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India's Textile and Apparel Sector

Understanding the Ecosystem and Readiness for Implementation of Extended Producer Responsibility

India's Textile and Apparel Sector: Understanding the Ecosystem and Readiness for Implementation of Extended Producer Responsibility

Anjali Taneja

Khushboo Garg

Pooja Verma

Center for Study of Science, Technology and Policy (CSTEP)

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Editor: Shayantani Chatterjee

Designer: Bhawna Welturkar, Alok Kumar Saha

Bengaluru

No. 18, 10th Cross, Mayura Street

Papanna Layout, Nagashettyhalli

RMV Stage 2, Bengaluru 560094

Karnataka (India)

Noida

1st Floor, Tower-A

Smartworks Corporate Park

Sector 125, Noida 201303

Uttar Pradesh (India)

Tel.: +91 (80) 6690 2500

Email: cpe@cstep.in

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Address:

A2/18, Safdarjung Enclave
New Delhi 110 029 India
T: +91 11 4949 5353
F: + 91 11 4949 5391
E: info@giz.de

I: www.giz.de/india

Responsible:

Meghana Kshirsagar,
Senior Advisor- Climate Change & Circular Economy
meghana.kshirsagar@giz.de

Knowledge Partner: Center for Study of Science, Technology and Policy (CSTEP)

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Executive Summary

In an era of growing environmental consciousness, the global textile waste management system is emerging as a critical concern. The textile and apparel industry, although a major contributor to global trade, is now becoming one of the most polluting industries worldwide. The rise of fast fashion, characterised by high consumption of low-cost, low-quality clothing, has aggravated the sector's environmental footprint. Globally, around 92 million tonnes of textile waste end up in landfills annually, resulting in the leaching of harmful materials and leaking of valuable resources from the value chain. Alarmingly, only 12%–15% of this waste goes to recycling facilities, of which only 1% is recycled into new clothing. This highlights the need to focus on maximising resource use and reducing emissions.

Global South countries have become manufacturing hotspots for several major brands owing to the availability of raw materials and cheap skilled workforce in these countries. Although this boosts their economies, it contributes to emissions and wastes generated along the entire value chain in this sector.

India has become one of the largest textile and apparel hubs in the world. The sector accounts for about 2% of the country's GDP and 12% of the exports. The textile sector is also one of the largest employers in the nation, directly employing 45 million people and supporting an additional 100 million jobs in related businesses. However, the sector leads to the generation of 7,800 kilotonnes of waste every year, which is either dumped in landfills or incinerated. All three waste streams, namely, pre-consumer, post-consumer, and imported waste, contribute to the total textile waste of the nation. Despite being a global leader in mechanical recycling, India does not have a circular approach in place for handling this waste. Because of the value chain's current lack of organisation and visibility, along with infrastructural and technological gaps, the waste leaks into the environment at several stages of the value chain and the sector is unable to build a comprehensive approach towards circularity.

Given these challenges, there is a clear and pressing need for a more structured and comprehensive approach to waste management in India's textile industry. The current practices, while partially effective, are insufficient to address the scale of the problem. Without significant improvements in collection systems, technological infrastructure, and regulatory frameworks, the industry will struggle to manage its waste sustainably. To this end, the introduction of Extended Producer Responsibility (EPR) presents a viable path forward. EPR is a model that advocates circularity by promoting a regenerative system, wherein textiles can be utilised for as long as they are valuable and may be fully recycled within the textile industry, therefore reducing waste, pollution, and leakage.

This report examines the key drivers and possible benefits of implementing a successful EPR system in the Indian textile sector. It examines India's preparedness for EPR, leveraging significant insights from the best practices in the Global North and the preparedness of Global South countries (particularly, Bangladesh, Cambodia, Brazil, Philippines, and Indonesia) in implementing EPR guidelines in the textile and apparel sector. The report also gathers learnings from India's experience with EPR implementation in other sectors such as plastics, which was introduced to curb the growing plastic waste menace.

A series of stakeholder consultations and semi-structured interviews were conducted to gather first-hand insights into the textile and apparel landscape, real-time opportunities,

challenges and benefits of waste management, and prerequisites for a comprehensive EPR framework in this sector.

An EPR framework has been proposed in this study, optimising the forward and reverse logistics. Critical components of the framework include

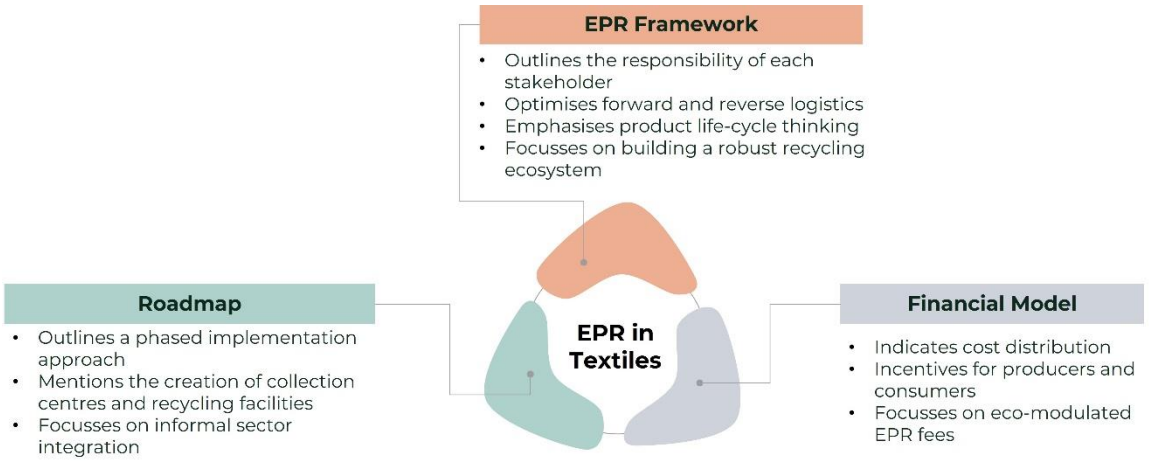
- encouraging sustainable raw material sourcing and design for the environment;
- setting targets for recycled material usage, enforced by the producer responsibility organisation(s) and monitored by the inspecting committee;
- separating textile waste collection and fostering a closed-loop system;
- establishing waste management infrastructure and encouraging technological innovation;
- introducing a product labelling system to aid end-of-life sorting and recycling;
- including the informal sector into the formal system of waste management; and
- conducting capacity-building and sensitisation drives to educate all stakeholders on sustainable practices.

Moreover, the study proposes a sustainable financial flow model, taking into consideration the equitable distribution of costs, provision of incentives and subsidies, and fair allocation of responsibilities or waste management burden across different stakeholders in the value chain. A decentralised EPR fund can be established with an eco-modulated fee based on the costs incurred in transporting, sorting, segregating, and recycling the waste.

A roadmap for the phased rollout of the EPR framework and financial model is also delineated in this report. It begins with stakeholder mobilisation, the formation of a consortium, and pilot experimentation of the framework, with voluntary participation in the short and medium periods. This can then be scaled up at the national level in the long run, after completing the feedback loop, with mandatory compliance. The roadmap suggests introducing incremental recycling targets, progressive enforcement mechanisms, and promoting collaboration among relevant stakeholders for knowledge and resource sharing.

The proposed framework, financial model, and roadmap not only meet regulatory requirements but also promote ethical practices, drive innovation, and support the long-term sustainability of the textile and apparel sector in India. It promotes transparent, equitable, and fair distribution of the waste management burden to ensure that the textile and apparel industry eventually transitions to a circular and sustainable model.

Proposed framework, financial flow, and the suggested roadmap



This report is a stepping stone in the right direction for formulating and successfully implementing a comprehensive EPR policy for enabling circularity and effective waste management in the textile sector. Further research is required to understand the socio-economic impacts of implementing the EPR policy in this sector, the environmental impacts of textile waste leakage, and the nature of technological innovations required to reuse and recycle at scale.

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Abbreviations

AFC	Australian Fashion Council
CPCB	Central Pollution Control Board
DfE	Design for Environment
EPR	Extended Producer Responsibility
EU	European Union
GDP	Gross Domestic Product
LEED	Leadership in Energy and Environmental Design
MMF	Man-made fibres
MSME	Micro, small and medium enterprise
MSW	Municipal Solid waste
NCPSS	National Clothing Product Stewardship Scheme
NGO	Non-Governmental Organization
PaCT	Partnership for Cleaner Textile
PIBO	Producers, Importers, Brand Owners
PNRS	National Solid Waste Policy (Brazil)
PRO	Producer Responsibility Organisation
RFID	Radio Frequency Identification
R&D	Research and Development
ULB	Urban Local Bodies
WFD	Waste Framework Directive


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1. Introduction

The textile and apparel industry is one of the largest industries in the world, contributing significantly to global trade. In India, an average consumer spends approximately 6% of their annual income on clothing and footwear (Chintan Environmental Research and Action Group, n.d.). While the sector's growth is impressive, it has become one of the most polluting industries worldwide.

The apparel and footwear industry contributes to 8%–10% of global emissions, and the dyeing and finishing processes account for 20% of industrial wastewater pollution (Leal Filho et al., 2022). The sector's environmental footprint has been exacerbated by the growth of fast fashion, i.e. mass-produced, low-quality clothing designed to be trendy and inexpensive, which promotes frequent purchases of such merchandise.

Globally, around 92 million tonnes of textile waste ends up in landfills every year (Earth.Org., n.d.), resulting in the leaching of harmful materials and leakage of valuable resources from the value chain. Only 12%–15% of this waste reaches recycling facilities, of which only 1% is recycled into new clothing (Earth.Org., n.d.).

In the era of growing environmental consciousness, the global textile and apparel waste management system has emerged as a critical concern. Many significant fashion businesses in the world have pledged to achieve net zero, steering the global fashion industry towards sustainability. Moreover, environmental regulations in the European Union (EU) are becoming increasingly stringent, with an increased focus on recycled content, eco-design, and carbon border taxes. As one of the largest textile and apparel hubs, India must adapt to these evolving global standards to sustain its crucial role in the global textile and apparel value chain.

1.1. Indian textile industry

The Indian textile and apparel sector plays a critical role in the development and growth of the national economy. The sector, excluding the cultivation of raw materials such as cotton and wool, accounted for 2.3% of India's gross domestic product (GDP) and 12% of its exports in the fiscal year 2021–22 (Invest India, n.d.). India is the third-largest exporter of textiles and apparel globally, with its major markets being the United States (27%), EU (18%), and United Kingdom (6%) (Ministry of Textiles, n.d.). This global reach reinforces the industry's strength and underscores its importance in international trade.

The sector is also one of the largest employment-generating sectors in the country, providing direct jobs to approximately 45 million people and supporting another 100 million in allied industries. The sector's growth projections are also impressive, with targets set to achieve USD 250 billion in textile production and USD 100 billion in exports by 2030 (India Brand Equity Foundation, n.d.). However, the rapid growth of this industry brings significant challenges, particularly in sustainability and waste management. These issues are discussed in detail in the subsequent chapters of this report.

1.1.1. Environmental impact of textile production

The textile supply chain includes various stages: raw material extraction or fibre production, yarn and fabric production, wet processing, garment manufacturing,

consumption, and end-of-life. Examining the environmental footprint at each stage is critical for better waste management.

Textile fibres can also prove to be extremely environmentally harmful. The diverse range of fibres can be broadly categorised as natural fibres (including cotton, wool, and silk) and man-made fibres (MMFs; including polyester, nylon, and viscose). Globally, the MMF-to-natural fibre consumption ratio is 72:28, indicating that MMFs dominate the global textile fibre consumption (International Cotton Advisory Committee, n.d.). India is the second-largest producer of MMFs, with exports reaching USD 9.56 billion in FY 2021–22. Synthetic fibres are more dominant in the market because they are more durable, stain- and wrinkle-resistant, and cheaper and easier to produce than natural fibres. However, these fibres are non-biodegradable owing to their complex molecular structures and are extremely polluting because of the chemical processes involved in their production, which also require an enormous amount of energy. Many synthetic fibres shed microfibres that contribute to marine and soil pollution. However, although natural fibres are generally more sustainable, the production of crops such as cotton may be water-intensive and environmentally taxing when traditional methods of crop production are deployed. Further, when natural and synthetic fibres are mixed, they form blends that are also non-biodegradable and difficult to recycle. Moreover, there exists a technology gap in India to recycle synthetic and blended fabrics effectively.

1.1.2. Textile waste production

The textile and apparel industry generates a significant amount of waste annually in India, most of which is currently disposed of as municipal solid waste (MSW). This industry is responsible for the third-largest waste stream in the dry fraction of MSW, after plastics (Down to Earth, n.d.). India is estimated to generate approximately 7,800 kilotonnes of textile waste annually, equivalent to about 5 kg of waste generated per person (Fashion for Good, 2022).

Textile waste can be classified into three types (Figure 1):

Pre-consumer waste (42%): Waste generated during the manufacturing process, such as fabric scraps, yarn trimmings, and cutting waste (Fashion for Good, 2022)

Post-consumer waste (51%): Waste from textiles that have been used and disposed of by consumers (Fashion for Good, 2022)

Imported waste (7%): Discarded waste entering a country from other regions, including mutilated rags and second-hand clothing

Figure 1. Textile waste categories and end-of-life management

A majority of this waste ends up in two major textile clusters of India: Panipat in northern India and Tirupur in southern India. Panipat has become a global destination for recycling rejected clothing, and the Tirupur–Coimbatore–Erode belt specialises in cotton-rich textile waste recycling. Figure 2 illustrates the flow of this waste (Dwij Upcycled in India, 2024; Fashion for Good, 2022).

At present, 59% of India's textile waste re-enters the industry through reuse, upcycling, or recycling. However, only 25% is recycled into yarn, with quality issues often preventing it from re-entering the global supply chain. The remaining 41% of waste is downcycled (19%), incinerated (5%), or landfilled (17%). Table 1 provides an overview of the end-of-life waste management mechanisms and the quantity of waste managed against each.

