SEPTEMBER 2025

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# ACCELERATING SUSTAINABLE PRACTICES WITHIN THE TYRE VALUE CHAIN

WHITEPAPER

# Contents



It is imperative to align climate goals with business strategy, unlocking scalable, policy-relevant pathways that can define the sector’s sustainable future.”

# FOREWORD

**Abanti Sankaranarayanan**
Group Executive Board Member and Chief
Public Affairs Officer, Mahindra Group

The Mahindra Group is committed to its ‘planet positive’ strategy and one of its pillars emphasises on decarbonising industries by addressing our scope 3 emissions, often working in close collaboration with supply chain partners. Tyres are a key component for the vehicles we sell across our auto, farm, and commercial segments. Mahindra procures tyres worth ~$400M annually and we consider it our responsibility to work with our supply chain partners to reduce the environmental implication from its manufacturing, use and recycling. Additionally, the EPR regulations for End-of-Life Tyre (ELT) management by Ministry of Environment further reinforces the need for sustainable practices in the tyre sector and the financial case for pragmatic environmental action, aligning with our commitment to a greener future.

**Ankit Todi**
Chief Sustainability Officer
Mahindra Group

The tyre industry has significant environment implications across its entire value chain—from natural rubber sourcing to manufacturing given the high energy intensive process, to use during its life and finally during end-of-life processing. At Mahindra, we recognise the importance of addressing and reducing the impact as part of our planet positive strategy. Tyres also represent a significant part of our Scope 3 Category 1, i.e., product purchase emissions, accounting for ~10% in for the auto sector and ~15% for the farm sector, following steel & aluminium as the other big components. The management of End-of-Life Tyres (ELT) is also a critical challenge with 1.5 million tonnes being generated annually, of which a significant portion is still processed in the informal sector. Moreover, rubber, a key tyre component, has the 2nd highest emission factor after aluminium among the materials used in a car. With the rapid growth of the tyre recycling ecosystem and strong synergies with CERO (our end-of-life vehicle recycling company), addressing end-of-life tyre management is a very timely step and important step. The engagement of the entire tyre ecosystem and related value chain in understanding and investing to explore sustainable practices and emissions reduction initiatives is also commendable. This whitepaper put together as a collaborative effort lays out the current landscape, challenges, and solutions to accelerate pragmatic, business aligned sustainable practices in the tyre value chain.

**Suman Jagdev**
Partner
Xynteo

We are strong believers in the power of collaboration and this whitepaper is a product of that collaborative ethos. Its primary objective is to examine critical sustainability trends and identify actionable opportunities to enhance sustainable practices across the tyre value chain, encompassing sourcing, manufacturing, use, and recycling—with a particular emphasis on management of end-of-life tyres. By addressing the critical imperatives, we aim to drive innovation and resource efficiency while minimising adverse environmental impact. We look forward to engaging with stakeholders to develop actionable pathways that drive circularity at scale in the tyre industry.

# 1

# Introduction

## 1.1. TYRE INDUSTRY OVERVIEW

| | | |
|---|---|---|
| **4-5%**<br>India’s contribution to the global tyre market by revenue (FY23)[1] | **$12.84 Bn**<br>India’s tyre market size (FY24)[2] | **$22 Bn**<br>India’s tyre market size (FY32 forecasted)[3] |
| **26%**<br>contribution of the export market by revenue (FY23)[4] | **2.5 Mt**<br>Annual production of tyres in FY23 (217 mn. units)[5] | |

**Sources:** [1] Xynteo analysis, global market size [2] Wright [3] Crisil [4] ATMA [5] Xynteo anaylsis, Mongabay

India’s tyre industry stands as a cornerstone of economic progress, significantly influencing both domestic and global markets. It is ranked as the world’s fourth-largest tyre market, behind China, Europe, and the United States[1]. Two wheelers, constituting 77% of total automotive production[2], propel tyre demand. While the replacement segment representing 60-70%[3] of total revenues thrives due to an aging fleet. Exports bolster the sector’s global footprint, contributing roughly 26%[4] of total sales and expanding India’s reach to diverse international markets.

Key growth catalysts include rising vehicle ownership spurred by an expanding middle class, supportive government policies such as ‘Make in India’[5], a strategic push towards electric vehicles targeting 30% of new car sales by 2030[6], and ongoing infrastructure development coupled with radialisation initiative.

### 1.1.1. Tyre value chain

The tyre value chain supporting this growth is a complex, interconnected system involving multiple stakeholders, from raw material suppliers to manufacturers, distributors, and end-of-life recyclers. Each stage plays a critical role in delivering tyres to consumers, but it also contributes to significant environmental impact, particularly greenhouse gas emissions.

| | Upstream | Operations | Downstream | | |
|---|---|---|---|---|---|
| **Step** | **Raw material sourcing and procurement** | **Tyre manufacturing** | **Distribution, sales and retail** | **Tyre use and maintenance** | **End-of-life** |
| **Key activities** | • Natural rubber cultivation and processing*<br>• Synthetic rubber and chemicals production*<br>• Carbon black production and sourcing*<br>• Steel procurement*<br>• Mining for silica and other minerals | • Compounding and mixing of raw materials* (rubber, carbon black, chemicals)<br>• Component preparation (Tread and sidewall extrusion,* cord fabrication and bead making)<br>• Tyre building<br>• Curing/ Vulcanisation* | • Logistics and warehousing of finished tyres*<br>• OEM sales<br>• Replacement market sales<br>• Export | • Vehicle operation*<br>• Maintenance<br>• Retreading | • Collection of End-of-Life Tyres (ELT)<br>• Retreading<br>• Recycling (Shredding, Pyrolysis,* Reclaimed rubber)<br>• Energy recovery*<br>• Disposal* |
| **Key stakeholders** | • Rubber farmers and plantation owners<br>• Mining companies - silica and coal-based carbon black<br>• Petrochemical companies<br>• Importers and traders<br>• Steel manufacturers<br>• Government bodies | • Tyre manufacturers - Equipment suppliers<br>• Chemical suppliers | • Auto OEMs<br>• Tyre manufacturers<br>• Logistics players<br>• Distributors and retailers<br>• Export and import agencies<br>• Consumers | • Tyre manufacturers<br>• Consumers and fleet operators<br>• Service centres<br>• Repair shops<br>• Regulatory | • Tyre manufacturers<br>• Recycling companies<br>• Retreading companies<br>• Recycling technology providers<br>• Informal sector<br>• End-users of recycled products<br>• Regulatory bodies |

**Fig. 1:** Tyre value chain highlighting key emissions sources

*Activities resulting in high emissions

The journey begins with raw material extraction and procurement. These primarily include natural rubber, synthetic rubber, silica, carbon black, and steel. This stage is an emission hotspot, as rubber plantations and petrochemical processes are energy-intensive and release substantial GHG emissions. Tyre manufacturing is another major hotspot. Processes like mixing, molding, and vulcanisation consume substantial energy and generate significant emissions.

