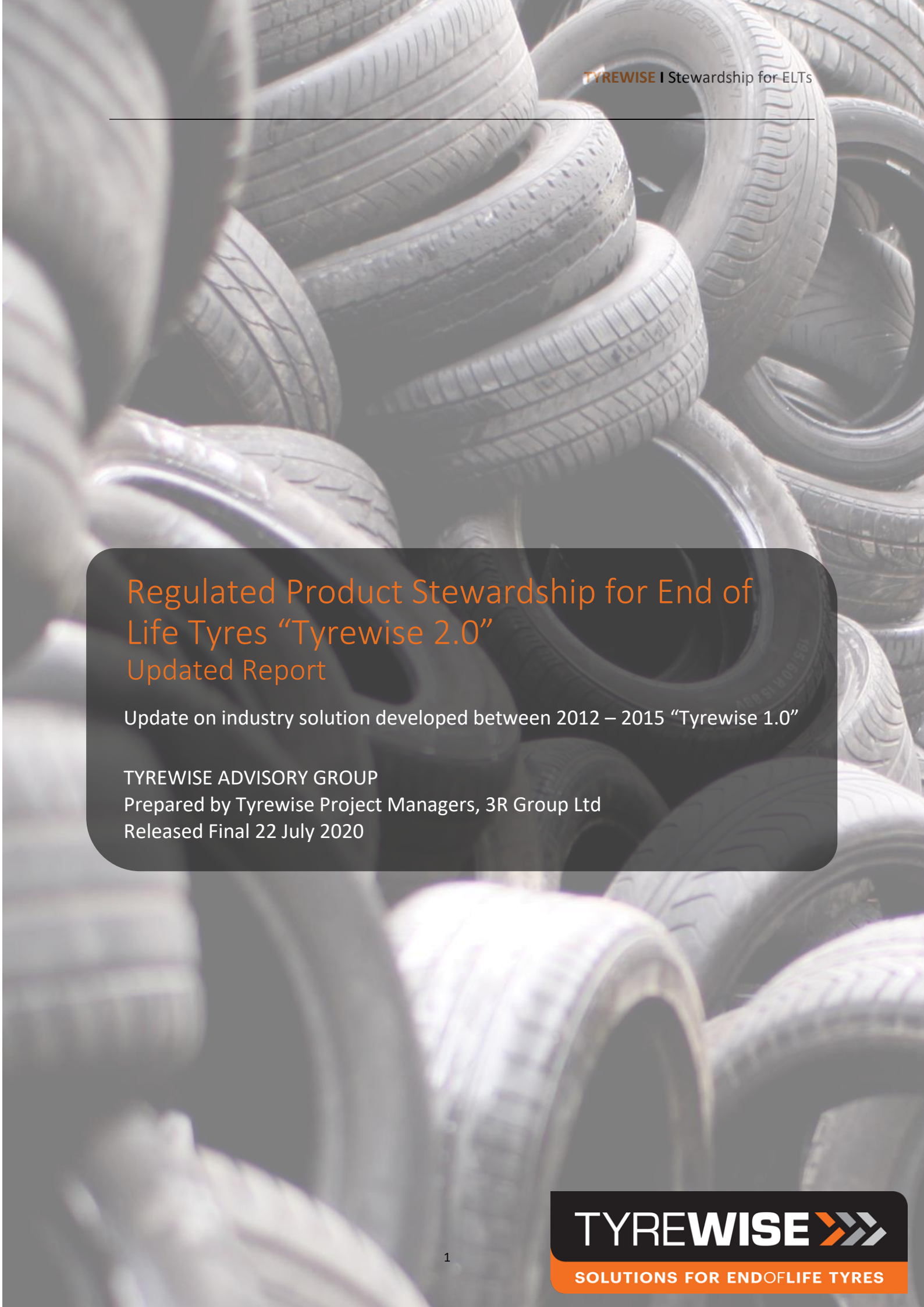

# Regulated Product Stewardship for End of Life Tyres "Tyrewise 2.0"

## Updated Report

Update on industry solution developed between 2012 – 2015 "Tyrewise 1.0"

TYREWISE ADVISORY GROUP
Prepared by Tyrewise Project Managers, 3R Group Ltd
Released Final 22 July 2020



TYREWISE
SOLUTIONS FOR ENDOFLIFE TYRES

**Disclaimer Clause**
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# Abbreviations

| | |
|---|---|
| AA | NZ Automobile Association |
| ADF | Advanced disposal fee |
| BOFI | Brand Owner First Importer |
| CBA | Cost Benefit Analysis |
| ELT | End of life tyre |
| EPU | Equivalent passenger unit |
| MIA | Motor Industry Association |
| MTA | Motor Trade Association |
| NZTRACA | NZ Tyre Recycler and Collector Association |
| PSO | Product stewardship organisation |
| TDA | Tyre derived aggregate |
| TDF | Tyre derived fuel |
| TDP | Tyre derived product |
| VIA | Imported Motor Vehicle Industry Association |
| WMA | Waste Minimisation Act 2008 |

# Glossary

**Advance disposal fee**
A fee that is charged to the originators of tyres imported into the New Zealand market, either as loose tyres or as tyres fitted to vehicles

**Buffings**
Rubber removed from tyre casings to prepare them for retreading or during finishing of the tyres after the retreads are applied

**Collector**
An entity who operates a collection site

**Collection site**
A location where end of life tyres are consolidated from either a member of the public or from generators. In areas where there is only one collection site the collection site **must** be able to accept tyres from the public. In the case of closed landfills only commercial operators/contractors with a waste disposal license will be allowed access

**End of life tyre**
A tyre that is no longer capable of performing the function for which it was originally made

**Environmentally sound use**

a) Means the use of end of life tyres for:
   i) Recycling into tyre crumb, shred, chips, granules, steel or other tyre components
   ii) Use as a fuel (other than in direct incineration) or other means to generate energy;
   iii) Production of tyre derived products including tyre derived fuel
   iv) Civil engineering (including the civil engineering use of tyre derived products to improve the functioning of landfill sites)
b) But excludes
   v) Disposal through dumping, landfill, incineration or burning;
   vi) Stockpiling as an end point;
   vii) Export of whole baled tyres for operations listed under b (v) and (vi)

**Equivalent passenger unit**
A standardised measure for the quantity of tyres. One EPU contains as much rubber and other materials as a 'typical' passenger tyre

**Fee**
A charge to the originators of tyres imported into the New Zealand market, either as loose tyres or as tyres fitted to vehicles. Same as advance disposal fee

**Generator**
An entity that generates tyres as a result of their operations; these businesses then register as a generator. A generator is **not** required to take ELTs from the public other than as a result of providing service to their customers (i.e. garage). Any arrangements put in place around the volume required for a pickup or the frequency of pickups will be made between the generator and the transporter

**Importer**
An entity that imports loose tyres or imports vehicles that are fitted with tyres and spare tyres

**Landfill**
Waste disposal sites used for the authorised deposit of solid waste on to or into land

| |
|---|
| **Legacy tyre**<br>Stockpiled tyres that still have an owner/responsible person |
| **Manufacturer/end user**<br>An entity that receipts in product derived from ELTs that have been produced by a processor. The manufacturer/end user uses this product in the manufacture of further products or in an end use |
| **Microplastics**<br>Traffic-related non-exhaust particulate matter mainly consisting of tyre wear, brake wear, and road wear from the use of the tyres. |
| **Orphan tyre**<br>A tyre that has been abandoned and is deemed to no longer have an owner |
| **Priority product**<br>A product that the Minister has declared "priority" in accordance with Section 9 of the Waste Minimisation Act 2008. A product that causes significant environmental harm when it becomes waste; or there are significant benefits from reduction, reuse, recycling, recovery, or treatment of the product, and it can be managed effectively under a product stewardship programme |
| **Product stewardship**<br>A term that describes 'cradle to cradle' methodology that helps reduce the environmental impact of manufactured products, where producers or manufacturers, brand owners, importers, retailers, consumers and other parties accept responsibility for the environmental effects of their products – from the time they are produced until the end of their useful life and are recycled or disposed. Also known as extended producer responsibility (EPR) |
| **Product stewardship organisation**<br>The entity designated by a producer or producers to act on their behalf to administer a product stewardship programme. It can also be referred to as a producer responsibility organisation (PRO), industry funding organisation or delegated administrative organisation |
| **Processor**<br>An entity recovering rubber, steel, textile and/or other materials and processing it into a form whereby it can be used as an intermediate product in the manufacture of tyre derived products. The processor receipts in end of life tyres (either whole or partially processed) from a transporter. The processor then transforms the end of life tyre into either a functional end use product or a product that is sold/supplied to a manufacturer/end user. Also called a recycler |
| **Pull model**<br>A term that refers to a model that "pulls" the stewarded product (in this case the end of life tyre) through the supply chain with payments focused on creating demand for the material which facilitates the "pull" effect |
| **Push/pull model**<br>A term that refers to a model that both "pushes" and "pulls" the stewarded product (in this case the end of life tyre) through the supply chain with payments placed at all points within the chain to facilitate this |
| **Regulated product stewardship programme**<br>Legislation requiring that a priority product must be stewarded within a regulated product stewardship programme. The programme(s) will be compulsory rather than voluntary. As at 21 December 2019 there were no declarations of priority product and therefore no related products stewardship programmes. |
| **Re-use**<br>Collecting a tyre for the same or similar purpose as the original purpose without subjecting the tyre to a manufacturing process that would change its physical appearance |
| **Re tread**<br>Tyre casings are recapped typically specialty and large commercial tyres. |

| |
|---|
| **Seller and Sale**<br>Seller means a person who sells or agrees to sell goods as defined in the Sale of Goods Act 1908 |
| **Transporter**<br>A transporter of end of life tyres (either whole or part processed) that collects from both collection sites and generators and delivers these end of life tyres to a processor |
| **Tyre**<br>A vulcanised rubber product designed to be fitted to a wheel for use on, or already fitted to, motorised vehicles and non-motorised trailers towed behind motorised vehicles. For the purpose of this report a 'tyre' includes but is not limited to those for motorcycles, passenger cars, box trailers, caravans, light commercial vehicles, trucks and truck trailers, buses mining and earth moving vehicles, cranes, excavators, graders, farm machinery, forklifts and aircraft |
| **Tyre bank**<br>The mass volume of tyres in New Zealand at any one moment in time. |
| **Tyre derived aggregate**<br>A crumbed rubber applied in rubber asphalt for roading applications or as an alternative to sand or gravel in civil engineering applications |
| **Tyre derived fuel**<br>A fuel derived from end of life tyres and includes whole or shredded tyres used for this purpose |
| **Tyre derived product**<br>Any product produced from rubber, steel, textile or other material recovered from end of life tyres |
| **Tyrewise**<br>The name given to the industry product stewardship programme for end of life tyres in New Zealand. www.tyrewise.co.nz |

# Executive Summary

Adele Rose, Chief Executive 3R Group Limited

**Tyrewise Project Managers**

### Capturing a wasted resource

End of life tyres represent a huge potential resource that is lost when they are dumped or put in landfill. A regulated product stewardship scheme makes economic and environmental sense and will enable a circular economy approach to deal with these tyres.

The total volume of tyres (car, truck, aircraft etc.) which come to the end of their useful life in New Zealand each year is currently equivalent to over 7.75 million passenger tyre equivalents – some 73,700 tonnes worth.

### Shovel ready: A new era, regulation sought

The management of tyres at the end of their life are poised to enter a new era if declared a priority product under the Waste Minimisation Act 2008. This means that a regulated product stewardship scheme will have to be established to ensure all end-of-life tyres (ELTs) are responsibly managed, effectively ending the practice of dumping or stockpiling tyres and ensure this valuable resource stays out of landfill. Tyrewise is this scheme and will be submitted for accreditation as a regulated product stewardship scheme.

The move is long-awaited by the tyre industry. In 2012 stakeholders established the Tyrewise project and welcomed the introduction of an industry-led framework for a regulated stewardship scheme. This report updates the solution proposed in 2012, and further reiterates that industry remains ready to respond to the act of declaring tyres a priority product with this industry led stewardship solution.

The industry has long been in favour of a regulated product stewardship scheme for tyres. The key impact of regulation will be to ensure there is a level playing field for all manufacturers and distributors, without the negative impact of free-riders who choose not to participate voluntarily.

### Confidence for consumers

This report covers how the Advanced Disposal Fee, under regulation, remains with the tyre through to its eventual end of life and removes a range of fees consumers currently pay with no controls on their quantum or their outcome. This Advanced Disposal fee **will give consumers confidence** that the **stewardship fee they pay when they purchase a new tyre** will be used for the purpose intended.

The fee will be used to:

- incentivise end markets placing payment with those manufacturers for products produced
- make payment for collection, transport and processing of tyres reducing ratepayer cost impost due to Councils funding clean ups of stockpiles and illegal dumps
- deliver a managed, auditable and transparent system that tracks storage of tyres to reduce environmental and harm to human health
- provide an “easy-to-use and engage with” regulated scheme for all participants

Tyrewise is a working example of industry led, government supported solutions for problematic materials. Thank you to the governance board and the advisory groups who have participated in the development and review of this report.

# Material changes Tyrewise 1.0 v Tyrewise 2.0

The material changes between the model developed known as Tyrewise 1.0 submitted for accreditation in 2012 and current day are:

- Change in volumes of tyres (units), Categories and EPU's by Categories
- Global review of schemes and recommendations completed in 2019 by the World Business Council for Sustainable Development
- Impact of investment in processing of ELTs

### Change in volumes of tyres (units), Categories and EPU's by Categories

- 2011 4.8 million tyres (units) = 7.7 million EPUs = 73,000 tonnes (new weight)
- 2019 6.3 million tyres (units) = 10.2 million EPUs = 96,000 tonnes (new weight)
- Significant increase in imported trucks, buses and coaches = higher EPUs = more tonnage
- Decrease in passenger tyres since the peak of 2016 = lower EPUs per unit
- Increase of imported vehicles in 2019 over 2011 where a decrease was predicted

The number of tyres entering the New Zealand market using the 2019 import data is conservatively estimated at 6.3 million tyres.

This is a significant increase in the number of tyre units imported over data collected for Tyrewise 1.0 with the net result is a considerable growth on Tyrewise 1.0 data of 73,000 tonnes compared to 2019 96,000 tonnes.

A high percentage of this growth is coming from trucks, buses and coaches with a single tyre being equivalent to 4.2 EPU.

This partially goes against the predicted trend by the Tyrewise Working Group (Tyrewise 1.0) that there would be a total decline in tyres imported during 2015 – 2019 therefore less tonnage to process. In addition, some of this increase falls into the group of tyres which require more collection transport and processing cost per unit simply due to the size of the tyre.

Used car imports have been decreasing since a peak of 169,771 cars in 2003. In 2011 84,028 used vehicles were imported into the country, so this source of ELTs is decreasing year on year as have used loose tyres.

In 2016 and 2017, this figure is materially the same. Reference "The New Zealand vehicle fleet: fact and fiction Iain McGlinchy". Principal Adviser, NZTA.

In 2019 there are over 2,727 aircraft that use tyres registered in New Zealand with a high proportion of these being small aircraft. This is up from 1,900 in 2011.

### Global review of schemes and recommendations

In December 2019, the WBCSD released the Report "Global ELT Management – A global state of knowledge on regulation, management systems, impacts of recovery and technologies" with a view to sharing best practice globally.

This report provides a useful summary of international programmes which are used extensively in this report to ensure that evaluation can be across a consistent framework and for the latest information on underpinning and emerging technologies for processing ELTs.

### Technologies

There is little change to the range of technologies available for the recovery, recycling and reuse technologies during the period 2015 – 2019. Note that in 2012, full annual reporting data sets from 2011 were frequently used.

There is a significant change in the elevation / exclusion in the waste hierarchy of recycling product groupings globally (essentially against vertical landfilling).

### Investment (reference Appendix B)

In 2018, Tyre Stewardship Australia expanded its footprint to increase consumption of TDM in Australia by launching a demonstration and infrastructure stream which delivers practical end market development opportunities.

Specific impacts of from the Waste Minimisation Fund - investment in Golden Bay Cement and Waste Management Ltd

The impact of this investment is now noticeable in 2019, particularly in the upper, middle and central North Island regions, as Waste Management Ltd collect and process the ELTs and deliver the feedstock to Golden Bay Cement.

Competition for passenger tyres has increased in the Auckland Region between existing and emerging tyre processors. One outcome of this is that the easy to recover, less costly ELTs are being sought after leaving the more expensive and less accessible ELTs unrecovered. This is considered to be a perverse outcome without any mechanism to place an incentive or pay more for the recovery of all ELTs throughout NZ.

### Impact of COVID-19 and restricted trading conditions

Restraints on sales and decline in the demand for vehicles will have an impact on the predicted upwards trend of the tyre bank over the coming years.

Modelling for a percentage increase has been included. It is important to understand that there is a lag between any imported product and its availability for end of life. This impact is managed by the use of contingency funding that the managing entity should use to smooth out high impact events such as earthquakes and non-natural disasters.

# PART A

# Establishing a regulated product stewardship programme for End of Life Tyres

# 1. Introduction to this report

This report will outline for the reader changes to the management of end of life tyres from the situation documented during Tyrewise 1.0 to Tyrewise 2.0 and in many cases builds on that information as industry collaboration towards product stewardship has increased over the period. In 2011 or "Tyrewise 1.0" stakeholders who were involved in the import, distribution and end of life management of tyres (including local government) met and developed an industry preferred product stewardship solution for end of life tyres. It involved around 95% of the brand owner first importers, consumer representatives, garages and collector/processors.

Eleven industry members came together to take a leadership role in the development of Tyrewise and operated under a mandate to represent their sector. The Tyrewise Working Group was formed representing those that had the most influence and opportunity within the end of life tyres (ELT) supply chain to bring about effective change and to ensure that a structure for end of life tyre stewardship within New Zealand was robust.

The original **Tyrewise Working Group** representative organisations were:

| Organisation |
|---|
| Motor Trade Association (Inc.) (MTA) |
| Bridgestone NZ Ltd |
| Goodyear Dunlop Tyres (NZ) Ltd |
| Motor Industry Association Incorporated (MIA) |
| Imported Motor Vehicle Industry Association Incorporated (VIA) |
| The NZ Automobile Association Incorporate (AA) |
| Fleetsmart (Cardlink) |
| Local Government NZ |
| Value Tyres |
| NZTRACA (NZ Tyre Recycler and Collector Association) |
| Ministry for the Environment (MfE) observer |

A governance group was also formed of independently elected members who could represent industry groups when confidential information had to be discussed which could have resulted in a breach of the Commerce Commission Act regarding discussion of price and participation. This group sat under a structure known as the AutoStewardship New Zealand, a not-for-profit trust.

One of the key tasks of the Tyrewise Working Group was to ensure that the wider industry stakeholder groups (inclusive of ELT tyre collectors, processors and end users) were aware of their opportunity to have their say throughout the process.

One of the tasks for the project managers (3R Group Ltd) was to ensure that reports delivered facts-based evidence to the working group for their consideration, and to inform decisions that collectively moved the project through each milestone.

A series of investigations were conducted to provide facts-based evidence and gauge the readiness of the industry to participate in stewardship solution for this problematic end of life waste.

This solution, presented to the then Minister for the Environment in 2013, called for tyres to be declared as **priority product** and to put in place product controls around the importation of tyres to effect mandatory participation in stewardship.

The declaration of priority product did not proceed, and little change has occurred in the provision of end of life management of tyres since 2015. The industry remains committed to mandatory participation in stewardship. The Tyrewise Working Group structure remains in place and the group now act in a governance role for the project managers.

The original Tyrewise scoping reports included a series of guiding documents that collectively provided the necessary information for implementing a comprehensive and robust nationwide product stewardship programme for ELTs.

### Scoping Report One

Presented an investigation into the current situation for collection and disposal of ELTs in New Zealand and internationally.

### Scoping Report Two

Investigated alternative uses for collected tyres internationally and in New Zealand, and then ranked these potential uses by cost efficiency and resource recovery effectiveness and the degree of supporting verifiable evidence available locally or internationally for claims made.

### Scoping Report Three

Looked at feasible options for a product stewardship programme for ELTs in New Zealand, investigated the likely costs and benefits of the options and reported on the nature of any regulatory framework that might be required.

### Scoping Report Four

Looked at what success might look like, developed a set of guiding principles for the ELT product stewardship programme, outlined governance of the proposed programme and outlined the programme coverage, limits, regulatory framework required for viability and the proposed indicative timelines.

### Cost Benefit Analysis

Presented a range of assumptions and estimates that underpin a cost benefit analysis (CBA) of options relating to an industry-led product stewardship programme for end of life tyres in New Zealand.

# 2. History

| Year | Key Actions |
|---|---|
| **2002** | NZ Government - Waste Strategy was launched |
| **2004** | TyreTrack Scheme Launched *(MTA & MfE initiative)* |
| **2004** | Management of End of Life Tyres – Firecone Report |
| **2004** | End of Life Tyre Management: Storage Options – MWG Report published |
| **2006** | Parliamentary Commissioner for the Environment recommendation |
| **2006** | Product Stewardship of End of Life Tyres - URS Report Published *Recommended regulatory intervention and use of economic tools* |
| **2008** | Waste Minimisation ACT 2008 *(provision for priority product declaration)* |
| **2009** | Ministry for the Environment Consultation on Priority Products (Round 1) |
| **2009** | TyreTrack Scheme disbanded |
| **2010** | NZ Government - Waste Strategy (Update 1) |
| **2011/12** | Tyrewise 1.0 stewardship programme design commenced *Partially funded by WMF* |
| **2013** | The Taming of Mt Tyre presentation by Laurie Gardiner – MWH NZ Ltd |
| **2014** | Ministry for the Environment Consultation on Priority Products (Round 2)<br>*Including End of Life Tyres* |
| **2015** | Inaugural NZ Tyre Industry conference held in Auckland<br>*Speakers included global experts* |
| **2015** | Industry call for ELTs to be declared priority product declined |
| **2015** | KPMG Economic Impact Study of proposed Tyrewise Industry Programme published |
| **2018** | Provision of a tyre stewardship fund being included in the Coalition Agreement<br>*Coalition Government is made up of Labour, NZ First, Greens* |
| **2019** | Ministry for the Environment Consultation on Priority Products (Round 3) *including End of Life Tyres* |
| **2019** | Tyrewise 2.0 stewardship programme design refreshed *Funded by WMF* |

## 2.1 Tyretrack (2004 – 2009)

The Tyretrack scheme was initiated by the Ministry for the Environment (MfE) and administered by the Motor Trade Association. It was set up in 2004 as an initial step that would provide a tracking system for ELTs and minimise the illegal dumping of tyres. The scheme was intended to act as a precursor to more responsible disposal and hopefully, recycling[2].

The URS report Product Stewardship Case Study for End of Life Tyres[1] which reviewed the scheme in 2006 identified that approximately 40% of the tyre sector registered for the scheme including the two major tyre brands Bridgestone and Goodyear/Dunlop, but the majority of the 300-600 smaller tyre retailers did not register. Between 25 and 30% of end of life tyres were tracked. On the basis of information collected by Tyretrack 75% of waste tyres were sent to landfill. The remaining 25% were used for farm silage covers, speedways, playground matting and other valid alternatives, or disposed of illegally.

The report concluded that TyreTrack was not meeting all of its intended objectives and was not fulfilling proposed government policy objectives. However, it was an established basis for an active industry forum and there was strong industry support to expand its operations and enforce membership. Tyretrack was eventually disbanded in 2009.

## 2.2 Tyrewise 1.0 – design phase 2012 - 2015

Tyrewise is the name given to the regulated product stewardship programme designed by industry for managing end of life tyres in New Zealand. It remains ready to launch pending declaration of tyres as priority product under the Waste Minimisation Act 2008.

During the period 2012 – 2015 stakeholders who were involved in the import, distribution and end of life management of tyres (including local government) met and developed a regulated product stewardship solution for end of life tyres. This solution called for tyres to be declared priority product and proposed a series of product regulations to give effect to regulated stewardship. The entire solution and all materials were delivered as part of Waste Minimisation Funding Deed 20098.

The declaration of priority product did not progress, and little change has occurred in the provision of end of life management of tyres in the intervening period. The industry remains committed to regulated stewardship and seek to progress this.

[1] SOURCE SURS report Product Stewardship Case Study for End of Life Tyres

# 3. Consultation, collaboration and expertise

A structure for engaging with industry has been in place since 2012. This has been expanded with two specific Industry Advisory Groups for the review of the Tyrewise Product Stewardship Programme 2019 ("Tyrewise 2.0").

- Tyrewise Governance Group
- Importer/Distributor Advisory Group
- Collector/Processor/End Market Advisory Group
- Tyrewise Website - www.tyrewise.co.nz
- Tyrewise e-news distributed to interested and impacted parties including local government, waste management industry, farming and agriculture, not-for-profit and community good entities and commercial entities
- Tyrewise database - **603 registrations as at 21_12_2019**
  Direct Mail
  - 558 registrants - tyre importer/distributors
  - 77 registrants - collectors, transporters, processing entities, ELT market entities

## 3.1 Tyrewise Governance Group 2019

| Organisation |
|---|
| **Motor Trade Association (Inc.) (MTA)**<br>Ian Baggott<br>Sector Manager – Energy and Environment |
| **Bridgestone NZ Ltd**<br>John Staples<br>Director New Zealand Business<br><br>Garth Middleton<br>Technical Field Services and Solutions Development Manager |
| **Goodyear & Dunlop Tyres (NZ)**<br>Bill Prebble (Retired 31 January 2020)<br>Head of Technical, Product and Aviation |
| **Motor Industry Association Incorporated (MIA)**<br>David Crawford<br>Chief Executive |
| **Imported Motor Vehicle Industry Association (VIA)**<br>David Vinsen<br>Chief Executive |
| **The NZ Automobile Association Incorporate (AA)**<br>Stella Stocks (Retired December 2019) replaced by Jonathan Sergel (from January 2020)<br>General Manager - Motoring Services |
| **Value Tyres Ltd**<br>Bruce Donaldson<br>Managing Director |
| **Ministry for the Environment (MfE) Observer**<br>Dana Peterson<br>Senior Analyst, Hono Tātaki – Resource Efficiency and Innovation |

## 3.2 Advisory Group 1 I Importer/Distributor

| Organisation | Brands |
|---|---|
| **BG World Wheels**<br>Geoff Dixon<br>Managing Director | Classic Tyres<br>www.bgworldwheels.co.nz |
| **SuperTyre Warehouse**<br>Shane Epiha<br>Business Development | Michelin, Hankook, Triangle<br>www.SuperTyre.co.nz |
| **Tiger Tyres (NZ) Ltd**<br>Byron Duncan<br>Director | Tyre Supermarket multi-brands<br>www.facebook.com/tigertyresNapier |
| **Tyremax NZ Ltd**<br>Daniel Moore<br>National Operations Manager<br>Jonathan Moore<br>Director – Sales & Marketing | Wholesaler/distributor of Car, 4WD, Agricultural and Forestry<br>Continental, Maxxis, Starmax, Vredestein Nokian<br>www.tyremax.co.nz |
| **YHI (New Zealand) Ltd**<br>Chris Talbot<br>Managing Director | Car, Agricultural & Industrial<br>Toyo, Pirelli, Nitto, Nankang, Achilles Radial, Accelera, Neuton, Longmarch, CEAT, Barkley<br>www.yhiautomotive.co.nz |
| **Treadlite NZ**<br>Brad Pierce<br>Managing Director | Importer<br>www.treadlite.co.nz |

## 3.3 Advisory Group 2 I Collector/Transporter/Processor/End Markets

| Organisation | Area of Interest |
|---|---|
| **Allied Locks Ltd**<br>Daniel Irvine | Processor<br>End Markets |
| **Blended Fuel Solutions / Nufuels Ltd**<br>Leigh Ramsay<br>Managing Director | Processor<br>End Markets including pyrolysis and non-conventional fuels |
| **Burgess Matting & Surfacing Ltd**<br>Russell Burgess<br>Managing Director | Processor<br>End Markets |
| **Ecokiwi Recycling Ltd**<br>Peter Smith<br>Director | Transporter<br>Processor<br>End Markets |
| **Eneform Ltd**<br>Chris Copplestone<br>Director | Processor<br>End Markets including pyrolysis |
| **Alan Copsey**<br>ELT Industry Consultant | Transporter<br>Processor<br>End Markets |
| **Golden Bay Cement**<br>Peter Bray<br>Technical & Engineering Manager | Processor<br>End Markets including Hot Disc Technology |
| **LessWaste**<br>Bruce Gledhill<br>Processing / Waste Consultant | Waste consultancy |
| **OceanaGold**<br>Russell Squire<br>Senior Environmental Advisory | Mine Operator (Generator) |
| **Power Retreads Ltd**<br>Dave Leicester<br>Director | Reuse (retread light and heavy Truck and Bus tyres)<br>Recycler |
| **Redwood Lakes Ltd**<br>Nadene McClay<br>Consultant | Representing Processor |
| **Resource Recovery Ltd**<br>James Boughey<br>Director | Processor |
| **Revyre Ltd**<br>Shaun Zukor<br>Director | Transporter<br>Processor |
| **Scrap Tyre Movements**<br>Andrew Dick<br>Director | Processors<br>Member – NZTRACA |
| **Tiger Tyres**<br>Byron Duncan<br>Owner | Retailer<br>Processor<br>Supplier/Importer |

| | |
|---|---|
| **Treadlite NZ**<br>Brad Pierce<br>Managing Director | Importer<br>Transporter<br>Processor including micro processing<br>End Market |
| **Tyre Collection Services**<br>Daryl Shackleton<br>Director | Collector<br>Transporter<br>Processor |
| **Tyre Disposal Services (2012) Ltd**<br>Craig Shaw<br>Director | Collector<br>Transporter<br>Processor<br>Member - NZTRACA |
| **Tyre Removals**<br>Rod Lovegrove<br>Director | End markets – Energy<br>Member - NZTRACA |
| **Owen Douglas & Co**<br>Owen Douglas<br>Owner | Processor |
| **Waikato Tyre Removals**<br>Alvin Cobb<br>Director | Collector<br>Transporter<br>Member - NZTRACA |
| **Viroment Technologies Ltd**<br>Danny Liufalani<br>Director | Processor<br>End Market including green fuels |
| **Waste Management Ltd**<br>Mike McSaveney<br>General Manager UNI | Collector<br>Transporter<br>Processor |

## 3.4 Inaugural Tyre Industry Summit June 2015


80 attendees across the whole tyre supply chain and local government attended the inaugural Tyre Industry Summit in June 2015 with the purpose of seeing how the industry could move forward and improve outcomes for tyres.

The Summit brought together speakers from successful programmes overseas, scientists at the forefront of end-use processes, central and local government representatives, tyre manufacturers and importers, and recycling industry providers to discuss common goals for tyre stewardship in New Zealand.

The Summit is an example of how the Tyrewise Working Group has included broad consultation methodology to openly engage with the whole industry including those that have been willing to share their experiences with us in the development and delivery of international programmes. The inaugural Chair of Tyre Stewardship Australia, which was newly formed, also attended as a speaker.

## 3.5 World Business Council for Sustainable Development

WBCSD is a global, CEO-led organization of over 200 leading businesses working together to accelerate the transition to a sustainable world. They help member companies be more successful and sustainable by focusing on the maximum positive impact for shareholders, the environment and societies. Member companies come from all business sectors and all major economies, representing a combined revenue of more than USD $8.5 trillion and with 19 million employees.

The Global Network which includes the Sustainable Business Council of New Zealand (a brand of Business NZ) is part of 70 national business councils that enables member businesses unparalleled reach across the globe.

WBCSD works with member companies along and across value chains to deliver high-impact business solutions to the most challenging sustainability issues.

For Tyrewise 1.0, the "Guidelines for Developing End of Life Solutions for Tires" report was used as a baseline to inform the development of Tyrewise.

We were able to use this information to help us determine what is the best end use for ELTs in New Zealand alongside research of international ELT programmes and the various technologies that are available to process tyres.

### Tire Industry Project (TIP)

In 2005 the World Business Council for Sustainable Development brought together 11 tyre companies in a project called the "Tire Industry Project". [2]TIP is a proactive organisation that operates under the umbrella of the World Business Council for Sustainable Development (WBCSD) and is designed to advance sustainability throughout the industry.

### Global ELT Management Report

In December 2019, the WBCSD released the Report "Global ELT Management – A global state of knowledge on regulation, management systems, impacts of recovery and technologies" with a view to sharing best practice globally.

This report provides a useful summary of international programmes which are used extensively in this report to ensure that evaluation can be across a consistent framework and for the latest information on underpinning and emerging technologies for processing ELTs.

For the benefit of the reader, the full report is attached as an attachment to this report as it covers a range of information such as emerging technologies, economic drivers, environmental and sustainability consideration and some future trends.

[2] SOURCE https://www.wbcsd.org/Sector-Projects/Tire-Industry-Project.

# 4. What is product stewardship?

Product stewardship (PS) is a 'cradle to cradle' methodology that helps reduce the environmental impact of manufactured products. Under product stewardship programmes, producers or manufacturers, brand owners, importers, retailers, consumers and other parties accept responsibility for the environmental effects of their products – from the time they are produced until the end of their useful life when they are recycled or disposed of.

There are many definitions of product stewardship, but the one of most relevance to New Zealand industry is that provided in Part 2 of the Waste Minimisation Act 2008, which states:

> The purpose of this Part is to encourage (and, in certain circumstances, require) the people and organisations involved in the life of a product to share responsibility for
>
> (a) ensuring there is effective reduction, reuse, recycling, or recovery of the product; and
>
> (b) managing any environmental harm arising from the product when it becomes waste.

Product stewardship programme participants take responsibility for the environmental effects of their products and take these costs into account when making decisions about the production, purchase and disposal of their products. This means more efficient and responsible use of resources, rather than dealing with the waste problem at the point the product is thrown away. For manufacturers, this includes planning for and if necessary, paying for, the recycling or disposal of the product at the end of its useful life. This may be achieved by redesigning products to use fewer harmful substances, to be more durable, reusable and recyclable, and to make products from recycled materials. For retailers and consumers, this means taking an active role in ensuring the proper disposal or recycling of an end of life product.

Product stewardship shifts the physical and financial responsibility of waste disposal away from local government(s) to the producers and users of products. Many countries around the world have product stewardship legislation including Canada, The European Union Member States, Japan, Korea, Norway, many States in the USA, Australia and New Zealand.

A waste hierarchy applied to end of life tyres will inform activities and options for end use, from design through implementation and ongoing delivery. Actions at a higher level in the waste hierarchy can reduce the costs of actions at a lower level and the environmental impacts of activity at a higher level are generally less than those at a lower level. An example of a waste hierarchy for ELTs can be found in Section 13.

As there is no tyre manufacture in New Zealand, there is little opportunity to encourage design improvements that would reduce the amount of waste tyres created. However, there are opportunities to reduce the waste produced by encouraging and/or providing:

- education on extending tyre life by monitoring tyre pressure;
- the use of retreads, primarily for truck tyres;
- improved road surfaces so there is less wear and tear on tyres;
- minimum standards for used tyres entering New Zealand; and
- information to allow responsible purchasing decisions by consumers.

At complete of Tyrewise 1.0, the main opportunities for waste reduction through Tyrewise was in the areas of re-use, recycling and recovery. The essential concept at the heart of the circular economy is to ensure we can unmake everything we make.

The Ministry for the Environment maintains a register of accredited product stewardship programmes and these can be found on their website.[3]

Product stewardship is now widely accepted as being the building block of the circular economy. The current Coalition Government (2019) is incorporating the principals of the circular economy through all departments of Government policy and procurement.

[3] SOURCE https://www.mfe.govt.nz/waste/we-all-have-role-play/responsible-product-management/about-product-stewardship

# 5. The circular economy and end of life tyres

Major tyre brands are incorporating elements of the circular economy into the production of tyres.

Leading tyre manufacturers through the Tire Industry Project (TIP) are also drafting Product Category Rules (PCR). These rules lay out industry-specific guidelines, in compliance with the ISO 14025 standard, that manufacturers use to determine the environmental impact of their products for Environmental Product Declarations (EPD).

To name three of the recognisable brands in New Zealand:

**Bridgestone** I Published Bridgestone's View on Circular Economy, Hiroshi Mouri, Central Research, Bridgestone, September 2016

**Goodyear** I Inspired by the principles of the circular economy, with emphasis on reducing material waste, emissions, and energy loss, their Oxygene concept is designed to integrate seamlessly into future cityscapes, featuring several performance solutions

**Michelin** I Reduce, Reuse, Recycle, Renew: With its 4Rs strategy, Michelin is actively involved in the circular economy throughout its tyres' life cycle. The Group also created a circular economy steering committee in 2017

The report "The Redesigning of Tires and the Recycling Process to Maintain an Efficient Circular Economy" by Dan Dobrotă, Gabriela Dobrotă, Tiberiu Dobrescu and Cristina Mohora published in September 2019 states that the redesign of tyres - namely the structure of the materials and the constructive shape of these products – will enable beneficial deconstruction in to their component parts which will design a technological process that allows the separation of the three main ingredients in their structure – therefore the recycling of the tyre will take place in several parts to increase the overall recovery of materials back to reuse.

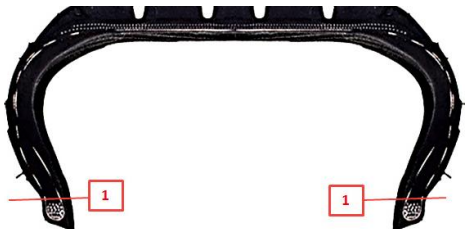


**FIGURE 1**
First phase where heel is separated from rest of tyre

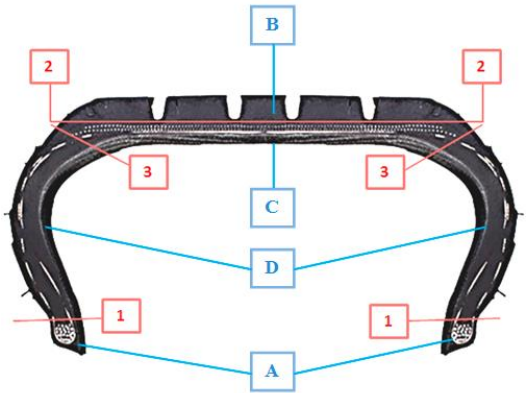


**FIGURE 2**
Proposed new scenario where tyre is divided in several parts in three directions

The authors of the report state that by applying the new tyre recovery scenario in phase 1, the following waste categories result:

- 38% waste containing rubber and textile insertions (part D of the tyre);
- 30% waste containing rubber, textile, and metal insertions (part C and A of the tyre);
- 32% rubber waste (part B of the tyre).

Alongside that is a standardised labelling system on the outside of the tyre (by the rim) detailing the materials used in the manufacture of that tyre.

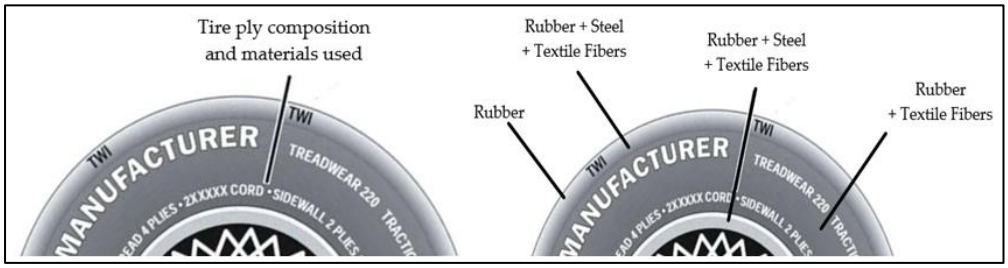


***FIGURE 3***
*Standardised labelling system on outside of tyre*

For the European tyre industry, the circular economy begins with design by developing tyres for both optimal performance and longevity as demonstrated in this schematic[4].

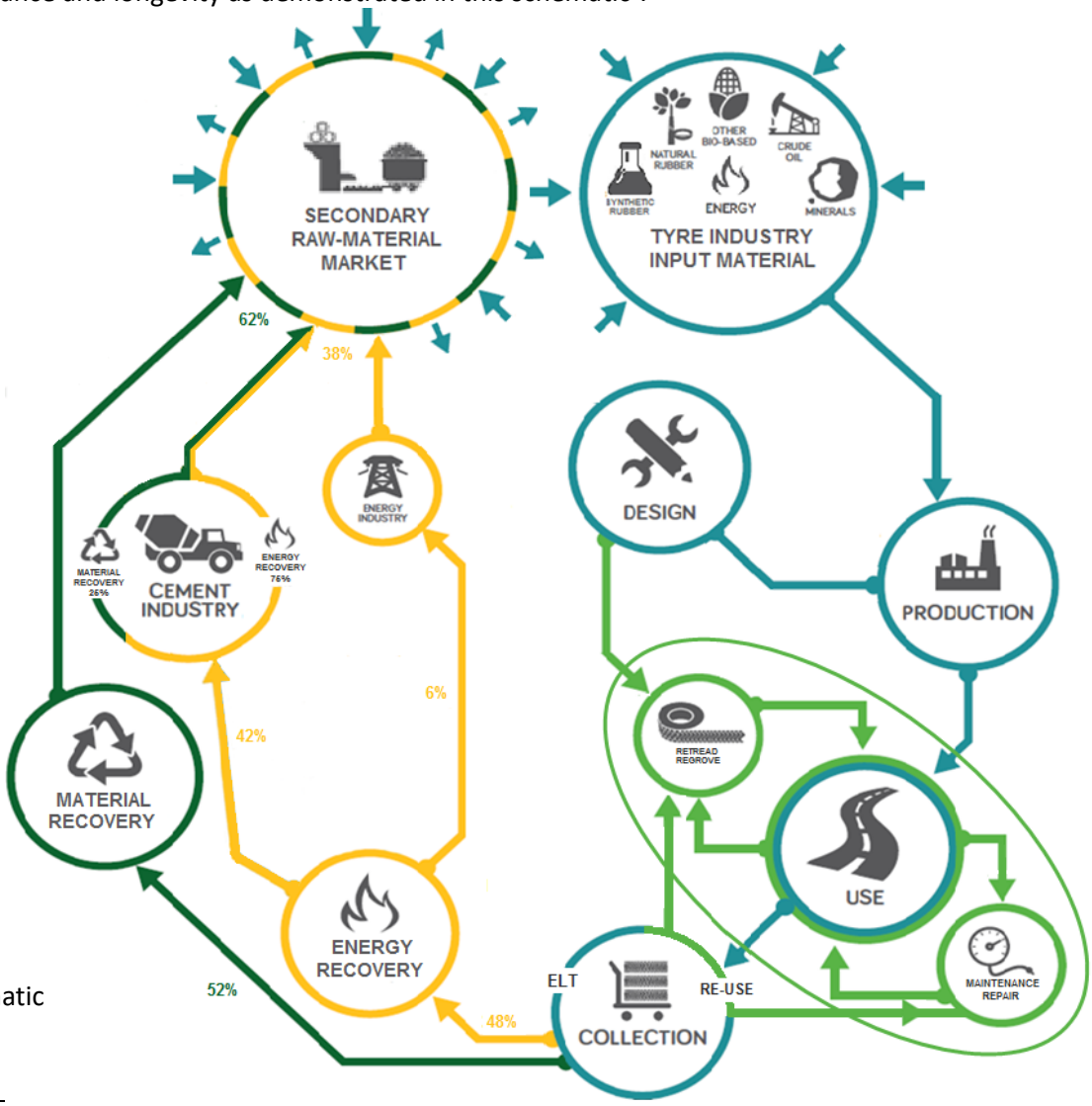


**FIGURE 4**
Longevity schematic

[4] SOURCE European Tire and Rubber Association

## 5.1 Why transition to the circular economy I Ministry for the Environment

Growing international research and evidence shows numerous benefits over the traditional linear economy.

These include:

- long-term cost savings
- increased local job opportunities
- encouragement of technical innovation
- reducing the amount of harmful waste produced
- reversing our impacts on climate change

When a product's component materials are reused rather than put in a landfill, not only is that material no longer waste but new raw materials are not required to be extracted.[5]

[5] SOURCE https://www.mfe.govt.nz/waste/circular-economy

# 6. Tyre composition

The composition and make up of each tyre category influence the recycling process and materials that can be extracted by recycling and possible end uses. Therefore, it is important to understand the composition of the different tyre types to assess what the recycled material may consist of when designing a product stewardship solution.

In general, manufacturers design and construct tyres to maximise their life in relation to the design parameters. Tyres are not designed for easy disassembly as other products may be. In addition, the design and construction of tyres is dynamic with manufacturers changing the mix of rubber, steel and textiles to respond to market demands relating to safety, economy, performance, costs, material availability and the needs of the automobile industry.

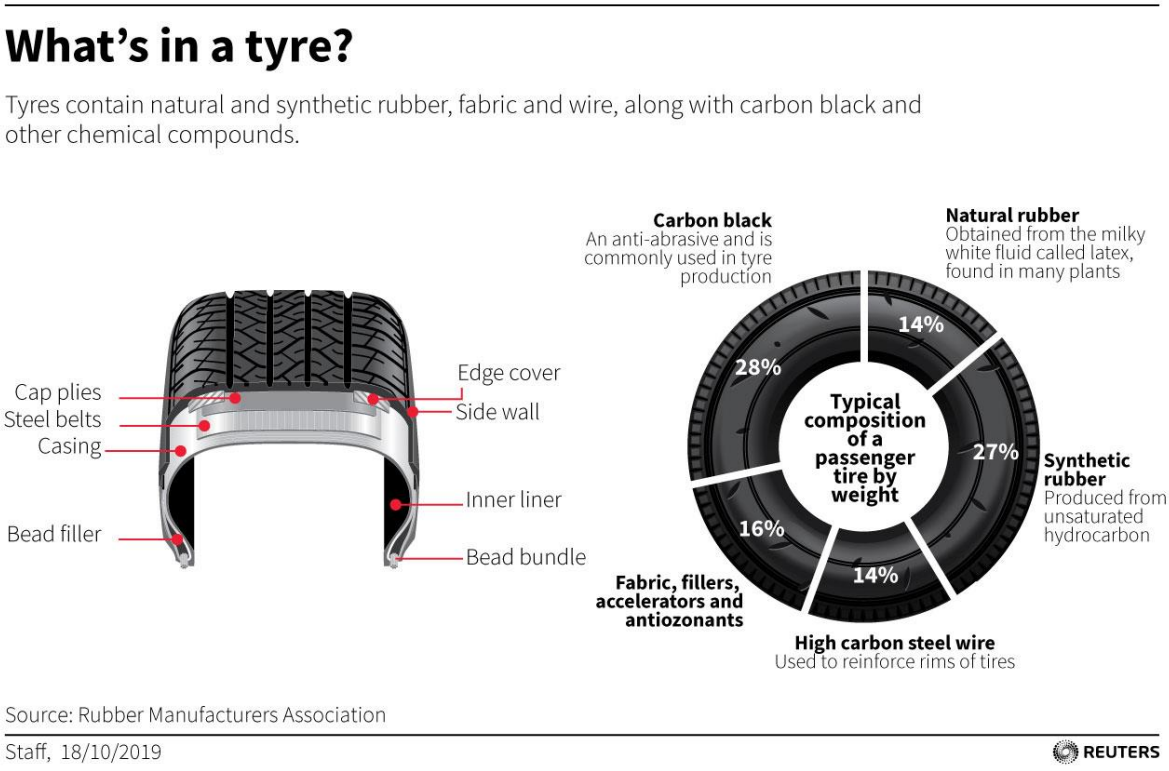


**FIGURE 5** What's in a tyre?

The following table summarises the three basic material types – rubber, steel and textiles – that are most relevant for tyre recycling. The other components such as carbon black, zinc oxide, sulphur and additives are combined into the rubber during the manufacturing process and are difficult to separate out.

The breakdown has not materially changed since Tyrewise 1.0 and those percentages have been used for this report.

**TABLE 1** Breakdown of top three material types per tyre (relevant for recycling)

| Tyre category | Rubber (% and kg) | | Steel (% and kg) | | Textile (% and kg) | |
|---|---|---|---|---|---|---|
| Motorbike | 70% | 2.8 | 18% | 0.7 | 12% | 0.5 |
| Passenger | 72% | 5.7 | 21% | 1.7 | 6% | 0.6 |
| Light and medium commercials | 69% | 11.1 | 25% | 4.0 | 5% | 1.0 |
| Truck, bus, | 68% | 27.2 | 32% | 12.8 | 0% | 0.0 |
| Off road (graders, earthmovers, forestry) | 70% | 140 | 30% | 60 | 0% | 0.0 |
| Airplane | 70% | 9.8 | 10% | 1.4 | 20% | 2.8 |

Note that we have only reported on the three categories of rubber, steel and textile and have used these for the Cost Benefit Analysis Appendix A.

Referencing the US Rubber Association website, "tyres contain so many different compounds and ingredients because they are engineering miracles, expected to handle the tortures of heat and cold, high speed, abrasive conditions, and often not enough air pressure. They are expected to perform for tens of thousands of miles and retain their essential properties despite horrendous driving habits and sometimes poorly maintained or built roads. The rubber compound alone is designed for nine different applications/components within a radial passenger tyre".

## 6.1 Looking to the future

Smithers' report "The Future of Tire Raw Materials to 2021"[6] identifies some changes to the global tyre market. Due to increased focus on environmental and social license to operate factors, some of these will eventually impact on the New Zealand market:

- Despite rising populations, slower GDP and tyre industry growth in key markets will mean that new capacity coming on stream may take longer to reach economic utilisation levels and investment plans may be delayed, especially with OEM and premium tyres.
- Materials availability and cost reduction by manufacturers looking to achieve significant savings in material input costs specifically the choice of rubber – especially natural rubber (NR) versus synthetic rubber (SR), such as stirene butadiene rubber (SBR).
- Historically, NR has been more expensive than SR, making SBR more prevalent in blends used for passenger car tires. If the present low relative price of NR continues, it can be expected that a move in favour of NR and a related reduction in the use of SR and SBR will be seen. This in turn will slow the implementation of related low rolling resistance technologies.
- Low oil prices are starting to feed through to SBR prices, narrowing of the difference in price between NR and SBR.
- Changes in tyre composition, including the move toward lighter weight tyres, using more sustainable ingredients and reclaiming materials for production from end-of-life tyres (not in New Zealand), are reducing materials demand.

[6] SOURCE https://www.smithers.com/resources/2016/mar/four-key-factors-shaping-the-tire-materials-market

- Consumers in the replacement tyre market continue to focus more on initial cost of a tyre, rather than its other attributes that could save them money in the long run. This trend will limit how much progress advanced technologies, such as low rolling resistance, can make in the replacement market.
- At the same time, emissions and labelling regulations are expected to favour the use of low rolling resistance technologies and materials including highly dispersing (HD) silicas/silanes and SSBR and BR elastomers. As tyre labelling expands to different regions, it is expected to cover noise emissions (the EU label already does), which will influence materials choices.
- The largest uncertainty is over regulation of durability, which is not covered by the current EU label. If at some point it is added, it will have an impact on materials consumption.

Fuel prices is another significant trend that affect use - low prices increase distance driven and create greater demand for replacement tyres. At the same time, the lower fuel prices reduce consumer interest in fuel economy and undermine any incentive for them to adopt tyres with low rolling resistance.

# 7. Why recycle end of life tyres?

- **Carrying on as we are represents a $34 Million lost opportunity for the economy**
- **Balancing sustainability solutions with environmental impact**
- **Changes to Warrant of Fitness frequency impacts**

It is widely known that the disposal of used tyres in New Zealand is problematic. Disposal of tyres in landfill (as opposed to use of tyres as engineered solutions) takes up valuable landfill space as well as creating issues for landfill stability and management as the tyres tend to work their way back to the surface over time.

Storage and tyre stockpiles also pose major health and environmental concerns as well as fire risks. Burning tyres cause air pollution from the dense and toxic smoke and ash and result in large quantities of oil effluent and run off that can contaminate water sources.

Tyre stockpiles also hold water which can be a breeding ground for mosquitoes. In New Zealand, diseases associated with mosquitoes include dengue fever and Ross River virus. Currently in New Zealand there are not many mosquitoes capable of carrying serious diseases, and those that exist do not appear to breed in tyres. However, mosquitoes capable of carrying serious diseases that are known to breed in tyres are discovered on occasion by MAF on entry to New Zealand[1].

Many other countries around the world have identified end of life tyres as a valuable resource for material recovery, energy recovery and civil engineering and backfilling, along with payments to create demand for new value-added products.

Some examples of this is the use of carbon black in the creation of high value wetsuits in Taiwan, use of rubber granulate in roof and flooring tiles with sound reduction and impact reducing properties and civil engineered solutions

In 2018/19, New Zealand permitted the first use of ELTs as an alternative fuel in the Golden Bay Cement kilns recognising that this was a fuel source with a high calorific value, renewable energy component and a slightly reduced carbon intensity relative to traditional coal fossil fuel use. Reduced carbon intensity was ~1% of the total $CO^2$ emitted during cement manufacture.

In 2019, there is a focus on mitigating negative impacts and enhancing efficiency, with reductions in energy and water consumption in the use of new technologies.

If New Zealand can utilise our bank of end of life tyres as a valuable resource instead of considering them a waste that needs disposal, both the environment and the economy will benefit.

## 7.1 New Zealand's tyre industry

The tyre industry in New Zealand is made up of a range of companies importing both new and used loose tyres and tyres fitted on vehicles. Imports of used tyres mostly originate from Japan and remain a smaller portion of the tyre import market in New Zealand.

Manufacture of tyres in New Zealand ceased with the closure of the Bridgestone/Firestone factory at Papanui in 2010 and the earlier closure of the South Pacific Tyre factory in Upper Hutt during 2006. There has been no change to that situation in 2019.

The major brands noted during Tyrewise 1.0 that there was a trend towards online sales of tyres. Online sales channel allows store staff to focus on their core skill sets and allow the contact centre to focus on sales. It is also convenient for the customer who can research and compare brands and quotes online without having to visit a store. It is expected that this channel will continue to grow as customers become more familiar with online tyre purchasing.

There appears to be a limited seasonal trend for sales of passenger vehicle tyres with increases prior to holiday periods as more attention is placed on vehicle safety before travel. Also truck tyre sales tend to increase during August to April. Apart from these minor seasonal adjustments, the market for tyre sales is fairly constant.

## 7.2 Warrant of Fitness/certificate review

Poor tyre maintenance, particularly running tyres under-inflated, and punctures due to road hazards and debris made up the most frequent causes of failure in tyres of all types further adding to the increase in tyre debris pollution on our road network.

In 2013, the original Tyrewise Working Group noted there is currently a review under way on the Warrant of Fitness/Certificate of Fitness process. In many cases New Zealand motorists use the WOF/COF inspection and a failure due to tyres, as a proxy for when to replace tyres. They indicated that any change to the WOF/COF process that will extend the time period between inspections may impact the number of tyres that are replaced, and hence ELTs generated.

In July 2014, the move was made towards a 12-month warrant of fitness where cars purchased after the year 2000 only need a warrant once a year, newer vehicles every three year. It is hard to find facts-based evidence on the impact of tyre rotations/replacement corresponding to sales of tyres specifically due to this change. The Hutt City Council parking services manager Barry Rippon is on record as saying that “over the last 12 months the number of car tyres he had seen with the canvas showing has doubled.

> "We previously identified about 25 a month, but in the last 12 to 18 months we've been writing tickets at a rate of about 55 a month," he said. "The tyres that we're reporting on are not just insufficient tread depth - it's because the canvas is actually showing. “

Mr Rippon has attributed this to the change in WOF requirements where if tyre tread was unlikely to pass the next WOF the owner of the vehicle would be required to replace the tyres. MTA and AA have both stated their concerns about the length of time between WOF’s and impacts on tyres and safety.

This may have impacted on tyre sales, the quantity of useable rubber left on the tyre at end of life, and an impact on microplastics in the environment as the tyre has continued to wear.

## 7.3 Types of tyres

Tyres used in New Zealand come in various sizes ranging from small scooter tyres through to large off road tyres used by forestry or industrial vehicles. Accordingly, the size, shape, composition and wear characteristics also vary, so there is not a standard tyre that is indicative of the volume or type of tyres going to landfill or recycling.

For Tyrewise 1.0 eight categories of tyre in use in New Zealand were defined by their 10-digit NZ Customs tariff codes (all codes within 4011 and 4012) and then summarized by the rim size of the tyre. These categories have subsequently been used throughout this report and for modelling.

A summary of the categories, the average weights for new and used tyres and Equivalent Passenger Unit (EPU) and Used EPU (UEPU) is presented below.

## 7.4 Conversion factors used tyre unit tonnage to EPU

To convert tyre units into weight, estimates of the average weight of used tyres have been taken from the Australian report "Financial and Economic Analysis of the Proposed Used Tyre Stewardship Scheme" (URS 2005) and data supplied by the NZ tyre importers.

For Tyrewise 1.0, Grader, earthmover, and forestry tyres are grouped together and designated Off The Road (OTR) tyres. The reason for this was that the OTR's were not split out further by import code. The Tyrewise working group assigned an average weight of 200 kg to this category for the purpose of estimating tonnage of end of life tyres generated in New Zealand.

In 2019, we were able to further split out the OTR tyres and their weights enabling greater accuracy when calculating EPUs for collection, transport and processing.

Major airlines and the RNZAF retread casings multiple times. These casings are sent offshore for retreading and are usually scrapped offshore at the retread plants. Many commuter airlines and most general aviation tyres are single life and are scrapped in New Zealand. In 2019 there are over 2,727 aircraft that use tyres registered in New Zealand with a high proportion of these being small aircraft. This is up from 1,900 in 2011. Tyres from these aircraft would also be scrapped in New Zealand.

**1 passenger tyre = 9.5kg average weight = 1 EPU**

**1 EPU = 9.5kg**

**A tractor tyre that weighs 77kg = 8.1 EPU**

### BOX 1 Relationship between customs tariff codes and size of loose tyres

Loose tyres entering the market particularly those being classified as Truck and Bus tyres v Light truck tyres are primarily from the out of date tariff code classifications (international) being used by importers. That coupled with no duty being imposed for many years meant that there was no need for any importer to be accurate as to how they reported. Bridgestone's view is that there could be a significant number of loose tyres classified as Light Truck which may actually be 4x4 or SUV tyres that would fall into the passenger tyre grouping. This is an issue that will need to be addressed with NZ Customs if any payment of fee is going to be linked to the use of the tariff code to determine size of tyre x EPU

**TABLE 2** Imported Tyres by category, EPU and weights, condition new and used

| Registration Category | Management Classification | Loose Imports *Refreshed 2019* | | On Vehicle Imports *Refreshed 2019* | | New Tyres Weights/EPUs | | | | Used tyres *84% of new weight* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Quantity | EPUs @ 9.5 Kg | Quantity | EPUs @ 9.5 Kg | Avg. Kg | EPU @ 9.5 Kg | Total EPUs / Category | Total Tonnes / Category | Avg. Kg | EPU @ 8 Kg | Total EPUs / Category | Total Tonnes / Category |
| Off road ATV | On Road | 49,163 | 15,525 | | | 3 | 0.3 | 15,525 | 147 | 2.5 | 0.3 | 13,041 | 124 |
| Motorbike | On Road | 120,795 | 60,398 | 22,010 | 11,005 | 4.75 | 0.5 | 71,403 | 678 | 4.0 | 0.5 | 59,978 | 570 |
| Passenger | On Road | 3,601,330 | 3,601,330 | 1,370,171 | 1,370,171 | 9.5 | 1.0 | 4,971,501 | 47,229 | 8.0 | 1.0 | 4,176,061 | 39,673 |
| Aircraft | On Road | 4,027 | 7,630 | | | 18 | 1.9 | 7,630 | 72 | 15.1 | 1.9 | 6,409 | 61 |
| Light commercials/industrial | On Road | 145,478 | 290,956 | | | 19 | 2.0 | 290,956 | 2,764 | 16.0 | 2.0 | 244,403 | 2,322 |
| Tractors - small | Bus/Truck | 13,610 | 35,816 | 6,032 | 15,874 | 25 | 2.6 | 51,689 | 491 | 21.0 | 2.6 | 43,419 | 412 |
| Solid industrial (forklift) | Bus/Truck | 24,222 | 86,689 | | | 34 | 3.6 | 86,689 | 824 | 28.6 | 3.6 | 72,819 | 692 |
| Off Road (forestry) | Bus/Truck | 259,046 | 1,145,254 | | | 42 | 4.4 | 1,145,254 | 10,880 | 35.3 | 4.4 | 962,014 | 9,139 |
| Truck, Bus | Bus/Truck | 252,061 | 1,061,309 | 584,520 | 1,494,467 | 40 | 4.2 | 2,555,777 | 24,280 | 33.6 | 4.2 | 2,146,853 | 20,395 |
| Construction/Industrial | Bus/Truck | 17,678 | 89,320 | | | 48 | 5.1 | 89,320 | 849 | 40.3 | 5.1 | 75,029 | 713 |
| Tractors - large | Bus/Truck | 19,346 | 156,804 | 6,032 | 48,891 | 77 | 8.1 | 205,695 | 1,954 | 64.7 | 8.1 | 172,784 | 1,641 |
| Off Road (graders) | Off Road | 543 | 12,578 | | | 220 | 23.2 | 12,578 | 119 | 184.8 | 23.2 | 10,566 | 100 |
| Off road (earthmovers) | Off Road | 10,213 | 646,119 | | | 601 | 63.3 | 646,119 | 6,138 | 504.8 | 63.3 | 542,740 | 5,156 |
| | **TOTALs** | **4,517,512** | **7,209,730** | **1,759,181** | **2,940,408** | | | **10,150,138** | **96,426** | | | **8,526,116** | **80,998** |

*56,327 tyres classified as "used tyres" were imported into NZ for reuse in 2019 and are not included in the above calculations*

**TABLE 3** Tyre Bank by classification, EPU and Weights New and Used

| Management Classification | Imported Tyres | New Tyres | | Used tyres *84% of new weight* | | % of Tyre Bank by Classification |
|---|---|---|---|---|---|---|
| | Quantity | Total EPUs / Classification @ 9.5 Kg / EPU | Total Tonnes / Classification | Total EPUs / Classification @ 9.5 kg / EPU | Total Tonnes / Classification | |
| On Road Passenger | 5,312,974 | 5,357,015 | 50,892 | 4,499,892 | 42,749 | 94% |
| On Road Bus/Truck | 952,963 | 4,134,426 | 39,277 | 3,472,918 | 32,993 | |
| Off Road | 10,746 | 658,698 | 6,258 | 553,306 | 5,256 | 6% |

# 8. Extracting value from ELTs I Markets

When assessing and referring to markets for ELTs, the World Business Council for Sustainable Developments (WBCSD) December 2019 report "Global ELT Management – a global state of knowledge on regulation, management systems, impacts of recovery and technologies" uses the following **technology categories**:

**TABLE 4** Technology categories

| Technology category | Sub-category |
|---|---|
| Material recovery | Tyre derived medium (TDM) |
| Energy recovery | Tyre derived fuel (TDF) |
| Civil engineering | Tyre derived medium |
| Backfilling | Tyre derived medium |

For consistency, the same approach is used in this section as well as four distinct **product groupings** in order to communicate the extent of the potential uses for recovered/recycled ELTs:

**TABLE 5** *Product groupings*

| Recovery & recycling[*1] product groupings |
|---|
| Whole tyres |
| Fabricated / cut products |
| Ambient & cryogenic material recovery |
| Further use – crumb as an end-use functional product |
| Further use – crumb as an additive in a product |
| Further use – crumb in a secondary process |
| Further use – crumb in a destructive process |
| Devulcanisation |

[*1] *Recycling is referred to as grinding ELTs into crumb rubber while removing steel, fibre and other contaminants*

There are a range of processing and end market solutions in New Zealand some well-established through to those in pre-feasibility phase primarily using TDF as an energy source.

**TABLE 6** Solutions in NZ

| Processing and End Market Solutions in New Zealand<br>*Refreshed April 2020* |
|---|
| Baler (Cut) |
| Civil Engineering Solutions |
| Devulcanisation (pre-commercialisation) |
| Shredding (multiple commercial ventures) |
| Surfacing Solutions |
| TDF - Energy Unknown (pre-commercialisation) |
| TDF - Hot Disc |
| TDF – Pyrolysis (small scale commercialisation) |

## 8.1 Key research points

For Tyrewise 1.0, the Tyrewise Working Group undertook a long running investigation into the alternative uses for ELTs in the New Zealand and global markets. The findings were informed from a mixture of literature review, interviews and site visits (both invited experts to New Zealand and local entities) over the period.

When reported, the results were grouped by:

- what was already happening (there is a commercial entity and commissioning is complete)
- what was in commissioning stage (non-commercial but consented if required); and
- what was planned for in the future (no consents or approvals sought, business plans in place)

There is little change to the range of technologies available for the recovery, recycling and reuse technologies during the period 2015 – 2019.

There is a significant change in the elevation / exclusion in the waste hierarchy of recycling product groupings.

Repeated in many case studies and advisories and summed up in the WBCSD December 2019 report is that *"overall some intervention and policy measures from the government is usually necessary in order to properly develop the ELT recovery industry".*

The most significant growth in product is **reclaimed rubber.** This is likely due to the increase in ELT stewardship/takeback programmes coming online, accompanied by government policies that aim to reduce the volume of ELTs to landfill and the maturing of industries in countries with well-established schemes. A trend in those countries is the addition of regional/country objectives that encourage recycling and reuse, limit other forms of recovery (such as energy), and ban landfill either generally or for future landfill mining all together. A greater use of the waste hierarchy when making investment and policy decisions is evident. Refer to **TABLE 18** Hierarchy of Uses by processes, possible in NZ.

## 8.2 Summary of uses by product grouping

The following section is a **summary** of uses globally and in New Zealand updated to 2019:

a. Alternative uses for collected tyres globally (this informs what is possible in New Zealand in the future)

b. Alternative uses for collected tyres in New Zealand (what is possible now and informs what is possible in the future, showing any constraints including investment)

## 8.3 Whole tyres

The following end uses involve using the tyre in its original state; that is **no transformation process** that reduces the tyre into its component parts.