Figure 2. (a) Imported waste flow (b) Domestic waste flow

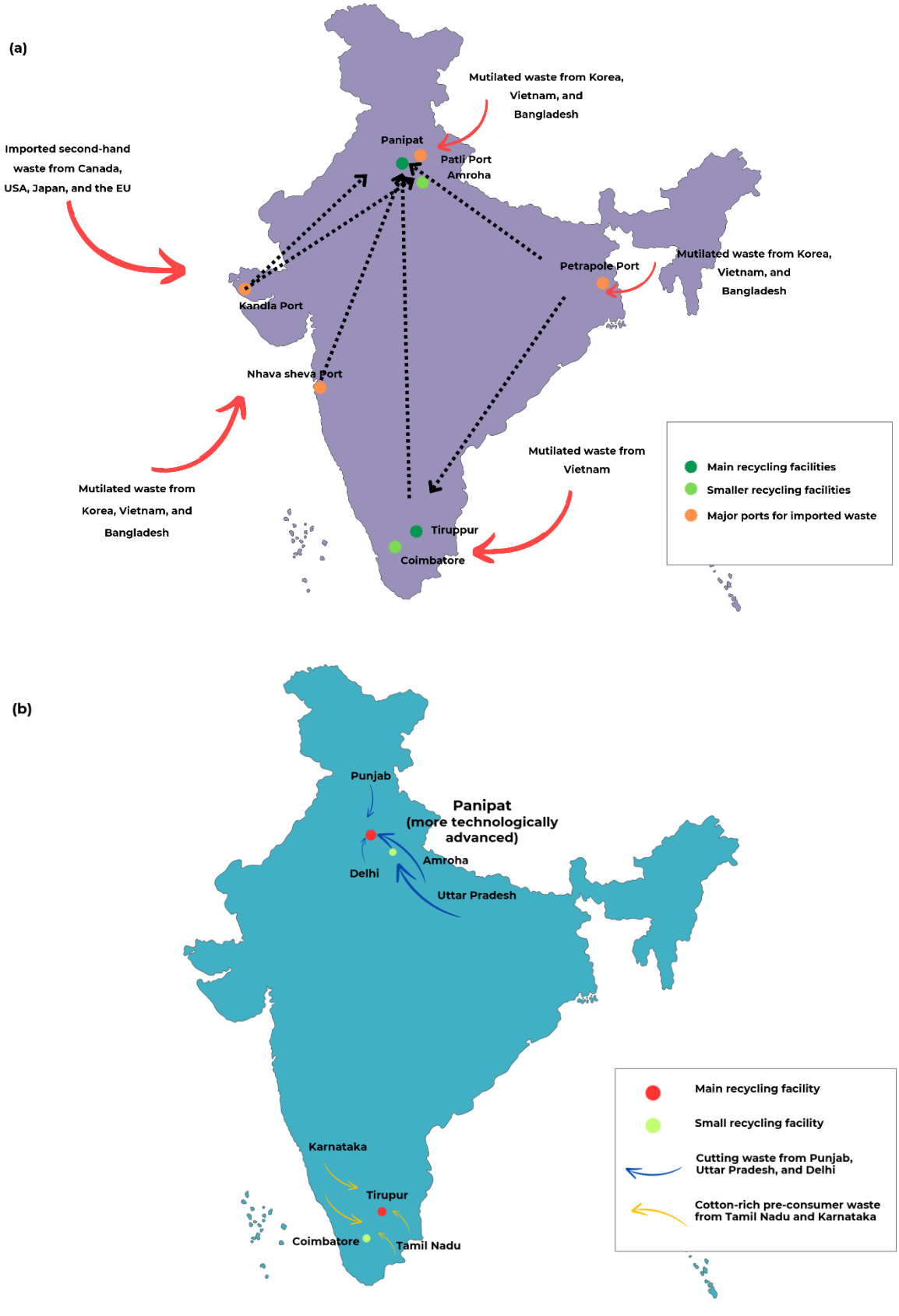


Table 1. End-of-life (EoL) management of textile waste

EoL waste management	Methods	Quantity (%)
Reused	Repaired and converted into new products	34%
Recycled	Recycled into yarns	25%
Downcycled	Use in secondary industries (e.g. automobiles and wipes)	19%
Incinerated	Energy recovery in brick kilns and boilers	5%
Landfilled	Disposal	17%

1.2. Current textile waste management practices

Waste management in the Indian textile industry faces significant challenges, stemming from both the rapid expansion of the sector and the complexities inherent in textile waste. The Solid Waste Management Rules, 2016, introduced by the Ministry of Environment, Forest, and Climate Change, emphasise source segregation and door-to-door collection of waste to inculcate concepts such as recovery from waste and reuse and recycling of the waste (Ministry of Environment, Forest & Climate Change, n.d.). However, there are no clear guidelines for managing textile waste, resulting in most of it being discarded as MSW and often contaminated, landfilled, or incinerated.

Pre-consumer waste is relatively easier to manage but is not always optimally recycled. Despite the potential for reuse or downcycling, most of this waste is underutilised, mainly because of a lack of infrastructure and technological investment in recycling facilities.

Post-consumer waste, however, presents a more formidable challenge. The complexities of collecting and sorting post-consumer textiles are aggravated by the diverse materials involved in modern clothing, such as blends of natural and synthetic fibres. These materials complicate recycling efforts, as existing technologies struggle to separate and process them effectively. Additionally, the logistics of reverse supply chains, wherein products are returned from consumers for recycling, are underdeveloped, leading to inefficiencies and increased costs.

Moreover, imported textile waste, which is intended for recycling or upcycling, often faces quality issues. The substandard condition of this waste further strains the existing waste management systems, leading to increased disposal rates rather than recovery and reuse.

The current practices, while partially effective, are insufficient to address the scale of the problem. Without significant improvements in collection systems, technological infrastructure, and regulatory frameworks, the industry will struggle to manage its waste sustainably. Given these challenges, there is a clear and pressing need for a more structured and comprehensive approach to waste management in India's textile industry.

To this end, the introduction of a comprehensive Extended Producer Responsibility (EPR) framework, based on circular economy principles, presents a viable path forward to create a more sustainable and accountable textile waste management system in India.

1.3. Objectives of the study

This project aimed to assess the potential benefits of implementing EPR in India's textile and apparel sector for effective waste management and to implement circular economy principles in the overall textile[1] supply chain.

The specific objectives of this study are as follows:

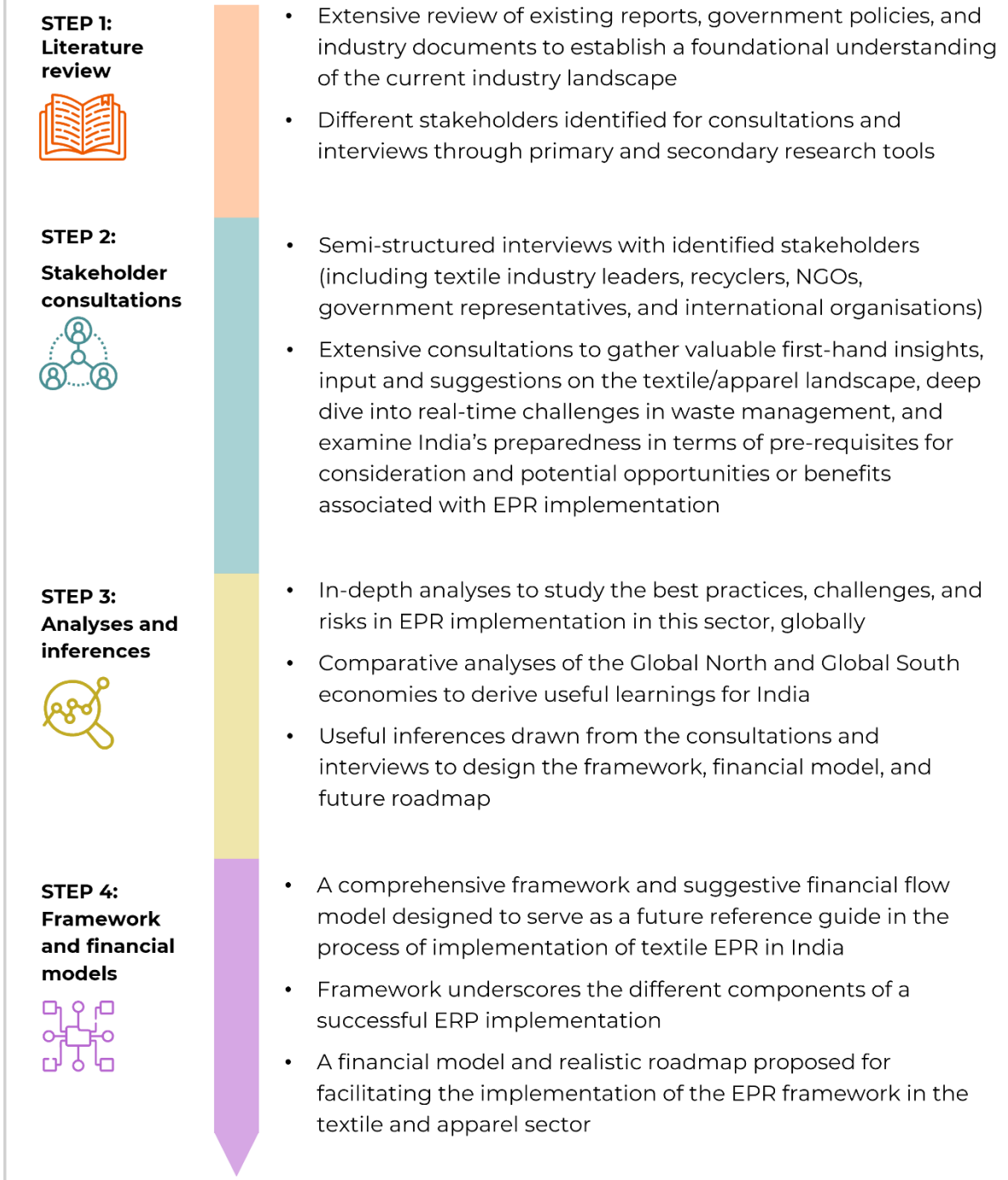
1) Examine the policy ecosystem surrounding the management of textile waste in India
2) Identify existing challenges and barriers in textile waste management
3) Explore the benefits of a textile EPR scheme in India
4) Evaluate alternative EPR models suited to the Indian context, considering business initiatives, financial implications, critical materials, and implementation challenges
5) Identify potential risks associated with EPR

1.4. Study methodology

To achieve these objectives, the study employed a mixed-method approach, combining desk research with an extensive process of consultations and interviews with different stakeholders in government, industry, civil society, academia, etc. The list of stakeholders consulted or interviewed is given in Appendix A, and the semi-structured questionnaire prepared for these interviews is given in Appendix B. Ethical research guidelines were rigorously followed throughout the study, including obtaining informed consent, ensuring data confidentiality, and respecting participants' privacy. The stage-wise methodology is given in Figure 3.

[1] In this report, 'textiles' refers to clothing, footwear, and household items (such as bed linen).

Figure 3: Study Methodology



This methodological framework and financial model are designed to provide a comprehensive understanding of India's readiness to implement EPR in the textile and apparel sector while identifying the key challenges and proposing potential strategies for successful implementation.

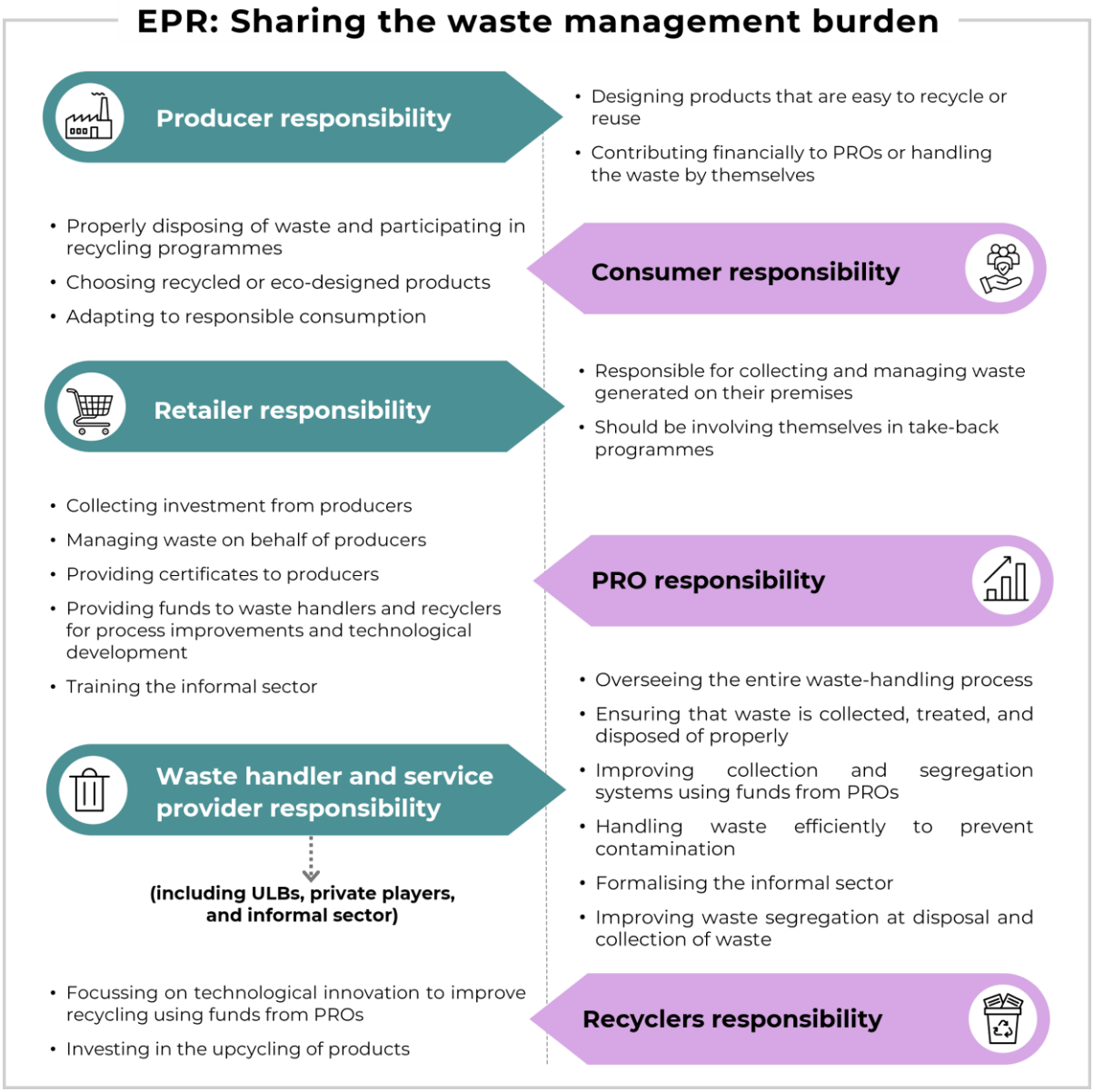
2. EPR: Importance, Relevance, and Challenges

EPR is an environmental policy approach that extends the responsibility of producers to the post-consumer stage of a product's lifecycle. Under EPR, producers (material manufacturers, product manufacturers, or sellers) are held accountable for the environmental impact of their products, from production to disposal. The responsibility can be physical, wherein the producer is responsible for collecting, treating, recycling, or disposing of the product, or financial, wherein the producer is financially liable for the management of the product. EPR encourages upstream changes in material selection and product design by holding producers responsible for their products.