Transportation and distribution of raw material and finished tyres add to the footprint, with global shipping and logistics relying on diesel-powered vehicles. During the use phase, tyres contribute indirectly to emissions through vehicle fuel consumption, influenced by rolling resistance. During vehicle operations, tyres wear down due to friction with the road surface, releasing Tyre and Road Wear Particles (TRWP). TRWP is a major source of microplastics in the environment, particularly in urban runoff and aquatic systems. These particles are a significant source of non-exhaust emissions, contributing to air, soil, and water pollution. Finally, end-of-life management-whether landfilling, incineration, or recycling—can be an emission source if not handled sustainably. Scope 3 contributes more than 95% of the total emissions with category 1, 11, 12 being relatively significant contributors[7].

| Scope | Emissions | India context | % of total GHG emissions |
|---|---|---|---|
| **Scope 1** | Manufacturing emissions | • Most tyre manufacturing plants in India rely on fossil fuels for steam generation (for vulcanisation)<br>• Favouring fossil fuels due to its low cost and availability, despite its high $CO_2$ emissions | <5% |
| **Scope 2** | | • High electricity consumption and coal-heavy electricity grid (carbon intensity - 0.82 kg $CO_2$/kWh), results in significant scope 2 emissions for tyre plants | |
| **Scope 3 (Category 1)** | Purchased goods and services | • The product of rubber, carbon black etc. is highly energy-intensive<br>• The operations rely on fossil fuels like coal and oil, with emissions stemming from land preparation, fertilisation, processing, and petrochemical processes | 95% |
| **Scope 3 (Category 11)** | Use of solid products (Use phrase) | • In India, most vehicles (trucks, buses, cars) run on diesel or petrol, higher rolling resistance leads to significant $CO_2$ emissions over a tyre's lifespan | |
| **Scope 3 (Category 12)** | End-of-life tyre management | • In India, end-of-life tyres are often incinerated, or informally burned, releasing $CO_2$ and CH4. Informal recycling is prevalent, with tyres burned in open pits for fuel or material recovery, causing significant emissions and air pollution | |

**Fig. 2:** Context specific to India, analysis based on publicly available data from tyre (OEMs)

This confluence of fossil fuel dependency, limited renewable energy integration, and End-of-Life Tyre (ELT) mismanagement underscores the urgent need for targeted decarbonisation strategies tailored to India's tyre industry.

# 2

# Deep Dive: Key Emission Sources

The below section deep dives into the key sources of emissions across the value chain including tyre manufacturing, purchased goods and services, use of sold products and end-of-life tyre management in India.

## 2.1. DEEP DIVE: TYRE MANUFACTURING (SCOPE 1 AND SCOPE 2)

Most companies have scope 1 and 2 targets and a roadmap for achieving these emissions. Key levers adopted by companies are energy efficiency and energy demand management, moving the energy mix away from fossil fuels, adoption of hard to abate solutions such as green hydrogen, Carbon Capture Utilisation and Storage (CCUS), adoption of carbon sinks.

In addition, companies are also focusing on enhancing water efficiency in tyre manufacturing processes to reduce freshwater consumption. Additionally, circularity measures such as recycling and reuse of process water and production waste are being increasingly adopted to lower environmental impact.

### 2.1.1. Collaborative opportunities

1. Shared Energy Efficiency Initiatives: Tyre OEM and auto OEMs can partner to implement renewable energy solutions, such as solar or wind power, at tyre OEM and auto OEM production lines.

## 2.2. DEEP DIVE: PURCHASED GOODS AND SERVICES (SCOPE 3 – CATEGORY 1)

Key levers adopted by tyre companies globally and in India[8] are:

- Use of sustainable, and recycled feedstocks (sustainable rubber, bio-based silica and low-emission materials: green steel). For instance, based on Life Cycle Assessments (LCAs), emissions released from production of natural rubber (0.84 Kg$CO_2$e/Kg) is significantly lower than the emissions from synthetic rubber (2.4 - 2.8 Kg $CO_2$e/Kg). Similarly emissions from silica (sand) (2.8 – 3.2 Kg $CO_2$e/Kg) is significantly higher than the emissions from silica produced from rice husk (1.2 Kg$CO_2$e/Kg)[9]
- Reduce material consumption
- Enforce supplier climate commitments

Most tyre companies have targets pertaining to the use of sustainable material (bio-based, recyclable) in the production of new tyres. Key challenges associated with sustainable and low emission materials include material availability and quality issues and associated cost impact. Another challenge is the lack of standards associated with recycled products[10].

### 2.2.1. Collaborative opportunities

1. Joint Research and Development (R&D) for Sustainable Materials (Technology Cluster): Tyre OEMs, auto OEMs, recyclers and academic institutions can collaborate on R&D to develop and integrate sustainable materials, such as reclaimed rubber, recycled carbon black, and bio-based materials, into tyre production.
2. Supply Chain Integration for Recycled Materials: Create a closed-loop supply chain where recyclers collect and process End-of-Life Tyres (ELTs) to produce materials like crumb rubber, pyrolysis oil, and Recovered Carbon Black (rCB), which tyre OEMs can use in new tyre production. Auto OEMs can facilitate collection by integrating EPR-compliant disposal systems at their service centers.
3. Standards for Recycled Products: Tyre OEMs, recyclers, auto OEMs, and other stakeholders—such as government regulators, industry associations, and standardisation bodies can collaborate through joint consortia, workshops, or multi-stakeholder forums to establish unified standards for recycled tyre materials, focusing on quality, safety, and sustainability criteria. This involves sharing data, conducting pilot tests, and lobbying for regulatory alignment to ensure consistent material specifications across the supply chain.

## 2.3. DEEP DIVE: USE OF SOLD PRODUCTS (SCOPE 3 – CATEGORY 11)

Further in the use phase, category 11 of Scope 3 emissions refers to the greenhouse gas emissions resulting from the use of sold products by customers over their expected lifetime. This includes both direct emissions from products that consume fuels or energy during use—such as vehicles, appliances, and electronics—and indirect emissions from related energy consumption. It captures the total anticipated emissions generated when the products are used by end-users, reflecting a critical part of a company's downstream carbon footprint.