### Export of used tyres for reuse as tyres

**Globally:** A variety of countries import (or accept imports of) used tyres for further use on vehicles. These used tyres come from a number of countries including New Zealand. The data from Statistics New Zealand Infoshare database shows that in 2011 used tyres were exported from New Zealand to Vietnam, Namibia, Fiji, Tonga, Samoa, Romania and Singapore.

**New Zealand:** 71,000 tyres were exported from New Zealand for reuse primarily to pacific island countries. An importer who is charged an advanced disposal fee on imported tyres and then who subsequently exports whole tyres for reuse (verified end market) will need to be rebated that fee upon evidence of the end market use.

### Retread

In its most simplistic form, the retreading of tyres is a process whereby the tyre casing is buffed to remove the remainder of the tread and a new tread is adhered to the casing.

> The Automotive Tire Retreading Services Market 2020 Report states that "retreaded tires help control environmental pollution significantly by increasing the actual productive life of tires. This is because retreads are applied to original casings of used worn-out tires that have not fully completed their actual lifecycle. As the original casing can be used twice or thrice for retreading, it results in efficient utilization of a tire's lifecycle. In addition. the use of rubber resources can be optimized by avoiding the need to scrap millions of worn out tires every year which reduces the number of tires in landfills. Retreaded tires also conserve less energy compared to the energy used up in manufacturing new tires. Moreover, the manufacturing process of retreaded tires takes less time and can lead to better tire management in terms of economy and efficiency. Hence environmental benefits of retreaded tires are crucial boosters for the automotive tire retreading services market".

**Globally:** Truck tyres as well as some passenger tyres are retreaded globally. In 2013, the market for passenger tyre retreading was declining however, in 2019, the market for OTR, truck and bus retreads is predicted to grow at 1% pa.

**New Zealand**: There are a small number of bus and light commercial and truck tyre retreaders. At time of writing this report Carters Tyre Service and Tyreline Ltd offer specialty/passenger and truck tyre retreads.

- A by-product of the retread process is rubber buffings which can be used in some end use market products and is typically considered a high value material.
- A fair mechanism for an advanced disposal fee for the imported "retread" will need to be established with the importers as these specific importers are identified.
- As the portion by comparison to the total tyre bank is small this can safely be done within the EPU calculation by weight using 9.5 Kg as the average "EPU" calculation.

### Civil engineering

**Globally:** Tyres that are baled can be used for retaining walls, temporary roads or sea embankments.

**New Zealand:** Civil engineering applications are the same as the global examples.

### Farming

**Globally:** There are examples of ELTs being used as weights on silage pits, specifically the side wall discs of large OTRs to prevent additional harm from exposed wires from passenger tyres. In America for example, tyres must be cut in half or have holes drilled in them for water drainage to prevent the build-up of water. There is a trend to use alternative anchor systems manufactured from ELTs as a value-add product.

**New Zealand**: ELTs are used to anchor and generate heat for silage pits on farms in significant volumes

## 8.4 Fabricated/cut products

**Globally:** ELTs may be recycled by primary processing consisting of cutting, punching, shredding or stamping them into various rubber products after removal of the steel bead. For example:

- Using the sidewalls of the tyre to create the base for traffic cones, as weights for silage pit covers or to be baled together for retaining walls
- Using the tread area to build blasting mats
- Tyres that are shredded can be used for backfilling or drainage in culvert beds
- Tyres with one side wall removed can have aggregate placed inside them to form a structural unit which can be used as a retaining wall or to build up quarries
- A variety of other products include floor mats, belts, gaskets, shoe soles, dock bumpers, seals, muffler hangers, shims, slope stabilisation, sound barriers and washers

**New Zealand:** Some of the above are undertaken in New Zealand currently, those being the side walls as weights for silage pits, dock bumpers and the retaining wall applications.

- A multi-year research project "Recycling of end-of-life tyres in civil engineering" undertaken by Laura Banasiak Groundwater scientist, Institute of Environmental Science and Research Ltd and G. Chiaro, A. Palermo & G. Granello, University of Canterbury applications: Environmental implications[7]. This research is focused on tyre toxicity of Eco-rubber seismic-isolation foundation systems, a new market for civil engineered solutions in NZ.

## 8.5 Ambient and cryogenic material recovery / size reduction[8]

In an **ambient** system, the tyres remain at room temperature as they enter the granulator. Ambient grinding is a multi-step processing technology that uses a series of machines (usually three) to separate the rubber, metal, and fabric components of the tyre.

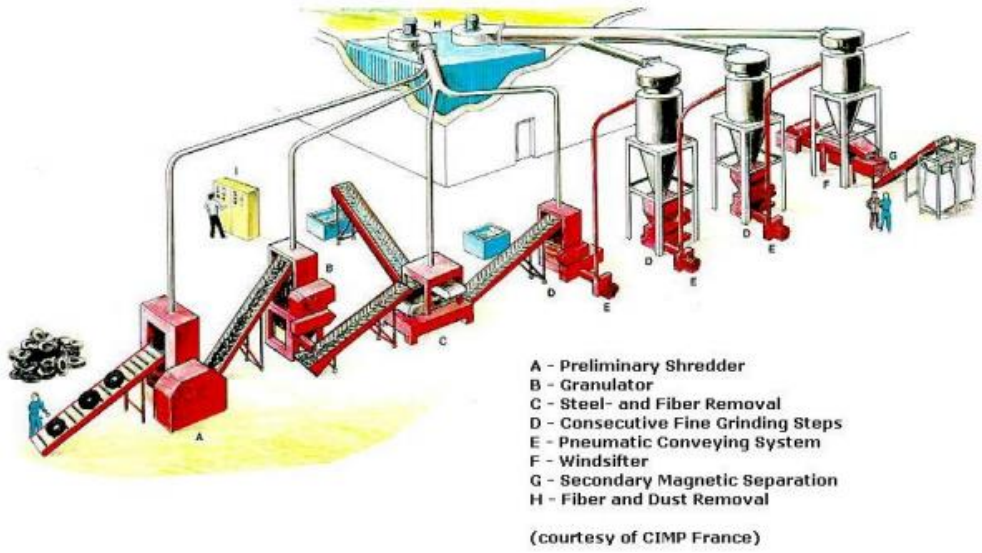


**FIGURE 6**
Example of ambient [scrap tire] recycling system

In a **cryogenic** system the whole tyres/tyre chips are cooled down to a temperature of below –80°C using liquid nitrogen. Below this "glass transition temperature" rubber becomes nearly as brittle as glass and size reduction can be accomplished by crushing and breaking. This requires less energy and fewer pieces of machinery when compared to an ambient system. Another advantage of the cryogenic process is that steel and fibre extraction is much easier, leading to a cleaner end-product.

[7] SOURCE https://ir.canterbury.ac.nz/bitstream/handle/10092/17599/WasteMINZ2019%20paper_Banasiak.pdf
[8] SOURCE http://www.entire-engineering.de/Scrap_Tire_Recycling.pdf

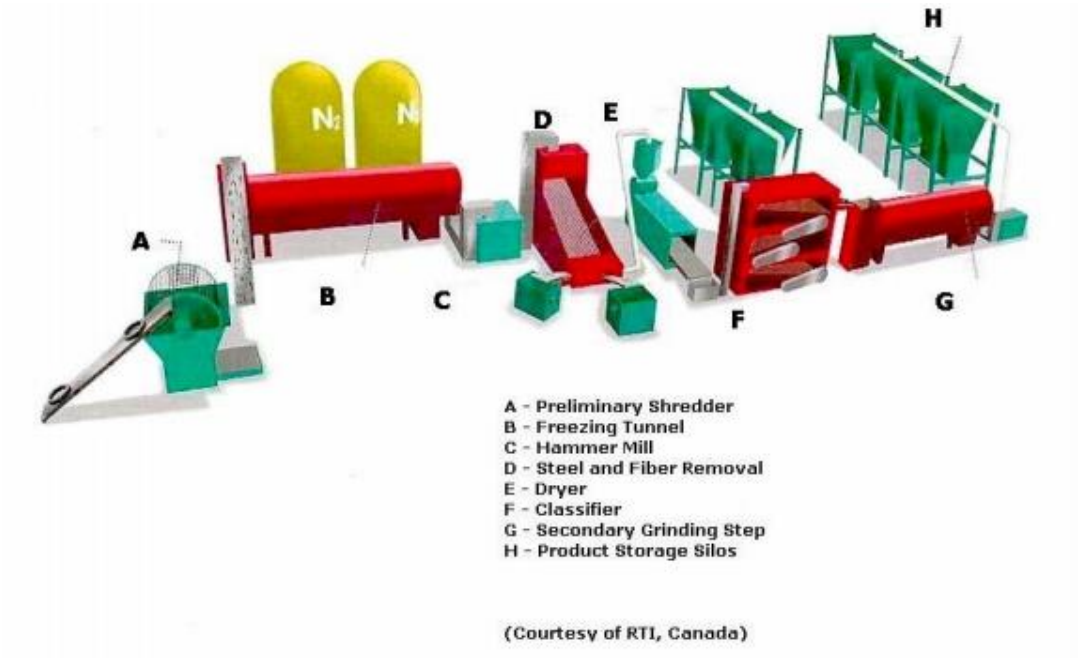


**FIGURE 7**
Example of a cryogenic [scrap tire] recycling system

## 8.6 Tyre derived product/medium (TDP/M) or tyre derived fuel (TDF); Further use of rubber extracted as result of ambient or cryogenic processes

- Rubber crumb as an end-use functional product
- Rubber crumb as an additive in a product
- Rubber crumb in a secondary process
- Rubber crumb in a destructive process
- Buffings from retreaders

The crumb characteristics vary depending on the process undertaken; in ambient processing the crumb has rough edges whereas in cryogenic processing the crumb edges are smoother.

For some manufacturing end uses of TDP/M the procurer will have a specification of the type of material including how it is produced (ambient or cryogenic).

- End use market(s) knowledge by the PSO will be required to balance investment from the ADF in the technology or end use products to support demand pull through initiatives.

The table below compares some of the most important parameters of crumb resulting from ambient or cryogenic processing.[9]

**TABLE 7** Parameters of crumb resulting from ambient or cryogenic processing

| Parameter | Ambient | Cryogenic |
|---|---|---|
| Operating Temperature | ambient, max. 120° C | below - 80° C |
| Size Reduction Principle | cutting, tearing, shearing | braking cryogenically embrittled rubber pieces |
| Particle Morphology | spongy and rough, high specific surface | even and smooth, low specific surface |
| Particle Size Distribution | relatively narrow particle size distribution, only limited size reduction per grinding step | wide particle size distribution (ranging 10 mm to 0.2 mm) in just one processing step |
| Maintenance cost | higher | lower |
| Electricity Consumption | higher | lower |
| LN2 Consumption | N/A | 0.5 – 1.0 kgLN2 per kg tire input |

**Globally:** The most recent WBCSD December 2019 review of the globally markets for "granulated" product and applications states that some markets for applications have fallen in significance between 2014 - 2017 such as the artificial turf infill due to health concerns; and the rubber-modified asphalt market which is still limited by regulatory barriers. On the other hand, innovative technologies are opening new markets, an example of this is the use of granulate in moulded rubber products used for civil engineering purposes such as earthquake modulators in Japan and SE Asia.

**New Zealand**: There is limited small scale ambient processing with variable crumb size output, this is set to change when Golden Bay Cement's FLSmidth HOTDISC®[10] is fully commissioned in October 2020.

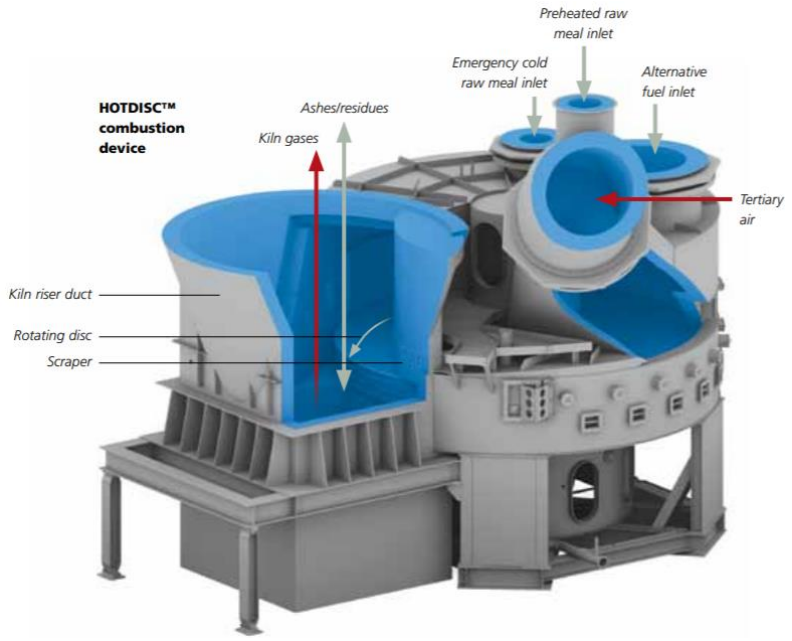


**FIGURE 9** Example of FLSmidth HOTDISC Technology

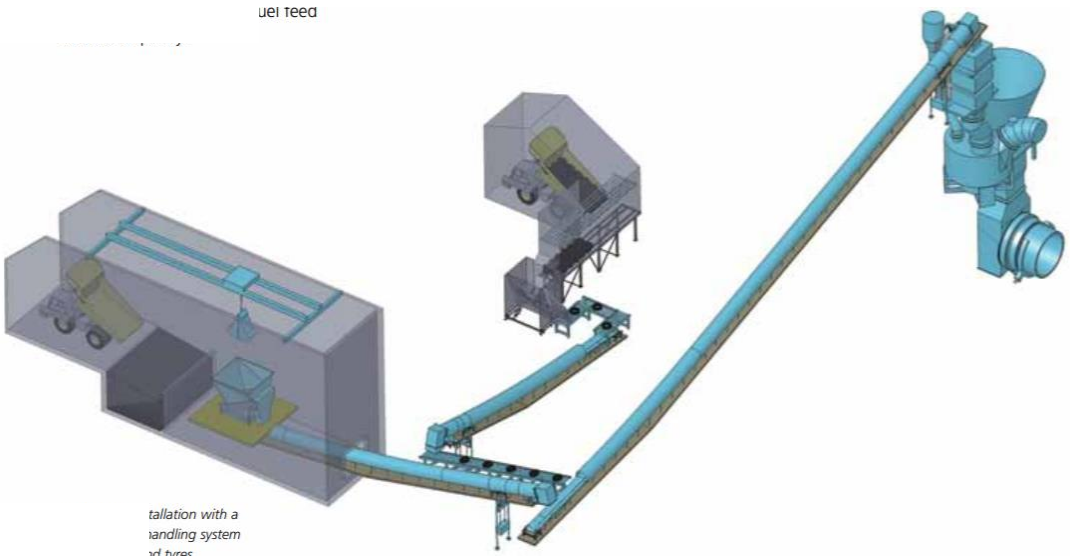


**FIGURE 8** A HOTDISC installation with a fuel feed and handling system for bulk fuel and tyres

[10] SOURCE https://www.flsmidth.com/en-gb/discover/cement-2019/flsmidth-to-help-slash-new-zealands-tyre-mountains

### Further use – rubber crumb as an end-use functional product

Rubber crumb derived from an ELT can be used as an ingredient in further applications or products, or it can be used as a product on its own.

**Garden applications - mulch**

As decorative landscape cover, recycled rubber mulch can be used in place of wood or stone mulch.

**Garden applications - lawn**

Reinforcing rubber crumb for lawns is made from recycled passenger tyres, granulated to form small rubber crumbs. It can be used as a top dressing or mixed directly into a new surface.

**Landfill engineering**

Shredded tyres can be used as a layer for landfill drainage in place of river gravel.

**Roading applications**

As a drainage medium around pipes, slope stabilisation, rubberised median barriers or sound barriers.

**Equestrian arenas**

This surface is composed of a layer of granulates bound with resin and covered with a layer of loose granulates. It combines the qualities of shock absorption, flexibility and elasticity, allowing the horse good impulsion and reducing the risk of injury from falls. Unlike the sand usually used in indoor arenas, this surface does not produce any dust, does not need to be watered and makes possible considerable savings in terms of horseshoes. This product is operational and patented and has been commercially produced in France since 2008.

- Treadlite NZ a recently formed tyre collection company and micro-processing plant based in Cambridge, Waikato, recently launched Premium Arena Mix is just one of a number of innovative products they are bringing to the market[11].

### Further use – rubber crumb as an additive in a product

**Reclaimed/recovered rubber back into manufacture of tyres**

Reclaimed rubber is rubber recovered from vulcanized ELTs (as by grinding old tyres and treating with alkali, oils, and plasticizers). It is often mixed with crude rubber for compounding and is used mainly in rubber-moulded products. Reclaimed rubber has been used in new tyre manufacture in small quantities globally. Due to the volume of reclaimed rubber in the global market close to the manufacturing source of new tyres, and currently exceeding demand, this is not seen as a viable market for New Zealand in the initial 10-year period.

Rubber is cured via a thermo-chemical process that softens and expands the product to reduce the overall viscosity and break the cross-links. The final product is highly uniform and costs around one-third of existing polymer prices.

This inexpensive raw material is largely preferred by manufacturers owing to its lower power consumption rate and reduced thermal plasticity levels that make it easier to break down while processing, in comparison with the synthetic counterpart. The ready availability of waste tyres and low cost of reclaimed rubber has further contributed to industry growth in recent years. The production of reclaimed rubber from TDM is dominant in the Southeast Asian countries China, Japan and Thailand.

[11] SOURCE https://www.facebook.com/Treadlite-NZ-111549960195655/

**Adhesives**

Recovered rubber can also be used to produce industrial adhesives, particularly as a tile adhesive. Rubber crumb is used in the manufacture of tile adhesives providing a range of product benefits such as weight reduction (bag weight), improved coverage, longer workability, flexibility and sound attenuation. The addition of rubber crumb products prepared for plastic applications are used to modify and/or extend thermoplastic materials. Interest in tyre derived product (TDP) use in adhesives is now spreading to Europe as manufacturers develop global formulations of products in keeping with global/international standards.

Rubber crumb does also have disadvantages in this end use market however, primarily related to poor bonding into the adhesive matrix. Research indicates that this is because styrene butadiene rubber (SBR) binders present in motor vehicle tyres generally do not bond as well as polymer additives, which are used specifically to improve adhesion and are substitute products to TDPs in adhesives. Rubber with higher proportions of natural and not synthetic rubber (as is the case for most motor vehicle tyres) generally has higher proportions of SBR. The use of surface modification to solve this difficulty and bond particles together better has proven to be too expensive in this end market use.

- 2015 - the New Zealand Forest Research Institute (Scion) received government grants for a range of building industry projects:
  - $100,000 for MDF Panel Boards Utilising Crumb Rubber Sourced from End of Life Tyres
  - $178,000 for Acoustic Building Products from End of Life Tyre Sourced Crumb Rubber
  - $182,550 for Extrusion devulcanisation of waste tyres for to replace imported polymers
- 2015 - Toi Ohomai Institute of Technology, Bay of Plenty received a government grant for $60,000 to investigate the use of end of life tyres as sustainable building products

**Moulded products**

Once granulates are mixed with binders or resins, they have many applications in moulded objects. They can be transformed into speed ramps, curb ramps, wheel chocks, mats, cable guards, signalling posts, accessories for equipping cycle tracks. Additionally, there are landscaping applications such as stepping stones, cobblestones, rubber pavers and tree guards.

If granulates are finely shredded and then dried to remove all traces of humidity, they become tyre powder. This powder is combined with a vulcanisation agent and then homogenised in kneading machines. The resulting mixture is then poured into preformed presses and vulcanised in the form of bandages. In this way, it is possible to manufacture wheels for waste containers, as well as casters for scaffolding, wheelbarrows, hand trucks or high-pressure cleaning equipment.

There are various building and construction applications including a rubber roof tile which has 80% recycled content and looks like cedar shingles.

Carpet underlay is a further application which uses rubber crumb and is moulded into a new product.

- June 2017 - Eco Rubber Industries Ltd was provided with a grant of $600,000 towards $2.4 million of machinery to maximise production volumes to produce rubber granules for rubber underlay, with a capacity for 600,000 tyres per year.

**Artificial turf (sports grounds)**

Synthetic turf is composed of a mat of synthetic grass into which a bed of ballast is generally added, made of sand covered in a layer of loose granulates.

This technology makes it possible to use stadia in all weathers and all seasons as the covering is not sensitive to either frost in winter or drought in summer, nor is it sensitive to flooding caused by heavy rain. It requires a very limited amount of upkeep and does not need to be watered. Above all, synthetic turf surfaces feel very similar to playing on natural turf. Previously it was thought that synthetic turf surfaces have no negative environmental or health impacts on those who use them however the same health concerns for sporting arenas documented below, applies.

**Sporting arenas**

The shock absorbing properties of used tyres make them an adequate material for manufacturing flexible sporting areas in the form of granulates bound together with resin to form a mat. There are many applications based on tyre granulates: athletics arenas and multisport platforms (traction, shock absorption, durability), indoor sports arenas, urban sports installations, weight-training rooms, tennis courts and stabilised soils.

- **Health concerns relating to the use of tyre crumb in artificial turf and sporting areas (specifically inhaling gases, micro crumb from hand to mouth):** In the USA, public health concerns have been raised regarding the potential adverse health effects in humans exposed to the crumb rubber infill component of synthetic turf fields. In February 2016, a multi-agency research effort called the "Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds (FRAP)" was launched by the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR) and the U.S. Environmental Protection Agency (EPA), in collaboration with the Consumer Product Safety Commission (CPSC).

  In August 2019, the first report "Synthetic Turf Field Recycled Tire Crumb Rubber Characterization Research Final Report: Part 1 -Tire Crumb Rubber Characterization" was released. [12]

  In early 2020, the Exposure Characterisation Report will be released which will provide evidence of harm and accepted testing framework against a range of characteristics such as indoor/outdoor, age, use patterns, etc.

- **Environmental concerns.** No obvious data on environmental concerns relating to the release of micro "crumb" could be found other than limited evidence of it tracking off the fields through soles of shoes and clothing. It follows that it will be covered in the release of the Exposure Characterisation Report reference above.

**Rubber modified asphalt**

Rubber crumb obtained from used tyres along with additional polymers can be incorporated into asphalt or associated with road coatings. It improves the acoustic characteristics of the asphalt surface as well as its resistance to cracking during frosts and thaws. Similarly, such surfaces also encourage vehicle adhesion. Importantly, there is a significantly increased service life and a lower life cycle cost.

The textile fibres obtained from tyres can also be integrated into road surfacing materials, once the fibres have been cleaned and treated. Several studies have been carried out to verify the characteristics of this product and optimise the dosage. The result is that the incorporation of treated fibres makes it possible to improve the coating's stress resistance by 20%, thus resulting in an increase in the asphalt's life expectancy of several years compared to conventional asphalt.

[12] SOURCE https://www.epa.gov/chemical-research/federal-research-recycled-tire-crumb-used-playing-fields

## 8.7 High level technical barriers to implementation in New Zealand

- Absence of substantive ASTM (American Society for Testing and Materials) testing to inform the properties of the recycled rubber to be specified for procurement contracts and the construction methods required for is a barrier to supply against the recognised standards used in the pavement industry
- High capital cost of technology used to "lay" the rubber modified asphalt; would require technology transfer of wet mix blending equipment, sprayer and nozzles plus resource from overseas to train of local workers
- **Considerations of health and safety** for:
    - workers in the proximity of the equipment due to the heat at which the rubber modified asphalt needs to be kept at in situ - would need to fit with emulsion technology that has reduced health & safety risks to date as this has given significant improvements in health and safety, energy use and environment (carbon footprint)
    - addressing workers concerns about use of rubber crumb in roading production causing health risks from carcinogenic compounds and issues with odours
- **Environmental concerns** relating to vertical landfill waste hierarchy position and run off toxicity – potentially crumb rubber limits the options for RAP (recycling in situ) which has important environmental benefits for whole of life calculations
- Guaranteed supply of crumb rubber in specification, in time
- Tenders are lowest price. Benefits are cost driven, not environmental lack of philosophical step change to improve the roading surfaces, so that they last much longer or never need to be replaced, as is the case in the USA and Europe (relates to procurement and demand pull through)

## 8.8 Volume barrier for the NZ market

**Chip seal roads make up 90% of NZ's roads.** Aggregate is relatively inexpensive and readily available regionally. Overseas, rubber powder is added to the chip seal as a bitumen extender and is used to give added surface life to cracked or near end life road surfaces. Common blends contain at least 20% rubber by mass. Total annual bitumen consumed in NZ annually is estimated at 150,000 tonnes.

A major problem for chip seal surfaces in New Zealand is flushing. The chip seal is generally blended on-site but could also be blended at plant.

- The estimated maximum potential market for this use would be 30,000 tonnes annually, at 20% of total bitumen.

It is estimated that 5-8% of asphalt roads are modified in New Zealand, and the potential market for crumb rubber in this application is, at maximum, 1,500-2,000 tonnes per annum (2015).

**Asphalt pavements make up about 10% of New Zealand roads,** comprising main highways and motorways and are concentrated around major population centres such as Auckland, Wellington, and Christchurch.

Approximately 5-8% of these state highways are polymer modified with SBS (styrene-butadiene-styrene. The SBS polymers are imported to New Zealand costing $5-$6 per kg and have three-month lead time. Importing these polymers contains risk of increasing costs and delivery issues, which could be mitigated by using a New Zealand product such as tyre derived rubber powder.

Globally, crumb rubber is substituted for SBS polymers, and by mass 5 times of rubber crumb is required to give the same performance benefits of the SBS polymers.

A wet mix process is most commonly used offshore, where rubber and bitumen are combined together at high temperatures. This requires special blending equipment and sprayers, estimated to cost about $0.5 million per contractor for the blending equipment.

A dry mix process where rubber is added to the aggregate prior to mixing with bitumen can also be used but has more variability. In August 2018, the Federal Highway Administration Research and Technology User Guideline for Asphalt Concrete Dry Process was updated and states that "Additional research is needed to define the properties of binders produced by the dry process. Desirable properties for dry process hot mix asphalt mixtures need to be better defined". Plants need recycling collar or double drum mixers to be able to introduce recycled materials. It was thought there are several plants in NZ that have these facilities, with Fulton Hogan having four.

Rubber modified asphalt mix usually includes 2.5% recycled rubber by mass.

In 2015, consensus from the roading contractors is there is not enough market for them to justify the investment. A finding from the research project "Rubber in Roading" which brought together OPUS, NZTA, crumb rubber suppliers and roading contractors was that this attitude could be changed by demonstrating that the material can be used cheaply, effectively, and in numerous applications other than just roads.

- 2015 - government grant of $199,850 to Opus for "Dedicated Cycle Lanes using Tyre Derived Rubber in Construction Material" project – resource consents and processing issues remain when using this medium as at 2020. Opus is now known as WSP.
- NZTA – update on NZ Transport Authority's project ART 14/06 to identify the barriers to using tyre derived crumb rubber in bitumen binder in NZ roading and the methods to remove these barriers to create market demand for NZ waste tyre derived products and its 2015 extension into use in cycleways.[13]
- 2016 – NZTA report 655 investigates the use and specification of Polymer modified binders (PMBs). The executive summary of the report states that "PMBs internationally was reviewed and compared with practice in New Zealand. In New Zealand and internationally elastomeric polymers (typically SBS, SBR type), at 3–5% concentration are the most widely used. Internationally the use of crumb rubber from recycled tyres is also very common. Crumb rubber has been employed in New Zealand on occasion over the past few decades but is not currently in use.[14]
- June 2017 - government grant of $40,000 to Fulton Hogan to cover feasibility studies into "Rubber Modification Of Bitumen Binders".
- In 2018, Tyre Stewardship Australia expanded its footprint to increase consumption of TDM in Australia by launching a demonstration and infrastructure stream which delivers practical outcomes for an array of sectors including roads, advanced manufacturing, civil infrastructure, rail and building construction. One of these projects was the announcement of a test of new mixes of crumb rubber asphalt on a 335 metre stretch of road in Mitcham, South Australia. Alongside this is another trial on an arterial road in Victoria between the Victorian Department

[13] SOURCE https://www.nzta.govt.nz/assets/resources/578/578-removing-barriers-to-the-use-of-crumb-rubber-in-roads.pdf
[14] SOURCE https://www.nzta.govt.nz/assets/resources/research/reports/655/655-Performance-benefits-of-polymer-modified-bitumen-binders-for-thin-surfacings.pdf

of Transport and the Australian Road Research Board. Both trials are multi-year projects. Information on the new national specifications for crumbed rubber modified (CRM) asphalt, for open graded asphalt (OGA) and gap graded asphalt (GGA) mix designs can be found on www.tyrestewardship.org.au

- It is important to understand that the commercial scale production of rubberised asphalt and furthermore the recycling of "recovered" rubberised asphalt in New Zealand context (specifically for resource consents) has is unproven.

**Recycled tyre filament fibres (RTFF) in the construction industry**

Recycled tyre filament fibres (TTF) are extracted from the textile reinforcement and steel commonly embedded into tyres to guarantee their performance as well as rubber granules. These are also a by-product from primary shredding processing.

Using filament/polymer fibres to reinforce concrete is not new, these are typically manufactured to a specification with steel fibres versus polymer fibres delivering a range of beneficial properties to the structural concrete of different grades.

There are a range of studies progressing to assess the opportunities resulting from incorporating the granulates or textile fibres, obtained from shredding used tyres, into the mortars and concretes used as the basis for cement.

Typically globally, and certainly in New Zealand, the use of any performance enhancing product into the use of concrete has to following a strict range of testing by ASTM International, formerly known as American Society for Testing and Materials. This is an international standards organisation that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

The incorporation of filament/polymer fibres means both lightening the concrete and increasing its performance (increased resistance to cracking and the deformation capacity of these materials). Beyond applications for which resistance to the cracking caused by deformation is a priority, the use of textile fibres is also an advantage for ground-strengthening techniques.

- In June 2017, researchers at the University of British Columbia (UBC) used recycled tyres to develop an extra resilient concrete that could be used for buildings, roads, bridges and dams.

  According to researcher Obinna Onuaguluchi, a postdoctoral fellow in civil engineering at UBC, the team tested different parts of recycled tyre fibres and other concrete-based materials like sand and water to find the "ideal mix," which includes 0.35 per cent of tyre fibres.

  The new concrete was used to resurface the steps in front of the McMillan building on UBC's campus in May 2017. Its performance is being tracked using sensors embedded in the concrete, looking at development of strain, cracking and other factors. So far, the results support laboratory testing that showed it can significantly reduce cracking (up to 90% reduction compared with a standard structural mix design).[15]

  A paper published in Science Direct on the influence of recycled tyre polymer fibers (RTPF) [16] on concrete properties shows that recent studies on RTPF have shown that the addition of this type of fibres in fresh concrete mixes has a positive effect on volume deformations at an early age and mitigates the explosive spalling at high temperatures without affecting the

[15] SOURCE https://link.springer.com/article/10.1617/s11527-017-1025-7

[16] SOURCE Influence of recycled tire polymer fibers on concrete properties, AnaBaričevićMarijaJelčić RukavinaMartinaPezerNinaŠtirme

residual mechanical properties of concrete [6,8]. Further studies are required to evaluate and distinguish influence of crumb rubber inclusions from fibres' contribution, as recent studies have indicated a significant potential of RTPF in the construction industry.

## 8.9 Further use - rubber crumb in a secondary process

This section relates to crumb being broken down further for use in a secondary process.

**Pyrolysis**

Pyrolysis is a method to break down tyres using a catalyst – normally from crumb into potentially usable end products. Called by a variety of names, such as thermal distillation and destructive distillation, pyrolysis involves the heating of organic compounds (tyres) in a low oxygen environment which generates combustible gases, oil, and char products. The quantity and quality of each product depends on variables including temperature, pressure, and residence time.

The products derived from pyrolysis can be used for the following applications;

- **Oil** recovered from the pyrolysis process has many potential applications, including industrial lubrication, high value solvents, and alternative fuels.
- **Char products** (carbon black) recovered from the pyrolysis process can be used in the manufacturing of inks, paint, dye, plastics, and rubber products.
- **Energy** derived from pyrolysis can be used to help power on-site generators, and eventually can provide some of the electricity needs of a pyrolysis plant.
- **Blended diesel fuel** - There have been trials globally using varying percentages of pyrolysis oil as a blend with diesel.

The WBCSD December 2019 Global ELT Management report (attachment) notes that informal (where there are a lack of controls) pyrolysis activities in Asia focused on producing oil are facing a new wave of restrictions where new safer forms (closed loop systems) of pyrolysis technology are developing with a focus on other components, notably carbon black and is diverse applications. It reports that overall, efficient technology producing high quality outputs are not widespread.

Barriers to large scale application in New Zealand are:

- Need for pre-processing of the feedstock and post-processing measures of the components
- Competition pressures for price (and sometimes quality) compared to use of virgin products, mostly due to relatively high processing costs compared to imported products
- Consumers and regulators understanding of actual versus perceived environmental risks compared to “incineration” and “waste to energy” and NIMBY

Interest in establishing full commercial ventures in New Zealand has substantially increased since the completion of the initial Tyrewise project in 2015, the plastic bag ban in 2019, and the impact of China National Sword on New Zealand’s ability to recycle its own plastic “waste”. Trials and pilot projects continue globally.

- June 2017 - Nufuels Ltd is being provided a $90,000 grant for a $135,000 pilot pyrolysis plant to produce tyre pyrolysis fuel on a decentralised basis which would use 150,000 tyres per year.

## 8.10 Further use – rubber crumb in a destructive process

This section relates to crumb being consumed in a destructive process.

**Mining**

In Australia rubber crumb has been proposed for two mining applications; these are stemming and blasting mix.

When blasting and charging is conducted in mines in Australia holes are commonly filled with explosives and then packed with "stemming" (material which plugs the hole and ensures that the energy from the explosion goes back into the surrounding rock rather than back out of the hole). Currently certain sized gravel is being used as stemming, but trials have been undertaken that replace the gravel with ELT products. Feedback from aggregates experts in New Zealand advise that stemming aggregate in NZ is very low cost by comparison to Australia, and that consideration would need to be give the rubber contamination of the end product (e.g. concrete as rubber granules in the concrete manufactured from gravel would likely not be acceptable).

The explosives in the holes are made from a mixture of ammonium nitrate and diesel; there is some proprietary work that has been undertaken whereby mixing a rubber crumb with the diesel reduces the required percentage of ammonium nitrate.

Tyre Stewardship Australia funded research work by Blew Chip International to develop the products in 2016. It is unclear at the time of writing this report what the status is.

**Carbon and steel recycling – foundries and steel works**

Since 2007, shredded used tyres have been used commercially in foundries in France, as a source of metal (steel) and carbon black (replacing anthracite, a coal of a hard variety that contains relatively pure carbon and burns with little flame and smoke).

Their experience shows that loading shredded tyres into the hot blast cupola of the foundry alters neither the fusion processes nor the quality and properties of the cast iron produced and decreases manufacturing costs. An important consideration is the standardisation of the tyre shedding process to determine the best size shred for these industrial processes.

Since 2004 shredded tyres have been used as a replacement for anthracite in electric arc furnaces as they contain large quantities of carbon. It is process that can be found in use in Japan and Europe. The market opportunity is affected by the price of scrap metal and anthracite as well as any regulatory moves by regions/countries on the use of coal products as a resource.

In October 2019, the World Steel Association reports that steel production in New Zealand increased to 59.30 thousand tonnes in November from 51.42 thousand tonnes. Steel production in New Zealand averaged 66.07 thousand tonnes from 1992 until 2019.

- Australian Academy of Science Fellow Professor Veena Sahajwalla, an invited speaker at the Inaugural Tyre Industry Conference in 2015, spoke of research she led at the University of New South Wales Centre for Sustainable Materials Research and Technology (SMaRT). The method they have developed, called 'polymer injection technology', uses shredded-up car tyres to help manufacture steel.

  The car tyres have their steel rims removed and are then shredded to pieces of less than 5 millimetres in size. The shredded rubber polymer is then injected straight into the furnace to react with iron oxide to make the iron needed for the steel. Steel was manufactured at OneSteel.

In 2019, InfraBuild, the new owner of OneSteel, on using the Polymer Injection Technology (PIT) states that "PIT doesn't have any adverse effects on steel quality, and it improves the environmental sustainability of the steelmaking process. For builders, engineers and architects, this means they can take advantage of steel's strength and flexibility while boosting their environmental credentials. In fact, using PIT will earn one Green Star point if using reinforcing steel in buildings.

**Savings of 15–35 per cent on total carbon injectant costs** makes the technology attractive for fabricators, distributors and developers, who can expect improvements in yield and productivity, inject oxygen consumption, refractory and electrode consumption and injection system wear".

**Tyre derived fuel (TDF) – cement works, pulp and paper, power generation, industrial boilers and tyre manufacture**

**Cement works**

Using TDF in cement kilns makes it possible to make savings in petroleum coke, coal and heavy fuel and also in carbon emissions. Using tyres occurs only under particularly strict and well-controlled conditions. In certain factories, the substitution rate for traditional fuels can be as much as 50% of the furnace's thermal consumption. Golden Bay Cement (GBC) contest that the 50% value as too high and are unaware of any factories successfully using this level of TDF substitution.

In France, Aliapur has been delivering whole or shredded tyres to cement makers since 2004.

In the USA, 41% of ELTs are burnt as fuel in cement kilns which make clinker—a primary component of Portland cement. A cement kiln is basically a large furnace in which limestone, clay, and shale are heated at extreme temperatures and a chemical reaction transforms them into clinker. Clinker is ground together with gypsum to form Portland cement.

The use of whole tyres as kiln fuel is possible for some type of cement kilns. For these cement kilns, truckloads of whole tyres are delivered to the end of a conveyor. Tyres are manually unloaded from the truck onto the conveyor. The conveyor feeds the tyres to a mechanism that inserts one tyre at a time into the kiln at specified time intervals. The advantage of utilising whole tyres is that there are no costs to create rubber crumb. The removal of the steel is unnecessary since cement kilns have a need for iron in their processes. Rubber crumb may also be utilised because there is very little manual labour involved in handling crumb versus whole tyres, however, producing crumb from whole tyres increase costs. However, GBC advise that the substitution rate for whole tyres is considerably less than for TDF chips where the delta can be as much as 1/5. With whole truck tyres the wire beading can remain intact through its transition through the kiln. This will cause massive mechanical damage to the process equipment after the kiln. This does not happen with chipped TDF.

There are "add on" combustion devices available that allow some existing cement kilns to use TDF. An example of one of these is HOTDISC™. HOTDISC™ allows a variety of solid wastes up to 1.2m in diameter to be utilised which means tyres from truck size and below can be combusted without being reduced to a crumb. This eliminates the step of shredding truck and passenger tyres prior to use in cement kilns. Rather than being shredded to a crumb, larger tyres could be reduced into pieces less than 1.2m for use. The use of TDF in cement kilns is not all "upside" and GBC advise that some of the downsides to be considered are the effects of the higher sulphur content of TDF compared to coal and the detrimental effect on output.

- June 2017 - Golden Bay Cement, a subsidiary of Fletcher Building, was provided with a grant of $13.6 million towards the $18.1 million cost of new equipment that is sized to dispose of 3.1 million shredded tyres (not EPUs) per year. Then Minister for the Environment, Nick Smith,

stated that "this technology [sic HOTDISC™] is globally one of the most common and economically viable solutions to waste tyres. The high temperature incineration minimises pollutants, the steel in the tyres contributes to the iron requirements of cement and the rubber provides a fuel substitute for coal. The major environmental gain from this initiative is a solution for millions of waste tyres but there is also a benefit in reduced greenhouse gas emissions. Golden Bay Cement is New Zealand's fifth largest emitter and the substitution of rubber biofuel for coal reduces emissions by 13,000 tonnes per year, or the equivalent of 6,000 cars".

2019 – 10,000 tonnes of TDF is being accumulated at Portland as a feedstock in advance of the commissioning of the combustion equipment; the specialised combustion device will not be commissioned until October 2020 (*reference Pete Bray, Technical Services Manager, GBC 13/2/2020*)

**Pulp and paper industry**

According to the USA EPA, about 26 million tyres per year are consumed as fuel in boilers at United States pulp and paper mills. Pulp and paper mills have large boilers which are used to supply energy for making paper. This energy is normally supplied by wood waste; however, wood varies substantially in heat values and moisture content, so the mills often supplement the wood fuel with other fuels, such as coal or oil, to make the operation more stable. TDF is also used in many plants as a supplement to the wood because of its high heat value and low moisture content.

The main problem in using TDF in the paper industry is the need to use de-wired tyres. The wires often clog the feed systems. Also, the mills sometimes sell the resulting ash to farmers who require the ash to be free of iron. De-wired TDF can cost up to 50% more than regular TDF.

**Utility and industrial boilers**

In the electric utility industry, boilers typically burn coal to generate electricity. TDF is often used as a supplement fuel in electric utility boilers because of its higher heating value, lower NOx emissions, and competitive cost as compared to coal. However, only certain types of boilers are conducive to burning TDF.

Cyclone boilers are the most used of all the utility boilers for burning TDF as they require no changes to be made to the boiler itself, thus reducing the capital investment. Therefore, the only additional equipment needed is a conveyor to transport the tyre pieces into the boiler. Cyclone boilers cannot accept whole tyres which increases the cost of obtaining the fuel (the optimum size of the tyre pieces is 1 inch x 1 inch and it must be de-wired). Stoker fired units are also economical with the residence time of the fuel being longer, larger tyre pieces can be used. The optimum size of these pieces is 2 inches square which reduces the cost of obtaining the fuel for cyclone boilers and makes it more economical.

- Use of TDF as fuel for boilers is not seen as a viable outcome for New Zealand given accessibility to renewable energy sources.

**Tyre manufacture**

In Japan, some tyre manufacturers use TDF in their tyre factories. The uses of TDF in a tyre factory are:

- A heat source for boilers
- Cogeneration in grate incineration
- Power generation in a fluidized-bed incinerator

There remains no commercial tyre manufacturing capacity in New Zealand as at December 2019.

## 8.11 Devulcanisation – chemical, ultrasonic, microwave

**Globally:** Devulcanisation is a procedure where tyre rubber is converted using chemical, ultrasonic or microwave processes into a state in which it can be mixed, processed and then vulcanised again.

- For the **chemical process** to occur the rubber crumb is mixed in a reactor with a reagent to create a chemical reaction. At the conclusion of the reaction the remaining product is filtered and dried to remove undesirable chemical components.
- The **ultrasonic process** occurs when rubber crumb is fed into an extruder via a hopper and the rubber is mechanically pushed and pulled serving to heat the rubber particles and soften the rubber. The softened rubber is transported through the extruder and subjected to ultrasonic energy. The combination of these activities is enough to achieve varying degrees of Devulcanisation.
- The **microwave process** applies thermal energy swiftly and uniformly to the rubber crumb. The applications for microwave Devulcanisation are limited as the only rubber that can be successfully used is rubber with polar polymers. Polar polymers are not usually found in tyres.

**New Zealand:** At time of writing this report there is no Devulcanisation occurring outside of pre-commercialisation phase.

### BOX 2 Disclaimer of Endorsement

Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favouring by the Tyrewise Working Group or Advisory Groups.

They are provided so that the reader understands what happens in a global market and what may be possible for a national market in the future, and the examples of NZ businesses who are working with these products are for information purposes only.

# 9. Legislation and regulatory controls

## 9.1 The legal framework for waste

This section has been included in this report for the benefit of the reader and to assist with consultation with industry and affected parties. It is a direct copy of the section on the Ministry for Environment Website as at 22 December 2019 - (reference https://www.mfe.govt.nz/waste/waste-strategy-and-legislation/legal-framework-waste)

Waste management and minimisation planning legislation is primarily provided by the following three Acts:

- the Waste Minimisation Act 2008
- the Local Government Act 2002
- the Resource Management Act 1991.

**TABLE 8** Information on these Acts, other relevant legislation and international agreements.

| Legislation | |
|---|---|
| Waste Minimisation Act 2008 | The Waste Minimisation Act encourages a reduction in the amount of waste we generate and dispose of in New Zealand. This to protect the environment from harm and provide environmental, social, economic and cultural benefits.<br><br>For more information see the Waste Minimisation Act web page. |
| Local Government Act 2002 [New Zealand Legislation website] | The Local Government Act empowers councils to promote the well-being of communities.<br><br>The purpose of local government is to:<br>• enable democratic local decision-making and action by, and on behalf of, communities<br>• promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.<br>Solid waste collection and disposal is identified as a core service to be considered by a local authority. |
| Resource Management Act 1991 | The Resource Management Act (RMA) is New Zealand's main piece of environmental legislation and provides a framework for managing the effects of activities on the environment. The RMA controls the environmental impacts of waste facilities such as disposal facilities, recycling plants and cleanfills. |

| | |
|---|---|
| Litter Act 1979 [New Zealand Legislation website] | The Litter Act was established to make better provision for the abatement and control of litter. The Act is a basic mechanism for local government to prevent littering.<br><br>The functions of the Act include:<br>• establishing enforcement officers and litter wardens who may issue fines and abatement notices for litter offences<br>• allowing territorial authorities to force the removal of litter<br>• allowing public authorities to make by-laws pursuant to the provisions of the Act. |
| Climate Change Response Act 2002 | The Climate Change Response Act 2002 put in place a legal framework to allow New Zealand to ratify the Kyoto Protocol and to meet its obligations under the United Nations Framework Convention on Climate Change.<br><br>This Act also enables the New Zealand Emissions Trading Scheme (NZ ETS). Operators of disposal facilities have specific obligations under the NZ ETS. See Climate Change (Waste) Regulations 2010 [New Zealand Legislation website]. |
| Health and Safety at Work Act 2015 [New Zealand Legislation website] | The aim of the Health and Safety at Work Act 2015 is to provide for a balanced framework to secure the health and safety of workers and workplaces. The Act contains mechanisms to protect workers and other persons from harm, provide for resolution of workplace health and safety issues, and promote health and safety education. |
| Hazardous Substances and New Organisms Act 1996 | The Hazardous Substances and New Organisms Act 1996 (HSNO) and its regulations control the import, manufacture, use and disposal of manufactured chemicals that have hazardous properties.<br><br>The HSNO Act prohibits the import or manufacture of a hazardous substance unless it is done under an approval. An approval sets controls (rules) for the substance throughout its lifecycle such as requirements for storage, identification, emergency management and disposal. The approval covers the lifecycle of the substance until it is disposed of according to the controls on the approval (eg, treating it so that it is no longer a hazardous substance or exporting it from New Zealand as a waste). |
| Ozone Layer Protection Act 1996 | New Zealand's commitments under the Montreal Protocol on substances that deplete the ozone layer are contained in the Ozone Layer Protection Act 1996 and the Ozone Layer Protection Regulations 1996.<br>The Ozone Layer Protection Act lays down the broad controls for ozone-depleting substances. |

**International agreements**

International agreements are legally binding agreements between participating countries. Agreements relevant to the waste sector are to do with reducing, banning and regulating types of waste.

**Key agreements**

| | |
|---|---|
| Basel Convention | The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal aims to reduce the amount of waste produced by signatories. It also regulates the international traffic in hazardous wastes especially to developing countries. |
| Stockholm Convention on Persistent Organic Pollutants | The Stockholm Convention on Persistent Organic Pollutants aims to protect human health and the environment by banning the production and use of some of the most toxic chemicals known to humankind. |

## 9.2 The legal framework for managing end of life tyres

| Situation reported in 2013 | Situation updated 2019 |
|---|---|
| In 2013, there were no central or local government regulations specific to tyres, however several pieces of legislation existed that could control the storage and disposal of end of life tyres.<br><br>Specifically, these are: | In 2019, there have been some changes which have enhanced the ability for enforcement of illegal dumping, as well as the development of the National Environmental Standard for the Storage of Tyres which provides guidance for industry and regulators specifically as it relates to management of the tyre for run off and fire controls. |
| **Litter Act – Section 15.** It is illegal to dump tyres on any property whether publicly or privately owned, without the owner's permission. An individual can be fined $400 and in the case of a body corporate the fine can be up to $20,000. | **2018 Amendment** of the Litter Act 1979 increased the maximum fine for an infringement offence from $400 to $1,000. No change to the body corporate limit. |
| **Resource Management Act (RMA) Section 9.1** Under the Resource Management ACT no person may use any land in a manner that contravenes a rule in a district plan unless the activity is expressly allowed by a resource consent granted by the territorial authority responsible for the plan. Storing of tyres would be considered a form of land use.<br><br>**Section 15 Discharge of Contaminants**: where tyres are a contaminant. | **Under Review**<br><br>The Resource Management Act (RMA) is currently under its most comprehensive review. The scope of the review includes looking at the RMA and how it interfaces with the:<br>• Local Government Act 2002<br>• Land Transport Management Act 2003<br>• Climate Change Response Act, to be amended by the Zero Carbon Amendment Bill.<br><br>Stage one is to determine issues and options to be considered by the review, submissions are **open until February 2020.** |

| Situation reported in 2013 | Situation updated 2019 |
|---|---|
| **Purpose** National Environmental Standards are regulations made under the Resource Management Act 1991 (RMA). They provide certainty about rules across the country by setting nationally consistent planning requirements for certain specified activities. *Ref MfE* | |
| **National Environmental Standards for Air Quality Regulations 2004 – Clause 7.** This regulation prohibits the burning of tyres: (1) The burning of tyres is prohibited.<br><br>(2) Subclause (1) does not apply if the tyres are burnt at industrial and trade premises that have—<br><br>(a) a resource consent for the discharge produced; and<br><br>(b) emission control equipment that is designed and operated to minimise emissions of dioxins and other toxics from the process. | **Amended regulations came into force on 1 June 2011.** Standards were revised to address concerns regarding the perceived 'stringency' of the ambient standard, the lack of equity for industrial air pollution sources, and the difficulty in achieving the original target timeline of 2013. |
| **National Environmental Standards for Storage and Disposal of Tyres.** The Tyrewise Working Group recommended that this be developed in conjunction with the declaration of tyres as priority product. | **The National Environmental Standards for Outdoor Storage of Tyres** has been through a series of consultation phases since 2017. MfE website advises that "we will continue to work on the proposed NES in collaboration with council waste management experts to ensure it is fit-for-purpose. We expect the NES to be completed December 2019/early 2020". |
| | **Tyre Movement and Storage Guidelines** were developed in 2017 by the Waikato Regional Council. These guidelines are available to be adopted by all local government entities. |
| **Local Government Act (Part 8).** This gives local authorities the right to make by laws to protect the public from nuisance and to maintain public health and safety. It states that this includes the right to pass by laws on waste management, trade waste and solid wastes. | **This Act is regularly under review**. While sub parts of Part 8 have been reviewed since 2013, it appears that the intent of Part 8 remains intact specifically the right to pass by-laws on waste management, trade waste and solid wastes. |
| **Waste Minimisation Act 2008.** This provides a regulatory framework, administered by MfE for the establishment of product stewardship of end of life products. In 2013, ELTs were not a priority product but the outcome of the Tyrewise project was to provide recommendations for an industry led government supported product stewardship | The Tyrewise Governance Group continue to recommend the Minister declare tyres a 'priority product' under the Waste Minimisation Act 2008 and implement a range of product controls related to the import of tyres.<br><br>Previous MfE policy statements regarding implementation of regulation had advised that: |

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| approach for end of life tyres, including a call for priority product status.<br><br>Before a Minister declares a priority product, he or she must (as per section 8 of the WMA): obtain advice from the Waste Advisory Board, consider public concerns, provide the public with an opportunity to comment, and consider the effectiveness of any relevant voluntary product stewardship scheme.<br><br>An alternative option is for the Minister to utilise Section 23 of the WMA - Regulations in relation to products (whether or not priority products), materials, and waste – which would require a product regulation be placed on imported tyres. The pathway for consultation is similar to priority product declaration. | "…neither economic instruments nor regulation will be introduced by the Ministry to manage waste unless industry wants those policy tools to be used."<br><br>*(Parliamentary Commissioner for the Environment, Report on Changing Behaviour: Economic Instruments in the management of waste, 2006, p46)*<br><br>" The Act provides a regulatory framework for establishing and accrediting product stewardship schemes. At this time, product stewardship schemes are voluntary, but priority products may be regulated to ensure producers and others in the supply chain share responsibility for end-of-life products" (MfE's 'New Zealand Waste Strategy', 2010, p10) |
| **Purpose:** Landfills are facilities for the final controlled disposal of waste in or onto land. Landfills must have consent conditions which are appropriate to the material they accept under the Resource Management Act 1991 (RMA). Types of landfills can be found here https://www.mfe.govt.nz/waste/waste-guidance-and-technical-information/types-of-landfills | |
| **Waste Levy.** Under the Waste Minimisation Act 2008, landfills that accept household waste (which is not entirely from construction, renovation, or demolition of a house) must register as a disposal facility.<br><br>Disposal facilities are subject to the waste disposal levy of $10 per tonne of waste disposed of at the facility.<br><br>The levy encourages New Zealanders to start taking responsibility for the waste they produce and to find more effective and efficient ways to reduce, reuse, recycle or reprocess waste.<br><br>It also creates funding opportunities for waste minimisation initiatives. | **Waste Levy Review.** A review of the effectiveness of the Levy is currently under way and consultation on the quantum and application of the Levy closes in February 2020.<br><br>This is likely to impact on the cost of disposal of end of life tyres to landfill by waste operators or large generators.<br><br>A regulated product stewardship scheme would ensure that end of life tyres are not landfilled.<br><br>https://www.mfe.govt.nz/consultations/landfill-levy |
| **Landfill Acceptance Criteria (2004)** End of life tyres fall into waste category code 16 01 03 | **Landfill Acceptance Criteria (2004**) No change to the end of life tyres waste category code 16 01 03. When a product stewardship scheme is established in a region, it would make sense that end of life tyres should be prohibited from entering landfill as "waste", with the exception that they are used for engineered solutions. It is envisaged that some Landfills will operate as |

| | |
|---|---|
| | collection sites to capture tyres which may be included in household waste. |
| **Basel Convention on the Control of Transboundary Movements on Hazardous Wastes and Their Disposal Guideline (#10**) Technical Guidelines on the Identification and Management of Use Tyres covers the effects of leaching and dust hazard on the storage and movement of tyres. Tyres are not considered hazardous waste under the Basel Convention. Tyres contain a total of approximately 1.5% by weight of hazardous waste compounds listed in Annex 1 of the Basel Convention. These compounds are encased in the rubber compound or present as an alloying element.<br><br>Restrictions on transboundary movements are placed by the importing country. However, tyres are considered "waste" that must be managed in an environmentally sound manner.<br><br>"Environmentally sound manner" is defined in the Basel Convention is "taking all practicable steps to ensure that hazardous wastes **or other wastes** are managed in a manner which will **protect human health and the environment against the adverse effects which may result from such wastes**".<br><br>It was noted by NZTRACA that NZ have obligations under the Basel Convention on Trans-boundary Movements of Waste and some local by-laws relating to disposal of tyres to landfill, which are flouted regularly. | **Basel Convention decision taken 10 May 2019** Inadequate emission controls of importing countries for various waste streams, specifically plastics, is leading to a review of the export requirements of tyres by the signatories, including New Zealand. The amendment to the convention in May 2019 relating to plastic waste (tyres generate microplastics) will require consent from the governments of receiving countries before shipping.<br><br>In August 2019, Australia banned waste exports, including tyres with their waste regulator stating that it was "aware of allegations of unsustainable processing of waste tires in some importing countries" and did not want "to be part of such practices". The export of all whole tyres including baled tyres are banned by December 2021.<br><br>MfE consulted in August 2019 on the likely impacts of all imports and exports of wastes covered under the Basel Convention being subject to a 'prior informed consent' (PIC) procedure. In New Zealand, this means that they require a permit from the EPA under the Imports and Exports (Restrictions) Prohibition Order (No 2) 2004. |
| **Customs Import Control Act 1988, Import Control (Tyres) Conditional Prohibition Order 1996 (SR 1996/384) This** order is to protect New Zealand consumers from unsafe and incorrectly specified merchandise. There are various controls on the importation of tyres. | **No change.** There has been some change in the Tariff Code groupings in 2019 which only impacts on the matching of data from 2013 to 2019 year. |

It prohibits, except with the consent of the Minister of Commerce, the importation of new and used tyres that do not meet a range of standards and specifications. This relates to rim diameter, retreading and obscuring of marks and identifiers. It does not relate to the importation of "scrap tyres" for secondary use.

Tariff Codes (2019 Tariff Index)

- Rubber waste and scrap 4004.00
- Rubber, reclaimed, in primary forms or in plates, sheets
- or strip 4003.00
- Tyre treads, interchangeable, of rubber 4012.90
- Tyres, pneumatic, new, of rubber 40.11
- Tyres, pneumatic, used or retreaded, of rubber 40.12
- Tyres, solid or cushion, of rubber 4012.90

## 9.3 Use of product regulations in the Waste Minimisation Act 2008

The original Tyrewise Working Group were clear that it wanted to seek priority product declaration for tyres from the Minister for the Environment under the Waste Minimisation Act 2008, to ensure full participation with product controls for regulatory support.

A number of the participants raised concerns regarding who would police and enforce any regulations that are implemented. This will be clearer once consultation on Regulated Product Stewardship Scheme Guidelines is completed Q4 2019/20. A copy of the Tyrewise submission to the consultation can be found as an attachment.

Options for regulatory support, which may be implemented alone or in combination with declaration of tyres as priority product, could include:

1. Recycling or recovery targets can be set. These could include a collection target such as "XX% tyres imported annually must be **collected** by an accredited regulated product stewardship programme annually", or "100% of tyres presented for collection, must be collected within xx time frame", so no stockpiles can accumulate. Recovery targets such as "100% of tyres collected must go to environmentally sound end-use" can also be set.

2. There could be government targets around take back services including programme coverage and accessibility for consumers, setting of fees and refundable deposits, who must pay the fee and at what stage in the product lifecycle a fee is collected.

3. Landfill bans or restrictions on tyre disposal could be enacted, either under the local government bylaws (which would only apply to council managed disposal facilities) or at a national level to apply to all disposal facilities.

4. Labeling requirements for products can be prescribed.

5. Amendments to the National Environmental Standards for Air Quality under the Resource Management Act **could** allow and encourage consents for burning tyre derived fuel to be promoted as an alternative fuel source.

6. Government procurement policy could be amended to support tyre derived products and promote their use in public contracts. This sends a clear signal to the market and can influence corporate decisions and public perceptions. One of the six core principles of the Government Procurement policy framework requires "sustainably produced goods and services wherever possible, having regard to economic, environmental and social impacts over their life cycle".

   An example of this would be specifying products with recycled rubber content such as flooring, roof tiles, earthquake buffer systems and rubber modified asphalt.

## 9.4 Regulation that may be required

This section looks at the regulation that may be required for a regulated product stewardship programme for end of life tyres.

### BOX 3 Regulations made by Cabinet

We note that in the Ministry for Environment Guide on Accreditation of a product stewardship scheme (published October 2009) that Section 2, Page 5, Point 3 referencing Section 13(1)(e) of the application form advises that regulations are made by Cabinet and there is no guarantee of timely or successful resolution. It may be that the Minister is unable to accredit a scheme if a request for regulations is not supported. The Minister is not required to enact regulations to implement the scheme.

The Tyrewise Working Group recognised in 2015 the need to ensure that any enactment of regulatory support that may result in increased supply of ELTs through the supply chain, or demand of TDPs by end use markets, could be met by increased processing capacity. In some instances, investment in infrastructure and resources by the public and private sector will be required.

In 2019, their views remain unchanged, and their recommendation for a staged implementation approach follows:

1) **Declaration of tyres as a priority product under the Waste Minimisation Act 2008**. It will be mandatory for a product stewardship scheme to be implemented and gain accreditation. Priority product status also brings with it further requirements to meet Ministerial guidelines and setting of recycling targets and timeframes for implementation. Along with regulatory targets around take back services including scheme coverage and accessibility for consumers.

2) Apply a production control condition on the import of tyres (loose and on vehicles) requiring all importers, manufacturers and retailers of tyres to belong to an accredited regulated product stewardship scheme for ELTs.

3) Submit Ministry for the Environment Accreditation for Product Stewardship scheme application inclusive of programme effectiveness targets.

4) Setting and collection of fees. If an advanced disposal fee (ADF) is to be collected by any government department, regulatory support will be required to change legislation enabling collection of the ADF and its remittance by any government department (eg Customs, NZTA) including any recommendations for changes to be made to data collection and financial management systems.

5) Landfill bans or restrictions on tyre disposal. This would occur either under the local government bylaws (which would only apply to council managed disposal facilities) or at a national level to apply to all disposal facilities. It is expected that this change would be implemented regionally as and when the demand for ELTs can suitably mange the expected increase in supply and it is expected that there would be an effective date within the implementation phase Year 0 – 3.

6) Labeling requirements for products would be prescribed and are likely to include declaration by the seller of tyres that the ELT is managed by a product stewardship solution; and that the various TDPs would need to display their scheme registration/accreditation credentials (likely to be a logo or similar).

7) Amendments to government procurement policies. Government procurement policy would be amended to support tyre derived products and promote their use in public contracts. This sends a clear signal to the market and can influence corporate decisions and public perceptions.

   An example of this could be specifying products with recycled rubber content such as tiled flooring in public building such as hospitals, or a requirement for a percentage of new roading projects to use rubber modified asphalt. Given the amount of civil construction and building work to support population growth, there could be significant opportunity to specify and promote the use of tyre derived products in these construction applications.

## 9.5 Risk identified

Throughout development of Tyrewise 1.0, feedback from the project's MfE observer highlighted potential implications for regulatory support of the working groups preferred model of Customs and NZTA collecting the fee and remitting this to the PSO.

Specifically:

- Both Customs & NZTA need specific power to collect a new fee
- Initial research indicated that there were no precedents for a government agency to collect a levy/fee and pay the monies directly to an external organization such as the proposed Product Stewardship Organisation. If monies go to an external organisation either the organisation is named in the legislation, or the money goes through a departmental account and is allocated on set criteria.
- a fee gathered by a government agency such as Customs or NZTA is a taking of money by government and the use of public funds provisions apply
- the right to take money must be approved by Parliament = based in legislation

- regulatory powers under the Waste Minimisation Act do not specifically include levy-making for product stewardship, but they do allow for regulations on setting a fee for management of a product (the Waste Disposal Levy, established in the Act, is only on waste deposited at Disposal Facilities as defined in the Act).

# 10. NZ market GAP analysis

For Tyrewise 1.0, the Tyrewise Working Group used the framework published by the World Business Council for Sustainable Development's report on a framework for effective management systems. This framework was used to analysis the gaps between New Zealand's situation in 2012 and what was seen as being necessary for a successful product stewardship approach to end of life tyres. This GAP Analysis has been updated comparing 2012 "situation" and the situation in 2019. Note in 2012, the full year of data available from 2011 was used.

Below is a table showing the framework for an industry best practice product stewardship approach as taken from the World Business Council for Sustainable Developments report on a framework for effective management systems. We have used this framework to analyse the gaps between New Zealand's current situation and what would be necessary for a successful product stewardship approach to end of life tyres.

All fictional requirements that make up an effective management system are incorporated into the Tyrewise Stewardship programme.

**TABLE 9** GAP analysis

| Functional Requirements | NZ Market Analysis 2012 | Market updates 2019 |
|---|---|---|
| **Step 1: Managing Used Tyre Disposal** | | |
| • Disposal fee charged to fund the process (either at tyre retailer or at point of entry to country) and shown as separate line item on invoice | Partially exists. We have a disposal fee charged by the two major tyre retailers and shown as separate line item on invoice. Other retailers may charge a fee dependant on competition, price and demographics of customers. | No change. |
| • Network of authorised used tyre collection points (retailers) who are responsible for appropriate handling | Partially exists. We have a network of collection points (retailers) but they are not required to be registered or authorised | No change.<br>Partially exists. Some organisations such as MTA attempt to inform their members on operators who are free from prosecution and who do what they say they do. |
| • Fees paid to collection point based on market value or cost of handling used tyre | Partially, the collection point (retailer) is paid fee by the customer but this may or may not reflect the market value of handling the used tyre. | No change. |

| Functional Requirements | NZ Market Analysis 2012 | Market updates 2019 |
|---|---|---|
| **Step 2: Collect & sort used tyres, transport to ELT processor** | | |
| • Network of authorised used tyre collectors and transporters | Partially exists. Yes there is a network, but they are not registered or authorised | No change |
| • Collectors and transporters paid by the retailer/collection point | Yes, collectors and transporters are paid by the collection points | Partial change.<br>Collection, transport and processing infrastructure put in place by Waste Management Ltd demonstrates a closed loop logistics system. |
| • Regulated storage/sorting facilities | Only regulated by council land use consents and local by laws | No change.<br>National Environmental Standard for transport and storage of tyres in consultation. |
| • Defined process for sorting used tyres into ELTs and those for re-use | No, doesn't exist | No change.<br>Undertaken by the retailer/garage and collectors. |
| **Step 3: Process ELTs** | | |
| • Processing companies to shred/grind tyres | Yes we have processing companies. But not sure if we have enough to process all the ELTs generated in NZ | Significant change.<br>Since 2012, existing processing companies have resized to take on new market areas or work strategically with partners. Waste Management Ltd has added additional capacity to the NI market.<br>However, there remains a significant gap in capacity in the SI.<br>There remains a significant gap in the value add market. |
| • Processing companies paid (or charged by) collector or third party | In most cases the collector and the processor is the same company, so no payment is made | No change.<br>Mixed market situation continues |
| **Step 4: Recycle ELTs** | | |

| Functional Requirements | NZ Market Analysis 2012 | Market updates 2019 |
|---|---|---|
| • Recovery companies who will use ELTs for energy generation | No, doesn't exist in NZ at present.<br>But there are potential companies who could use ELTs as substitute fuel | Significant change<br>Golden Bay Cement Hot Disc plant taking in shredded ELTs for TDF for their cement plant in upper North Island. |
| • Recycling companies who will use ELT secondary raw materials (e.g. crumb) to make new products (e.g. synthetic turf, asphalt, mat products, civil engineering products) | Yes, some exist currently | No change<br>Minimal growth in ELT as a secondary raw material onshore, export market was still strong until mid-2019. |
| • Recovery or recycling companies pay (or charge) for ELTs | Generally recycling companies charge to take ELTs | No change.<br>Commercial relationship between Golden Bay Cement and their suppliers is commercially sensitivity |

| Research, Accountability & Legislation | Currently Exists in NZ | Market updates 2019 |
|---|---|---|
| **Research & Development** | | |
| • Industry R&D projects to develop new applications for ELT derived products | No, generally funded privately. Trial pyrolysis plant has been partly funded by Waste Minimisation Fund. We are aware of a number of other projects in trial stage. | Limited change.<br>Reference Appendix B for list of projects which have been funded by the WMF since 2012 |
| **Accountability** | | |
| • A manifest system to document the tyre disposal route | No, doesn't exist | Limited change.<br>Some NZTRACA members are using a spreadsheet system for exported ELTs |
| • System to manage ELTs on basis of weight | No, doesn't exist | No change.<br>Industry typically uses load weights. |
| • Verification of process to ensure safety and environmental standards are met | No specific verification, other than meeting Resource Management ACT requirements | No change. |
| **Legislation:** that specifies: | | |

| Research, Accountability & Legislation | Currently Exists in NZ | Market updates 2019 |
|---|---|---|
| • ELTs are non-hazardous waste | Yes | No change.<br>Research underway by Laura Banasiak, G. Chiaro, A. Palermo & G. Granello to determine whether there is risk of leachate from use of ELT and ELT derived products in construction. |
| • Clearly defines responsibilities and obligations of all stakeholders in the ELT management programme | No, doesn't exist | No change |
| • Illegal dumping and uncontrolled land filling are banned activities | Yes illegal dumping is banned.<br>No, land filling is not banned | No change |
| • A separate line item on new tyre invoice showing the tyre disposal fee is required | No, legislation does not specify this | No change |
| • ELT transporter to be registered and have a permit (includes background check, performance bond used to clean up illegally dumped ELTs | No, doesn't exist | No change |
| • ELT storage must comply with environmental and safety guidelines (length of time, volume, configuration) | Partial, no central legislation that controls ELT storage.<br>But some local controls via consents for land use | No change<br>We now have "Guidelines for Storage and Transport of Tyres (Waikato Regional Council/ECAN)" which can be adopted by TLA's |
| • ELT derived products are designated as secondary raw materials or alternative energy | No, doesn't exist | No change |
| • Promotion of use of ELT derived products in public contracts | No, doesn't exist | No change |
| • A reliable reporting or manifest system is set up to record weight/volume, reporting/audit requirement every time | No, doesn't exist | No change |

| Research, Accountability & Legislation | Currently Exists in NZ | Market updates 2019 |
|---|---|---|
| ELTs change hands in the process from tyre dealer/collector to recovery or recycling | | |

# 11. Market failure

- **Increase in loose tyres**
- **Increase in OTRs on vehicles**
- **Increased awareness of microplastics**
- **Some improvements in infrastructure provision**

A market failure is defined as "when an unregulated market system has failed to achieve the optimal allocation of resources or social goals". As the current situation for ELTs does not recognise them as a valuable resource, it is fair to say that we remain with a failed market.