The objective of EPR is to reduce the lifecycle impact of a product. It facilitates the reverse logistics and recycling of post-consumer waste so that it returns to the system and the resources are efficiently recovered. The funding for reverse logistics is often generated by the producers, who incorporate the environmental cost of treatment and disposal in the product's price. This approach also highlights the product's environmental impact in the market through its cost, thereby allowing the consumer to choose a more sustainable product. Thus, EPR can help reduce waste, increase the use of recycled materials in production, and increase resource efficiency.

Effective EPR implementation depends on the participation of all actors in the product chain. While producers play a crucial role by taking physical or financial responsibility for the product, the government plays an essential role by streamlining policies and regulations, promoting awareness, and providing incentives to producers and recyclers. Most EPR schemes are mandated by law and have a defined set of responsibilities, functions, and powers for producers. Some schemes, however, are voluntary, wherein companies take back products or packaging individually or collectively. Consumers play an important role by adopting sustainable consumption and disposal practices, thereby influencing market demand. Figure 4 describes the responsibility of various stakeholders under EPR guidelines.

Figure 4. Responsibility of various stakeholders under EPR guidelines



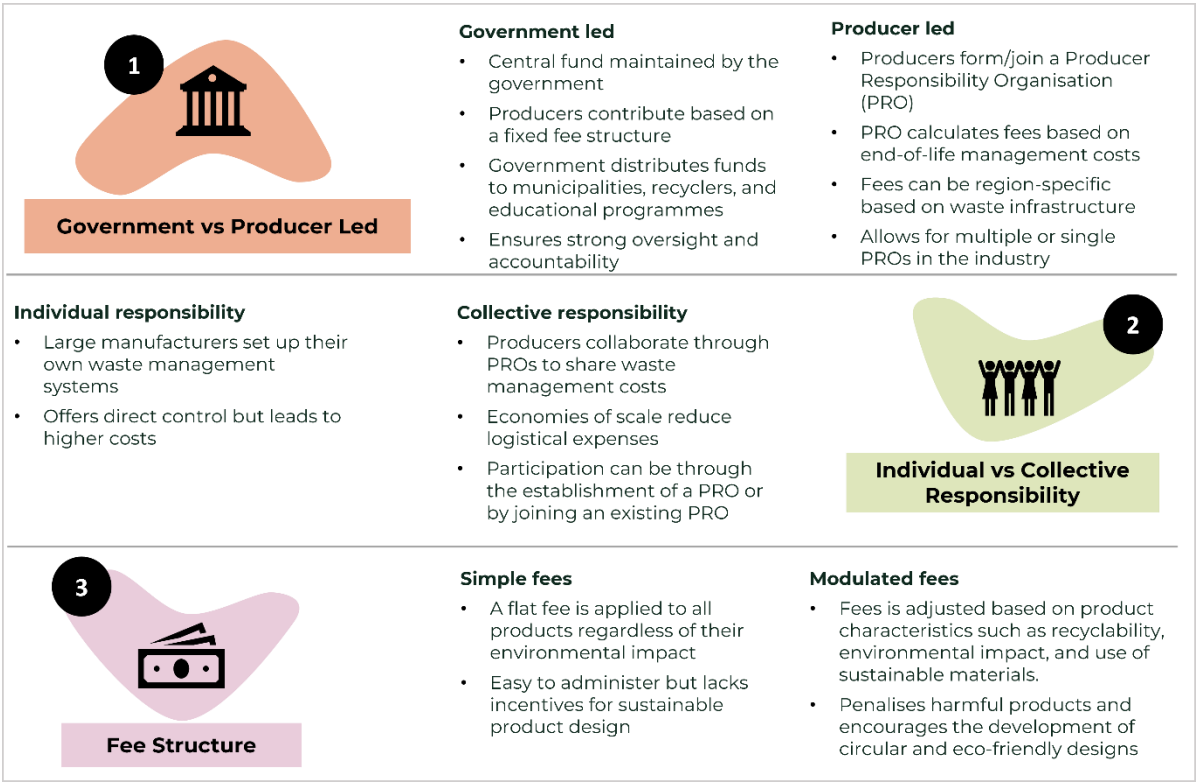
PRO: Producer Responsibility Organisation; ULBs: Urban Local Bodies

EPR is necessary to address the growing challenges of waste management, particularly in a world where consumption and production patterns are becoming increasingly unsustainable. Initially emerging in Organisation for Economic Co-operation and Development member countries, EPR has now become a prominent approach for channelling funds from producers into waste management systems and creating incentives for producers to minimise waste and improve product design. EPR has been widely applied to waste streams such as packaging, electronics, and batteries and is now expanding to textiles.

2.1. Different models of EPR

EPR can be implemented in various ways, depending on the specific needs of the industry and varied waste management structures in the country (OECD, 2001). Figure 5 presents key models and approaches that can be applied independently or as a mix.

Figure 5. Different models of EPR (OECD, 2001)



2.2. Relevance of EPR in India's textile industry

Owing to the lack of source segregation, post-consumer textile waste is mixed with other dry waste, making it prone to contamination and rendering it unfit for recycling or reusing. The contaminated textile waste often gets incinerated or ends up in landfills, increasing greenhouse gas emissions and aggravating air pollution. Additionally, the contaminated waste poses health risks for workers employed in textile recovery facilities. The linear business model in the textile industry, entailing take-make-dispose practice, coupled with a fragmented supply chain and underdeveloped waste management infrastructure, leads to significant volumes of mismanaged textile waste and leakage of toxic gases into the environment.

EPR offers a strategy to address these issues by streamlining the collection and management of textile and apparel waste and transitioning this sector towards a sustainable circular economy. The benefits of EPR for the textile and apparel sector include the following:

1) **Improvement in textile waste management**: Implementing EPR will streamline recovery systems by assigning clear responsibilities to manufacturers and brands. This includes disclosing material composition and production processes and promoting transparency and accountability. Additionally, EPR can help channel funds from

producers into waste management systems and financing processes such as collection and recycling infrastructure.

2) **Market stimulation and economic growth**: EPR can stimulate demand for recycled textiles, driving growth in the recycling sector and creating new economic opportunities, particularly in labour-intensive areas such as sorting and processing. The scheme can make sectors like upcycling and recycling more viable by enabling economies of scale.

3) **Adoption of sustainable design principles**: One of the underlying aims of EPR is to encourage producers to design textiles that are easier to recycle, reducing overall waste management costs and minimising environmental impacts. Design for environment (DfE) and eco-design principles involve the designing of products considering their end-of-life and eco-friendly disposal. The adoption of such principles can help reduce the environmental footprint of the pre-consumer textile supply chain, particularly in terms of water use, carbon emissions, and waste generation.

4) **Enhancement of research and development (R&D) and technological innovation**: EPR can drive technological innovation by providing firms with a clear incentive to invest in R&D, particularly in DfE, recycling technologies, and material recovery processes.

5) **Inclusion of the informal sector**: EPR provides an opportunity to integrate the informal waste sector with formal systems, with the potential to improve working conditions, provide job security, and increase the efficiency of textile waste management. This could be particularly impactful in India, where waste is mainly handled by the informal sector. By bringing informal workers into the formal economy, EPR mandates standardised reporting, data collection, and monitoring processes. This integration allows better material tracking and can improve transparency and compliance in waste management practices.

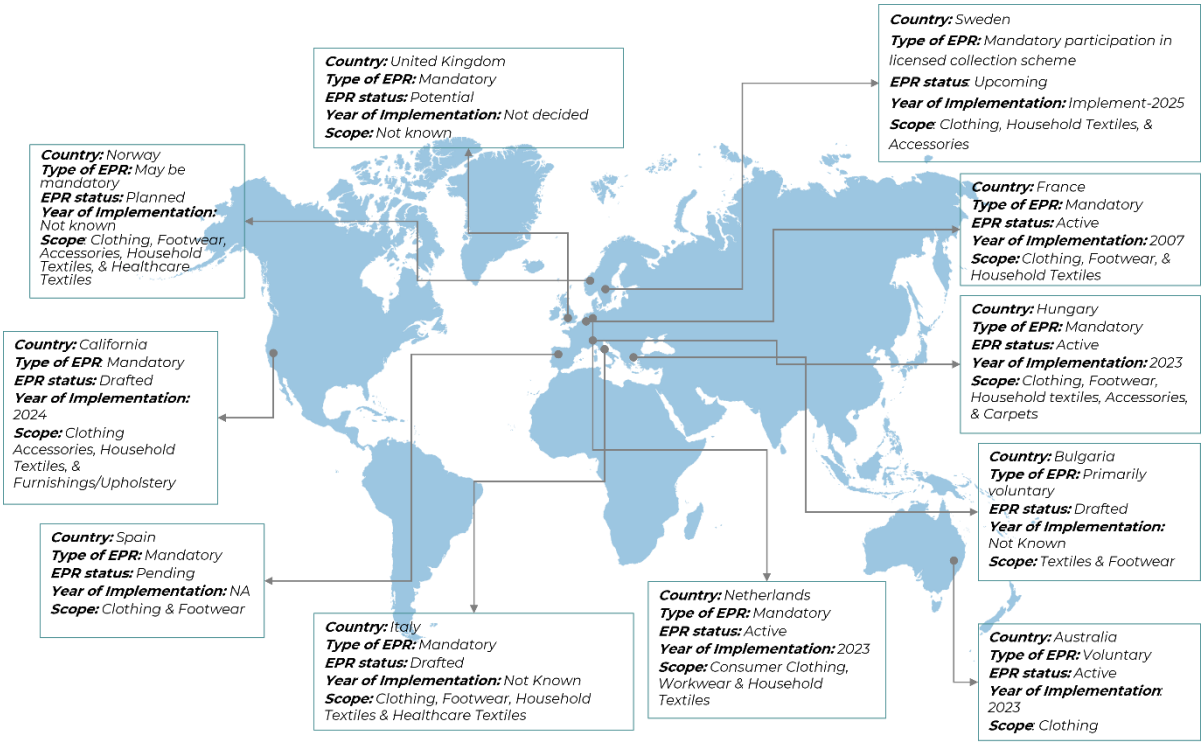
6) **Promotion of responsible consumption**: EPR can encourage consumers to make sustainable choices, such as purchasing products with recycled content and participating in take-back schemes, through mechanisms including modulated fees and public awareness campaigns.

A comprehensive and well-planned EPR framework can help improve the recycling infrastructure, promote sustainable practices, and encourage eco-design of products, ensuring the industry's competitiveness in a market increasingly driven by sustainability objectives. It will also facilitate the industry's alignment with global sustainability standards and enhance its competitiveness in international markets. Additionally, as textile waste is commonly discarded as MSW, EPR in the textile sector aligns with India's commitment to implementing a Circular Economy Action Plan for Mixed Municipal Waste Dry Fraction (Confederation of Indian Industry, 2023).

2.3. EPR in textiles: Global North

At present, EPR in textiles has been introduced in only a few regions in the Global North. Figure 6 highlights the status and scope of EPR in the textile sector across the Global North.

Figure 6. EPR status in the Global North



Some of the strategies adopted in the Global North to streamline EPR guidelines for the textile industry are discussed below:

- **EU:** The EU currently produces 12.6 million tonnes of textile waste annually. In accordance with the Circular Economy Action Plan and the European Green Deal, the EU aims to raise the percentage of textile waste collected for recycling and reusing, which is currently at 22%.

  The European Commission released the EPR Textile Proposal on 5 July 2023, which was then adopted earlier this year (Ecosistant, n.d.). The proposal's primary aim is to hold the producers accountable for the whole lifecycle of textile products and to promote the sustainable management of textile waste. The EPR Textile Proposal will modify the Waste Framework Directive (WFD). Under the existing WFD, the member states are required to set up separate collection systems for textile waste by 2025. This proposal details how the member states' responsibility to collect textile waste should be organised. Moreover, the EPR Textile Proposal defines reusable textiles and textile waste. The EPR will apply to all textile, textile-related and footwear products, headgear, curtains, and bed linen mentioned in the proposal.

  The proposal will shift the burden of the cost of collecting textile waste from the authorities and consequently from the taxpayers to the producers of the textiles. Producers will be accountable for covering the costs of managing textile waste. They

will also be incentivised to reduce waste and increase the circularity of the products by focussing more on the design phase of the textile products.

This proposal will impose a fee on textile companies, producers, and distributors to help fund waste collection and treatment. This fee will also apply to manufacturers, importers, and distributors of textiles, who are placing textiles on the market for the first time within the borders of the EU. Additionally, vendors of textile-related goods who engage in direct distance selling to final consumers (for instance, through online platforms) will come under the purview of the EPR Textile Proposal. This proposal also mandates the member states to introduce a 'textile register', which will help monitor and report the amount of textiles being put out in the market by the producers. The proposed directive also requires producers to be part of a Producer Responsibility Organisation (PRO), which will help them fulfil their EPR obligations by managing waste collection, recycling, and reporting on their behalf. In return, the producers are obliged to make a financial contribution to the PRO. The financial contribution for a producer is calculated using 'Eco-modulation', a concept based on the textiles' environmental performance. These expenses will vary depending on factors such as the weight of the products and their eco-design requirements (Nortonrosefulbright, 2023).

- **France**: France is a frontrunner in implementing EPR in textiles, with a well-established system that includes multiple PROs working under government contracts. As of 2022, around 827 thousand tonnes of textile waste was handled by the country annually (Global Measure, n.d.). To handle this waste, the country introduced EPR in 2008, which applies to clothing, footwear, and household.

  According to the textile EPR guideline, producers can meet their EPR obligations through collective or individual compliance. In case of collective compliance, the producers join a PRO (a collective body that represents multiple producers in a specific industry), and the PRO handles tasks such as collection, sorting, recycling, and reporting on behalf of its members against a fee paid by the producers. In contrast, in case of individual compliance, each producer is responsible for managing their waste.

  France also introduced the concept of eco-modulated EPR fees, which means that products that are hard to recycle and harmful to the environment attract higher EPR fees than those that are easy to recycle and eco-friendly. As per the current EPR fee structure, the average fees lie between 0.01 and 0.06 euros/garment (WRAP, 2024).

  With robust mechanisms and streamlined policies, the country has been able to increase its material recovery rate gradually. Today, nearly 95% of the textile market in France comprises registered members of the Refashion collective compliance scheme. The collection and recycling of consumer textile waste have increased by three times since 2006 after the introduction of the EPR guideline and the material recovery rate has the potential to reach up to 90% (WRAP, 2024).