- Highest source of emission – making it a key focus area for tyre OEMs
- Key decarbonisation levers[11] by tyre OEM to reduce scope 3 – category 11 emissions are as below:
  - Developing Low Rolling Resistance (LRR) tyres
  - Incorporating light-weight materials
  - Enhancing tyre durability and longevity
  - Promoting circular business practices such as retreading
- Most Indian tyre companies are still in the process of measuring their scope 3 emissions (category 11)[12] (Based on publicly available data) as allocating scope 3 'product is use' emissions to tyre is complex[13]

### 2.3.1. Collaborative opportunities

1. Standardised Scope 3 Measurement: Tyre OEMs, auto OEMs, and industry bodies can collaborate to develop standardised methodologies for measuring category 11 emissions, addressing the complexity and lack of uniformity. This includes creating shared frameworks for Life Cycle Assessments (LCAs) and emissions modelling based on real-world tyre and vehicle usage data.
2. Tyre Longevity Programmes: Collaboration between tyre OEMs, auto OEMs, and fleet operators to enhance tyre durability through joint R&D and maintenance programmes, reducing replacement frequency and associated emissions.
3. Retreading and Circular Economy Initiatives: Tyre OEMs, auto OEMs, and recycling firms can establish retreading programmes and take-back schemes, extend tyre life and minimise waste-related emissions during the use phase.
4. Consumer Education Campaigns: Tyre OEMs, auto OEMs, and Non-Governmental Organisations (NGOs) can collaborate on campaigns to educate drivers on proper tyre maintenance and driving habits, minimising emissions during vehicle operation.

# 2.4. DEEP DIVE: END-OF-LIFE TYRE (ELT) MANAGEMENT IN INDIA (SCOPE 3 – CATEGORY 12)

## 2.4.1. Introduction – End-of-life tyre management in India

| 1.5 MT | 70% | 54% | 1.4 MT |
|---|---|---|---|
| ELTs generated annually in India in terms of weight[1] (FY23) | % of ELTs processed through the informal sector by weight[2] (FY23) | % of the total pyrolysis units that are non-compliant with government guidelines in India[3] | ELTs imported annually in India (in terms of weight[4]) (FY24) |

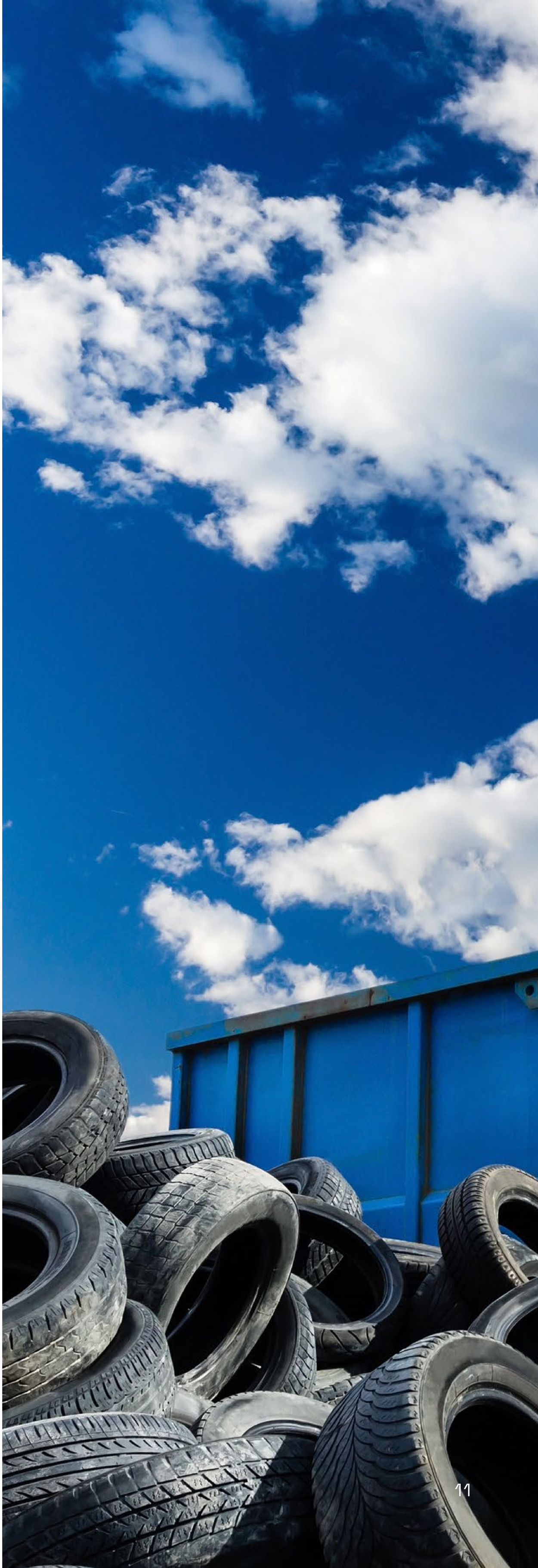
**Notes:** [1] MRAI [2] MRAI [3] Report [4] TOI

India is confronted with a growing crisis in managing end-of-life tyres (ELTs), with over 1.5 million tonnes[14] generated annually, supplemented by 1.4 million tonnes[15] of imported waste tyres. However, unlike in Europe, where landfilling is common, waste tyres in India are treated as a commodity rather than waste, with minimal disposal in landfills.[16] However, 70% of ELTs (collection, segregation and recycling)[17] is managed by the informal sector, which employs rudimentary processing methods such as manual cutting and grinding, producing low-value products, open burning, which releases toxic pollutants, or batch pyrolysis undertaken by non-compliant pyrolysis plants, yielding low-quality oil and carbon black while posing significant health and environmental risks. Some of the imported waste tyres are also retreaded and sold, impacting overall safety of customers.

## 2.4.2. Technology landscape

Formal tyre recyclers in India employ technologies such as shredding, grinding, controlled incineration, advanced pyrolysis, and devulcanisation to process end-of-life tyres. Shredding and grinding break tyres into crumb rubber for use in road construction and playground surfaces, while pyrolysis heats tyres in an oxygen-free environment to produce fuel oil, carbon black and gas. Emissions from pyrolysis include carbon dioxide and trace pollutants, which can be mitigated by scrubbers. Incineration in cement kilns burns tyres for energy, yielding ash and significant carbon dioxide, nitrogen oxides (NOx), and sulphur oxides (SOx) emissions, though controlled by strict regulations. Lastly, devulcanisation reverses rubber vulcanisation for reuse in new products and produces reclaimed rubber.

Amongst these technologies, pyrolysis is the dominant technology adopted. Adoption of devulcanisation and other advanced recycling technologies is limited to less than 15%[18]. Further, advanced global technologies, including cryogenic grinding, thermochemical gasification, microwave-induced pyrolysis, and biotechnological devulcanisation, offer prospects for higher-value outputs and reduced emissions; however, their adoption in India remains limited primarily due to high capital investments and regulatory barriers. Continuous pyrolysis, another technology, represents an efficiency upgrade but demands substantial infrastructure development.



## 2.4.3. Regulatory landscape

The regulatory landscape for ELT management in India has evolved from basic waste management guidelines to Extended Producer Responsibility (EPR).

