented in Europe during the 1990s. Producers are required to adhere to the collection and recycling rates established by EPR legislation, which extends their responsibility for their products beyond the consumption stage. In this paper, we conduct a systematic review of EPR, which encompasses its advantages for society, the environment, and business, in light of the significance of this subject. This initiative is spearheaded by the Central Pollution Control Board (CPCB) through centralized digital portals. This study examines the present efficacy and constraints of the EPR framework in the Indian waste management ecosystem. The integration of the extensive informal sector, which is responsible for managing nearly 90% of India's refuse, is a multifaceted social and logistical challenge.

Methodology: Employed a combination of secondary data from official CPCB Reports and Ministry (MoEFCC) filings, which was supplemented by a systematic case study of technology driven Producer Responsibility Organizations (PROs) such as Recykal.

Findings: Although the initial compliance rate for e-waste was high in 2023-24 (approximately 92.15%), the performance experienced a substantial decline to approximately 48.32% in 2024-25, indicating a developing implementation gap.

Future of EPR in India is becoming more high-tech and expansive. The market is anticipated to reach \$5 billion by 2030, with block chain-based traceability serving as a foundation for transparency. EPR will evolve from a trivial regulatory obstacle to a primary factor in the promotion of sustainable industrial innovation and resource security.

Keywords: Extended producer responsibility (EPR), Central Pollution Control Board (CPCB), and Producer Responsibility Organizations (PROs).

I. INTRODUCTION

In a 1990 report to the Swedish Ministry of the Environment, Thomas Lindhqvist formally introduced the concept in Sweden. EPR is a strategy for environmental preservation that aims to reduce the total environmental impact of a product by requiring the product manufacturer to be responsible for the entire lifecycle of the product, with a particular emphasis on the take-back, recycling, and final disposal procedures. Extended Producer Responsibility (EPR) is a potent environmental policy instrument that transfers the responsibility for a product's entire lifecycle, particularly its disposal, from the government and taxpayers to the original producers. In addition, EPR has the potential to encourage producers to participate more actively in the

comprehensive redesign of products and packaging, with the ultimate objective of reducing waste and thereby reducing the negative effects on the environment and health. The E-Waste Rules of 2011 marked the beginning of its evolution, which was substantially advanced by the 2016 and 2022 amendments, which established mandatory, quantifiable targets for plastics, electronics, and batteries. Currently, it encompasses a wide range of streams, such as end-of-life vehicles, tyres, and used oil, which is indicative of a comprehensive regulatory shift. This framework offers substantial advantages. It reduces the demand for virgin resources through urban mining and diverts millions of tons of waste from landfills, which is beneficial for the environment. Economically, it is formalizing the waste sector, which is expected to generate more than one million green employments and promote "design for environment" by facilitating the recycling of products to reduce compliance costs. The future of EPR in India is becoming more high-tech and expansive. The market is anticipated to reach \$5 billion by 2030, with block chain-based traceability serving as a foundation for transparency. EPR will evolve from a trivial regulatory obstacle to a primary driver of sustainable industrial innovation and resource security as targets increase to 80–90% recovery rates for batteries and e-waste. EPR directs companies to develop products that are more durable, simpler to recycle, and less toxic by imposing financial or physical responsibilities for waste. The company incurs additional compliance fees when the product is costly to recycle; conversely, they conserve funds by optimizing its design. The financial and/or operational responsibility for managing products at the conclusion of their life cycle is shifted from municipalities and taxpayers to the producers themselves through EPR programs.

This may necessitate a variety of strategies, such as

- ⇒ **Financial Responsibility:** Producers are responsible for the collection, processing, and recycling or disposal of their products. Producers frequently implement this by paying fees that are contingent upon the quantity or type of product they sell.
- ⇒ **Operations Responsibility:** Producers are responsible for the direct management of the collection, processing, and recycling/disposal systems. This may entail the establishment of collection points, the establishment of partnerships with recyclers, or the operation of their own recycling facilities.
- ⇒ **Shared Responsibility:** A hybrid of financial and operational responsibility in which producers contribute financially and participate in the administration of the end-of-life process.

II. EVOLUTION OF EPR IN INDIA

E-Waste (Management) Rules, 2011 & 2016	India was among the first developing countries to implement EPR in the management of e-waste.
Plastic Waste Management Rules, 2016 (Amended 2022)	Make Extended Producer Responsibility (EPR) mandatory for plastic producers, importers, and brand proprietors.
Battery Waste Management Rules, 2022	Encouraged circularity and material recovery by introducing EPR for used batteries.
E-Waste (Management) Rules, 2022	Moved to a centralized EPR registration portal, which enhanced accountability and traceability.