  However, France is struggling to make the EPR system profitable. Moreover, the current infrastructure is insufficient to handle the increasing volume of waste. As a result, a significant proportion of textile waste is being exported for processing.

- **Netherlands**: In view of the growing textile waste management challenges, the Netherlands implemented the textile EPR guidelines in July 2023 (Ecosistant, n.d.), focussing on creating a circular economy for the textile sector in the country.

In 2018, Dutch households discarded approximately 5,000 tonnes of textiles, equivalent to 17.7 kg per person. Although 44.6% of this textile waste was collected separately, the remaining 55.4% ended up as household waste (WRAP, 2024). The reuse market declined, and limited recycling capacity in the Netherlands and Europe made separate collections less cost-effective. Consequently, half of the textile waste was being sent to incinerators (WRAP, 2024).

The EPR scheme currently works on a single PRO model. The scope of EPR applies to consumer clothes and household textiles, excluding footwear, bags, blankets, and curtains. EPR mandates producers to organise free-of-charge waste collection systems for consumers. It also set various targets to be achieved by 2025, such as preparing or reusing a minimum of 50% of all textiles and processing 25% of recycled textiles through fibre-to-fibre recycling. The textile EPR fee in 2004 was 0.10 euro/kg and is expected to increase to 0.20 euro/kg in 2025 (WRAP, 2024).

Currently, the country is struggling with the challenges of low investment in automated sorting processes and making the business profitable. Additionally, small-scale producers are struggling to keep up with the ambitious targets and lack of investment.

> *"EPR for textiles can only be successful if it builds on existing practices and if it is designed for the specific country context in which it is introduced. Establishing an effective scheme takes time, requiring solid analysis and feedback loops to ensure fees fully cover the net cost associated with managing discarded textiles. In the process, it is key to engage a range of stakeholders within the existing collection, sorting, reuse, and recycling systems. EPR is a starting point, and needs to evolve over time to raise the ambition level towards circular market creation."*
>
> Ms Valérie Boiten, Senior Policy Officer,
> Ellen MacArthur Foundation

- **Australia:** The textile EPR schemes in Australia are a part of the National Clothing Product Stewardship Scheme (NCPSS). The country has adopted the EPR schemes for textiles on a voluntary basis (Ellen MacArthur Foundation, n.d.). The NCPSS was launched in June 2023 along with a roadmap to achieve clothing circularity by 2030 called Seamless launched by the Australian Fashion Council (AFC). It includes both

imported and domestically manufactured clothing (Mestroni, 2023). However, it excludes single-use protective wear, accessories, and footwear. This scheme has the potential to reduce 200 thousand tonnes of textile waste that currently goes to landfill every year in the country (WRAP, n.d.).

Per the EPR schemes, product stewardship accountability lies with the product's producer, importer, and seller. This will also facilitate incentivising clothing design that is more sustainable, fostering new circular business models based on the concepts of reuse, recycle, rental, and manufacturing. It will also help increase the amount of clothing collected and sorted to maximise their reuse and ensure that items that are no longer usable are upcycled into high-quality new materials and products. It will encourage consumer behavioural changes for purchasing clothes and their use, care, and disposal (WRAP, n.d.).

The Australian Federal Government has offered funding support (AUD 1 million) to set up the scheme, and the New South Wales Environment Protection Authority has contributed AUD 100,000 for the transition phase as a supporting partner. The Seamless scheme proposes a 4 cent per garment levy to be paid by clothing brands and retailers who are required to become members of the scheme. AFC has indicated that a financing pool of USD 36 million will be raised annually if 60% of the market by volume signs up for the Seamless scheme. The scheme also has some modulation—if the brand owners comply well with the regulations, the levy can potentially be reduced to 3 cents per item (Mestroni, 2023).

- **California:** California's EPR programme for textiles, also known as the Responsible Textile Recovery Act of 2024, is currently underway. Under this scheme, the producers are responsible for forming a PRO (Rosengren & Quinn, 2024). This is expected to reduce textile waste from entering landfills by placing a shared responsibility for end-of-life product management on the producers and other stakeholders involved in a product's value chain (Hey Fashion, n.d.). The PRO will be responsible for submitting a textile collection, repair, and recycling plan by 2030. The scheme will also extend to online marketplaces (e-commerce platforms) with annual sales of USD 1 million or more, and the PRO will need to create an evaluation for covered products. CalRecycle, California's Department of Resources Recycling and Recovery, will be responsible for developing the regulations for the scheme by 2028 (Retail Council of Canada, 2024). By facilitating the flow of funds to companies and groups that are actively handling textile waste, the new law also seeks to improve recycling and promote reuse (Hey Fashion, n.d.).

While some Global North countries have initiated the implementation of EPR, Global South countries remain in the early stages of EPR planning. Despite accounting for a significant global textile share, countries such as Bangladesh and Cambodia have not yet adopted EPR policies, primarily because of different waste management priorities and a focus on post-industrial rather than post-consumer waste. Further, EPR's scope in countries such as Brazil and the Philippines is limited to plastic packaging. The challenges faced by the Global South in managing textile waste and the lessons for India are discussed in the next section.

3. Lessons Learnt: EPR in Manufacturing Hubs in the Global South

The implementation of EPR in Global South countries presents unique challenges that are different from those faced by Global North countries. These challenges stem from a combination of economic, social, and infrastructural factors that complicate waste management and effective implementation of EPR guidelines.

3.1. EPR status in the Global South

Global South countries, such as Bangladesh, Cambodia, the Philippines, Brazil, Indonesia, and Mexico, are some of the most important manufacturing hubs of textiles and apparel globally. Table 2 represents the status of the implementation of the EPR system and the associated challenges in these economies.

Table 2. Status of EPR implementation in the Global South

Country	Current textile sustainability policies	EPR implementation status	Estimated textile waste (tonnes)	Challenges and issues	Progress
Bangladesh	Bangladesh has initiated the Green Factory Certification. As of 2023, the country has over 202 Leadership in Energy and Environmental Design (LEED)-certified facilities, adhering to environmentally friendly practices, reducing greenhouse gas emissions and minimising pollution through efficient resource management and manufacturing processes (Conserve Consultants, n.d.). The Partnership for Cleaner Textile (PaCT) initiative, in collaboration with the International Finance Corporation and the Bangladesh Garment Manufacturers and Exporters Association, aims to promote sustainable water resource management, focussing on zero discharge of hazardous	Early stages of development, with ongoing efforts to establish a framework for managing textile waste	500,000 (Chatham House, n.d.)	Material waste (post-production waste including cotton lint, damaged yarn, unfinished cones, fly fibre, greige fabric, rejected coloured fabric, and fabric cut pieces) in the supply chain does not receive adequate attention (Khairul Akter et al., 2022). There are significant knowledge gaps in understanding the amount of waste generated in the supply chain (Khairul Akter et al., 2022), as Bangladesh is a thriving market for rejected ready-made garments or excessive production of ready-made garments (LightCastle Partners, n.d.). There is a lack of new and modern technology and infrastructure and supportive policy and legislation (Khairul Akter et al., 2022).	Cotton scraps are currently exported to India, Hong Kong, and Sweden for recycling. The government, in collaboration with the United Nations Industrial Development Organization and Chatham House, is leading efforts to develop a circular economy strategy for the industry (United Nations in Bangladesh, n.d.). LightCastle Partners, participating in the 'Oporajita: Collective Impact on the Future of Work' initiative funded by the H&M Foundation and managed by the Asia Foundation in Bangladesh, are assessing future shifts in market dynamics and regulatory requirements, impacting the apparel industry and workers'

Country	Current textile sustainability policies	EPR implementation status	Estimated textile waste (tonnes)	Challenges and issues	Progress
	chemicals to prevent pollution (Ovi, 2023).			Financial and technical support from key stakeholders (brands, government, and trade organisations) is lacking (Khairul Akter et al., 2022).	livelihoods (LightCastle Partners, n.d.).
Cambodia	The National Environment Strategy and Action Plan 2016–2023 (Kingdom of Cambodia, 2017), following the principle of 3Rs 'reducing, reusing, and recycling', will enhance the performance of the nation's waste management policy and introduce market-based mechanisms such as landfill and incineration fees, pay-as-you-throw policy, and EPR schemes (Switch Asia, 2022).	Early stages of development, with significant progress made towards establishing a framework for managing textile waste	140,000 (Textile Media, n.d.)	Despite relevant waste disposal policies and laws being in place, non-compliance prevails owing to a lack of monitoring efforts. Most of the textile-producing factories are owned by foreign capital investors, attracted by low labour costs and being export-oriented. These players in the global supply chain have a substantial influence on the industry's push for sustainability. However, weak local enforcement of environmental and social regulations hinders progress. Further, the supply chain is fragmented and adequate infrastructure and advanced technology are lacking (Switch Asia, 2022).	The Waste Management Strategy and Action Plan 2018– 2035 envisages the improvement and optimisation of the collection and sorting system, creating the necessary infrastructure for waste disposal. Environmental labelling and product certification: Under this strategy, standards will be created and designed for an eco-labelling programme that will ensure the assessment and optimisation of material ingredients so that they are compatible with the current international frameworks for export goods, including textiles

Country	Current textile sustainability policies	EPR implementation status	Estimated textile waste (tonnes)	Challenges and issues	Progress
					and apparel (Switch Asia, 2022).
Philippines	The current solid waste management system in the Philippines comes under the Ecological Solid Waste Management Act of 2000 (RA 9003). It entails the collection of solid waste from residential or commercial areas and its transportation to a disposal site or material recovery facility. Solid waste in the Philippines also comprises textile waste (1.61% of municipal solid waste). However, post-consumer textile waste is not segregated even though it has been classified as recyclables (Republic of the Philippines-Department of Science and Technology., n.d.).	EPR act was passed in 2022 but is only limited to plastic packaging (Deloitte Philippines, n.d.)	267,111 (Business World, n.d.)	A high volume of textile waste is produced. About 29% of Filipinos discard their clothes after single use (Sustainabiity.ph, 2022). Roles and responsibilities are not clearly delineated. There is a lack of transparency, and data comparability is difficult. Enforcement mechanisms are lacking, and assessing the cost-effectiveness of EPR policies is complicated. Informal waste management and improper working conditions are prevalent (Sustainabiity.ph, 2022). There are infrastructural gaps and logistical bottlenecks, and investments in product design are lacking (World Wide Fund for Nature, 2024). Understanding of the importance of collection, sorting, and recovery of waste	Focus is still on research and development to make the textile industry circular. Government's 10-year plan: This plan has been initiated by the Board of Investments to strengthen the links among government, industry, and private sector and establish a trade office. This plan also aims to abolish the proliferation of used clothing imports from North America and Europe, which compete with local supplies. Under this plan, manufacturers will be provided fiscal incentives through lower value-added taxes and reduced power rates. This plan will also address the existing infrastructural gaps and logistical challenges (Fibre2Fashion, n.d., p. 2).

Country	Current textile sustainability policies	EPR implementation status	Estimated textile waste (tonnes)	Challenges and issues	Progress
				is insufficient (Asian Development Bank, 2013).	
Brazil	The National Solid Waste Policy (PNRS) of Brazil was formulated in 2010 to advance environmentally friendly waste management techniques. It promotes reverse logistics for recycling agrochemicals, tyres, and batteries, but textile implementation is limited as there are no specific rules yet (Garcia et al., 2020).	Discussions are ongoing for an additional section in the PNRS, incorporating the idea of EPR for textiles. Currently, as per the PNRS and Brazilian legislation, producers are not responsible for the final destination of their products. It is only applicable to a few industries such as tyres, lubricating oils, and pesticide packaging (Garcia et al., 2020).	170,000 (Believe Earth, n.d.)	A high volume of textile waste is produced, making the country the fourth major producer of textiles and fifth major producer of apparel. Textile waste imports into Brazil: The national industry relies heavily on recycled materials for producing items such as clothing and packaging. However, owing to insufficient domestic recycling efforts, limited waste is recycled, forcing the country to import textile waste to meet demand. The waste collection systems are underdeveloped. Weak compliance and regulation: Although districts are mandated by the constitution to allocate urban garbage, only 7% of the 5,564 municipalities in the country have recyclable waste collection process. Textile waste collection relies on charity, lacking a	The Brazilian Government is considering the implementation of EPR policies, which would hold producers accountable for the lifecycle of their products and goods, including waste management.

Country	Current textile sustainability policies	EPR implementation status	Estimated textile waste (tonnes)	Challenges and issues	Progress
				structured government system. The textile reuse and recycling industry relies more on imported textile waste over utilising the abundant national textile waste available because of the following reasons: (a) Poor management of materials; waste discarded with dirt and a mixture of various raw materials, hampering the sorting process (b) High labour cost for waste segregation (c) Lack of financial support and incentives for commercialisation of the products (d) Transport and logistics costs (Amaral et al., 2018)	
Indonesia	The Ministry of Industry under the Policy Circular No. 2 of 2023 ensures that the industry pays more attention to reducing its environmental impact (reducing hazardous gas	Ongoing efforts to establish a framework for managing textile waste	2.3 million tonnes (Global Green Growth Institute, n.d.)	Indonesia's textile waste is exacerbated by the fast fashion industry's mass production, which leads to the accumulation of abandoned textile waste (Zahra et al., 2023).	Implementation of circular economy in the textile industry is under the deliberation stage with various stakeholders (Ali, 2024).

Country	Current textile sustainability policies	EPR implementation status	Estimated textile waste (tonnes)	Challenges and issues	Progress
	emissions) from production activities. Companies in the textile industry are required to comply with the policy. It necessitates the integration of the textile industry with Continuous Emission Monitoring Systems in their operations to monitor hazardous gas emissions (Ali, 2024).			There is a complex supply chain in the manufacturing industry. Policies and regulations lack clarity (World Wide Fund for Nature, 2022). There is a lack of investment in better infrastructure; improper sorting decreases recycling efficiency (Bonafide Research, n.d.).	The Global Green Growth Institute Indonesia, the Ministry of National Development Planning (Bappenas), Bandung Polytechnic of Textile Technology, and PT Daur Langkah Bersama (Pable) along with the support of the Finnish Ministry of Foreign Affairs signed an agreement to embark on a partnership for a sustainable future in the textile industry (Global Green Growth Institute, n.d.).

The waste management systems in Global South economies are often under-resourced and less advanced than those in the Global North. They also face significant challenges in terms of financial constraints, informal sector dominance, unorganised supply chains, limited technology advancements, and erratic or irrational consumer behaviour. It is, therefore, essential to address these challenges to ensure the effectiveness of EPR guidelines.

3.2. Learnings for India

India, being one of the largest economies in the Global South, can derive significant learnings from the challenges and risks faced by its peers to establish a well-informed and comprehensive EPR mechanism in the textile and apparel sector. Table 3 summarises the critical challenges and lessons learned from the Global South for India.