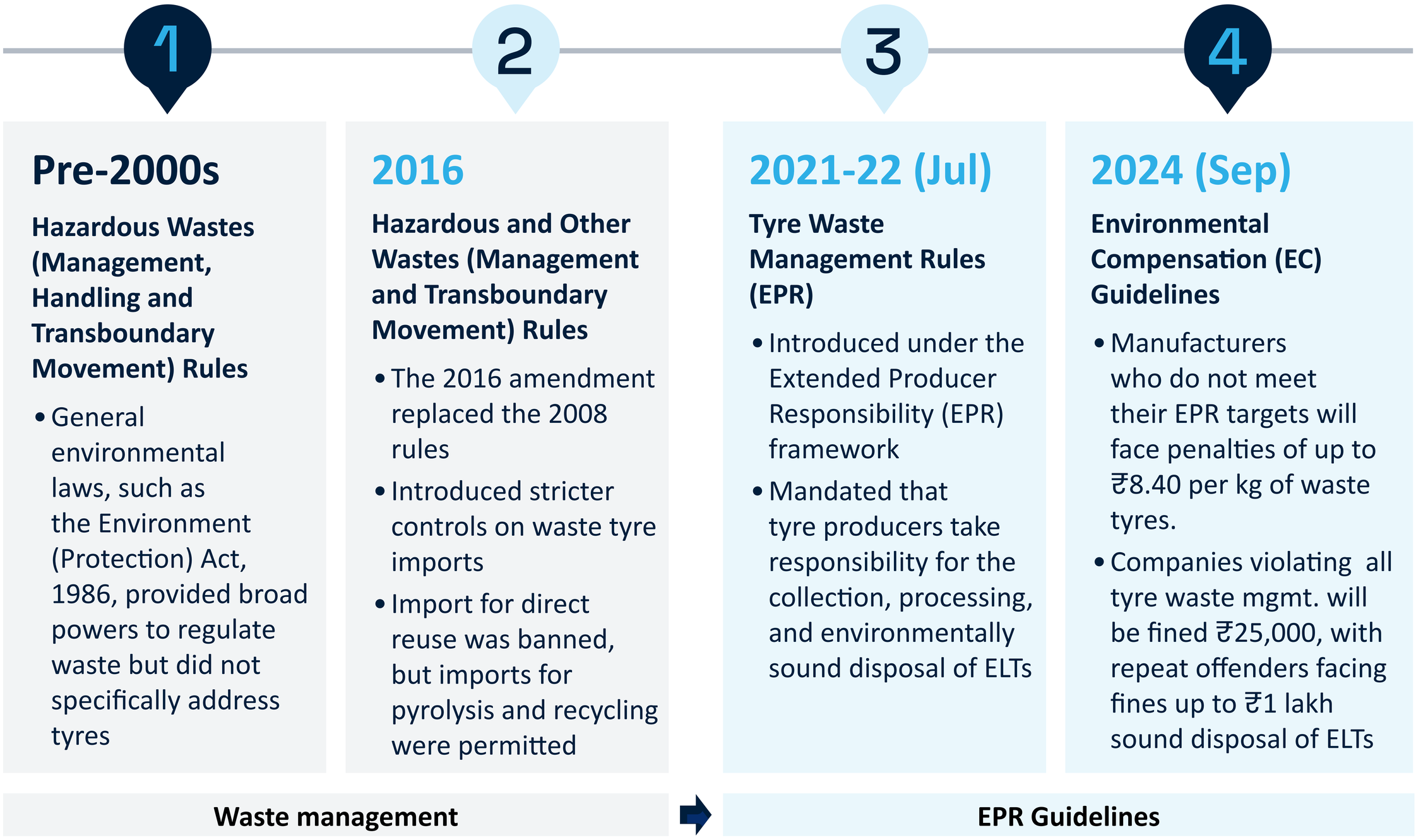



**Fig. 3.** Evolution of the regulatory landscape around waste tyres

## 2.4.4. EPR guidelines

| Producers | Mandate | Compliance and penalties |
|---|---|---|
| Must register on the CPCB EPR portal, meet recycling targets, buy EPR certificates, and file reports<br><br>**Recyclers**<br><br>Must register, recycle tyres legally, issue certificates, and report data | • **2022–23: 35%** of tyres manufactured/imported in 2020–21<br>• **2023–24: 70%** of tyres manufactured/imported in 2021–22<br>• **2024–25 onwards: 100%** of tyres manufactured/imported two years prior. | • **Environmental compensation:** Up to ₹8.40/kg of unfulfilled waste tyre obligation<br>• **Fine for violations:** ₹25,000 (₹1 lakh for repeat offences) for producers and ₹12,500 for recyclers and retreaders<br>• **False EPR certificates or >5% over-reporting:** Up to 5 years imprisonment or ₹5 lakh fine |

**Fig. 4.** EPR guidelines

The 2024 amendment included retreaders and enforced stricter reporting through a centralised portal. The EPR guidelines also includes prohibition of waste tyres for producing pyrolysis oil or char due to environmental concerns, as pyrolysis is classified as a high-pollution activity. As per the recent guidelines for environmental compensation in July 2024, tyre manufacturers/ importers who do not meet their EPR targets face penalties, potentially up to ₹8.40/kg[19]

(environmental compensation) of waste tyres, which is also the maximum price of the EPR certificates. The guidelines also establish a minimum price of ₹2.52/kg[19] (30% of environmental compensation) for value of the EPR certificate. Currently, the transfer of the EPR certificates by the registered recycler to the tyre manufacturer/importer happens over the Central Pollution Control Board (CPCB) portal[19].

The EPR framework has catalysed increased investment in recycling infrastructure and heightened awareness of sustainable tyre disposal practices. However, its implementation faces challenges, including inconsistent enforcement and inadequate monitoring mechanisms. Strengthening the EPR framework through clear guidelines, robust enforcement, and incentives for adopting advanced technologies is critical to unlocking the full potential of tyre recycling in India.

**BARRIERS TO UNLOCKING TYRE RECYCLING POTENTIAL AND REDUCING CURRENT ENVIRONMENTAL FOOTPRINT**

| Bucket | Barriers | Impact |
|---|---|---|
| **Collection and segregation** | • A majority of the collection and segregation is undertaken by the informal sector; there is limited involvement of tyre OEMs and their channels | • This impacts the quality of feedstock for the recycling process. The recycled output is not suitable for automotive and other applications requiring high quality.<br>• There is a higher cost of collection and segregation as compared to formal collection avenues and reverse logistics deployed by developed countries.<br>• This leads to unregulated flow of imported ELT used for retreading as well as pyrolysis. |
| **Recycling** | • Informal sector: As per MRAI, 70% of the recycling is undertaken by the informal sector consisting of unregulated pyrolysis units emitting significant pollutants. | • There is diversion of feedstock away from formal recyclers.<br>• There is a negative environmental impact. This includes increased emissions of greenhouse gases and other environmental impact.<br>• There is an impact on the overall quality of end products, which is not suitable for automotive and other applications requiring a higher quality. |
| | • Formal sector: Lack of adoption of devulcanisation and other advanced recycling technologies. | • Lower value is generated from the current recycling processes. Closed loop recycling is practiced to a limited extent only. |

