→ *Tire Industry Project White Paper*

Environmentally sound management of tires at end of life *through a circular approach*

A guide for decision makers in the tire value chain

Executive Summary

Formed in 2005 by ten leading tire companies, the Tire Industry Project (TIP) has a mission to anticipate, understand, and address global environmental, social, and governance (ESG) issues relevant to the tire industry and its value chain.

This white paper reflects TIP's efforts to advance a comprehensive approach to end-of-life tire (ELT) management within the circular economy. It introduces the ELT Management Hierarchy and the Tire Recycling Ecosystem as tools to guide material recovery. Furthermore, it presents environmentally sound practices and highlights how data can enable circular material flows.

1. The *ELT Management Hierarchy in the Tire Life Cycle* tool serves as a key framework for optimizing tire lifecycle management, focusing on prevention, minimization, recycling, and energy recovery to enhance circular material flows and decision-making.
2. The Tire Recycling Ecosystem tool visually maps ELT movement through treatment processes, identifying those best suited for material recovery and energy generation.

These tools offer decision-makers in the ELT value chain around the world a common language and framework for ELT management.

To optimize ELT recovery and treatment, the white paper advocates for robust collaboration across the tire value chain. By prioritizing material recovery and adopting environmentally sound principles, stakeholders can significantly improve ELT management efficiency and elevate the sustainability of the tire industry.

In avoidance of doubt, this white paper is informational and policy-oriented. It does not recommend, require, or facilitate any coordinated commercial conduct. Each decision-maker shall exercise its own independent discretion and judgement in compliance with the applicable laws.

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Abbreviation	*Full Term*
ELTs	end-of-life tires
ESM	environmentally sound management
TIP	Tire Industry Project

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01. Introduction

1.1 What are end-of-life tires and how are they managed?

Tires play a crucial role in society. They are essential for the safe and efficient transport of people and goods and can enhance vehicle performance and comfort. Tire engineering is critical to ensure driving safety, endurance and comfort. Tires are complex, component-rich and innovative products that are designed to perform critical functions including:

- → Supporting vehicle weight
- → Gripping the road to steer, accelerate and brake
- → Optimizing rolling resistance for energy efficiency
- → Absorbing impacts and vibrations
- → Resisting heat and speed
- → Performing in wet and wintry weather
- → Ensuring a long wear life

Like the vehicles they serve, tires become worn as a result of their use and must be replaced when they can no longer perform their intended functions safely and effectively. Tires at the end of life have ideally been fully utilized through proper maintenance over their lifetime, having carried the vehicle for a maximum distance in safe conditions before being dismounted (Tire Industry Project, 2019).

When tires are no longer fit for use on a vehicle, they become a waste to be managed. Similarly, tires that are still functional but are removed prematurely for a variety of reasons also become a de facto waste. In this paper, end-of-life tires (ELTs) refers to tires that no longer serve their original purpose on a vehicle, covering both cases: tires that are no longer functional and tires that are still functional but dismounted and not intended for further use (International Organization for Standardization (ISO), 2024).

In June 2026, TIP published an Interactive Data Map providing the latest overview of ELT management practices worldwide. The map presents current data on ELT volumes managed through material recovery, energy recovery, and other end-of-life treatment pathways.

Drawing on information from 56 countries, the dataset captures approximately 33 million metric tons of ELTs annually. This expanded coverage represents a significant step forward in improving the visibility and understanding of global ELT management. While the dataset offers the most comprehensive picture assembled to date, it reflects only the countries for which data was available and should not be considered a complete global estimate.

- → Available data indicate that around **71% of global ELT arisings are recovered through known treatment pathways**, while the treatment route for approximately **21%** remains unknown.
- → **Material recovery** is the primary end-of-life management route worldwide, accounting for approximately **45% of ELT arisings** (12.5 million metric tons). Material recovery has continued to increase and represents the fastest-growing treatment pathway globally.
- → **Energy recovery** represents approximately **24% of ELT arisings** (6.7 million metric tons), making it the second most important recovery pathway. While energy recovery volumes continue to grow, its relative share is gradually declining as material recovery expands.
- → **Other recovery applications**, including civil engineering and similar uses, account for approximately **2% of ELT arisings** (0.6 million metric tons).
- → **No recovery** pathways, including landfill and uncontrolled disposal, account for approximately **7% of ELT arisings** (2.0 million metric tons). This proportion remains substantially lower than reported in earlier global assessments.
- → Approximately **21% of ELT arisings** (5.9 million metric tons) are reported as **unknown**, reflecting remaining data gaps and uncertainties regarding treatment routes. Although this category has decreased significantly compared with previous assessments, important information gaps remain, particularly in several large Asian markets and other regions where reporting systems are still developing.
- → Despite significant improvements in data availability and transparency achieved through TIP's 2025 Data Collection Initiative, important gaps remain in the reporting of ELT management pathways across several countries and regions. Addressing these gaps will require continued harmonization of reporting methodologies, stronger engagement with local stakeholders, and ongoing collaboration. As a result, actual global ELT generation and treatment volumes are likely to exceed the figures currently captured in the dataset.