Table 3. Lessons for India from the experiences of the Global South

Challenges	Learning for India
Informal sector penetration The dominance of the informal sector in managing most of the waste is common in many developing countries. Excluding the informal waste pickers from participating in the official recycling systems can hinder the overall effectiveness of the system and perpetuate social inequalities. However, integrating the informal sector is also not easy. Many countries often face challenges such as ensuring fair compensation for informal workers.	Ensuring fair compensation and meaningful involvement of informal workers in waste management is essential. Including informal sector representatives in stakeholder consultations can lead to the formulation of inclusive policies and smoother implementation of EPR guidelines.
Data and transparency The textile supply chain is fragmented, making it difficult to track the material flow and impose EPR fees. Lack of formalisation complicates the implementation of EPR by creating gaps in data and accountability.	Enhancing data collection and transparency across the value chain is crucial for the success of EPR guidelines. Developing robust monitoring and reporting mechanisms will help in tracking textile waste and ensuring accountability.
Infrastructure and technology Many Global South economies lack proper infrastructure and advanced technologies for effective waste management, hindering the implementation of effective waste management.	Bridging infrastructure gaps through targeted investments is essential. Collaboration between research institutions and industry should be facilitated to drive advancements in technology, improving recycling processes and waste management mechanisms.
Competition and fee allocation Creating fair competitive markets for recycled materials and effectively allocating EPR fees are common challenges in developing countries.	Clear regulations that ensure fair competition among stakeholders, including Producer Responsibility Organisations, are vital. Transparent fee allocation systems should be established, and competitive markets for recycled materials should be fostered to ensure EPR's success.
Adequate understanding of material recovery There is a lack of understanding of the overall material recovery concept. For example, the Philippines' initiative to establish Material	Promoting awareness and developing consumer understanding will help drive sustainable and resource-efficient practices.

Recovery Facilities in villages to recover recyclable materials from municipal solid waste could not be sustained because of the lack of awareness (Asian Development Bank, 2013).	
Recycling targets for the sector The lack of specificity in recycling targets across the sector presents a challenge to the overall effectiveness of the EPR system.	Clear and tailor-made recycling targets should be set for different materials within the sector to ensure that the recycling efforts are aligned with the specific needs and capabilities of each material category, leading to effective EPR implementation.

India can tailor its EPR strategy by inculcating these learnings to address the unique challenges faced by the textile and apparel sector. This will ensure that the industry moves towards achieving more sustainable and circular practices.

> *"Effective EPR in the textile sector requires a holistic approach: standardising sustainable practices, strengthening recycling infrastructure, and fostering collaboration through a consortium of key players. Product design and development must work together to drive innovation and build a sustainable ecosystem, supported by capacity building and upskilling for a circular economy."*
>
> Dr Deepti Gupta, Professor,
> Department of Textile Technology, IIT Delhi

4. Examining India's Preparedness for Implementing EPR in the Textile Industry

The previous sections explored the global status of EPR implementation in the textile sector and the various challenges associated with it. These discussions offered insights relevant to the textile and apparel industry. However, it is equally important to assess the Indian landscape and gather the perspectives of relevant stakeholders for evaluating the feasibility of implementing EPR in the textile sector.

This section examines the challenges and successes of India's existing EPR framework for the plastic industry and various initiatives aimed at integrating the informal sector into formal waste management practices. In this study, insights from different stakeholders were analysed to identify the key challenges and potential opportunities for implementing EPR guidelines in the textile and apparel industry in India.

4.1. Analysing India's existing EPR policies and other initiatives

Several policies and regulations related to EPR have been introduced in India, mainly on plastic and electronic waste. Moreover, decentralised initiatives to integrate the informal sector into waste management systems have been undertaken. Some of these initiatives have been underlined to examine the challenges faced and the prerequisites for implementing EPR in the textile and apparel sector.

4.1.1. Case study I: EPR implementation for plastic waste in India

This case study analyses the EPR framework in plastics, highlighting its key components, challenges, and potential for improvement.

India is grappling with a significant plastic waste management crisis. In 2017–2018, the Central Pollution Control Board (CPCB) estimated that the country generated approximately 9.4 million tonnes of plastic waste per annum, of which approximately 60% was recycled (5.6 million tonnes per annum) (Ministry of Housing and Urban Affairs and Government of India, 2019).

Out of the 60% recycled plastic,

- 70% was recycled at formally registered facilities,
- 20% was recycled by the unorganised sector, and
- 10% was recycled at home.

Under the Plastic Waste Management Rules (2016), EPR is defined as the producer's obligation to manage a product sustainably to the end of its useful life. The Rules outline the responsibilities of producers, importers, and brand owners (PIBOs) in managing plastic waste. The PIBOs are also required to register on the Centralized EPR Portal for Plastic Packaging developed by the CPCB and to comply with recycling targets. Table 4 summarises the roles and responsibilities of all relevant stakeholders under the Plastic Waste Management Rules.

Table 4. Roles and responsibilities of various stakeholders

Activity/Action	Actors responsible
Bear the primary responsibility for managing plastic waste, including collection, recycling, and disposal	Producers, Importers, and Brand Owners
Handle the processing of collected plastic waste through recycling, co-processing, or other environmentally sound methods	Plastic Waste Processors
Oversees EPR implementation, provides guidelines, and monitors compliance	Central Pollution Control Board
Implement EPR regulations at the state level, monitor compliance, and coordinate with local authorities	State Pollution Control Boards
Responsible for waste management infrastructure, collection, and sorting in their respective areas	Urban Local Bodies (including Municipal Corporation, Nagar Nigam, Nagar Parishad)
Plays a crucial role in waste collection and recycling, often operating outside the formal system	Informal sector

Although plastic waste management in India has made considerable progress, the sector is still grappling with the following challenges:

1) *Data management:* There is a lack of standardised reporting and transparency in the supply chain, making it difficult to maintain accurate data on plastic waste generation, collection, and recycling.
2) *Infrastructure gaps:* Inadequate waste collection, sorting, and recycling infrastructure hinder the efficient implementation of EPR.
3) *Informal sector integration:* While the informal sector plays a vital role in waste management, its inclusion in the formal mechanisms remains a challenge.
4) *Enforcement and compliance:* Ensuring compliance with EPR regulations is complex owing to a vast number of stakeholders in the supply chain and the informal nature of the waste management sector.

Addressing these issues will be crucial for the successful implementation of EPR in the sector as well as other sectors, including textiles.

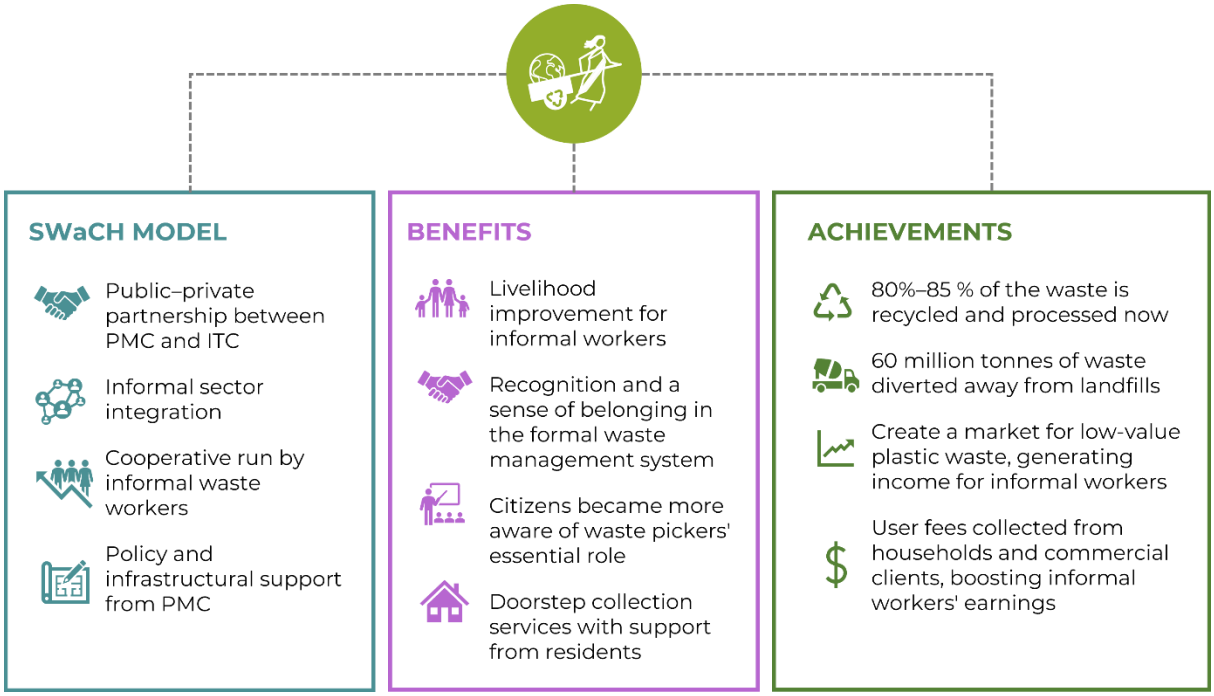
The textile industry in India can derive significant insights from the implementation of EPR for plastic waste to develop an effective framework for textiles. First, establishing **comprehensive data management systems** is essential for accurately tracking textile waste generation and collection. Second, **adequate recycling infrastructure** is needed to manage the growing textile waste, and investing in innovative technologies can help improve recycling rates. This can also lower the risks of resource leakages in the value chain. Third, recognising the **informal sector's vital role** in waste management is

important. Strategies should be developed to introduce formal waste management practices in the informal sector through training and by providing access to markets. Fourth, engaging with all stakeholders, e.g. manufacturers, retailers, consumers, and waste workers, will foster a **collaborative approach**. Awareness campaigns can sensitise consumers on responsible waste disposal practices. Fifth, **clear guidelines and compliance monitoring** for both domestic and imported textile waste will ensure adherence to EPR guidelines, with penalties imposed for non-compliance and incentives offered otherwise. Finally, aligning **EPR with existing textile waste management** regulations will help in formulating policies and facilitating the interstate trade of recycled materials.

4.1.2. Case study II: Integration of the informal sector in Pune's SWaCH Initiative

The SWaCH Pune cooperative demonstrates a successful model of integrating informal waste pickers into the EPR system. Figure 7 illustrates the key characteristics of the model (Pune Municipal Corporation, n.d.; SWaCH Pune Seva Sahakari Sanstha, n.d.).

Figure 7: Model of the SWaCH Pune cooperative



Likewise, India's textile industry should concentrate on forming public–private partnerships and promoting the integration of the unorganised sector. This may offer an opportunity to the unorganised sector workers in the textile value chain to make a better living and provide healthy working conditions, which are now lacking in most textile waste management facilities. Similar to the SWaCH model, this may also encourage consumers to separate their textile waste from solid waste, reducing the contamination of textile waste.

Additionally, public–private partnerships can provide policy and infrastructural support to informal workers in the textile industry. For example, the Municipal Corporation of Pune provides equipment and health benefits to support SWaCH's operations. This can also

improve the collection infrastructure and upgrade sorting facilities. Public–private partnerships can invest in establishing a network of textile waste collectors in centres across the country and help develop large-scale textile sorting facilities equipped with advanced technologies.

By applying the lessons learned from the current plastic EPR system and the SWaCH model, the textile waste management sector can successfully establish a textile EPR system.

4.2. Stakeholder perspectives

The success of EPR depends on the roles played by various actors in the product value chain. Thus, to examine India's preparedness and formulate a comprehensive EPR framework, it is essential to understand the perspectives and insights of the relevant stakeholders in the value chain.

Table 5 describes the real-time insights gathered from different stakeholders through a series of consultations and interviews via online and offline modes. A generic semi-structured questionnaire was used for the study (Appendix B). The questions and interviews were customised as per the expertise and knowledge of each stakeholder.

> *"Implementing EPR for textiles in India presents unique challenges, such as logistical costs, recycling infrastructure gaps, and complex supply chains. However, the industry is willing to adopt circular practices. A voluntary EPR model with government support, incentives, and improved recycling quality can help drive progress."*
>
> Mr Padmakar Pandey, Assistant Vice President, Corporate Sustainability, Aditya Birla Fashion and Retail Limited

Table 5. Stakeholder views on India's preparedness for EPR implementation in the textile and apparel sector

Stakeholder category	Perspective on EPR implementation	Key challenges identified	Recommendations and strategic insights
Industry (excluding off-takers, recyclers, and waste management service providers)	EPR can help manage the growing textile waste, but it needs to be supported by advanced and efficient recycling technologies and a robust sustainable ecosystem. It can be applied to pre-consumer waste. Moreover, up to 25% of post-consumer waste can also be managed. Scaling up will take time. The industry might willingly adapt if there is adequate and suitable government support.	The industry is highly fragmented, with a significant presence of the Micro, Small and Medium Scale Enterprises and informal sectors. Recycling facilities are limited in India and mainly focus on downcycling (e.g. waste recycling system in Panipat), depreciating the material's value. Significant costs are associated with reverse logistics, especially for producers located far from recycling hubs. Visibility of the value chain is limited to Tier 1 and Tier 2 cities, making it difficult to track the material flow. The lack of economically viable and advanced technologies makes recycling even more challenging. Insufficient waste management facilities, inadequate waste management knowledge, high costs of logistics, limited market acceptance of recycled materials, and fragmented value chains deter compliance.	Leveraging digital tools for data collection and material flow tracking can help improve compliance. A phased implementation, beginning with voluntary adherence followed by mandatory enforcement, with clearly defined annual goals might work better for the Indian landscape. Reducing blends and shifting towards single polymer products can help simplify the recycling process. The introduction of tagging systems including the composition of the garments can facilitate the sorting process. Indian certification authorities should be responsible for monitoring supply chains. Investments are needed to improve and scale up efficient recycling technologies. Capacity-building and awareness programmes are needed to ensure proper waste segregation by individuals or agencies disposing of the waste and separate collection by waste pickers. A central governing body with single or multiple regional PROs can prove beneficial for streamlining waste management.