| | | |
|---|---|---|
| | • Currently, pyrolysis predominates across available recycling technologies owing to better returns on investment–lower capex, opex—the presence of an established market for pyrolysis end products, limited market for reclaimed rubber, and its ability to address mixed waste. | • There are higher emissions generated compared to those generated from devulcanisation and mechanical recycling.<br>• It leads to an unregulated fuel market with increased adulteration and emissions. |
| | • Design constraints hinder recyclability. | • This leads to process challenges during recycling.<br>• This leads to slowed technological developments. |
| | • There is lack of stakeholder awareness around formal tyre recycling. | • Diversion of feedstock away from formal recyclers.<br>• Limited consumer incentive for tyre OEMs to get involved in formal collection. |
| **Policy and guidelines** | • There are policy loopholes around crumb rubber imports enabling access to lower-cost EPR credits, encouraging informal players.<br>• Owing to the ban on import of waste tyres specifically intended for pyrolysis, recycling companies are importing tyres under the pretext of crumb rubber production and subsequently using it as inputs in pyrolysis plants. Since the cost associated with collection and segregation in the latter case is low, EPR credits are available at a lower cost. | • The EPR credits are available at a lower cost.<br>• This leads to weaker compliance of existing policy and underutilisation of crumb rubber as a resource.<br>• The misuse of the term crumb rubber has contributed to the flourishing of the informal recycling ecosystem. |
| | • There is limited transparency on the allocation of weightages for recycled product (outputs) when calculating EPR credits. | • There is a lack of consensus on methodology for assigning weightages to recycled products. |
| | • There are lack of standards for recycled products (outputs). | • Without BIS standards, the quality of recycled outputs like TPO (Tyre Pyrolysis Oil) and rCB (Recovered Carbon Black) vary widely, limiting their marketability and demand.<br>• The absence of clear BIS (Bureau of Indian Standards) standards creates uncertainty for investors, for instance, recyclers, as there is no assurance of consistent product quality or compliance with environmental regulations.<br>• Non-compliant and illegal pyrolysis plants, which operate without adhering to environmental or quality standards, offer cheaper recycled products, undermining legitimate recyclers. |

| | | |
|---|---|---|
| | • There is no current mandate around use of recycled material for production in the current EPR guidelines. | • No incentive for tyre OEM and recyclers to invest in closed loop recycling technologies. |
| | • There is no clear methodology to ensure that the EPR funds are used by recyclers to invest in new technologies. | • Limited investment in advanced recycling technologies. |
| | • There are lack of audits and validation mechanisms for recyclers. | • Weak validation mechanisms enable the creation and sale of fraudulent EPR certificates. Recyclers may report inflated recycling volumes to generate excessive credits (beyond the 5% allowable limit), distorting the market and reducing trust in the EPR system. |

## POTENTIAL SOLUTIONS TO UNLOCKING TYRE RECYCLING POTENTIAL AND REDUCING CURRENT ENVIRONMENTAL FOOTPRINT

| Focus areas | Collaborative opportunities | Remarks |
|---|---|---|
| **Infrastructure development** | • **Public-private partnerships (PPPs):** Establish PPPs between tyre OEMs, recycling companies, and local governments to create formalised collection and segregation networks. These partnerships can set up collection points at tyre dealerships, service centres, or municipal waste facilities.<br>• **Incentive-based collection programmes for reverse logistics:** Tyre OEMs can introduce Deposit Refund System (DRS) or buy-back schemes where consumers receive discounts or refunds for returning used tyres to authorised dealers. This encourages proper disposal and reduces reliance on informal channels.<br>• **Capacity building and formalisation of informal sector:** Train informal sector workers in safe and efficient tyre collection, segregation, and handling practices. Provide them with protective equipment, storage facilities, and access to recycling centers. | • Lower cost of feedstock for recycler.<br>• Better quality of feedstock for the recycler for recycling. |
| **Advanced technology adoption** | • **Recycling hubs:** Establishing centralised recycling hubs through PPPs can address the lack of infrastructure and reduce the cost of collection, storage, and processing. These hubs can house advanced technologies like devulcanisation and continuous pyrolysis, benefiting from economies of scale.<br>• **Research and Development (R&D) collaborations:** Foster partnerships between academic institutions, research organisations, and industry to innovate cost-effective and efficient devulcanisation processes, such as supercritical $CO_2$-based methods, which are environmentally benign and avoid banned chemical solvents. | • Better ROI for recycler.<br>• Better quality of feedstock for the recycler for recycling. |

| | | |
|---|---|---|
| | • **Establishing industry standards:** Tyre OEMs, recyclers, auto OEMs, and other stakeholders—such as government regulators, industry associations, and standardisation bodies can collaborate through joint consortia, workshops, or multi-stakeholder forums to establish unified standards for recycled tyre materials, focusing on quality, safety, and sustainability criteria. | • Increased demand for recycled products, bringing down the cost to compete with the cost of virgin material. |
| **Market development and awareness** | • **Awareness campaigns and market education:** Launch campaigns to educate consumers, businesses, and policymakers about the benefits of recycled tyre products, addressing misconceptions about quality and encouraging adoption.<br>• **Public-Private Partnerships (PPPs) for market expansion:** Form PPPs to fund infrastructure projects using recycled tyre products, such as rubberised asphalt roads or sports surfaces, combining public demand with private innovation to scale markets.<br>• **Ecolabelling:** Ecolabelling can boost the market development of tyre-recycled products by certifying their environmental benefits, enhancing consumer trust, and differentiating them in competitive markets. | • Ecolabelling will help drive consumer awareness and support to brand owners. |

## 2.5. POLICY RECOMMENDATIONS

### 2.5.1. Current EPR framework and methodology

- Revise methodology for assigning weightages based on waste hierarchy principle and Lifecycle Impact Assessment (LCA).
- Develop methodology to ensure allocation of EPR funds for technological upgrades in recycling to promote adoption of advanced technologies by recyclers.

### 2.5.2. EPR enforcement and implementation

- Ensure transactions on the EPR portal are backed by Goods and Services Tax (GST) invoices to eliminate regulatory loopholes. Over time, integrate the EPR portal with the GST system to improve traceability.
- Strengthen audits and validation mechanisms for recyclers to ensure alignment between the EPR credits generated and the recycling completed.

### 2.5.3. Other recommended modifications

- Develop a mechanism to eliminate loopholes related to the import of waste tyres for use in unregulated pyrolysis plants and retreading. For example, require importers to submit mandatory quarterly end-use certificates, verified by third-party auditors, detailing the quantity processed into crumb rubber or retreaded products and sold to legitimate buyers.
- Reduction in EPR obligation for tyre OEM based on usage of recycled materials for incentivising tyre OEM to use recycled materials in tyre production.
- Inclusion of incentives for promoting investments (PLI/viable gap funding) in setting up recycling infrastructure and investment in new technologies.
- Policy to include corporate grants for R&D with private institutes for research on new technologies, potential application of recycled products.
- Mandate use of recycled material  in new tyres for tyre OEMs.