The most common barriers for success identified for Tyrewise 1.0, remain in 2019 which are:

- There is no level playing field for all industry participants
- There is a lack of supporting legislation for the transport and storage of ELTs
- There is a lack of secure supply of ELTs for processors "at the right product, in the right quantity and the right condition, to the right place at the right time for the right customer at the right price"

In 2019, while there is a more established network of end of life tyre collectors, processors and some emerging end market solutions than there was in 2015, there remains a market failure as the true value of end of life tyres remains unrealised.

End of life tyres are still largely viewed as a waste problem to be disposed of, often as cheaply as possible, rather than a valuable resource.

In 2013, a survey showed that most tyre retailers charged their customers an "environmental fee" ranging from $2.50 up to $16.00, depending on the size of the tyre from passenger tyres through to off road tyres. Passenger tyres were only typically in the range of $2.50 to $7.00.

Surveys undertaken during 2019/20 showed no material change to this range with common practice being that the retailer retained 50% of the fee for administrative costs and the balance being passed on to the transporter for removal.

Landfills and transfer stations charge a disposal fee depending on the size of the tyre. Some landfills reject tyres outright leaving the consumer to find another disposal pathway.

There remains a high degree of mistrust and suspicion from the established tyre collector and processing industry about what happens to collected tyres; and with consumers as to what the collected fee is used for.

In many regions major waste companies continue to supply bins to the tyre retail shops. The bins can hold a large number of tyres. In 2013 the average collection cost was as low as $40 per bin.

In addition to this, the average cost charged per tonne for the transport of used on road tyres is an $161/tonne.

The practice of some waste disposal companies who collect from tyre retailers who then dispose of the tyres to landfill continues as this remains the cheapest disposal option for the tyre retailers and results in a large volume of end of life tyres going to landfill even when there are valid recovery options available in the area.

- June 2017 - the Government provided a grant of $3.8 million for Waste Management New Zealand to set up a nationwide tyre collection network and tyre shredding facilities in Auckland and Christchurch involving capital investment of $6.4 million. The intention of this was to reduce a major barrier to re-use of waste tyres is their bulk, making transport and disposal uneconomic. The shredding machinery was imported in 2017, and operational in Auckland at the end of 2017 and in Christchurch in 2019/20.

The impact of this investment is now noticeable in 2019, particularly in the upper, middle and central North Island regions, as Waste Management Ltd collect and process the ELTs and deliver the feedstock to Golden Bay Cement. Some North Island based tyre collectors and processors report that competition for passenger tyres has increased in the Auckland Region between existing and emerging tyre processors. One outcome of this is that the easy to recover, less costly ELTs are being sought after leaving the more expensive and less accessible ELTs unrecovered. This is considered to be a perverse outcome without any mechanism to place an incentive or pay more for the recovery of all ELTs throughout NZ.

During research for Tyrewise 1.0, it was found that in some cases in the Auckland region ELTs at retail stores are being exchanged for cash or alcohol. These tyres were then dumped illegally or exported for reuse to the Pacific Islands, mainly Samoa or Tonga.

No specific evidence of this was reported in 2019, however it is potentially a factor in the increased illegal dumping reported by councils in other regions where demand for ELTs is yet to be felt.

Tyre retailers outside of the upper and central North Islands still allow farmers or other people who may have a use for the tyres to take them away free of charge, or for a small fee. Tyres for use in engineering construction and silage pit management are a viable use and are not considered end of life tyres for the purpose of the stewardship programme until the farmer requests their removal.

Cheap used tyres which have a short life span continue to be imported and add to the disposal problem. This is specifically an environmental problem, not an economic one, as the Tyrewise programme design enables the capture of the ADF at point of importer therefore the stewardship cost of this ELT is covered. The Advanced Disposal Fee is further explained in Section 28

Increasingly the industry recognises the impact of microplastics from tyre “wear and tear” on the road. This is leading to improvements in the tyre stock influenced by change in the country of origin of the tyres. We believe that this will be the biggest driver for change in the imported tyre markets.

# 12. Waste hierarchy for end of life tyres (WBCSD)

The waste hierarchy is used to inform investment decisions on the use of recovered ELTs. **A hierarchy is country specific and the one shown here is generic for consultation purposes**. It can reflect the current and future desired state as new technology and end markets are developed for the processed ELTs.

WBCSD published an updated waste hierarchy in December 2019 which reflects trends in available recovery methods and applications. This hierarchy **could be used as a guide for setting payments** to stimulate "push/pull" stewardship model. For full details on the hierarchy, reference Page 42 of WBCSD report.

| WASTE HIERARCHY | REUSE | RECYCLING | | OTHER MATERIAL RECOVERY | RECOVERY HYBRID | | | ENERGY RECOVERY | DISPOSAL |
|---|---|---|---|---|---|---|---|---|---|
| ELT INPUT | **Whole tires** | Whole or Shredded tires | Rubber granulate | Whole or Shredded tires, Rubber granulate, Crumb rubber and Powder | Whole or Shredded tires | Whole or Shredded tires | Steel cords, Whole or Shredded tires | Textile, Whole or Shredded tires | **Whole tires** |
| MANAGEMENT METHODS | **Repairing Regrooving Retreading** | **Granulation and associated applications** | **Reclamation** | **Civil engineering** | **Pyrolysis and gasification** | | | | **Landfill Incineration** |
| PRODUCTS (OUTPUT) | | Granulate and powder | Reclaimed rubber | N/A | Oil, gas, carbon/char, steel | | | **Other energy recovery** | |
| APPLICATIONS | | • Artificial turf infill<br>• Athletics tracks<br>• Molded rubber products<br>• Playgrounds<br>• Roofing material<br>• Rubber-modified asphalt | • Inner tubes<br>• Insulation tiles used in public transportation for reducing the noise level<br>• Tiles for laying pedestrian concrete areas<br>• Tubeless tire liners | • Agricultural use<br>• Baled tires<br>• Breakwaters<br>• Coastal protection<br>• Erosion barriers<br>• Ground improvement<br>• Landfill construction operations<br>• Road embankments<br>• Shelters<br>• Slope stabilization<br>• Sound barriers, insulation applications | Carbon black: industrial gaseous effluents treatment (e.g. mercury, suplhur dioxide)<br>Char: water and purification<br>Oil and gas: TDF | **Cement Kilns** | **Steel production** | Alternative or additional fuel for energy generation in:<br>• Brick production<br>• Industrial boilers<br>• Power plants<br>• Pulp and paper mills<br>• Waste-to-energy plants | |
| EXAMPLES OF ADVANCED TECHNOLOGIES | | • Absorption of phenol and oil in water<br>• Composites<br>• Concrete<br>• Micronized rubber powder<br>• Porous pipes from recycled ELT | Reclamation by depolymerisation by nitrous oxide | • Retaining walls<br>• Soft clay reinforcement | Use as anodes in lithium, potassium and sodium-ion batteries | N/A | N/A | N/A | |

*The waste hierarchy category "Reduce" is not in the scope of this analysis. In addition, "Reuse" has been included, however this is not applicable to all tires and would depend on the condition of the product in relation to the appropriate safety standards.

**GUIDE 1** WBCSD [Fig 6] Position of recovery methods and applications along the waste management hierarchy. A global perspective

# 13. Microplastics from tyres

- **What we can expect to experience in the short – medium term**
- **What manufacturers are doing about it**

Various articles have been published in Europe and America specifically on the effect of microplastics from tyres on the environment. Articles range from high impact (up to 28% down to less than 5%).

The Scion study "Turning the tide on plastic microparticles" which was published in March 2019 and funded in part by the Waste Minimisation Fund, may be able to provide some initial data on microplastics from tyres differentiating it from microplastics from plastic type 1 – 7 and natural polymers.

The level to which contamination impacts on the environment is the pathway of water from roads through to the drains and out to sea and is impacted by variables including the age of the tyre, the type of roading and the way the vehicle is drive,

EU lawmakers are considering regulations that would set minimum standards for tyre design to reduce microplastic pollution, such as the rate of abrasion and durability.

The 'Rethinking plastics' report[17] from the Prime Minister's Chief Science Advisor released in November 2019, proposes that New Zealand develop a standard measure of tyre tread abrasion rate as a pre-requisite to including tyre tread abrasion rates on the tyre label to inform consumer choices or uses regulation for tyre tread abrasion to restrict the worst performing types from entering the market.

[17] SOURCE https://www.pmcsa.ac.nz/topics/rethinking-plastics/

# 14. Sizing the end of life tyre problem

There are various ways to estimate the number of used tyres that are generated annually:

- **From industry estimates of sales and market size of new tyres, and by assuming a new tyre replaces a used tyre**
- **Based on import statistics for new and used tyres and vehicles**
- **Based on vehicle fleet numbers, mileage and scrappage rates**
- **Estimated from population**

## 14.1 Methodology for loose tyres

Given the various methods we have decided that the import numbers captured by Statistics NZ are the most reliable, comprehensive and publicly available data source. The level of detail required to understand the tyre size and use meant that an Official Information Act request was put into Statistics NZ for data for the calendar years 2012-2019.

The data for new tyre imports includes those suitable for:

- Cars, bus and truck
- Tractors
- Motorbikes
- Aircraft
- Earthmovers and industrial vehicles
- Forklifts (solid industrial tyres)

Data was extracted using the 10-digit customs tariff codes, all codes between 4011 and 4012), then summarized by type of vehicle and then rim size of the tyre. Reference TABLE 10, Section 17. The New Zealand Harmonised System Classification was updated in 2012 and 2017, so some matching was required to get a consistent data set for trend data.

The data for used tyre imports includes those suitable for:

- Cars, bus and truck
- Aircraft
- Other vehicles (not cars, truck, bus, aircraft, light commercial)

## 14.2 Methodology for tyres on vehicles

The vehicle import data includes:

- Passenger car/van
- Goods van/truck/utility
- Bus
- Caravan
- Motorcycles
- Tractors
- Trailer

To calculate the number of tyres entering New Zealand via imported vehicles (new and used) the following assumptions were made:

- five tyres for passenger car/van (given most have a spare);
- two tyres per motorbike
- four tyres per tractor
- To determine gross weight category and percentage proportions, the 2011 registration data for commercial vehicles was analysed. An assumption on the number of tyres per vehicle for each weight category had to be made. For example, 89% of commercial vehicles registered in 2011 had gross weight less than 1500 kg, so were assumed to have 5 tyres. 5% of commercial vehicles registered in 2011 had a gross weight of more than 20,000 kg and were assumed to have an average of 14 tyres. These percentages and corresponding tyre numbers were applied to the total number of van/truck/buses that were imported each year to estimate the tyres entering New Zealand via these imported vehicles. This assumption has been used to refresh the data to 2019.

# 15. Sources of end of life tyres

## 15.1 Replacement for new

The majority of used tyres from trucks, passenger and light commercial vehicles originate from retail tyre shops and garages or workshops. Common practice is for consumers to take their vehicles for a warrant of fitness (WOF or COF) inspection. When the tyres do not meet the safety requirements, replacement tyres are purchased through tyre retail shops, garages or workshops.

The used tyres are removed at the tyre retailer, garage or workshop and require disposal.

## 15.2 Non-standard imports

Some used tyres originate from used car imports when the tyres they are imported with, are not suitable for New Zealand conditions. For example, snow tyres or those tyres that do not meet the WOF minimum tread requirements. It is not uncommon for used cars imported from northern Japan to have four snow tyres in the boot, in addition to four summer tyres on the vehicle.

The unwanted snow tyres are the responsibility of the car importer and require disposal.

Used car imports have been decreasing since a peak of 169,771 cars in 2003. In 2011 84,028 used vehicles were imported into the country, so this source of ELTs may be less than in previous years.

## 15.3 Vehicle scrapping

Another source of end of life tyres are from end of life vehicles when they are scrapped at vehicle wreckers. In 2011, 145,000[24,10] passenger vehicles were scrapped. Assuming five tyres per vehicle, this extrapolates to 725,000 ELTs per annum.

In 2016 and 2017, this figure is materially the same. Reference “The New Zealand vehicle fleet: fact and fiction Iain McGlinchy”. Principal Adviser, NZTA.

## 15.4 Retreads

Truck tyres can be retreaded between 2 and 4 times depending on the tyre and road conditions. There are truck retread operations in Auckland, Hamilton, Mount Maunganui, Rotorua, Palmerston North, Christchurch and Greymouth. Retread companies will have end of life tyres as a direct result of their operations.

Large transport companies often have their own workshops and source their replacement tyres direct from tyre companies. In some cases, companies may even import the tyres directly. These large transport companies will be a source of used tyres that require disposal.

## 15.5 Silage pit redundancy

Farmers who decide they no longer need tyres for silage pit covers or other of farm uses, will also be a source of end of life tyres.

In August 2017, Federated Farmers of New Zealand, Kerry Thomas, wrote in their submission to the “Proposed National Environmental Standard for the Outdoor Storage of Tyres”[18] that:

[18] SOURCE https://www.mfe.govt.nz/sites/default/files/Tyre%20Submissions%20Zipped/Federated%20Farmers%20of%20New%20Zealand.pdf

- There is a lack of systematic, accurate data on the amount of tyres used for silage weights and regions where tyre use is concentrated.
- Furthermore, farmers frequently underestimate the numbers of tyres that they use.
- If farmers follow best practice guidelines for silage coverage, tyres should be touching one another. With 200m$^3$ volume, tyres cover approximately 460-700m$^2$ of silage surface (2,500 to 3,800 tyres respectively), based on a single 17" tyre covering 0.185m$^2$. Smaller tyres cover less surface area, therefore more tyres are needed to cover the same surface area.
- The 200m$^3$ volume equates to coverage of between one and two small to average sized silage pits (12x30m – silage volume depends on depth) or one large silage bunker/bund.
- These figures are conservative as smaller tyres cover less surface area. This volume of silage (and tyres) is not enough for all herd sizes and in all regions.

**Using the above as modelling purposes:**

- For Tyrewise 1.0 we estimated that there would be 3.6 million tyres held across 12,000 dairy farms on the assumption that an average farm had 300 tyres.
- In 2019, Data from Stats NZ on the number of dairy and beef/sheep farms, and the Submission from Federated Farmers in August 2017 on the proposed National Environmental Standard for Outdoor Storage of Tyres[19] indicates that there may be as many as 58 million tyres held for the purposes of silage pits. This is conservatively based on 48,000 farms with 15% of those farms having silage pits of less than 200m3 (1,090 tyres) and 85% greater (1 pit of 460m3 (2500 tyres).

For Tyrewise 1.0, the Working Group held the view that there is an unknown but very large number of end of life tyres currently being used on farms as weights for silage covers or stockpiled as they are no longer needed.

Farmers are generally not willing to pay to have unwanted tyres collected for recycling, so they continue to stockpile them even if they no longer have a use for them.

These stockpiled tyres will also have weathered and aged as well as potentially having significant levels of organic contamination. Information gathered from commercial tyre processors indicates the weathered or aged tyres will still be able to be processed in a number of applications. Depending on the application, a possible initial step for stockpiled tyres will be to ask the owner of the tyres to remove significant levels of organic contamination. This will ensure the tyres are more recyclable.

## 15.6 Legacy tyres

Legacy tyres are those that are stockpiled and have an owner / responsible entity, however they are no longer required for the purpose they were intended for. Legacy tyre ownership can often pass from generation to generation.

[19] SOURCE https://www.mfe.govt.nz/sites/default/files/Tyre%20Submissions%20Zipped/Federated%20Farmers%20of%20New%20Zealand.pdf

## 15.7 Orphan tyres

Orphan tyres are those that have no owner and the ownership often falls by default to the territorial authority. Often these are tyres that are public or private property contributing to the litter problem.

There is no way to accurately count legacy or orphan tyres; for Tyrewise 1.0 it was estimated that there were 3.5 million tyres across these two categories.

### BOX 4 How many?

Any calculation used in this report is conservative due to the **hidden nature of tyre stockpiles**.

There is no accurate calculation of the legacy and orphan tyres in NZ, save for a few calculations where prosecution or tidy-up's have been in play.

This remains an entirely unknown and unquantified risk both to the environment and to any future amnesty which would be geared to bring these into a recycling system.

Targeted investigations need to be undertaken to quantify this volume on a region by region basis which may include providing an amnesty for prosecution similar to that used for the uncover of banned chemicals such as DDT and 245-T.

# 16. Mass Balance Data

## 16.1 Loose and on vehicles by unit

- 2011 4.8 million tyres (units) = 7.7 million EPUs = 73,000 tonnes (new weight)
- 2019 6.3 million tyres (units) = 10.2 million EPUs = 96,000 tonnes (new weight)
- Significant increase in imported trucks, buses and coaches = higher EPUs = more tonnage
- Decrease in passenger tyres = lower EPUs per unit
- Increase of imported vehicles in 2019 over 2011 where a decrease was predicted

The number of tyres entering the New Zealand market using the 2019 import data is conservatively estimated at 6.3 million tyres.

This is a significant increase in the number of tyre units imported over data collected in 2011 with the net result is a considerable growth on 2011 data of 73,000 tonnes compared to 2019 96,000 tonnes.

A high percentage of this growth is coming from trucks, buses and coaches with a single tyre being equivalent to 4.2 EPU.

The following table is a summary of the tyres entering the New Zealand market over the past ten years using the methodology described in Section 17.

**TABLE 10** Tyres entering NZ market by condition and method

| Year | New tyres NZ production[*1] | New tyres Loose imports | Used tyres Loose imports | Tyres via vehicle imports[*2] | Total (units of tyres) |
|---|---|---|---|---|---|
| 2010 | 112,158 | 3,364,130 | 365,668 | 934,494 | 4,776,450 |
| 2011 | 0 | 3,532,312 | 282,153 | 922,740 | 4,737,205 |
| 2012 | 0 | 3,603,991 | 224,312 | Missing data | |
| 2013 | 0 | 3,833,684 | 201,542 | Missing data | |
| 2014 | 0 | 4,127,949 | 185,362 | Missing data | |
| 2015 | 0 | 4,046,332 | 122,647 | Missing data | |
| 2016 | 0 | 4,541,567 | 126,299 | Missing data | |
| 2017 | 0 | 4,637,043 | 85,609 | 1,818,068 | 6,540.720 |
| 2018 | 0 | 4,628,736 | 82,014 | 1,738,155 | 6,448,905 |
| 2019 | 0 | 4,517,512 | 56,327 | 1,663,771 | 6,237,610 |

[*1] Tyres were manufactured in New Zealand until 2010

[*2] Tyres on vehicles are understated due to the grouping of Vans/Trucks/Utes by NZTA.

## 16.2 Imported on/with vehicles

**TABLE 11** Category mapping 2011 : 2019

| Vehicle type - NZTA registration category | 2011 | 2019 | Average number of tyres | Total tyres annually | Category for purpose of calculating EPU | EPU per tyre |
|---|---|---|---|---|---|---|
| Agricultural machines | 157 | *1 | 4 | - | Off Road | 4.4 |
| ATVs | 808 | *1 | 4 | - | Off road ATV | 0.3 |
| Buses and coaches | 921 | 1,760 | 6 | 10,560 | Truck, bus | 4.2 |
| Cars | 150,755 | 244,540 | 5 | 1,222,700 | Passenger | 1.0 |
| Miscellaneous *1 | 24,995 | 44,214 | 3 | 132,642 | Passenger | 1.0 |
| Mobile machines | 1,464 | *1 | 4 | - | Construction/industrial | 5.1 |
| Mopeds | 3,570 | 2,129 | 2 | 4,258 | Motorbike | 0.5 |
| Motor caravans | 991 | *1 | 5 | - | Passenger | 1.0 |
| Motorcycles | 6,468 | 8,876 | 2 | 17,752 | Motorbike | 0.5 |
| Special purpose vehicles | 37 | *1 | 4 | - | Off road graders | 23.2 |
| Towed caravans | 2,556 | 4,943 | 3 | 14,829 | Passenger | 1.0 |
| Tractors | 2,714 | 3,016 | 4 | 12,064 | Tractor | 8.1 |
| Trucks*2 | 23,215 | 57,396 | 10 | 344,376 | Truck, bus | 4.2 |
| | | **366,874** | | **1,759,181** | | |

*Data Source: NZ registrations*

**1 Miscellaneous*
In 2019 this category now includes ATVs, motor caravans, mobile machines, special purpose vehicles, agricultural machines.
*2 Tyres on vehicles are understated due to the grouping of Vans/Trucks/Utes by NZTA

For Tyrewise 1.0, we excluded from the data are imports of industrial or heavy agricultural vehicles or airplanes, as this data was not easily sourced. The working group advised that the majority of earthmovers and some tractors are imported without tyres.

### Fleet analysis

In 2011, data from the New Zealand Transport Authority showed that the New Zealand vehicle fleet numbers had remained constant over the last four years at 3.2 million vehicles. For the financial modelling it was assumed then that vehicles imported into the country (and their attached tyres) will replace vehicles that are being scrapped and generate corresponding ELTs.

The Fleet Composition data for the period 2011 to 2018 (calendar year) shows a different pattern than that assumed in 2011, primarily the increased import of trucks and buses and goes against the prediction that vehicle imports would decrease from 2011. The financial model has been adjusted to reflect both the composition of imported tyres on vehicles and the volume of tyres.

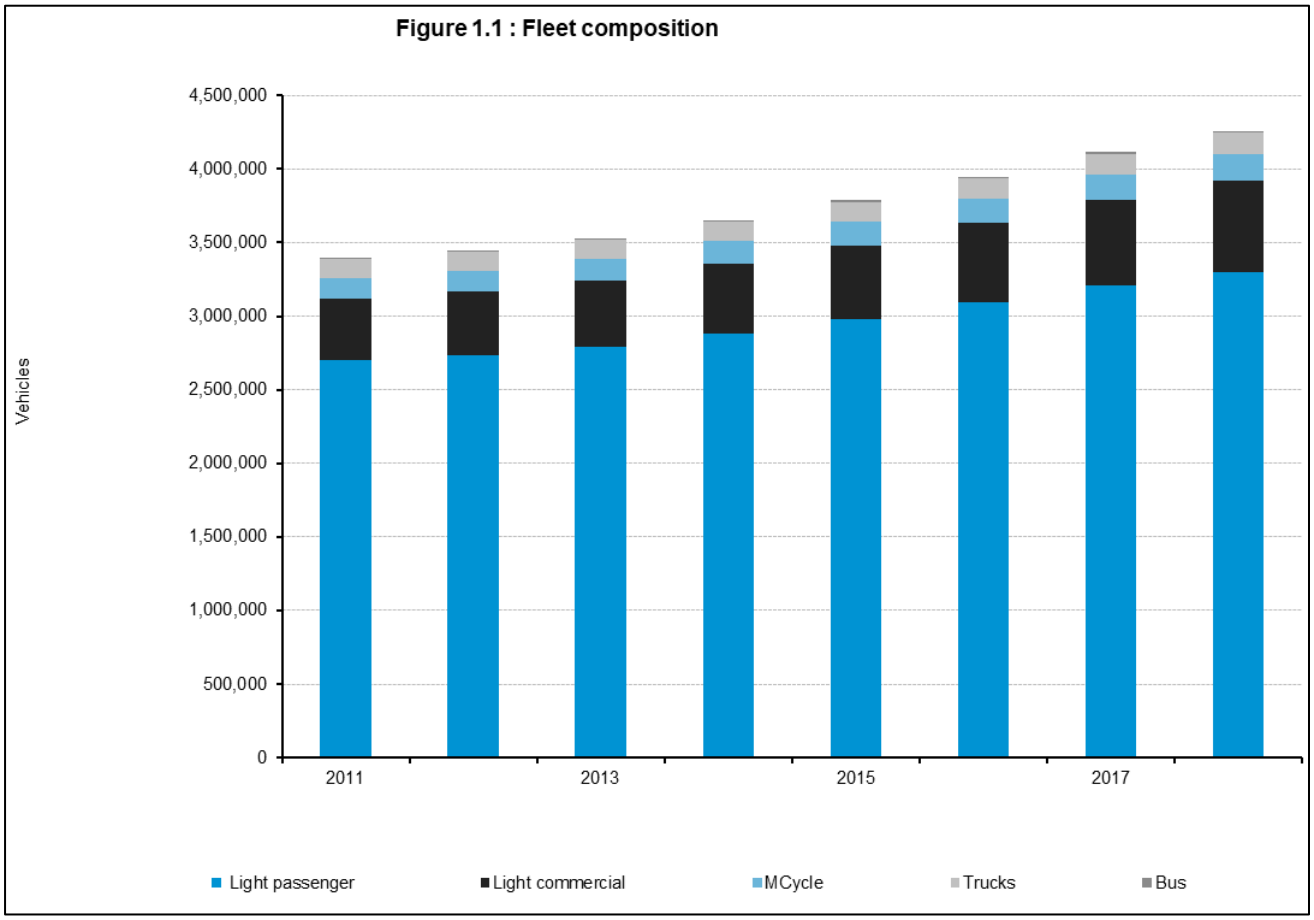



**FIGURE 10**
[Fig 1.1] Fleet composition

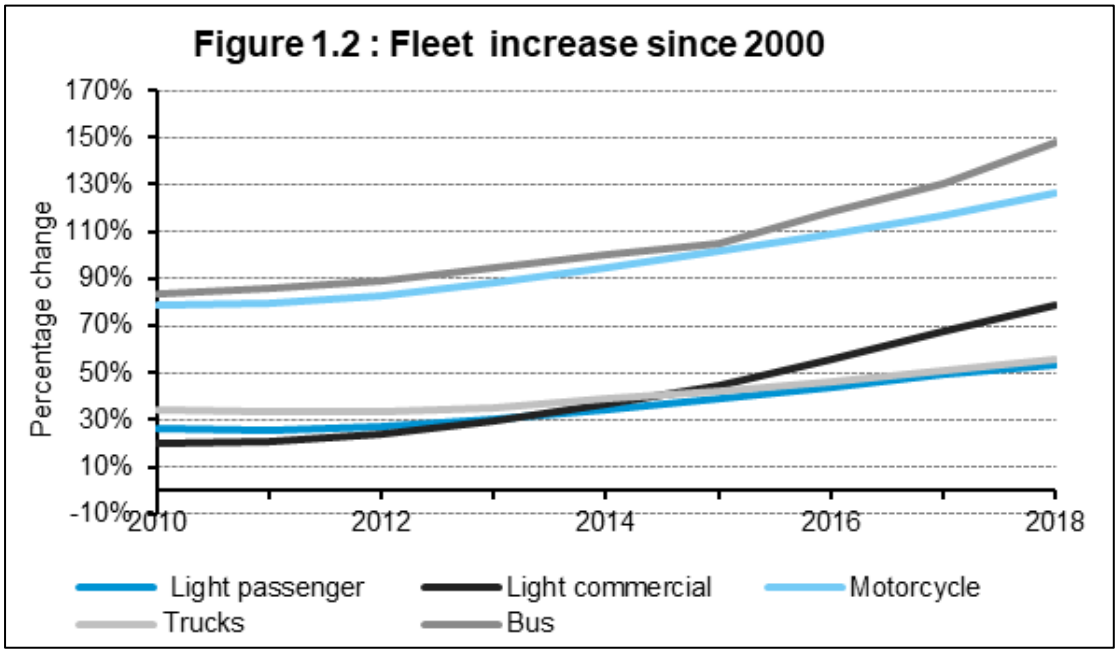



**FIGURE 11**
[Fig 1.2] Fleet increase since 2000

## Tyres loose and on vehicles by weight

The ELTs entering stewardship (Used) are based on a system of weights. Reference TABLE 11 Number of USED tyres and material composition by weights (below).

While passenger tyres are the dominant tyre category in terms of units, when ELTs are expressed in tonnes, “Truck, bus” and “Off the road” tyres are significant categories.

In 2011, end of life tyres originating from the Off the road (OTR) category including forestry, graders and earthmovers accounted for 25% of the ELTs by weight.

In 2019 – The same category accounts for 14% of the weight with an increase in Truck and Bus tyres representing 45% by weight.

As with all OTR tyres, they are difficult to deal with due to the large size and cost to collect and transport to processors. Most of the processing companies do not have the expensive machinery or capability to process OTR tyres. We understand there are no recycling options for ELTs from mining operations in New Zealand yet however there have been some enquiries from investors who have stated that they have an interest in this category of tyre.

There are a number of assumptions that were made in this calculation both in 2011 and 2019:

1. The Australian model has an additional category for heavy industrial tyres, commonly used in mining, which have rim sizes of 24 inch to 57 inch and weigh anywhere between 100 kg to 4 tonnes, with an average weight of 800 kg. New Zealand may well have some tyres of this type included in the OTR category but a more conservative approach was taken by assigning an average weight of 200 kg per tyre to this category, rather than 800kg. Data provided by Goodyear and Bridgestone showed a range between 3 kg and 3,007 kg for forestry, industrial and OTR tyres.
2. The Australian model[20] did not include aircraft tyres; however, the French model includes three categories for airplane tyres – regional and military, commercial and general with weights ranging from 6 to 77 kg. New Zealand industry data for general aviation tyres supplied by Goodyear recommended an average weight of 14 kg was assigned to aircraft tyres.

| Table 12 Number of USED tyres and material composition by weights[20] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tyre type | Avg used weight (kg) | Material composition (percentage) | | | Volume of tyres (Units) | | | | Material Weight - End of Life Tyre (tonnes) | | | |
| | | Rubber | Steel | Textile | New tyres imported (2019 data set) | Used tyres imported (2019 data set) | Tyres on vehicles (2019 data set) | Total tyres (units) | Rubber | Steel | Textile | Total weight (tonnes) |
| Aircraft | 1.6 | 70% | 10% | 20% | 4,027 | 0 | 0 | 4,027 | 42.62 | 6.09 | 12 | 61 |
| Construction/Industrial | 4.2 | 70% | 30% | 0% | 17,678 | 0 | 0 | 17,678 | 498.94 | 214 | - | 713 |
| Light commercials /industrial | 1.7 | 69% | 25% | 6% | 145,478 | 6,338 | 0 | 151,816 | 1,602.06 | 580.46 | 139 | 2,322 |
| Motorbike | 4.0 | 70% | 18% | 12% | 120,795 | 0 | 22,010 | 142,805 | 398.85 | 102.56 | 68 | 570 |
| Off road ATV | 2.5 | 70% | 18% | 12% | 49,163 | 0 | 0 | 49,163 | 86.72 | 22 | 15 | 124 |
| Off road (earthmovers) | 53.1 | 70% | 30% | 0% | 10,213 | 0 | 0 | 10,213 | 3,609.22 | 1,547 | - | 5,156 |
| Off Road (forestry) | 3.7 | 70% | 30% | 0% | 259,046 | 0 | 0 | 259,046 | 6,397.39 | 2,742 | - | 9,139 |
| Off Road (graders) | 19.5 | 70% | 30% | 0% | 543 | 132 | 0 | 675 | 70.26 | 30 | - | 100 |
| Passenger | 0.8 | 72% | 21% | 7% | 3,601,330 | 211,493 | 1,370,171 | 5,182,994 | 28,564.26 | 8,331.24 | 2,777 | 39,673 |
| Solid industrial (forklift) | 3.0 | 70% | 30% | 0% | 24,222 | 0 | 0 | 24,222 | 484.25 | 207.53 | - | 692 |
| Tractors - large | 6.8 | 70% | 30% | 0% | 19,346 | 0 | 6,032 | 25,378 | 1,149.01 | 492 | - | 1,641 |
| Tractors - small | 2.2 | 70% | 30% | 0% | 13,610 | 0 | 6,032 | 19,642 | 288.74 | 124 | - | 412 |
| Truck, Bus | 3.5 | 68% | 32% | 0% | 252,061 | 33,050 | 354,936 | 640,047 | 13,868.67 | 6,526 | - | 20,395 |
| **Total tonnes of TDP's annually** | | | | | **4,517,512** | **251,013** | **1,759,181** | **6,527,706** | **57,061** | **20,925** | **3,012** | **80,998** |
| | | | Measurement | | **Units** | | | | **Tonnes** | | | |

[20] SOURCE Tyrewise 2.0 Financial Model – Income Calculation worksheet

# 17. End of life tyres I Materials flows

A used tyre is defined as a "used, rejected or unwanted motor vehicle tyre, that can be reused for its original purpose, retreaded, transformed, recycled or that may be destined for final disposal"[3]. Used tyres can be either be generated in New Zealand or can be imported as used tyres.

Used tyres currently have four different pathways in New Zealand:

- Landfill and disposal
- Recycling or transformation
- Reuse, exported for reuse, or retreaded (truck tyres only)
- Energy as Tyre Derived Fuel (from October 2020)

The following diagram describes the flows of tyres through the industry in New Zealand and the different end use pathways for end of life tyres without a stewardship model in place (i.e. status quo).

The uses for ELTs are wide and varied and can be as simple as using a whole passenger car tyre to grow potatoes in the back yard, through to a set of complicated chemical processes to break the tyre back down into its original components for use in further processing.

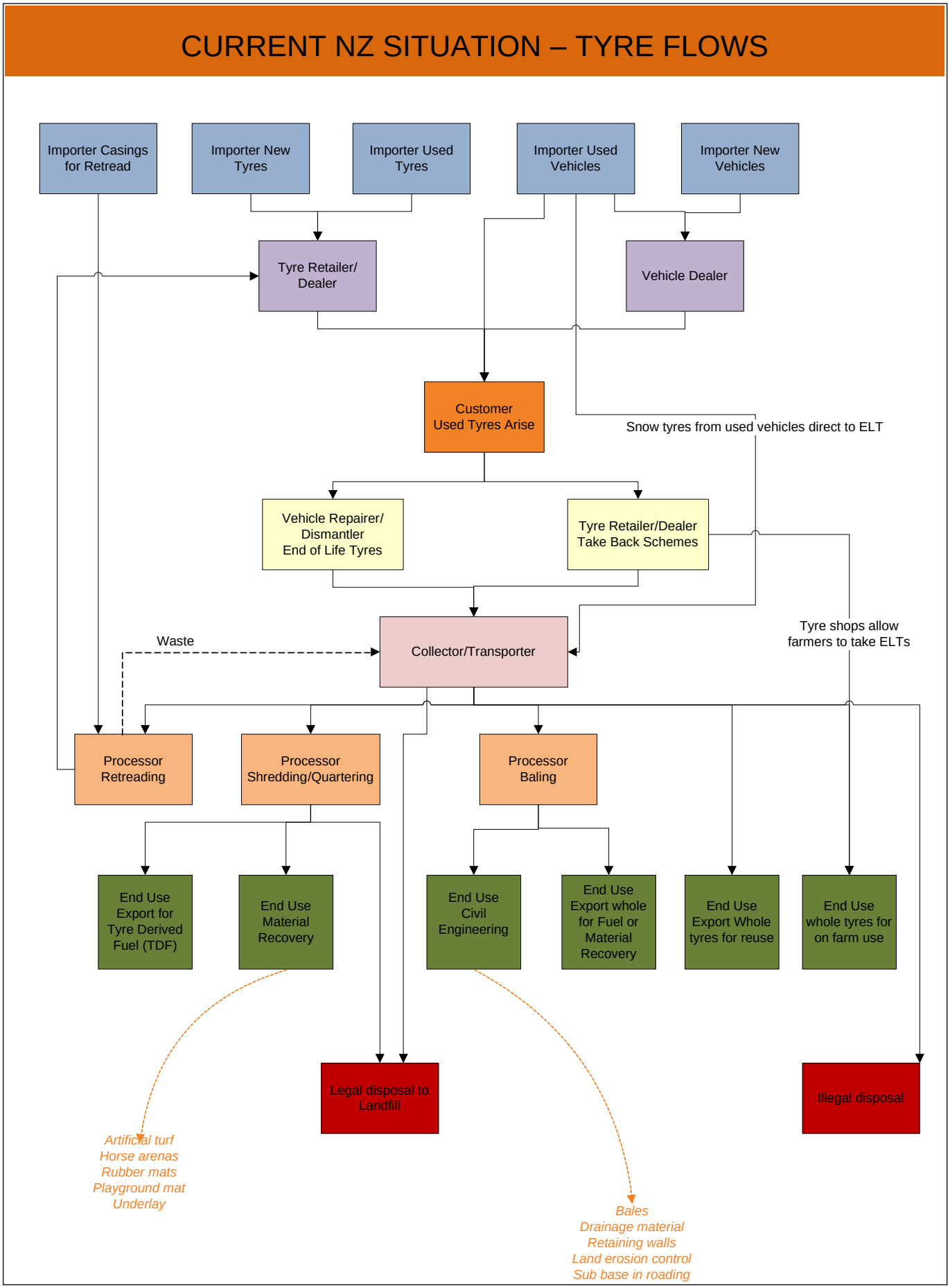



**FIGURE 12**
Current NZ Situation - Tyre Flows without stewardship

# 18. Market opportunities using ELTs

Internationally, alternative uses for collected ELTs fall into four product groupings:

T**ABLE 13** Product groupings

| GROUP | One | Two | Three | Four |
|---|---|---|---|---|
| PROCESS | Whole tyres | Fabricated / cut products | Ambient and cryogenic material recovery further use:<br>**Crumb** as an **end-use functional product**<br>Crumb as an **additive in a product**<br>Crumb in a **secondary process**<br>Crumb in a **destructive process** | Devulcanisation |

As at 2013, fabricated/cut products, cryogenic material recovery and Devulcanisation were considered unlikely to be commercialised by 2016 and therefore unlike to attract incentive payments.

A feature of successful international ELT programmes is a mix of uses from energy recovery in some form such as tyre derived fuel, through to high value end uses from fine crumb. It has to be noted that in many countries there is industrial competition as a fuel mainly established by TDF for electricity generation (from incineration). This is unlikely to be the case in New Zealand given our renewable electricity generating capacity and planned new geothermal.

# 19. Identifying feasible stewardship options

## 19.1 Methodology

For identification and evaluation of feasible programme options, detailed case studies were undertaken of schemes for management of end of life tyres operating in the market during Tyrewise 1.0.

Schemes were categorised by their key attributes covering:

- management models
- scheme participation
- scope of tyres included for levy and recovery
- where a levy was collected
- what activity the levy funds
- reporting obligations and obligations other than financial

Four possible options for a NZ programme were identified and presented to the working group.

1. Full product stewardship with levy at Brand Owner First Import (BOFI) for both loose and fitted tyres based on Ontario Tire Stewardship model *(option discarded because of potential risk of free riders if legislation for regulation didn't follow)*
2. Limited product stewardship with levy at Brand Owner First Import based on proposed Australian model for tyres *(option discarded because it would not address the market failure conditions)*
3. Full product stewardship with levy at retail based on Tire Stewardship British Columbia model (*option partially adopted*)
4. Co–regulatory model based on Australian Television Take Back Scheme *(option discarded because of lack of control by industry in outcomes of its own products at end of life)*

| **GUIDE 2** | **Components Tyrewise Working Group considered were important for product stewardship of ELTs in NZ** | | |
|---|---|---|---|
| **Management Models** | Tax System | Co-Regulatory | Product Stewardship |
| **Structure & participation** | Rules based | Voluntary scheme – rules only | Regulated product stewardship (WMA) |
| **Tyres in scope (for ADF and recovery)** | Only passenger tyres | All tyres except off the road | All tyres including off the road and aircraft |
| **ADF charged on** | Used loose tyres | New loose tyres | All tyres (loose and on vehicle, new and used) |
| **ADF placed at** | Border or First Import (BOFI) | Retail including online | Border for loose tyres and off road only vehicles (NZ Customs) first point registration for tyres on "road |

| | | | |
|---|---|---|---|
| | | | registered" vehicles (NZTA) (BOFI) |
| **Advanced Disposal Fee paid to** | Government | Product Stewardship Organisation (PSO) | $ & data remitted to Product Stewardship Organisation (PSO) by government agency |
| **Tyre collected at** | Registered collection points (retailers, resource recovery centres, vehicle dismantlers) | Retailers | Event based e.g. collection days |
| **Incentives or market-based contracts** | No incentives – free market | Payments made following proof of activity | Fully contracted services |
| **Provision for** | Orphan/historic tyre collectors | R&D marketing development | Consumer education |

## 19.2 Regulatory support implications

The provision to declare products "priority" and to put in place "product regulations" remained untested during the design of Tyrewise. Therefore, much discussion took place between the Tyrewise Working Group and the MfE Independent Observer about what regulatory support may be required for their preferred programme option with the understanding that, while parts of the Act were untested, there was provision for regulation and product control.

The Working Group was presented with a flow chart that set out the steps involved in the declaration of a priority product by the Minister, as well as what that might mean in relation to tyres and the responsibilities of the Group.

The discussion in relation to this process was clear that the Group would like mandatory participation in a programme and that regulatory support in the way of product controls would be required to affect this.

In 2014, during Round 2 of consultation on priority products, much time was spent with impacted parties across industry on "what this might look like" under several different scenarios.

In 2018, the first use of product regulations under the WMA was enacted through the ban on microbeads, with the second ban of plastics bags (within scope) in 2019. For plastic bags, this followed a period of consultation on the potential impacts of a ban, and the result was that the Prime Minister declared a ban on plastic bags based on advice from the Associate Minister for the Environment who was responsible for the waste portfolio. This did not require plastic bags to be declared a priority product in the first instance.

## 19.3 Regulated Product Stewardship

In the **Ministry for the Environment. 2019. Proposed priority products and priority product stewardship scheme guidelines: Consultation document**, page 11 provides the reader with further explanation on regulatory support.

To 'level the playing field', the WMA offers the option of a 'priority product' declaration (WMA Section 9) and regulation that prohibits the sale of a priority product except in accordance with an accredited product stewardship scheme (WMA section 22(1)(a)). The WMA section 22(1)(a) option is only available for declared priority products. Without this regulation, participation in an accredited scheme is not enforceable.

The documents figure 2 (*copied below*) summarises the inter-relationship of WMA sections 9, 12 and 22(1)(a).

Other potential regulatory options under the WMA that would help to 'level the playing field' for activities include advance product management fees, deposit–return systems and labelling requirements (WMA section 23).

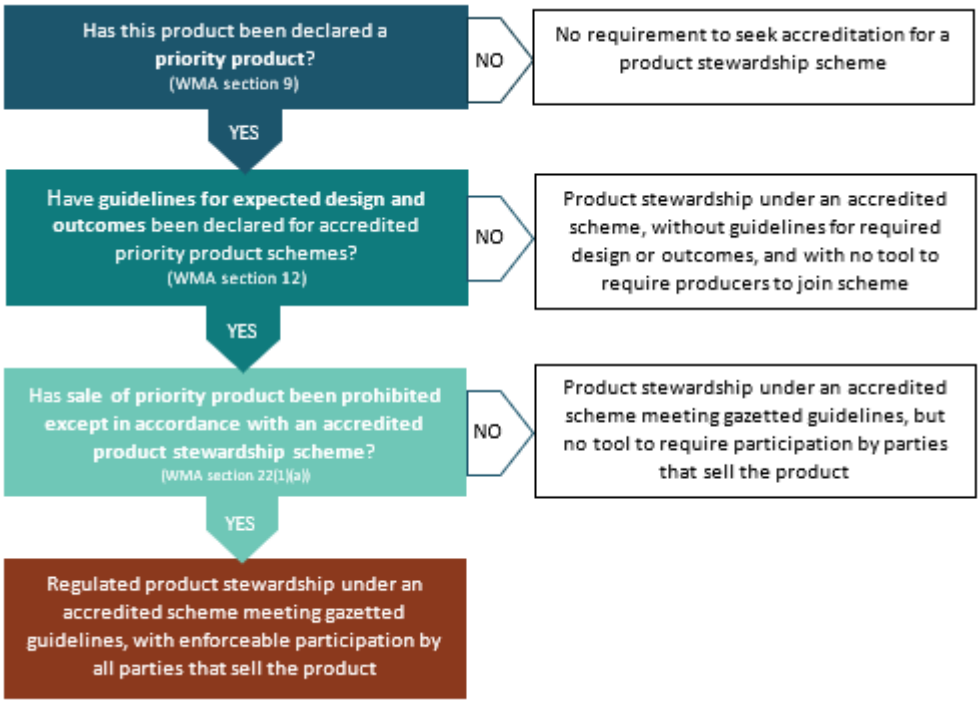



**FIGURE 13**
[Fig 2.] Inter-relationship and effect of actions under Waste Minimisation Act 2008 sections 9, 12 and 22(1)(a)

Various terms are used overseas to describe regulated government approaches to product stewardship, including 'co-regulatory' (eg, Australia) and 'extended producer responsibility' (eg, Europe and North America). Definitions for 'voluntary', 'regulated' or 'mandatory' are not set out in the WMA.

MfE chosen the terms 'regulated' and 'co-design' for their consultation document. 'Regulated' relates to priority product stewardship schemes that will need one or more WMA regulations for effective operation.

'Co-design' refers to the development of schemes and proposals for regulations with stakeholders.

The declaration of priority products triggers a requirement for a scheme to be accredited for that product.

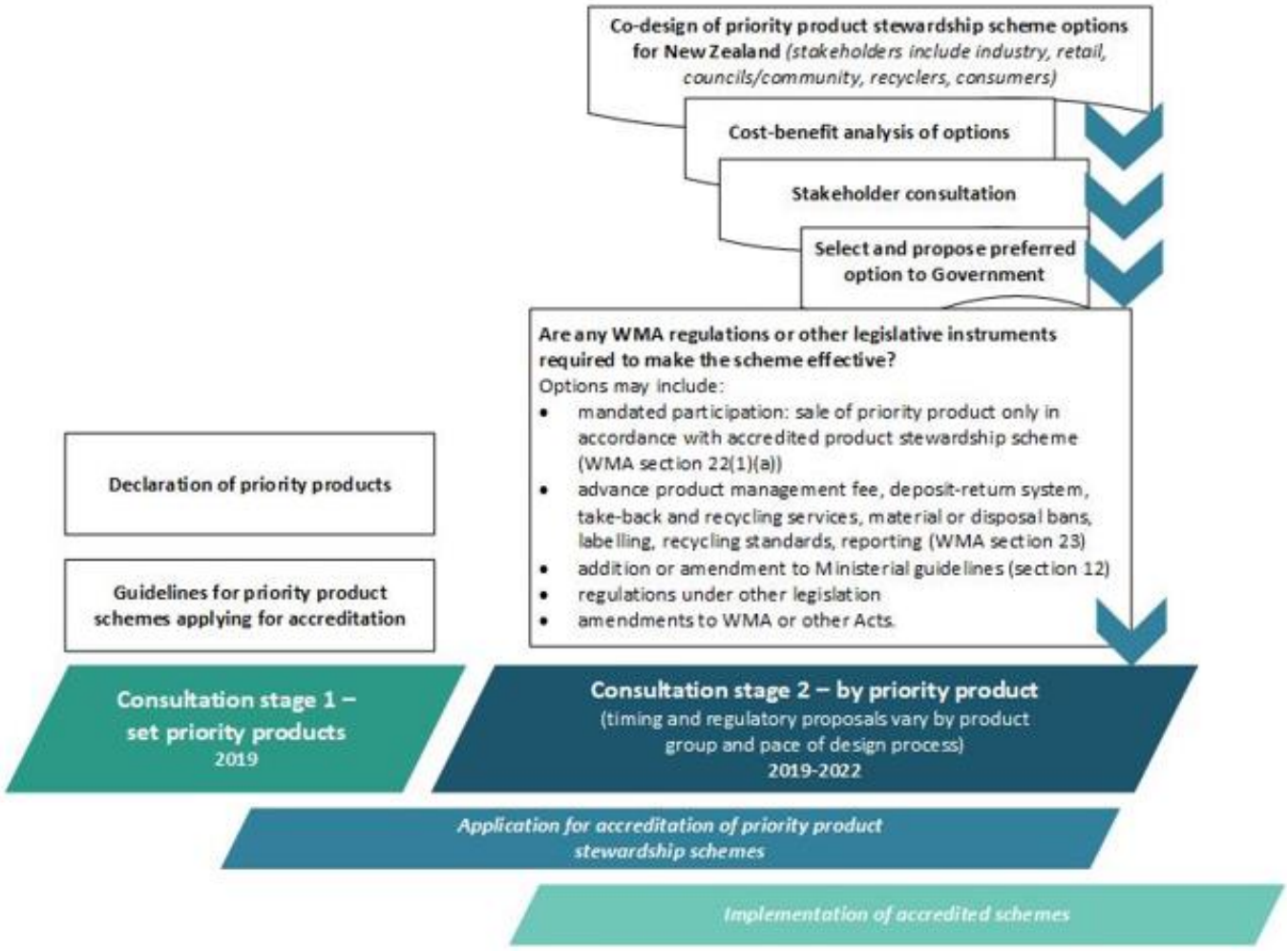
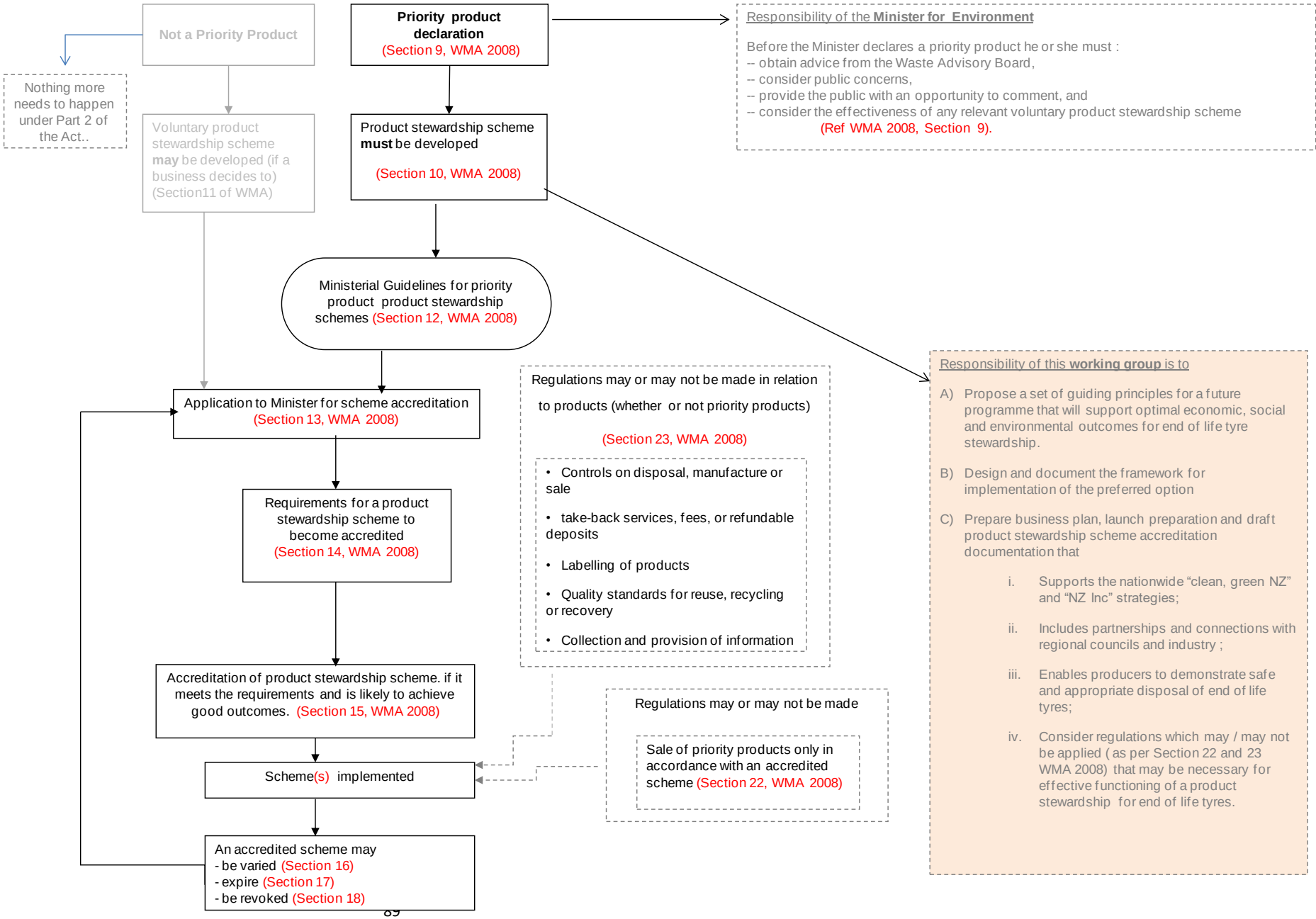



**FIGURE 14**
[Fig 4.] Proposed stage one and stage two consultations for product stewardship schemes under the Waste Minimisation Act 2008 (WMA)

# GUIDE 2 Product Stewardship – Part 2, Waste Minimisation Act 2008 (WMA)



# 20. Preferred approach for New Zealand

## 20.1 Industry readiness

To ensure full participation and regulatory support, a "priority product" approach is preferred. The Tyrewise Governance Group remain steadfast in their call for priority product declaration for tyres and the use of product regulations on the import of tyres from the Minister for the Environment under the Waste Minimisation Act 2008. Voluntary approaches have been tried in New Zealand and continue to be ineffective.

It is understood that affected party and public concerns might result from this approach. This report addresses those concerns that have been raised since Tyrewise 1.0 and these have been factored into the programme design.

The report considered the ability of industry stakeholders to undertake significant investment in the kind of infrastructure and timeframes that would be required to address mandatory product stewardship for ELTs. It also includes any changes to the market conditions from private investment and government investment (through the Waste Minimisation Fund) during the period 2013 - 2019.

Specifically, consultation in 2019 has focused on what financial resources would be required throughout the supply chain and what contractual arrangements would need to be in place to underpin the supply of ELTs for processing including off-take agreements for the resultant manufactured products.

Further consultation has been undertaken into the use of incentive payments throughout this supply chain to address the market failure providing feedback on how long these incentive payments may need to be in place to guard against a "forever subsidy" market condition.

A review in 2013 of the four developed options from Tyrewise 1.0 in the context of the New Zealand market and supporting regulatory framework saw a preferred model emerge:

Full product stewardship with priority product declaration and

- an ADF collected on loose tyres collected by NZ Customs **or (if unviable)** via sales declarations from brand owners, and
- an ADF collected on tyres fitted to vehicles at the point of first registration via the NZTA.

The ADF will be remitted to the product stewardship organisation (PSO) with responsibility for the environmentally sound management of end of life tyres.

Registered tyre collection points would be available for consumers to take back tyres free of charge.

Payment for services would be paid to registered and accredited parties involved in the tyre recovery chain.

The programme would have some financial provision for collection of legacy and orphan tyres, research and development.

## 20.2 Objective of the preferred model

- To develop solutions and new markets for tyre derived products locally and reduce the export of whole tyres or tyre derived fuel to unverified end use or to comply with any export bans which may come into place before the implementation of Tyrewise.
- To implement a manifest tracking system and reporting obligations for all parties who are eligible to receive inventive payments.
- To encouraging cost efficiencies and end use value growth.
- Incentive placements that support the push-pull model
- Guide PSO use of funds by assessing various projects and choosing those which would create more demand for ELTs in New Zealand with additional capital investment.

## 20.3 Key attributes for the preferred model

**Governance and management** - a product stewardship approach with a non-profit product stewardship organisation (PSO) is the preferred option for management of Tyrewise.

**Regulatory support** - a priority product approach is preferred, to ensure a level playing field and ensure supporting regulations.

**Scope of tyres in programme** - preference is for the programme in principle to encompass all pneumatic tyres, including OTR and aircraft tyres. However, bicycle tyres, tyres on wheel chairs, mobility scooters, and wheel barrows should be excluded from Phase 1 of implementation but should be considered under Phase 2 when collection and processing capabilities are established.

**Advanced disposal fee application** – there will be an ADF applied on all loose tyres, all tyres fitted on vehicles and casings that are imported for retread operations.

**2013 position of the original Tyrewise Working Group: ADF collection** - the preferred option is that an ADF on **loose tyres** should be collected by NZ Customs. The second preference is an ADF based on sales declarations from first importers/brand owners with cross reference to import information supplied by NZ Customs. This approach was preferred over the retail model which was considered too complex from an administration perspective when dealing with more than 4,000 tyre retailers. In comparison, the preferred approach would deal with around 50 importers of loose tyres.

**2019 position of the Tyrewise Governance Group: ADF collection** - the ADF on **loose tyres** and **off road tyres on vehicles** should be collected by the programme based on sales declarations from first importers/brand owners with cross reference to import information supplied by NZ Customs. This is known as a Brand Owner First Importer (BOFI) Model.

The ADF on **tyres fitted to vehicles** should be charged at first point of registration for use on the road and become part of the initial “on road costs” (ORC) and the funds collected redeemed to the governing agency (how that agency within the Ministry for the Environment “passes on” funds to an external agency is unknown at this time).

All ADF funds would be remitted to a PSO for management and distribution to their agreed plan.

**Regulated product stewardship programme reporting obligations** - a BOFI model for loose tyres places the reporting obligations on first importers to declare sales volumes of loose tyres imported or sold.

- In 2019, the Ministry for the Environment consulted on "Regulated Product Stewardship Scheme Guidelines for Priority Products"[21]; it is expected that some reporting from NZ Customs to the regulated programme PSO will be in place. This will provide transaction information to the PSO that a transaction has occurred which requires payment of an ADF. In addition, a tyre will not be able to be imported loose without evidence of the importer's participation in an accredited regulated product stewardship programme.

There would also be reporting and levy remitting obligations from the NZ Transport Agency who would collect the levy on tyres fitted to vehicles when they are first registered, on behalf of vehicle importers and pass the levy to the PSO.

**Payments**– to be paid to participants registered with the programme:

- Collection points (retailers, garages, vehicle dismantlers, landfills, community groups, etc)
- Transporters/haulers
- Processors
- Product manufacturers/end markets using material from processed ELTs as a raw material

Tyrewise makes payments for all parties in the tyre recovery chain. This would also support the need for a manifest tracking system and reporting obligations on all parties who would be eligible to receive incentive payments.

An electronic data capture programme that requires a manifest system to record movements of tyres from registered collection points, via transporters, to processors and tyre derived product manufacturers is consistent with the World Business Council for Sustainable Development (WBCSD) Framework for End of Life Tyres[5].

**Other provisions** – The Tyrewise programme has provision for:

- Funding of orphan and legacy tyres recovery
- Investment in research and development programmes and community good
- Investment in market development with a weighting on end use markets

**Cost Benefit Analysis** – A cost/benefit analysis including economic and environmental factors is set out in Appendix A. A set of principles to be achieved by Tyrewise have been agreed to. A series of economic and environmental costs and benefits have been identified and the preferred and alternative options examined to compare outcomes for each. This has been updated using 2019 data.

[21] SOURCE https://www.mfe.govt.nz/publications/waste/proposed-priority-products-and-priority-product-stewardship-scheme-guidelines

## 20.4 Stewardship programme structure(s)

There are as many structures to schemes as there are schemes operating worldwide. When considering the best structure for a programme first we need to develop a:

- Purpose (the materials in scope)
- Mission (what it is set up to achieve)
- Vision (looking forward to enabling forward planning)

Secondly, we look at the structures that can meet the purpose, mission and vision.

Tyrewise is a non-profit stewardship programme. Organisation structures that are most commonly used in New Zealand for that purpose are:

- Incorporated Society
- Charitable Trust

### Incorporated Society

An Incorporated Society is generally more structured. It can be incorporated under the Societies Act 1908 for certain protections for members and will have a set of rules or constitution under which the PSO operates. It:

- has a board of at least five members;
- has a membership of a minimum of 15 individuals or five corporate bodies such as other societies, charitable trusts or companies (each corporate body counts as three individuals), or a mix of both;
- can make profits and employ/contract providers but may not distribute profits to members; and
- has its income taxed although it may be eligible for a range of tax exemptions.

### Charitable Trust

A Charitable Trust generally enables a greater level of flexibility. It is incorporated under the Charitable Trusts Act 1957 and:

- will have a trust deed under which the PSO operates;
- has a board of at least two trustees;
- must have charitable aims i.e. not be for private profit;
- once registered and incorporated, has a separate legal identity distinct from its members or trustees; and
- must be registered with Charities Services to obtain or keep charitable tax-exempt status.

Examples of different governance and legal structures for product stewardship programmes.

**Agrecovery Rural Recycling (New Zealand)**

The Agrecovery Foundation is an example of how governance of a product stewardship programme works in a New Zealand context. The Agrecovery Foundation is a not-for-profit charitable trust which consists of trustees that represent rural organisations.

The Agrecovery Foundation has a deed that forms the legal framework for the Foundation and excerpts from the deed that may be applicable to a product stewardship programme for end of life tyres are:

Limited liability: No Trustee is liable for any loss not attributable to his or her own dishonesty or to the wilful commission by that Trustee of any act known by him or her to be breach of trust.
Indemnity: Every Trustee: is absolutely indemnified out of the Trust Fund for all liabilities incurred by that Trustee in the exercise or attempted exercise of any trust, power, authority or discretion vested in the Trustees; and has a lien on and may use moneys forming part of the Trust Fund for this indemnity
Purposes: The objects and purposes of the Trust, to the extent that they are charitable purposes, are to devote or apply both capital and income of the trust fund to, or for, any charitable purposes in New Zealand, which are from time to time selected by the Trustees and are valid charitable purposes. Without limiting this in any way, such purposes may include as follows:

(a) to promote the aims of product stewardship as set out in [clause 5 of the Trust Deed] and environmentally sound waste management practices in the primary sector to the benefit and advantage of all New Zealanders through the development of model product stewardship policies, programmes and legislation for the recovery and recycling of agricultural plastics and unwanted agrichemicals; researching technical issues; and helping agencies, organisations and companies develop viable solutions; and
(b) to bring key stakeholders together to reach voluntary negotiated agreements on product stewardship programmes; and
(c) to manage developed programmes on behalf of industry groups and organisations (both public and private); and
(d) to promote the adoption of programmes developed under (c) by the agricultural sector of environmentally sound waste management practices
(e) to pursue every object or purpose within New Zealand which in accordance with the laws of New Zealand for the time being is charitable.

**Tire Stewardship British Columbia (Canada)**

Tire Stewardship British Columbia (TSBC) is a not for profit society responsible for operating British Columbia's scrap tyre recycling programme in accordance with its Ministry of Environment approved Tire Stewardship Plan and the British Columbia Recycling Regulation. TSBC is governed by the following four member organisations:

- Retail Council of Canada
- Western Canada Tire Dealers Association
- The Rubber Association of Canada
- New Car Dealers Association of BC

TSBC also have an advisory group to support the board.

**Ontario Tire Stewardship (Canada)** – *wound up by end 2020 into Resource Productivity & Recovery Authority (RPRA)*

Ontario Tire Stewardship (OTS) is a corporation without share capital incorporated pursuant to the Corporations Act (Ontario). OTS is also deemed an Industry Funding Organization incorporated under Ontario's Waste Diversion Act, to implement and operate the Used Tires Program. The Used Tires Program was folded into a broader PSO called the Resource Productivity & Recovery Authority (RPRA) in late 2018 – this RPRA is a master PSO that provides governance to multiple priority schemes with multiple service providers.

In 2013, the board of OTS was made up of;

| |
|---|
| President of The Rubber Association of Canada |
| President of Ericway Tire |
| Manager, Product & Environmental Stewardship at Canadian Tire Corporation |
| Director, Environmental Affairs at the Ontario Tire Dealers Association |
| Senior Corporate Counsel at Michelin Canada |
| Counsel & Secretary at Goodyear Canada |
| Environmental Compliance Manager at Wal-Mart Canada |

## 20.5 Product stewardship organisation (PSO)

Good governance (as opposed to operational management) of the programme is required throughout the implementation phase and into its operational phase and beyond.