The societal challenge we face is to further strengthen ELT management around the world. Adopting environmentally sound management (ESM) principles will play a pivotal role in ensuring that waste is handled responsibly, resources are recovered efficiently, and environmental impacts are minimized (Basel Convention, 2013).

1.2 How ELT management contributes to a circular economy of materials

ELTs have been part of a circular economy for many years in countries where a structured management system has been developed, whether through producer responsibility organizations, government-run systems or free markets framed by regulation (International Organization for Standardization (ISO), 2024; Tire Industry Project, 2026).

Strengthening the circular economy of ELTs depends on three key factors:

- improving the collection rate,
- increasing the overall recovery rate (material and energy recovery), and
- growing the share of material recovery versus energy recovery.

Indeed, material recovery is the sole pathway to extending the use of the resources extracted, processed and used in the production of new tires. It is only through material recovery that these resources can be re-processed to remain part of the economy: as secondary raw materials for the creation of new products.

This paper examines pathways to material recovery in two ways:

- First, by taking a fresh look at the "waste hierarchy" approach, which underpins public policy on waste management in many countries and expanding it to "tire lifecycle management hierarchy" in line with circular economy principles.
- Second, by mapping the material flows from ELTs to secondary raw materials through the different types of recovery and treatment methods and highlighting the material flows that are circular.

In this paper, TIP aims to empower decision-makers in the ELT value chain to reexamine ELT as a valuable opportunity to contribute significant volumes of secondary raw materials to the economy, rather than merely viewing them as a waste management challenge. The environmental benefits of circular material flows are multiple: improved waste management and resource conservation by reducing the demand for virgin resource extraction, and the potential for lower life-cycle impacts from

02. End-of-life tire (ELT) Management Hierarchy in the Tire Life Cycle

TIP's approach to promoting the circular economy and a more environmentally sound management of ELT is grounded in the leading policy framework worldwide for waste management: the "waste hierarchy."[1] The concept is straightforward, as it involves implementing measures in the following order of priority at a societal, governmental, household, or individual level:

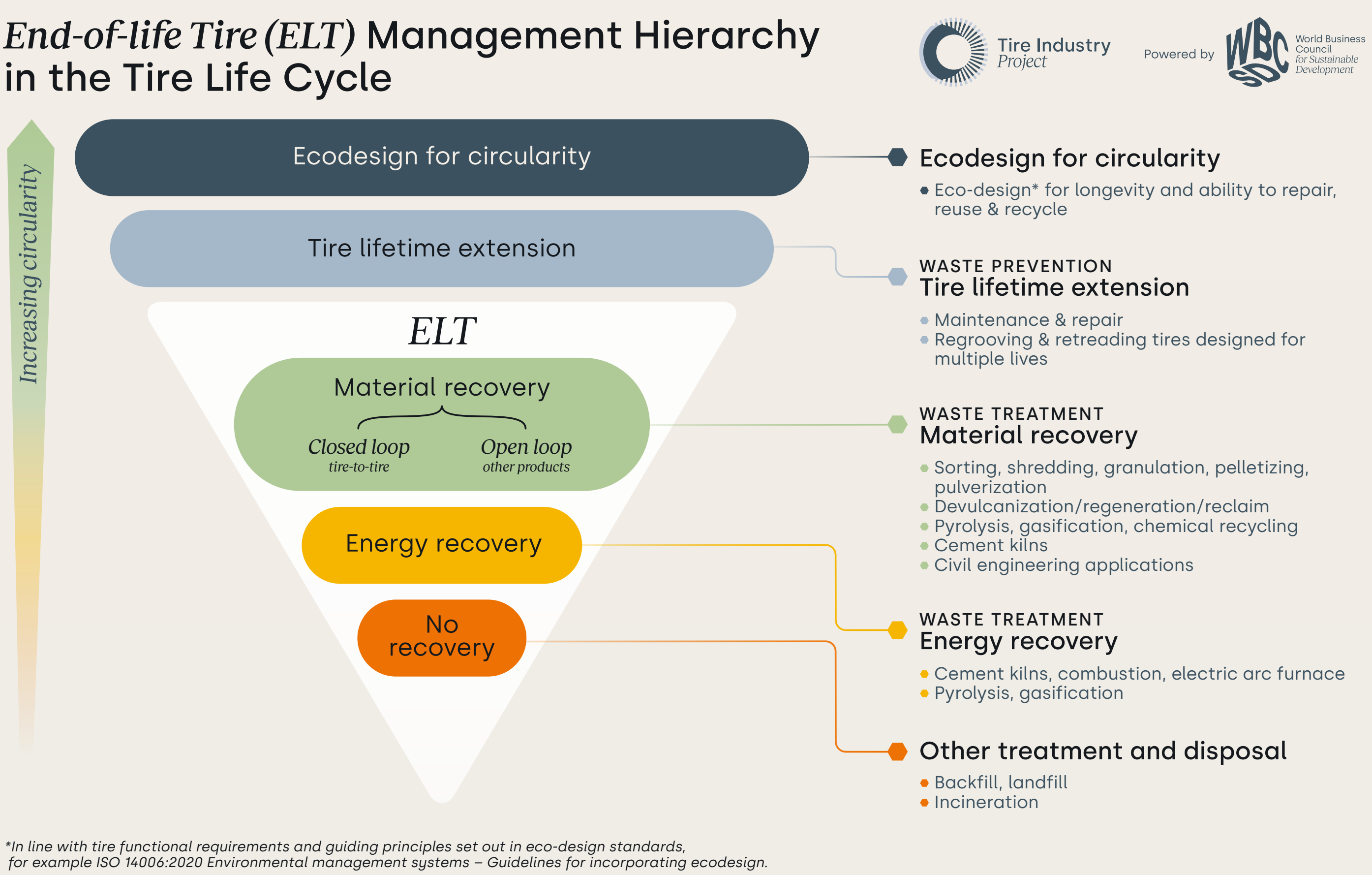
1. Prevent: Stop waste from being created in the first place
2. Minimize: Reduce the amount and toxicity of waste generated
3. Reuse: Extend the life of products or materials without major reprocessing
4. Recycle: Convert waste materials into new products or materials
5. Recover in other ways: Extract value from waste through energy recovery
6. Dispose: Safely manage residual waste that cannot be prevented, minimized, reused, recycled, or recovered