# 03

# Way Forward

The Indian tyre recycling industry is currently valued at approximately USD 0.7–0.9 billion[20], with significant untapped potential to expand to USD 2–2.5 billion[20] through a strategic shift toward higher-value recycled products. Realising this growth opportunity—while simultaneously enhancing the sector's environmental sustainability and reducing dependence on virgin materials—will require concerted collaboration among key stakeholders, underpinned by robust governmental policies and support.

As the industry charts this transformative path, it is critical to establish clear and actionable metrics to track sustainability progress across each step of the tyre value chain. These metrics enable tyre OEMs, recyclers, and ecosystem stakeholders to benchmark performance, identify areas for improvement, and transparently communicate progress to relevant stakeholders and the market. By standardising measurement (ecolabelling) around emissions, material use, water, and circularity, these metrics provide a foundation for data-driven decision-making and collaborative action.

| Stakeholder | Value chain step | Metrics |
|---|---|---|
| **Tyre OEM** | • Manufacturing | • Scope 1 emissions (absolute) measured in metric tonnes of $CO_2$ equivalent.<br>• Scope 2 emissions (absolute) measured in metric tonnes of $CO_2$ equivalent.<br>• Scope 1 and 2 emission intensity measured in metric tonnes of $CO_2$ equivalent per tonnes of tyres produced.<br>• Water-use efficiency: Litres of water used per unit of production measured in liters per kilogram of the product.<br>• Water recycling/reuse rate: Percentage of water recycled or reused within manufacturing operations. |
| | • Purchase goods and services | • Carbon footprint of raw materials measured in kilogram $CO_2e$ per unit of purchased material.<br>• Percentage of sustainable material used compared to total raw material used in production measured in metric tonnes. Sustainable material includes renewable, recycled or bio-based materials. |
| | • Use phase emissions | • Carbon footprint of use-phase emissions measured in metric tonnes of $CO_2$ equivalent.<br>• Rolling resistance coefficient*: Rolling resistance is the force opposing tyre motion, measured as resistance per load in kilogram per tonne.<br>• Tyre wear rate**: The rate of material loss from tyres during use measured in gram per kilometre per tyre. |
| | • End-of-Life management | • ELT collection rate: Percentage of tyres collected at the end of their life cycle compared to the total units of tyres sold.<br>• Use of secondary materials in new tyres: Percentage of recycled materials (e.g., carbon black, rubber, or steel from ELTs) incorporated into new tyre production. |
| **Recycler** | • End-of-Life management | • ELT collection rate: Percentage of tyres collected at the end of their life cycle compared to the total units of tyres sold.<br>• Compliance rate with regulatory standards: Percentage of recycling units meeting CPCB guidelines.<br>• Upgrading recycling technology: Percentage of EPR funding utilised towards recycling technology advancement.<br>• Material recovery rate: Percentage of tyre mass recovered as usable materials (e.g., rubber, steel, carbon black) from recycling processes.<br>• Material used in new tyre manufacturing: Percentage of recycled material utilised in new tyre manufacturing.<br>• Revenue from recycled products measured in INR per tonne of tyres recycled. |

| | | |
|---|---|---|
| **Ecosystem level** | • End-of-Life management | • ELT collection rate: Percentage of tyres collected by the formal sector compared to the total units of tyres sold.<br>• Revenue from recycled products measured in INR per tonne of tyres recycled.<br>• Retreading: Percentage of tyres retreaded or reused before final disposal.<br>• Formal recycling rate: Percentage of total tyres processed by formal recyclers. Formal recyclers include those approved in accordance with CPCB compliance standards. |

***Rolling resistance coefficient:** The force resisting a tyre's motion relative to it load: where a lower coefficient means improved fuel efficiency and reduced emissions, a decrease is desirable.

****Tyre wear rate:** The rate at which tyre tread material is lost during use, measured by the reduction in tread depth, with lower wear rates indicating longer tyre life and better safety.

# 4

# Appendix

**This whitepaper incorporates insights and perspectives shared during the workshop, ‘Advancing Sustainability Practices within the Tyre Value Chain’, convened at Mahindra Headquarters on June 30, 2025.**

The workshop assembled 84 participants from 42 organisations, including tyre and automotive OEMs, Non-Governmental Organisations (NGOs), financial institutions, government bodies, and technology providers. The objective was to share best practices and identify innovative approaches for advancing sustainable tyre production and end-of-life management.

The session emphasised the critical need to address the tyre industry’s significant contribution to vehicle emissions and the challenges of End-of-Life Tyre (ELT) management in India. Key addresses highlighted sustainability as a strategic imperative driven by regulation, market expectations, and environmental urgency, with goals set for emissions reduction through innovation in product design, manufacturing, and circularity. Tyre OEMs presented varied strategies focusing on net-zero ambitions, retreadability, use of sustainable materials, and advanced recycling frameworks, while the panel discussion identified priorities such as system-wide coordination, regulatory support for retreading, enhanced audit mechanisms, consumer engagement, and formalisation of the informal recycling sector. Stakeholders stressed overcoming barriers in recycling technology, supply chain integration, and enforcement of Extended Producer Responsibility (EPR) schemes.

Overall, the discussions facilitated during the workshop established a robust foundation for ongoing collaboration among stakeholders, thereby strengthening collective efforts to promote sustainability across the tyre value chain.