Stakeholder category	Perspective on EPR implementation	Key challenges identified	Recommendations and strategic insights
Off-takers and recyclers	EPR is necessary for creating sustainable supply chains. It is crucial for supporting recycling infrastructure, creating jobs, and enabling structured waste management practices. Given India's diverse geography, a phased and decentralised approach can be successful in addressing varied challenges across regions.	Textile waste is currently not collected separately, resulting in waste contamination. Manual segregation and sorting can expose workers to various health hazards. There is a limited number of recyclers for handling post-consumer waste, and most of the waste is either incinerated or ends up in landfills. Currently, India relies on mechanical recycling, which can only process specific materials. More innovative and advanced technologies are needed for complex waste streams such as blends. The lack of consumer awareness further complicates the waste collection and segregation process.	Introducing minimal EPR tax can help generate revenue for waste management without financially burdening consumers. Investment in indigenous R&D technology, especially sorting and fibre segregation machinery, is crucial to improving recovery rates. Mandatory composition tags can be introduced to simplify the recycling process. Producers can also have a share in the operational responsibility to ensure efficiency. Audits are needed to ensure that environmental and social parameters are met. Non-recyclable products should have higher EPR fees than recyclable ones. EPR fees should be made clear and transparent and classified into separate components such as collection fees and transportation fees. Including the informal sector in formal waste management should be mandated. Financial investment for developing decentralised recycling units and piloting projects for initiating chemical recycling processes should be encouraged.
Government (state and central)	EPR is essential for managing textile and apparel waste and can create a lot of economic	Digital tools should be introduced for monitoring, followed by adequate capacity-building exercises on their application, as they	Tailor-made or customised EPR fees for different types of producers can help regulate the financial burden.

Stakeholder category	Perspective on EPR implementation	Key challenges identified	Recommendations and strategic insights
	opportunities. Adequate data collection and formalisation of the sector will be key to its effective implementation.	might become overwhelming, especially for MSMEs. Maintaining transparency in financial or monetary flows is one of the biggest challenges. Inadequate infrastructure, limited R&D investment, and integration challenges for the informal sector are also major issues. Diverse regional conditions complicate uniform policy enforcement and stakeholder alignment.	Distinguishing between biodegradable and non-biodegradable materials is important for policymakers and industry stakeholders, as it helps in developing different regulatory measures for various textile categories. Investments in building sorting centres and recycling infrastructure are essential. Developing stringent regulations, supporting decentralised recycling systems, and conducting regular audits can help ensure transparency and compliance.
Think tanks and academia	EPR is essential for managing textile and apparel waste. A focus on research and development, public awareness initiatives, product innovation, and upstream solutions can help create a sustainable ecosystem. Streamlined frameworks, shared responsibilities, and phased implementation are critical.	The disconnect among different actors in the value chain, particularly between design and product development companies, hinders the implementation of effective EPR systems. Imported textile and apparel waste adds to the burden of waste management on the domestic recycling system, besides contributing to environmental pollution. Stringent cross-border guidelines are needed. Garments are made to be long-lasting, but owing to changing consumption patterns, the waste is piling up. Post-consumer waste when recycled into yarn often results in the formation of low-quality fibres, posing a challenge to the recycling process.	Product innovation must be encouraged to create a sustainable ecosystem. Robust EPR system design, involving all key stakeholders and ensuring the inclusion of the informal sector, can help in proper collection, recycling, and accountability, avoiding waste leakage into the environment. A consortium of relevant stakeholders from diverse knowledge bases can be formed to ensure collaboration and compliance. Single or multiple regional PROs, guided by the consortium and monitored by a central government agency, should be set up. Partnerships between academia and industry can help bridge the gap between research and

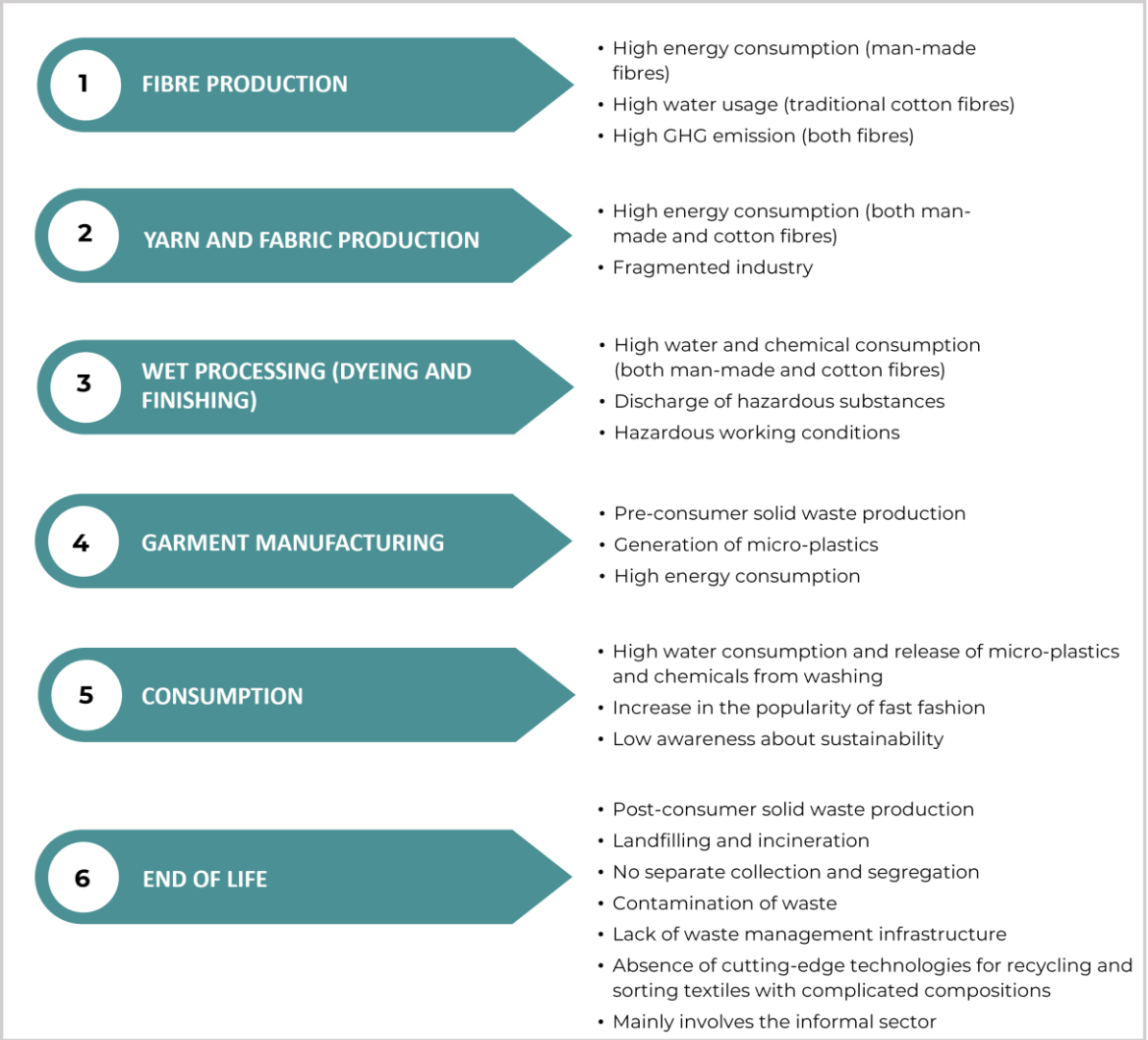
Stakeholder category	Perspective on EPR implementation	Key challenges identified	Recommendations and strategic insights
		Proper collection and sorting infrastructure and an adequate number of recycling facilities are lacking.	practical application of waste management principles. Capacity building and upskilling as well as improving existing technologies and innovating new ones can help strengthen the EPR infrastructure. Labelling the product with composition tags can help improve traceability and recycling efforts.
International organisations	Streamlined EPR guidelines align with global trends towards sustainable textile supply chains and can enhance India's market competitiveness. It can help create job opportunities, support the informal sector, improve labour market conditions, and reduce the environmental impact of the textile value chain.	The initial cost of implementing EPR is significant, and therefore, the burden must be shared among the relevant stakeholders. Integration of the informal sector can be challenging and must be done strategically to avoid unintended consequences. The lack of reliable data on waste generation and flows as well as recycling rates is one of the most critical challenges. The absence of a clear regulatory framework hinders monitoring and compliance. The complexities of managing multiple PROs and informal sector integration pose additional challenges.	The EPR framework must consider the views of all key stakeholders and reflect India's diversity. Phased implementation, with a focus on building the recycling infrastructure, might perform better. Data transparency and accountability should be ensured for effective EPR implementation. Incentives or rewards can promote the adoption of eco-design models and sustainable practices, behavioural changes, and waste reduction. A central governing body with single or multiple regional PROs might help improve waste management. The operations of such PROs can be regularly monitored. Infrastructure development, data transparency, compliance enforcement, and circular business models are key areas that require support.

The cost of transitioning to a circular economy is peanuts, especially when considering the long-term environmental benefits. While the cost of EPR is not very high, the real concern lies in the potential for mindful consumption and degrowth that may influence market dynamics. However, fostering sustainable choices should be our priority."

Ms Shobha Raghavan, Chief Executive Officer and Director,
Saahas Zero Waste

The varied perspectives of all stakeholders are crucial for formulating a comprehensive EPR framework or guideline, which promotes circularity and balances the socio-economic and environmental considerations. Figure 8 describes the key challenges across the supply chain identified by the stakeholders.

Figure 8. Challenges across the textile value chain



To adopt EPR guidelines for textile and apparel waste management in India, these challenges need to be addressed through systemic changes at different levels. Strategies such as decentralised waste management, phased implementation, and incentives or reward systems can expedite the implementation of EPR throughout the industry.

4.3. Preparing the textile industry for EPR implementation

India is expected to develop and adopt an EPR framework in the textile and apparel sector. In this regard, insights from the EPR for plastic waste and learnings from other Global South countries have revealed several critical challenges, risks, and prerequisites, which must be carefully considered to avoid further fragmentation of the supply chain.

The first critical requirement is establishing a separate collection channel for the textile and apparel waste stream to avoid mixing with other types of MSW. Investments in formalised and decentralised collection systems while integrating the informal sector must be encouraged to ensure accountability, efficiency, and equitable waste management across the country.

Another essential step is to address the technological and infrastructure gaps. The lack of adequate infrastructure and modern recycling technologies poses a significant barrier to the effective implementation of EPR in the textile sector. Currently, textile waste segregation is performed manually; thus, contaminated textile waste can raise health risks and psychological concerns for workers or labourers working in such facilities. For example, the Textile Recovery Facility of Saahas Zero Waste, a waste management company in Bengaluru, has been displayed below (Image 1). While this facility is equipped with skilled workers to handle the sorting process and technologies to enhance the sorting efficiencies and quality of material sorted, recycling for post-consumer waste with blended material is inadequate and needs appropriate technology and a closed-loop market.

Image 1. Textile Recovery Facility, Saahas Zero Waste, Bengaluru

Additionally, as there are a very limited number of recycling units, producers not in proximity have to bear higher logistics costs. Without substantial investment in waste management facilities and technological innovation, achieving the desired outcomes from an EPR will be challenging.

Moreover, given the unorganised nature of the textile and apparel value chain, there is limited credible data on material flow. Thus, it will be challenging to monitor the successful implementation of the EPR framework. Efforts are needed to build data management and traceability systems that can help track waste flows and ensure transparency.

Lastly, active participation from all key stakeholders in the supply chain must be ensured to implement EPR successfully. A shared understanding of roles and responsibilities and the need to adopt sustainable practices is necessary for compliance. Clear regulatory frameworks, strong enforcement mechanisms, stimulated market demand for recycled products, and capacity building and awareness programmes can facilitate the transition towards a circular economy in textiles.

The following sections discuss the proposed EPR framework, financial model, and future roadmap for successful implementation.

5. Suggested Interventions for Implementing EPR in the Indian Textile Industry

EPR is a transformative approach to waste management that holds producers accountable for the entire lifecycle of their products, particularly post-consumer waste. Implementing EPR in the textile industry can play a pivotal role in (a) reducing waste sent to landfills and incinerators, (b) fostering recycling and reuse of products, (c) promoting cleaner production, and (d) improving material management.

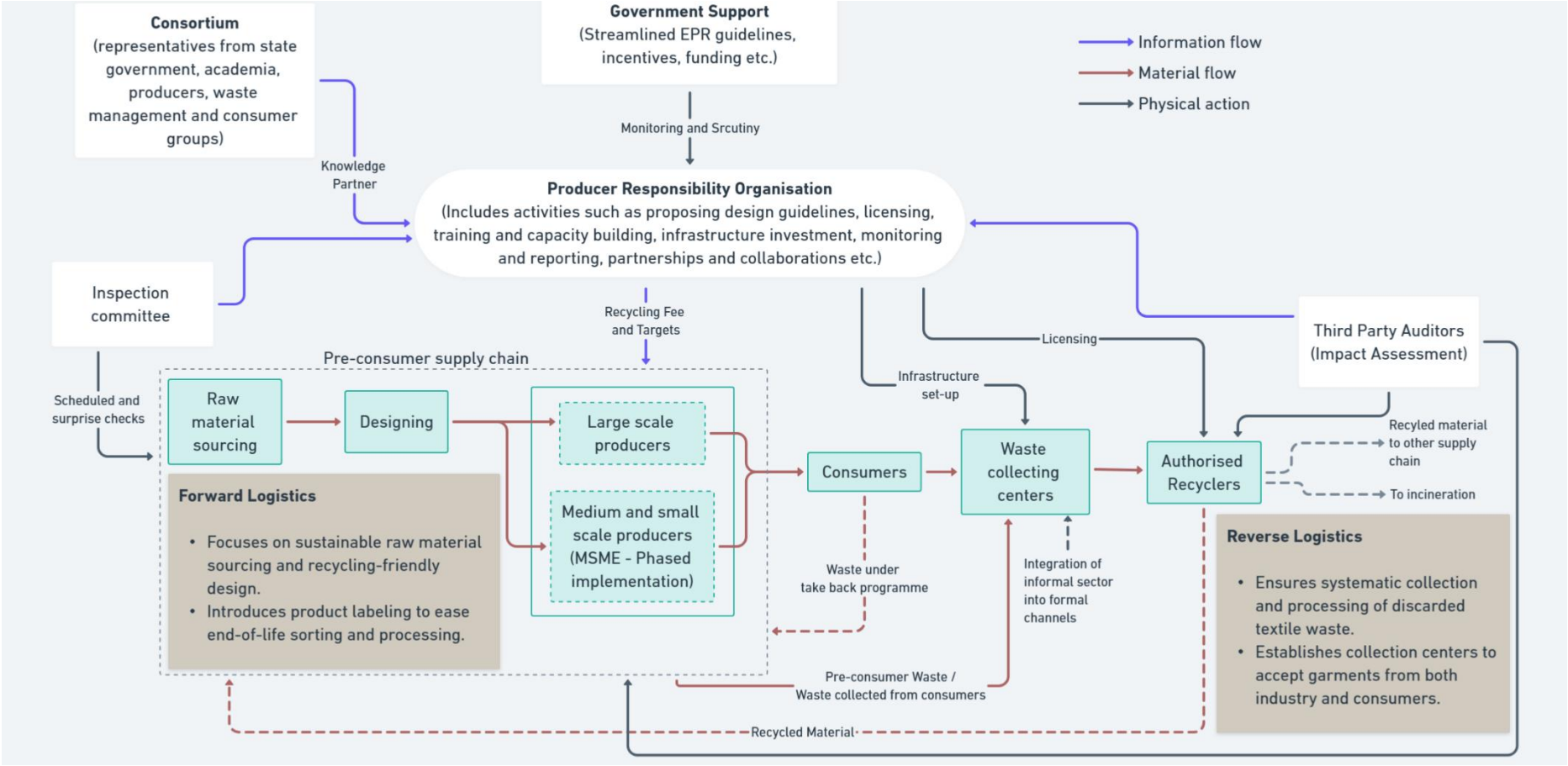
The proposed EPR framework can help embed circular economy principles in the textile and apparel industry and facilitate the continued circulation of materials in the supply chain.