Based on its assessment of waste hierarchy principles, TIP developed the *ELT Management Hierarchy in the Tire Life Cycle* (see Figure 1), a framework adapted specifically to the case of ELTs. It follows the same hierarchy of priorities and suggests actions specifically related to tire management. These actions span product design, product use and end-of-life treatment.[2]

Eco-design for circularity

Eco-design principles provide a framework to set improvement goals for reducing environmental impacts across the life cycle of a product. The principles specify product functions, determine the relevant environmental parameters and environmental improvement objectives, set targets for the environmental parameters, create product specifications that address these targets, and develop solutions to meet the product specifications (International Organization for Standardization (ISO), 2020).

Figure 1: ELT Management Hierarchy in the Tire Life Cycle



[1] A waste hierarchy is presented in the 2013 edition of the "Revised Technical Guidelines for the Environmentally Sound Management of Used and Waste Pneumatic Tyres" under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal to which 191 countries are parties. The waste hierarchy approach has been used by many governments around the world as well as by international institutions: as recently as 2024 in United Nations Environment Program" Global Waste Management Outlook", and as far back as 1993 when the "Lansink Ladder" included in the Netherlands Environmental Management Act of 1993. Longstanding examples include the European Commission. Waste Framework Directive (2008), the United States Environmental Protection Agency Sustainable Materials Management framework and solid waste guidance dating back to the 1980s.

[2] The term "treatment" refers to all types of management at end of life, including material recovery, energy recovery and disposal.

Applied to tires, the approach entails a focus on creating long-lasting tires with minimized usage of materials, incorporating a higher proportion of recycled or renewable raw materials, and reducing pollution risks through responsible chemical management of substances in the tire value chain. The principles extend the operational lifespan of tires, enhance their reparability, reusability, and recyclability, while maintaining essential safety and driving performance standards.

Eco-design standards (e.g., ISO 14006) ensure that the final product meets all functional requirements, including those with regulatory thresholds and/or labelling requirements (e.g., safety, energy efficiency, noise) and reduce environmental impacts across the full life cycle, from cradle to grave.

Tire lifetime extension

Before a tire reaches the end of its service life and becomes waste to be managed, several approaches can enable a longer service life.