These structure that supports the programme is called a Product Stewardship Organisation (PSO) and it enables protection for sensitive information and programme participants from breaches of the Commerce Act including cartel conduct and anti-competitive agreements.

The Ministry for the Environment notes in its "Guide to Product Stewardship" that proper governance is necessary to ensure that the programme:

- carries out what it says it will;
- provides a process for decision-making with appropriate checks and balances;
- is monitored and reviewed regularly;
- can adjust to advice, challenges, criticisms and opportunities;
- is an equitable programme, including managing conflicts of interest and giving all participants an opportunity to provide comments and be aware of the actions performed on behalf of them; and
- records all important information and reports it to relevant stakeholders.

The WMA does not specify a particular governance or legal structure for a product stewardship programme whether voluntary or regulated. However, as part of the accreditation process, the Minister will look at the programme to ensure that the governance, and if necessary, legal structure adopted is suitable for the programmes design and objectives.

The following principles of good governance will be the cornerstones for the governors of the PSO:

### Accountability
PSO is able and willing to show the extent to which its actions and decisions are consistent with clearly-defined and agreed-upon objectives. The PSO will proactively identify and manage risks.

### Transparency
PSOs actions, decisions and decision-making processes are open to an appropriate level of scrutiny by the programme stakeholders.

### Efficiency and effectiveness
PSO will produce quality outputs that continue to meet the intentions of the guiding principles of the programme.

### Responsiveness
PSO is sufficiently capable and flexible in order to respond rapidly to changes, it takes into account the expectations of the stakeholder's interest and is willing to critically re-examine its role as these needs change.

### Forward vision
PSO is able to anticipate future opportunities and issues based on current data and trends and as such develop strategies and policies that take into account future cost increases/decreases and associated industry/process changes (e.g. demographic, economic, societal, environmental, etc.)

### Representation
Representation throughout the supply chain with participation by consumer representative groups, automotive retailer groups, local government, tyre processor and collector representation, and tyre and vehicle importer companies, thus ensuring there is full representation in all decisions made. A mixed model of elected and appointed trustees work with advisory boards to ensure that the rule of law is adhered to.

### Rule of law
PSO operates within New Zealand laws, regulations and best practice codes. An example of one regulation the PSO will operate within is the Commerce Commission regulation about ensuring competition is not lessened.

One example of this is when competing parties come together to discuss product stewardship solutions for the industry, they must ensure that they not enter into a contract or arrangement that substantially lessens competition. Discussions and processes engaged to reach decisions need to be well documented.

## PSO structure examples

A robust stewardship programme has some typical features when it comes to how it handles declarations of product imported/produced, management of levies, ADF and take back fees.

There are different legal and governance structures that can be established for a PSO to manage these functions.

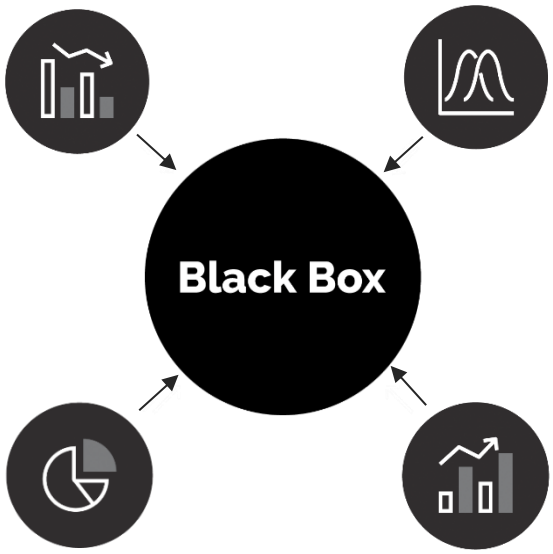
### Feature 1 I Black Box declaration data and financial management

A "Black Box" structure set up to receive in product declaration information from brand owners to enable accounting of fees/charges for participation in the programme. It is kept separate from the PSO); it can be involved with the internal structures and workings of the PSO, but the reverse cannot occur, the PSO cannot be involved with the internal structures and workings of the "Black Box" function.

It reports only aggregated product data and financial information that does not identify the specific brand owner or product supplier.

It is typically an accounting function and works under a contract arrangement.

For regulated stewardship programmes, provision can be made for Government participation in this structure due to the need to ensure sound fiduciary management of funds resulting from regulation of products under the WMA.




### Feature 2 I Product stewardship organisation

The PSO is a not-for-profit entity. It is a governance function and best practice is that those sitting in a trustee position, are not directly benefiting from the funds collected for participation in the programme, nor could they make use of the aggregated data for their own commercial/professional gains.

Its key functions are to:

- Receive aggregated product data and financial reports;
- Provide oversight of the programme on behalf of participating brand owners/supply chain;

- Award and monitor commercial contracts for service delivery (management. marketing, auditing, collecting, transporting, processing, end use);
- Set strategic plans, and audit against these;
- Manage the use of funds against the purpose, mission and vision of the programme; and
- Work with advisory groups which may be set up from time to time for the betterment of the programme


**Feature 3 I** Advisory groups

Advisory groups are an integral feature to the ongoing success of an industry-wide stewardship programme. They can be brought together around a particular area of expertise - for example extraction of materials to maximise value which may be unique; through to functions such as evaluating tenders from service providers.

They are typically directly involved in the production, distribution, collection and reprocessing of the product being stewarded and are at arm's length to the PSO and the decisions it must make around use of funds and provision of data.

### Legislative requirements for a PSO

Regardless of the type of entity created to manage a product stewardship programme in New Zealand there would be the requirement that all relevant legislative requirements are met.

In the table below are the types of entities that exist in New Zealand and the legal act that applies to the entity.

As at December 2019, it is unknown what legislative requirements may be required for a regulated programme that stewards a priority product.

**TABLE 14** Legislative Acts applicable to different not-for-profit entity types

| **Entity type** | Incorporated Society Registered | Charitable Trust (society-based) | Registered Charitable Trust (trust-based) | Company | Industrial and Provident Society |
|---|---|---|---|---|---|
| **Applicable Act** | Incorporated Societies Act 1908 | Charitable Trusts Act 1957 | Charitable Trusts Act 1957 | Companies Act 1993 | Industrial and Provident Societies Act 1908 |

The flowcharts used on Page 104 and 105 demonstrate likely interactions and key Governance relationships separate from the Operational relationships of the proposed Programme pre and post launch.

# PART B

# The regulated product stewardship programme for End of Life Tyres

# 21. Tyrewise™

Tyrewise is the name given to the industry product stewardship programme for management of end of life tyres.

Tyrewise Limited has been set up as a legal entity holding company for registration of the product stewardship scheme. Currently held on behalf of industry by the project manager.

## Mission statement

The mission statement for Tyrewise is:

**Improving the value for end of life tyres in cost effective and environmentally sound ways**

## Programme framework

Tyrewise has been designed as a result of investigating the situation as it was in 2012, refreshing that information in 2019 so we could identifying any continuing market failure, understanding changes in the market as to what is now possible both from offshore and within New Zealand in terms of viable alternative uses for ELTs, understanding what is available now, the immediate short term and over the long term.

## Guiding principles, goals and targets

The guiding principles recognise the need for collaborative efforts with all stakeholders to enable success. The four guiding principles reflect the programme design options and inform the goals to be set for implementation of Tyrewise. These are to be:

- Collaborative
- Economically effective
- Environmentally sound
- Best practice

The guiding principles then go on to inform the programme design principles as demonstrated in the following matrix.

**Mission**

**Improving the value for end of life tyres in cost effective and environmentally sound ways**

| Guiding principles | Collaborative | Economically effective | Environmentally sound | Best practice |
|---|---|---|---|---|
| **Scheme design options to enable guiding principles to be achieved** | • The scheme is governed by representatives on behalf of all stakeholders<br>• All stakeholders in the product life cycle are involved and have clear responsibilities<br>• Partnerships are encouraged<br>• Communities are engaged via education and/or participation<br>• Outcomes of the scheme are shared with wider society | • Scheme is self funding by a fair fee, which will reduce as markets and value for tyre derived products increase<br>• Compliance costs to consumers are minimised<br>• ELTs are recognized as a valuable secondary resource with end uses that are incentivised to maximise positive outcomes<br>• Avoid costs of disposal (landfill or illegal dumping) by maximising waste reduction and waste diversion (reuse, recycling & recovery);<br>• Supports NZ's "clean, green" reputation and access to trade opportunities | • Minimise health, safety, environmental and social impacts throughout the tyre recovery "life cycle";<br>• Reduce need for virgin raw materials by maximising waste reduction and waste diversion (reuse, recycling, & recovery);<br>• Reduce environmental impacts of toxic air emissions and leachate caused by tyre fires, illegal dumping and incorrect storage of tyres<br>• Recognise and certify processes that contribute to a reduction in New Zealand's green house gas emissions | • The scheme is designed for a New Zealand context while learning from international experience<br>• The scheme is credible and auditable to relevant standards (e.g. ISO14001 and PS accreditation)<br>• The structure and funding of the scheme is well defined and transparent<br>• All processes are clearly documented and subject to periodic review and improvement<br>• Programme participants are measured to agreed criteria: positive results are rewarded and non-sanctioned activity carries consequences<br>• Investment is made in R&D to improve outcomes and efficiency |

**GUIDE 4** Programme design principles

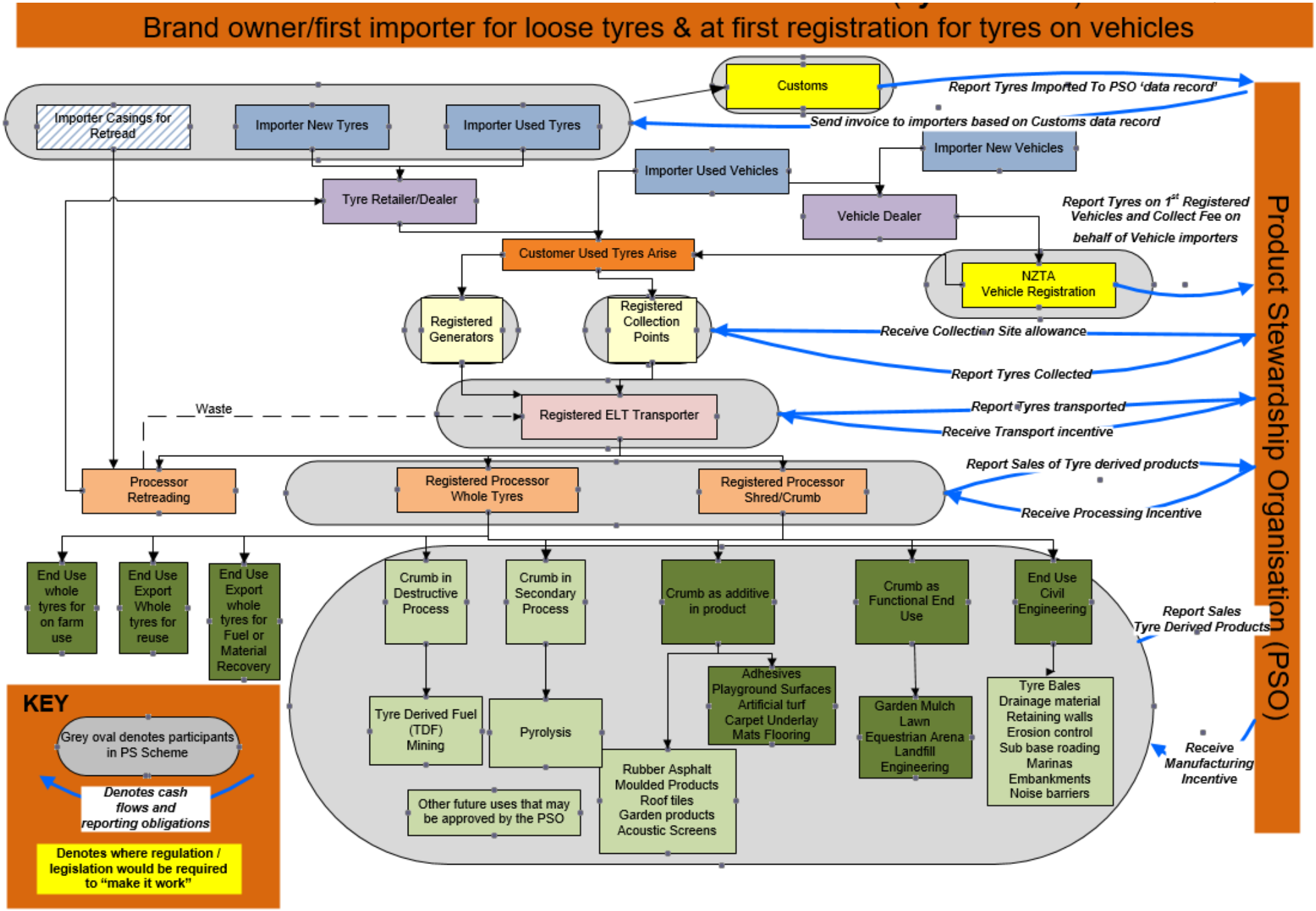



**FIGURE 15** Schematic showing brand owner first importer (BOFI) tyre stewardship model for NZ – financial, data and reporting obligations

# 22. Product stewardship organisation

The original Tyrewise Working Group recognised that the governance needs of the PSO may change throughout design, implementation and delivery phases. In 2013 legal advice was sought for the best structure for the proposed programme prior to a trustee position description being developed and a legal entity to hold the programme (the PSO) formed.

This PSO is Auto Stewardship New Zealand (ASNZ). Refer Appendix C for the trust deed.

The purposes of the ASNZ Deed are to:

(a) to promote the aims of product stewardship and environmentally sound waste management practices in the tyre to the benefit and advantage of all New Zealanders through the recovery and recycling of end of life tyres and related products as identified from time to time; and

(b) to hold and manage Tyrewise on behalf of the industry; and

(c) to link and liaise with other developed programmes that may be at various stages of launch; and

(c) to promote the adoption of programmes by the industry of environmentally sound waste management practices; and

(d) to pursue every object or purpose within New Zealand which in accordance with the laws of New Zealand for the time being is charitable.

A Board of four trustees representing industry organisations and up to an additional six trustees from wider community or interest groups (not less than eight, not more than ten) were appointed along with an independent chairperson.

An interim Trust Deed was put in place to provide a governance structure for the development phase from 2013 to 2015.

At the point at which that designation of tyres as a priority product is declared, it will trigger a change to the terms of this Deed and the governance structure to reflect the agreed future governance approved by the Tyrewise Working Group and as amended by agreement as a result of this declaration.

The Trustees fulfilled the “Black Box” review function for the review of the full financial model and associated cost benefit analysis published in 2013.

### Deed trigger

The Deed was structured to meet the needs of some of the industry trustee representatives who could only commit resources to the PSO at the point at which priority product was declared by the Minister – this was seen as a signal that Government were serious in working with industry on a national stewardship programme that was applicable to all tyre importers.

Therefore, there is a clause in the Deed that is triggered for the next phase to occur. This is the appointment of the balance of industry trustees, an action for their own industry organisations to undertake a legal review of the Deed, application for charitable trust status, and incorporation of the “Black Box” function and finally appointment of Directors to Tyrewise Limited.

At announcement of “priority product” for tyres, a tender for a programme manager for the Tyrewise product stewardship programme would be advertised and the recruitment process would be undertaken by the PSO.

The expression of interest for programme manager process is included in Appendix D.

Tyrewise Limited was set up and directors representing the tyre importers incorporated (at point of declaration of tyres as a priority product) – at arm's length from the governance organisation and income.

The current working group for Tyrewise continues to act in a governance capacity.

## 22.1 PSO governance capability

The PSO will consist of a Board, with appointed directors or trustees with specific governance skills or professional trustee experience.

These appointees will represent tyre brand owners, first importers and those with a responsibility for product stewardship of tyres, as a minimum.

Generally, a board will have between three and seven directors or trustees and roles that include Chair, Treasurer and Secretary.

## 22.2 Ownership of the programme

The PSO is the legal entity that owns and governs the stewardship programme on behalf of the supply chain.

## 22.3 Responsibility versus ownership [title] of the end of life tyre

A tyre is not at its "end of life" until a decision has been made that it is no longer wanted for the original purpose for which it was intended. Up until that time the ownership remains with the person who has it in their control.

### Responsibility for the ELT

The PSO becomes *responsible* for the management of the ELT at the point that it is made available for collection within the programme structure.

The PSO is then *responsible* for ensuring that this ELT is then collected and processed according to the policies that govern the programme.

The *responsibility* for the ELT at each part of the stewardship process is underpinned by service level agreements/contracts with the various providers within the programme structure.

### Ownership of the ELT (passing of title)

The *ownership* or title to the ELT changes as it travels throughout the supply chain.

The only point at which the PSO could have title to the ELT is when it is at a collection site, otherwise that ELT is owned by the processing or manufacturing entity that procures and/or possess the ELT at that point of the transaction in compliance with the regulations around carriage of goods and standard shipment terms and conditions.

The *ownership* of the ELT is clearly documented in any service level agreement/contract with the registered participants including those at any collection point. The service level agreements/contracts for service relating to procurement of ELTs must be explicit as to whether they are Free-on-Board Origin (FOB) or Destination.

- **FOB shipping point (FOB origin):** The buyer (processor or manufacturer) owns the goods in transit. Title passes to the buyer at the moment the goods are transferred to the carrier (tyre transporter). The buyer files any damage claims.

- **FOB destination**: The seller (processor) owns the goods in transit. The title passes to the buyer (manufacturer/value-add) when the goods reach their destination. The seller files any damage claims.

## 22.4 Governance interactions I PSO, Advisory/Technical Steering Committees

- PSO Board – governs the programme on behalf of the supply chain
- Advisory Group members – industry representatives that support/inform the PSO Board
- Programme manager – delivers operational aspects of the programme on behalf of the PSO

### Establishment Board – implementation phase

The PSO will initially be governed by an Establishment Board whose directors could for example be nominated by the Tyrewise Working Group. In some instances, past and current members of the Working Group are eligible to be on the Establishment Board and from a continuity and Intellectual Property perspective it makes sense to do this.

The Establishment Board would govern the PSO for a determined period with this timeframe included within any underpinning Deed.

The Establishment Board at the end of its tenure would then call for nominations to serve once their term is up.

Best practice management of boards would be in play **including** succession planning to protect against loss of intellectual property and knowledge as terms expire.

### Board interactions

The board of the PSO has responsibility for the vision and long-term goals of the programme, the strategy to achieve that vision and the monitoring of the implementation of that strategy. The board members provide governance for and complement the role of the programme manager and offer long term planning, financial oversight and inside knowledge.

Some of the specific board responsibilities are to:

- Set the vision and goals for the ELT programme
- Maintain a visionary position
- Review the ADF and recommend/set fee quantum (it is unclear at the time of writing this report how this responsibility will be managed under a regulated product stewardship programme for priority products)
- Negotiate and hold contracts/agreements with brand owners, NZTA and other government agencies as required, programme managers, generators, collection sites, transporters, processors and manufacturers
- Review performance against agreed KPIs
- Payment of approved rates based on evidence of activity received from the programme manager
- Be responsible for the financial performance of the programme
- Investigate and ultimately undertake actions that reduce or eliminate the fee (e.g. transport efficiencies)
- Have a clear and transparent process for appointing the programme manager

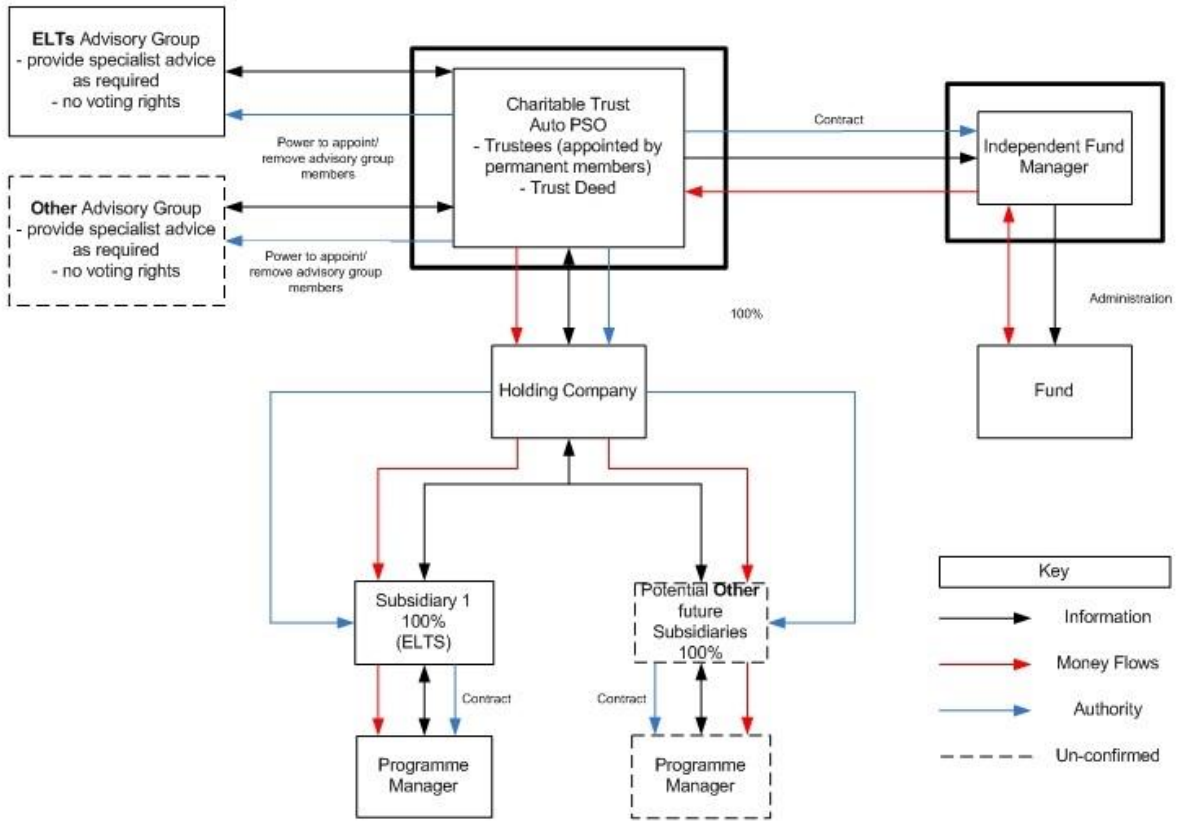



**FIGURE 16**
Flow diagram demonstrating PSO structure including holding company "Tyrewise Limited"

## Advisory Groups/Technical Steering Committees

It is expected that the PSO would form technical subcommittees to provide specialist or expert direction on a number of key topics. These topics may include OTR tyres, research and development, and transport.

A key component of the programmes governance is the use of Advisory Groups/Technical Steering Committees which support the PSO Board as the programme matures.

The use and structure of these groups will be written in the Deed. A Terms of Reference would be established at the formation of any group and expected to follow governance best practice.

Groups will consist of individuals with unique knowledge and skills that complement the knowledge and skills of the formal PSO board members in order to more effectively govern the programme.

Groups can make recommendations and provide information to the PSO Board, but they cannot issue directives or make decisions regarding payments.

It is expected that any groups will appoint a chair who moderates the group and is the point of contact between the group and the PSO board of directors and/or the programme managers if required.

Governance interactions on the following flowchart illustrate the working relationship between the PSO and its holding company Tyrewise Limited and its stakeholders: New Zealand Transport Authority (NZTA), New/Used Vehicle Importers, PSO Advisory Group, Customs, Tyre Importers, OTR Vehicle Importers, Ministry for the Environment and the Audit Committee. This flowchart also shows where these entities interact with each other

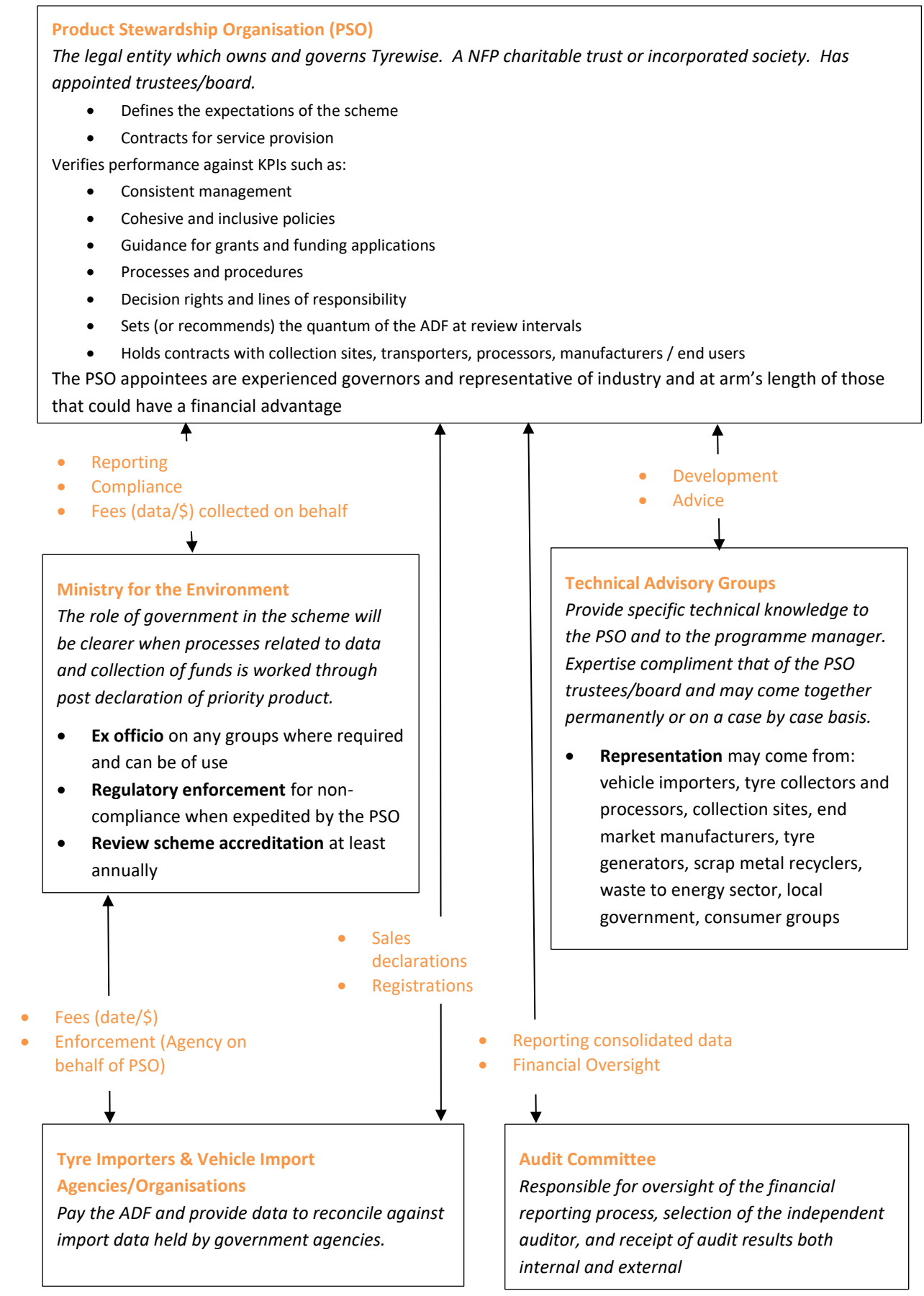



**FIGURE 17**
Flow Diagram demonstrating governance interactions between PSO and stakeholders within the PSO itself

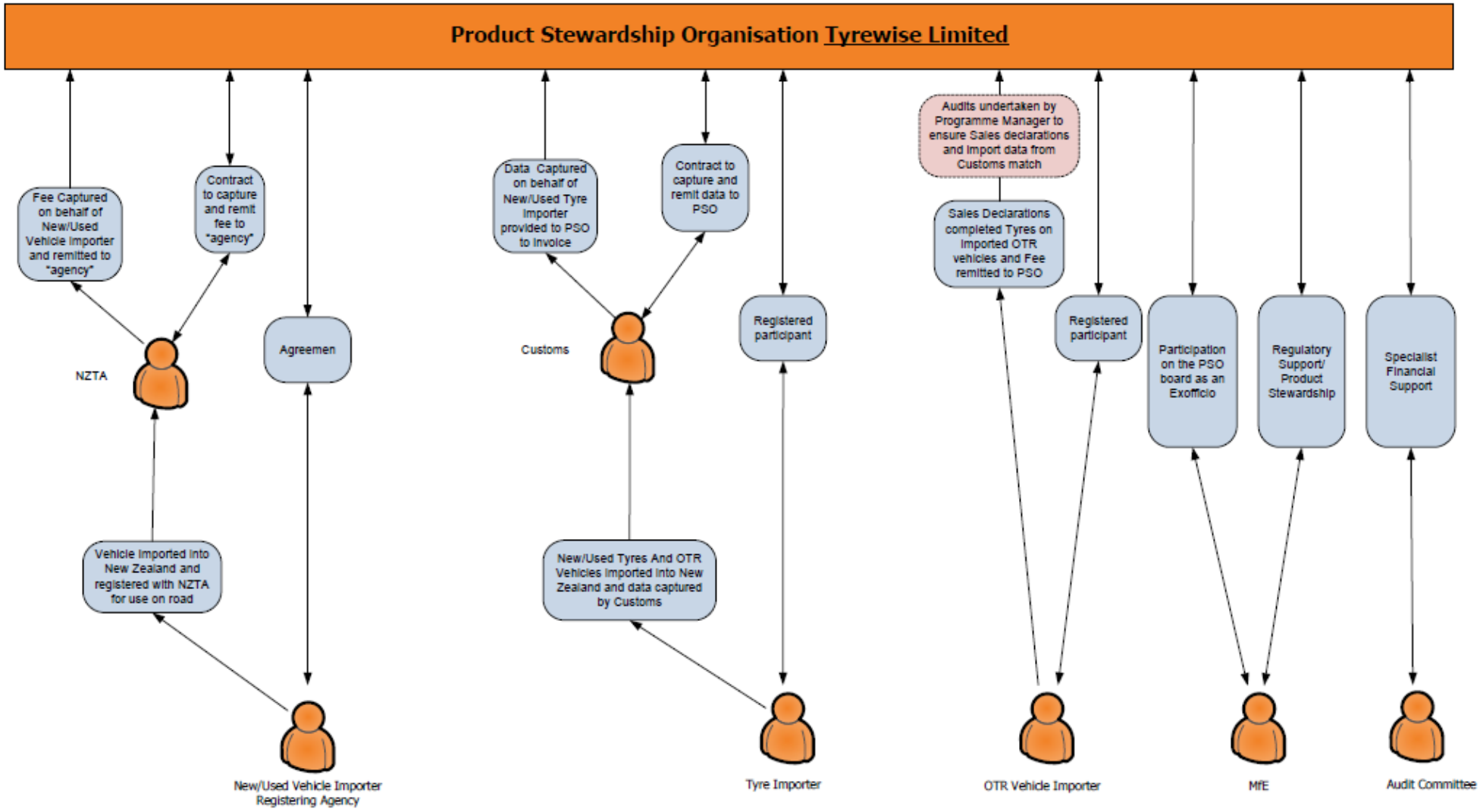



**FIGURE 18**
Flow Diagram demonstrating governance interactions between PSO and stakeholders with the PSO within the Scheme

# 23. Tyres in scope

To consider what tyres should be in scope you need to know:

- The mix of tyre categories entering the country
- The capacity to collect each category
- Processing needs per category

There are geographic barriers to recycling OTR tyres, however they represent a significant quantity of rubber and steel potentially available for recovery. A processing facility with the capability and capacity to handle our OTRs would be a significant investment and an economic feasibility study would need to be undertaken to support any investment by the PSO.

### Initial scope

Tyres in the initial scope of the Tyrewise product stewardship programme are defined as all pneumatic tyres including OTR and aircraft tyres, casings for retreads, and loose or already fitted to:

- aircraft
- buses
- caravans
- cranes
- excavators and graders
- farm machinery
- forklifts and
- light commercial vehicles
- mining and earth moving vehicles
- motorcycles
- passenger cars
- trailers
- trucks and trailers

### Out of scope

Tyres outside of the initial scope are tyres on bicycles, toys, wheel chairs, mobility scooters, wheel barrows and other non-motorised equipment.

### Scope Two

It is expected that once collection and processing pathways are established, that out of scope tyres could be recovered and a suitable funding model developed for them which reflects the most efficient point of entry data in order to quantify an advanced disposal fee that is balanced against the cost of collection and recovery of the tyres.

# 24. Operational interactions

Tyrewise has been designed to comply with the internationally recognised environmental standard ISO 14001:2015 and will be an accredited regulated product stewardship programme under the WMA.

The Tyrewise submission (attachment) covers in substantial detail how Tyrewise will meet (or exceed) the proposed "Guidelines for a Regulated Product Stewardship Programme for a Priority Product" versus a voluntary programme.

## 24.1 Meeting standards

Setting standards enables the programme deliverables to be monitored, measured and benchmarked against international programmes; and enables the setting of a fair and level playing field for all entities that interact with it.

Therefore, all entities involved in the movement of ELTs through Tyrewise will be required to become registered with the PSO.

As part of the registration process a service agreement will be put in place between parties outlining how each participant in the programme will operate in a manner that meets or exceeds the standards determined by Tyrewise. These programme participants may also maintain accreditation within their respective industries which may complement the programme registration and reduce duplication of information.

## 24.2 Registration criteria

What follows is a **non-exhaustive list** of potential standards and registration criteria Tyrewise may establish to enable the programme mission and guiding principles to be met. These standards and requirements are applied to the applicable programme participants with an ongoing expectation of registration within the programme.

**Auditing**

Recommended standard: All registered programme participants consent to regular physical and/or data audits of their processes that are applicable only to the programme.
Purpose: To ensure that all registered programme participants are meeting the specifications of their registration.
Measurement: This could include site visits and verification of processes and the checking of manifests both paper and electronic.
Example: Examples of audits may include checking storage against the standard, submission of an Environmental, Health and Safety Plan and adherence to this plan.

**Storage**

Recommended standard: All registered programme participants adhere to the National Environmental Standard (under consultation by Ministry for the Environment, March 2020) for the Storage of ELTs both on physical sites and during transport.

Purpose: Meeting the standard for the safe storage and transport of ELTs will mitigate risk to people, property and the environment throughout the ELTs life cycle.
Measurement: Physical audit by the programme manager to ensure that the storage and transport requirements are being met.
Example: The requirements may include appropriateness of storage location, volume stored at any one time, security of the storage site, covered storage and distance ELTs can be stored from waterways or buildings.

**Processing**
Recommended standard: All registered processors and manufacturers/end users register their process type with the programme.
Purpose: To ensure that payment is only made for ELT processing types that are certified by Tyrewise and any variation to the type of processing is raised with Tyrewise.
Measurement: Physical audit by the programme manager to ensure the processing that is specified as part of the programme registration is taking place.
Example: A processor or manufacturer/end user is claiming an incentive for a processing type that they are not actually undertaking and potentially using the ELTs in an end use not certified by Tyrewise.

**Engagement**
Recommended standard: Throughout the programme supply chain registered participants will only be able to engage with other registered programme participants.
Purpose: To ensure that collected ELTs and any payments are only made for end uses certified by Tyrewise.
Measurement: Reports provided to the Programme Manager show the engagement that occurs between entities in the supply chain.
Example: Registered transporters can only deliver ELTs to registered processors.

**Reporting**
Recommended standard: All registered programme participants will report on their activity undertaken within the programme.
Purpose: All information collated will be used to report on volumes collected, volumes processed and the overall effectiveness of the programme. If payments (proposed) are to be made, then this information will be used to calculate incentive payments. However, reporting requirements will be mandatory regardless of any incentive structure.
Measurement: Reports are received by the programme manager, at or before their due date, and are completed in full.
Example: This may include volume and number of ELTs collected, distance travelled, other programme participants engaged with (time, date and location) and products manufactured with TDPs in them.

**Sanctions**
Recommended standard: Sanctions are placed on programme participants that either have a serious breach or multiple breaches of a non-serious nature of Tyrewise standards which may relate to product regulation under the WMA.

Purpose: To ensure that the criteria programme participants are expected to meet as part of their registration are actually met.
Measurement: Information compiled through both physical and data audits are used to determine if breaches of standards have occurred.
Example: These sanctions could be in the form of suspension of registration until nonconformance is rectified or ultimately the removal of registration altogether.

## 24.3 Electronic data capture

All interactions between registered participants in the programme must be captured through an electronic or paper manifest system.

The system will be provided by Tyrewise and where possible directly interact with data capture systems that are already established by participants. An example of this is electronic weigh bridge dockets.

# 25. Overview of programme information for participants

## Participant roles

Those programme participants involved in the operational interactions and their respective roles. For an easy to reference guide, refer to Appendix E – What Tyrewise means for me.

**Tyrewise programme manager**

Who: The entity which oversees the operational functions of the programme.

Definition: The programme manager responsibilities are to:

- Monitor the operational collection and recovery network
- Facilitate the registration of participants in the programme
- Audit programme participants
- Assist with the development of end use markets for the ELTs
- Educate consumers, programme participants and industry
- Report on performance
- Through various media, share programme performance on a regular basis with the wider community
- Undertake and maintain product stewardship accreditation on behalf of the PSO and undertake and maintain other relevant external accreditation e.g. ISO 14001.

Financial incentive: Paid by the PSO to oversee the operational functions of the programme

Regional variations: Not applicable

**Registered generator**

Who: Examples of registered generators - trucking firms, forestry contractors, scrap metal yards/vehicle dismantlers, large fleets eg councils and prisons, police, fire & emergency services, Automotive Aligned Garages and Automotive Aligned Retailers.

Definition: A registered generator is a business that as a result of their operations generates tyres; these businesses can then register as a generator. A registered generator is **not** required to take ELTs from the public other than as a result of providing service to their customers (i.e. if a garage). Any arrangements put in place around the volume required for a pickup or the frequency of pickups will be made between the registered generator and registered transporter.

Financial incentive: Registered generators are entitled to free collection by a registered transporter or they may deliver ELTs to a registered collection site. A registered generator does **not** receive any form of payment from Tyrewise.

Regional variations: Not applicable

**Registered collection sites**

Who: Examples of registered collection sites - resource recovery parks, transfer stations, landfills and community groups/organisations.

Definition: A registered collection site is a location where ELTs are consolidated from either members of the public or from registered generators. In areas where there is only one registered collection site the collection site **must** be able to accept tyres from the public. In the case of closed landfills only commercial operators/contractors with a Waste Disposal License will be allowed access.

Financial incentive: A registered collection site **does** get paid by Tyrewise. The payment will be a monthly/quarterly service fee that reflects the work involved by the registered collection site to offer the service, scaled, based on the level of activity. An example of the banding is below:

| Table 15 Service level bands for collection sites | |
|---|---|
| 1 – 100 tyres per month | Low |
| 101 – 250 tyres per month | Medium |
| 251 – 500 tyres per month | High |
| 500+ tyres per month | Very high |

A registered collection site must **not** charge customers when accepting tyres. Registered collection sites are entitled to free collection by a registered transporter

Regional variations: In certain geographic locations, as determined by the PSO, there may be role variations, e.g. the local garage in Nuhaka may be a registered generator but if there are no suitable local alternatives they may also act as a registered collection site.

**Registered transporters**

Who: Examples of registered transporters - specific ELT transporters, processors that have vertically integrated their business and local or national transport providers.

Definition: A registered transporter is a transporter of ELTs (either whole or part processed) that collects from both registered collection sites and registered generators and delivers these ELTs to a registered processor.

Financial incentive: A transporter **does** receive payment from Tyrewise. Payment for the delivery of the ELT is made by Tyrewise to the registered transporter. The registered processor and registered transporter have an agreement/contract between them in regard to the supply of ELTs. A registered transporter may have commercial arrangements in place with multiple registered processors, registered collection sites or registered generators.

Regional variations: There will be mechanisms and funding available to ensure that ELTs generated in remote and difficult to access locations are able to be collected.

**Registered processors**

Who: Examples of registered processors - an entity that turns ELTs into crumb or uses ELTs within a physical or mechanised process.

Definition: A registered processor is an entity that receipts in ELTs (either whole or partially processed) from a registered transporter. The processor then transforms the ELT into either a functional end use product or a product that is sold/supplied to a registered manufacturer/end user.

Financial incentive: A processor **does** receive a payment from Tyrewise. The processor will be paid on evidence that the product produced by the registered processor has been sold/supplied to a registered manufacturer/end user. A registered processor may have agreements in place with multiple registered transporters.

Regional variations: Not applicable

**Registered manufacturers/end users**

Who: Examples of registered manufacturers - any entity that uses products derived from an ELT in further manufacturing or production or uses whole ELTs as a fuel source.

Definition: A registered manufacturer/end user is an entity that receipts in a product derived from an ELT that has been produced by a registered processor. The registered manufacturer/end user then uses this product in the manufacture of further products or in an end use.

Financial incentive: A registered manufacturer/end user **does** receive an incentive from Tyrewise. The registered manufacturer/end user will be paid on evidence that the product produced by the registered manufacturer/end user has been sold.

Regional variations: Not applicable

### Additional or top up payments

Any financial transaction for additional or top-up payments of the ELT between the registered transporter, registered processor or registered manufacturer/end user is a commercial relationship and not within the scope Tyrewise.

### Payment to Tyre Retailers

It is proposed that tyre retailers are paid a PC sum per month of $100 each to cover the cost of completing and reconciling paperwork required for statistical data collection by the Product Stewardship Organisation.

# 26. Reporting requirements

To the extent of what is commercially and legally allowable, the principal of transparent and timely reporting will be a hallmark of Tyrewise. Alongside that, is keeping administrative costs to a minimum for all parties. An example of this is the use of an electronic manifest system that will track the flow of tyres through Tyrewise.

The Product stewardship organisation will report:

- to the Ministry for the Environment (and any other regulator) on how it is meeting its obligations under the Regulated Product Stewardship Programme Guidelines for a Priority Product (at least annually as part of the accreditation review process)
- publish an Annual Report, including audited accounts, and make that publicly available
    - The independent accounting function will report summary financial activity to the PSO monthly
    - Advisory Groups and Technical Steering Committees will report as per their Terms of Reference

The programme manager will report:

- At least every two months to the PSO using a typical board reporting format
- Specific reports to Advisory Groups/Committees
- Provide data to registered programme participants

Registered programme participants will report:

- Quarterly materials flows (tyres in, ELTs processed, proof of sales) Note that it is intended that these are electronic with final signoff only required for claims.
- Use of funding awarded for R&D, market development and community grants
- Status of any work removing legacy or orphan tyres

Agencies who collect the advanced disposal fee will also be providing reports to the accounting function.

### BOX 5 Use of Public Funds

While the ADF is neither a tax or a levy, it is expected that some form of "use of public funds" type reporting for collection and use of the ADF would be required. A full annual report will be provided for all aspects of the programmes use of funds and audit provisions relating to operations and administration of the fund will be put in place

# 27. Advanced disposal fee (ADF)

This section covers:

- The objective of the ADF
- How the ADF is calculated
- The ADF value
- How the ADF will be applied
- Transparent application of the ADF in the supply chain
- Who will collect the ADF
- What the ADF will be used for

## 27.1 The objective of the advanced disposal fee

The objective of any ELT product stewardship programme should be to develop solutions and new markets for tyre derived products locally and reduce the export of whole tyres or tyre derived fuel to unverified end use.

This is consistent with meeting NZ's obligations under the Basel Convention for the Control of Transboundary Movements of Waste, including pending changes in 2020. A relevant provision in the convention is that all parties shall not allow export of waste to developing countries, where it has reason to believe that the waste in question will not be managed in an environmentally sound manner, or where the country has prohibited by their legislation the import of that waste.

Therefore, incentive payment structures for Tyrewise have been designed to incentivise ELT derived products which would increase the feedstock available for NZ based end use markets as they develop over time.

In 2013, Bridgestone (ANZ) put forward that the key to a successful programme is firstly the development of the demand of the end products such as rubber crumb, TDF, tyre derived asphalt. They would like to see the PSO develop the demand by working with organisations such a cement companies, paper companies, etc. that would have a constant demand for this fuel. At that time, NZ had no commercial scale use of TDF.

In 2019 the first use of TDF started with the commissioning of the Hot Disc Technology used by Golden Bay Cement. This infrastructure investment has significantly changed the supply and demand curve for ELTs in the upper to middle North Island market for passenger EPU, increasing competition amongst collectors and processors established in the market.

Incentive payments consulted on have included those paid to:

- Collection points (retailers, garages, vehicle dismantlers, landfills, community groups, etc.)
- Transporters/haulers
- Processors
- Product manufacturers using material from processed ELTs as a raw material

Awarding of payments and where those payments should be made will remain contentious. Differing views are held by parties during the design phase of Tyrewise who may believe higher weighting should be given to some parts of the recovery supply chain over others, or that some processors should be included or not others. When making decisions about where an incentive payment is placed, and reviewing it from time to time, both the Tyrewise mission statement *"Improving the value for end of life tyres in cost effective and environmentally sound ways"* and the objective of the ADF which is "*to develop solutions and new markets for tyre derived products locally and reduce the export of whole tyres or tyre derived fuel to unverified end use"* provide an effective sense check.

Tyrewise has also made provision for:

- Orphan and legacy tyres
- Research and development programmes
- Market development
- Consumer/industry education

There would need to be some controls around acceptance of legacy or orphan tyres, with a maximum of five tyres being accepted at a registered collection point at one time from one person or entity. Large scale collections or clean ups would need to be managed and funded separately, most likely in collaboration with local councils and landowners.

Some of the original Tyrewise Working Group supported education programmes around extending tyre life with the aim of reducing waste generation. It was agreed that funding for education programmes around tyre life and tyre pressures would be a lower priority than funding for legacy/orphan tyres and research and development activities. All participants noted that education and consumer awareness will be a key success factor and that education builds awareness and support. Funding for a comprehensive public/retailer education campaign is expected to be part of the initial programme budget.

In 2013, there was little awareness of the impact of microplastics on the environment from tyres. The impact and opportunity to reduce the impact is part of the circular economy of tyres. Impacts on extending the tyre life and the relationship with microplastics will need to be better understood. Refer to Section 14 for more on this.

Collection site payments are on a per tyre basis and vary by type/size of tyre. Transport payments would be payable predominantly by weight but with flexibility to make payment on the most appropriate basis for that transaction.

Rates of payment and incentive payments would be reviewed at least annually to ensure short term and long-term outcomes are being met. For more detail about how the weightings for incentive payments has been reached and how new processes entering the market will be incorporated see Section 30.

## 27.2 How the ADF is calculated

A **dynamic financial model** has been built that factors in all costs to effectively capture ELTs from their point of drop off (including orphan/legacy), pay for their delivery to processors, track volume through to processing and end use manufacturers.

It covers all administration responsibilities, provision for behaviour change campaigns, allocation of research/development and market stimulation funding to correct the market failure situation.

Also factored into the financial model are input criteria such as:

- Mass balance data – what enters the country and what is recovered now
- The processing value hierarchy available now and the future desired state such as infrastructure that exists now and what would be required as the programme matures over a ten-year timeline
- Circular economy system drivers
- Results of consultation on longevity of the ADF (reducing as result of operational efficiencies)
- The extent of the legacy problem to manage particularly in the first three years from programme implementation
- Market failure to be corrected (i.e. push/pull model or not)
- Involvement of brand owners in stewardship of ELTs
- Involvement of the ELT supply chain in stewardship of ELTs, inclusive of consumers

The financial model is dynamic meaning that it has been built such that changes to any of the input criteria models over a ten-year timeline (three years of implementation and seven years for the initial product stewardship accreditation period).

## 27.3 The ADF value

At the time of completing this report and making some assumptions for inclusions in the financial model where firm industry data has not been made available, Tyrewise proposes to charge an ADF of $5.50 per EPU (excluding GST) to the Brand Owner First Importer.

### Reducing ADF quantum

The ADF would be expected to reduce in the second ten-year period as the markets for tyre derived products develop and the need for supply chain payments decrease. This will be a matter for the Tyrewise Governance Board and will be based on past impact and future desired impact of the ADF.

### Brand owner stewardship contribution beyond the ADF

The consumer will likely bear the whole cost of the ADF for the tyres they purchased. There is no material evidence internationally that the ADF has been rebated or absorbed by the distributor as part of any sales campaign.

While the ADF is paid by the consumer and collected at retail, the importers of tyres share their stewardship responsibility by paying for their own administration costs to declare and make payment of the ADF, providing services to the PSO and its groups/technical committees and promoting the programme through their distribution networks to assist with consumer behaviour change.

They recognise that they have a role in shifting the waste disposal burden from local authorities to the consumer and users of their products and that payment of the ADF is not the end of their stewardship responsibilities. This includes investing in R&D to reduce the impact of microplastics from wear and tear of the tyres on roadways and fuel efficient tyres that contribute to reduction in global carbon emissions.

## 27.4 How the ADF will be applied

Consistent amongst ELT product stewardship programmes researched, the ADF is payable on **all loose tyres and all tyres fitted to vehicles**, either manufactured (does not apply in New Zealand) or imported.

The ADF will apply across all vehicle users and type of pneumatic tyres. It will be fairly applied to all consumers of tyres and will be transparently declared. This addresses a current market failure where disposal or environmental fee charges are ad hoc and may not be used for the intended purpose of paying for the management of the ELT.

Tyres that are imported "loose" as part of a vehicle import such as spare tyres are also included. It follows that they will need to be stewarded at end of life which may be on import (if non-regulation) or on use.

The cost to recover (collect/transport/process) an ELT is the same whether it had entered New Zealand as a new or used tyre. Therefore, a pragmatic approach was taken with the application of the ADF, irrespective of whether it was a new or used tyre.

- This does not consider circular economy drivers which would look at the wasted "energy" in the original tyre production when non-regulation tyres are imported into New Zealand as spares or on used vehicles.

### Retreaded tyres

- Any tyres imported that are classified as "retreads" would have an ADF applied to them
- Any tyres "retreaded" in New Zealand have already had an ADF applied to them at the initial import therefore would not have an additional charge applied

### Casings

- Casings that are imported for retread operations

### Transparent application of the ADF through the supply chain to the consumer

The ADF payment will be passed from the importer, as a separate transaction in the wholesale price of tyres, to the distributor/reseller, and on to the consumer where it will be transparently displayed. Likewise, on imported vehicles, it will be included in the vehicle registration costs for tyres fitted to vehicles and paid for by the consumer.

The Tyrewise Working Group submitted that the ADF be transparently disclosed in each part of the sales transaction throughout the supply chain to the eventual consumer (whether loose or fitted to a vehicle), using the product regulation tools under the WMA alongside declaration of ELTs as priority product.

### The ADF cannot be altered by the supply chain

Compliance with this transparent disclosure will be monitored by Tyrewise and action taken as allowed by the enforcement agency (likely a government agency) within the "Regulated Accredited Product Stewardship Programme Guidelines" for a priority product (publishing of these guidelines by MfE is pending as at 31 December 2019).

An example here is shown for the Resene PaintWise programme where the PaintWise ADF is transparently disclosed on the customers receipt separate to the purchase of the paint product.

Resene Paints Ltd.

Tax Invoice (incl GST) GST # 11-251-293

Operator:Sarah Tr# 2194287
Branch: Hastings Date: 16/12/13
Phone: 06 878 4070 Time: 08:36
Fax: 06 878 7456 Till 2

Customer No.EC413R
Name: 3R - STAFF (Cash Account)
Address: STAFF A/C ONLY
MUST SHOW PROOF OF WORKING F
**********
Order No. duncan

Cash Sale

| Code | Qty | RRP | Disc % | Extn |
|---|---|---|---|---|
| 1480104 | 1 | 136.50 | 27.75 | 98.62 |
| 4 lt Lustacryl White Colour | | | | |
| PW | 8 | 0.15 | 0.00 | 1.20 |
| Paintwise Advance Disposal Levy | | | | |
| FH | | | | |
| alabaster | | | | |
| 6230104 | 1 | 126.50 | | 126.50 |
| 4 lt Decorator Low Sheen Colour | | | | |
| FH | | | | |
| fossil | | | | |

Total incl GST $ 29.52
RESENE PAINTS - HAST
HASTINGS
NEW ZEALAND
*----------EFTPOS----------*
TERM 391821000002
TIME 16DEC 08:37
TRAN 005865 CREDIT
THOROUGHBRED
CARD .....7073
RID A000000003
PIX 1010
TC 3BF73F97B044F9FE
AUTH 096565
PURCHASE NZ$226.32
TOTAL NZ$226.32
(00) ACCEPTED
*-------------------------*
V-Visa 226.32

Please retain as Proof of Purchase

Receipt must be presented for returns

All goods are sold subject to Resene's Terms of Trade, full copies of which are available from any Resene Outlet.

Thank you for shopping at Resene

**FIGURE 19**
Example of transparently disclosing an ADF in this case, Resene Paints Limited paint and packaging recycling levy

## 27.5 Who will collect the ADF?

The ADF will be charged on all tyres entering New Zealand through a system known as the BOFI model – Brand Owner First Importer. It will be charged by Tyrewise.

The following assumption has been made for collection of the ADF:

- *That evidence of a tyre importers participation in an MfE accredited regulated product stewardship programme for end of life tyres is required under the WMA.*

Tyrewise will require all tyre and vehicle importers to register with the programme and that terms of the participation in the stewardship programme is underpinned by a Service Level Agreement outlining the commercial arrangements between parties.

**The ADF is payable on:**

- Loose tyres at the first point of import
- Tyres fitted to vehicles at first point of registration

The structure used for the collection of New Zealand's Synthetic Greenhouse Gas Levy is used as a precedent for NZ Customs Service and NZ Transport Agency to be involved in notification and/or collection of the ADF.

**New Zealand's Synthetic Greenhouse Gas Levy**

**Purpose of the Levy**

A levy is used to set an emissions price for synthetic greenhouse gases (SGGs) in imported goods and vehicles rather than having an obligation under the NZ ETS. Using a levy decreases administration and compliance costs and increases the certainty of the emissions cost for businesses importing goods containing SGGs.

**How the Levy is set**

The SGG Levy is based on the amount of SGG contained in an item, the global warming potential of the SGG, and the average price of emission units surrendered in the NZ ETS. A range of goods are listed in Schedule 2 of the Climate Change (Synthetic Greenhouse Gas Levies) Regulations 2013 [New Zealand Legislation website], differentiated by type and quantity of the SGG it contains. The Levy rates are updated every year to align with the prevailing market price for emission units in the NZ ETS.

**Paying the Levy**

The person who registers a leviable motor vehicle is responsible for paying the Levy to the **New Zealand Transport Agency**. The Levy on motor vehicles applies when a motor vehicle is first registered for on-road use in New Zealand.

The Levy on all other goods that contain HFCs and PFCs applies at the point of import and is collected by the **New Zealand Customs Service** from the person who imports the goods.

In 2017, the number of people who failed to comply with the payment of the SGS Levy was nil. (Ref Environmental Protection Agency, 2017-Synthetic-Greenhouse-Gas-Levy-Report)

### 27.5.1 Loose tyres collected at the first point of import notification I NZ Customs Service

1. Tyrewise will receive a transaction notification from the NZ Customs Service advising of an import transaction containing tyres in scope.
2. Tyrewise will confirm status of brand owner's registration with the programme with NZ Customs Service
    a. If not registered, NZ Customs Service will request evidence of programme registration before release of the import
3. Tyrewise will either match the NZ Customs Service import notification with the brand owner quarterly declaration or will generate a user invoice at the time of notification. Commercial arrangements with brand owners who import frequently may differ from occasional importers.

## BOX 6 Data and NZ Customs

a) If the ADF data record cannot be provided by NZ Customs at the point of import then a process has been designed to identify new tyre importer where the flow of information comes to the programme manager in order to identify new importers and raise an invoice for the ADF.

b) There are some imports which are not covered by NZ Customs Service either their import codes are mis-reported, or they fall outside the NZ Customs Declaration services. It is accepted that while participation in a programme will regulated (assumption above) there will be a small number of transactions that will need to be investigated for compliance with the regulation.

### 27.5.2 Tyres fitted to vehicles charged at first point of registration for use on roads I NZ Transport Agency

On-road costs typically include vehicle registration, Warrant of Fitness (WoF), and Road User Charges (RUC) for diesel vehicles. If a vehicle contains a Synthetic Greenhouse Gas in its air conditioning system, payment of the SGG Levy is also required.

The ADF will become part of the initial new vehicle registration "on road" costs in the same way that the SGS Levy is handled.

Tyrewise will work with NZTA and the Ministry for the Environment (Government Agency) to add the ADF calculation to the on-road costs motor vehicle registration process, and alongside that a mechanism for the collected funds are remitted eventually to the PSO.

It is proposed that the system is configured so that the applicant does not need to make any additional calculation for the ADF payable as this will be loaded by category of vehicle being registered – making the system easy to use with the least barriers for payment possible. Payment is proposed to be applied by NZTA in the same way that the SGS category is declared by the applicant.

[22]

## Synthetic greenhouse gas levy

Owners of passenger vehicles and goods vehicles that contain a synthetic greenhouse gas (SGG) in the air conditioning unit are required to pay a synthetic greenhouse levy when their vehicle is registered.

The SGG levies include GST and may be subject to rounding. Note that the levy will be increased from 1 January 2020.

| Passenger car/van | Levy | Levy from 1 Jan 2020 |
|---|---|---|
| Small passenger vehicle (cars and vans with no more than nine seating positions including the driver) | $19.62 | $24.22 |
| Medium bus (passenger vehicle with more than nine seating positions including the driver with a gross vehicle mass five tonne or less) | $26.15 | $32.28 |
| Large bus (passenger vehicle with more than nine seating positions including the driver with a gross vehicle mass over five tonne) | $130.77 | $161.43 |

| Goods vehicles | Levy | Levy from 1 Jan 2020 |
|---|---|---|
| Small goods vehicles (vehicles constructed primarily for the carriage goods with a gross vehicle mass 3500kg or less) | $19.62 | $24.22 |
| Large goods vehicles (vehicles constructed primarily for the carriage of goods with a gross vehicle mass over 3500kg) | $26.15 | $32.28 |

**FIGURE 20**
Screenshot of the SGG levy calculator found on the NZTA website February 2020

If there is more than one MfE accredited regulated product stewardship programmes for ELTs, work will need to be undertaken by the PSO's to determine how the fees collected are redeemed for stewardship purposes.

As the number of vehicle importers remains and the use of **NZTA Approved Entry Certifiers** who typically certify the bulk of imported motor vehicles is relatively low in terms of transaction numbers, the same programme registration process would apply.

### 27.5.3 Tyres fitted to vehicles charged at first point of registration for **off road use only**

As these vehicles are not typically registered for road use, for example tractors, they will be captured via customs using the existing declaration process for vehicle imports. Should they be registered for road use at some point in the future, the registrant will be able to claim a rebate for the ADF using evidence from NZTA.

[22] SOURCE https://www.nzta.govt.nz/vehicles/licensing-rego/vehicle-fees/registration-fees/.

## 27.6 Who receives the ADF?

The ADF is remitted to the PSO via the use of the financial management provider (a black box function where confidential data is secure).

## 27.7 What will the ADF be used for?

The ADF is used to:

- encourage manufacturers to make new products using ELT derived crumb; and
- pay an incentive for processing of ELTs; and
- fund the collection and transport of ELTs

The sum of the ADF collected annually funds the whole of costs of the programme with no additional payments from government or consumers.

Funding categories (in alphabetical order) are:

- **Administration:** The management of Tyrewise administration functions to run the programme including electronic records and payments systems, registration of participants and ensuring that the NZ ELT value chain has access to international best practice and shared learning. Primarily, this is about shifting the burden of costs and action from local government to Tyrewise with KPIs in place over a ten-year period.
- **Audit and compliance:** Providing evidence of activity against the "Accredited Product Stewardship Programme Guidelines for a Regulated Programme"; ensuring that registered participants are meeting their service agreement terms; working with regulators for expedited non-compliance complaints such as non-payment of the ADF after import.
- **Collection Sites:** The registered collection site is paid a monthly/quarterly service fee for acting as a public collection site to offset the costs incurred in handling and storage of used tyres once they are removed from a vehicle (by others). Sites would be selected regionally to ensure that there is a nationwide aggregation/collection network. There is no charge for collection of tyres from a registered collection site.
    - Depending on volume, large volumes of legacy tyres will not be accepted at collection sites for at least the first 12 months of operation. This is to ensure the programme can build funds and/or secure further funding to be able to run a national amnesty. The national amnesty, when undertaken, will be run on a regional basis.
- **Processing and end user/manufacturer payments** (see separate section below)
- **Legacy tyres:** "Stockpiled tyres with an owner/responsible person." Funding for ELTs that are still owned by a person or business that no longer require the tyres for the purpose they were intended for but for which they are unable to finance their removal (application to this fund will need to meet strict criteria including what remedial action has already taken place and/or pursued by the courts).
- **Market Investment Grants:** To help create demand for the use of tyre derived products (TDPs) in a variety of end use applications.
- **Orphan tyres:** "Tyres with no Owner." Funding for ELTs that are dumped on public or private property. Managed on a regional basis in conjunction with local government etc. – dependent upon robustness of collection network in area.

- **Regional fund for transport in remote locations:** A discretionary fund to enable ELTs from remote locations to be collected and delivered to registered processors, recognising that there are additional costs to service outlying regions.
    - Payable to registered participants on application and fulfilment of appropriate criteria. An example of which could be funding to invest in equipment to minimise the size of OTR tyres to create transport efficiency from remote locations such as the West Coast of the South Island, including consumer/industry education. The initial programme budget will have funding for a comprehensive public/retailer behaviour change education campaign.
- **Research and development:** A "by application" fund designed to facilitate research and development into ELT processing and end use market development – this may include, but not be limited to, investigating OTR collection and processing.
- **Transporter payments** – a rate paid by Tyrewise (or charged by the transporter) for transporting ELTs from a registered collection site/participant to point of drop off to a registered participant. Registered transporters pick up tyres from registered participants for no charge, enabling the free and easy entrance of these tyres into the value-added recovery pathway.

  Standard commercial business practice terms and conditions apply and could be negotiated per:
    - Km
    - Tonne
    - EPU
    - Activity/route

  The rate will take into account proximity to registered processors and demand/capacity for ELT processing. Depending upon the commercial arrangements in place, the transport rate could be paid by Tyrewise to the registered transporter, or by Tyrewise to the registered processor but will only be paid upon evidence of delivery to the registered processor.

## 27.8 Opportunity for operational efficiencies

A function of the PSO is to investigate and implement ways the quantum of the ADF can be reduced as market failures "correct" in the medium to long term (seven to ten years from implementation).

One of these will be to adopt incremental changes in operational efficiencies that ensure the programme is delivered to meet the mission of "Improving the value for end of life tyres **in cost effective and environmentally sound ways**".

Getting the most value from the resources available and eliminating waste across all operational functions is paramount if a reduction in the quantum of the ADF is to be achieved over the medium to long-term.

### BOX 7 Motor Industry Association view on reducing levy

MIA have expressed concern as that this report does not address how the level of the ADF might change over time and what it would need for there to be no ADF. In their view, a key principle for the waste disposal scheme of tyres is that over time the fee is no longer needed as markets develop for the product streams that flow from the recycling effort. This is addressed in Box 8

# 28. Operational Payments

## 28.1 Public ELT drop off point

Providing easily accessible and monitored places for the public to drop off their ELTs for free is one of the mechanisms to combat illegal dumping of tyres.

Tyrewise will have a network of public drop off points we call registered collection sites, the services provided by the registered collection site will be covered by a service level agreement which will include (and not limited to) compliance with any regulations regarding the storage of tyres and agreement to use the Tyrewise electronic reporting system to track in/out movements so that payments can be made to the registered collection site and the registered transporter who collects the ELTs.

In the implementation year, 200 registered collection sites will be established working closely with transporters and processors in the region as well as the regional landfill owners to ensure full diversion from landfill is possible. Sites would be selected regionally to ensure that there is a nationwide aggregation / collection network.

A range of entities have already registered their interest in acting as a public collection site – from community groups, resource recovery parks, rural schools, small garages and waste management companies. In some regions, landfill owners may also operate as paid collection sites if no other facilities are available in their region.

*Note:* Depending on volume, large volumes of legacy tyres will not be accepted at collection sites for at least the first 12 months of operation. This is to ensure the programme can build funds and/or secure further funding to be able to run a national amnesty. The national amnesty, when undertaken, will be run on a regional basis.

### Predicted activity

Of the 6.3 Million ELTs available for collection annually, it is estimated that 6.2 Million ELTs will be delivered directly to processors; 90% from registered generators and 10% or 626,000 of them will be collected from registered collection sites. The balance, being off road tyres, will have bespoke management and pre-processing before arrangements made with appropriate processors.

### Registered collection site payment to cover handling costs

- Per ELT collected per cycle [2019 Financial Model] $1 per ELT
- Administration fee payment – in the range of 2 ½ hours per month for e-filing of records

### Site volume capacity / service fee banding

Collection sites will be sized by ELT collection opportunities available in the region, proximity to the public, site footprint and the ability for the host to meet regulatory compliance requirements such as proximity to fire fighting equipment, hard stand area, location to buildings etc.

A model has been used showing four activity bands with corresponding ELTs to be dropped off per month based on 10% of the total ELT bank.

1. Low (1 – 100 ELTs)
2. Medium (101 – 250 ELTs)
3. Medium-high (251 – 500 ELTs)
4. High (500 + ELTs)

**TABLE 16** Collection site service band quantities and fees – potential earnings per site / PSO spend on sites per annum

| Activity | Service Fee Band ELTs /month | Av ELTs / month | No. of sites NZ | ELTs per band/month | Service fee per site | Fee/ month | Fee per annum per Site |
|---|---|---|---|---|---|---|---|
| **low** | 1 – 100 | 100 | 100 | 120 | $12,000 | $100 | $12,000 |
| **med** | 101 – 250 | 250 | 250 | 30 | $7,500 | $250 | $7,500 |
| **med-high** | 251 – 500 | 500 | 500 | 20 | $10,000 | $500 | $10,000 |
| **high** | 500+ | 1000 | 1000 | 23 | $23,000 | $1,000 | $23,000 |
| | | | **200** | **52,500** | | **$ 43,750** | **$630,000** |
| | | | | **630,000** | | | |
| | | | | **ELTs per annum** | | | |

## BOX 8 Flexible payments modelling that reflects market changes

It is expected that after the first three years of Tyrewise bedding in, confidence in the payments and incentive process will have been gained and a commercial demand/supply market should be establishing if not in place.