Advantages of EPR:

Advantages for the Environment	Economic and Social Advantages:	Corporate Benefits
<ul style="list-style-type: none"> • Decreased landfill and pollution. • Promotes the development of sustainable resource efficiency design 	<ul style="list-style-type: none"> • Cost shift borne by taxpayers. • Employment Generation. • Efficiency in Operations • Fair Competition 	<ul style="list-style-type: none"> • Improved Customer Loyalty and Brand Reputation. • Resource Efficiency and Cost Savings. • Compliance and environmental impact were diminished. • Product Design Improvement and Innovation. • Access to New Markets and Business

		<p>ss opportunities.</p> <ul style="list-style-type: none"> • Fair Competition and a Level Playing Field. • Partnerships and Collaborations. • Addressing the Increasing Expectations of Consumers. • Minimizing Potential Regulatory Risks. • Supporting the Circular Economy.
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Environmental Benefits:

- ⇒ **Decreased Landfill and Pollution:** Significantly reduces environmental contamination and greenhouse gas emissions by preventing electronics, plastics, and batteries from entering landfills.
- ⇒ **Promotes Sustainable Design:** Incentives manufacturers to reduce hazardous materials, enhance the lifespan of products, and utilize recyclable materials (eco-design).
- ⇒ **Resource Efficiency:** Encourages the recovery of valuable materials, thereby reducing the necessity for virgin material extraction.

Economic and Social Benefits:

- ⇒ **Cost Shift from Taxpayers:** This approach frequently advocates for the "polluter pays" principle by shifting the financial burden of waste management from public systems to manufacturers.
- ⇒ **Employment Generation:** Fosters the development of green employment by stimulating the recycling and waste management sectors.
- ⇒ **Operational Efficiency:** Fosters innovation among businesses by promoting circular models such as leasing or refurbishing.
- ⇒ **Fair Competition:** Establishes a level playing field by ensuring that all producers are accountable for end-of-life management.

Industrial and Regulatory Impact:

- ⇒ **Infrastructure Development:** Compels the establishment of more effective refuse collection and processing infrastructure.
- ⇒ **Supply Chain Sustainability:** Promotes the adoption of improved environmental, social, and governance (ESG) practices by companies

Corporate Benefits:

- ⇒ **Better Brand Reputation and Customer Loyalty:** Consumers are becoming more cognizant of environmental concerns and are actively seeking out brands that exhibit a dedication to sustainability. Engaging in EPR programs demonstrates a company's commitment to responsible environmental practices, which in turn enhances its brand reputation and fosters consumer trust. This can result in a competitive advantage in the market and increased customer loyalty. Businesses can attract environmentally conscious consumers and establish themselves as sustainability leaders by proactively managing end-of-life.
- ⇒ **Cost Savings and Resource Efficiency:** Although EPR programs may incur initial expenses; they can also result in long-term cost savings. Businesses can mitigate waste disposal expenses and material costs by developing products that are both durable and recyclable. EPR can also encourage innovation in product design, resulting in a more efficient use

of resources and a reduced reliance on virgin materials. Moreover, the cost of waste management can be more cost-effective when participating in shared collection and processing systems than when managing it individually.

- ⇒ **Compliance and Reduced Environmental Impact:** EPR programs are intended to reduce the environmental impact of products throughout their lifecycle. Businesses can reduce landfill waste, conserve resources, and minimize contamination by assuming responsibility for end-of-life management. This assists businesses in adhering to environmental regulations and avoiding potential penalties. Businesses can also demonstrate a commitment to environmental stewardship and remain ahead of evolving regulations through proactive engagement with EPR.
- ⇒ **Product Design Improvement and Innovation:** EPR has the potential to stimulate innovation in product design. Producers are motivated to develop products that are simpler to recycle, reuse, and restore by being accountable for the end-of-life management of their products. This has the potential to result in the creation of innovative recycling technologies, more enduring products, and more sustainable materials. This emphasis on environmental design can also result in enhancements to the functionality and efficacy of products.
- ⇒ **Access to New Markets and Business Opportunities:** Businesses that exhibit a dedication to sustainability are being prioritized by a growing number of governments and retailers. In sectors where environmental considerations are of the utmost importance, participation in EPR programs can provide access to new markets and business opportunities. Businesses that can exhibit responsible end-of-life management may have an advantage in bidding for government contracts or procuring shelf space in environmentally conscious retail stores, for instance.
- ⇒ **Fair Competition & mitigate uncertainty:** EPR programs ensure that all producers contribute to the costs of end-of-life management, thereby creating a level playing field and fair competition for businesses. This serves to prevent organizations that externalize these expenses from acquiring an unwarranted competitive advantage. EPR programs also establish consistent and transparent regulations for the management of product end-of-life, thereby fostering fair competition and mitigating uncertainty.
- ⇒ **Partnerships and Collaboration:** EPR programs frequently necessitate partnerships and collaboration among producers, recyclers, governments, and other stakeholders. This can result in the establishment of valuable partnerships and networks, which can promote the sharing of knowledge and innovation. Businesses can optimize their product end-of-life management processes through collaboration.
- ⇒ **Meeting the Increasing Expectations of Consumers:** Businesses are being compelled to assume responsibility for the environmental impact of their products by consumers. Businesses can establish trust with consumers and demonstrate their dedication to meeting these expectations by participating in EPR programs. In a competitive market, this can serve as a substantial differentiator.
- ⇒ **Minimizing Future Regulatory Risks:** Governments are likely to impose more stringent regulations on product end-of-life management as environmental concerns continue to escalate. Businesses can anticipate and mitigate future regulatory risks by proactively engaging with EPR. This can prevent costly compliance issues, thereby saving businesses time and money in the long term.
- ⇒ **Contributing to a Circular Economy:** EPR is a critical element of a circular economy, a system in which resources are maintained in use for the maximum amount of time, the maximum value is extracted from them while in use, and products and materials are recovered and regenerated at the end of each service life. Businesses contribute to the advancement of a circular and sustainable economy by engaging in EPR programs. This has a positive impact on society as a whole, in addition to individual enterprises.