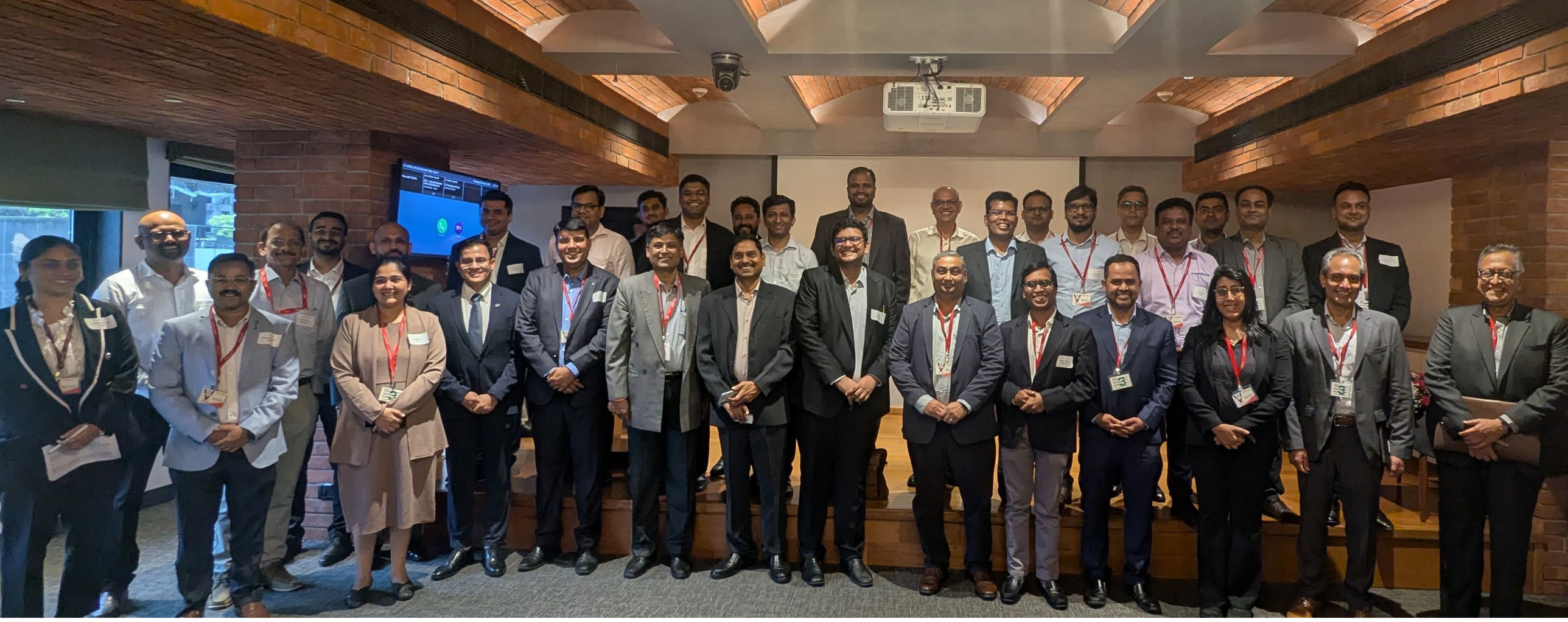
# EVENT DETAILS

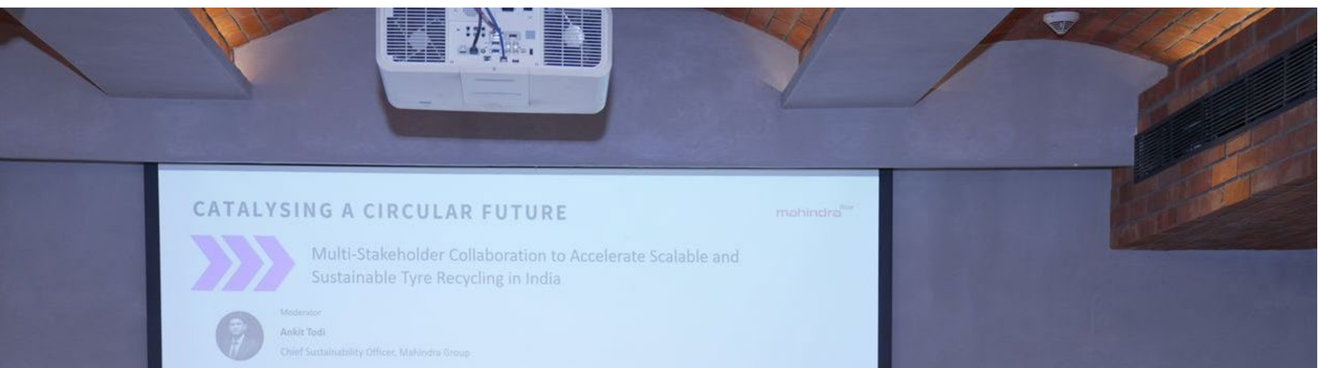
## ACCELERATING SUSTAINABLE PRACTICES WITHIN THE TYRE VALUE CHAIN

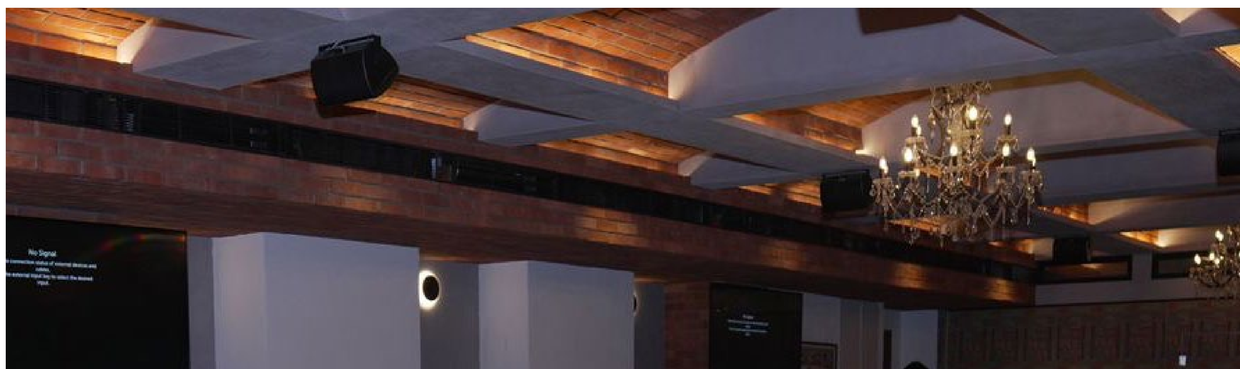
## AGENDA

30th June 2025 | 10:00 Hrs. – 16:00 Hrs. | Mahindra Towers, Worli, Mumbai

| # | Agenda Brief | Speakers | Time |
|---|---|---|---|
| 1. | **Welcome** | • A. Todi, Chief Sustainability Officer, **Mahindra Group** | 10 mins<br>(10:00 - 10:10) |
| 2. | **Keynote Address** | • A. Goenka, Vice Chairman, **RPG Group** | 20 mins<br>(10:10 - 10:30) |
| 3. | **Context Setting** | • V. Doshi, Associate Partner, **Xynteo** | 15 mins<br>(10:30 - 10:45) |
| 4. | **Stakeholder Perspective: Tyre OEM's Take** *(10-15 mins per OEM)*<br><br>"Sustainability in Manufacturing, Action for Tyre Recycling & Ecosystem Challenges" | • G S Bedi, AVP, OE Sales, **JK Tyres and Industries Limited**<br>• Dr. R. Jindal, Head, Global Regulatory & Compliance, **Apollo Tyres**<br>• J. Sharda, SVP, Quality, BE & Sustainability, **CEAT**<br>• S. Nakula, Director of Tech, APAC, **Goodyear Tires & Rubber Co.**<br>• Dr. A Sreekumaran Nair, DGM, R&D, **MRF**<br>• P. Saxena, Director, Enterprise Quality Mgmt. & Sust., **Bridgestone** | 90 mins<br>(10:45 - 12:15) |
| 5. | **Panel Discussion**<br><br>"Catalyzing a Circular Future: Multi-Stakeholder Collaboration to Accelerate Scalable & Sustainable Tyre Recycling in India" | • S. Chatterjee, ADG, **Association for Tyre Manufacturers** (ATMA)<br>• S. Sharma, Senior President & Director, BD & Strategy, **BKT Tires**<br>• Jyotin Kutty Sastabhavan, VP & CSO, **Tata Motors**<br>• Ekta Narain, Cofounder and CBO, **Recykal**<br>• V Babu, Former Director & Chief Vigilance Officer, **CPCB**<br><br>Moderated by A. Todi, CSO, Mahindra Group | 45 mins<br>(12:15 - 13:00) |
| 6. | **Lunch** | | 45 mins<br>(13:00-13:45) |
| 7. | **Stakeholder Perspective: A Recycler's Take**<br><br>India Recycling Landscape, Challenges & Best Practices | • H. Gandhi, Director, **Material Recycling Association of India** | 20 mins<br>(13:45 - 14:05) |
| 8. | **Stakeholder Perspective: supply chain partner's Take**<br>*(10 minute each)*<br><br>Tyre Recycling Technologies, Challenges and Solutions | • S. Dixit, CEO, **APChemi**<br>• Dr. P. Shinde, Regional Sales & NBD, **LyondellBasell**<br>• C. Dhole, AVP – Technical, Asia & ME, **Birla Carbon** | 30 mins<br>(14:05 - 14:35) |
| 9. | **Driving Sustainable Sourcing**<br>Challenges & Solutions for Natural Rubber Value Chain | • B. Bains, Communication Director, **Global Platform for Sustainable Natural Rubber** | 20 mins<br>(14:35 – 14:55) |
| 10. | **Solutioning Session: Group Discussion** | • Moderated by **Xynteo** | 40 mins<br>(14:55 - 15:35) |
| 11. | **Call For Action** - Measurement & Reporting Framework | • D. Gandhi, Manager, Strategic Sourcing, **Mahindra Group** | 10 mins<br>(15:35 - 15:45) |
| 12. | **Closing Remarks** | • A. Todi, CSO, **Mahindra Group** | 05 mins<br>(15:45-15:50) |
| | | **Followed by hi-tea and networking** | |







Sustainability is a strategic imperative driven by regulation, customer demand, investor expectations, and employee sentiment. The goal is to reduce emissions intensity by 50% by 2030 through innovations in product design, procurement, tyre usage, manufacturing, and end-of-life recovery. Achieving this requires strong change management, with leadership actively modelling and embedding sustainability into business practices."

**- Mr. Anant Goenka**
**Vice Chairman, RPG Group**

# REFERENCES


1. ATMA. Indian Tyre Industry Revenue to Soar to USD 22 Bn by Fiscal 2032.
2. SIAM (2022) Press Release: Tyre and Treads Industry in India.
3. Xynteo (2025) Market Research on Indian Tyre Industry.
4. ATMA. Indian Tyre Industry Revenue to Soar to USD 22 Bn by Fiscal 2032.