This **could** result in the removal of the payment for transporters and processors, and if payment is still necessary, they could be solely placed with registered manufacturer/end users, this model is referred to as the "pull" model.

The registered manufacturer/end user would be paid an incentive for using TDPs in their manufactured products. They then engage directly with registered processors and pay them for their products at market rates.

The registered processor engages directly with registered transporters whom they pay for their services at commercial rates.

**If this stage is reached**, the incentive would be paid once the manufacturer/end user has provided sales evidence of the products that include TDPs.

The exception to this may be an enduring equalising payment to ensure ELTs distant from processing capability are not marginalised from inclusion in end use options.

## 28.2 For transporting ELTs

As would be expected, paying for the pickup/transport/logistics of ELTs uses a substantial apportionment of the ADF.

A mix of both large and small transport operators will be required.

In a country that is long and skinny, with an expensive piece of water in between its two islands, and with largely centralised processing, small business operators may be able to offer exceptional efficiency in order to compete with larger companies with greater economies of scale and bargaining power.

Efficient routing and delivery scheduling nationwide will generate efficiencies for collecting ELTs from generators and collection sites nationwide, or by region or in a specific district. Commercial tenders for transport/logistic services will ensure that the matrix of transport/logistic operators can deliver this for the programme. A transport model has been built to calculate distance from regions to closest processor to guide a calculation of revenue needed to transport ELTs from collection sites and generators to processors.

For the purposes of calculating the ADF an **average transport rate per tonne** has been used and is correct only as at the date of publishing this report. The parameters of the model have been informed by consultation with those who already transport tyres to include what current rates are and what differences between those and sustainable transport models, and with experienced logistics operators.

At time of launch of the scheme, the Programme Manager will work with the Road Transport Association or similar agencies to publish a fair and transparent schedule of rates per km which will be reviewed annually and published on the Tyrewise website.

- These are also intended as a **guide only** when negotiating commercial agreements as for the scheme to set rates would be a **breach of the Commerce Commission Act**.

| TABLE 17 Data set used to inform financial model (guide only) | |
|---|---|
| 1 tonne = | 120 ELTs |
| Av. Rate per Tonne On Road tyres | $161 ex GST |
| Av. Rate per Tonne Off Road tyres | $323 ex GST |
| Remote area / difficulty payment per tonne | $85 ex GST |

**GUIDE 5** Below is an example of Tire Stewardship BC Transportation Rates (Snapshot published 01/022020) Using conversion rate of $1 Canadian = $1.190 NZD – comparable to a NZ Example

| Distance range in Km's | Rate: CAN$ | Rate: NZD |
|---|---|---|
| 0-30 | $3.787 | $ 3.182 |
| 31-75 | $ 2.644 | $ 2.222 |
| 76-125 | $1.750 | $ 1.471 |
| 126-200 | $1.272 | $ 1.069 |
| 201-300 | $0.622 | $ 0.523 |
| 301-400 | $0.496 | $ 0.417 |
| 401-500 | $0.438 | $ 0.368 |

## 28.3 Processing & end use / manufacturer payments [*proposed*]

### Payment of services

To address the market failure, application of service payments throughout the supply chain has been scaled from implementation phase through to business as usual where it is expected market failure would be well on the way to being addressed (referred to as the "pull" model).

Payment for services to collection sites, transporters and processors reverses the current situation where generators of ELTs (i.e. tyre retailers and automotive garages) and collection sites (i.e. recycling transfer stations, community recycling networks and some landfill operators) have to pay a transport operator to remove their tyres, and the transport operator in most cases must pay the processor to take them off their hands because there is a lack of value (and current demand) for Tyre Derived Products (TDPs).

### How are payment amounts determined?

Since the socialisation of payments as part of the work undertaken by the working group during the project phase, significant investment in end use processing is pending.

Based on industry surveys undertaken in November 2019, in the North Island and South Island two large-scale New Zealand companies are poised to invest millions of dollars into new plant, subject to entering agreements with the proposed programme that enables supply of tyres and payments made to help underpin their investment and offset risk in the initial years. In both of these cases large volumes of ELTs would be used in manufacturing and processing, with the establishment of the plant proposed in the South Island there is also a reduction in the environmental and economic cost of transporting ELTs long distances to alternative processors.

Payments are established by creating a weighting against the hierarchy of uses of ELTs refer Section 30.

This weighting (or value calculation) results in a financial calculation that will be regularly assessed by the PSO and the Tyrewise Programme Manager to ensure that any innovation is captured and rewarded. An example of the procedure to review innovation is included in Appendix F.

## 28.4 Tyre Derived Products

### A guide to processor and end market/manufacturer payments

A review of international incentive payments and information provided by the New Zealand processors/end users through a confidential survey process has enable an initial incentive payment structure to be put in place for the purposes of consultation for Tyrewise 2.0.

Any forecast surplus is incorporated in the funding allocation until all costs are known.

### BOX 9 Incentive payment disclaimer

These unit incentive payments will be settled during the implementation phase as they are subject to normal market conditions and variations relating to demand and supply. Publishing the full range of inventive payments will be done using normal commercial practice including lead times for notification of changes.

This table should be used as a **guide** only.

**BOX 10** The reader should recognise that there is a **relationship** between:

- Processing capacity available in New Zealand or the near term relative to the date of launch of the product stewardship programme (demand and supply)
- Market conditions including impact of price per tonne available internationally
- The intention of the stewardship programme to incentivise outcomes for material up the value hierarchy

The schedule of incentive payments will be revised as the market matures and is a core function of the technical advisory groups within the PSO.

### Carbon Black and Fuel Oils

An example of this is Carbon Black and Fuel Oils as result of TDF. There is no verified commercial rate for these products in the NZ market. It is a dis-incentive to "pin prices" to the international commodity market due to market volatility in 2020. Therefore, these markets will initially be funded from pool funding (TDP4) to stimulate this market as the NZ demand curve rises.

**GUIDE 6** Guide to end market payments per product type

| | Code | Description | Av. Processing / end user payment / tonne Ex GST |
|---|---|---|---|
| Processed from Feedstock: Varying sized crumb as end use functional product or raw material for secondary process e.g. Mulch, Landfill Engineering, Equestrian Arenas, Civil engineering | TDP1 | Rubber Powder (mesh size 30, 0 micron - 0.9mm). Total NZ roading market is 2000T/yr | $390 |
| | TDP2 | Rubber Granulate (mesh size 1-29mm) Uncoloured | $365 |
| | TDP3 | Rubber Chip (30-299mm mesh size XX) | $85 |
| | TDP4 | End use / Fabricated products (use 75% by weight of TDP 1- 3) | $160 upwards *(incentive per application)* |
| Feedstock / Tyre Derived Aggregate | TDF1 | Primary Shred for further use in a destructive process or secondary process: Tyre derived fuel or Pyrolysis. Cut tyres or portions 300mm+ | $365 |
| | TDF1e | Primary Shred exported to verified market | $150 |
| | TDF2 | Whole Tyres for Energy Recovery | $70 |
| | TDP6 | Whole Tyres- Civil Engineering (Baled - Retaining Walls, Temporary Roads, Sea Embankments, Blasting mats) | $165 |

## 28.5 Only registered participants can receive payments

Payments will only be made to registered participants if there are supporting electronic manifests from the process upstream in the supply chain. These manifests will be audited by the Programme Manager to ensure they match.

An example of how the incentive payment structure **may** work;

- A **registered collection site** cannot be paid unless a registered transporter has collected the ELTs and supporting e-information has been uploaded by the registered transporter.
- A **registered transporter** cannot be paid unless the ELTs have been delivered to a registered processor or registered manufacturer/end user and supporting e-information has been provided by the registered processor or registered manufacturer/end user.
- A **registered processor** cannot be paid unless the ELTs have been processed and sold/supplied to a registered manufacturer/end user and supporting e-information has been provided by the registered manufacturer/end user.
- A **registered manufacturer/end user** cannot be paid the incentive unless they provide details of the sale of the products they have manufactured using TDPs and the volume of ELT derived product used in these goods.

An entity can operate in an individual area e.g. as a registered transporter and be eligible for a single payment or can operate across a range of services e.g. transport and processing and be eligible for payments at each part of the supply chain.

There may be other payments made between entities within the ELT supply chain e.g. processors and transporters.

These payments are individual agreements that those within the supply chain may make but are not covered by the ELT Product Stewardship Scheme.

Tyrewise will require registered participants to report using e-manifests. It is important that any of the interactions between those involved in the ELT supply chain follow a set of robust reporting requirements. This helps ensure that if payments are to be paid that they are accurate and that the entire process can be audited and reported on.

# 29. Weighting methodologies

## Payments to support a “pull/push” market

The purpose of payments from the ADF is to support and generate demand for products created from ELTs by Manufacturers / End Users for both existing and new activities as well as a replacement for currently used raw materials.

The Tyrewise Programme uses weighted payments throughout the supply chain as one mechanism to encourage investment by the market to resolve the market failures and to increase the value of ELT products up the waste hierarchy.

Payments for services and investment funds are levers that the PSO can use to stimulate the ELT market.

# 30. Hierarchy of uses I Weighted value for payments (future market)

For Tyrewise 1.0 a set of core questions was been developed for environmental and economic factors and the social aspects are woven into the commentary that follows them. A score is given to each of the potential uses against the waste hierarchy and the questions asked of the applicant to assist the PSO to arrive at a weighted value for that use. This is shown below.

**TABLE 18** Hierarchy of Uses by processes, possible in NZ

| Alternative Processes for ELTs | Products within each process | Questions: Environmental Factors | | | | | Questions: Economic Factors | | | | | | Social Rating | Waste Hierarchy | Total Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Are there limitations on the types of tyres that can be processed? (Can all tyre types and/or different tyre conditions eg weathered be processed or are there restrictions) | Will the process fulfill all the International, National and Local legislative requirements? Examples to fulfill are The Commerce Act, Basel Convention, Local Government bylaws, Resource Management Act, Health and Safety in Employment Act. | Will the process create a reduction in the use and/or import of virgin materials or products in New Zealand? | Does the process completely recycle all materials derived from the ELT? | Will (or does) the process create any environmental hazards and/or emissions whilst being undertaken? | Is there potential market demand for the end use product in New Zealand? | Is the market for the end use product viable and expected to continue in the long term? | Is the ELT market large enough to sustain the process? | Is the process self funded? I.e. revenue generated from the end use market covers the cost of procuring the ELT. | Could the processing improve existing infrastructure? Examples could be reduced transport costs, infrastructure aesthetics or amenities | Will the processing be able to be located in a geographic location that is close to a significant volume of the ELTs? | | | |
| Further use - Crumb as an additive in a product | Moulded Products, Adhesives, Artificial Turf (Sports Grounds), Sporting Arenas, Rubber Asphalt, Concrete | 5 | 4 | 5 | 3 | 3 | 5 | 5 | 5 | 2 | 4 | 5 | 7 | 20 | 73 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ambient and Cryogenic material recovery | Varying sized crumbs with either an ambient or cryogenic finish. | 5 | 3 | 5 | 4 | 4 | 5 | 5 | 5 | 2 | 3 | 3 | 6 | 20 | 70 |
| Whole Tyres | Export of used tyres for reuse, Retread, Civil Engineering (Baled - Retaining Walls, Temporary Roads, Sea Embankments), Farms | 2 | 3 | 2 | 4 | 4 | 2 | 3 | 4 | 3 | 2 | 4 | 4 | 30 | 67 |
| Further use - Crumb as an end-use functional product | Mulch, Gardens, Landfill Engineering, Equestrian Arenas, Civil Engineering | 5 | 3 | 3 | 3 | 5 | 3 | 3 | 5 | 2 | 1 | 5 | 4 | 20 | 62 |
| Further use – Crumb in a destructive process | TDF (Cement Works, Pulp and Paper, Power Generation, Industrial Boilers, Tyre Manufacture), Mining, Carbon and Steel Recycling (Foundries, Steel Works) | 5 | 3 | 5 | 5 | 2 | 5 | 5 | 5 | 2 | 4 | 5 | 6 | 10 | 62 |
| Further use - Crumb in a secondary process | Pyrolysis (Oil, Char - Carbon Black, Energy, Blended Diesel Fuel) | 5 | 3 | 2 | 3 | 2 | 2 | 3 | 5 | 2 | 3 | 5 | 6 | 20 | 61 |

## BOX 11 Purpose of the hierarchy and its relationship to market conditions

During consultation with industry in 2019 and 2020, it was clear that as market conditions have changed since Tyrewise 1.0 essentially due to increased investment in processing, greater awareness of the potential of regulated product stewardship, and finally the purpose of the hierarchy to guide incentive payments, there is now significant debate and disagreement about whether the ranking should be weighted higher for economic factors and lower for environmental factors than it was during development of Tyrewise 1.0.

That is to say that the processing sector put forward that the hierarchy should recognise the market conditions and capacity now and not dis-incentivise what processing capacity we would have at launch as to do so may lead to perverse outcomes for existing operators.

The **reader should note** that the hierarchy of uses and ranking will be reviewed by the PSO prior to scheme launch utilizing the skills of the technical advisory groups, to review the rapidly changing pyrolysis market and any other new technology or end uses that have come to market in New Zealand.

The hierarchy and incentive payment rates will also be reviewed on annual basis once scheme is implemented. Both are tools used to correct market failure.

# 31. Advisory / technical committee input

The Tyrewise Working Group recognises that setting incentive payments is one area of the programme where immediately post launch a significant level of administrative and technical interaction between all parties will be required.

The high level of interaction is to ensure that the process of make payments meets the objectives of being clear, transparent, auditable and ultimately weighted towards end use and reflect a programme design which takes into account the New Zealand context and current market failures.

The proposed "push and pull" model has taken into account the working groups recommendation for potential payments to:

- Product Manufacturers/End Users using material from processed ELTs as a raw material
- Processors that transform the ELT into a raw material for further processing
- Transporters paid an incentive which takes into account the weight of ELTs carried (both whole ELTs or already part processed) and distance travelled.
- Collection points paid a monthly/quarterly service fee based on a sliding scale

Initially funding may be payable on a short-term basis to exporters of ELTs or TDPs who can verify that they have a Basel consent or other such evidence (as determined by the PSO), verifying the end use the ELTs or TDPs are going to. This however would be reviewed annually and if required, removed at the sole discretion of the PSO.

## 31.1 An auditable, transparent and inclusive process

The payment process needs to be simple, clear, transparent and auditable, economically viable and reviewed at least annually by the PSO and the programme manager. The PSO and their technical committee(s) will follow a procedure (example can be found in Appendix F) to undertake assessment of innovation of a new or existing ELT Processing Type or TDP end use. The procedures, scores, weighting and ranking will be published on www.tyrewise.co.nz.

As Tyrewise matures (from 7 years operation onwards) payments may not be paid on a per unit basis but could be used to fund research and development and create end use capacity.

The value of the amounts paid to processors and manufacturers will be determined by the type of product that they derive from the ELT. The PSO will consider the beneficial end use of the ELT as well as the weighting described previously.

There are 3 stages to establish (or review) the ranking.

### Stage one – establish the current capacity

The first stage is to determine which of the end use groupings were able to be undertaken in New Zealand (or are being undertaken). The questions that were applied during Tyrewise 1.0 development and 2019 were;

- Is there currently any processing in New Zealand to generate these types of products?
- Are the products derived from the process proven overseas?
- What is the minimum volume to be commercially viable?
- Does the technology exist in New Zealand to undertake the process?

- Does a market exist for the products derived from the process?
- What are the potential tonnes of ELT that could be utilised in this process?
- What would the investment be to implement the plant and/or equipment for this process?

### Stage two – Generate a score using a set of queries

The second stage is to establish a set of queries that were scored between 0 and 5.

- The final score for each query was decided by the Tyrewise Working Group for Tyrewise 1.0
- When the scores are added together this creates a ranking.
- There were 5 Environmental questions, 6 economic questions and a social summary with the highest possible score available in this section of 65.

### Stage three – Weight the score using the waste hierarchy

The third stage is to apply a weighting based on the Waste Hierarchy.

- The scores range from 40 for Waste Reduction to 0 for disposal.
- This weighting is then added to the score from the second stage which then provides an overall ranking.
- The PSO will be tasked with ensuring the hierarchy is reflective of industry developments and any scoring adjustments take place.

## BOX 12 Hierarchy scoring Tyrewise 1.0

The final score determined by the Tyrewise 1.0 working group was based on significant research undertaken by the Project Manager which included personal discussions with both National and International Processors of ELTs and research from both National and International literature. The international research included but was not limited to the World Business Council for Sustainable Development Managing End of Life Tyres full report and the Basel Convention Revised Technical Guidelines on the Environmentally Sound Management of Used Tyres.

# 32. Implementation Steps

- **Government Process**
- **Tyrewise Governance Group**
- **Readiness of industry**

This report has been prepared using funding from the Waste Minimisation Fund Round 2020, for the purpose of re-establishment of the Tyrewise Governance Group and establishing two advisory groups, to update mass balance data on tyre imports, recovery and recycling (updating Tyrewise 1.0), and hold consultation with the two advisory groups.

This work has been conducted to advise the Ministry for the Environment as to possible declaration of tyres as a priority product under the Waste Minimisation Act 2008.

## Government Process

Receive final report and request for accreditation of Tyrewise as a regulated product stewardship scheme.

All activities related to recommendation for tyres to be declared priority product and to fulfill requirements under the Waste Minimisation Act 2008 Part 2 which may include:

- Announcement of Tyres as priority product
- Independent consultation with industry (using this report to inform consultation)
- Recommending regulatory guidelines for stewardship of tyres as priority product
- Working with Government Agencies NZTA and NZ Customs on any changes to legislation to receive data and/or Advanced Disposal Fees and the management of those fees

## Tyrewise Governance Group

The trigger point for the Tyrewise Governance Group to legally form the PSO and appoint Directors to Tyrewise Limited comes when tyres are declared a priority product. Therefore, their next steps are:

- Decide whether the PSO will be a NFPT or an Incorporated Society (Deed)
- Appoint legal representation and lodge the Deed
- Appoint financial representation to establish financial independence
- Confirm trustees to the PSO based on industry representation and governance experience
- Appoint a Board and elect a Chairperson for the initial term recognising that during implementation the work load may be higher than BAU
- Nominate Directors of Tyrewise Limited and transfer ownership
- Project Manage implementation (appoint contractors)
- Have structure of scheme in place within 12 months of declaration of tyres as priority product

### Readiness of industry

Tyre and vehicle importers and those agencies represented on the Tyrewise Governance Group have been "ready" for tyres to be declared priority product since completion of the Tyrewise 1.0 stewardship scheme. They remain committed to regulated product stewardship and Tyrewise.

Throughout consultation, the collection, transport and processing sectors have increasingly engaged with product stewardship and have significantly enhanced the offering of Tyrewise as a regulated product stewardship solution.

Their role will be to ensure that they contribute to any public consultation undertaken by MfE as result of the declaration of tyres as a priority product with a view to continuing to ensure that we can extract economic growth from the use of end of life tyres and reduce poor environmental outcomes within a regulated structure.

Contact with these parties will be maintained through regular newsletters and updates on the Tyrewise Website so that communication channels are maintained and added to over the next phase.

"The urgency for our scheme to kick in is increasing by the day……"

"It's a no brainer…let's get this thing started "

# 33. References (guides, figures and tables)

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| 3. | Actions and responsibilities when considering product stewardship | 89 |
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| 6. | Guide to end market incentive payments per product type | 132 |
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# Appendices

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| A | Tyrewise Cost Benefit Analysis (Updated 2019)<br>*Detailed financials subject to commercial sensitivity and provided separately* |
| B | Projects relating to ELTs funded by the WMF between 2015 – 2019 |
| C | Sample Product Stewardship Organisation Draft Trust Deed<br>*Final entity to be put in place if tyres declared priority product.* |
| D | Sample Expression of Interest for Programme Management<br>*Final EOI to be reviewed and published during implementation phase* |
| E | A3: What Tyrewise means for me – information for participants |
| F | Tyrewise Procedure for review of innovation (draft) |
| G | Document control and sign off |

# Attachments

| | |
|---|---|
| 1 | World Business Council for Sustainable Development Global ELT Management Report<br>https://www.wbcsd.org/rhrg3 |
| 1 | Tyrewise submission – MfE Priority Product consultation 2019<br>Can be found on www.tyrewise.co.nz. Tyrewise-Consultation-on-Priority-Product-and-Product-Stewardship-Guidelines-for-Priority-Products-04-Oct-2019-Final.pdf |

# Appendix A

## Cost Benefit Analysis

*Updated Model 2019*

## 1. Analysis Approach

The cost benefit analysis presents a range of assumptions and estimates that underpin an analysis of the current status v industry led regulated product stewardship scheme for end of life tyres in New Zealand.

The CBA is an economic assessment tool that enables comparison of the status quo "do nothing" scenario with the impacts of Tyrewise which will address the environmental and resource waste issues currently observed relating to end of life tyres. Economic cost and benefits will be measured from the perspective of society, and for comparative purposes, where possible monetized and discounted to convert them to their net present value (NPV).

To do this the following key estimates and assumptions have been made:

| | Assumption Type | Base Case or Status Quo | Preferred Scenario |
|---|---|---|---|
| General | Base year for data collection | 2019/20 | 2019/20 |
| | Evaluation period | 10 years | 10 years |
| | Discount Rate | 1.69% | 1.69% |
| Projections (Per annum) | Quantities of ELTs generated | 96,000 increasing by 2% annually | 96,000 increasing by 2% annually |
| | Recycling Rates | 30,720 tonnes/yr<br>32% | 72,559 tonnes/yr<br>95% (Year 5) |
| | Land filling/Export: | 52,561 tonnes | 3,000 tonnes |
| | Illegal Dumping. | 3,000 tonnes | 0 tonnes |
| | Tyre Fires | 4 fires per year | 3 fires per year |
| | Retailer Fee | $25 million | |
| | Tyrewise Advance Disposal Fee | | $54 million (Yr1) to $60.3 million (Yr10) |
| Cost Assumptions (over 10 years of CBA Analysis) | Government Costs | $0 | $6.3 million |
| | Business Cost (compliance + capital investment) | $97.4 million | $54.5 million |
| | Illegal Dumping (orphan tyres) | $15.9 million | $15.9 million (avoided) |
| | Tyre Fires | $11.8 million | See benefit assumption |
| | Landfill stability leachate issues | Not quantified | Not quantified |

| | | | |
|---|---|---|---|
| | Public Health (mosquito borne disease) | Not quantified | Not quantified |
| | Market value of resources | TDF NCV in NZ | $82 million |
| | New industry and employment | $0 | $326.7 million |
| Benefit Assumptions (over 10 years of CBA Analysis) | Benefits of tyre derived fuel | $14.4 million | $113.6 million |
| | Benefits of rubber asphalt | $0<br>Rubber roads not in use | $2.9 million<br>Further benefits tbc by new project potential |
| | Avoided costs illegal dumping | n/a | $16 million |
| | Avoided costs tyre fires | n/a | $3.25 million |
| | Avoided landfills operating cost | n/a | $24 million |
| | Avoided cost public health liability – legacy tyres | n/a | Not quantified |
| | Avoided cost to NZ's brand, tourism and export industries | n/a | |
| | | -$43.3 million | $34.5 million |

# 2. Options Reviewed

## 2.1 Base Case. Do nothing – current scenario

The base case "do nothing" scenario which is covered in Part A of this report.

The key considerations from the base case scenario are:

6.2 million tyres are now imported into New Zealand annually. These include tyres for motorbike, passenger, light and medium commercials, truck, bus, off road, and aircraft.

The used of tyre derived fuel (TDF) in New Zealand is in its infancy, and currently has no commercial value and in some cases is sold at a net loss offshore.

There is also no history of rubberized roading, although New Zealand processors are exporting rubber powder to Australia and other markets for this end use. Some trials have been undertaken for cycleways, but these have not progressed to commercial viability phase, and unless procurement levers are pulled by Government, won't progress.

The most significant change with sector participants since Tyrewise 1.0 and this report is increasingly ELTs are seen as a wasted resource as opposed to "a waste issue".

## 2.2 Regulated Product Stewardship for End of Life Tyres

This scenario is presented in Part B of this report.

During consultation, variations on the industry preferred model were put forward. Following conversations and presentations, by the completion of consultation, there was consensus for one model for regulation of the industry product stewardship solution for end of life tyres to be progressed.

Tyrewise is the accredited stewardship programme for End of Life Tyres (ELTs) in New Zealand. It is an industry led and government supported via the priority product provisions of the Waste Minimisation Act 2008. Stakeholders include key industry participants, government and public/consumer groups.

The preferred scenario assumes that the regulatory powers under the Waste Minimisation Act, relating to "setting of fee" for management of a product and "class of person or persons" who must pay the fee will be sufficient to allow/require Customs and NZTA to collect the fee and or data in the proposed manner.

The CBA assumes that with the regulated structure in place as proposed, the industry has been able to manage the long term environmental, economic and social impacts of ELTs whilst minimising the cost to stakeholders.

Key to the CBA is:

- The recovery rate moves from 90 - 95% of assessed volume available for recycling within 5 years. The aim is to achieve an effective 100% recovery rate to beneficial use within 10 years. This recognises that whole tyres that are not end of life yet are not available for recovery – such as tyres used for silage pits and covering.
- Processing occurs within New Zealand and the economic gains are recognised here.
- The option to landfill tyres is being phased out as consents expire or as mandated in various plans of councils. This transition will be complete by 2023.

- Tyre Derived Fuel (TDF) has become an integral option for ELT use in New Zealand (upon completion of GBC plant commissioning in October 2020), and TDF export reduce as the New Zealand market demand meets supply.
- Other bulk uses include as crumb into asphalt which has been led by public sector procurement practice in the first instance and becomes an accepted offering in the marketplace.
- Regional solutions are in place such as operating pyrolysis plants and facilities to manage off-the-road tyres close to source
- Payments, funded by fees, remain a feature through the initial ten years of the programme. Payments for value added material will increase to continue to stimulate the investment of higher priced goods created in New Zealand and available for export.
- Initially payments are weighted to encourage the highest volume product to be processed to reflect current and near-term investment in infrastructure.
- There is a robust system in place which manages information on the flow of tyres into beneficial use.
- Research and development activity is highly regarding with funding grants to reflect investment in future value products, and to create and stimulate regional investment.
- The incidence of stockpiles or non-compliant activity will virtually cease as there is no incentive to be outside the scheme and the value of the tyre remains with it at end of life only if it is recovered through the scheme.

## 3. General Assumptions

This report presents a range of assumptions and estimates that underpin the cost benefit analysis of the two options relating to the end of life management for tyres in New Zealand.

- **Incremental basis -** based on the New Zealand Treasury Cost Benefit Analysis Primer all option costs and benefits are measured incrementally relative to the base case. This enables assessment of the potential impact on society relative to the preferred option. This analysis considers the impacts of the proposed nationwide and regulated product stewardship scheme for ELTs across all sectors of the economy.
- **Evaluation period** – the total period of the evaluation should be long enough to capture all the potential costs and benefits of a proposal. The NZ Treasury Cost Benefit Analysis Primer suggests the period should be for the economic life of the underlying proposal or assets, subject to a maximum of twenty years. In this assessment a ten-year period has been assumed from 2019 to 2029 as is expected that a positive benefit should be realized within this time frame.
- **Base year of appraisal** – 2019_20. This is a practical assumption that relates to the data collected for end of life tyre volumes, recycling rates and some costs.
- **Real discount rate** – 1.69%. In accordance with the guidance on the NZ Treasury website a discount rate of 1.69% was used for this analysis. The discount rate is effectively a desired return, or the return that an investor would expect to receive on some other typical proposal of equal risk.

## 4. Projections

Underlying projections in tonnes for the quantities of end of life tyres generated, recycling rates, landfill and illegal dumping are required for the two options. This is because a number of the costs and benefits will be dependent on the quantity of ELTs that will be managed in an environmentally sound way versus the quantity going to unsound disposal option such as landfill or to an unknown end use either in New Zealand or internationally.

In 2019/20 There remains a considerable lack of data on what is actually going to landfill (whole or cut) and what is illegally dumped. Export and recycling data is provided in approximate terms only mainly due to commercial sensitivities.

- **Tonnes of End of Life Tyres - it** was estimated that 6.257 million tyres enter New Zealand each year either as loose tyre imports or fitted to vehicles. This equates to **96,000 tonnes** of end of life tyres generated annually.
- **Available ELTs** – an increase of 2% of imported tyres loose and on vehicles has been accounted for as the trend date shows an average increase per year from 2011 – 2019.
- **Recycling rates -** The base case scenario assumes that the current arrangements continue with approximately 30,720 tonnes/yr or 32% of ELTs are either processed in New Zealand for material recovery or civil engineering uses or exported for fuel or material recovery. It does not recognise that there is some plants coming on line in the 2020-2022 years which may increase this volume because without stewardship, those who are investing in infrastructure advise that it is not commercially viable without regulated product stewardship and a guarantee of tonnage of tyres in specification to their plants for processing – and stimulus to create demand for the end market.
- The regulated product stewardship option assumes recycling rates will increase initially from the base case of 32% through to a 95% recovery rate after five years of scheme operation. These assumptions are in line with experience in British Columbia and Ontario when regulated tyre product stewardship schemes were established. In Ontario, a recovery rate of 96% of its passenger and light truck tyres was achieved by 2011, two and a half years after the scheme was established in 2009.
- The financial modelling that underpins the preferred model allows for material to be processed and stored (debulked and stored compliantly) to account for an excess of supply v demand during that five-year period.
- **Land filling -** The base case scenario assumes that the current arrangements continue with an estimated 52,000 tonnes of ELTs going to legal landfill or unsound disposal per annum. The regulated scheme option assumes that landfill quantities will be the difference between total ELTs available, less those recycled. So by year five of the preferred scenario, with a recovery rate of 95%, it is assumed that the remaining tonnes of ELTs are going to landfill disposal because they are too contaminated to be recovered and are likely from recovery of in ground illegal stockpiles.
- **Illegal dumping –** The base case assumes that 3,000 tonnes of tyres are illegally dumped per annum nationally. This assumption was based on data provided by a tyre collector in the Auckland region and scaled up to a national estimate based on population (2011). These ELTs are included in the tonnes that are assumed to go to legal landfill disposal after they are dumped.

Additionally, it is assumed that one large scale tyre stockpile or illegal dumping event occurs every three years. This assumption is based on the Napier stockpile of 2,000 tonnes of tyres which was cleaned up in 2010, and the discovery in 2011 of over a million tyres buried illegally on a Huntly property.

In 2019/20 insufficient data is available to dispute or more finely tune those figures and this is recognised in the report.

Significant funding is set aside to cover the cost of recovery of stockpiled tyres AND the processing of these tyres recognising that they will need to be identified and managed on a case by case basis.

The regulated solution assumes that illegal dumping of tyres is eradicated, as the collection points are easy for public and business to access and free of charge and there is no incentive to stockpile tyres as the payment for recovery is only made at point of drop off at an accredited processor.

- **Tyre Fires –** the base case assumes four small tyre fires per year caused primarily by arson activity, plus one large scale tyre fire every 3 years. This is based on evidence of nine tyre related fires in the two-year period from Apr-2011 to Mar-2013, with the figures adjusted for CPI. The regulated scenario assumes the incidence of tyre fires will decrease but probably not significantly as arsonists will still find targets for fires. A request has been made to the NZ Fire Service for costs and data on fires relating to tyres and we are still waiting for a response, and in addition have requested data from ECAN for the tyre fire in Amberly in 2019 and will request data for the tyre fire in Rolleston in 2020.

## 5. Assumptions

There are assumed to be incremental costs to government, households and businesses under both the preferred scenario option and the alternative option.

### 5.1 Environmental Fee v Tyrewise Advanced Disposal Fee

Under the base case scenario most tyre retailers include the cost to dispose of the end of life tyre in the transactional price of a new or replacement tyre. In some instances, this is transparently displayed to the consumer as a disposal fee, but in many cases it is not. In either situation it is the consumer who is paying for the disposal of the ELT, even though they may be unaware that cost is included in the purchase price of their new tyres. The cost commonly ranges between $2.50 and $7.00 for a passenger tyre however an amount significantly less than that is actually passed on to the collector/processor to manage the tyre at end of life. Under the base case scenario, the disposal fee is only collected at the end of the tyres useful life. It is estimated that the cost of disposal fees to consumers under the base case scenario is **$25 million per annum.**

Over the ten-year period of this analysis it is estimated that the total costs borne by the households and businesses relating to disposal fees under the base case scenario are $164 million.

For the regulated product stewardship scheme the ADF will be collected when a loose tyre or off road vehicle enters the country (data collected by NZ Customs and passed to the POS to invoice the importer) and by the New Zealand Transport Authority when a vehicle is first registered in New Zealand. This captures a fee on **all** tyres entering New Zealand. This means the fee will be captured on the greatest number of tyres. The consumer will also bear the cost of the Advanced Disposal Fee, as it will be passed on from the importer in the price of tyres and included in the vehicle registration costs for tyres fitted to vehicles.

It is estimated that the cost of the ADF to the householder under the **regulated scenario is $53.9 million** in year one of a scheme. This is based on a $5.50 per EPU fee. The fee includes provision for full payment of collection and transport costs on behalf of the consumer. The ADF is not modeled to reduce over the first ten-year period as the investment in infrastructure to support the markets for tyre derived products need to develop and the need for supply chain payments are seen as essential.

Over the ten-year period of this analysis it is estimated that the total costs borne by the households and businesses under the regulated scenario is $560.4 million. Over the ten-year period the sum of the ADF is more than the current disposal costs ($275m), but $511 million from the ADF directly translates into economic benefits for society including investment in a new ELT recycling industry, increased employment and export opportunities. In addition, it will bring international environmental reputation and branding benefits that are not available under the status quo. The ADF will apply across all vehicle users and type of pneumatic tyres so will be fairly applied to all consumers of tyres and will be transparent, unlike the current disposal costs.

It is assumed that all costs to administer and operate the Tyrewise scheme will be covered by the ADF There would be no additional costs to the householder, with the ADF transparently declared on the sales receipt.

Scheme administration costs of an industry run product stewardship organization (PSO) to administer the Tyrewise programme initiatives are estimated at 1.2% of the total revenue. The 2011 Australian Packaging Cost Benefit Analysis[6] estimated scheme administration costs of $750,000 per annum for an industry run PSO.

### 5.2 Government Costs

#### New Regulation Design and Implementation

Under the status quo it is assumed there are no costs to Government. However, this is likely not the case and that the costs are not captured sufficiently to be able to report on them.

Under the preferred scenario the Government will incur costs to design the new priority product regulations proposed under the Waste Minimisation Act, which is likely to include provision for an ADF, controls on disposal and sale of tyres, criteria for accreditation of a regulated product stewardship scheme, and the collection and provision of information. There will also be costs involved in obtaining advice from the Waste Advisory Board and for further public consultation. Potentially there may be a need for new or changes to existing legislation to enable NZTA to collect the ADF on behalf of a government agency, and NZ Customs to collect data on loose tyre imports and off road vehicle imports and to be able to pass that data to the PSO to enable the PSO to raise an invoice to those importers for the ADF.

Based on Ministry for the Environment in-house and consultation costs for new regulations in 2012, a range between $350,000 and $2.5 million could be expected, with contentiousness and complexity adding to costs. It is assumed that proposed new Tyrewise regulations would sit in the mid to upper cost range given the potential involvement of two other government agencies NZTA and NZ Customs, and as tyres are likely to be one of the first priority products to be declared under the Waste Minimisation Act. For the purpose of this analysis a cost of $2.3 million was assumed for Year 1.

As a comparison, the 2011 Australian Packaging Cost Benefit Analysis which looked at various regulatory support options to increase packaging recycling rates estimated regulatory costs for a mandatory advance disposal fee scheme at $1 million over two years. This included a separate levy bill and amendments to its Product Stewardship Act and direct costs in project team travel costs, consultation road show, consultancy fees for regulatory impact statement development and

teleconferences. There are no further government reference documents available which would inform costs more precisely.

### Ongoing Costs to Administer Regulations

There will also be costs over the ten-year analysis period to amend the ADF depending upon where it is set (ie if set in regulations). The financial model shows that the ADF of $5.50 per EPU modelled over 10 years with a 4% contingency factor enables a small reserve to be held to cover any unforeseen circumstances (such as natural disasters disrupting logistical supply chains).

For the purpose of this analysis it is assumed the fee will be reviewed annually and if required changed by way of a gazette notice issued by the Minister. Annual costs for these changes are minimal.

Additionally, the Government will incur costs to review the product stewardship scheme accreditation application, which could be the first for a priority product. These costs are estimated at $15k per accreditation for a full product life cycle stewardship programme. There will also be costs to audit the accredited scheme on an annual basis, which is not required currently. For the purpose of this analysis we have estimated this as $5k per annum.

### Enforcement Costs

Enforcement activity in relation to the proposed new priority product regulations under the Waste Minimisation Act regulations have been estimated at $300,000 per annum. This estimate is based on current enforcement activity costs in relation to the Waste Minimisation Act and the TV Takeback scheme and was provided by the Ministry for the Environment in 2011.

## 5.3 Illegal Dumping – Orphan Tyres

Illegal dumping is a regular occurrence. With no supporting regulation requiring tyre generators to use the small number of responsible ELT recyclers, disposal of the ELTs is simply a cost to most businesses. There are instances of unscrupulous operators picking up ELTs from tyre retailers for a minimal fee, under cutting the responsible recyclers and then storing or dumping loads of tyres in gullies, under houses, or burying them on properties.

Local government are left with significant costs involved in clean up activity following illegal dumping or stockpiling.

- A Napier man collected 250,000 ELTs and stored them on a leased site owned by Land Information New Zealand. His intention was to export the tyres but when that business venture failed and he left the country, LINZ and Napier City Council were left with a large tyre stockpile on low lying land in close proximity to major wetland areas and residential populations which posed a significant environmental risk. The removal and disposal of the tyres during 2010 took several months and cost approximately $2 million dollars of local ratepayer and central government money.
- In 2012, Environment Waikato and the Franklin District Council discovered more than one million tyres buried illegally on a Huntly property. The tyres had been collected from tyre retailers in the Waikato area over a period of several years and buried at five different sites on the large rural property. The owner did not have resource consent to bury the tyres and had received several abatement notices over several years. A prosecution was brought against owner Ross (Des) Britten Limited, who was convicted and fined $77,600. However, he has also left the country. So far, the tyres have not been removed as it is estimated there would be further detrimental environmental impact in unearthing and removing the tyres. Additionally, an environmentally responsible disposal solution for what would be very

contaminated tyres would be hard to find. Costs borne by Environment Waikato in bringing the prosecution before the courts were estimated at $200,000.

- Data on costs incurred for illegal tyre dumping collection and disposal for the financial years from 2008/09 though to 20012/13 was provided by a legitimate tyre collector for the Auckland City Council region. This tyre collector has the contract with the Auckland City Council to collect and dispose of illegally dumped tyres, and also provides a similar service to business or individuals who experience illegal tyre dumping problems. This data was used to estimate the total cost of illegal dumping at a nationwide level at $600,000 per annum. This estimate is believed to be conservative and has been CPI adjusted for this model.
- In the 2006 report Market Failure in End of Life Tyre Disposal prepared for the Australian Department of the Environment and Heritage, it was estimated that illegal disposal costs were between $35 and $70 million over a 10 year period. Applying a conversion based on the relative population sizes of 20.404 million in Australia and 4.134 million in New Zealand, this estimates the costs incurred due to illegal dumping to be in the order of $6-7 million per annum.
- In 2018, estimates of costs reaching $250,000 to partially clean up a stockpile (on hard stand) in Hamilton, where an estimated 150,000 tyres were found at a Frankton property after a business tasked with disposing of them went out of business, leaving Hamilton ratepayers to foot the cleanup bill.
- A similar volume of tyres is predicted in the Amberley stockpile (also linked to a tyre fire in 2019), work is underway to estimate the volume and establish how the cleanup will be funded.

If we do nothing, it is assumed that there will be no change in illegal dumping activity, and that it will continue to be a major cost that is borne by households through their rates payments to local councils, who arrange the cleanup activities. Costs of $15.9 million have been assumed in costs associated with illegal dumping.

## 5.4 Tyre Fires

**Figure 21** Source STUFF A pile of disused tyres caught fire in Rolleston, near Christchurch, on Sunday 17 May 2020

“Environment Canterbury (ECan) says there is no immediate risk to waterways from fire-water run-off caused by a large tyre fire.

Eleven fire trucks were sent to Diggalink's yard off Weedons Rd, near State Highway 1, about 4.25pm on Sunday.

A hedge fire had spread to a **1500-square-metre pile of disused tyres** at a neighbouring property.

The fire was contained about 7pm, but was still burning through the evening. A Fire and Emergency New Zealand spokeswoman said firefighters were at the scene until the fire was “totally knocked down” about midnight.

There was no electricity in the area at the time of the blaze, so that was not being considered as a potential cause.

An ECan spokeswoman said incident response staff were sent to the scene on Monday.

"There is no immediate risk to waterways from the run-off, and foam/water pools remaining at the site will be removed by sucker trucks."

They remained at the scene late on Monday afternoon.

Diggalink managing director John Giltrap said he was unsure what caused the fire.

**The tyres had been stored next door for a "long time".**

They had "**always been a fire hazard**", but he said he understood the owner was in the process of getting them moved.

Diggalink suffered no damage in the blaze, and it was business as usual on Monday.

A fire crew was expected to check the area on Monday morning in case of any flare-ups.

Stuff reporter Dominic Harris, who was near the scene on Sunday, said large flames, higher than a nearby building, were shooting into the air.

"The smoke was jet black. There was quite a thick, acrid smell."

People in the area were advised to stay indoors and avoid the heavy smoke until the blaze was extinguished."[23]

**Figure 22** Source STUFF. Big plumes of smoke over Rolleston after a pile of disused tyres catches fire.

Tyre fires produce hazardous air emissions and toxic effluent run off which have both adverse health and environmental implications. With regards to health impacts tyre fires produce smoke and run off containing a range of toxic and carcinogenic compounds including dioxins, furans, mercury and lead. Typically, nearby communities need to be evacuated in the event of a tyre fire.

Environmental impacts from tyre fire air emissions have the potential to contaminate water supplies and crops and the effluent run-off can contaminate nearby water sources and ground water. The land itself can also be contaminated by the effluent run off, limiting its further use.

Internet research showed there were nine fires related to storage of tyres in the two-year period from February 2011 to March 2013. Most of these fires were at tyre retailers and were caused by arson. Costs to business were estimated at $250,000 per event based on data provided by Tony's Tyre Service in Porirua and Wanganui Tyres and Alloys. Both of these businesses suffered fires caused by arson and resulted in economic losses including clean-up costs, disposal of burnt materials, loss of equipment, loss of stock, loss of earnings, temporary relocation to new premises, insurance, and rebuild costs.

Updated costs of fires have been requested from NZ Fire Service and from Ecan which has had two significant tyre fires in their region between 2013 and 2019, however this data is not available at the time of preparing this report.

For status quo it is assumed that there will be no change in arson activity and the number of fires relating to tyres in storage will continue to occur at around four per annum, with business costs of $250,000 per event.

[23] SOURCE https://www.stuff.co.nz/national/121541000/canterbury-tyre-fire-thought-to-be-accidental?cid=app-iPhone

A further cost directly relevant to tyre fires is the cost of the NZ Fire Service to attend and extinguishing these fires. A pc sum has been estimated at $45,000 per incident, based on historic cost data available in 2011 and 12. This cost is funded by the householder who pays a Fire Service Levy on insurance premiums.

Historic data (circa 2004) was available for large scale fire of approximately 30,000 tyres in Hamilton which fell to local councils to cover the cost of cleanup. Costs included:

- Environment Waikato $31,000 to collect the 30,000 litres of oil discharged and prosecute the site operator for water and air discharges.
- Waikato District Council costs of $14,000 to deal with the effects on the local population including temporary accommodation for ten families.
- Department of Conservation acting as the rural fire authority $45,000 to extinguish the fire.

Therefore, the costs of environmental impacts have been assumed conservatively at these rates in this analysis.

### 5.5 Landfill Operating Costs

According to the 2011 Australian Packaging Cost Benefit analysis[6] there are avoidable direct costs associated with operating landfills including the opportunity cost of land and other ongoing operating costs which vary with landfill volumes. The private costs of landfill include:

- Land purchase
- Resource consent approval process
- Equipment and buildings
- Construction costs such as excavation and lining of landfill bases to minimize leaching
- On site gas recovery
- Fencing
- Operational costs like fuels and materials
- Monitoring and reporting
- Capping landfills and landscaping
- Rehabilitation and after care
- Employee and
- Contractor costs

The report estimates the following dollar value operating costs of landfills per tonne.

| Size of landfill | Best practice controls | Poor controls |
|---|---|---|
| Small | $100 | $74 |
| Medium | $80 | $44 |
| Large | $40 | $30 |

Under status quo it is assumed that there is no change to the current practice of disposal of ELTs in landfill. As there will be no change to the practice, there will be no change to landfill operating costs due to disposal of ELTs.

The disposal of ELTs in landfill can cause problems with leachate (depending on landfill liner) and stability issues caused by whole tyres "floating" to the surface. Costs relating to landfill leachate or stability issues specifically as a consequence of tyre disposal are not available therefore no costs were quantified for inclusion in this analysis.

### 5.6 Business Costs

For regulated product stewardship using the priority product regulations under the Waste Minimisation Act, it is assumed there will be reporting requirements on those involved in the import, sale, collection, transport and processing of tyres.

The registered scheme participants will incur compliance costs in preparing monthly or quarterly reports of ELT movements. This reporting will be necessary to understand the flow of tyres from generators and collection sites through to processors and eventual end use, so that recovery rates can be calculated, scheme performance assessed, and supply chain payments calculated. These compliance costs borne by businesses under the preferred scenario will be offset by the payments that a registered scheme participant will receive.

Under Tyrewise it has been assumed:

| | |
|---|---|
| Importers: assume 800 tyres plus 600 vehicle importers. Quarterly reporting, # vehicles by type, # of tyre, plus paying of fee | 1 day per month, $1,920/yr per business. |
| Generators: 3000 | 0.5 day per month, $768/yr per business. |
| Collections Sites: 200 | 2.5 day per month (1 hour per day)/ $4,800k per yr) |
| Transporters: 10 | 1 day per month, $1,900/yr |
| Processors and Manufacturers: 25 | 1 day per month, $1,900/yr per business. |

In total business compliance costs incurred under Tyrewise are estimated at $4.5 million annually. Over the 10 years analysis period this equates to $54 million.

- This is likely to be overstated as the actual number of importers is firmed up and the benefits of a fully automated system are realised

It is assumed that there will be capital costs borne by businesses who invest in new processing technology. These costs are incremental to the status quo.

- The most significant change since 2011 being the investment made at Golden Bay Cement and Waste Management Ltd as result of co-funding from the Waste Minimisation Fund. In 2011, it was assumed that a new processing facility would be established in the South Island, at a cost of $5 million spread over the first two years. It was also assumed that a Hot Disc or similar facility would be implemented at one suitable cement kiln to allow whole tyres as tyre derived fuel to replace imported coal. The cost of the Hot Disc technology was estimated at $15 million based on industry supplied information and spread across the first three years of the scheme.

### 5.7 Public Health Risk

New Zealand has 12 native species of mosquito and four introduced species; these are at present harmless but have the potential to transmit disease if certain other disease-carrying species of mosquito slip into the country and become established. There have been many interceptions of exotic mosquitoes at ports and discoveries of populations of a cool climate tolerant species capable of transmitting Ross River virus have been found in Hawke's Bay (1998, 2000), Gisborne (2000), Kaipara (2001), Auckland (2001, 2002, 2004) and Marlborough (2004) regions. This highlights the very real risk that mosquitoes of public health significance may be introduced and establish here in New Zealand.

The most likely potential diseases to be transmitted are arboviral diseases such as Ross River virus and Dengue Fever. Dengue fever is the world's fastest spreading tropical disease, with a recent report[10] estimating 390 million people infected each year, more than triple the World Health Organisation previous estimate. The report based on several years of analysis highlights the growing worldwide burden of mosquito borne viral disease. As yet there is no approved vaccine or treatment for Dengue fever which is not normally fatal but lands many victims in hospital.

The risk of mosquitoes of public health significance becoming established in New Zealand is likely to increase greatly with the effects of climate change and warmer temperatures extending the possible habitats. Stockpiles of ELTs are a perfect breeding environment for mosquitoes, and the link between mosquitoes and tyre stockpiles is widely reported. So far establishment of successful populations has been controlled by New Zealand's strict biosecurity measures and the good fortune of a cool climate. When climate conditions are favourable, eradication and control would become exceptionally difficult given the extent of suitable habitat.

A report on the economic cost of dengue fever epidemics in Australia estimated annual costs of $2.7m, which included lost workdays plus epidemic control costs. This cost did not include intangible costs to individuals or society which can greatly detract from quality of life and wellbeing.

Under the status quo it was assumed that New Zealand's biosecurity and import controls will remain successful at keeping New Zealand free from mosquito borne disease. While we would continue to have unregulated ELT stockpiles, which could be potential breeding grounds for mosquitoes, it was not reasonable to assume the tyre stockpiles would directly link to increases in mosquito borne disease and associated public health costs. Therefore, no incremental costs to society were assumed either under the base case or the preferred scenario.

## 6.0 Benefit Assumptions

There are assumed to be benefits and avoided costs to government, households, businesses and the recycling and tyre derived product industries.

### 6.1 Market Value of Resources

The disposal of tyres into landfill under the base case scenario means that the resource is not available for tyre collectors and processors to capture the economic market value of tyre derived products.

Currently, most tyre derived products have a cost negative value, that is, the cost to transform them from ELTs to a tyre derived product is more than the market value of the product. This is influenced by the lack of demand for TDPs in New Zealand. For example, there is a world market for tyre derived fuel as a replacement for fossil fuels, but often the cost of shipping from New Zealand makes this outcome uneconomic.

The table below estimates the current and future market value of various tyre derived products

| Table 19 Product | Current NZ Market Values | Future Market Value Per Tonne |
|---|---|---|
| *A: Whole Tyres* | Generally, have to pay someone to take them. There is a small export market for used tyres to Pacific Islands and Africa, receiving about $5/tyre | $55 |
| *B: Rubber Powder* | $300 - 400 tonne | $390 |
| *C: Rubber Crumb* | $300 - 400 tonne | $365 |
| *D: Rubber Chip* | Cost negative | $85 |
| *E: Cut tyres or portions* | Cost negative | $165 |
| *F: Whole Tyres (TDF or Pyrolysis) or Civil Engineering* | No market | $70 |
| *G: Shred Tyres (TDF or Pyrolysis)* | Cost negative | $365 |

Under the current scenario the total market value of tyre derived products is estimated at $7.7 Million annually. This is based on current market prices provided by industry and the estimated recycling volumes.

- The information on actual rates and volumes is commercially sensitive so this should be treated as an estimate only.
- The price per tonne quoted for future market value is that which is required by the processors to have a sustainable business in the New Zealand market and would not be competitive on an international basis.

In the preferred scenario with a recovery rate of 95% at year five of the scheme, an estimated 72,000 tonnes of ELTs will be diverted from landfill to an environmentally sound end use per annum.

Assuming a split between tyre derived products such as 68% going to tyre derived fuel, 32% going to tyre derived aggregate and more highly processed end uses such as rubber powder for roading, artificial turf or niche consumer products, a more attractive financial benefit greater than $7-10 million per annum could be realized.

The future market values are assumed to be the same as the current market values provided by industry sources. There is volatility in the TDP market internationally with some traders advising that they pay for the cost of shipping only and that material is provided for free, leaving the processor with the cost of processing the material to ensure that the storage of tyres is managed appropriate.

It is estimated in with regulated stewardship that $210 million of financial benefit would be gained from the market value of these products over the ten year analysis period.

### 6.2 New Industry and Employment

As a minimum the payments made by the Tyrewise scheme to the registered scheme participants would all be direct economic benefits to businesses and society as a whole.

A significant proportion of the ADF paid by consumers to the Tyrewise Product Stewardship Organisation (PSO) will directly fund new business in New Zealand, in turn creating employment opportunities. The proposed scheme has provision for the following economic benefits:

- Payments made throughout the ELT supply chain including ELT collection sites, transporters, ELT processors and recyclers and new product manufacturers.
- Research and development grants to allow for specific funding to develop new and innovative end uses for tyre derived products
- Community development grants to provide funding for New Zealand based non-profit organizations to use NZ made tyre derived products in public spaces or buildings.
- Funding for orphan and legacy tyre collections to remove them from the environment and ensure they are recycled in environmentally sounds manner.

➢ Creating an electronic system that delivers data records for reporting on mass balance numbers and types of tyres imported and disposed of will assist the waste industry and the tyre industry and be the first of its kind for a “waste” mass balance reporting system in New Zealand.

➢ Added benefits not monetized are the ability for the electronic system to incorporate other items of waste to data tracking in real time, and materials flow information which will assist tyre and vehicle importers have accurate intelligence about their own market information (currently not available).

In addition to the above funds there will be additional benefits to service providers involved in communication and marketing, promotion and education, programme management and scheme administration as well as paying a fair price for the cost of compliance and enforcement.

All of these financial benefits from the Tyrewise scheme will go directly to New Zealand based businesses with flow on effects on employment.

Under Tyrewise, it is estimated that these financial benefits will total around $33 million per annum and accumulate to $307 million over the 10-year analysis period.

### 6.3 Benefits of Rubber in Roading

Under the status quo, it is expected that the current situation will prevail, and the use of rubber in roading will not be common practice.

Under the preferred scheme scenario, it is assumed that the use of rubber in roading surfaces will be an important end use for ELTs in New Zealand. Rubber can be used in both rubber modified asphalt for motorway surfaces as well as chip seal roads. Chip seal roads make up around 90% of New Zealand's road surfaces.

*The following information was provided in 2011, the situation has not changed, and this remains an opportunity that needs significantly more work.*

Rubber crumb can replace imported SBS polymers used in modified asphalt, which is approximately 10% of the roading surface laid in New Zealand. To achieve the same performance criteria five times the quantity of rubber must be used as a substitute for the SBS polymer. For this analysis it was assumed that a maximum of 2000 tonnes of rubber powder could be diverted to this end use annually. It was assumed that rubber powder was available at a cost of $750/tonne, which is in line with the industry supplied market values discussed in the previous section. Assuming five times the amount of rubber crumb is needed to achieve the same performance benefits as the SBS polymers this would represent a cost saving of $10 per tonne modified asphalt, compared to the imported SBS polymers which cost $4000 per tonne at today's prices. Over the ten years of this analysis the cost benefit from using rubber crumb in modified asphalt is estimated as $1 million.

While the use of rubber in roading as a substitute for SBS polymers in modified asphalt may only give a slight cost benefit, from an environmental point of view it is a preferred outcome. Also, as the cost of imported SBS polymers increase and the cost of processing crumb rubber in New Zealand decreases due to the Tyrewise scheme payments, the economic benefit will only increase.

A second use of rubber in roading is as an aggregate or drainage material replacement. Overseas literature shows that this has benefits including engineering performance such as compressibility, lightweight, better insulation and drainage as well as being cost effective. The financial benefits of using tyre derived aggregate have not yet been fully quantified for New Zealand. For the purpose of this analysis it is assumed tyre derived aggregate could be supplied for $10 per tonne cheaper than the replaced aggregate. This would equate to $2.25 million economic benefit over the 10 year analysis period.

The use of rubber in roading also takes advantage of the elasticity and the noise absorbing characteristics of rubber. The following benefits of rubber roading have been reported internationally:

- 50% increase in life span of the road surface and therefore reduced maintenance costs
- 50% increase in the safety of the road in wet conditions, resulting in less accidents
- 30% reduction in noise pollution
- Reduction in road marking costs as rubber asphalt holds colour longer
- Reduction in roading construction costs.

These claims have yet to be tested for New Zealand contexts. It is expected that in the initial years there are likely to be additional labour and equipment costs, until the technology is established and the benefits of longer wearing roads can accrue. It is likely there will be financial benefits associated with increased life span of road surfaces, but at this stage and for the purpose of this analysis they have not been quantified.

A new project began as a spin off from the Tyrewise 1.0 project which was termed "Rubber in Roading" which specifically identified and addressed the remaining barriers for rubberised roads in appropriate applications in New Zealand and sought to future proof this end use for recycled tyre rubber.

To give an idea of scale of investment in roading projects, the National Land Transport Programme (NLTP) represents $12 billion investment over the three years from 2012-15[18]. From that, $4.3 billion is set aside for new and improved local and state highway infrastructure while a further $4.8 billion is designated for local and state highway renewals and maintenance. This shows the significant size of the roading industry and why it is considered an important end use pathway for ELTs.

- In 2019, the use of tyre derived products in this way has been limited by the technology in the hot mix plants availability in New Zealand **(what is required is well understood)** but the capacity to improve crumb rubber has improved. As new plants are built there will be more flexibility to allow for recycled materials to be added to the mix. It is estimated that costs to upgrade existing plants to allow for tyre derived aggregate to be substituted in a dry mix process would be around $60,000 per plant.
- In addition, there is a significant health and safety impact to be worked through due to the New Zealand industry spending considerable time reducing temperatures at which hot mix is delivered on road to reduce burns.
- NZTA and Local Government procurement policies for roading do not support the use of longer lasting roading at higher cost therefore change will need to be made to include % of recycled aggregate AND % of rubberized content for any real advancement to be made.

### 6.4 Benefits of Tyre Derived Fuel

Under the status quo it is assumed that the tyre derived fuel is slowly increasing in use in New Zealand through Golden Bay Cement demand pull for supply to their kilns.

Tyre derived fuel is expected to be an important end use pathway for ELTs in New Zealand especially in the first ten years of Tyrewise. The product stewardship scheme will increase the supply of ELTs available and support industry to eliminate the security of supply issue. Payments from the scheme and government support of tyre derived fuel use from an environmental viewpoint will also encourage industry to use tyre derived fuel.

### 6.5 Avoided costs of illegal dumping

For Tyrewise, it is assumed that illegal dumping will cease, as there will be easily accessible free public collection points for the general public to access. In addition, tyre retailers and other generators of ELTs will have free collection of their tyres so the opportunity for unscrupulous operations to undercut reputable tyre collectors will disappear. Based on this assumption there will be avoided costs of illegal dumping of $16 million over the 10-year period of this analysis (conservatively).

### 6.6 Avoided costs resulting from tyre fires

Even with a product stewardship scheme it is assumed that tyres in storage will still be a target for arsonists. However, as Tyrewise will provide regular scheduled collection of ELTs from generators sites, who will need to comply with scheme guidelines for safe storage of ELTs awaiting collection, the incidence and risk of large scale tyre fires will decrease. A 25% reduction in fires related to tyres has been assumed under both the preferred and alternative scenarios. This equates to three tyre per year instead of four, with an avoided cost of $240,000.

### 6.7 Avoided operating costs of landfills

In the status quo it is estimated that 52,561 tonnes of ELTs are destined for landfill each year. Under Tyrewise it is assumed that with ELTs being diverted to environmentally sound end use, there will be a reduction in the volume of ELTs going to landfill, and this amount will reduce in line with the recovery rate of ELTs. In year five of a scheme when there is a 95% recovery rate, only 3,000 tonnes are estimated to go to landfill disposal.

There will be avoided landfill operating costs associated with this reduced volume to landfill. For this analysis it was assumed that New Zealand landfills were split evenly between small and large size and 50% have best practice controls and 50% have poor controls. The total avoided costs of landfill operation over the 10 year period of this analysis are estimated at $24 million.

### 6.8 Avoided public health risk

In the preferred scenario, it is assumed that the storage of ELTs will be controlled by guidelines and auditing of registered scheme participants. Improved storage, less incidence of stockpiles and illegal dumping of tyres and will provide fewer habitats for mosquito populations to become established. The risk of mosquito borne disease and associated public health costs will reduce, but for the purpose of this analysis this benefit has not been quantified.

## 7.0 Net Benefits

The base case scenario shows negative net benefits, or a cost to society as whole at a rate of -$3 to -$5 million per annum. Converted to a net present value (NPV) using the discount rate of 1.69% over the 10 year analysis period this equates to a negative **NPV of -$43.3 million.**

Under the preferred scenario with an industry led and government supported product stewardship scheme for ELTs and the ADF remaining with the tyre for extracting the value from it at the end of its useful life, the annual net benefit averages $1.9 million per annum.

Converted to a net present value using the discount rate of 1.69% over the 10 year analysis period this equates to a positive **NPV of $34.5 million.**

## 8.0 Conclusions

Based on the estimates and assumptions made, the 10-year cost benefit analysis shows that the preferred scenario “Tyrewise” delivers economic, environmental and social benefits far in excess of the “do nothing” approach.

# Appendix B

**Projects relating to ELTs funded by the WMF between 2015-19 (ref Ministry for the Environment, WMF Funding page)**

| TITLE | APPLICANT | PROJECT TYPE | WASTE STREAM | FUNDING AWARDED (UP TO) | YEAR FUNDING AWARDED | REGION | PROJECT STATUS |
|---|---|---|---|---|---|---|---|
| Tyre recovery and recycling at Golden Bay Cement | Fletcher Concrete and Infrastructure Limited (Golden Bay Cement) | Infrastructure | Tyres | $13,591,055 | 2015 | Northland | In progress |
| MDF Panel Boards Utilising Crumb Rubber Sourced from End of Life Tyres | The New Zealand Forest Research Institute (Scion) | Investigative | Tyres | $100,000 | 2015 | Bay of Plenty | Completed |
| Acoustic Building Products from End of Life Tyre Sourced Crumb Rubber | The New Zealand Forest Research Institute (Scion) | Investigative | Tyres | $178,000 | 2015 | Bay of Plenty | Completed |
| Extrusion devulcanisation of waste | The New Zealand Forest Research Institute (Scion) | Investigative | Tyres | $182,550 | 2015 | Bay of Plenty | In progress |

| TITLE | APPLICANT | PROJECT TYPE | WASTE STREAM | FUNDING AWARDED (UP TO) | YEAR FUNDING AWARDED | REGION | PROJECT STATUS |
|---|---|---|---|---|---|---|---|
| tyres for to replace imported polymers | | | | | | | |
| End of Life Tyres as sustainable building products | Toi Ohomai Institute of Technology | Investigative | Tyres | $60,000 | 2015 | Bay of Plenty | Completed |
| Producing tyre pyrolysis fuel on a decentralised basis | Nufuels Ltd | Infrastructure | Tyres | $90,000 | 2015 | Wellington | In progress |
| Tyre Rubber Modification Of Bitumen Binders | Fulton Hogan Ltd | Investigative | Tyres | $40,000 | 2015 | Auckland | Completed |
| Maximising Production Volumes | Eco Rubber Industries Ltd | Infrastructure | Tyres | $600,000 | 2015 | Auckland | |

| TITLE | APPLICANT | PROJECT TYPE | WASTE STREAM | FUNDING AWARDED (UP TO) | YEAR FUNDING AWARDED | REGION | PROJECT STATUS |
|---|---|---|---|---|---|---|---|
| Waste tyre disposal - national expansion | Waste Management New Zealand | Services | Tyres | $3,851,005 | 2015 | Nationwide | In progress |
| Dedicated Cycle Lanes using Tyre Derived Rubber in Construction Material | Opus International Consultants | Investigative | Tyres | $199,850 | 2015 | Wellington | Completed |
| Mandatory Product Stewardship for End of Life Tyres (ELT) - Update of Materials produced under WMF Deed 20098 "Tyrewise" | 3R Group Ltd | Investigative | Tyres | $79,625 | 2018 | Nationwide | In progress |

# Appendix C

## Sample Product Stewardship Organisation Draft Trust Deed

*Final entity to be put in place if tyres declared priority product.*

**Dated: xx xxxxxx 2020**

**Deed Of Trust**

**for**

**Auto Stewardship New Zealand**

**This Deed** is made this _____ day of _____

**Parties**

**Auto Stewardship Foundation New Zealand**

("the Settlor")

**1_____, 2_____, 3_____, 4_____**

(together "the Trustees")

**Background**

A. The Settlor wishes to establish a trust ("the Trust") in New Zealand for the purposes described in clauses 4 and 5 of this Deed and to give effect to such desire are at the same time giving the Board the sum of ten dollars ($10) by way of gift to be held on the trusts set out in this Deed.

B. The Trustees have agreed to become trustees of the Trust upon the trusts and with and subject to the powers and provisions contained in this Deed.

C. The Trustees have agreed to enter into this Deed specifying the purposes of the Trust and providing for its governance and management.

**This deed witnesses**

**1. Name**

The name of the Trust shall be "Auto Stewardship New Zealand".

**2. Office**

The registered office of the Trust shall be such place as the Board of Trustees may determine from time to time. The initial registered office of the Trust shall be C/- Insight Perspective Limited, PO Box 87 274, Auckland 1742.

**3. Trust**

3.1 The Trustees acknowledge and declare that they hold the Trust Fund on trust on the terms and conditions contained in this Deed. For the purposes of this clause, 'the Trust Fund" means the sum of $10.00 given by the parties to this Deed to the Board and all other property which may be paid to or held under the control of or vested in or acquired by the Trustees for the Trust from any source on or after the date of this Deed and whether by way of gift, bequest, devise, purchase, exchange or otherwise, and the property from time to time representing the same and the income therefrom.

**4. PURPOSES**

The objects and purposes of the Trust, to the extent that they are charitable purposes, are to devote or apply both capital and income of the trust fund to, or for, any charitable purposes in New Zealand, which are from time to time selected by the Trustees and are valid charitable purposes. Without limiting this in any way, such purposes may include as follows:

(a) to provide the governance structure for a product stewardship programme for end of life tyres (Tyrewise) and which is the subject of a submission to the Minister for the Environment for designation of tyres as a priority product under the Waste Minimisation Act 2008. At the point at which that designation is approved it will trigger a change to the terms of this Deed and the governance structure to reflect the

agreed future governance as amended by agreement as a result of this designation; and

(b) to pursue every object or purpose within New Zealand which in accordance with the laws of New Zealand for the time being is charitable.