- ⇒ **Regulatory Framework and Compliance:** The Ministry of Environment, Forest and Climate Change, Central Pollution Control Board, and state bodies are responsible for the operation of India's Extended Producer Responsibility laws, which are organized in a tiered structure.

III. PROCEDURES FOR THE IMPLEMENTATION OF EPR

- ✓ Step 1 Checking for Applicability is the initial step.
- ✓ Step 2: Complete the registration process with the CPCB/SPCB.
- ✓ Step 3: Develop an EPR Action Plan
- ✓ Step 4 Achieve the collection targets.
- ✓ Step 5: Arrange Reports for Storage

Steps for Compliance: Check to see if your product is covered by EPR, especially the plastic EPR rules. Batteries, plastics, e-waste, and tires are all covered by EPR. Sign up for the EPR portal and upload the listed papers. Describe how you'll collect trash, who will be helping, and set clear due dates. Get at least the weight or volume that you promised to collect or discard. Keep up-to-date records and send in your quarterly and annual returns on time.

IV. CHALLENGES IN IMPLEMENTATION OR EPR

- ⇒ **Traceability and Data Gaps:** The absence of centralized, dependable data on waste generation complicates the process of monitoring products from their sale to their recycling.
- ⇒ **Informal Sector Integration:** In developing regions, such as India, the informal sector manages over 95% of waste, which poses risks for compliance and presents challenges for formalization.
- ⇒ **Regulatory Complexity:** Multinational companies face challenges in complying with the diverse labeling, reporting, and fee regulations of various regions, such as the European Union and various Indian states.
- ⇒ **Infrastructure Deficits:** A paucity of certified, capacity-verified recyclers is present, particularly in non-metro areas and for specific plastics.
- ⇒ **"Free Riders" and Enforcement:** The burden is placed on compliant firms as a result of weak penalties, which enable certain producers to evade obligations.
- ⇒ **Certificate Market Volatility:** The unregulated or volatile pricing of EPR credits can make budgeting challenging and, at times, fail to incentivize genuine recycling.
- ⇒ **Waste Generation vs. Management:** Although EPR frequently enhances collection, it has not yet effectively decreased overall waste generation.
- ⇒ **Financial Burden:** Expensive recycling, reporting, and collection fees.
- ⇒ **Small and Medium Businesses (SMBs) encounter challenges** in complying with intricate regulations and reporting requirements due to their inadequate internal expertise.
- ⇒ **Credibility and Auditing:** Guaranteeing that third-party refuse processors recycle materials rather than merely issuing fraudulent certificates
- ⇒ **Weak Enforcement and Low Compliance:** The framework's effectiveness is undermined by the fact that many small producers evade EPR obligations due to minimal penalties and ineffectual enforcement by pollution control boards.

- ⇒ **Fluctuations in the Unregulated Certificate Market:** The absence of benchmark prices in certain sectors results in a decrease in the price of EPR certificates, which undermines formal recycling and forces producers to operate in unregulated channels.
- ⇒ **Market Distortion by Informal Recycling:** Formal recyclers are undermined by informal recyclers who operate outside of tax and environmental norms.

V. CONCLUSION

Implementing EPR principles provides enterprises with a route to sustainability, diminished environmental impact, and improved market competitiveness. Businesses should proactively engage in global initiatives to reduce waste and combat climate change while seizing new economic prospects. Life Cycle Assessments (LCAs) are essential in this process, enabling firms to pinpoint environmental hotspots, enhance product designs, and adhere to regulatory requirements efficiently. EPR compliance presents challenges due to diverse rules, initial expenses, and the necessity for customer engagement; however, these obstacles can be mitigated by collaboration, education, and inventive solutions. Through collaboration with governmental entities, industry counterparts, and sustainability specialists, organizations can enhance compliance and develop more robust supply chains. Ultimately, EPR is an opportunity for enterprises to diminish their dependence on limited resources, enhance their brand reputation, and discover new prospects in a swiftly changing market. By employing effective tactics and support, including Carbon Bright's AI-driven LCA solutions, firms can transform EPR difficulties into concrete advantages, positioning themselves as leaders in the shift towards a circular economy.

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