- → **Preventive maintenance:** Regular tire rotation and monitoring of inflation pressure help maintain even wear, improve safety, and extend the tire's useful life before major interventions are needed.
- → **Repair:** Minor damage such as punctures can sometimes be safely repaired by trained professionals to restore functionality without replacing the entire tire.
- → **Regrooving:** Removes additional rubber from the tread to deepen the grooves, restore grip, traction and extend the service life.
- → **Retreading:** Involves replacing the worn tread of a tire on a casing designed for multiple lives with a new tread layer by vulcanization [3], extending the tire's service life without the need for full replacement.

Material recovery

Once a tire reaches the end of its (extended) life, prioritizing material recovery is essential in managing ELT. Material recovery encompasses all treatment processes aimed at reclaiming materials from ELT for reuse, which can be broadly categorized into two main approaches:

- → **Closed-loop recycling** involves using ELT-derived secondary raw materials, such as rubber compounds, to manufacture components for new tires. Due to stringent tire performance and safety requirements, advanced recycling methods are necessary to produce high-quality secondary materials that meet these standards. Since current global production of such materials is limited, increasing capacity is a priority for stakeholders throughout the value chain to enhance circularity within the tire industry.
- → **Open-loop recycling** refers to the utilization of ELT-derived secondary raw materials for non-tire applications across various sectors, such as construction, public works, automotive components and consumer goods. ELT can also be applied as a whole or in large cut pieces in civil engineering projects, where they offer structural benefits when safely incorporated into infrastructure. This form of recycling helps divert tires from waste streams and supports a variety of industries.

While the closed-loop approach is more circular, it also currently faces technical limitations, particularly in meeting the demanding safety and performance criteria of new tires. In contrast, the open-loop approach can accommodate ELT materials with fewer quality constraints, thereby providing immediate markets. Both approaches are therefore valuable depending on the situation. Over time, research and development, innovation, and tires with eco-design principles are expected to enable higher-quality ELT-derived secondary raw materials suitable for closed-loop reuse, gradually shifting the balance toward more circular tire production and consumption models (International Organization for Standardization (ISO), 2024).

Energy recovery

When reuse or material recovery options are limited or economically infeasible, ELTs can be a valuable source for energy recovery through combustion. Waste tires have a calorific value ranging from 30-40 MJ/kg, which exceeds that of coal and other solid fuels. This makes ELTs an attractive alternative fuel for industrial applications in cement kilns, pulp and paper mills, and power plants (Recycling Europe, 2022). Known as tire-derived fuel or TDF, this alternative fuel is also commonly used in electric arc furnaces to supplement energy needs. The co-combustion of ELTs with coal, for example, can improve boiler thermal efficiency and is also employed in processes to produce electricity, paper, lime, and steel (Pan, Jiang, Guo, Huang, & Pan, 2021).

No recovery: Other treatment and disposal

Finally, there are treatment methods that lead to neither material nor energy recovery, the main ones being land disposal and incineration with no energy recovery. These processes should be minimized to the greatest extent possible in the future as they permanently end the flow of materials and resources from ELTs and thus do not support any type of circular economy models.

By taking an overall view of the tire life cycle, it becomes clear that circular economy principles fit seamlessly in the waste hierarchy policy approach. Producing secondary raw materials from ELTs is a central step in the continuum of circular actions that are possible across the waste prevention, minimization, and treatment stages.

The next section focuses on recycling methods and the materials that can be produced and re-entered into the economy.

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[3] Vulcanization is a process of cross-linking rubber molecules chemically with organic or inorganic substance through heat and pressure. It makes rubber elastic. Devulcanization, which breaks these cross-links to restore processability, is described in the following content on chemical recycling.

03. Generating materials from end-of-life tires

To aid in understanding the full set of options for recycling ELTs, TIP developed the diagram below (see Figure 2) which shows the main recycling pathways known to date. Starting at the top, the diagram outlines the initial processes of collecting and sorting used tires, followed by various treatment processes.

The treatment flows end with the outcomes: secondary raw materials or energy recovery through combustion. The outcomes are color-coded according to the ELT Management Hierarchy in the Tire Life Cycle. From left to right, the colors indicate the type of recovery.