**5. Description of product stewardship**

5.1 The aim of product stewardship is to reduce the environmental impact of products.

5.2 Under product stewardship a company or an industry sector takes primary responsibility for managing the environmental impacts of its products throughout their life cycle – from raw material selection to final disposal. This stewardship may also be shared with consumers, retailers, recyclers and local authorities.

5.3 The term 'extended producer responsibility' (EPR) is used in a similar way, although usually with a narrower focus on the responsibilities of producers.

5.4 Product stewardship aims to encourage producers and other parties to internalise a substantial proportion of the environmental costs arising from the final disposal of their products and packaging. Internalising involves creating schemes that help to shift the costs of managing wastes from ratepayers and taxpayers back to those who benefit from the product. This ensures the costs of wastes get considered when design, production, distribution and use decisions are made. In this way, product stewardship schemes can contribute to both a reduction in waste and to better recovery of materials from the waste stream.

5.5 In many cases producers and others will voluntarily accept responsibility for their products and undertake activity to manage the environmental impact of the product. This is often done through a variety of methods, including operating a materials recovery scheme, recycling schemes and product redesign. In other cases government can regulate aspects of product stewardship.

**6. Members of the board**

6.1 **Numbers**: The Board of Trustees ("the Board") shall consist of not less than three nor more than seven members. The initial members of the Board shall be the signatories to this Deed.

6.2 **Term of Trustees**: Unless otherwise specified in this Deed each member of the Board shall hold office for a term of three years, or until she or he dies, or is declared bankrupt or is convicted of an indictable offence, or shall have his or her property affairs managed under the Protection of Personal and Property Rights Act 1988 upon the grounds of lack of competency to manage those affairs, or is a "patient" as defined in s 2 of the Mental Health (Compulsory Assessment and Treatment) Act 1992, or indicates in writing that she or he wishes to resign from the Board. Any retiring member shall be eligible for re-appointment.

6.3 **Appointment of trustees**: Any appointment of Trustees shall be by notice in writing under the hand of Autostewardship New Zealand Foundation

**6.4 Termination of trusteeship:** The Board shall terminate a trustee's membership of the Board in the following circumstances.

(a) Where an industry representative group advises the Board in writing that it wishes to have its appointed trustee terminated

***(b) Other conditions (list)***

**7. Powers**

7.1 **General and specific powers**: In addition to the powers implied by the general law of New Zealand or contained in the Trustee Act 1956 or the Charitable Trusts Act 1957, the powers which the Board may exercise in order to carry out the Trust's charitable purposes are set out in Schedule 1.

7.2 **Advisory Groups**: The Board is expressly empowered to appoint advisory groups to provide advice to the Trust upon any terms of reference as the Trustees see fit.

**8. Income to be applied to charitable purposes**

8.1 **Application**: Any surplus income in the discretion of the Board shall be applied to the charitable purposes of the Trust.

**9. Proceedings of the board**

9.1 **Proceedings of the board**: Proceedings of the Board shall be regulated in accordance with the provisions contained in Schedule 2. The Trustees shall have the power to amend the provisions in Schedule 2, whether in whole or in part, in accordance with clause 13.1.

9.2 **Interested trustee may vote**: A Trustee who is interested in a transaction entered into, or to be entered into, by the Trust, may:

vote on a matter relating to the transaction;

attend a meeting of Trustees at which a matter relating to the transaction arises and be included among the Trustees present at the meeting for a purpose of a quorum;

sign a document relating to the transaction on behalf of the Trust; and

do any other thing in his or her capacity as a Trustee in relation to the transaction,

as if the Trustee were not interested in the transaction.

9.3 **Remuneration to be authorised by the board**: The Board may authorise the payment of remuneration to a Trustee for services as a Trustee provided that such remuneration is reasonable and does not exceed the industry standard rates of remuneration for trustees of similar trusts; and may authorise reimbursement to Trustees for reasonable travelling, accommodation and other expenses incurred in the course of performing duties or exercising powers as a Trustee.

9.4 **Insurance**: The Trust may with the prior approval of the Board, effect insurance for a Trustee in respect of:

**liability,** not being criminal liability, for any act or omission in his or her capacity as a Trustee;

costs incurred by that Trustee in defending or settling any claim or proceeding relating to any such liability; or

costs incurred by that Trustee in defending any criminal proceedings:

(i) that have been brought against the Trustee in relation to any act or omission in his or her capacity as a Trustee or employee; and

(ii) in which he or she is acquitted.

(d) The Trustees who vote in favour of authorising the effecting of insurance under paragraph (a) of this clause must sign a certificate stating that, in their opinion, the cost of effecting the insurance is fair to the **Trust.**

9.5 **Limited liability**: No Trustee is liable for any loss not attributable to his or her own dishonesty or to the wilful commission by that Trustee of any act known by him or her to be breach of trust.

9.6 Indemnity: Every Trustee:

is absolutely indemnified out of the Trust Fund for all liabilities incurred by that Trustee in the exercise or attempted exercise of any trust, power, authority or discretion vested in the Trustees; and

has a lien on and may use moneys forming part of the Trust Fund for this indemnity.

9.7 **Proceedings against co-Trustees**: No Trustee is bound to take any proceedings against any other Trustee for any breach or alleged breach of trust committed by that Trustee.

9.8 **Appointment of Advisory Committees**: The Trustees may form advisory committees of interested parties specific to product stewardship programmes; their advice to be sought on an ongoing basis as to the performance, improvements to form and participation and the future of those programmes.

**10. Accounts**

10.1 **True and fair accounts**: The Board shall keep true and fair accounts of all money received and expended.

10.2 **No private pecuniary profit**: No private pecuniary profit shall be made by any person from the Trust, except that:

any Trustee may receive full reimbursement for all expenses properly incurred by that Trustee in connection with the affairs of the Trust;

the Trust may pay reasonable and proper remuneration to any officer or servant of the Trust (whether a Trustee or not) in return for services actually rendered to the Trust;

any Trustee may be paid all usual professional, business or trade charges for services rendered, time expended and all acts done by that Trustee or by any firm or entity of which that Trustee is a member, employee or associate in connection with the affairs of the Trust;

any Trustee may retain any remuneration properly payable to that Trustee by any company or undertaking with which the Trust may be in any way concerned or involved for which that Trustee has acted in any capacity whatsoever, notwithstanding that the Trustee's connection with that company or undertaking is in any way attributable to that Trustee's connection with the Trust.

10.3 **Trustees to comply with restrictions**: The Trustees, in determining all reimbursements, remuneration and charges payable in terms of this clause shall ensure that the restrictions imposed by the following clause are strictly observed.

10.4 **Recipients not to influence benefits**: Notwithstanding anything contained or implied in this Deed, any person who is:

a Trustee of the Trust; or

a shareholder or director of any company carrying on any business of the Trust; or

a settlor or trustee of any trust which is a shareholder of any company carrying on any business of the Trust; or

an associated person (as defined by the Income Tax Act 1994) of any such settlor, trustee, shareholder or director referred to in paragraphs (a) to (c) above,

shall not by virtue of that capacity in any way (whether directly or indirectly) determine, or materially influence in any way the determination of the nature or the amount of any benefit, advantage or income or the circumstances in which it is or is to be received, gained, achieved, afforded or derived by that person.

10.5 **Professional account and influence**: A person who, in the course of, and as part of, the carrying on of his or her business of a professional public practice shall not, by reason only of his or her rendering professional services to the Trust or to any company by which any business of the Trust is carried on, be in breach of this clause.

10.6 **Audit**: The Board shall, if required by any applicable legislation or if the Board so determines, cause the accounts of the Board for that financial year to be audited as soon as practicable after the end of every financial year by an accountant appointed for that purpose and the audited accounts shall be made available to the public.

10.7 **Bank accounts**: The Board shall open an account or accounts with one or more trading banks operating within New Zealand and all cheques or other negotiable instruments drawn upon such bank or banks shall be signed by such person or persons as the Board shall from time to time determine.

**11. Power to Delegate**

11.1 **Power to delegate**: The Board may, from time to time, appoint any committee and may delegate any of its powers and duties to any such committee or to any person, and the committee or person, as the case may be, may without confirmation by the Board exercise or perform the delegated powers or duties in like manner and with the same effect as the Board could itself have exercised or performed them.

11.2 **Delegate bound**: Any committee or person to whom the Board has delegated powers or duties shall be bound by the charitable terms of the Trust.

11.3 **Delegation revocable**: Every such delegation shall be revocable at will, and no such delegation shall prevent the exercise of any power or the performance of any duty by the Board.

11.4 **Delegate need not be Trustee**: It shall not be necessary that any person who is appointed to be a member of any such committee, or to whom any such delegation is made, be a member of the Board.

**12. Common Seal**

12.1 The Board shall have a common seal which shall be kept in the custody a person as shall be appointed by the Board, and shall be used only as directed by the Board. It shall be affixed to documents only in the presence of, and accompanied by the signature of, two members of the Board.

**13. Alteration of Deed**

**13.1** The Board may, by unanimous vote of the Board, by supplemental deed, make alterations or additions to the terms and provisions of this Deed, provided that no such alteration or addition **shall:**

**detract from the exclusively charitable nature of the Trust or result in the distribution of its assets on winding up or dissolution for any purpose that is not exclusively charitable; or**

**be made to clauses 4, 5, 9.3, 10.2 or 13 unless it is first approved in writing by the Inland Revenue Department, Charities Commission or other relevant Government authority as the case may be.**

**14. Winding up and disposition of surplus assets**

14.1 The Trust may be wound up at any time on the passing of a resolution to wind up carried by a unanimous vote of the Trustees and voting at a meeting called for the purpose on not less than 14 days notice.

14.2 If at any time the objects of the Trust shall fail or if for any other reason the purposes hereof shall become wholly frustrated and incapable of being carried out, then and in such case the Trustees shall proceed to wind up the Trust.

14.3 Upon a winding up for any reason, the surplus assets and funds of the Trust, after payment of all liabilities, shall be applied towards such purposes in New Zealand being charitable according to the law of New Zealand as may be determined by the Trustees, or in default of their determination, as may be decided on an application to a Judge of the High Court of New Zealand.

**15. Proper Law**

15.1 This Deed and the trusts of this Deed shall be governed by and construed in accordance with the law for the time being in force in New Zealand.

**In witness** this Deed is duly executed.

**Signed** by 1_____

) _____

By ) Trustee

) _____

) Trustee

**Signed** by 2_____ )

) _____

in the presence of: ) Trustee

Witnessed by:

_____ (signature and name)

_____ (occupation)

_____ (address)

**Signed** by 3_____ )

) _____

in the presence of: ) Trustee

Witnessed by:

_____ (signature and name)

_____ (occupation)

_____ (address)

**Signed** by 4 _____ )

) _____

in the presence of: ) Trustee

Witnessed by:

_____ (signature and name)

_____ (occupation)

_____ (address)

**Signed** by 5 _____ )

) _____

in the presence of: ) Trustee

Witnessed by:

_____ (signature and name)

_____ (occupation)

_____ (address)

**Schedule 1**

**Trustees' Powers**

The powers which the Trustees may exercise (without limitation and by way of examples) in order to carry out Autostewardship New Zealand purposes are as follows:

To seek, accept and receive koha, donations, subsidies, grants, endowments, gifts, legacies, bequests, cash, and any other revenue, either in money or in kind or partly in money and partly in kind, whether in local or foreign currency, for all or any of the purposes of Auto Stewardship New Zealand;

To use as much of the funds of the Trust as the Board thinks appropriate in payment of the costs and expenses of the Trust (such costs and expenses being no greater than market rates);

To purchase, take on lease or exchange or hire or otherwise acquire any land or personal property and any rights or privileges which the Board thinks necessary or expedient for the purpose of achieving the purposes of the Trust and to sell, exchange, bail or lease, with or without option of purchase, or in any manner dispose of any such property, rights or privileges;

To carry on any business either directly or indirectly and whether via companies, partnerships, trading trusts or other structures;

To invest all or any part of the Trust in any way permitted by law and in such manner and upon such terms as the Board thinks fit;

To borrow or raise money from time to time with or without security and upon such terms as to priority and otherwise as the Board thinks fit;

To give guarantees and indemnities, alone or with third parties;

To lend and advance money (with or without security) or give credit to any person or organisation upon such terms and conditions and in such manner as the Trustees may determine;

To enter into any arrangement with any Government or authority, supreme, municipal, local or otherwise that may be seen as conducive to the objects of the Trust or any of them, and to obtain from any such Government or authority any rights, privileges and concessions which the Trustees may think it desirable to obtain, and to carry out, exercise and comply with any such arrangements, rights, privileges and concessions;

to enter into contracts of service or for services for any person, firm, corporation of body (whether incorporated or not) and to pay remuneration for services rendered as the Trustees may think fit;

to adopt such means of making known the activities and objects of the Trust as may seem expedient, and in particular, but without limiting the generality of the foregoing, by advertising in the news media, by publication of books, brochures, pamphlets, circulars and any other printed and illustrated material, by film and other means as the Trustees may from time to time determine;

To do all things as may from time to time be necessary or desirable to enable the Board to give effect to and to attain the charitable purposes of the Trust;

To employ and appoint such staff and professional advisers as the Trustees think appropriate

to manage the affairs of the Trust, the cost of this to be no greater than at market rates;

To appoint any company or body corporate whether constituted in New Zealand or overseas to be a custodian trustee of the Trust or investment manager, and the provisions of sub-sections (2), (3) and (4) of section 50 of the Trustee Act 1956 shall apply to any custodian trustee so appointed;

To incorporate itself into a trust board under Part II of the Charitable Trusts Act 1957.

**Schedule 2**

**Trustees' Procedural Rules**

1. The Trustees shall have absolute management and entire control of the Trust property and may from time to time make such rules and regulations not being inconsistent with the general purposes and objects of the Trust and the provisions of this Deed as they may deem necessary or expedient for the management of the Trust property.

2. The Trustees may meet together for the dispatch of business, adjourn and otherwise regulate their meetings as they think fit. Questions arising at any meeting shall be decided by a majority of votes and every decision so made shall be final and binding on all the Trustees. In the case of equality of votes the chairman shall have a second or casting vote.

3. The quorum for meetings of Trustees shall be three.

4. The Trustees shall appoint a chairman of their meetings and determine the period for which he is to hold office, but if no such chairman is elected, or if at any meeting the chairman is not present within five minutes after the time appointed for holding the meeting the Trustees present may choose one of their number to be chairman of the meeting.

5. The Trustees may appoint a secretary, who may but need not be a Trustee, and the secretary may be appointed on such terms and conditions and with such reasonable remuneration as the Trustees consider fit. Any secretary so appointed may be removed by the Trustees.

6. The Trustees shall cause to be kept minutes of all their meetings and any minute or extract from any minute purporting to be signed by the chairman or acting chairman of the meeting at which such minute was confirmed shall be sufficient evidence without further proof of the matters therein contained.

7. The Trustees shall cause proper books of account to be kept showing all assets comprising the Trust property and all moneys received and disbursed by the Trustees and shall prepare annual accounts which shall be audited by a person who shall be appointed by the Trustees as auditor.

8. The Trustees shall hold one meeting on each calendar year (except the year in which this Trust Deed is executed) which shall be called the Annual General Meeting and the accounts of the Trust shall be placed before this meeting for approval. The first Annual General Meeting shall be held within fifteen (15) months from the date hereof and each subsequent Annual General Meeting shall be held not later than fifteen (15) months after the date of the previous meeting. At least ten (10) clear days written notice of the Annual General Meeting specifying the time and place of the Annual General Meeting and the general terms of the business to be transacted thereat shall be given to the Trustees.

9. All moneys payable to the Trustees may be paid to any one of them or to any secretary, accountant or other officer appointed by the Trustees for the purpose and the receipt of such Trustee, secretary, accountant or other officer shall be a full and sufficient discharge for all moneys so payable.

# Appendix D

## Sample Expression of Interest for programme management

*Final EOI to be written and published during implementation phase.*

### XX XXXXXX 20xx

### Auto Stewardship New Zealand calls for Expressions of Interest

Auto Stewardship New Zealand (ASNZ) the Product Stewardship Organisation (PSO) who manages the nationwide end of life Tyre Product Stewardship Programme "Tyrewise" is calling for expressions of interest (EOI) from companies interested in managing the operational aspects of the programme and who would like to be considered for the contract work to deliver this programme for ASNZ.

The Programme Manager is likely to be an established business with a range of staff with skills and people and who is sufficiently competent in the delivery of the tasks, on time and in line with the budget.

We are seeking companies who have demonstrable experience and are interested in the following:

**Project Management** - Setting the plan, allocating the available funds and monitoring budgets to achieve the milestones set down in the contract with ASNZ and reporting the progress of the agreed schedule and budget to ASNZ.

**Programme Coordinator** - Collaborating with and mentoring those who are delivering the Tyrewise public consultation workshops and communication plan to ensure that an acceptable standard and consistent message occur, in addition, prior to any consultation/communication being delivered, developing these resources.

**Administration** – to set up core services for Tyrewise stakeholders to interact with such as phone numbers, managing queries about access to services such as collection sites, transport operators and processors and preparing reports.

**Business Management** - to work with stakeholders through an audit and accreditation process, monitoring achievement against agreed standards and applying sanctions when those standards are not achieved.

**Communications and Marketing** - to deliver a launch plan and develop ongoing resources for the delivery of this plan as the programme becomes business as usual.

**Please forward by email your EOI to XXX@autostewardship.co.nz by: 5pm, XXXXX. We will then contact selected potential contractors with more details about task briefs and contractual arrangements.**

## 1.0 Programme Manager's Role & Responsibilities

### 1.1 Implementation Phase: From declaration of tyres as a priority product to the end of 24 months.

- Set up and provide core services – 0800#, administration, website, marketing materials
- Preparation of an implementation phase budget for approval of ASNZ
- Write specifications for IT and Data Management for all operational interactions with the accredited participants and reporting stakeholders (e.g the governance body, Central Government)
- Specify hardware and technical services costs relating to reporting requirements above
- Development/Customisation of tyre logistics tracking software
- Develop and document the risk management framework and risk assessment process using the principals of AS/NZS 31000:2009 and apply to all processes
- Develop a communication and advertising plan and deliver
- Develop and deliver an education and public awareness campaign - public road show, advertising, events
- Develop and deliver training materials - resource pack for collection sites, web seminars
- Develop & Implement process & systems
    - Create registration process for scheme participants and review/acceptance
    - Creation of programme guides for participants (importers/collection points/transporters/processors/manufacturers)
    - Create process and guide for auditing and compliance
    - Create process for Fee and/or data collection with NZ Customs and NZTA
    - Create process for data matching verification of submitted incentive claims
    - Create process for payment for services/allowances to registered participants
    - Create process for refund of Fee for verified importers
    - Create process for review of Community grant, Research Fund, Orphan/Legacy funding applications
    - Create process for annual review of incentive payments, new end uses/technology
- Conduct Industry Consultation workshops
- Consult with councils, industry and general public on the scope of the scheme and how they interact with it
- Identify and register scheme participants (approximately 1,000) to this accredited process
- Continue identifying key Stakeholders and develop relationships
- Complete the Product Stewardship Scheme Accreditation Process
- Design and document the ISO14001:2015 Environmental Management System (EMS)
- Design and document the Health & Safety Management plan using AS/NZS ISO 45001 the international standard for health and safety at work

### 1.2 Business As Usual: From completion of 24 month Implementation Phase for a further X years.

General Programme Management of the Tyrewise Programme including:

- Provide core services – 0800#, administration, website, marketing materials
- Preparation of an annual Business Plan and operating budget for approval by ASNZ
- Manage IT and Data Management for all operational interactions with the accredited participants and reporting stakeholders (e.g the governance body, Central Government)
- Populate the Waste Tracking Software and introduce enhancements from time to time
- Deliver communication and advertising activities
- Deliver education and public awareness campaign - public road show, advertising, events
- Deliver Training programmes and keep training materials current
- Maintain and enhance all processes & systems
- Conduct Industry Consultation workshops
- Consult with councils, industry and general public on the scope of the scheme and how they interact with it
- Continue registering scheme accredited scheme participants, conducting audits on a scheduled basis
- Continue identifying key Stakeholders and develop relationships
- Complete the Product Stewardship Scheme Accreditation Process
- Design and document the ISO14001:2015 Environmental Management System (EMS)
- Preparing quarterly reports for ASNZ and at least annual reports for the Ministry for the Environment
- Prepare full annual report for public disclosure on behalf of ASNZ

## 2.0 Compliance

The ISO 14001:2015 standard requires the Programme Manager to meet a stringent set of criteria in terms of infrastructure and environmental management planning to demonstrate that it complies with environmental laws and standards, and to continuously improve its environmental performance and achievement of measurable environmental objectives. As the Tyrewise programme is an accredited Product Stewardship programme monitoring of waste minimisation activities on an annual basis and reporting of variances and new initiatives is required. All programme operations risks should be identified, and mitigation of these risks identified using a risk matrix.

## 3.0 Supply Process & Timetable

Auto Stewardship New Zealand is required to show a contestable process for the Programme Management of Tyrewise. Organisations wishing to supply an EOI should do so no later than 5:00pm, <<DATE>>.

The Tyrewise EOI evaluation group will review all submissions against pre-set criteria. A recommendation will be made to the Tyrewise PSO by the review group to:

a) Enter into more detailed discussions with one or more of the respondents with a view to selecting preferred contractor(s), or

b) Enter into a tender process to select preferred contractor(s).

ASNZ may enter into negotiations with the preferred contractor(s) with a view to signing off a Programme Manager Agreement by end of <<DATE>>.

## 4.0 Statement of Requirements

Respondents are asked to provide the following information:

- Structure of company, years in business, ownership
- A demonstration of their experience in managing diverse stakeholders to positive outcomes
- Size and scale
- An understanding of Product Stewardship and its influence on sustainable supply chains
- Written information about previous operational experience in areas comparable to the services required, listing the name of the company and/or contact person for reference.
- Provide a summary of their health and safety record over the past two years including:
  - Accident type and services, time off for injured employees
  - Copy of Health & Safety Policy
  - Copy of ACC employer claims history notification
- Provide their environmental record over the last five years including any details of any fines, infringement notices, abatement notices or enforcement orders issued to the contractor or named subcontractors resulting from the management of hazardous substances and/or wastes.
- For key management personnel, provide details of their name, experience and skills relevant to the services they are registering their interest to provide.
- List plant and equipment which you propose to use to provide the service (make and year)
- List any proposed subcontractors which the contractor wishes to use to provide the service
- Provide an **indication** as to the level of cost of their service offering for the Implementation Phase and Business As Usual.

## 5. Expressions of Interest Terms and Conditions

This section describes the procedures and practices used by ASNZ to govern this EOI process and sets out some of the terms and conditions of the registration process.

Respondents are instructed to carefully read and understand all requirements detailed within this EOI. Failure to meet any requirement in full may jeopardise, and perhaps eliminate the acceptability of the submission.

5.1 Respondent Questions

All questions concerning this EOI must be directed by email exclusively to the contact named below.

Auto Stewardship New Zealand

PO Box XXXX

AUCKLAND

Attention: The Chairman

Email: xxxx@autostewardship.co.nz

### 5.2 Clarification and Negotiation

ASNZ may consider and treat submissions at its complete discretion and is not bound to accept any submission put forward or to undertake any further discussion or negotiation with all or any respondents.

ASNZ, may however, in its sole discretion, negotiate further with one or more of the respondents who present submissions and if it so elects with more than one respondent concurrently to the exclusion of all other respondents. ASNZ may at its discretion invite one or more respondents to join a short list, or reject any or all respondents.

ASNZ is not bound to give any reason for any of its decisions, nor is it bound to give any feedback to any respondents. Should a respondent request clarification on a point relating to this EOI or the Tyrewise Programme, ASNZ may issue notices to the other respondents.

ASNZ reserves the right to vary or cancel the EOI or the time frames at any time, for any reason. ASNZ may, at its discretion, waive any informality or non compliance with this EOI.

### 5.3 Conflicts Of Interest- Exclusion

ASNZ requires that conflicts of interest (potential or actual) do not arise in the delivery of the various services that are to be performed. To achieve this ASNZ may, in its absolute discretion and without being required to give any reason for its decision, prohibit any Respondent from submitting a proposal, or exclude or reject any submission or proposal from consideration or further consideration, for any of the services. No Respondent may have any claim against ASNZ by reason of rejection or exclusion on the above basis. This power is in addition to any other power or discretion of ASNZ in this EOI

### 5.4 Information Provided

The information provided by ASNZ connection with this EOI or otherwise is indicative only. ASNZ does not warrant the accuracy, reliability or completeness of any matter or information provided, nor makes any representation as to such information. The Respondent is solely responsible for assessing the information provided, and submissions are made solely on the Respondent's own judgement.

As this is an EOI, the information contained herein is contained solely for the use by respondents. The information is not all-inclusive and does not necessarily contain all the information that a Respondent may require.

### 5.5 No Legal Relations

ASNZ does not intend to create any legal relations or obligations with the Respondent by inviting the Respondent to submit a submission. In providing a submission, the Respondent acknowledges that

no legal relations will be created between the Respondent and ASNZ. It is acknowledged that the Tyrewise Ltd is at liberty, at any time, to terminate the EOI process.

### 5.6 Confidentiality

Information pertaining to Tyrewise provided to or obtained by the Respondent, its employees and agents as a result of its participation in this EOI process is confidential to ASNZ and is provided to the Respondent for the purpose of inviting submissions only. The information must not be disclosed by the Respondent to any third party, or used by the Respondent for any other purpose.

### 5.7 Rejection

No respondent may have claim against ASNZ by reason of rejection or exclusion for any reasons under this EOI.

The submission of a Respondent may be rejected and not receive further consideration where:

The submission has failed to meet or has not been submitted in accordance with instructions and the procedural requirements of this EOI; or

The Respondent fails to cooperate in any attempt by ASNZ to verify any information provided by the Respondent.

The submission of any Respondent may be rejected at any time during the evaluation process where it is found that the submission contains incomplete, false or misleading information.

ASNZ is not bound or liable to accept any submission put forward or to undertake any further negotiation with all or any parties.

### 5.8 Incurred Costs

ASNZ shall not be liable for any costs incurred by respondents for the preparation or presentation of submissions, or participation in any further evaluation process, discussions or negotiations.

### 5.9 Submission Return

The submission and accompanying materials submitted by the respondents are the property of ASNZ and will not be returned. ASNZ will respect the copyright and proprietary systems which may be presented as part of a respondent's expression of interest.

### 5.10 Material Changes

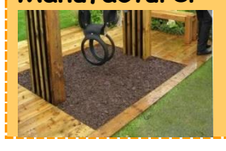
Respondents must advise ASNZ of any material change in the undertakings or proposed arrangements contained within their submission until this evaluation process is concluded and respondents are advised of the status of their submission. Failure to provide such notification may nullify the submission.

### 5.11 Authorising Officer

The submission must designate the individual who is authorised to negotiate any subsequent supply agreement on behalf of the Respondent.

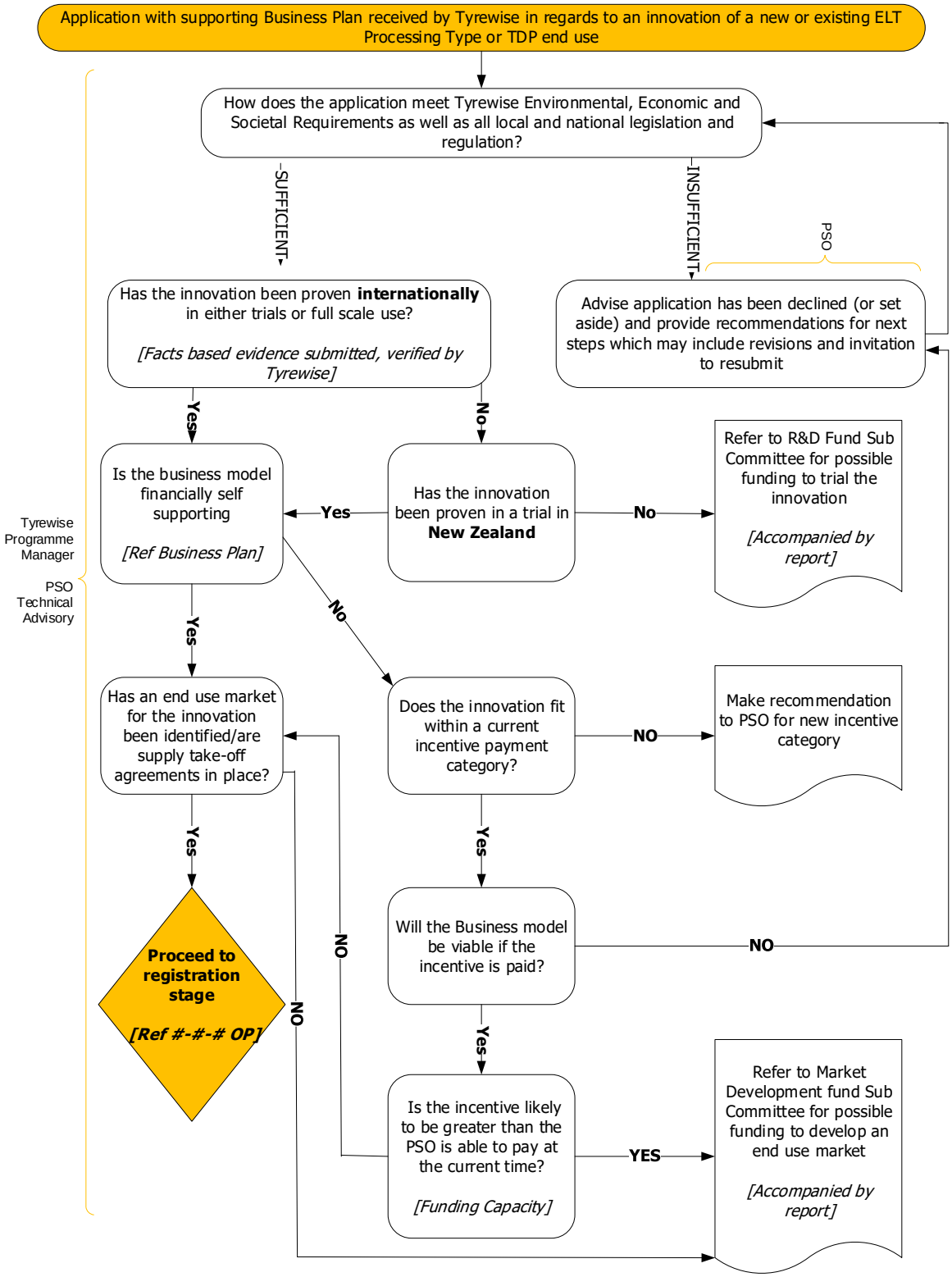
# Appendix E

## A3: What Tyrewise means for me – information for participants

| WHAT AM I?  | WHAT DOES THIS MEAN?  | DO I HAVE TO PAY?  | DO I GET PAID BY TYREWISE?  | ANY SMALL PR INT I SHOULD KNOW?  |
|---|---|---|---|---|
| **Tyre Importer**  | You are an organisation which imports tyres into NZ.<br>- New tyre importers<br>- Used tyre importers (includes casings)<br>- New vehicle importers<br>- Used vehicle importers | **YES**<br><br>**'The Tyrewise Fee'** is captured for all tyres at the first point of importation or registration.<br>- Fee or dataset for loose tyres included in customs payments<br>- Fee or dataset for tyres on all vehicles collected by NZTA at first registration | **NO** | All importers would be mandated to contribute to an accredited stewardship scheme (such as Tyrewise) under the Waste Minimisation Act 2008 Priority Product legislation.<br><br>Importers may be able to claim rebates if the tyres they import fall outside of eligibility criteria for a stewardship programme (e.g. mobility scooter tyres). |
| **Consumer**  | **You are 'Joe Public'**.<br><br>When you buy new tyres you need to get rid of the old ones.<br>OR<br>You may have old tyres for other reasons that you need to get rid of. | **NO**<br><br>The cost of the programme is built into the price of all new tyres This is called **'The Tyrewise fee'.** | **NO**<br><br>You do not get any money for recycling your tyres. | Landfills will no longer accept tyres.<br><br>You must recycle your tyres via a registered collection site, or you can leave them with the company that fitted your new tyres.<br><br>AND<br><br>Any inappropriate dumping of tyres will result in fines and/or prosecution. |
| **Generator**  | You are either:<br><br>A tyre seller and/or fitter who takes old tyres when you sell new ones<br><br>OR<br><br>A large user of tyres & your tyres are replaced on-site | **NO**<br><br>Any tyres that you take from your customers are collected for free. | **NO**<br><br>You should not charge customers for taking their old tyres. (but remember you don't have to pay to have them collected either) | If tyres are a **Priority Product** this means that you will need to register with **Tyrewise** as a condition of selling/fitting tyres.<br><br>If you sell or fit any tyres, you MUST be prepared to take the used tyres from your customer for disposal.<br><br>These tyres can either be kept by you for collection **or** taken to a **Collection Site.**<br><br>Your may be asked by **Tyrewise** to provide auditable reports on the volume of tyres that you accept. |
| **Collection Site**  | You are a place where **Consumers and/or Generators** can drop off unwanted tyres if they aren't purchasing new ones (such as a transfer station) | **NO**<br><br>Any tyres that you collect at your site are picked up for free. | **YES**<br><br>Collection sites are paid a nominal service fee by **Tyrewise** to act as aggregation points for tyres to be collected.<br>Payments are on a sliding scale (Very busy sites would get paid more than small sites) | You must be registered with **Tyrewise** as an approved **Collection Site**.<br><br>Your may be asked by **Tyrewise** to provide auditable reports on your collection volumes.<br><br>A **Generator** could also act as a **Collection Site** and aggregate tyres for **Customers** and other **Generators**. |
| **Transporter**  | You collect tyres from **Generators and/or Collection Sites** and deliver them to **Processors** | **NO**<br><br>All tyres are collected at no charge to the **Generator** or **Collection site.** | **YES**<br><br>**Tyrewise** pays you for the tyres you deliver to a **Processor**. | You must be registered with **Tyrewise** as an approved **Transporter.**<br><br>So you get paid, you must have a contractual relationship with a **Processor / Manufacturer** to accept the tyres.<br><br>Your may be asked by **Tyrewise** to provide auditable reports on your transported volumes. |
| **Processor**  | You **transform** the tyres in some way so that they can be put to a good end-use. | **YES**<br><br>You may pay **Transporters** to deliver the tyres you need.<br><br>(This is for you to negotiate - **Tyrewise** does not get involved.) | **YES**<br><br>In addition to money you make from selling your products, **Tyrewise** makes a payment per kg of tyres processed and supplied/sold to a **Manufacturer**.<br><br>The level of payment depends on what your tyre derived product is eventually used for. | You must provide evidence of the **Manufacturers'** end-use for the processed material in order to receive payments from **Tyrewise**.<br><br>Your reports may be subject to audit by **Tyrewise** in order to ensure the subsidy is being paid correctly. |
| **Manufacturer**  | You purchase tyre derived products from a **Processor** to use in your business (such as for fuel or as an ingredient for a new product).<br><br>NOTE: If you purchase whole tyres directly from a **Transporter** you would be classified as a **Processor** as well as a **Manufacturer.** | **YES**<br><br>Typically you would pay a **Processor** a market price for the products.<br><br>(This is for you to negotiate - **Tyrewise** does not get involved) | **YES**<br><br>**Tyrewise** pays you for the tyre derived product you use in manufacturing**.** | You will need to provide **Tyrewise** with evidence of what you use the tyre derived products for. This is because it affects the payments made to you by **Tyrewise.** |

# Appendix F

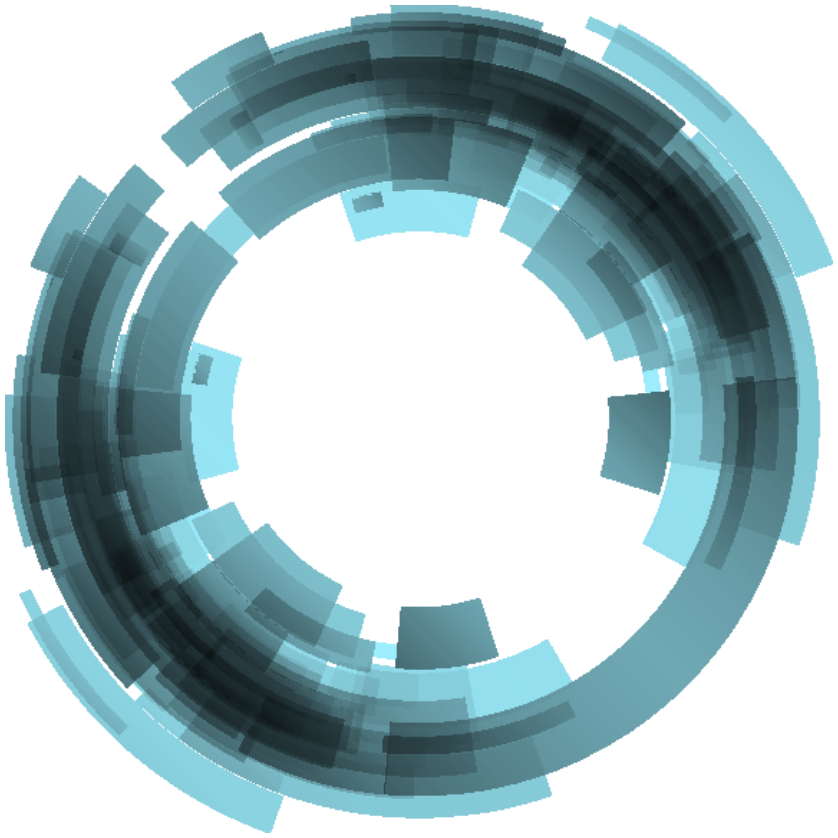
## Tyrewise Procedure for review of innovation (draft)



# Appendix G

## Document control

| | | | |
|---|---|---|---|
| 19/05/20 | Pre-Release Final | Tyrewise 2.0 Master Report | 3R Group Ltd<br>Tyrewise Project Managers |
| 22/7/20 | Final with amends following Governance Group review | Tyrewise 2.0 Master Report.<br>Grammatical changes<br>Position statements re use of tariff codes to determine tyre sizing (Box 1)<br>Position on declining levy over 10 years. (Box 7)<br>Boxes renumbered<br>Definition of Sale and Seller added | 3R Group Ltd<br>Tyrewise Project Managers |



# Global ELT Management – A global state of knowledge on regulation, management systems, impacts of recovery and technologies

**December 2019**

# Contents

# Executive summary

Deloitte was commissioned by the World Business Council for Sustainable Development (WBCSD) in the context of the Tire Industry Project to conduct a study on end-of-life tire (ELT) management and prepare the present report. This report has been submitted and published by WBCSD. This present study provides an update to the State of Knowledge (SOK) in a selection of countries (Part I) from the previous WBCSD ELT study conducted between 2016 and 2017 but also delves deeper into aspects such as studies conducted on the impacts of recovery methods, products, applications on human health and the environment, and research and development of advanced ELT recovery technologies. In addition, the report also analyses the feasibility of different major ELT recovery categories (Part II) through the associated methods, products and applications according to a number of criteria covering regulatory context, technical feasibility, economic drivers, and sustainability considerations.

The results of the study presented in this report are based on information collected via literature review and interviews with a variety of different stakeholders. The quantitative data on ELT management presented in this study needs to be interpreted in relation with the methodological assumptions and limitations. We would like to thank all of those who kindly participated in the study, through interviews or by other means, supporting the completion of this project.

The purpose of **Part I**, the SOK, is to provide an overview of the current ELT management systems for a selection of 45 countries: Argentina, Brazil, China, Europe (Throughout the report the scope for the region includes countries covered by ETRMA - European Tyre & Rubber Manufacturers' Association), India, Indonesia, Japan, Mexico, Nigeria, Russia, South Africa, South Korea, Thailand, and USA which cover 83.5% of vehicles in use in the world (Source: OICA, [International Organization of Motor Vehicle Manufacturers], 2015 data. Including the countries from the 2016-17 WBCSD TIP ELT study as shown in Figure 3, the coverage rate reaches 89%). In relation to the last study, the scope of this report focuses on countries identified as having well-established ELT management systems (including data availability), countries with particularly interesting dynamics regarding growth in recovery methods, products and applications markets, and countries that have significant potential for development in this domain. Nigeria was added to the scope due to its significant contribution to the number of vehicles in use and for the potential for development of a formal ELT management system and ELT markets in the country.

Different ELT management systems exist and there is no ‘one size fits all’ approach to a successful system. Extended Producer Responsibility (EPR) systems or take-back obligation system, government responsibility financed through a tax, and free market systems make up the management systems identified during the SOK. In practice, hybrid systems can be implemented and other variants of these systems also exist. Overall, some form of intervention and policy measure from the government is usually necessary in order to properly develop the ELT recovery industry. Transportation generally represents an important cost factor especially when collection points are not accessible or if infrastructure is insufficient. That can constitute a barrier in some countries that have a free market system. Therefore, in countries where an eco-fee is collected, a significant part of it is usually allocated to cover the transportation fees.

Based on the results from the current SOK, the total amount of ELT recovered (including ELT collected in China with undetermined end use) in the 13 countries and the region of Europe (as listed above) is estimated to be around 26 million metric tons (57 billion lbs) per year, while the amount of ELT generated is estimated to be around 29 million metric tons (64 billion lbs). The countries and regions that recover the largest quantities of ELT are China, United States and Europe. China is considered to have the highest recovery rate, of 100%, although just under two thirds are not formally registered and are deemed to be ELT collected with undetermined end use. Meanwhile, the management system in Brazil was reported as just short of full recovery (99.8%), in

relation to targets based on generation, through EPR. Finally, India follows closely (98%) with a significant portion also informally recovered.

The technologies selected for evaluation in **Part II** were identified as major global categories during the extensive SOK review of ELT management around the world. The scope of this Part II includes: cement kilns and other energy production (e.g. power plants and boilers), civil engineering (e.g. barriers and embankments), granulation (e.g. rubber-modified asphalt, artificial turf infill, playgrounds, molded rubber products), pyrolysis, reclamation and steel production. As in the last study, the main ways to recover ELT have been grouped into the following categories: material recovery, energy recovery and civil engineering and backfilling.

Overall, the majority of the ELT generated (in metric tons) in the countries/regions included in the present study combined with the additional countries from the 2016-17 WBCSD TIP ELT study are distributed to forms of recovery with a determined end use including **material recovery** (42% of ELT generated) and **energy recovery** (15% of ELT generated) with a small portion directed to civil engineering and backfilling (2% of ELT generated) (see world map on page 21). Although the two recovery sub-categories, tire-derived fuel (TDF) and tire-derived material (TDM), are rather well spread at the global level and used as the main recovery routes in a large number of countries, the production of reclaim rubber is mainly developed in Asian countries: China, Japan and Thailand. Reclaim rubber is the main confirmed recovery route in China (34% of the total domestic recovery market) that represents close to one fifth of the total ELT recovered (including civil engineering and backfilling) for the selected scope. Reclaim rubber is mainly used in rubber-molded products and has been used in new tire manufacturing, albeit generally in only small quantities.

Forms of material recycling to obtain products with value and a significant lifespan stand out in particular in terms of overall feasibility. For example, although the production of rubber granulates and powder can require higher process costs as well as demanding efforts to create new partnerships with other secondary end-user industries, it also generates products with greater added value and has better environmental performance in terms of resource saving and emissions reduction.

Some regions or countries have set objectives to encourage recycling and limit other forms of recovery, while others have established more stringent **regulation** to exclude energy recovery from ELT management systems. Setting up grant programs is also common in some areas, such as North America, where subsidies are given for the use of rubber granulate in high value applications, promoting material recycling.

Energy recovery can be a particularly efficient way to deal with high volumes of ELT and eliminate long-standing stockpiles because it is generally technically straightforward to implement and can be deployed on a large scale to achieve relatively quick pay-back for the initial investment. The use of ELT as an alternative fuel is also encouraged to reduce CO2 emissions. Nevertheless, as a general trend, once a country has established a more mature approach to ELT management, material recovery is often supported through policy-making prioritizing recycling over other forms of recovery, such as energy recovery, following a waste hierarchy (prevent, reuse, recycle, recover, dispose). Indeed, energy recovery may be constrained by regulatory context aligned with the waste hierarchy, and the compliance with or promotion of such waste management hierarchies is common in many of the regulatory frameworks assessed in this study. However, other more indirect policies in the context of energy transition such as greenhouse gas emission (GHG) reductions and energy security can be responded to through use of ELT as an alternative fuel, with a high calorific value, renewable energy component and reduced carbon intensity relative to fossil fuels such as coal.

From a **technical feasibility** standpoint, various recovery routes are capable of treating significant volumes. For instance, cement kilns can absorb large amounts of ELT without significant technical difficulties. However, as capital investment is necessary for adaptation, a long-term perspective is required. Civil engineering applications on the other hand do not require the same level of initial investment but have relatively high capacities. Despite the currently limited market, civil engineering may have considerable potential. Meanwhile, TDM obtained through granulation is overall a straightforward well-established process with particularly advantageous properties and performance for applications such as rubberized asphalt.

Enabling both material recovery and energy recovery, the cement industry, with significant capacity, remains an important hybrid destination for ELT provided that a number of **economic criteria** are met, including traditional fuel costs remaining high in comparison and the availability of gate fees as an additional incentive.

For the collection and delivery tied to the cement industry, for instance, this was as simple as the retraction of gate fees provided through extending producer responsibility financial transactions.

Meanwhile, business profitability depends on the price of the TDF or TDM. The economic assessment of ELT recovery routes must make a distinction between those that depend on the added value of output products using ELT as feedstock (material recycling in particular), and those that replace traditional materials or fuel with ELT. The economic model for several granulation applications may require relatively high investment costs for equipment and infrastructure, while the economic viability of other applications will depend on the price of the traditional counterpart (e.g. fuel). The competitiveness of TDF or TDM is directly affected by the prices of competing products and materials.

The **sustainability** considerations relative to ELT recovery routes can be assessed through their environmental performance in particular. Some recovery routes have considerable benefits in terms of avoided impacts according to several life cycle analysis/assessment (LCA) studies, such as the use of ELT in cement kilns and in artificial turf infill. Seizing the importance of this issue, new technologies are placing a lot of focus on mitigating negative impacts and enhancing efficiency, with reductions in energy and water consumption for example. The impact of these technologies on human health must also be considered, and a wide array of studies have been conducted on those that are considered of potential risk. Nevertheless, public and industry perception play a crucial role in the acceptance of these technologies, and therefore in the further development and expansion of recovery routes.

Finally, the major factors differentiating the feasibility of ELT recovery technologies in countries with developing or non-existing ELT management systems when compared with those with mature ELT management systems are directly related to governance and infrastructure. Where little framework exists, the stages of the supply chain lack synergy and consequently the case for investment in large scale facilities is harder to make.

# Glossary of terms used

**Cement and other energy production:** Recovery methods by which ELT are used as tire-derived fuel (TDF) in energy intensive industries such as cement kilns, power plants and industrial boilers. In the case of cement kilns both energy and material recovery occurs in the process.

**Civil engineering and backfilling:** Recovery route where ELT are recovered through civil engineering applications (water retention and infiltration basins, supporting walls, etc.) and through landfilling of mining activities (tires that are shredded and mixed in with other geological materials to reclaim sites that have been mined out for example).

**Devulcanization:** Chemical process by which bonds of vulcanized rubber are broken without shortening the carbon chains. Devulcanization is a recovery method for material recovery.

**Devulcanized rubber:** Rubber produced from the devulcanization process.

**End-of-Life Tire or End-of-Life Tires (ELT):** A tire that can no longer serve its original purpose on a vehicle. This excludes tires that are retreaded, reused, or exported in used cars.

**End-of-life vehicle (ELV):** A vehicle that can no longer serve its original purpose.

**Energy recovery:** Recovery category where ELT are recovered as tire-derived fuel (TDF). For the purpose of this study, it was considered that 75% of ELT used in cement kilns are recovered as energy. For ELT that are recovered through unknown means of recovery, a 50/50 split has been made between energy recovery and material recovery except for China where material recovery is favored.

**Extended Producer Responsibility (EPR):** In the case of ELT, the producer of tires (manufacturer or importer) is held responsible by law to organize the ELT management, with targeted volumes generally defined based on the quantities of tires put onto market.

**Gate fee (or tipping fee**): The price levied on the entity delivering ELT to a landfill or to a recovery or a recycling facility.

**Granulation:** Recovery method which involves the breaking down of ELT into smaller particles through different processes to obtain rubber granulate and powder, used in multiple applications.

**Hybrid recovery route:** ELT recovery routes which lead to both energy and material recovery (e.g. use of ELT in cement kilns).

**Material recovery:** Recovery route category where ELT are recovered as a new material. It can be used to produce tire-derived material (TDM) for instance. For the purpose of this study, it was considered that 25% of ELT used in cement kilns are recovered as material. For ELT that are recovered through unknown means of recovery, a 50/50 split has been made between energy recovery and material recovery except for China where material recovery is favored.

**Off–the-road tires (OTR tires)**: Tires used on large vehicles that are capable of driving on unpaved roads or rough terrain. Vehicles include tractors, forklifts, cranes, bulldozers, earthmoving equipment, etc.

**OICA, International Organization of Motor Vehicle Manufacturers (Organisation Internationale des Constructeurs d'Automobiles):** International trade organization representing the global automotive industry.

**Producer Responsibility Organization (PRO):** An entity that is either set up directly by a government or by producers in the context of EPR, to organize ELT management and associated requirements such as recovery targets.

**Pyrolysis:** Decomposition of ELT material into oil, gas, steel and char in different proportions depending on conditions under pressure and high temperatures and usually the absence of oxygen. Carbonisation, gasification and thermolysis are related recovery methods.

**Reclamation/reclaim rubber process:** Conversion of vulcanized rubber waste into a state in which it can be mixed, processed, and vulcanized again. Reclamation usually involves a chemical process. It is a recovery method. This does not refer to authorized landfill or backfilling in this case.

**Reclaimed rubber**: Rubber produced from the reclamation process, which can be vulcanized again.

**Recovery application:** The use of a recovery product (see below) e.g. tire granulate in rubber-modified asphalt.

**Recovery method:** The process used to treat an ELT e.g. granulation.

**Recovery product:** The output following processing through a recovery method e.g. tire granulate.

**Recovery route (RR):** The value chain from the point of collection, through processing and treatment methods to products and applications reaching end markets. For the purpose of this study, retreaded, reused, landfilled or stock-piled tires are not considered as ELT recovered.

**Recycling:** This involves reprocessing of articles such as ELT to produce products, materials or substances. This excludes the production of tire-derived fuel (see below).

**Regrooving:** Consists of cutting a pattern into the tire's base rubber.

**Retreading:** Also known as recapping or remoulding. Process of renewal of tires for reuse by replacing the worn-out rubber belts/treads with new ones.

**State of knowledge (SOK):** A review and analysis of the current information available on a topic. In this context the aim is to provide an overview of the ELT management systems in place including the ELT collection rates, recovery routes, and management methods.

**Steel production:** Use of ELT in the form of extracted tire-derived steel for the production of new iron, or steel in electric arc furnaces, steel mills and foundries for the manufacturing of secondary steel. Use of ELT in steel production is a recovery method.

**Tire-derived material (TDM):** Recovery sub-category. TDM is a product made from the recycled material of ELT.

**Tire-derived fuel (TDF):** Recovery sub-category. TDF is ELT used as an alternative fuel to produce energy through combustion (energy recovery). TDF also refers to the fuels produced by a specific treatment of ELT (such as pyrolysis, which can produce oil and gas output products along with a TDM portion). Although the use of ELT in cement production is considered both energy and material recovery, it is included in TDF for the purpose of the report.

**Tire Industry Project (TIP) members: Bridgestone** Corporation, **Continental** AG, **Cooper Tire & Rubber** Company, The **Goodyear** Tire & Rubber Company, **Hankook** Tire Co., Ltd., **Kumho Tire** Company Inc., Compagnie Générale des Établissements **Michelin**, **Pirelli** & C.S.p.A., **Sumitomo Rubber** Industries, Ltd., **Toyo Tire Corporation**., and The **Yokohama** Rubber Co., Ltd.

**Total ELT generated (from available sources):** Amount of ELT generated (in metric tons) according to the most reliable and comprehensive source available.

**Total ELT recovered (excluding civil engineering and backfilling):** Amount of ELT recovered (in metric tons), through material and energy recovery. This does not include any tires that are recovered for civil engineering and backfilling, abandoned, landfilled or stockpiled.

**Total ELT recovered (including civil engineering and backfilling):** Amount of ELT recovered (in metric tons), through material, energy recovery and civil engineering & backfilling. This does not include any tires that are abandoned, landfilled or stockpiled.

**Types of vehicles:**
- Passenger cars: road vehicles excluding motorcycles with a capacity of below nine people in total (i.e. nine seats or less - inspired by the OICA definition).
- Commercial vehicles: light duty commercial vehicles, coaches, buses, heavy duty vehicles such as trucks (inspired by the OICA definition). These will also include the OTR vehicles.
- Motorcycles: Two and three-wheeled motorized vehicles including mopeds, scooters and motorcycles.

**Vehicles in use:** All registered vehicles on the road during a given period-specific date (inspired by the OICA - definition).

# Introduction

Formed in 2005, the Tire Industry Project (TIP) serves as a global, voluntary, CEO-led initiative, undertaken by 11 leading tire companies with an aim to anticipate, identify, analyze and address the potential human health and environmental impacts associated with tire development, use and management through end of life. TIP is a proactive organization that operates under the umbrella of the World Business Council for Sustainable Development (WBCSD) and is designed to advance sustainability throughout the industry. Together, TIP member companies work to collaborate on sustainability challenges facing the industry, improve understanding of and educate about these challenges, and develop potential solutions for a more sustainable future.

### Context and objectives of the ELT project

The tire industry recognizes that there are both opportunities and challenges associated with tire manufacturing and sustainable development. By taking an early look at industry issues, TIP works to more fully understand environmental and health challenges pertinent to the tire industry and formulate an approach for making the industry more sustainable.

TIP has an objective to advance ELT management globally by engaging stakeholders in a process of identifying and sharing best practices.

### Objectives of this study

This study has been conducted with the support of Deloitte to collect and summarize current information on ELT management practices and data for a selection of 45 countries.

The report's analysis of the current ELT management in the countries within this scope includes:

- An overview of current and prospective regulations, ELT management systems (collection, transport & intermediate treatment stages);
- The distribution of ELT across recovery methods, products and applications;
- A better understanding of the feasibility of different recovery route categories and associated methods, products and applications.
- An overview of studies conducted on the risk of impacts on health and the environment and
- A panorama of advanced technology and innovations in ELT recovery to overcome risks and improve viability.

There is fairly good knowledge of ELT management and practices in Europe and countries such as the USA, Japan, South Korea and Brazil where the existence of regulatory authorities, trade associations or ELT management organizations allow the collection and consolidation of rather comprehensive data that can be easily accessed. However, there is still a diversity of methods used to obtain the data, with different vocabularies and different scopes covered (in terms of types of tires). Those countries and regions are also the ones with relatively mature ELT management systems and best practices to share.

On the other hand, limited information is publicly available in other key countries such as China, India, Argentina, Thailand and Nigeria for parts or all of the ELT market in certain cases. The lack of data availability can be explained by the coverage level of existing formal ELT management systems and reporting capacity for consolidating the data notably on specific distribution. The opportunities for the future of ELT management at the global level are tremendous in these countries. Limited knowledge of statistics and ELT practices can be an impediment to improving the local and global ELT management.

In addition, very heterogeneous practices can be observed in terms of ELT management from one country to another in terms of legislative framework, network organization and present and future markets for

Recovery Routes. A better knowledge of these practices will allow for the identification of good practices and opportunities for future collaboration with local stakeholders.

Therefore, the purpose of the state of knowledge (SOK) is to provide an overview of the current ELT management systems for a selection of 45 countries:

Argentina, Brazil, China, Europe (Throughout the report the scope for the region includes countries covered by the European Tyre & Rubber Manufacturers' Association scope [ETRMA]), India, Indonesia, Japan, Mexico, Nigeria, Russia, South Africa, South Korea, Thailand, and USA; which covers 83.5% of vehicles in use in the world (Source: OICA, 2015 data. Including the countries from the 2016-17 WBCSD TIP ELT study as shown in Figure 3, the coverage rate reaches 89%).

The main criterion used for the selection is the number of vehicles in use. We ensured that the selection includes the countries with the most important car markets, representative of different geographical zones. In relation to the last study conducted between 2016 and 2017[1], the scope of this present report focuses on countries identified as having well-established ELT management systems (including data availability), countries with particularly interesting dynamics regarding growth in recovery methods, products and applications markets, and countries that have significant potential for development in this domain. Nigeria was added to the scope due to its significant contribution to the number of vehicles in use and for the potential for development of a formal ELT management system and ELT markets in the country.

### Methodological approach

The results of the study presented in this report are based on information collected via literature review and interviews with stakeholders.

A stakeholder mapping has been performed in order to include key stakeholders in the data collection and consultation process.

The findings presented in this report are solely based on the data sources presented above. The purpose of the study is to capture the best knowledge possible with the means and timeline defined for the project. Efforts have been made in order to avoid introducing biased opinions in the data collected through the interviewees, by presenting the most factual information possible and being transparent about the sources of information. It is important to note that the intention of the study is not to audit nor validate the data collected from different sources.

The quality of quantitative data collected on ELT management varies from one country to another:

- Countries where there is no formal organization in charge of the ELT management at the national level generally suffer from a lack of reliable consolidated data. Inconsistent data from different sources can be observed in these cases.
- Even in countries where official data is published by a formal, well-recognized organization, it still needs to be interpreted with caution. For instance, ELT generated by ELV are not always included in the consolidated data.

Another limitation is related to the share of ELT from illegal import, treated by illegal operators or never declared by legal operators, which can constitute quite a significant volume, even in countries with a mature ELT system. The share is not included in the official consolidated data where the volume of total ELT generated is underestimated and the recovery rate can be overestimated.

Retreading and reusing tires that can still meet safety standards can reduce ELT generation by prolonging the lifespan of the product. However, these practices are generally limited, due to technical and safety reasons, to specific tyre categories, such as truck and bus, OTR, agricultural, and airplane tyres. In some countries, retreaded and reused tires are included in the official recovery rates. However, quantifying the amount of these tires reinjected in the market is not always possible and the reliability of the data can be questionable because assumptions are often used regarding the number of times a tire can be retreaded/reused. For this reason, the data presented in this study focuses only on ELT.

Therefore, the data presented in this study needs to be interpreted carefully. For more information regarding the limitations, assumptions and scopes of the data collected and consolidated in the study and the assessment of the data reliability, please refer to the chapter "Part I: State of Knowledge on Targeted Regions/Countries".

We would like to thank all of those who kindly participated in the study, through interviews or by other means, supporting the completion of this project.

[1] Other countries studied in 2016-17 included: Australia, Canada, Malaysia, Morocco, New Zealand, Saudi Arabia, and Ukraine.

# Part I: State of Knowledge on Targeted Regions/Countries

The purpose of this SOK is to get an overview of the current ELT management systems for a selection of countries: Argentina, Brazil, China, Europe, India, Indonesia, Japan, Mexico, Nigeria, Russia, South Africa, South Korea, Thailand, and USA. This chapter will summarize this SOK based on individual reports.

### Methodology on data collection, consolidation and limitations

As stated in the Introduction, the information presented in this chapter has been collected through two main approaches:

1. Literature review such as public studies, public databases and statistics, academic studies, existing and emerging regulations, etc.
2. Stakeholder consultation process based on interviews. In some cases, mainly for language barriers, the information was collected via written feedback after an interview guide was sent to the interviewee.

For the purpose of comparing the different countries' performances in terms of ELT management, a set of definitions and scopes have been used. For this reason, the data available in the different sources has been adjusted when necessary in order to align the definitions and scopes with those used in this study. The definitions (such as what is excluded/included in ELT) is explained in the chapter "Glossary of terms used" of this document. Nevertheless, the following elements must be taken into account when analyzing the data included in this study:

- The following is NOT considered as ELT and will therefore be excluded from data: retread tires, second-hand tires and tires exported with used cars. This change in scope is the main reason why some of the Recovery Routes communicated in the study may vary from the source data.

- When possible, the most recent source of data (mostly 2017) has been used. However, it's important to note that not all of the countries have data corresponding to the same year. No extrapolations have been made for alignment to a given base year.

- When available, the unit used to measure ELT management indicators is metric tons. Conversions between short tons (USA) to metric tons or from number of units to tons have been made where necessary. Data regarding ELT generation in Mexico and India are available in number of tires and not in tons. An estimation of 10kg/tire has been used for Mexico and an average of 8kg/tire in the case of India.

- The ideal target scope for this study includes all types of tires: passenger car, truck, and airplane, agricultural, two and three-wheel as well as OTR tires. Nevertheless, the data presented hereafter is limited to the scope of each source of data found. Passenger cars, bus tires and truck tires are included in all of the country/region data (these are the most significant quantities in terms of units of ELT generated). OTR tires (an important category because of the significant weight per tire) and the other categories are not always included in the source data. The completeness of data with regards to our target scope is evaluated in each country/region report. Where possible, the missing ELT categories are specified.

A cross analysis of data consistency between different sources has been performed to conclude the data reliability. Regarding the quantity of ELT generated, the data collected at the local level has been compared with the data estimated based on the number of vehicles in use published by OICA (2015 data). In case of significant inconsistency and where the level of credibility is deemed equal, the data which gives the lower recovery rate is used as a precaution to avoid overestimation.

- In order to further analyze the consolidated data, the different recovery routes have been grouped within the following three categories: material recovery (excluding civil engineering & backfilling), energy recovery and civil engineering & backfilling. Although for some recovery routes, the split between material and energy recovery is debatable, we have calculated the tons of ELT recovered based on the following assumptions:

- Tons of ELT used in cement kilns: 75% energy recovery and 25% material recovery[2];
- Steel production (except when ELT is burnt as a TDF): 100% material recovery;
- Pyrolysis: 100% material recovery;
- When recovered through an unknown means of recovery, or when data available regarding exportation of shredded tires: 50% energy recovery and 50% material recovery.

Data collection on ELT management across the countries studied generally includes a combination of real data and estimations. A number of best practices have been identified to ensure data is the most reliable. For the USA, the data published by the U.S. Tire Manufacturers Association (USTMA) is drawn from multiple sources including surveys of state regulators and scrap tire processors, interviews with experts and end users, as well as trade association and other industry data. Similarly, ETRMA gets data for its Europe scope from collection and processing organizations including ELT management companies, ETRMA member companies, EU (including Eurostat) and national waste statistics, and annual reports from Producer Responsibility Organizations (PROs), or national EPR reports for example. The consolidation of these different sources of data and consistency checks on overlapping or duplicate figures enhances the reliability of data collection.

Trade associations have a key role to play as an intermediary and point of consolidation of information in both system management but also data collection. When these actors or an equivalent are responsible for ensuring correct collection and distribution data this facilitates and further reinforces the reliability of data collection.

Overall, the ELT generation statistics are based on tire sales with some adjustments. Estimations are usually made on this basis (e.g. Nigeria). This information can be collected through declarations on production and imports (e.g. the information requested by the Brazilian Institute of the Environment and Renewable Resources [IBAMA] for Brazil). For South Korea for example, the Korea Tire Manufacturers Association (KOTMA) calculates ELT generation based on a wear rate applied to sales in a given year.

It is important to note that for European countries, for example, as in other countries, the quantity sold onto the market equates to the quantity dismounted. Therefore, both end-of-life vehicles and historical stockpiles are excluded. In addition, illegal activity and non-declaration that will not be accounted for in generation statistics but could be included in treatment.

Where possible, statistics on recovery methods, products, and applications, can be drawn from tracking data related to validated treatment (e.g. as understood to be used in Japan and South Korea).

The following table could serve as a template for the general statistics on ELT management in a country.

**ELT data scope/ category** (Units: mass or number of tires by type e.g. truck or car)

| |
|---|
| Total ELT Generated (from available sources based on replacement tire sales) |
| Total ELT Recovered |
| Sub-total Material Recovery |
| Sub-totals recovery methods, products and applications |
| Sub-total Energy Recovery |
| Sub-totals recovery methods, products and applications |
| Sub-total Civil engineering and backfilling |
| Sub-totals recovery methods, products and applications |
| Total ELT non-recovered/ unknown |

Table 1 General categories of ELT Management

[2] Based on ETRMA, End-of-life Tire Report 2015.

## Summary and cross-analysis of the ELT markets

There are many different ways to recover ELT that can be grouped into the following three categories:

- Material recovery
- Energy recovery
- Civil engineering and backfilling: tires can also be used in 1) civil engineering as water retention basins, tire-derived aggregates for road construction, etc., and 2) as backfilling (land rehabilitation or backfilling in mining sites).

According to the data collected during this study, the total amount of ELT recovered in the 13 countries and the European region amounts to approximately 25.7 million metric tons per year and 26.1 million tons per year if we consider civil engineering and backfilling as a recovery route. The overall amount of ELT generated in these countries is estimated to be 29.1 million tons.

The countries that recover the most ELT in volumes are China, India, United States (USA) and Europe as illustrated in Figure 1.

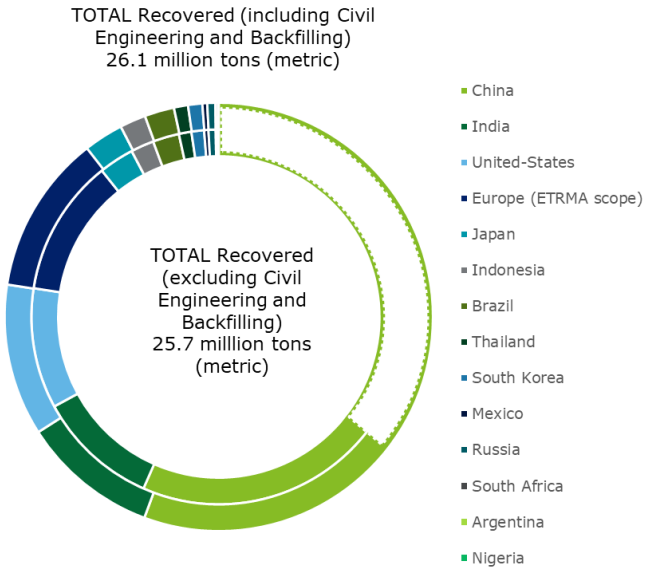



Figure 1. Total ELT recovered in the scope and contribution by country/region. Note that for China, the highlighted blank portion within the dotted line is unconfirmed/ not formally registered, which is therefore ELT collected with undetermined end use.