5.1. Proposed EPR framework

Figure 9 outlines the proposed framework. A decentralised approach with regional PROs supported by the government or a regulatory body may be logical, considering the regional differences in textile and apparel waste management and the fragmented value chain.

> *To implement effective EPR in India, we must encourage a single polymer system and use RFID tagging for automated sorting and efficient recycling. Developing commercial chemical recycling technologies and collaborating with NGOs will be vital. Mandating the use of a minimum portion (%) of recycled materials in specific end uses would ensure better compliance. It is also important to instil circular recycling methods among the producers. A phased approach, stronger regulations on imports, and independent certification for monitoring are essential for creating a sustainable EPR ecosystem in India over the next 10–20 years.'*
>
> Dr Prakash Vasudevan, Director,
> The South Indian Textile Research Association

Figure 9. Potential EPR framework for the textile sector



The key characteristics underlining the successful implementation of the EPR framework are as follows:

Streamlined guidelines and government support

Clear guidelines on 'who is responsible for what' is essential for effective EPR implementation. Moreover, regulations on recycling targets, use of recycled and recyclable materials, and penalties for hard-to-recycle products must be specified. Financial support for Micro, Small and Medium Scale Enterprises (MSMEs), tax subsidies for recyclers or off-takers, incentives for compliant producers, and reward systems for consumers can help smoothen the value chain. A comprehensive regulatory framework will help lay out a strong foundation for enabling the transition towards circularity. Furthermore, robust import guidelines should be established to ensure that textile products or waste entering the national market comply with the EPR framework.

Establishment of a consortium

A consortium of representatives from the government, industry, academia, waste management, and consumer groups must be established. This consortium can help navigate the varied perspectives of all key stakeholders and ensure that the legal framework for EPR is fair and equitable. It can also support the PRO as a knowledge partner and streamline the roles and responsibilities of all actors in the supply chain.

Promoting sustainable material use

The varied and complex composition of textiles makes their disposal difficult and increases their environmental footprint. Complex textile products, mainly synthetic fibres and blends, are often resistant to decomposition and shed microfibres when washed during the use phase. Their recycling is also not viable because the lack of advanced recycling technologies makes the recycled yarn of inferior quality. Additionally, integrating recycled material from other supply chains, such as synthetic fibres from polyethylene terephthalate bottles, into the textile supply chain may not always be a sustainable solution. To address these challenges, it is crucial to introduce material regularisation guidelines. Setting targets for reducing the use of blends and encouraging the adoption of a single polymer system (100% natural or 100% synthetic) can help simplify the recycling process.

Mandating labels that indicate material composition and recyclability can help recyclers efficiently process textiles. Implementing radio-frequency identification (RFID) technology for product labelling can revolutionise the sorting process by automating it, reducing labour costs, and increasing accuracy. The product label can also explicitly mention if the product sheds microfibres when washed, thereby keeping the consumers informed of the potential environmental

consequences. These initiatives can help spur market demand for sustainable products.

Separate collection and sorting of textile waste

Currently, household textile waste is discarded in the MSW dry fraction waste stream, leading to waste contamination. The waste is eventually incinerated or landfilled. Separate collection of textile waste and efficient sorting are necessary to prevent the waste from entering the MSW waste stream. This should be done during the initial stages of handling post-consumer waste. Consumer awareness, sensitisation drives, and persistent waste collection initiatives by Urban Local Bodies (ULBs) and waste pickers can help streamline and improve the collection processes.

R&D and technology innovation

Investment in R&D is crucial for building a circular economy in textiles. Currently, composition sorting is done manually, which poses health risks for workers. Moreover, as recycling technologies are only compatible with certain materials and produce low-quality recycled fibre, most of the textile waste is downcycled, which only delays the waste going into landfills or incineration plants by a few years. These challenges hinder the growth of the recycling industry. Furthermore, the lack of efficient recycling technologies affects the circular material flow and renders the separate collection process futile. Research on automated sorting and efficient recycling technologies is essential for effective EPR implementation. Additionally, product innovation, e.g. the development of products with characteristics similar to synthetics but easy to recycle, must be encouraged. Increased investment in R&D and piloting of innovative technologies can help build and scale a strong operational recycling infrastructure in India.

Infrastructure establishment

Building adequate infrastructure is essential for implementing the EPR framework. Presently, there are limited textile recovery and recycling facilities in India, which increases the logistics costs for brands and ULBs located far from these hubs. First, regional collection centres must be established to facilitate efficient collection and sorting of textile waste. Second, advanced recycling plants can be initially established in waste-producing hotspots or Tier 1 cities. These facilities can then be scaled to other cities, as per requirement. Without sufficient investment in recycling infrastructure, it will be difficult to mandate 100% EPR compliance and can render the process financially ineffective. Further, a digital marketplace can be established for recycled materials, enabling producers to buy and re-integrate recycled fibres into the supply chain.

Integration of the informal sector

The informal sector plays a significant role in waste management, particularly in the collection and initial processing of textile waste. However, the lack of regulation and recognition for informal workers presents challenges for their integration into formal waste management systems. Formalising the role of informal waste pickers through legal recognition, training, and proper resource access is crucial. Encouraging partnerships among NGOs, startups, and informal sectors can streamline as well as improve waste collection and recycling, particularly in Tier 2 and Tier 3 cities.

Capacity building and behaviour change

Periodic capacity-building and awareness initiatives must be undertaken to keep the stakeholders updated on the best practices, new resource recovery and recycling technologies, and regulatory changes. Training programmes for waste pickers and informal sector workers involved in recycling facilities can help increase the collection and sorting efficiency and equip the workers with the necessary knowledge and skills to recycle various textile wastes. This will also ease the inclusion of the informal sector in the formal waste management system.

Awareness programmes for consumers are a must for changing the overall consumer behaviour and enabling a shift from fast fashion to responsible fashion. Training programmes for providing technical assistance and ensuring compliance with regulatory guidelines must be arranged for MSMEs to help them adapt to the EPR framework.

Transparency and accountability

Ensuring transparency and accountability is important for preventing unethical practices. An inspection committee comprising third-party auditors, textile associations, or select members from the consortium can be established and assigned the task of carrying out periodic audits and surprise inspections. The audit reports can then be shared with the consortium and PROs, facilitating discussions, deliberations, and coordinated actions.

Digital monitoring and reporting

A centralised digital platform should be developed to track all waste management activities, including material sourcing, waste generation, recycling rates, and financial contributions. This platform can enable real-time tracking of materials and financial contributions and generate compliance reports for regulatory bodies. Ensuring that all relevant stakeholders have access to the platform, with appropriate data privacy and security measures in place, will enhance monitoring and reporting.

Licensing and accreditation	Implementing a licensing system for recyclers and waste collectors will ensure that only those meeting prescribed standards are designated as authorised dealers. This information can be integrated into the digital platform, further ensuring transparency and facilitating reliable partnerships between brands and recyclers. Certifications should also be provided to producers adhering to design guidelines issued by the PROs. Additionally, various Indian-based certifications can be introduced for producers, which will help consumers identify products made through sustainable raw material sourcing, having a single polymer composition, or adhering to DfE approaches. This will encourage market competition for sustainable products and help consumers make informed choices. Regular audits of licensed stakeholders will ensure compliance with EPR standards, with non-compliant defaulters facing the risk of license revocation.

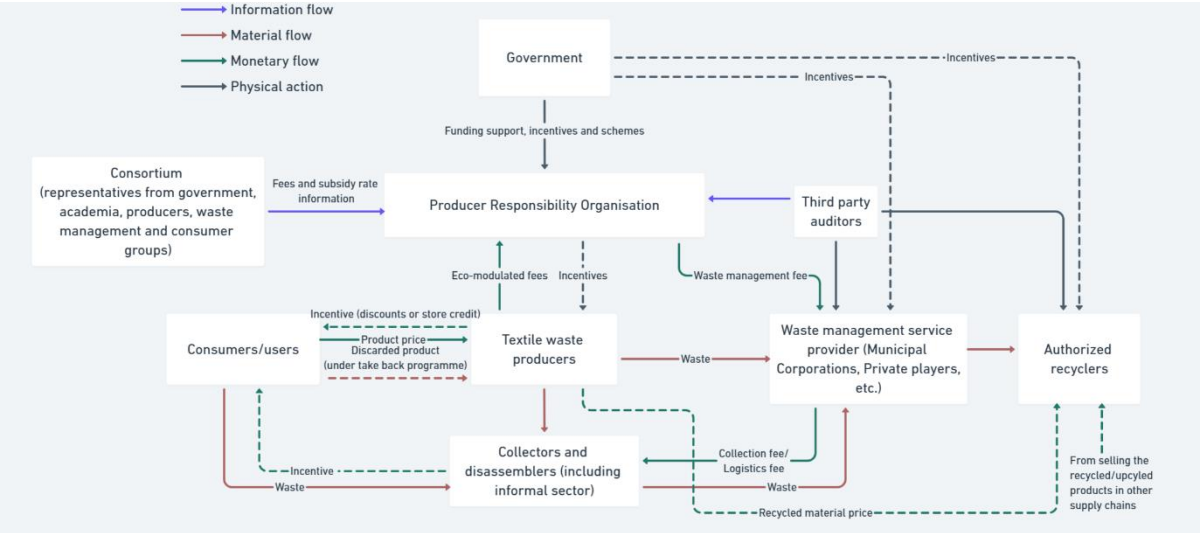
The ultimate goal of the EPR framework is to enable a circular economy, wherein recycled materials are reintegrated into the supply chain, reducing reliance on virgin resources and limiting the carbon footprint of the textile and apparel value chain. These strategies can help this industry advance towards sustainability, enhance recycling efficiency, and adopt circularity in their operations.

5.2. Financial model

It is essential to understand the financial flow of the EPR framework for its successful implementation. In case of the textile and apparel industry, it is essential to ensure that the cost is shared among the stakeholders, distributing the responsibility of sustainable practices across the supply chain and diversifying the funding sources to ensure financial stability. Moreover, a pricing mechanism needs to be implemented to ensure that EPR rates are fair and sufficient to cover the costs of recycling operations. This will prevent the need for recyclers to economise and ensure that quality standards are maintained. Additionally, establishing mechanisms to ensure timely payments from producers to supply chain partners, particularly MSMEs, will help avoid financial strain and operational disruptions.

Overall, the financial mechanism should be transparent, equitable, and sustainable. Figure 10 illustrates a potential financial flow for EPR in the textile sector.

Figure 10. Financial flow for EPR in textiles



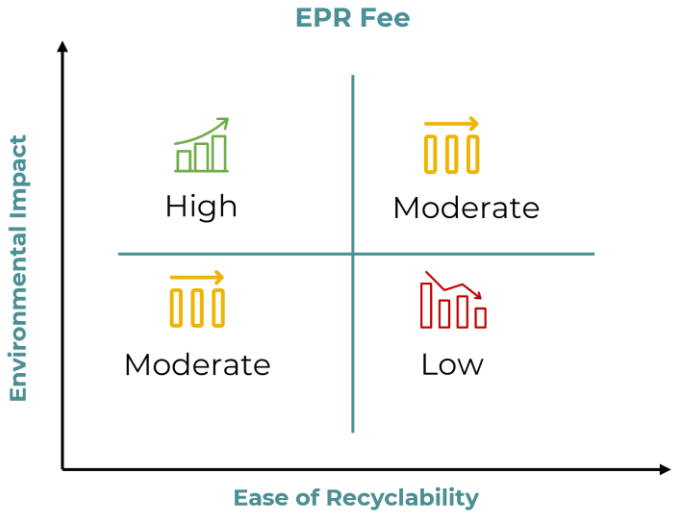
As per the suggested financial flow model, the cost burden will be shared among producers, consumers, and municipal corporations. A decentralised EPR fund (region-based or textile cluster-based) can be established, and producers can contribute an eco-modulated EPR fee to the fund. PROs can be assigned the responsibility of distributing these funds to the authorised waste management service provider and ensuring compliance.

The fees paid to the waste management service provider can be segregated into (a) transportation fee, (b) waste sorting and processing fee, and (c) recycling fee. Additionally, financial support for MSMEs and incentives for producers, consumers, and recyclers can be introduced to encourage the adoption of sustainable and ethical practices across the supply chain. These incentives can be in the form of tax rebates, subsidies, or consumer rewards for mindful consumption.

The eco-modulated EPR fee can be levied based on different parameters categorised according to (a) recyclability and (b) environmental impact, analysing both the production phase and the end-of-life management phase of the product. The fee can be determined by relevant stakeholders with the legal expertise and domain knowledge.

Figure 11 reflects a matrix underlining the dynamics between these variables and fee structures. A progressive fee structure can be introduced, wherein products with high recyclability and low environmental impact incur lower fees or receive discounts, whereas other products incur higher fees.

Figure 11. Dynamics between EPR fees and impact parameters



To cover the nuances of the textile industry, the consortium can help finalise the relevant parameters and their weightage to ensure fair calculation of the EPR fees. This will ensure that the fees cover the entire waste management cost of the product, and its breakdown will help ensure transparency and encourage the adoption of sustainable practices across the entire supply chain. Table 6 suggests a list of possible parameters for consideration.