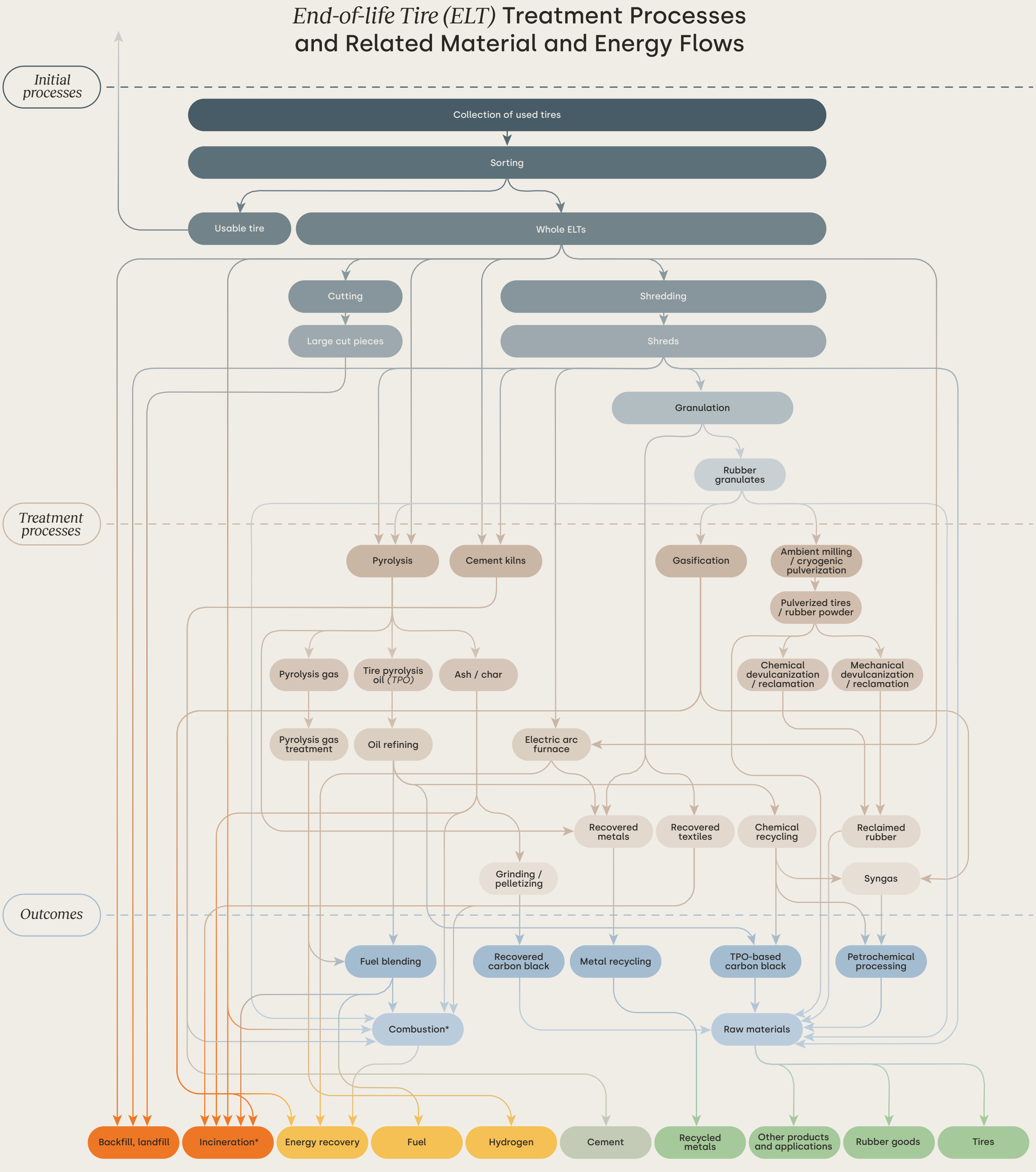
→ **Green:** "Material recovery"

→ **Green & yellow:** "Hybrid treatment"

→ **Yellow:** "Energy recovery"

→ **Orange:** "No recovery"

Figure 2: Tire Recycling Ecosystem



*Residues can be used as a raw material, for example in civil engineering applications, or can be disposed of in a landfill.

Initial processes

Once a used tire has been collected, the next crucial step in the life cycle is sorting. Each tire needs to be assessed for two options that keep the tire itself or its materials in the economy: potential reuse[4], or processing as an ELT to be recycled.

Next, recycling begins with pre-processing methods that prepare the ELT for further treatment, including:

1. Initial cutting of wire rolls into pieces, which are approximately 100 cm. (see Figure 3)
2. Processing into shreds (containing metal), which are approximately 5-30 cm. (see Figure 4)
3. An intermediate step of processing into chips (containing metal), which are approximately 1.5-5 cm. (see Figure 5)
4. Removing the metal and processing into granulates, which are approximately 0.1-0.5 cm. (see Figure 6)

Treatment processes

Following the completion of pre-processing, materials can undergo various treatment methods aimed at material and energy recovery. These include mechanical, thermal, and chemical techniques that transform the outputs into usable components:

- → Mechanical: pulverization through ambient milling or cryogenic methods, devulcanization/reclamation, pelletizing/grinding
- → Thermal: pyrolysis, gasification[5], cement kilns, electric arc furnace, combustion
- → Chemical: syngas treatment, oil refining, chemical recycling, fuel blending, devulcanization/reclamation
- → Thermo-chemical-mechanical: devulcanization/reclamation

The treatment processes yield a variety of recovered materials, highlighted as outcomes below.