However, the number of ELT recovered per year in a given country needs to be put into perspective with the amount of ELT generated. The recovery rate (total tons of ELT recovered / total tons of ELT generated) seems to be the best indicator to analyze the performance of the ELT market in a given region.

For this study, two different recovery rates are calculated depending on whether "civil engineering and backfilling" is considered as a recovery route. In the recovery rate where it is not considered as such, the amount would be considered as non-recovered or equivalent to landfill disposal. The distinction is made since considering these two ELT end-markets as a means of material recovery is debatable (especially when referring to backfilling in mining sites).

China, Brazil and India are identified as having the highest recovery rates within the selected countries (Figure 3 below). Brazil, which has an EPR system, has been increasing its recovery rate approaching targets through delivery to cement kilns and granulators. For both China and India, around two thirds of recovery is understood to occur in informal markets. The volumes of ELT generated in China far outweigh the quantities in other countries, the most significant recovery route being reclaim rubber technologies. In India, besides energy recovery and reclaim rubber, applications include artisanal products, use on fishing boats, roofs-tops or swings. ELT are therefore seen as a valuable material in India for various applications. In the future, in the context of a growing middle class, this recovery rate might decline.

Europe's recovery rate was 92% in 2017[3] with 1.9 million tons in material recovery, 1.2 million tons in energy recovery and 0.1 million tons in civil engineering, public works and backfilling.

ELT recycling markets worldwide are mainly driven by the regulatory context in each country. Government regulations are enacted to address environmental issues related to illegal dumping or importation of ELT as well as historical stock piles leading to public health and sanitary issues (e.g. fire hazards, breeding ground for mosquitoes and vermin, and the current issue of the Zika virus etc.) that can be the result of ELT collection and processing systems not functioning.

## Overview of recovery methods, products and applications

The rate of growth and viability of different recovery markets at a given time are directly linked to the demand for the recovery products.

In the case of TDF, this may be the most volatile. When traditional fuels are relatively cheap (recently natural gas

[3] Unlike ETRMA statistics for overall recovery rates, this study focuses on End of Life Tires only, and consequently excludes quantities processed through retread, reuse, and export from its scope, effectively reducing the recovery rate.

in the USA for example), demand for TDF as an alternative may be weaker.

Generally, energy recovery is a straight-forward means of recovery requiring limited processing and treatment. This explains why it makes up half of the ELT market in the USA (mainly use in cement kilns but also the pulp and paper industry and utilities) and South Korea (where there is a limit of the portion of ELT being sent for energy recovery, set at 70%) and even up to 40% in Europe, where material recovery is prioritized over energy recovery. In Japan, unlike other governments' policies, there is active promotion of the use of TDF through the country's energy policy (exemptions from reduction objectives) and ELT mainly becomes TDF for paper manufacturing boilers. Brazil also has a high rate and depends in particular on consumption by the cement industry (energy and material recovery).

For material recovery including the production of rubber granulate, facilities often have relatively high costs such as initial capital expenditure. Another key element is the need to develop secondary and end use industries to absorb the ELT product. As aforementioned, in Europe, material recovery is generally prioritized over energy recovery and makes up approximately half of ELT recovered. In Russia, policy directs ELT to material recovery, as energy recovery is not eligible to meet ELT management targets. A quarter of ELT generated in the USA becomes rubber granulate with applications including molded rubber products, playgrounds, sports facilities and asphalt. In California, material recovery is prioritized in particular. Material recovery makes up less than a quarter of ELT recovered in South Korea. It is important to note that the production of reclaim rubber is particularly predominant in Asia.

The recovery methods of pyrolysis and gasification are also significant in Asia for example in Indonesia, Thailand and Japan, which may have different levels of quality of end products. Pyrolysis is only slowly developing in the USA with some pilot plants. Overall, this recovery method has had some difficulty commercializing products and has been facing operational risk including safety hazards and air polluting emissions.

For the application of ELT in civil engineering and backfilling, there has been significant growth in the USA over the past decade to reach 10% of the ELT market.

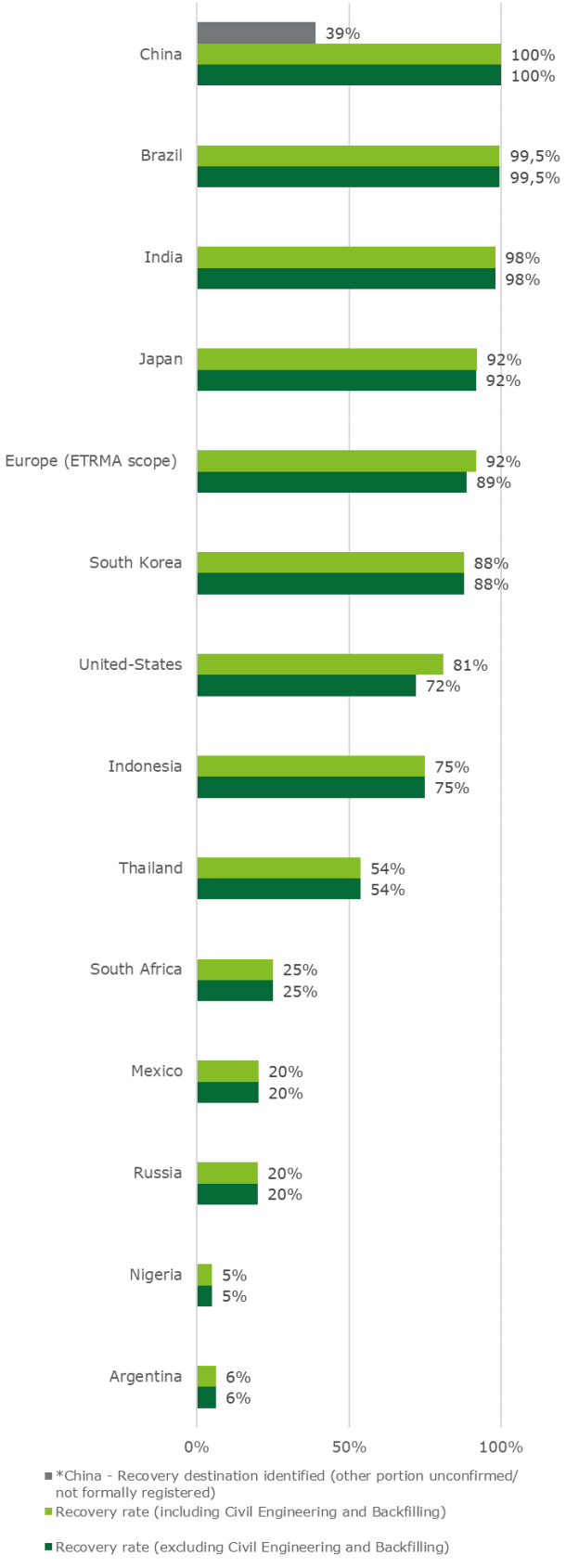



Figure 2. Recovery rates by country/region

### Regulation or intervention of public authorities

A minimum level of some form of intervention from the government is very often necessary in order to properly develop the ELT recycling industry.

In some countries, the role of the government is limited to the organization of the ELT stakeholders, or can be more interventionist regarding financial and technological development of the sector. Globally speaking, the development of ELT recycling markets is still quite recent. Although some recovery methods, products and applications are more profitable than others and examples of success stories exist in some regions, taken as a whole, the ELT market has been struggling to be profitable and self-sufficient. Financial support with a formalized ELT management system is very often an important factor to increase the competitiveness of the industry and achieve high recovery rates.

Different ELT management systems exist at the national level. Within the scope of our study, three main systems have been identified:

**EPR system or take-back obligation system:** In this system the responsibility for collecting and ensuring treatment of ELT is imposed on the actors that put new tires onto the market (tire manufacturers and importers) through an eco-fee. This is a very common configuration in European countries including Hungary, Italy, France, Spain, Netherlands, Sweden, Turkey, Belgium, Portugal, Finland, Estonia, Latvia, Lithuania, Greece, Slovenia, Czech Republic, Slovakia, and Ireland and is also used by Brazil, South Korea and Russia.

The system usually involves these actors setting up a non-profit organization (or PRO) that manages the collection and recovery of the end of life product. The extra cost is generally passed onto the consumers, with an environmental fee (eco-fee) added to the product price.

**Government responsibility financed through a tax:** In this system, the responsibility lies with the state and collection and recovery are financed by a tax on production which is passed on to the consumer. The few countries that run such a system include Denmark, Slovakia and Croatia.

**Free market system:** In this system, the state or federal legislation may set action plans (qualitative objectives) or obligations to have an ELT management plan (e.g. Mexico), however responsibility (eco-tax or eco-fee) is not imposed upon particular actors. The countries with this system are Argentina, China, India, Indonesia, Japan, Mexico, Nigeria, Thailand, UK, Germany, Switzerland, Austria, Serbia and the USA.

A comparison of the different ELT management systems/schemes is shown in Table 2.

Table 2. Comparative table of ELT management systems/schemes

| | Responsible actor(s) | Governance | Funding | Key features |
|---|---|---|---|---|
| 01 **Free market system** | Under a free market system, the legislator enacts objectives to be met, however there are **no responsible parties directly designed**. | Usually no dedicated organization, ELT issues are covered by more general waste-related regulation and governance system.<br><br>However, the existence of an **industry association** in charge of promoting responsible ELT management is common practice. | **No regulated eco-fee** collected for ELT management; free market. | - **Minimum state intervention.**<br><br>**- Less producer involvement.**<br><br>- **Market forces** being the main driver for ELT management, i.e. the most mature and cost-effective recovery routes representing the biggest share of the market.<br><br>- Cooperation of companies on a **voluntary basis** to promote best practices.<br><br>- More **difficult** for **more environmentally-friendly** Recovery Routes to develop, if not economically interesting at the beginning. |
| 02 **Tax system** | Under a tax system, the **State** is responsible for ELT recovery. | The **State** is responsible overall for the organization of ELT management and remunerates the operators in the recovery chain. | ELT management financed through a **tax levied on tire manufacturers and importers** and paid to the State, and subsequently **passed on to consumers**. | - The State guarantees a **level playing field** by enforcing the same product standards on all tire producers.<br><br>- Taxes may have the effect of **favoring more environmentally-friendly** recovery routes (e.g. material recovery over energy recovery) and prohibiting landfill. |

| | | | | |
|---|---|---|---|---|
| 03<br>**Extended producer responsibility (EPR) system** | The **producer of tires (manufacturer or importer)** is held responsible by law to organize the ELT management, with **targeted volumes** defined based on the quantities of tires put onto market. | Producers can either set up their **individual management system** or gather to set up a **producer responsibility organization (PRO)** (the latter representing the majority of cases).<br><br>The organization is in charge of managing the collection and recovery of a volume of ELT defined by regulation. | ELT management financed through an **eco-fee** on manufactured and imported tires, **paid by producers,** usually **passed on to consumers.**<br><br>The amount of the eco-fee depends on the cost related to ELT management and the secondary markets. It usually decreases over time, as the ELT management gets more and more mature and economically efficient. | **- Cost optimization** enabled by the creation of a **PRO.**<br><br>- Better **data traceability** through **reporting obligations**.<br><br>- Better transparency on how the eco-fee is used.<br><br>- **PRO** having the flexibility to determine **the most cost-effective solutions** to recover ELT or to favor the **most sustainable** options.<br><br>- **Lack of competition in some countries** for the ELT market with the creation of Producer Responsibility Organizations. |

In practice, hybrid systems can be implemented. For instance, the USA operates generally under a free market system, however some states can spontaneously influence markets with grants, taxes and subsidies.

The free market system presented above refers to countries where a legal structure has been defined for ELT management. In countries with weak regulation or non-existing regulation related to ELT management, the recycling market may still be freely developed with an important proportion of informal sectors on a small scale when ELT represents a source of value, leading to illegal operations with sanitation, environment, fire and safety risks.

Whenever an EPR system exists, there is usually an organization at national/state/province level in charge of the ELT coordination. Similar organizations exist in a free market system when legal regulation requires coordination between actors (such as the Mexican Management Plans for example). Usually, these organizations are created by the tire manufacturers.

The eco-fees or taxes, paid by manufacturers or consumers, are therefore used by the dedicated organization to finance the following activities:

- Collection, transportation; shredding/granulation, gate fee for granulators;
- Development grants and loans, R&D and partnerships to develop new markets for recycling;
- Subventions to encourage certain recovery routes that would not be profitable otherwise;
- The construction of treatment plants that in turn are sold on at a low price in order to increase recycling capacity and decrease the initial investment costs for recyclers (e.g. South Africa);
- Public awareness raising;
- Stockpile abatement (e.g. New Jersey, New York, USA) and illegal dump site cleanup (e.g. in the USA);
- ELT program management (licensing, enforcement, inspections), administration of ELT collection (e.g. in the USA);
- Tire fire cleanup (e.g. in Arizona, USA);
- Mosquito control (e.g. in Florida, USA); and
- Air pollution control (e.g. in California, USA).

Of course, how the fees are used can vary from one system to another. In free markets, there is a greater focus on raising public awareness in order to respect the competitiveness of the market. In more interventionist systems, regulations will favor some recovery routes over others (for example, material recovery over energy recovery for Russia, the EU, South Korea, and California in the USA).

There can be issues related to competitiveness when different systems are set up in broader regions. For instance, French granulators benefit from the financial support with the eco-fee paid by tire manufacturers (collection fee, gate fee), while the ELT are managed under a free market principle in Germany.

In case of a free market, energy recovery can be a very efficient way to deal with high volumes of ELT since it helps to get rid of long-standing stockpiles easily and requires relatively low investment. This is because whole, cut or shredded tires can be directly used as an alternative fuel. Nevertheless, as a general trend, once a country has established a more mature approach to ELT management, material recovery is often supported through policy-making. This evolution is in line with the waste hierarchy ladder and circular economy principles. This option is considered preferable in terms of environmental impact assessment and resource efficiency.

Although material recovery might require more initial investments, R&D efforts or partnerships with actors from new industries, it also generates products with higher added-values.

The ideal long-term vision for the ELT industry would be to find new or existing markets for ELT recycling that could help prioritize high-value products in order to generate enough revenue for the industry to be self-sufficient.

Some countries have very low awareness of the environmental and public health risks related to ELT, including the public authorities themselves. An important volume of tires is therefore simply dumped on the side of the road or abandoned in fields. This is a particularly significant problem when the ELT management system does not function, leading to stockpiles.

There is also a considerable but unquantifiable amount of ELT burnt or commercialized in black markets. This results in squandering of resources and a significant impact on environment and public health through mosquito transmitted-diseases, fire hazards, or lack of pollution abatement system, etc. In these countries, the government has a crucial role to play. A push from public policy makers is needed in order to raise awareness among the general public and public sector actors to set up a system to deal with ELT properly. Likewise, it is key to enforce sanctions of illegal activities and provide adequate investment for the resources needed to carry out inspections and enforce regulations.

Developing countries often lack high technology recycling factories, expertise, technical know-how and facilities to handle ELT. These countries could use the support from more experienced actors in developed countries in order to leapfrog to a successful ELT market.

### Approaches to establishing a successful ELT management system including supporting factors (best practices) and challenges faced

There is no one size fits all approach to establishing a well-functioning ELT management system. In Europe for example, there is a broad mix of different management systems including EPR, free market and tax based systems and overall the recovery rate is high.

Out of the three main systems outlined above, there are advantages and potential disadvantages to each. One of

the indicators of success of a system is the recovery rate in relation to the total ELT generated. Best practices can usually be identified in countries with high recovery rates as contributing elements to achieving these rates as identified below.

Trade associations have a key role to play in the success of ELT management through coordination at industry level. These associations can be pre-existing groups of companies in the same industry or specifically set up as an intermediary coordinator in the domain of ELT management. ELT management is usually successful when large associations are mandated to manage ELT as a cooperative organization (e.g. Reciclanip and EcoTyresUnion covering the majority of ELT generated in Brazil and Russia respectively) providing a form of critical mass to drive system and the processes of collection, treatment and application practices.

The designation of government agencies (e.g. CalRecycle in California) or non-government agencies to manage solid waste or if possible ELT in particular is another best practice.

In Brazil, an EPR system is in place, which involves regular weekly calculations by the government agency IBAMA based on declarations regarding production, imports and sales. The EPR system in South Korea also involves monitoring and control from the Ministry of Environment. For control in particular, a degree of resources and capacity is required that may not be possible in all countries. Monitoring through reports submitted by manufacturers and importers. Smaller actors may not always comply with reporting requirements (e.g. in Brazil).

The EPR system in South Korea includes a framework for recovery plans established every five years setting out roles and responsibilities for different actors. In Mexico, where the recovery rate is relatively low, a management plan required but it is deemed flexible in terms of content (i.e. no fees and no rate of ELT collection).

Where fees are charged, (e.g. through the EPR system in South Korea to manufacturers and importers or in the free market on new tires in the US, in New York and California) as well as tax-based systems, the financing can go towards research and development, start up funding and promotion of recovery. A best practice is when the funding is earmarked for ELT management. In Brazil the costs will now be shared by municipalities and car dealers to spread costs. Governments can also issue punitive fines, which is a measure of enforcement where necessary and can also contribute to these funds. In South Africa, where there has been a recent change in management, funding had also been directed towards the development of secondary industries, which is very important for the development of capacity of absorption and long-term demand. It is worth noting that demand is currently low for rubber granulate in Russia for example, where material recovery has specific targets.

In EPR systems, there are different ways in which mandatory recovery quantities are set around the world. In South Korea this takes into account past ELT recovery and business forecasts. In Russia, which recently implemented EPR, an annual incremental rise in the recovery rate is being used to develop the system.

In free markets on the other hand, such as the USA or in the UK (where there are also reporting obligations, which support the ELT management system), ELT is directed towards the lowest gate fee, which as the charge to waste reception determines the most efficient use of ELT. The free market in Japan is also supported by waste regulation providing some framework favorable to a higher recovery rate.

Other measures of a degree of government intervention can occur in free market systems to support ELT management and recovery industries. For example, states in the USA are providing grants and funding for stockpile clean up and subsidies to recovery facilities. EPR systems also have funding schemes. For example, the Brazilian development bank provides funding for shredding companies in particular. In Argentina, where the recovery rate is particularly low there is currently a lack of investment and funding in recovery facilities.

In India and Indonesia informal markets allow for particularly high collection and recovery rates, which are supported by a significant number of independent collectors and treatment facilities.

Many countries have indicated a potential shift towards EPR notably from free market systems, for example in Mexico, Thailand, Argentina and Nigeria, where recovery rates are low and the free market may not be functioning but also in India where the recovery rate is very high but the system is largely informal. This shift to EPR from free market was made most recently by Ireland in 2017. On the other hand, it has been foreseen, once markets are established, that the EPR system in place in South Korea could become a free market.

As a major challenge in some countries such as Mexico, South Africa, Indonesia, Argentina and Nigeria, supporting logistics and transportation can lead to a successful ELT management system. For example, establishing hubs between collection and processing or organizing delivery direct to processing if in close proximity. For example in Brazil, there is a requirement for reception points for tires in every city with a population of over 100,000. Funding for collection and

transportation through eco-fees has also been a measure implemented.

### Potential impacts on the environment and health of recovery methods, products and applications

With regards to ELT granulate, studies have focused predominantly on the risk to human health from exposure on artificial sports fields in particular the USA and in Europe. However, some individual studies have looked at different recovery methods elsewhere in the world.

Numerous studies have been conducted related to the use of granulate in turf fields. Overall, the conclusiveness has not found consensus due to the narrow scope and multiple variables leading to overall uncertainty regarding the potential impacts.

In February 2017, the European Chemicals Agency (ECHA) published the report "An evaluation of the possible health risks of recycled rubber granules used as infill in synthetic turf sports fields", which concluded that there was a very low level of concern regarding exposure to granules (ECHA, 2017b).

In September 2018, the French research institution ANSES (Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail) found that the risk of exposure to granulate in synthetic turf rubber infill was negligible to human health but there was a risk to the environment through transfer of zinc and phenols and that additional measures should be taken in terms of risk assessments and the methodologies of evaluations (ANSES, 2018).

Studies on the impact of health and the environment continue to focus on the use of granulate on artificial turf and are ongoing. Most recently, the committees for risk assessment and socio-economic analysis of the ECHA adopted and drafted opinions respectively supporting a restriction proposal of the Netherlands to not place granules and mulches on the market if the sum of identified polycyclic aromatic hydrocarbons is greater than 20 mg/kg to further reduce risk of an impact on human health (ECHA, 2019).

ETRMA published a statement on the safety of recycled rubber infill material in 2016. Rubber components which can come into direct contact with the general public must comply with EU REACH restrictions. Out of the 70 scientific reports and articles published worldwide by the time of writing of the ETRMA statement in 2016, many conclude that "there is no significant or scientifically justified risk associated to the use of rubber granules made from end of life tires" (ETRMA, 2016).

The study conducted by Institute Mario Negri IRCC found that the eight PAH covered by REACH Regulation restrictions were at levels lower than limits for public sale (TRR, 2017).

In the context of REACH, the European industry aims to clarify possible health concerns about the use of ELT derived materials on certain applications. For this purpose ETRMA, with the involvement of different actors from the value chain, has promoted the development of the European Risk Assessment Study on Synthetic Turf Rubber Infill named ERASSTRI involving 28 partners from 14 European countries (ETRMA, 2019).

The results of the study are expected to be published in the first half of 2020 (ETRMA, 2019)

### Advanced technologies and innovations in ELT recovery

During the study, it was identified that research institutions in most countries have initiated some form of research on the use of ELT. A variety of different trends have been observed regarding research in particular, some being specific to different countries on advanced ELT technologies and innovations.

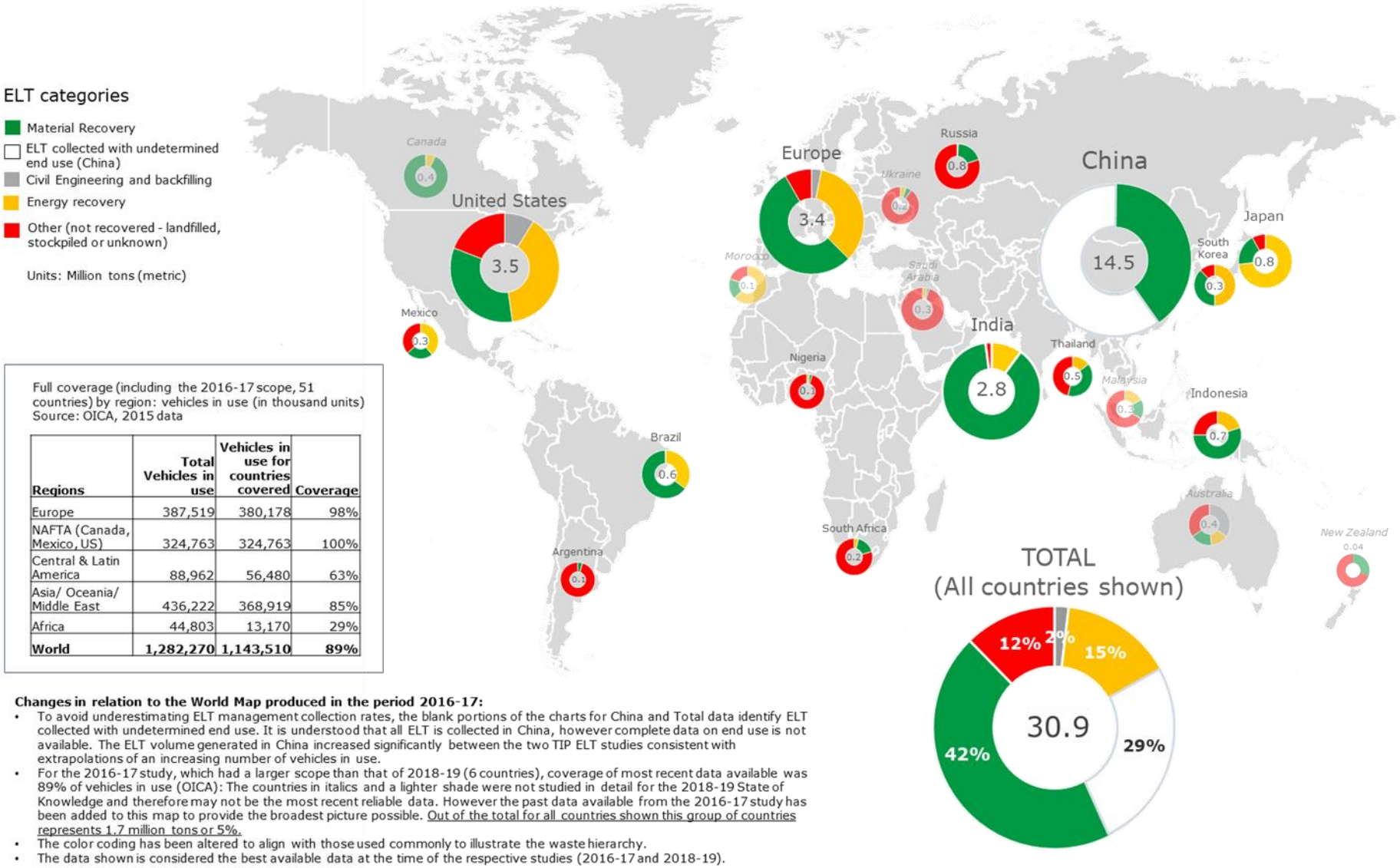
The majority identified were material recovery based research projects in line with the waste hierarchy promoting material recovery. For example, in South Korea, research has given particular attention to the use of ELT to form composites from polypropylene and TDM. Incorporation into plastics has been studied in Europe.

A number of research institutions and projects have focused on the development of pyrolysis as a recovery method and the products of the process. In Europe, research has given attention to high quality oil and carbon black and in South Africa, char as products of pyrolysis. In Russia, a form of accelerated pyrolysis is being studied. Work in China is focusing on low emissions pyrolysis technology. In the USA, studies have recently been conducted on the potential use of carbon from ELT in the production of batteries.

Institutions in countries have adapted the use of ELT to specific contexts, such as research in Nigeria, in which researchers have given particular attention to the capacity of ELT granulate to absorb oil from spills and other substances in wastewater. This capacity has also been studied in Brazil and USA. In Japan, civil engineering projects have focused on the use of ELT in structures faced with risks of earthquakes or tsunamis. Research institutions in Mexico, Brazil, India, Thailand and the USA have also focused on the use of ELT to reinforce concrete.

Rubberised asphalt has had continued study to understand its potential in Europe, Indonesia, Mexico Nigeria, South Korea and USA.

Studies into devulcanization have been conducted in Brazil. Various other applications have been identified, including porous pipes in Brazil, roofing and tiles in Argentina, and panels and matting in USA, and soundproofing in Indonesia.




Full coverage (including the 2016-17 scope, 51 countries) by region: vehicles in use (in thousand units)
Source: OICA, 2015 data

| Regions | Total Vehicles in use | Vehicles in use for countries covered | Coverage |
|---|---|---|---|
| Europe | 387,519 | 380,178 | 98% |
| NAFTA (Canada, Mexico, US) | 324,763 | 324,763 | 100% |
| Central & Latin America | 88,962 | 56,480 | 63% |
| Asia/ Oceania/ Middle East | 436,222 | 368,919 | 85% |
| Africa | 44,803 | 13,170 | 29% |
| **World** | **1,282,270** | **1,143,510** | **89%** |

**Changes in relation to the World Map produced in the period 2016-17:**

- To avoid underestimating ELT management collection rates, the blank portions of the charts for China and Total data identify ELT collected with undetermined end use. It is understood that all ELT is collected in China, however complete data on end use is not available. The ELT volume generated in China increased significantly between the two TIP ELT studies consistent with extrapolations of an increasing number of vehicles in use.
- For the 2016-17 study, which had a larger scope than that of 2018-19 (6 countries), coverage of most recent data available was 89% of vehicles in use (OICA): The countries in italics and a lighter shade were not studied in detail for the 2018-19 State of Knowledge and therefore may not be the most recent reliable data. However the past data available from the 2016-17 study has been added to this map to provide the broadest picture possible. Out of the total for all countries shown this group of countries represents 1.7 million tons or 5%.
- The color coding has been altered to align with those used commonly to illustrate the waste hierarchy.
- The data shown is considered the best available data at the time of the respective studies (2016-17 and 2018-19).

Figure 3 ELT Generation and recovery by country/region (map) - This information has been modified for some countries in order to align definitions and units. Please refer to the limitations of this chapter.

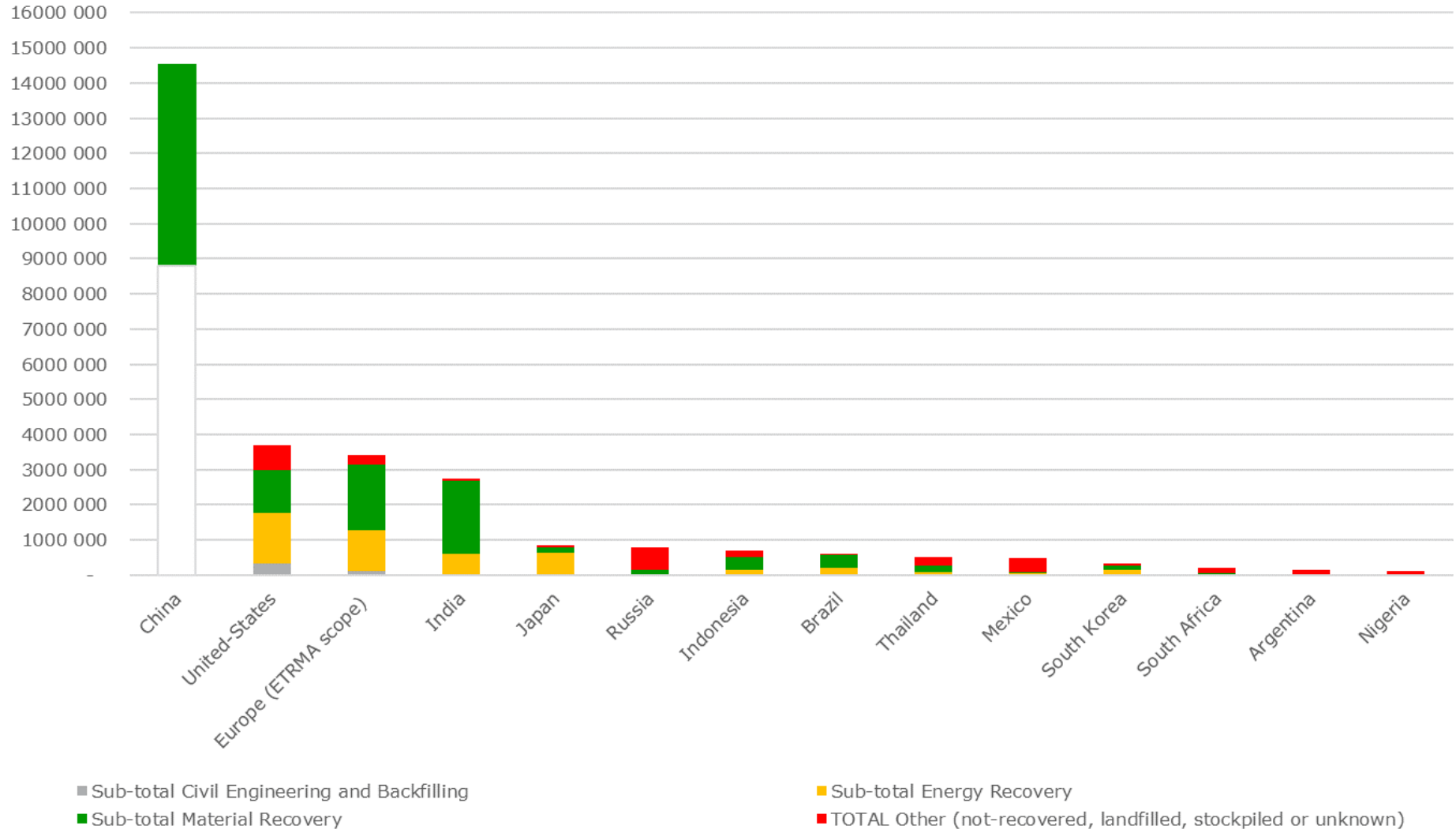



Figure 4 ELT Generation and recovery by country/region (graph). *Note for China: the blank portion highlighted shows ELT collected with undetermined end use.*

## Summary for each region/country

A brief summary of the current state and local context surrounding ELT management in each country/region is given below. The countries are listed in alphabetical order.

### Argentina

# Argentina

## Argentina

| ELT data (Casa Rosada, BAE, 2019) | Kilotons (metric) (2018) | Percentage of total ELT generated (2018) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **150** | **-** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **9.6** | **6.4%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **9.6** | **6.4%** |
| Sub-total Material Recovery | 9.6 | 6.4% |
| Sub-total Energy Recovery | 0 | - |
| Sub-total Civil Engineering and backfilling | 0 | - |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **140.4** | **93.6%** |

**Data availability and robustness:** *The most recent data available was reported by Casa Rosada for generation and the publication BAE for recovery (extrapolated from monthly processing). The latter only includes the amount of ELT processed by the organization Regomax for the granulation of rubber.

**Legal system:** A free market system is in place. The development of ELT management in this country is mainly due to two factors: the existing frameworks regarding general waste and ELT treatment (which is primarily concentrated in the Buenos Aires region) and the business opportunity of sport infrastructures in the country.

**Major changes in legislation/policy since 2016:** An EPR system was under evaluation by the Ministry of Environment and Sustainable Development and being debated in congress. Since the beginning of 2019, a new provincial law (No. 9143) has been implemented in the Mendoza, making municipalities responsible for the collection and treatment of ELT.

**Main ELT management organization:** The Ecological Coordination Society of the State Metropolitan Area (CEASME) – an organization created by the Province of Buenos Aires and the city of Buenos Aires for the integrated management of municipal solid waste in the metropolitan area. INTI, an institute in charge of contributing to the development of the rubber industry through quality control, technical assistance, technological development and specific training of technicians and professionals, manufacturers or users of rubber products.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):** Based on collected data, the recovery rate is of approximately 6%. The main recovery route in the country is granulation of ELT for application on sports surfaces (material recovery).

**Impacts on health and on the environment:** In general, the municipalities evaluate the health risks posed by discarded ELT, especially diseases such as dengue and rodents, indicating insufficient collection processes and the limited functioning of an ELT management system.

**Technological innovations:**
- Material: Ecological Roofing Tiles made with recycled rubber from ELT (2014).

**Opportunities and drivers:**
**-** An EPR system has been under evaluation by the Ministry of Environment and Sustainable Development and a bill has been proposed.

**Barriers and challenges:**
- Lack of a legal framework concerning ELT management and the need for financial support in the treatment process.
- An awareness campaign could help reduce the informal market of ELT.

## Brazil

# Brazil

## Brazil

| ELT data (IBAMA 2017) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **587.9** | |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **585.2** | **99.5%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **585.2** | **99.5%** |
| Sub-total Material Recovery | 379.1 | 64.5% |
| Sub-total Energy Recovery | 206.1 | 35% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | 2.7 | **0.5%** |

**Data availability and robustness: Data provided for 2016 and 2017 from both IBAMA and Reciclanip.**

**Legal system:** An EPR system with reverse logistics regulates ELT management in Brazil, in addition to laws regarding hazardous waste and disposal.

**Major changes in legislation/policy since 2016:** No changes to note.

**Main ELT management organization:** IBAMA, the Brazilian Institute of the Environment and Renewable Natural Resources, is the main organization which handles the EPR system, and determines ELT recovery targets. Reciclanip, a non-governmantal organisation, gathers 12 tire manufacturers, and handles all technical and operational aspects of tire recovery and monitoring for these manufacturers.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):** Material and energy recovery routes are widely used in Brazil. However, material recovery prevails over energy recovery in 2017.

**Impacts on health and on the environment:**
- No information available.

**Technological innovations:**
- Material: Devulcanization, Use of ELT in composites, concrete modified with crushed rubber.
- Civil engineering: Study on pipes made with recycled rubber.

**Opportunities and drivers:**
- Well-established ELT management system, and organization with significant national coverage (Reciclanip) handling waste tire recycling and recovery for over 80% of nationally generated ELT.
- Strong energy recovery sector (cement kilns).

**Barriers and challenges:**
- While being a very popular recovery route, the ELT management system relies significantly on cement kilns.

## China

# China

## China

| ELT data (CRIA, 2019 & CTRA, 2018) | Kilotons (metric) (2018) | Percentage of total ELT generated (2018) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **14545** | **100%** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **5650** | **39%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **5650** | **39%** |
| Sub-total Material Recovery | **5650** | **39%** |
| Sub-total Energy Recovery | **0** | **0%** |
| Sub-total Civil Engineering and backfilling | **0** | **0%** |
| **TOTAL Other (ELT collected with undetermined end use)** | **8895** | **61%** |

**Data availability and robustness:** The figures for generation and recovery presented in this table are midway between consistent data provided by CTRA and CRIA. It is understood that all ELT is collected. There is uncertainty however regarding the end use for a large portion of ELT collected, which is therefore identified as ELT collected with undetermined end use.

**Legal system:** ELT are not currently managed within a structured management system, however there is indication of the possibility of policy development urged by growing environmental considerations.

**Major changes in legislation/policy since 2016:** There have been no major changes in legislation since 2016, but the government has issued several environmental regulations to dismantle illegal non compliant activities.

**Main ELT management organization:** The China Tyre Recycling Association (CTRA) is a national civil organization in China operating on used tire retreading, reuse and recycling. The China Rubber Industry Association (CRIA) is an industrial organization, with a dedicated group for the use of waste rubber.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- Material recovery makes up a significant part of ELT recovery in China. The main determined recovery routes in China are reclaim rubber and granulation.
- ELT material is considered as a resource in China, and all ELT are understood to be collected, though the end use of 61% of used tires remains undetermined.

**Impacts on health and on the environment:**
- Awareness of the air pollution due to some operations of the pyrolysis industry.
- Some discussion on perceived potential risk of the use of rubber powder in synthetic turf.

**Technological innovations:**
- Innovative pyrolysis methods with low emissions are in construction.

**Opportunities and drivers:**
- Government policy enhancing attention to environmental issues.
- Associations pushing for legislative changes.
- ELT generally considered as a resource

**Barriers and challenges:**
- Most tire manufacturers are small scale and family-owned businesses, not considered prepared to assume responsibility for ELT due to potential costs.
- Considering ELT as a rubber resource in China limits their use in certain recovery routes such as tire-derived fuel in cement kilns.

## Europe (ETRMA scope)

# Europe (EU, Norway, Serbia, Switzerland, & Turkey)

### Europe

| ELT data (ETRMA, 2019) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **3425.5** | **100%** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **3035.5** | **89%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **3141.0** | **92%** |
| Sub-total Material Recovery | 1855.5 | 54% |
| Sub-total Energy Recovery | 1180 | 35% |
| Sub-total Civil Engineering and backfilling | 105.5 | 3% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **283.5** | **8%** |

**Data availability and robustness:**

Data from recognized source based on robust collection and consolidation methodology. Data for ELT management in Europe is consolidated at the EU level by ETRMA, drawn from a variety of sources (some uncertainty due to estimations/ extrapolations remains). In general, data does not include ELTs from ELVs. Unlike ETRMA statistics for overall recovery rates, this study focuses on ELT rather than Used Tires. Consequently quantities processed through retread, reuse and export are not included in the scope for this study, effectively reducing the recovery rate.

**Legal system:** Various systems depending on the state. Extended producer responsibility (EPR), free market, or government responsibility financed through a tax.

**Major changes in legislation/policy since 2016:** Ireland shifted from a free market to an EPR system in 2017.

**Main ELT management organization:** For physical systems, this depends on the country e.g. France: Aliapur; Italy: Ecopneus; Spain: Signus. For reporting and coordination: ETRMA at EU level.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- Rubber granulates and powder (43%)
- Cement kilns (38%)

**Impacts on health and on the environment:**
- Studies on the impact of health and the environment continue to focus on the use of crumb rubber on artificial turf and are ongoing. Most recently, the committees for risk assessment and socio-economic analysis of the European Chemicals Agency ECHA adopted and drafted opinions respectively supporting a restriction proposal of the Netherlands to not place granules and mulches on the market if the sum of identified polycyclic aromatic hydrocarbons is greater than 20 mg/kg to further reduce risk of an impact on human health.
- In September 2018, the French research institution ANSES (Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail) found that the risk of exposure to granulate in synthetic turf rubber infill was negligible to human health but there was a risk to the environment through transfer of zinc and phenols and that additional measures should be taken in terms of risk assessments and the methodologies of evaluations.
- In February 2017, the EU Chemical Agency published the report "An evaluation of the possible health risks of recycled rubber granules used as infill in synthetic turf sports fields", which concluded that there was a very low level of concern regarding exposure to granules.

**Technological innovations:**
Innovations and research on advanced ELT technology include projects on efficient pyrolysis technology, use of ELT in asphalt and low noise surfaces, and incorporation of ELT granulate in plastics.

**Opportunities and drivers:** Circular economy strategies, reputation and brand image, cost reduction

**Barriers and challenges:** Prices of raw materials, alleged health risks, constraints on innovation

## India

# India

### India

| ELT data (ATMA, 2018) | Kilotons (metric) (2015) | Percentage of total ELT generated (2015) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **2749.8** | |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **2694.8** | **98%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **2694.8** | **98%** |
| Sub-total Material Recovery | 2094.8 | 76% |
| Sub-total Energy Recovery | 600 | 22% |
| Sub-total Civil Engineering and backfilling | 0 | - |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **55** | **2%** |

**Data availability and robustness:** The most recent data available was provided by ATMA, the main ELT management organization in India, based on a study conducted in 2016.

**Legal system:** In 2016, the Government of India issued draft Waste Tyres Management Rules. If met with a positive response, the new rules would create a framework for managing ELT practices in a more organized, rigorous, effective and environmentally friendly manner.

**Major changes in legislation/policy since 2016:** Draft Waste Tyres management rules were circulated among relevant actors.

**Main ELT management organization:** The main stakeholder is the Automotive Tyre Manufacturers' Association (ATMA), which works alongside the government on potential regulations.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):** Data from 2015 shows that material recovery makes up the large part of ELT recovery (76% of generated ELT), mainly sent towards crumb rubber production.

**Impacts on health and on the environment:**
- Significant attention given to the negative environmental and health externalities caused by the pyrolysis industry, and governmental action to limit the technology's negative impacts.
- Study launched July 2018 by the State of Haryana's Pollution Control Board, on the impacts of pyrolysis on human health and the environment. Suspension of the installation of new pyrolysis plants in the state until the results of the study are finalized, expected 2019.

**Technological innovations:**
- ELT in steel production.
- Rubber-modified concrete.

**Barriers and challenges:** Lack of organized framework around ELT management, limited quantitative information and support from the government, and prevalence of actors involved in the informal ELT recovery sector.

## Indonesia

# Indonesia

### Indonesia

| ELT data (APBI/ITMA, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **684.4** | **-** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **513.3** | **75%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **513.3** | **75%** |
| Sub-total Material Recovery | 376.4 | 55% |
| Sub-total Energy Recovery | 136.9 | 20% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **171.1** | **25%** |

**Data availability and robustness:** The data was provided by APBI/ITMA, based on information gathered from large tire collectors but focused on the region of Jakarta and its surroundings.

**Legal system:** No regulation targeting ELT. It is a free market system.

**Major changes in legislation/policy since 2016:** There have been no major changes in legislation since 2016.

**Main ELT management organization:** No particular actors such as public sector actors or trade associations are specifically in charge of ELT Management. However, the Indonesia Tire Manufacturer Association (ITMA), also known as Asosiasi Perusahaan Ban Indonesia (APBI), is involved in the topic.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- Pyrolysis is the main recovery route in Indonesia. It is understood that the primary purpose is to produce oil as TDF for industry.
- ELT is also used as TDF for the manufacturing of bricks.
- 15% of ELT are sent towards material recovery, mainly granulation companies.

**Impacts on health and on the environment:**
- No research/information on impacts on health and the environment in Indonesia, apart from concerns regarding emissions identified near brick manufacturers.

**Technological innovations:**
- Material: Studies on rubber-modified asphalt (2018); use of woven waste tires for material reinforcement (2017); soundproof characteristics of reclaimed tire rubber (2016).

**Opportunities and drivers:**
- ITMA will be initiating discussions with the Ministry of Environment on a potential plan for ELT management.

**Barriers and challenges:**
- As the country is formed of many islands, this creates logistical issues, and high transportation costs.
- Lack of awareness on ELT recycling at all levels (government, manufacturer, retailer and consumer).

## Japan

# Japan

### Japan

| ELT data (JATMA, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **849** | |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **780** | **91.9%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **781** | **92%** |
| Sub-total Material Recovery | 160.5 | 18.9% |
| Sub-total Energy Recovery | 619.5 | 73.0% |
| Sub-total Civil Engineering and backfilling | 1 | 0.1% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **68** | **8%** |

**Data availability and robustness:** Data provided by JATMA, the main organization involved in ELT management in Japan

**Legal system:** Free market for ELT, ELT management regulated through the Waste Management and Public Cleansing Act.

**Major changes in legislation/policy since 2016:** No changes since 2016.

**Main ELT management organization:** The Japan Automobile Tyre Manufacturers Association (JATMA) monitors and publishes the status concerning ELT treatment, and promotes ELT management. It also carries out research on "production, distribution, consumption and trade" of tires and makes policy proposals concerning "safety and environmental preservation".

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- ELT are mainly recovered as energy in Japan (73%), followed by material recovery at close to 19%. There is only very little civil engineering and backfilling for ELT (0.1% in 2017).

**Impacts on health and on the environment:**
- No information available

**Technological innovations:**
- The geographical situation of Japan and its exposure to significant natural events have oriented technological innovations to use ELT as solutions to face these exceptional events (e.g. seawall protections against tsunamis, ground reinforcement in the event of earthquakes).

**Opportunities and drivers:**
- Favourable legislative context: energy produced from waste or renewable sources is exempted from the reporting and reduction objectives imposed on other energy sources.
- Large demand of ELT for some production uses as tire-derived fuel.

**Barriers and challenges:**
- Imports of ELT due to the high demand of some recovery routes.
- Small share of material recovery for the valorization of ELT.

## Mexico

# Mexico

### Mexico

| ELT data (CNIH, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **467.5** | **-** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **95** | **20.3%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **95** | **20.3%** |
| Sub-total Material Recovery | 27.9 | 6% |
| Sub-total Energy Recovery | 67.1 | 14.3% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **372.5** | **79.7%** |

**Data availability and robustness:** The date was provided by the Mexican Rubber Industry Chamber (CNIH), in units of ELT/Recovery route.

**Legal system:** ELT are managed according to an official standard, the NOM-161-SEMARNAT-2011, which requires the implementation of an ELT Management Plan, followed by tire producers, manufacturers, importers and exporters.

**Major changes in legislation/policy since 2016:** There have been no changes in legislation since 2016, though there have been discussions about setting up an EPR system.

**Main ELT management organization:** SEMARNAT (Secretaria de Medio Ambiente y de Recursos Naturales) is the governmental body in charge of environmental policy-making, and which established the ELT Management Plan. The MRLL (Manejo responsible Llantas Usadas) manages the ELT recovered by the members reporting to SEMARNAT.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- Energy recovery via cement kilns (14.3%) is the major recovery route, followed by material recovery (6%) comprising ground rubber and tire-derived products.

**Impacts on health and on the environment:**
- Low level of awareness of environmental issues.
- The United States/Mexico border region has been undergoing large clean-up programs.

**Technological innovations:**
- Rubber-modified asphalt perceived as a promising technology, encouraged by American neighbours (Arizona, California).
- A recycling company developed a line of waterproof construction products, partially made with ELT rubber powder.

**Opportunities and drivers:**
- Current shared responsibility system and discussions on a potential EPR system.
- Cooperation with the United States for clean-up programs.

**Barriers and challenges:**
- Large volumes of unauthorized used and waste tire imports into Mexico.
- High collection and transportation costs (inflation in the transport sector and increase in oil prices in 2017).

## Nigeria

# Nigeria

### Nigeria

| ELT data (Mathur and Hart, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **113** | **-** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **5.7** | **5%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **5.7** | **5%** |
| Sub-total Material Recovery | 2.8 | 2.5% |
| Sub-total Energy Recovery | 2.8 | 2.5% |
| Sub-total Pyrolysis | 0 | 0% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **107.3** | **95%** |

**Data availability and robustness:**
There is no national data consolidation or monitoring regarding ELT generation and processing. The figures provided in this table are based on estimations from Vineet Mathur of Infinity Tyres and Sunday Hart of Michelin Nigeria based on domestic tire consumption.

**Legal system:** There is currently no framework for ELT management in Nigeria and the sector for ELT recovery is informal. However, the Standards Organisation of Nigeria (SON) has been discussing the potential for some form of legislation with producers and importers. This is at a very early stage and only recommendations can be made by SON to the federal government. In addition the National Environmental Standards and Regulations Enforcement Agency (NESREA) has indicated the development of a policy on waste management has reached an advanced stage of progress and that there may be national regulation in the future regarding ELT management in addition to expectations to implement EPR and appoint PRO.

**Main ELT management organization:** There is currently no ELT management organization.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):** There is no consolidated data for ELT management. However, the following uses of ELT are known to occur:
- Direct Tire Derived Fuel (TDF) for roasting of cattle and goats
- Barriers in schools, carparks and use on marine jetties

**Impacts on health and on the environment:**
- The potential effects on human health and the environment of using ELT as TDF for roasting cattle and goats has been subject to study with recommendations against the practice.

**Technological innovations:**
- Multiple studies on the capacities of granulate to absorb oil following spills or other substances.

**Opportunities and drivers:**
- Discussions between the standardisation body and industry actors showing willingness to develop policy

**Barriers and challenges:**
- Transportation costs and logistics with regard to infrastructure and the lack of formal collection point or official dumping grounds from which to develop an ELT management system.

## Russia

# Russia

### Russia

| ELT data (EcoTyresUnion, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **800** | **-** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **160** | **20%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **160** | **20%** |
| Sub-total Material Recovery | 154 | 19.3% |
| Sub-total Energy Recovery | 6 | 0.7% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **640** | **80%** |

*Estimations were 600-1000 kilotons of ELT generated in 2014. Interviewee from EcoTyresUnion approximates the current number at 800 kilotons.

**Data availability and robustness:**
Data from different well recognized sources based on estimations, but remain consistent.

**Legal system:** The EPR system was established in 2015. The system determines yearly recycling rates to be achieved by tire manufacturers and importers, which can choose to recycle tires themselves, to outsource the activity to recyclers or to pay an eco-tax. They must report their data to the Russian Federal Service for Supervision of Natural Resources Usage.

**Major changes in legislation/policy since 2016:** The annual quotas are now based on sales rather than production and imports.

**Main ELT management organization:** EcoTyresUnion, founded in March 2017, unites some of the largest tire manufacturers in Russia, both to guarantee the independent compliance of its members to the ELT obligation but also to represent and protect its members' interests.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- 19.3% of generated ELT are sent for material recovery as crumb rubber or as pyrolysis, though few companies know of pyrolysis and those that use it have trouble with product quality. The remaining 0.7% goes towards energy recovery in cement kilns. In total, 20% of ELT are recovered.

**Impacts on health and on the environment:**
- No available information

**Technological innovations:**
- Accelerated pyrolysis method (acceleration from 8-12 hours to 1 hour processing time).
- Material: carbon sorbents from scrap tire (2015), tire reclaimation via depolymerization with nitrous oxide.

**Opportunities and drivers:**
- The main tire manufacturers in Russia joined the EcoTyresUnion, as a pledge for the sustainable management of ELT.
- The targets defined by the EPR system have been reached.

**Barriers and challenges:**
- Energy recovery is not considered by the authorities as eligible to meet the ELT management system targets, limiting the potential for ELT energy recovery methods.
- The funds gathered by the eco-tax are not used to further develop the ELT management system.
- There is understood to be potential risk of fraud in the ELT recycling declarations.

## South Africa

# South Africa

### South Africa

| ELT data (Redisa, 2016) | Kilotons (metric) (2015) | Percentage of total ELT generated (2015) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | 204 | - |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **51** | **24.9%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **51** | **24.9%** |
| Sub-total Material Recovery | 41.5 | 20.3% |
| Sub-total Energy Recovery | 9.4 | 4.6% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | **153** | **75.1%** |

**Data availability and robustness:** The most recent available data is that of Redisa for activity in 2015. More recent data is only partial in terms of annual operations and would require an extrapolation that appears inconsistent with historic data.

**Legal system:** From 2012 to 2017, ELT were managed via an EPR system. An interim system is in place since October 2017.

**Major changes in legislation/policy since 2016:** In the context of a thorough investigation regarding finances, in March 2019 a court cancelled a liquidation order for REDISA, the organisation overseeing the EPR system. During the investigation the government had published a call for new industry waste tire management plans, and had been managing the interim operations during the suspension.

**Main ELT management organization:** REDISA, an independent non-profit organization was the entity overseeing the EPR system until October 2017. The Department of Environmental Affairs' Waste Management Bureau had been ensuring the interim since then. Since the liquidation order was cancelled, the future management organisation has yet to be confirmed.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- Material recovery is the main recovery route (20% of generated ELT).
- Energy recovery is the second ELT recovery route (5% of generated ELT), especially for TDF in cement kilns.

**Impacts on health and on the environment:**
- No available information

**Technological innovations:**
- Two studies from 2018, on the use of recycled carbon black to modify the properties of other materials, and on the potential of solid char, produced via the pyrolysis of ELT.

**Opportunities and drivers:**
- Establishment of a new waste tire management system, co-designed by all relevant actors (public hearings and consultations on the proposals).
- Strong network of actors previously involved (recyclers, waste pickers) who have renewed their contracts for the new plan.

**Barriers and challenges:**
- Low global processing capacity in South Africa.
- Concentration of most waste tire processing and recovery facilities in certain provinces, bottlenecks and high transportation costs.

## South Korea

# South Korea

### South Korea

| ELT data (KOTMA, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **319.4** | |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **280.9** | **87.9%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **280.9** | **87.9%** |
| Sub-total Material Recovery | 120.9 | 37.9% |
| Sub-total Energy Recovery | 160 | 50.1% |
| Sub-total Civil Engineering and backfilling | 0 | - |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | 38.5 | **12%** |

**Data availability and robustness:** Data provided by KOTMA, the main organization involved in ELT management in South Korea.

**Legal system:** ELT are targeted by an EPR system as defined in national legislation, which provides a framework for the recycling plans, the roles and responsibilities of actors involved and provisions concerning waste reduction.

**Major changes in legislation/policy since 2016:** There have been no changes in legislation since 2016.

**Main ELT management organization:** KOTMA (Korean Tire Manufacturers Association) is a non-profit organization representing the interests of tire and tube manufacturers in Korea. It is the main ELT management organization in South Korea, and its roles include the management, collection and treatment of ELT in Korea, in an efficient and environmentally-friendly manner.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- In South Korea, ELT are mainly valorized for energy recovery (50.1%), and for material recovery (37.9%).

**Impacts on health and on the environment:**
- The use of ELT in crumb rubber for synthetic turf is restricted by reinforced standards in South Korea and potential incurred costs.
- A study commissioned by KOTMA and its member companies found that none of four major heavy metals considered harmful to human health (lead, cadmium, chromium, mercury) were detected in the lower layer of the urethane tracks analysed.

**Technological innovations:**
- Interest for rubber-modified asphalt but low demand.
- Material: use of ELT in composites; use of tire chips in bio filters.

**Opportunities and drivers:**
- Effective EPR system and high recovery rate.
- Government policy limitations on ELT sent to energy recovery (70%) to develop material recovery markets.

**Barriers and challenges:**
- Current dominance of recovery methods over ELT recycling.

## Thailand

# Thailand

### Thailand

| ELT data (Suparat, 2013*) | Kilotons (metric) (2012) | Percentage of total ELT generated (2012) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **515** | |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **277.7** | **53.9%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **277.7** | **53.9%** |
| Sub-total Material Recovery | 202.3 | 39.3% |
| Sub-total Energy Recovery | 75.4 | 14.6% |
| Sub-total Civil Engineering and backfilling | 0 | 0% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | 237.3 | **46.1%** |

**Data availability and robustness:**

In the absence of recent robust data, the figures presented above are considered the most recent statistics available.

**Please note that a reference had been misplaced in the report from the last study (2016-17). The year and organisation have since been corrected to was is considered to be the most reliable source available. The data was adjusted following recalculations.*

**Legal system:** Thailand has a free market for ELT, and the management of ELT is not considered to currently be a priority issue for the government. ELT are not the object of any specific law or regulation, but they fall under the category of solid waste, which is regulated.

**Major changes in legislation/policy since 2016:** There have been no changes in legislation since 2016.

**Main ELT management organization:** There is no main organization managing ELT in Thailand, but various actors are associated both from the private and public sectors such as the Pollution Control Department, the Department of Industrial Works under the Ministry of Industry and the Thai Automobile Tyre Manufacturers Association.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):** In Thailand, the estimated recovery rate is of 53.9%. Pyrolysis and cement kilns are the two main recovery routes in the country.

**Impacts on health and on the environment:**
- There is increasing attention to pyrolysis pollution. Local tire manufacturers highlighted that the industry is expecting the government of Thailand to issue regulations to control operations.

**Technological innovations:** Developing new technologies to recycle ELT is not considered as a priority in Thailand. However, some studies have been conducted:
- Integration of crumb rubber into cement bricks to lower their thermal conductivity (2013)
- Study of the use of ELT as geomaterials mixed with soil and stabilized by cement for road and embankment construction (2013)

**Opportunities and drivers:** The government recently commissioned a study on the implementation of a regulatory framework system for ELT management which would: either consist in a tax-based regulation system scheme, or a manufacturer responsibility system, very similar to EPR systems.

**Barriers and challenges:** Municipalities may lack technical and financial resources to implement recycling projects. Furthermore, there are no official collectors outside of major cities, which can make the collection of ELT difficult in rural areas.

## United States

# United States

### United States

| ELT data (USTMA, 2018) | Kilotons (metric) (2017) | Percentage of total ELT generated (2017) |
|---|---|---|
| **TOTAL ELT Generated (from available sources)** | **3700** | **-** |
| **TOTAL Recovered (excluding Civil Engineering and backfilling)** | **2668** | **72.1%** |
| **TOTAL Recovered (including Civil Engineering and backfilling)** | **2995** | **80.9%** |
| Sub-total Material Recovery | 1227 | 33.2% |
| Sub-total Energy Recovery | 1442 | 39% |
| Sub-total Civil Engineering and backfilling | 326 | 8.8% |
| **TOTAL Other (not-recovered, landfill, stockpiled or unknown)** | 706 | **19.1%** |

**Data availability and robustness:** Data provided by USTMA, the main association relating to ELT management in the United States.

**Legal system:** ELT are regulated at the state level through federal waste tire management programmes. Each state independently decides on the customer fee imposed on the purchase of new tires, and on potential grants and subsidies for ELT recovery projects.

**Major changes in legislation/policy since 2016:** There have been no major changes in policy or legislation since 2016, and no major shift expected at the national level.

**Main ELT management organization:** The United States Tire Manufacturers Association (USTMA, formerly RMA) is the national trade association representing tire manufacturers in the United States.

**Main ELT recovery methods, products and applications (expressed as a % of total ELT generated):**
- 39% of ELT are sent towards energy recovery in the United States, and 33.2% to material recovery, among which granulation is the main recovery route. In addition, 8.8% of ELT are directed towards civil engineering.

**Impacts on health and on the environment:**
A relatively high number of studies on health and environmental impacts of ELT recovery methods, especially for the use of crumb rubber for synthetic turf have been conducted in the US.
- Synthetic turf: Significant number of studies conducted within the last 15 years, but results have been inconclusive with regard to potential risk to human health.

**Technological innovations:**
- Material: Micronized rubber powder; rubber-modified concrete; adsorption of chemical elements using scrap tire rubber, etc.
- Energy: Recovered carbon as anodes for batteries, pyrolysis, etc.

**Opportunities and drivers:**
- Efficient and well-established ELT management systems.
- Active research into new technologies.

**Barriers and challenges:**
- Different ELT management methods in each state mean that some states are more advanced than others.
- Regulations can have detrimental effects on the smooth development of some markets (civil engineering, asphalt).

# Conclusion of the SOK phase

As expected, the performance of ELT management is generally directly related to the existence/absence and the level of maturity of a formal management system, especially those where one or several actor(s) are dedicated to ELT management (generally associations created by government or tire manufacturers). The older the system (EPR or other) that was implemented, the better the performance is (in terms of collection rate, recycling rate, etc.).

With just over 29.1 million tons (metric) of ELT generated in the 45 countries in the studied scope, approximately 25.6 million tons of ELT are recovered (excluding civil engineering and backfilling but including ELT collected in China with undetermined end use). This would mean that 88% of ELT generated is recovered (90% including civil engineering and backfilling). The market has high-potential for development, especially in countries such as Argentina, Mexico, Nigeria, South Africa, Thailand and Russia, where recovery rates remain relatively low.

Governmental support is crucial in providing the legal framework in which the ELT markets can be developed. Moreover, as they can affect public health, allow the development of new industries and create employment, there is an even greater expectation for local governments to drive ELT recovery markets and control illegal ELT generation and treatment. Setting the status of ELT is one of the first steps taken by local regulations, defining it as product or a form of waste and determining potential for import or export and the logistics of land transported ELT since, when considered waste, some countries require transportation companies to have a specific permit (e.g. Italy).

According to the information collected during this study for the 45 countries (13 countries around the world and the 32 countries of ETRMA scope for Europe), 97% of the ELT recovered with a determined end use are processed through material recovery and energy recovery. Although TDM and TDF are rather well spread at the global level and used as major recovery routes in a large number of countries, the production of reclaim rubber is mainly developed in Asian countries such as China and Thailand. This is the main recovery route in China (34% of the total domestic recovery market) that represents about one fifth of the total ELT recovered (including civil engineering and backfilling) for the selected scope.

The remaining portion of the market is mainly shared between pyrolysis & gasification and civil engineering & backfilling. Pyrolysis is one of the more important recovery routes in Indonesia and Thailand, while it remains very marginal in other countries. The market for civil engineering and backfilling is concentrated in certain countries and regions: Brazil, the USA and a few countries in Europe. In particular, it represents 9% of the domestic market in the USA.

# Part II: Feasibility evaluation

The second part of this report consists of the results of the second phase of this study, which aims to evaluate the feasibility of a selection of recovery routes through the associated methods, products and applications. The following technologies were identified for the feasibility evaluation (in alphabetical order) as major categories of ELT recovery:

- Cement kilns and other energy production (e.g. power plants, boilers and more);
- Civil engineering (e.g. of applications: barriers, embankments and more);
- Reclamation;
- Granulation (e.g. of applications: rubber-modified asphalt, artificial turf infill, molded rubber products and more);
- Pyrolysis; and
- Steel production.

The recovery routes above are presented in Figure 6 below.

The feasibility evaluation was conducted based on analysis in relation to multiple criteria across four main categories:

- Regulatory context;
- Technical feasibility;
- Economic drivers; and
- Sustainability considerations.

This report is then structured into chapters that highlight, compare and contrast between current situations and future trends facing recovery routes across each of the four categories listed above, followed by summaries of the individual feasibility evaluations of recovery routes and associated ELT applications.

### Methodological approach

As identified in Figure 6, it is important to note that where safety standards on a tire's useful life are respected, retreading and reusing tires before they are disposed of as ELT can be considered to promote circular economy as aligned with the waste management hierarchy. However, this study focuses on ELT, at the point at which the useful life of the tire is complete and it is deemed to no longer serve its intended function.

The results of the study presented in this report are based on information collected via literature review and interviews with stakeholders.

A stakeholder mapping has been performed in order to include key stakeholders in our data collection and consultation process.

We would like to thank all of those who kindly participated in the study, through interviews or by other means, supporting the completion of this project.

### Methodology on data collection, consolidation and limitations

As stated in the introduction, the information presented in this chapter has been collected through two main approaches:

1. Literature review such as public studies, public databases and statistics, academic studies, existing and emerging regulations, etc.
2. Stakeholder consultation process based on interviews. In some cases, mainly for language barriers, the information was collected via written feedback after an interview guide was sent to the interviewee.

The following is NOT considered as ELT and will therefore be excluded from data: retread tires, second-hand tires and tires exported with used cars. This change in scope is the main reason why some of the recovery routes communicated in the study may vary from the source data.

The ideal target scope for this study includes all types of tires: passenger car, truck, airplane, agricultural, two and three-wheel as well as OTR tires. Nevertheless, the data presented hereafter is limited to the scope of each source of data found. Passenger cars, bus tires and truck tires are included in all of the country/region data (these are the most significant quantities in terms of units of ELT generated). OTR tires (an important category because of the significant weight per tire) and the other categories are not always included in the source data.