5. Markets and Markets (2025) Future of Indian Automotive Industry: Growth Trends 2030.
6. Niti Aayog (2025) 'EV roadmap: Seeks time-bound national EV policy, sets roadmap to reach 30% EV sales share by 2030', The Times of India.
7. Integrated Annual Report/Sustainability Reports of Indian Tyre Companies.
8. Integrated Annual/Sustainability Reports of Indian Tyre Companies.
9. MRF (2025) Tyre OEM Presentation. Workshop conducted on 30 June.
10. Integrated Annual/Sustainability Reports and Tyre Presentations.
11. Goodyear (2025) Tyre OEM Presentation. Workshop conducted on 30 June.
12. Xynteo (2025) Research Based on Publicly Available Data.
13. CEAT (2025) Tyre OEM Presentation. Workshop conducted on 30 June.
14. MRAI. The Industry: Rubber.
15. Times of India (2025) 'Govt urged to ban import of waste tyres', The Times of India.
16. MRAI (2025) Presentation on Rubber Industry. Workshop organised on 30 June.
17. MRAI. The Industry: Rubber.
18. Centre for Science and Environment (2024) Waste Tyre Dialogue: A Review of Pathways and Regulatory Gaps.
19. MoEFCC (2024) Environmental Compensation for Tyres, July.
20. MRAI (2025) Presentation on Rubber Industry. Workshop conducted on 30 June.


**Figures**



# DISCLAIMER

## ABOUT MAHINDRA GROUP

Founded in 1945, the **Mahindra Group** is one of the largest and most admired multinational federation of companies with 320k+ employees in over 100 countries. Mahindra operates across 20+ industries, with Auto, Farm, and Services as key sectors. The Auto sector includes market-leading SUVs, LCVs, Last Mile Mobility electric 3-wheelers, trucks, buses, and iconic brands like JAWA and BSA. In Farm, Mahindra leads in tractors and has diversified into farm equipment and Agri-products. Additionally, Mahindra's Services sector spans diverse industries, including Mahindra Finance supporting farmers and entrepreneurs, Tech Mahindra driving global technology solutions, hospitality (Holidays), real estate (life spaces), logistics, steel (Accelo), auto recycling (Cero), renewable energy (Susten), and aerospace and defence. The Mahindra Group has a strong focus on sustainability via its 'planet positive' strategy and has committed to adopting 100% renewable energy across its operations and becoming carbon neutral (for Scope 1 & 2 emissions ) by 2040 or sooner and addressing ecosystem emissions.

Learn more ↗

## ABOUT XYNTEO

**Xynteo** is a specialist advisory firm, based in Europe and India, on a mission to help global organisations and investors accelerate sustainable impact and value creation.

In a market dominated by traditional consultancies, Xynteo is disrupting the status quo. Our work goes beyond 'just strategy' to transform complex decarbonisation, energy transition and circularity challenges into practical, actionable pathways for commercial success. By forging longterm partnerships with our clients, leveraging our expertise and extensive alliance ecosystem, we empower companies to identify, realise, and scale opportunities at all stages of their value creation journey.

Our tailored solutions help organisations achieve meaningful, measurable results. We unlock systemic challenges through collaboration, devise sustainable value strategies, bring to life economically viable transformation, and generate impact across the investor portfolio lifecycle.

Learn more ↗

**Ankit Todi,** Chief Sustainability Officer, Mahindra Group
**Dr. Devendra Gandhi,** Manager-Strategic Sourcing, Mahindra Group
**Adwait Padwal,** Lead, Sustainable Strategy, Mahindra Group
**Suman Jagdev**, Partner, Xynteo
**Vaibhav Doshi,** Associate Partner, Xynteo
**Abhijeet Pandey,** Manager, Xynteo
**Shambhavi Sharma,** Consultant, Xynteo

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