Figure 3: Bales of ELTs

Figure 4: ELT shreds

Figure 5: ELT chips

Figure 6: ELT granulates

[4] Potentially suitable for repair, regrooving and/or retreading, or fit to safely equip a vehicle following the appropriate technical assessments.

[5] Within the European context, pyrolysis and gasification are considered as chemical recycling.

Outcomes

Treatment processes usually result in either material outputs or fuel/energy outputs.

- Materials (highlighted in green): tire pyrolysis oil-based carbon black, recovered carbon black, rubber materials in several forms and sizes (granulates, powders, solid sheets or blocks), recycled metals, cement, and other products (including tires) manufactured out of the recovered raw materials.
- Fuel/energy (highlighted in yellow): hydrogen, fuel, recovered energy.

Finally, the outcomes resulting in neither materials nor energy (highlighted to the far left in orange) are incineration (with no heat recovery) and backfilling or landfilling.

The different ELT treatment processes depicted in the flow diagram are currently implemented at varying levels of maturity and practice, as indicated in Table 1 below.

Table 1: : Maturity and practice of ELT treatment processes with a focus on generation of secondary raw materials

Treatment process	*Secondary raw materials*	*Geographic occurrence*	*Maturity levels*: technological*	*Maturity levels*: industrial scalability*
Mechanical processes	Rubber granulates & powders	Worldwide (Verified Market Reports, n.d.)	Very high (Hoyer, 2020)	Very high (U.S. Tire Manufacturers Association (USTMA), 2024)
Thermo-chemical-mechanical processes	Devulcanized and reclaimed rubber	Worldwide (OEC World, n.d.)	Very high (OEC World, n.d.)	High (OEC World, n.d.)
	Recovered carbon black (from further processing of pyrolysis ash)	Asia, Europe, US (Strategic Revenue Insights, 2025)	Medium (Sorunmu, 2019)	Low to medium (Market Growth Reports, n.d.)
	TPO-based carbon black (from further processing of pyrolysis oil)	China, India, Europe, US (Strategic Revenue Insights, 2025)	Medium (Fortune Business Insights, n.d.)	Low to medium (Carbon Black Sales, n.d.)
	Monomers (from chemical recycling of pyrolysis oil)	Asia, US, Europe (Jafri, 2020)	Medium (EuRIC, 2022)	Low (IEA Bioenergy, n.d.)

*The maturity levels reported in this table are based exclusively on processed volumes.

04. Environmentally sound management (ESM) of ELT

ESM of ELT is grounded in the principles of the Basel Convention, including the "polluter pays" principle (European Commission, 2023) and the minimization of cross-border waste movement. Building on these foundations, the ELT management hierarchy (see Figure 1) is a practical framework for applying ESM in a tire-specific context (Basel Convention, n.d.).

By following the hierarchy, stakeholders can ensure that all viable options for prevention, reuse, recovery, and recycling have been systematically considered before disposal, translating ESM principles into concrete implementation steps for the tire sector.

The core ESM principles are:

1. **Prevention and reduction:** Extend the lifespan of tires through design innovation, maintenance, and retreading.
2. **Material recovery:** Prioritize recycling to recover valuable materials like rubber, steel, and textiles.
3. **Waste-to-energy or WtE:** Use controlled methods to convert ELTs into energy while minimizing emissions.
4. **Minimized environmental impact:** Prevent pollution from improper disposal methods.
5. **Circular economy integration:** Promote the reuse of ELT-derived materials in manufacturing new products (Basel Convention, 2013).

ESM framework and implementation

ESM involves establishing and enforcing national laws and regulations that align with international waste management agreements. By clearly delineating roles among stakeholders such as government agencies, industry, and civil society, effective implementation of ESM can be achieved:

- → **Establishing a policy framework** that includes adopting management systems and banning undesirable practices (such as landfilling and open burning of ELTs) are necessary to support ESM principles. It is essential for the public authorities to set specific recycling targets and make investments to develop robust recycling infrastructure.
- → Building **ELT collection and logistics systems,** optimizing logistics, and encouraging consumer participation all play a critical role in ESM effectiveness. As a part of this, developing technical capacities is crucial for efficient waste management.
- → **Training** initiatives for workers and regulators not only improve knowledge retention but also ensure adherence to ESM practices.
- → **Tracking systems** enhance accountability, prevent unauthorized disposal practices, and optimize transportation efficiency, while regular **audits and reporting mechanisms** reinforce commitment.