Table 6. Potential parameters for determining EPR fees

Parameter	Score/Cost factor (1 = Best, 5 = Worst)
Design for environment	Qualitative assessment based on recyclability standards
Ease of disassembly	Qualitative assessment based on how easily the product can be broken down into recyclable or reusable components
Carbon footprint	Greenhouse gas emissions per kilogram of textiles (kg CO2e/kg fabric)
Water footprint	Volume of water consumed during production (L/kg fabric)
Energy intensity	Energy consumed in the industrial process (kWh/kg fabric)
Microfibre shedding	Quantity of microfibres released per wash (mg/wash)
Use of recycled materials	Percentage of the product made from recycled material (% by weight)

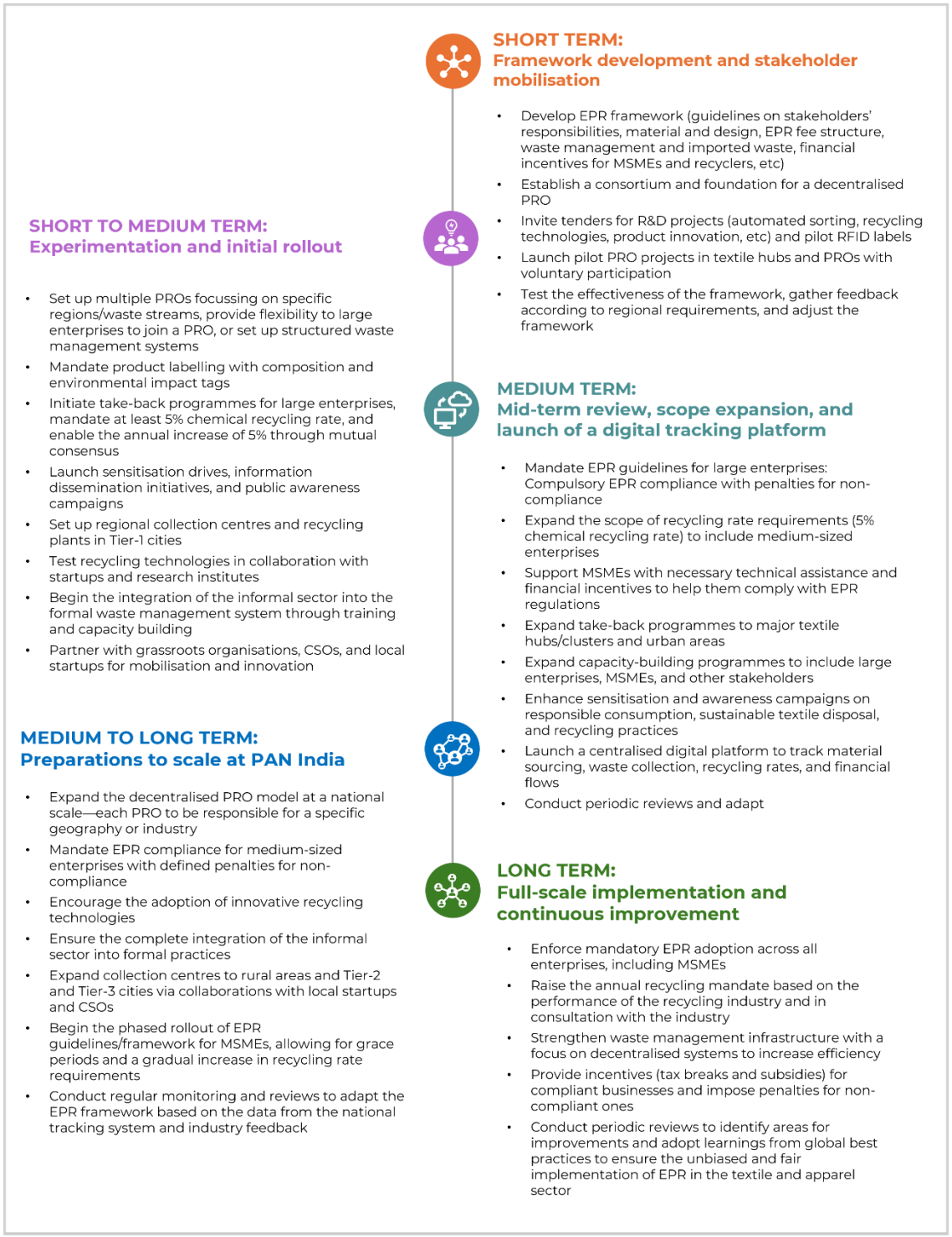
Once the parameters are finalised, the government or PROs can consider deploying an automated platform for calculating the eco-modulated fee using weightage-based parameters. The process can be further streamlined by allowing the producers to scan the product label (e.g. RFID tag) on the digital platform. Such automated processes can simplify the calculation process of the EPR fee and ensure reliability, efficient monitoring, and increased compliance.

The financial model for the EPR framework must be rigorously tested and experimented in pilot projects. The feedback from these pilots will help refine the model and ensure cost-effectiveness to implement at scale.

6. Way Forward

The EPR framework must be implemented in phases so that adequate time is provided for the industry to adapt to the new guidelines. Voluntary participation can be rolled out initially and eventually scaled to a 100% EPR mandate. A proposed roadmap for implementation with indicative timelines is outlined in Figure 12.

Figure 12: Proposed roadmap for EPR implementation in textiles and apparel sector



7. Conclusion

The Indian textile and apparel industry contributes over 2% to the country's GDP, which is expected to increase to approximately 5% by 2030. This growing sector is experiencing various challenges in waste management, mainly because of the predominant take-make-dispose or linear system. The existing waste handling practices are ineffective in managing a large amount of textile and apparel waste, resulting in significant resource loss, as the waste is either sent for incineration or dumped in landfills. Various challenges, such as a highly fragmented textile supply chain, unorganised waste management logistics, lack of advanced recycling technologies, lack of awareness, inadequate infrastructure for collecting and sorting the waste, lack of data and reporting, and involvement of the informal sector, hinder the proper disposal and recycling of textile waste. A comprehensive and streamlined EPR framework can help address these challenges and drive upstream solutions in the textile and apparel industry.

EPR encourages the reduction of waste at the source and the proper management of reverse logistics operations. The proposed EPR framework lays out a viable path forward for the textile industry. This framework can be implemented in phases over the short run, medium run, and long run, as discussed in Section 6. The framework optimises forward logistics by encouraging the addition of lifecycle thinking into product development and issuing guidelines for sustainable raw material sourcing, incorporating design guidelines that facilitate recycling and integrating product labelling for the ease of sorting. The reverse logistics of the framework focusses on the systemic collection and processing of discarded textile waste, enabling its re-introduction in the supply chain. Additionally, a financial model has been proposed in this report, which can help fund the operational and logistics costs associated with product disposal.

As the scope of the report is limited to fashion textiles, advanced research and in-depth analyses are required to delve into wastes from other streams of textiles such as technical or furnishing textiles. Further research is warranted to assess the socio-economic impacts of implementing the EPR policy for this sector, the environmental impacts of textile waste leakage, and the nature of technological innovations required to reuse and recycle at scale.

By addressing potential challenges and ensuring that the framework is transparent, equitable, and aligned with broader sustainability goals, the Indian textile and apparel industry can transition to a circular economy. The proposed framework, financial model, and roadmap not only meet regulatory requirements but also promote ethical practices, drive innovation, and support the long-term sustainability of the textile and apparel sector in India.

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9. Appendices

Appendix A. List of stakeholders consulted

S. no	Name	Designation	Representing organisation	Stakeholder category
1	Aakansha Shenoy	Associate-Impact Measurement and Management	Upaya Social Venture	Civil Society Organisation
2	Abbas Uddin	Director	Bangladesh University of Textiles, Bangladesh	Academia
3	Anjali Krishnan	Program Manager-Alternate Materials	IDH – The Sustainable Trade Initiative	International Civil Society Organisation
4	Ankit Gupta	General Manager-Sustainability	Indian Tobacco Company Limited	Private Industry
5	Anurag Gupta	Managing Director	Usha Yarns	Recycler
6	Beatriz Luz	Founder	Exchange 4 change Brasil, Brazil	Think Tank
7	Deepti Gupta	Professor-Department of Textile Technology	IIT Delhi	Academia
8	Emmanuelle Batista	Director-European and International Affairs	Citeo, France	Producer Responsibility Organisation (PRO)
9	John Girling	Head of EPR	WRAP	Climate Action NGO
10	J.K. Gupta	Head- Textiles Department	Bureau of Indian Standards	Government
11	Karan Kumar	Program Manager-Fashion	Laudes Foundation	Philanthropic Foundation
12	Khushbu Maheshwari	Scaling Associate	Fashion for Good	Innovators/Industry
13	Mahesh K Patil	Chairman	Goa State Pollution Control Board	Regional Government
	Livia D'Silva	Scientist "B"		
14	Makarand Kulkarni	Chief Executive Officer (CEO)	Revalyu	Recycler

S. no	Name	Designation	Representing organisation	Stakeholder category
15	Milind Rane	CEO	Ef4 Resurrect	Waste Management Services
16	Naresh Tyagi	Chief Sustainability Officer	Aditya Birla Fashion and Retail	Private Industry
	Padmakar Pandey	Assistant Vice President-Sustainability		
17	Pham Manh Hoai	Plastic Policy and Partnership Manager	WWF, Vietnam	International NGO
18	Prakash Vasudevan	Director	SITRA	Industry Associations
19	Rahul Mehta	Chief Mentor	Clothing Manufacturers Association of India	Industry Associations
20	Rajneesh Rai	Senior General manager-laboratory and Environmental sustainability	Shahi Exports	Private Industry
	Kritika Chauhan	Manager-Sustainability Innovations, Partnerships, and Environment Social Governance reporting		
	Snigdha Voruganti	Manager corporate communications		
21	Shobha Raghavan	CEO	Saahas Zero Waste	Waste Management Services
	Aastha Khubele	Associate Lead-Circular Economy		
22	Toby Connock	Project Lead	Pentatonic	Private Industry
23	Valerie Boiten	Senior Policy officer	Ellen MacArthur Foundation	International Organisation
	Sophie Moggs	Policy Analyst		
24	Varsha Gupta	Professor and Head of Research	NIFT	Academia

Appendix B. Study questionnaire

Based on the objectives of the project, a semi-structured questionnaire was devised considering the specific stakeholder groups.

Government departments / Regulatory bodies

1) What are the problems in terms of the effective, efficient use of textiles in India?
2) What are the policy/regulatory gaps in terms of resource efficiency and textile waste management in India?
3) Would a textile Extended Producer Responsibility (EPR) scheme be beneficial for India?
4) What do you see as the pre-conditions for introducing EPR in India? For example, do you take the view that collection systems need to be introduced in advance of EPR or do you see EPR as a means of paying for and establishing such systems?
5) What are the barriers to India implementing an effective EPR model in the textile and apparel sector?
6) What risks do you foresee in the implementation of a textile EPR scheme, such as less reuse and cutting out of the informal sector? How can these risks be addressed?
7) What are the potential benefits of implementing a textile EPR and how can it contribute to the country's sustainability goals?
8) How can a textile EPR scheme help India capture economic opportunity, e.g. improve the economics and viability of textile waste recycling operations?
9) Would EPR duplicate or overlap with other policies? How can EPR be integrated with other environmental policies (e.g. solid waste management and pollution control)?
10) What mechanisms can be put in place to monitor compliance with EPR regulations?

Local governments / Municipalities

1) How are used textiles and industrial textile wastes managed in your state/area/city/town? What is the quantity of textile waste that goes to landfills or is incinerated?
2) Do you see any opportunities for your city/state for better management of textile waste, e.g. new economic opportunities in terms of sorting, recycling, lower-cost materials and reduced water demand from agriculture?
3) What do you see as the solutions to the problems identified in terms of efficient textile resources?
4) How far can EPR help in addressing the problems? What are the benefits of EPR? Are there other simpler solutions?
5) What problems, if any, do you foresee if the responsibility of used textiles and industrial textile waste is put onto producers?
6) What is your preferred model of EPR and why?
7) How can the municipal authorities help support such a system?

Textile producers / Brands

1) What challenges do you face in increasing the efficiency of resource use and effective waste management? For example: a) lack of collection systems, b) poor sorting, c) expensive reprocessing equipment and processes.
2) What are the key drivers that would help address the challenges faced by brands and support efficient resource use and better management of textile waste, e.g. meeting Scope 3 emission targets and supply of good quality inputs?
3) What benefits could EPR bring to India? How do you envision a textile EPR scheme in India benefiting your company and the industry as a whole?
4) What are the potential challenges with introducing EPR in India and its implementation?
5) Which of the alternative EPR models do you think would be most suitable for the Indian textile industry, considering business initiatives in the Indian context and why?
6) What additional government action and policies, if any, are needed for a comprehensive EPR scheme for textiles?

Recycling and Re-processing sector

1) What sort of textile waste are you processing at the moment: industrial, post-consumer, and imported?
2) What are the major challenges you face in terms of recycling textile waste in India?
3) What are the solutions to the major challenges? How far can EPR help in solving these challenges?
4) How can EPR help capture economic opportunities?
5) What are the characteristics of the textile sector in India that may hinder the introduction of an effective EPR system in India? How can we address that?
6) Which of the alternative EPR models do you think would best enable more effective textile waste management?
7) What kind of financial and infrastructural support or other policies would be required from the government to facilitate the implementation of a textile EPR scheme?

Think tanks / Research institutions

1) What are the potential benefits of implementing a comprehensive textile EPR scheme in India, and how can it contribute to the country's sustainability goals?
2) What are the challenges involved in implementing EPR in the Indian textile industry?
3) What are the best practices and learning from other countries that can be adapted to the Indian context?
4) Which model of EPR is best suited to the India context? How can we implement EPR for the Indian textile industry in a way that minimises the cost burden on lower-income consumers, ensuring the affordability of textile products while achieving our environmental goals?
5) How can EPR promote inclusive and equitable waste management practices?
6) What are the potential social impacts of EPR on informal waste pickers and recyclers?

International organisations and other governments

1) What are the problems in terms of effective and efficient use of textile wastes/resources in your country?
2) What are the drivers for change, e.g. requirements of importers' scope 3 emission reductions and resource efficiency?
3) What do you see as the policy/regulatory gaps in terms of resource efficiency and good textile waste management in your country? How do you manage those OR how do you plan to do so?
4) What do you see as the potential benefits of implementing a textile EPR scheme in your country, and how can it contribute to the country's sustainability goals?
5) What do you see as the challenges in your country to implement an EPR model? OR did you face any challenges in implementing EPR?
6) How did you address those challenges? Are you introducing other policies in tandem to ensure that EPR is workable?
7) Which model of EPR do you prefer and why?

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

GIZ Office New Delhi
3rd Floor, A2/18 Safdarjung Enclave
110029, New Delhi, India

CENTER FOR STUDY OF SCIENCE, TECHNOLOGY & POLICY

Bengaluru
#18, 10th Cross, Mayura Street, Papanna Layout, Nagashettyhalli,
RMV II Stage, Bengaluru 560094, Karnataka (India)

Noida
1st Floor, Tower-A, Smartworks Corporate Park, Sector 125,
Noida 201303, Uttar Pradesh (India)

www.cstep.in | +91-8066902500 | cpe@cstep.in | @cstep_India