By building up **recycling capacity** with advanced technologies based on regional needs and resources – as described in Section 3 – material recovery can be enhanced significantly.

Collaborative engagement for ESM

Effective ELT management requires an inclusive approach that aligns industry initiatives with public engagement to ensure transparency and accountability. Providing open access to information and fostering community involvement, such as through education and awareness campaigns, are key to implementing ESM. Sharing knowledge and proven solutions would strengthen global waste strategies and support less advanced nations to adopt modern recycling technologies, thereby delivering better outcomes worldwide.

Applying ESM principles offers a practical framework to address waste challenges, enhance resource recovery, and advance circular economy goals while minimizing environmental impacts.

05. ELT data as an enabler for circular material flows

Data is pivotal to measuring material and fuel/energy outputs from recycling and can provide multiple benefits to support the development of circular economy business models in the tire industry.

High-quality ELT data can:

- enable baseline assessments of current resource uses and flows by region and worldwide
- be used to determine the effectiveness of ELT material recovery processes
- enable accurate market monitoring and non-prescriptive technology mapping for actors in the ELT management system
- support operators of ELT treatment facilities and management systems to make informed choices about processes that extend the useful life of materials
- help policy makers in setting frameworks to enable ELT collection, material recycling, and other recovery, and the market acceptance of ELT-derived materials
- support tire producers to make informed decisions about tire design in terms of secondary raw materials and their life cycle environmental impacts

TIP believes firmly in the need for all actors in the tire value chain to participate in making ELT data more available.

Going forward, TIP aims to build on the original 2019 worldwide data collection to create a comprehensive ELT data collection initiative[6] and deepen understanding of status and practices worldwide. This effort aims to contribute to discourse, pave the way to streamline systems, and support practitioners globally. To make it happen, we invite you – whether from industry, government, or organization – to collaborate with TIP by sharing your knowledge and experience. Together, we can shape the future of environmentally sound ELT management.

06. Conclusion

This white paper introduces two pivotal tools – the *ELT Management Hierarchy in the Tire Life Cycle* and the *Tire Recycling Ecosystem* – intended to guide decision makers in the ELT value chain, whether for public policy, market development, research and development, or investment. These tools serve as a strategic framework, fostering a shared understanding to enhance ELT management practices. Aligned with TIP's mission, the aim is to increase the circular material flow of ELTs to, in turn, significantly increase the market availability of secondary raw materials.

Improving ELT management requires robust data collection and standardized information on recovery and treatment processes across global markets. This will strengthen the management of ELT-derived secondary raw materials and help position them as tradeable commodities alongside virgin materials. Integrating ESM principles ensures responsible handling, minimizes environmental impacts, and highlights ELTs as valuable resources that support global sustainability goals.

The path forward lies in a shared vision of the market's potential and a more circular approach to ELT management. By adopting these tools and working collaboratively across the value chain, stakeholders can unlock new opportunities for resource efficiency, environmental soundness, and meaningful contributions to the circular economy.

Acknowledgements

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[6] Any TIP data initiative is based on aggregated, anonymized, and time-lagged data and prevents competitive inference at individual company or facility level.

Glossary of key terms

Ambient milling – A process where rubber is granulated and sieved at ambient temperatures and separated into granulates and powders (EuRIC, 2022).

Cement kilns – An industrial equipment used for the thermal processing stage of manufacture of cement.

Char – A solid carbonaceous residue formed during carbonization of organic compounds. The residue is formed via polymer decomposition and coking reactions during the pyrolysis of rubber goods, a process during which the organic components are thermally cracked and recovered predominantly as gas and oil products. A portion of this organic matter additionally cokes in-situ, creating carbonaceous residue. This carbonaceous residue can form on the surface of the fillers in the rubber article and in the reactor. The amount formed is highly process-dependent. In the absence of mechanical post treatment, char has low commercial value (ASTM, 2024).

Chemical recycling – A process which converts polymeric waste by changing its chemical structure to produce substances that are used as products or as raw materials for the manufacturing of products. Products exclude those used as fuels or means to generate energy (European Coalition for Chemical Recycling, n.d.).

Circular economy – An economic system that uses a systemic approach to maintain a circular flow of resources, by recovering, retaining or adding to their value, while contributing to sustainable development (International Organization for Standardization (ISO), 2024).

Closed-loop recycling – A resource flow model which uses ELT-derived secondary raw materials, such as rubber compounds, to manufacture components for new tires.

Combustion – An energy recovery method for ELT tires. ELTs are utilized as fuel in industrial boilers or kilns to maximize energy recovery.

Cryogenic milling – A technology for processing materials at very low temperatures. It is commonly used to embrittle rubber producing pulverized tires or rubber powder (Pegg, 2007; EuRIC, 2022).

Devulcanization – A process of reversing rubber vulcanization by breaking or modifying cross-links between rubber molecules, typically sulfur-based, to make the rubber reusable. Methods include thermal (using heat), chemical (using agents like thiols), mechanical (using shear forces), ultrasound (using high-frequency sound waves), and microbial (using microorganisms). It aims to restore rubber to a virgin-like state for reuse (Tzoganakis, 2019).

Electric arc furnace – A method where scrap metal is introduced into an electric arc furnace, followed by tires (shredded or whole), to convert carbon monoxide gas into carbon dioxide in the furnace. Carbon dioxide, in turn, is often used in steelworks (Tire Industry Project, 2008).

Energy recovery from ELTs – A process that involves extracting the fuel or heat value from whole or processed tires through combustion (Tire Industry Project, 2019).

End-of-life tire (ELT) – A tire that no longer serves its original purpose on a vehicle and is taken out of use. This can be a tire that is no longer functional or a tire that is still functional but is dismounted and not intended for further use.

Gasification of rubber – A method where chemical or heat processes are used to convert rubber into gas.

Granulation – A recovery method which involves breaking down ELTs into increasingly smaller pieces, down to fine particles through different processes to obtain rubber granulate and powder. In the process, textiles and metals are separated from the rubber.

Incineration – A process that involves reducing combustible wastes, such as scrap tires, to inert residue through controlled high-temperature combustion. Incineration does not lead to energy recovery.

Landfilling – A disposal method involving the final depositing of solid waste at, below or above ground level at engineered disposal sites, excluding uncontrolled waste disposal such as open burning and dumping.

Material recycling / recovery – A process in which ELTs are recovered as new materials.

Mechanical recycling of ELTs – A process in which ELTs are shredded and processed into materials such as crumb rubber and rubber powder, which can be used in construction (e.g., rubberized asphalt) and consumer & industrial products.

Open-loop recycling – A resource flow model which utilizes ELT-derived secondary raw materials for non-tire applications across various sectors, such as construction, public works, automotive components and consumer goods.

Pyrolysis of ELTs – A thermochemical decomposition process, occurring in the absence of oxygen, that breaks down waste such as tires at end of life through high-temperature heating (400-700℃) to produce high-quality raw materials.

Reclamation of rubber – A process where scrap rubber is treated to recover its original plasticity and flexibility. Unlike devulcanization, reclamation does not fully reverse vulcanization but rather involves softening rubber through heat and mechanical action and to partially break down the rubber matrix with chemicals.

Recovered carbon black (r-CB) – A material obtained by the pyrolysis of ELT rubber for tire-to-tire closed-loop applications. A mix of carbon blacks derived from the tire and ash (silica, ZnO, etc.), the material is semi-reinforcing and used as a filler to enhance the properties of rubber in tire formulations. As a filler, the overall quality is lower than that of sustainable carbon black (see definition of TPO-based carbon black below).

Recycling – A method that involves the reprocessing of articles such as ELT to produce products, materials, or substances. This excludes the production of tire-derived fuel, which converts scrap tires into energy.

Regrooving – A technique that consists of cutting a pattern into the tire's base rubber to extend the duration of its use.

Repair – A process aimed at extending a tire's lifetime by repairing punctures or other damage.

Retreading – A process of reconditioning/refurbishing a used tire by replacing the worn tread with a new tread material, which can also include renovation of the outermost sidewall surface and replacement of the crown plies or the protective breaker.

Reuse – Any operation where products or components that are not waste are used again for the same purpose for which they were created. This is a key waste prevention practice, a priority over recycling in the waste hierarchy, because it means the materials never become waste in the first place. In the case of tires, reuse involves remounting a used tire that is still fit for safe use on a vehicle or is made fit for continued use following repair, regrooving and/or retreading.

Rubber powder – A material known as micronized rubber powder (MRP) composed of dry powdered rubber particles, usually smaller than 1000μm.

Shredding – A recovery method which involves cutting ELTs into pieces ranging typically from 5 to 30 cm across.

TPO-based carbon black – A material produced from tire pyrolysis oil, or TPO, characterized by properties and performances similar to those of virgin carbon black. Sustainable carbon black (s-CB), a related form, is produced from distillated tire pyrolysis oil, and is considered "sustainable" because it is an equivalent substitute for carbon black produced from virgin fossil fuel feedstock, having the same properties. Both are used as a filler to reinforce the properties of rubber in tire formulations (BlackCycle, 2020).

Waste – A term describing objects or substances that are discarded, intended for disposal, or mandated to be discarded, often due to lack of utility or necessity.

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