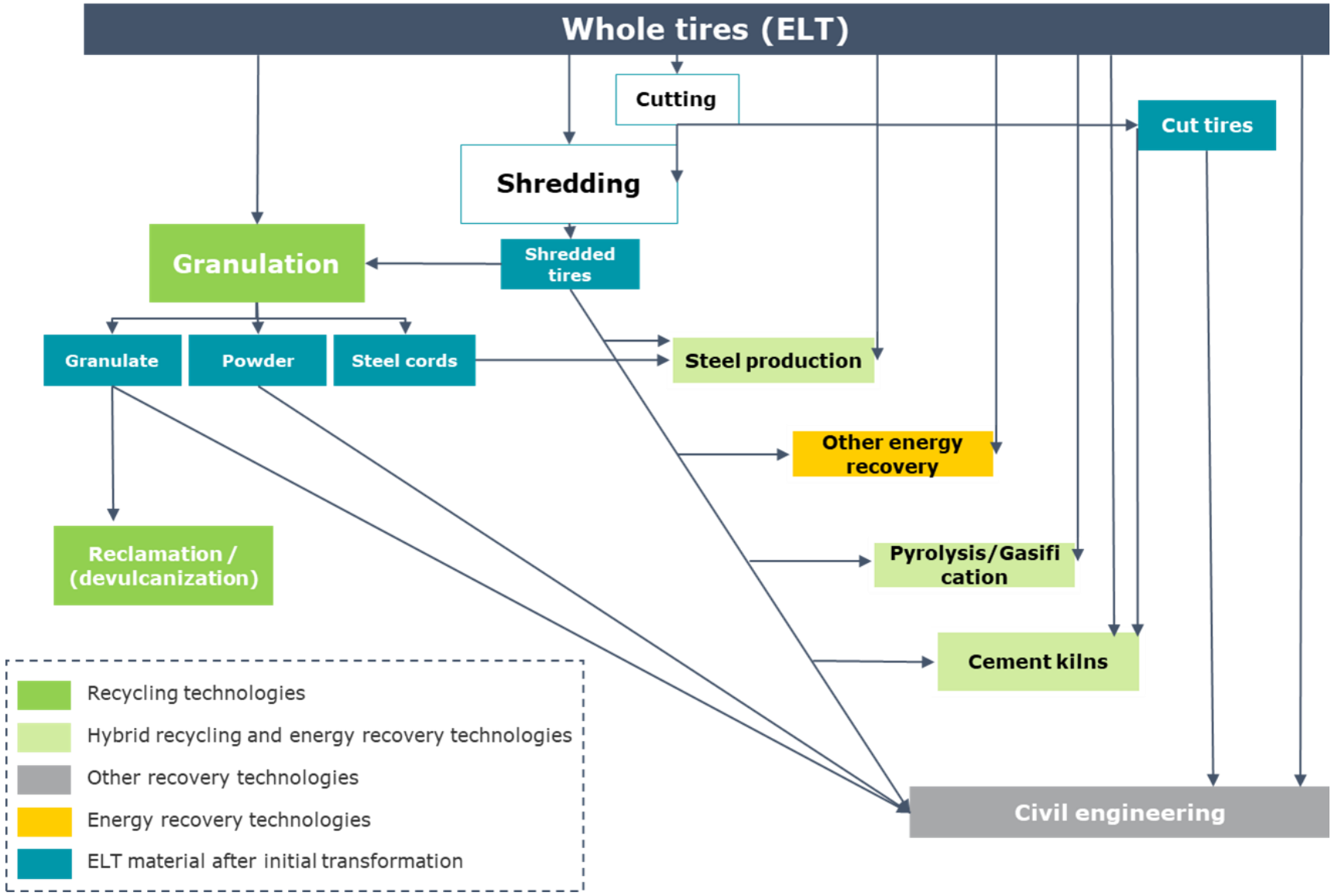



Figure 5 Illustration of non-linear links between recovery routes (initial stages of transformation pre-application)

### Scope of the feasibility evaluation

The following section presents the results from the feasibility assessment, which covered seven recovery routes and ten recovery applications. Findings from the Phase 1 SOK helped identify the major ELT recovery routes, while the applications were determined based on a number of factors, including their importance in volume, their potential for further development and the information available for each application.

However, recovery applications differ widely between countries, especially with regards to their technical and sustainability characteristics. The maturity of specific technical processes differs from one region to the next, and many separate processes can exist for a single application.

The evaluation carried out in the following section is built on the information that was available within the scope of this study.

| Recovery route | Recovery applications assessed |
|---|---|
| | |
| **Granulation** | Artificial turf infill |
| | Playgrounds |
| | Rubber-modified asphalt |
| | Rubber-molded products |
| **Reclamation** | Reclamation |
| **Pyrolysis** | In the absence of specific applications, the feasibility assessment was conducted on the entire recovery route. |
| **Cement production** | In the absence of specific applications, the feasibility assessment was conducted on the entire recovery route. |
| **Steel production** | In the absence of specific applications, the feasibility assessment was conducted on the entire recovery route. |
| **Civil engineering** | This recovery route was assessed as one application, due to the similarity of civil engineering applications in terms of regulatory, economic, technical and sustainability considerations. |
| **Other energy recovery** | In the absence of specific applications, the feasibility assessment was conducted on the entire recovery route. |

Table 3: List of recovery routes and applications assessed for the feasibility evaluation, and key sources of information

## Regulatory frameworks of ELT recovery routes

Overview of the regulatory context around ELT recovery routes: In terms of regulation, some recovery routes are directly subject to regulation at the national or at larger levels (e.g. EU level), while other methods are indirectly affected by rules imposed on other recovery routes.

A key element to highlight is the dichotomy (with some hybrid cases) between material and energy recovery, which appear throughout different policy measures, though these are strongly linked to the geographical area considered.

In areas where ELT management systems had to deal with historical stock piles, illegal landfill or dumping issues, TDF markets could be strongly encouraged by the government as a clean and efficient way to start in order to manage ELT. In addition, with increased environmental awareness and strengthened regulations on energy consumption and greenhouse gas (GHG) emissions, ELT prove to be an attractive alternative fuel to use. In Japan, the government has set up exemptions to reporting and reduction objectives for energy produced from waste or renewable sources.

In countries or regions with a more mature ELT management system, the use of ELT for energy recovery, which involves the combustion of tires, can be discouraged, capped or even forbidden to favor material recycling in line with a waste management hierarchy (energy recovery is positioned low in the waste hierarchy, and can be considered close to disposal).

Concrete examples of the limitations posed to energy recovery include:

- The European Waste Framework Directive 2008/98/EC which favors material recovery over energy recovery;
- The prohibition of waste material combustion, including ELT, to encourage the use of waste for higher-value markets in several Canadian provinces (OWNA, 2017);
- The absence of funding to expand the tire-derived market or to carry out studies about energy recovery in California; and
- The Russian EPR system, which excludes some recovery methods (namely cement production, steel production, energy generation and pyrolysis) to achieve yearly ELT recycling targets.

Material recovery methods, including granulation and reclamation, are in many cases considered as priority recovery routes.

Regulation specific to some recovery applications: Some pieces of regulation have also specifically targeted certain applications of ELT recovery, such as rubber-modified asphalt or artificial turf infill.

For instance, while controversy has arisen regarding the use of ELT in artificial turf infill, no regulation limits the use of this material as of 2019, except in South Korea, where the use of ELT as rubber granulate for synthetic turf has been restricted by reinforced standards (KS F 3888-1).

Financial perspective linked to regulation: subsidies, grants and taxes: The same dichotomy between material and energy recovery is expressed in terms of subsidies: many subsidies were identified for the use of granulate in high value applications (e.g. rubber-modified asphalt, devulcanization, etc.).

It is understood that there are very few subsidies available for cement industries using ELT, and the only case identified was in Japan. However, gate fees also have an influence on the use of ELT in cement kilns. In South Africa for example, some cement companies stopped using ELT in their kilns after gate fees supported by policy were removed for ELT, which made this waste stream no longer financially interesting for the cement industry (Doyen, 2019).

According to Barry Takallou, CEO of CRM a tire recycling company based in the USA and Canada, despite the need for subsidies to establish markets for recycled crumb rubber products, market-push tire recycling programs that provide incentives to the manufacturers can be considered as a form of artificial intervention by the government in the market place that can distort the true demand, potentially resulting in anti-competitive behavior, fraud, and dependency on incentives, as well as dumping of overproduced products that could force recycling companies out of business (Takallou, 2019). However, in a market-pull tire recycling program, the principle is that incentives are given to end users of the recycled tire products to develop local sustainable markets (Takallou, 2019).

Finally, grants can be awarded to innovative and developing technologies, which promotes research for new forms of recovery routes.

Regulation targeting environmental protection or safety: While many of the above regulations concern waste management and various applications of ELT recovery, more and more importance is given to the impacts of various recovery routes on the environment.

The risks posed by various recovery routes or methods in terms of human health are of utmost importance to public authorities. For example, measures are being taken by the government and the industry in China to move away from polluting reclamation methods by providing subsidies for cleaner methods.

The compliance with or promotion of a waste management hierarchy is a common trend in many of the regulatory frameworks assessed in this study. Some regions or countries have set objectives to encourage recycling and limit energy recovery, while others have established more stringent regulations to exclude energy recovery from ELT management systems. Many countries have yet to establish a clear framework for ELT management resulting in the establishment of informal systems.

## Technical feasibility of ELT recovery routes

The recovery methods, products and applications that make up the routes covered in this evaluation use a wide range of technologies even within a particular family of approaches to ELT management, where there are significant gaps between standard and advanced forms.

Granulation processes are historically well developed with a variety of different applications, some being more significant than others. These processes do not present major technical difficulties. This factor is equally if not more applicable to civil engineering applications, which involve limited processing or transformation. While reclamation has existed since the 1960s, some new innovative devulcanization processes are less than a decade old, but both are at stages of commercialization.

ELT have many technical properties (e.g. lightweight, thermal insulation etc.) that are suitable to civil engineering applications, however supply does not always meet demand in terms of required volumes for large scale projects. The capacity of large facilities such as power plants and cement kilns is also another opportunity to treat stockpiles in the short term. However, adaptations are required to support the use of ELT in these facilities.

Some applications of granulation are considered to be more technically advanced than others. The output products are usually of high quality and those applications that are more innovative will focus on higher added value products such as micronized-rubber powder.

In most cases, the main products of recent devulcanization techniques aim to be used in tires, while reclaimed rubber can be used in a wider variety of products albeit with limited added value such as in tubes, liners, cables or tiles and also in new tires, although the quality has been considered limited at the current stage of technological development for the latter.

There is a similar discrepancy for different pyrolysis technologies. Overall, efficient technology producing high quality outputs are not widespread. In parts of Asia the fundamental process of pyrolysis is in operation on a large scale, largely for the production of oil as TDF. However, research and development with some projects at commercial scale are underway for example on high quality carbon black and oil output products for which significant pre-processing and post-processing measures are required.

Barriers to entry have been observed in particular for countries with less mature ELT management systems due to the lack of funds to invest in high volumes and adequate technology (see economic drivers section).

The attention to quality for an existing process or product is key for industries that incorporate ELT as a replacement for fuel or material. The technical feasibility is generally positive for the use of ELT material in steel production thanks to the significant portion of steel in the tire and the capacity for ELT to replace anthracite to provide carbon. However, attention must be given to the composition and chemical balance to maintain the quality of the process and product. In cement kilns, and energy generators, the use of shredded tires is preferred or required due to the enhanced ability to dose the material to avoid detrimental impacts on production conditions. Adaptation of equipment and infrastructure and testing of processes for the replacement of traditional fuel with TDF will also be necessary to begin with but the ELT material is considered relatively stable.

It is worth noting that the composition of tires is relatively stable. This is a cross-cutting factor that supports most recovery routes and TDF in particular when compared to some municipal solid waste for instance.

In conclusion, the technical feasibility of the recovery routes differ based on a number of factors, among which their stage of development, their capacity to absorb large volumes of ELT and the quality of output products. Some methods are well-developed, without any technical difficulties, while others involve very complex processes. In some cases, one single recovery method can involve several separate processes (e.g. reclamation, devulcanization, pyrolysis). Finally, while certain methods absorb large volumes of ELT, others have given more priority to the production of high-quality products, despite the absorption of lower volumes.

## Economic drivers for ELT recovery routes

The economic drivers of recovery routes are determined by various costs, opportunities and market conditions. Certain recovery routes depend on the value added of output products using ELT as feedstock (material recycling in particular) while others replace traditional materials or fuel with ELT.

A number of cross-cutting factors may affect all recovery routes, including capital costs associated with storage, fire protection, infrastructure with varying degrees of necessary adaptation for existing facilities. Transportation and logistics can also result in major running costs depending on the ELT management system in place and the supply chains established.

The backlash against pollution may be restricting the economic drivers for reclaimed rubber, which has been a historically strong market in certain geographical zones, including China. Despite its current importance, this market is expected to be constrained in coming years due to restrictions imposed by local authorities related to the potential environmental impacts of chemical reclamation in particular.

Among the different recovery routes are those that involve minor adaptation of current facilities used for particular purposes and others that are established for the purpose to be dedicated to recovering TDF or TDM from ELT. The capital expenditure and operational expenditure required for the latter ELT recovery facility is of course more significant.

For example, the economic model for granulation and its applications with value added products may require relatively high investment costs on equipment and infrastructure than what is needed for other recovery methods, as granulation can entail advanced treatment and processing stages. The granulation industry is dependent on gate fees in some areas. The low prices at which granulate is sold for playgrounds or artificial turf for example creates a need for gate fees to support the activities of granulators (Domas, 2019).

The use of rubber granulate in playgrounds or artificial turf infill represent some of the key applications for granulation. However, one ton of the material ELT rubber replaces, which is ethylene propylene diene monomer (EPDM) rubber, can be sold for almost 7 times as much as ELT material. The large difference between the two and the smaller revenue generated by sales make some granulators dependent on gate fees (Domas, 2019). However, the market for playgrounds has seen a steady increase over the past decade, as opposed to that of artificial turf infill which has witnessed a drop in certain European markets due to negative public perception (Raahauge, 2019).

The development of high value products using innovative technologies in stages of processing can be a way of compensating for these capital and operational expenditures. On the other hand, rubber-molded products generally have less added-value, and the industry has been perceived as being dependent on subsidies where available.

On a global scale, economic drivers of pyrolysis are currently low due to the competitiveness of the products in relation to virgin or traditional materials. This is based on both price and quality. Overall the added value compared to these materials is low and the cost to produce them can be high. The profitability depends on the added value of the output product. The trend for further development is positive for pyrolysis. One output, carbon black, derived from ELT is currently in the process of being commercialized by a small number of companies for different applications and there appears to be potential for growth.

Multiple specific factors play a role in determining the economic drivers for applications. Some markets for applications of granulation have fallen in significance in recent years. The market for artificial turf infill fell by 30% in volume of ELT consumed between 2014 and 2017 in the USA due to public and industry perception (see sustainability section) and saturated markets.

Despite advantages in cost and durability, the market for rubber-modified asphalt has historically been limited by regulatory barriers linked to competition with traditional materials combined with industry reluctance to change, which also hinder its commercialization.

Although the market for civil engineering applications of whole or shredded tires remains small, with applications serving different purposes, these applications are often less expensive than traditional alternatives, and their implementation and processing costs are not considered as being limiting factors to economic viability. As with rubber modified asphalt, using ELT in civil engineering also creates products with a high added value, thanks to the advantageous technical properties of ELT.

For more innovative recovery technologies, there is some room for expansion of output products to new sectors for example devulcanized rubber and for granulation, innovative technologies focused on high quality output material.

Concerning TDF, the price of traditional fuels is critical for the competitiveness of ELT. Figures 5 and 6 show the changes in coal and oil prices over time. After a peak in 2011 followed by a dip until 2016, prices started to climb again. Under current circumstances, TDF has potential to be particularly competitive. It is important to note that the price of ELT varies across different countries and at different stages of the value chain. However, TDF is usually five to ten times less expensive than coal or petcoke, and represents major savings for the cement or other energy industries (Domas, 2019). This factor also concerns steel production and the replacement of anthracite.

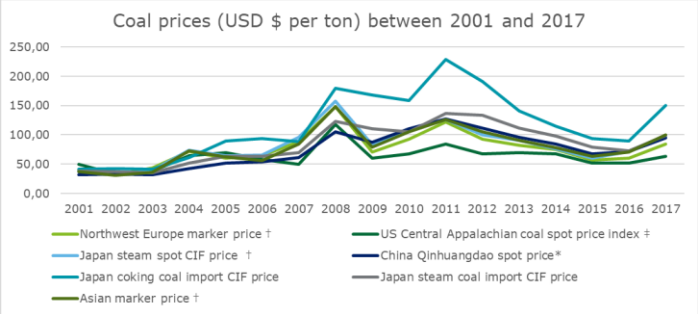



Figure 5: Graph showing changes in prices of coal over time. Source: BP Statistical Review of World Energy

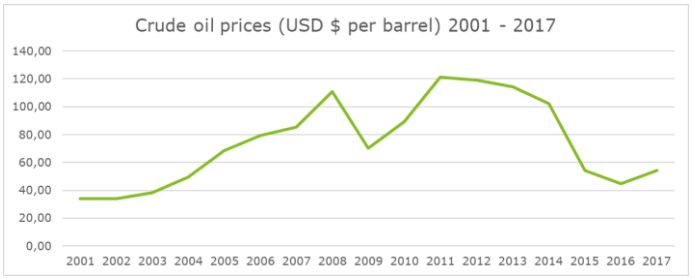



Figure 6: Graph showing changes in prices of crude oil over time. Source: BP Statistical Review of World Energy

Although other alternative fuels, including solid recovered fuel, may lead to greater competition for ELT stable ELT composition and high calorific value makes it a relatively appealing option (see technical feasibility section).

For material recovery, in particular reclaim rubber, over the past few years, the price of both natural rubber and synthetic rubber has been on the decline. According to the International Rubber Study Group (IRSG), the price of one ton of natural rubber was US$ 2,635[4] in 2013, falling to US$ 1,207 in 2016. In 2019, the price of natural rubber usually revolved around US$ 1,800 per ton (Global Rubber Markets, 2019). Nevertheless, the price of reclaim rubber is still significantly lower, at approximately 30% of the price of natural rubber (Gandhi, 2014). In addition, the price of reclaim rubber has remained relatively constant, only slightly increasing in recent years, compared to market volatility characterizing the prices of natural and synthetic rubber (GRP 2014).

A cross-cutting factor identified that can make up part of the financial transaction is the availability of gate or tipping fees particularly for industries that do not produce high value products including TDM and TDF. Depending on the output product and its market value, recyclers in different countries around the world are willing to pay between $5 USD and $100 USD per ton for ELT material, with an average of around $50 USD per ton.

Overall, the long-term context in a particular location must be assessed to evaluate viability taking into account the factors identified above and the significance of their impact.

[4] Based on the average of the prices for SGX RSS3, SGX TSR20, and Europe TSR20

In conclusion, a distinction is to be made between recovery routes which depend on the added value of output products using ELT as feedstock (material recycling in particular), and those that replace traditional materials or fuel with ELT. The economic model for several granulation applications may require relatively high investment costs for equipment and infrastructure, while the economic viability of other applications will depend on the price of the traditional counterpart (e.g. fuel). The market size must also be considered, as there appears to be room for new technologies, offering innovative products, while the market for certain traditional applications, such as granulate used in artificial turf infill, has decreased.

## Sustainability considerations relative to ELT recovery routes

Position in waste management hierarchy: The recovery routes and applications assessed in the scope of the study do not all have similar positions along the waste framework hierarchy, which considers the following preferred order to manage waste:

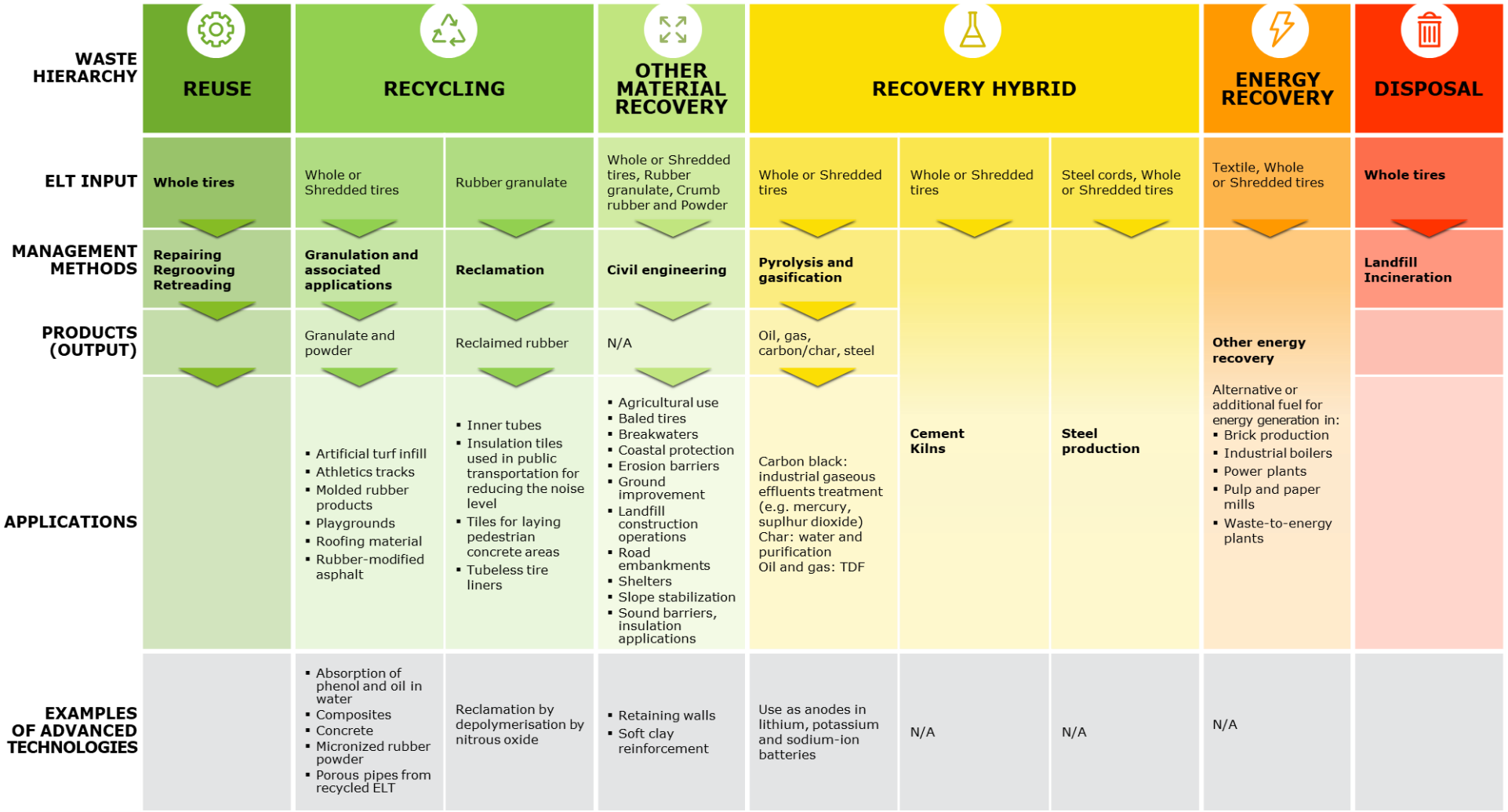
- Prevention;
- Re-use;
- Recycling;
- Recovery; and
- Disposal.

The positions of the different recovery routes and the associated applications are illustrated in Figure 7 below.

As seen from Figure 7, two recovery routes are positioned in the recycling category: granulation and all of the applications associated (e.g. rubber-modified asphalt, artificial turf infill, molded rubber products, etc.) and reclaimed rubber, which also involve material transformation to form reclaimed rubber.

Meanwhile, three recovery routes are split between material and energy recovery and are considered as hybrid technologies in the scope of the project: pyrolysis and gasification, the use of ELT in cement kilns, and the use of ELT in steel production. All three of these technologies contribute to material recovery. Pyrolysis for example generates char in addition to oil and gas. The iron that is released during the burning of tires in cement kilns is used as material in the composition of cement. ELT can replace anthracite in steel works to provide carbon and prevent oxidation of metal. Civil engineering, makes use of whole tires or tires recovered through processing to varying degrees although transformation is generally considered limited for this category.

Finally, only the wider group of energy recovery, which comprises the use of ELT in power plants, industrial boilers or pulp and paper mills, does not contribute to material recovery. This recovery route is considered as "Other energy recovery" and is not a priority route according to the waste management hierarchy.




**The waste hierarchy category "Reduce" is not in the scope of this analysis. In addition, "Reuse" has been included, however this is not applicable to all tires and would depend on the condition of the product in relation to the appropriate safety standards.*

Figure 6 Position of recovery methods and applications along the waste management hierarchy

Environmental considerations illustrated by life cycle assessments (LCA): The sustainability considerations relative to ELT recovery applications were assessed through various indicators in the scope of LCA studies.

The recovery of ELT for use in various applications is usually always environmentally preferable to traditional alternatives. The production of synthetic turf, the manufacture of molded products and the use of ELT in cement kilns stand out as the most advantageous methods on the basis of a selection of environmental indicators in a study conducted in 2010, including total primary energy consumption, water consumption and production of waste (Aliapur, 2010). The environmental performance of playgrounds is very similar to that of artificial turf infill, as the materials replaced by using recycled rubber are the same for both applications. In comparison, the environmental performance of civil engineering applications and retention and infiltration basins are relatively minimal.

The benefits of ELT recovery and of its different applications generally result from using ELT as substitutes for high energy-consumption materials (such as EPDM for artificial turf or molded products) and from avoiding the production and transport of certain substituted materials when the life span of ELT products is greater than those of the products they replace (Aliapur, 2010).

The high environmental performance of cement kilns and artificial turf was also illustrated in a number of other studies. The use of ELT in cement plants and in artificial turf provides reductions in GHG emissions, air toxics, and water consumption. The substitution of one ton of coal by TDF avoids an estimated 543 kg ($CO_2$ equivalent) of direct and indirect GHG emissions (Fiksel, 2011).

However, the use of ELT in artificial turf infill was already facing barriers back in 2011 because of market saturation. Currently, this market is even more limited due to recent controversy (Fiksel, 2011).

Results from LCAs tend to depict rubber-modified asphalt as an application with lower environmental benefits than the other recovery methods and applications considered in the study. Indeed, asphalt production involves additional processing steps for ELT granulate that may require high electricity and diesel consumption, with associated GHG emissions. However, rubber-modified asphalt still represents a very interesting application of ELT as it can be recycled, unlike most granulation applications. Rubber modified asphalt has been shown to improve the performance and durability of the pavement surfaces stream (Takallou, 2019). Moreover, it can be recycled multiple times at the end of its service live (Takallou, 2019). Many, rubber molded products, however, eventually end up in the landfill and would therefore in comparison be considered only to delay the waste stream (Takallou, 2019).

This trend was confirmed in a study carried out in 2017, indicating that rubber-modified asphalt did not show high environmental performance in terms of acidification, global warming potential, and depletion of abiotic resources for instance. The uses of liquid asphalt, gravel, and diesel in the process are considered key factors (Ortíz-Rodríguez et al., 2017).

Meanwhile, particular applications were also compared one-on-one, with comparisons of the environmental performance of material recycling (where ELT were sent towards artificial turf and asphalt) and both cement kilns and civil engineering applications.

Material recycling was found to have more environmental benefits than co-incineration, with major differences in terms of global warming potential, energy demand and acidification. For instance, between 0.07 and 0.31 person equivalents[5] are saved per ton of tires being recycled and not incinerated. If 650,000 tons of ELT (representing Germany's annual ELT production in 2009) were sent towards recycling instead of incineration, this would represent annual potential savings of between 40,000 and 200,000 person equivalents, depending on impact category (Kløverpris et al, 2009a).

Meanwhile, 570,000 tons of $CO_2$ emissions (corresponding to annual emissions from more than 50,000 Europeans) could have been saved if the annual amount of tires being sent to civil engineering applications in Europe in 2009 (300,000 tons) had been

[5] Person equivalents express the total impact of treating one ton of ELT relative to the total environmental impact caused by one person in one year.

used for material recycling instead (Kløverpris et al, 2009b).

Overall, material recovery routes were found to have the best environmental performance out of the applications assessed throughout LCAs. The use of ELT in cement kilns also shows high environmental benefits. The findings of separate studies are not comparable from one to the other, as the hypotheses made and the methodologies applied differ. It is also important to note that little data is available for some of the recovery routes and associated applications covered in this study, for example devulcanization, reclamation, pyrolysis, as they are still quite new methods.

Focus on some applications and innovative technologies: The following section provides a focus on the environmental performance of a selection of ELT recovery applications, for which quantitative information was available.

In the case of micronized-rubber powder production, which uses cryogenic granulation, current processes can release half the amount of $CO_2$ compared to traditional synthetic rubber manufacturing. The product is cooled using liquid nitrogen and therefore does not require water. Overall, the process can generate savings of 10kWh compared to the production of 1kg of synthetic rubber (Lehigh technologies, 2019).

Producing carbon black from tires during pyrolysis avoids its production through traditional methods, in which oil is the primary feedstock. For every kilogram of carbon black produced through ELT pyrolysis, around 5 kg of $CO_2$ are saved in relation to carbon black produced using oil (Cardozo, 2019). $CO_2$ eq. emissions reduction is hence generally above 80% compared to virgin carbon black production, which is also an economic factor when carbon pricing is applied (Ershag and Olofsson, 2019).

Finally, in terms of sustainability considerations, different devulcanization processes involve considerable environmental benefits compared to the production of a typical tire compound. Some processes consume low amounts of energy to convert ELT rubber crumb into devulcanized rubber compound. The total energy consumption for the production of ELT crumb and subsequent devulcanization represents 94% of energy savings compared to the energy required to produce virgin tire rubber compound (Visaisouk, 2019).

Potential risks to human health: Overall, the majority of studies have concluded that the recovery of ELT implies little or no risks for human health, except for some recovery methods and applications detailed below.

The use of ELT in artificial turf infill is a controversial ELT application due to perceived risks for human health. Many studies on the topic are still underway, in the USA and in Europe for example. In 2017, the European Chemicals Agency (ECHA) concluded that there was "at most, a very low level of concern from exposure to the granules" found in sports pitches and playgrounds (ECHA, 2017). As of 2019, the studies published on this topic indicate that there is very low or no risk for human health associated with the use of ELT in artificial turf and playgrounds.

For instance, Anses, the French Agency for Food, Environmental and Occupational Health & Safety, reviewed over 50 international studies on the potential health and environmental risks associated with artificial turf and playgrounds using recycled rubber. The main conclusions from the review indicate low concentrations of heavy metals, plasticizers, additives and volatile organic components (VOCs), all below reference toxicological values, in artificial turf infill and playgrounds. Given the low concentrations of carcinogens emitted or released by tire granulate, the studies consider the risk of carcinogenicity as low or negligible[6]. The study did however identify potential risk to the environment, through the transfer of zinc and organic substances such phenols or phthalates. However, the current SOK on this subject was not sufficient to draw any conclusions (Anses, 2018).

Furthermore, ETRMA published a statement on the safety of recycled rubber infill material in 2016. Rubber components which can come into direct contact with the general public must comply with EU REACH restrictions (ETRMA, 2016). According to the analyses conducted and rubber chemical registration dossiers submitted as well as the reactivity of used chemicals, "no known CMR [carcinogenic, mutagenic, or toxic for reproduction ]

[6] PAHs constitute the carcinogenic substances most frequently evaluated in the studies analyzed.

substances are present in the granules in concentrations equal or greater than either the relevant specific concentration limit specified in Part 3 of Annex VI of Regulation (EC) No 1272/2008, or the generic concentration limit" in Part 3 of Annex I of the same regulation (ETRMA, 2016). Many of the 70 scientific reports and articles published worldwide by the time of writing of the ETRMA statement in 2016 concluded that. "there is no significant or scientifically justified risk associated to the use of rubber granules made from end of life tires" (ETRMA, 2016).

There have also been concerns around the harmfulness of burning waste in cement kilns on human health due to air pollution. It was concluded that the risk to human health is minimal.

For other recovery routes, the wide array of technologies considered under one route leads to differences in terms of risks associated. For instance, the process of chemical reclamation used in some countries (e.g. China and India) requires large volumes of chemical solvents that are believed to be hazardous to the health of workers, in addition to causing pollution. Furthermore, in India, risks of water pollution and respiratory illness were associated to pyrolysis, and increasing attention is given to the human health risks of this technology in Thailand. However, in Europe, where the pyrolysis processes are very different and involve more advanced technology, there are no significant issues linked to human health at the moment.

Meanwhile, and in relation to the potential risks to human health, some applications of ELT recovery have suffered from negative media perception. The unsubstantiated negative media coverage surrounding artificial turf infill created a difficult decision-making environment for key stakeholders and caused a temporary decline in demand of approximately 30% in the USA between 2014 and 2017 (Bigelow, 2019). Similarly, some civil engineering applications, such as retention or drainage basins, are subject to public mistrust, due to the perceived potential hazardous effects the material could have on water (leaching, etc.). A lack of consensus rests on this matter, though specific studies have been conducted by some companies to demonstrate the absence of risk for water pollution. The use of recycled rubber in playgrounds is not considered as creating risk for environment and health, notably because a top coat covers the layer of recycled rubber in playgrounds (Raahauge, 2019).

In terms of public perception, significant work by cement companies is needed to overcome the perceptions of "black smoke" from open burning (Cumming, 2019). Although the science is well established that emissions tend to be lower with ELT use in high temperature, controlled kiln fuel use there continues to be significant negative press for the use of ELT in cement kilns, affecting brand image and potentially putting off some cement companies from using ELT in their kilns (Cumming, 2019). However, this perception appears to be specific to some geographical areas. In Brazil for example, there does not seem to be negative perception of the use of ELT in cement kilns, especially as it reduces stockpiles and landfill (Bastos Da Porciuncula, 2019). Technologies which are known to have negative environmental and health externalities, such as chemical reclamation, also suffer from bad public perception.

However, some applications or technologies are supported by the public and receive positive media coverage. This is the case for many innovative technologies, such as new devulcanization technologies, granulation methods (which produce micronized-rubber powder for example), or even advanced pyrolysis techniques. Public and industry perception can also be influenced by various contests and prizes, such as sustainability awards. Stakeholders state that winning such prizes has a strong influence on the public perception of their industries.

Lifetime of output products and recyclability: The recyclability of output products is also an important element to take into account when looking at sustainability considerations for recovery methods, products and applications. The information concerning this particular topic was limited, but it seems that most applications of ELT recovery are not recyclable, except for a few exceptions, such as rubber-modified asphalt.

The positive perception of rubber-modified asphalt has improved over the past few years, thanks to the support of tire associations highlighting its potential to improve durability for example (Sheerin, 2018). As aforementioned, it also has the potential for circularity, through recycling by recovery and integration into a new mix where necessary (Takallou, 2019).

In conclusion, the sustainability considerations relative to ELT recovery routes can be assessed through their environmental performance. Some recovery routes have considerable benefits in terms of avoided impacts according to several LCA studies, such as the use of ELT in cement kilns and in artificial turf infill. Seizing the importance of this issue, new technologies are placing a lot of focus on developing processes with increased attention for environmental considerations, with reductions in energy and water consumptions for example. The impact of these technologies on human health must also be considered, and a wide array of studies have been conducted on those that pose potential risk in terms of environmental and health concerns. Nevertheless, public and industry perception play a crucial role in the acceptance of these technologies, and therefore in the further development and expansion of recovery routes.

## Summary for each recovery route

A brief summary of the current state and context surrounding recovery routes is available below in alphabetical order.

### Cement production and other energy recovery

| Criteria categories | Cement production and other energy recovery |
|---|---|
| **Regulatory context** | Overall, where policy promotes material recycling which is generally the case, the regulatory context is not favorable to energy recovery due to restrictions and prioritization. Nevertheless, cement production stands out from this group due to the portion of material recovery comprised in the process. In addition, there are indirect policies that may promote the use of tire-derived fuel (TDF) such as those centered on emissions reductions objectives and the supply of alternative fuel. Although permit procedures may be demanding for large corporations, once this hurdle is surpassed, facilities are adapted for the long term. Economic factors such as gate fees may play a more determining role. |
| **Technical feasibility** | The capacity of large facilities such as power plants and cement kilns is useful to treat stockpiles of ELT in the short term. However, despite the fact that it is often possible to use whole tires in cement kilns, the preference of plants is to use shredded tires due to the enhanced facility of dosage. This is considered a prerequisite for other energy recovery facilities such as boilers. Adaptation and testing will also be necessary to begin with but the ELT material is considered relatively stable. |
| **Economic drivers** | The economic drivers of the use of ELT in cement kilns depend on a number of factors. Favorable circumstances for the use of ELT include gate fees and relatively high prices for traditional fuels. Although other alternative fuels including solid recovered fuel may lead to greater competition, stable ELT composition and high calorific value makes it an appealing option. Some investment on infrastructure and adaptations are required. Consequently the long term context in a particular location must be assessed to evaluate viability. Overall the outlook is most positive for cement kilns where there is a gate or tipping fee. |
| **Sustainability considerations** | Industries can switch from fossil fuel to ELT for a share of their energy needs and generate less greenhouse gas (GHG) or other polluting emissions. Alternative fuels, including TDF, are therefore useful for industries to decrease air pollution, and to comply with environmental regulations and improve overall sustainability performance. Some negative public perception has been observed in places with well-established ELT management systems in particular. Cement kilns stand out on top above other recovery routes thanks to additional replacement of energy intensive extractive material and lack of extra generated waste by default. Connected to the $CO_2$ reduction, the material recovery impact is enhanced by the biomass content (natural rubber) of the ELT. |

## Civil Engineering

| Criteria categories | Civil engineering |
|---|---|
| **Regulatory context** | While there are few regulatory frameworks directly applicable to civil engineering, different civil engineering applications may benefit from incentives such as price rebates or subsidies on the purchase of ELT or shredded ELT for use in high value applications. |
| **Technical feasibility** | The use of ELT in civil engineering applications does not present any technical difficulties, as its processing steps are the least advanced or demanding of all ELT recovery technologies. ELT have many technical properties (e.g. lightweight, thermal insulation etc.) which make them a very interesting resource that provide high quality civil engineering applications. However, some applications of civil engineering require high volumes of ELT, and the supply of ELT may be difficult to anticipate and to acquire. |
| **Economic drivers** | The market for civil engineering applications of whole or shredded tires remains small, with applications serving different purposes. However, these applications are often less expensive than the traditional alternatives, and their implementation and processing costs are not considered as being limiting. Using ELT in civil engineering also creates products with a high added value, thanks to the advantageous technical properties of ELT. |
| **Sustainability considerations** | Despite improvements in environmental impacts compared to baseline scenarios (e.g. use of rocks, gravel and sand), the overall performance of civil engineering is considered to be lower than other ELT recovery routes, due to the material that it replaces. |

## Granulation

| Criteria categories | Granulation |
|---|---|
| **Regulatory context** | Though few policies or regulations directly target granulation and its applications, this recovery method is indirectly supported through a number of policy measures, as it is considered as a priority recovery route over energy recovery. For example, granulators or industries involved in applications of granulation can benefit from a number of incentives or subsidies on the purchase of their raw material (ELT or crumb rubber).<br><br>General regulation is therefore in place to either promote applications deemed as having high potential, such as the use of granulate for products with a lot of added value (e.g. rubber-modified asphalt), or to restrict applications considered as potentially hazardous, such as some polluting recovery routes (e.g. reclamation). However, regulatory barriers remain for the use of crumb rubber in rubber-modified asphalt, and this application still faces red tape before it can become more widely used in some countries or states. |
| **Technical feasibility** | The granulation process is well developed, and does not present any major technical difficulties, yet some of its applications are more technically advanced. The products are usually of high quality, and those applications that are more innovative will focus on higher added value products, as it is the case for micronized-rubber powder for example. Furthermore, the main constituents of ELT must be separated during granulation (rubber, steel, fibers), which complicates the process and creates the need to find secondary markets for these products.<br><br>In countries that are less mature in terms of ELT management, many small granulation companies may try to establish themselves, but without sufficient funds to invest in high volumes and in quality technology. In these cases, the barriers to entry for the industry are more difficult to overcome, and it is more complicated to become established as a recognized company. |
| **Economic drivers** | The economic model for granulation and its applications may require more investment than what is needed for other recovery methods, as granulation entails advanced treatment and processing stages. Many granulation actors have based their business models on creating high-value products to compensate these high processing costs, and this trend is even more present with emerging innovative granulation technologies. On the contrary, rubber-molded products have a small added-value, and the industry was perceived as being highly dependent on subsidies.<br><br>Some markets for applications of granulation have fallen in significance: the market for artificial turf infill fell by 30% between 2014 and 2017 in the USA, and the market for rubber-modified asphalt is still limited by regulatory barriers, which also hinder its commercialization. Meanwhile, the market for playgrounds has been steadily growing over the past decade. Innovative technologies are now opening up new markets for granulate, crumb rubber or rubber powder, expanding the possibilities for these products. |
| **Sustainability considerations** | In terms of sustainability considerations, there is a reduction of environmental externalities for most of the applications of granulation that are assessed. All of them show benefits in terms of the use of resources, supported by a number of life cycle analyses. Granulation is also considered as material recovery, and is high up in the waste management hierarchy.<br><br>Some applications may be selective in terms of input material (type and quality of ELT), which implies that ELT that are refused at arrival, and sent towards less selective recovery routes, such as cement kilns. Finally, while most products are well-perceived by society, artificial turf infill has suffered from a negative public perception, due to perceived health and environmental hazards, causing a drop in the market. However, over the past ten years, the multitude of studies conducted have indicated very low or no risk associated with the use of ELT in artificial turf or playgrounds. |

## Pyrolysis

| Criteria categories | Pyrolysis |
|---|---|
| **Regulatory context** | Generally, as a significant portion of the output products of the pyrolysis process can be categorized as tire derived fuel, it is not always supported by waste management policies. In addition, the environmental impacts of operations have been under particular scrutiny by authorities. The recovery route is particularly common in the informal sector, where there is a lack of controls. On the other hand, grants may be available to support further development of innovative aspects of enhancing the added value of products such as carbon black. The specificities of these innovations are often protected by intellectual property rules, which may limit competition. |
| **Technical feasibility** | Overall, efficient technology producing high quality outputs are not widespread. In parts of Asia the fundamental process of pyrolysis is in operation on a large scale, largely for the production of oil as TDF. However, more trials and pilot projects are taking place across the globe with some at the beginning of commercial scale. Research and development on high quality carbon black in particular and also oil output products for which significant pre-processing and post-processing measures are required. |
| **Economic drivers** | All products of the pyrolysis process including char/carbon black, oil, syngas as well as residual steel have potential for use in a variety of applications. Currently, however, overall the economic viability of pyrolysis is low due to the competitiveness of the products in relation to virgin or traditional materials. Overall the added value compared to these materials is low and the cost to produce them is high. Demand will depend on the quality and the competitiveness in relation to traditional or virgin materials. The profitability depends on the added value of the output product. The trend for further development is positive however and tire-derived material (TDM) carbon black is currently in the process of being commercialized by a number of companies mainly based in Europe. |
| **Sustainability considerations** | Overall, the sustainability performance of pyrolysis is low due to the larger scale of the less advanced technologies used and unsatisfactory standards of widespread informal operations. Although gas produced by the process can be used to fuel it, where environmental standards are not upheld there can be significant air pollution. This depends on the location however and more advanced forms of the technology are developing with high environmental standards with emissions monitoring. |

## Reclamation

| Criteria categories | Reclamation |
|---|---|
| **Regulatory context** | Reclamation is considered as a material recycling technology, and the use of reclaimed rubber in rubber-molded products and/or in new tires is therefore a preferential recovery route according to the waste management hierarchy. The process of reclamation largely relies on the use of chemicals in some areas, as in China or India, and has hence been criticized for the negative environmental externalities it brings about. Governmental action has been initiated in China for instance, to limit the extensive use of chemicals by providing subsidies for cleaner recovery methods. |
| **Technical feasibility** | The term "reclamation" covers a number of technologies, with a variety of associated processes and of levels of complexity. This technology has existed since the 1960s, and is well-advanced and at the stage of commercialization.<br><br>However, reclaimed rubber is usually considered to be a low quality product, and it can be used in a wider variety of products with little added value, such as tubes, liners, cables or tiles. It can also be integrated in the manufacture of new tires although the quality has been considered limited at the current stage of technological development. |
| **Economic drivers** | The products of reclamation rely on an important market with a high demand. Indeed, the market for reclaimed rubber was historically strong in some geographical regions, especially in China. However, it is expected to be considerably limited in coming years due to restrictions caused by the environmental impacts of chemical reclamation. |
| **Sustainability considerations** | Some traditional reclamation processes, such as chemical reclamation, bring about a wide array of negative environmental externalities, linked to their high use of chemicals. This entails important use of resources, risks of air, water and soil pollution and potential risks to human health. Consequently, these technologies can be negatively perceived by the public. |

## Steel production

| Criteria categories | Steel production |
|---|---|
| **Regulatory context** | Steel production from ELT is not supported or constrained in a particular manner by regulatory context. The material recovery aspect will support the recovery route in the context of waste management policy. |
| **Technical feasibility** | The technical feasibility is positive for the use of ELT material in steel production thanks to the significant portion of steel in the tire and the capacity for ELT to replace anthracite to provide carbon. ELT therefore can act as reactant, fuel and/ or alloy element in the production process. On the other hand, the recovery route is not particularly well developed in terms of current use on a global scale and other sources may be used for the scrap steel portion. In addition, attention must be given to the composition to maintain the quality of the process and product. |
| **Economic drivers** | The market for ELT use in steel production is currently relatively marginal in relation to other major recovery routes and there is potential for some slow development. The price of anthracite and other sources of scrap metal, including accessibility of sufficient volumes will affect the economic viability directly. |
| **Sustainability considerations** | The ELT material directly replaces anthracite which is a high energy intensive extractive material and also iron ore, consequently reducing upstream energy consumption and emissions. |

# Concluding remarks

The compliance with or promotion of a waste management hierarchy is a common trend in many of the regulatory frameworks assessed in this study. Energy recovery may generally be constrained by regulatory context aligned with the waste hierarchy. However, other more indirect policies in the context of energy transition such as GHG emission reductions and energy security can be responded to through use of ELT as an alternative fuel with a high calorific value, renewable energy component and reduced carbon intensity relative to fossil fuels such as coal. Some regions or countries have set objectives to encourage recycling and limit recovery, while others have established more stringent regulation to exclude energy recovery from ELT management systems. Setting up grant programs is also common in some areas, such as North America, where subsidies are given for the use of rubber granulate in high value applications, promoting material recycling.

From a technical feasibility standpoint, various recovery routes are capable of treating significant volumes. For instance, cement kilns can absorb large amounts of ELT without significant technical difficulties. However, as a capital investment requirement is required for adaptation, a long-term perspective is required. Civil engineering applications on the other hand do not require the same level of initial investment but have relatively high capacities. Despite the currently limited market, civil engineering may have considerable potential. Meanwhile, TDM obtained through granulation is overall a straightforward well-established process with particularly advantageous properties and performance for applications such as rubberized asphalt.

The economic assessment of ELT recovery routes must make a distinction between those that depend on the added value of output products using ELT as feedstock (material recycling in particular), and those that replace traditional materials or fuel with ELT. The economic models for several granulation applications may require relatively high investment costs for equipment and infrastructure, while the economic viability of other applications will depend on the price of the traditional counterpart (e.g. fuel). The market size must also be considered, as there appears to be room for new technologies, offering innovative products, while the market for certain traditional applications, such as granulate used in artificial turf infill, has decreased.

Although only contributing in part to material recovery, the cement industry, with significant capacity, remains an important destination for ELT provided that a number of economic criteria are met, including traditional fuel costs remaining high in comparison and the availability of gate fees as an additional incentive. For the collection and delivery tied to the cement industry, for instance, this was as simple as the retraction of gate fees provided through extending producer responsibility financial transactions.

Trends have been observed concerning evolving technologies and enhanced enforcement of required standards. Reclaimed rubber operations that are significant in China and on a global scale may be constrained by policies to tackle non-compliance with regard to environmental standards. The related technology devulcanization is now developing under conditions that limit externalities and leave a higher quality output. In a similar manner, informal pyrolysis activities in Asia focused on producing oil are facing a new wave of restrictions, while new safer forms of pyrolysis technology are developing with a focus on other components, notably carbon black and its diverse applications.

The sustainability considerations relative to ELT recovery routes can be assessed through their environmental performance. Some recovery routes have considerable benefits in terms of avoided impacts according to several

LCA studies, such as the use of ELT in cement kilns and in artificial turf infill. Seizing the importance of this issue, new technologies are placing a lot of focus on having environmentally performant processes, with reductions in energy and water consumptions, for example. The impact of these technologies on human health must also be considered, and a wide array of studies have been conducted on those that are considered of potential risk. Nevertheless, public and industry perceptions play a crucial role in the acceptance of these technologies, and therefore in the further development and expansion of recovery routes.

Finally, the major factors differentiating the feasibility of ELT recovery technologies in countries with developing or non-existing ELT management systems when compared with those with mature ELT management systems are directly related to governance and infrastructure. Where little framework exists, the stages of the supply chain lack synergy and consequently, the case for investment in large scale facilities is harder to make.

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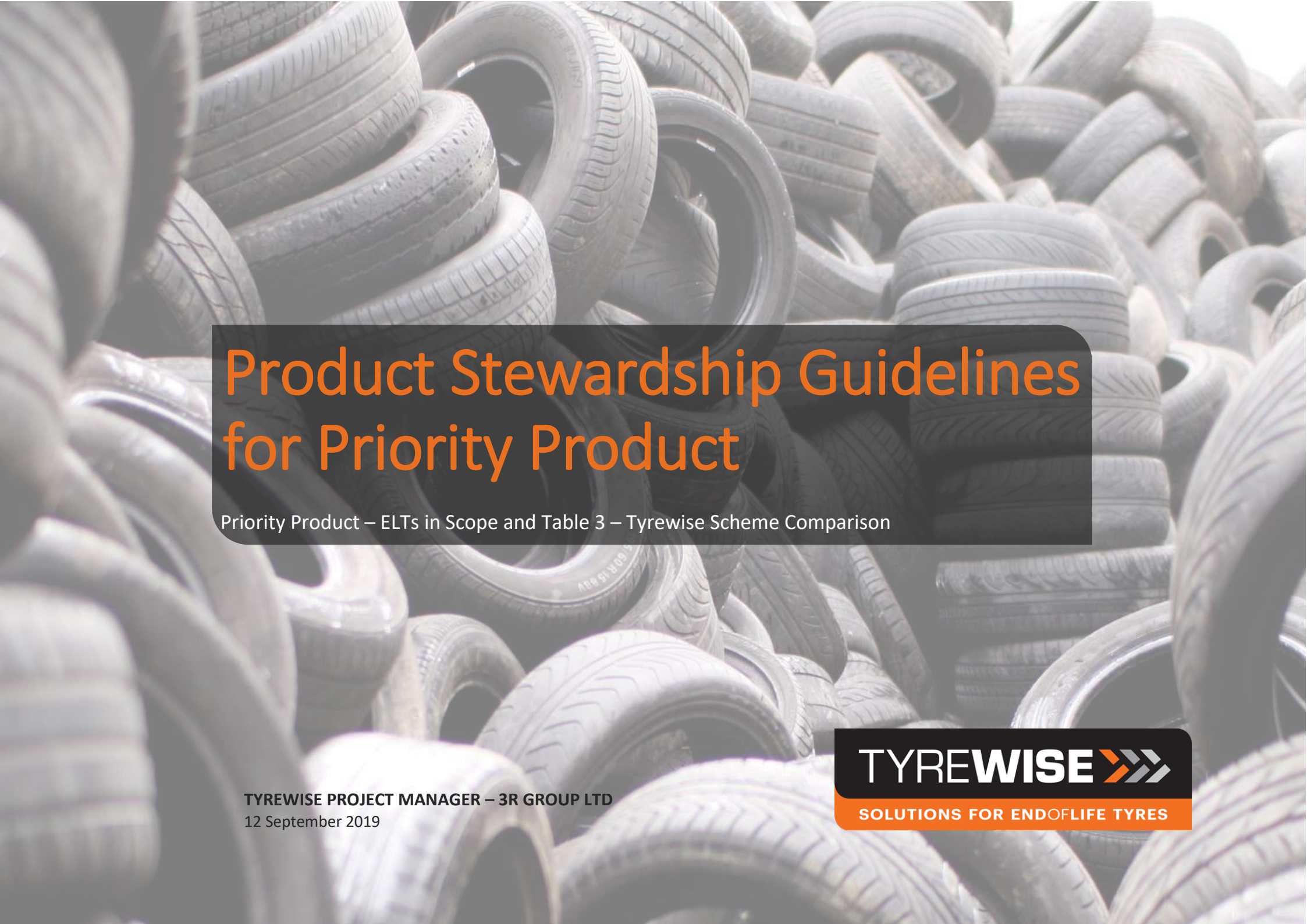

# Product Stewardship Guidelines for Priority Product

Priority Product – ELTs in Scope and Table 3 – Tyrewise Scheme Comparison

TYREWISE

SOLUTIONS FOR ENDOFLIFE TYRES

**TYREWISE PROJECT MANAGER – 3R GROUP LTD**

12 September 2019

# Proposed Priority Products and Priority Product Stewardship Scheme Guidelines

Ministry for the Environment Consultation Document 2019

# Tyrewise Product Stewardship Programme:  Project Manager Submission

Released 12 September 2019

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As Tyrewise Project Managers we have prepared a response to the Ministry for the Environment's Proposed priority products and priority product stewardship scheme guidelines Consultation Document using information taken from the published Tyrewise reports, meeting notes and consultation discussion viewpoints.

In addition to this, a reminder with links to the Consultation Document was sent out to 550 value chain entities that registered their interest in updates on tyre stewardship. Recipients were reminded to make their own submissions on the specific impact of the products they produce, manufacture or import, and their role as a transporters, recyclers and end users.

The Tyrewise Project Managers have provided support to interested parties who have completed their submissions since consultation opened in August 2019 and we are confident a range of views have been made available to the Ministry for the Environment team as they evaluate the submissions.

**Important links that provide context to this document:**

- The Submissions Document and process
- The Waste Minimisation ACT 2008

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**Visit www.tyrewise.co.nz to find out more about industry working together to deliver a consistent nationwide approach to the responsible disposal of tyres**

**Background**

It is widely known that the disposal of used tyres in New Zealand is problematic. Disposal of tyres in landfill takes up valuable landfill space as well as creating issues for landfill stability and management as pneumatic tyres in particular tend to work their way back to the surface over time. Storage and tyre stockpiles also pose major health and environmental concerns as well as fire risks. Burning tyres cause air pollution from the dense and toxic smoke and ash and result in large quantities of oil effluent and run off that can contaminate water sources.

End of life tyres should be treated as a valuable resource that can be recycled into new value-added products. If New Zealand can utilise end of life tyres as a valuable resource instead of considering them a waste that needs disposal, both the environment and the economy will benefit. To do that we need structures, systems, auditing and market stimulation to ensure that the value chain works in harmony – in short, we need a regulated product stewardship scheme.

**Consultation Document Page 35, Q1 (a)(b): Proposed Priority Product Declaration for End of Life Tyres**

Do you agree with the proposed scope for priority product declarations for:

Q1: End of Life Tyres

(a) All pneumatic (air filled) tyres and certain solid tyres for use on motorized vehicles (for cars, trucks, buses, motorcycles, all-terrain vehicles, tractors, forklifts, aircraft and off-road vehicles).

(b) All pneumatic and solid tyres for use on bicycles (manual and motorized) and non-motorised equipment.

**Q1 (a) Yes (b) Yes**

**How the Tyrewise working group calculated Tyres in Scope of their stewardship scheme**

There are various ways to work out how to include products in scope or out of scope of stewardship, and an understanding of the whole value chain is required before that recommendation can be made.

There are two ways of viewing it:

1. How do tyres enter the country (across borders); or
2. What are end of life tyres attached to at the point they become end of life

Tracking how pneumatic tyres and some solid tyres come across the borders; or at the other end, what situation they are in when they become end of life, is reasonably well understood.

The data sources to determine who the first importer is whether loose or on vehicles, and the national footprint/network of generators and garages available to capture pneumatic tyres at end of life are known and available. Compare that to solid tyres (Non-pneumatic) and a small volume of pneumatic tyres such as that on toys, bicycles, wheelchairs, trolleys etc. which has a dispersed importer framework data, therefore engagement and compliance is significantly more time-consuming relative to the harm or value from resource recovery.

- For example, a toy importer does not declare how many tyres come through on trolleys or bicycles and a medical equipment importer does not declare how many tyres are imported on wheel chairs or hospital beds. Secondly, solid tyres typically reach end of life after much more comparative use than pneumatic tyres and are less likely to be discarded in illegal dumps or water ways. As they are solid, they are much less "harmful" in terms of movement in landfill or their ability to host mosquito larvae.

If pneumatic of tyres (Q1(a)) were declared priority product in December 2019, Tyrewise would have resubmitted its request for accredited assessment and be implemented within twelve months and would commence building on existing national infrastructure for collecting, processing with value added resource use. This is of course subject to the complementary regulatory controls that are required to enforce participation in stewardship to manage out the impact of free riders. Available in Section 23 of the Waste Minimisation Act 2008, Consultation Document, Next Steps Page 32.

This then leaves the incorporation of solid tyres (Q1(b)) into the scheme, in a managed way, at a later point. The scheme could be extended to solid tyres and funding would be available to deliver the work that would be required to develop import declaration, tracking and capture systems. Rather than a declaration of priority product for solid tyres (Q1(b), an adjustment to the regulatory controls would all that would be required see them regulated and stewarded.

Therefore, the Tyrewise working group preference is for the scheme in principle to encompass all pneumatic tyres and some solid tyres, including off the road (OTR) and aircraft tyres, excluded from the scheme (initially) would be solid tyres and some pneumatic tyres on bicycles, toys, wheel chairs, mobility scooters, wheel barrows and other non motorised equipment.

**Tyrewise Product Stewardship Scheme:**
Comparison of **actual** Guidelines for the Scheme against **proposed** Guidelines for a Priority Product Scheme (regulated under the Waste Minimisation Act).

| Design feature | Proposed Waste Minimisation Act 2008 (WMA) section 12 guidelines for priority product scheme accreditation | Guidelines for Tyrewise Product Stewardship Scheme |
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| **1.Intended objectives and outcomes** | a) Specify the expected reduction in harm to the environment from the implementation of a scheme and/or the expected benefits from reduction, reuse, recycling, recovery or treatment of the product to which a scheme relates. | Tyrewise is a product stewardship scheme designed by industry. It is governed by a Product Stewardship Organisation (PSO).<br>The mission of Tyrewise is to improve the value for end of life tyres in cost effective and environmentally sound ways<br>6.5 Million Equivalent Passenger Unit Tyres enter New Zealand annually at last count in 2017/18. Without a structured product stewardship scheme the expectation is that only 50% of those would continue to be recycled in the absence of any framework for management and incentivising the collection and recovery of ELTs and an absence of supporting legislation to "level the playing field" and support universal access to stewardship for tyres.<br>Around 3 Million of these tyres would continue to make their way to landfill, be illegally dumped at unacceptably high rates, heightening the risk of tyre fires (due to stockpiling behaviour going unchecked) and resulting in an important resource value not realised.<br>In short, there would continue to be uncontrolled pathways for end of life tyres, risk to the environment through illegal dumping and tyre fires, added burdens to ratepayers for the clean-up of stockpiled tyres, loss of a valuable resource that can be transformed into valuable end products.<br>The measurement of success will be detailed in the targets and objectives of the scheme to be achieved over the initial 7-year accreditation period. |
| | b) Specify the expected quantifiable waste minimisation and management objectives for the product to which a scheme relates, and the plan to achieve significant, timely and continuous improvement. | Setting of targets and objectives incorporated within two areas:<br>1. the financial model with a target to recover volume to market from participants trending upwards from Year 1 of full operation (year 3 of implementation) at 90% to 95% by Year 7 of the first scheme accreditation period<br>2. In year 1 of full operation of Tyrewise, the resource recovery principals for the scheme enable per annum, a baseline of:<br>• 52,000 tonnes of rubber recovered<br>• 19,000 tonnes of steel recovered<br>• 3,000 tonnes of textile recovered |

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| | c) All schemes will be designed to incentivise product management higher up the waste hierarchy in priority order: waste prevention, reuse, recycling, recovery (materials and energy), treatment and disposal. | Tyrewise has an established framework for the hierarchy of value (uses) of the end of life tyre. This is supported by policy that means that this hierarchy of value is reviewed at least every three years or in the event of material changes in the market such as a new technology for processing or end use.<br>The current hierarchy of value from highest to lowest is:<br>• Further use - Crumb as an additive in a product<br>• Ambient and Cryogenic material recovery<br>• Whole Tyres<br>• Further use - Crumb as an end use functional product<br>• Further use – Crumb in a destructive process<br>• Further use - Crumb in a secondary process |
| | d) For products containing hazardous materials: industry certification and compliance with other legislation for installation or use, maintenance, collection, transport, storage and disposal pathways. | Tyrewise will accredit suppliers/providers and audit these against the scheme quality and compliance criteria set by the Product Stewardship Organisation (PSO) and in compliance with local laws and by laws including the (draft) Disposal to Land and Movement and Storage of Tyres regulatory documents. |
| | e) All schemes will be designed and financed to manage orphaned and legacy products,[1] as well as current products entering the market. | The financial model includes for setting aside 3% of its funds annually to cover orphan/legacy clean ups in a staged approached as facilities come online to process material collected, and the stockpiles are evaluated for their viability to be processed (eg tyres stored inground require cleaning before processing, tyres stored under cover and on hard stand require less clean up). |
| **2. Fees, funding and cost effectiveness** | a) The full net costs of collection and management of the priority product (reuse, recycling, processing, treatment or disposal) will be covered by producer and product fees associated with the scheme (eg, 'producer pays' or 'advance disposal fee').[2] | The Tyrewise advanced disposal fee (ADF) covers the cost of collection and transport of ELTs from the national network FIS to processors. In addition to this a differential payment is available for processing.<br>As the types of processing are many and varied including how they wish to receive the material, it is expected that the processors/end users will |

[1] Legacy products include those sold into the market in earlier years that are now obsolete or banned (eg, agrichemicals containing POPs). Orphaned products include current or recent products for which a liable producer is no longer present (eg, e-waste marketed by companies no longer in business).

[2] The WMA defines producers to include people who: manufacture and sell a product in New Zealand under their own brand; are the owner or licence holder of a trademark under which a product is sold in New Zealand; import a product for sale in New Zealand; or manufacture or import a product for use in trade by them or their agent.

| Design feature | Proposed Waste Minimisation Act 2008 (WMA) section 12 guidelines for priority product scheme accreditation | Guidelines for Tyrewise Product Stewardship Scheme |
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| | | stipulate how they wish to receive the ELTs and the collectors and transporters will deliver material in scope. Provision has been made in the financial model for the flexibility of application of the advanced disposal fee on a regional basis to stimulate collection in those regions and cover additional costs of transport to processors. |
| | b) The impact of more than one accredited scheme and opportunities for maintaining competition should be considered in terms of net cost effectiveness (including monetary and non-monetary costs and benefits). | This is understood. Tyrewise is offered as the industry product stewardship scheme; the Product Stewardship Organisation that will undertake the governance role can govern more than one tyre stewardship scheme should that come to pass. |
| | c) Specify plans to manage risk to sustainable scheme income, such as price volatility and leakage of materials into other markets. | The income to fund the stewardship of ELTs relies entirely on payment of the advanced disposal fee.<br>Good governance principals will be applied and review this at least every three years to incorporate any market changes for materials value which may result from the awarding of funds to support investment in infrastructure which may result in change the commodity value of an ELT from a negative to a positive.<br>It is proposed that the Advanced Disposal Fee is not a "forever" fee and that value in the ELT will eventually support its stewardship. |
| | d) Specify how existing and emerging technologies will be used to help track and manage product or waste throughout the supply chain (eg, bar codes, radio frequency identification (RFID), and block chain). | Tyrewise will have a Waste Tracking IT system which tracks the bookings for ELTs available for collection, actually collected and processed at various parts of the supply chain. This will be fully electronic and based on the use of bar code and RFID technology. The platform that hosts the software is SQL based therefore the aggregate data can be included into a block chain platform when it becomes available to capture national waste data (held by authorities). The IT technology is also linked to weigh scales so it can record tonnage or volumes can be entered manually. It also tracks the chain of custody of the ELT and is linked to the payment approval process for cost of service. It is a low cost, low administration technology solution. |
| **3. Governance** | a) The scheme governance entity will be independent, non-profit and represent producers and wider stakeholders, including public interest. | Tyrewise is held by a Product Stewardship Organisation (PSO) and delivered under a not-for-profit trust deed and structure. Independent trustees will be nominated that represent the stakeholders but who are at arm's length from payment of the advanced disposal fee or benefit from payment for services. An independent chair will also be appointed. The matrix of skills to deliver good governance will be in |

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| | | accordance with best practice as laid out by the Institute of Directors, specially paying attention to the Commerce Commission requirements for an industry led product stewardship scheme.<br>The Trust comes into effect upon the declaration of tyres as priority product, it is at that time that a review of current trustees (appointed in 2015). |
| | b) Governance should include wider stakeholders in two types of advisory groups: those including product producers and recipients of product management fees who have technical or supply chain knowledge, and other stakeholders who represent wider community and consumer interests. | The PSO is able to appoint advisory groups on an as needed basis – these advisory groups may include scheme participants that can give specific industry and scheme advice to both the PSO the Scheme Managers. This practice has been in place throughout the design of the scheme with an additional positive outcome being increased communication with the supply chain within a pre-competitive environment. |
| | c) Structure and accountability of the scheme governance entity will be specified. Clear mechanisms will be implemented to fully control scheme operation, manage non-compliance and report on outcomes. | The structure, accountability and governance responsibilities are incorporated within the Trust Deed and the policies that support the management and execution of the purpose of the Trust. This includes best practice for managing a tender process and appointing contractors, financial and legal literacy and dispute resolution. It also allows for the appointment of a Financial Provider who can undertake the black box functions – obtaining mass balance data from brand owners and providing that in aggregate form to the PSO and the Scheme Manager and managing the receipts from the brand owners and payment of services to the contracted parties who deliver the scheme. Oversight from Government is expected within this Trust and the Financial Provider due to the quantum of fees gathered on behalf of consumers. In addition to this the Scheme Manager has clear policies on what non-compliance activities need to be expedited to the PSO who in turn will expedite any requirement for government enforcement when that is understood. |
| | d) The selection process for scheme directors will be transparent, and scheme governance provisions will follow best practice guidelines for New Zealand.[3] | The selection process of scheme directors (governance) is prescribed in the Trust Deed and will be audited against Policies and Procedures which incorporate best practice guidelines for governance. |

[3] For example, the Institute of Directors of New Zealand *Code of Practice for Directors* (www.iod.org.nz/Portals/0/Publications/Founding%20Docs/Code%20of%20Practice.pdf).

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| | e) | Given the size of New Zealand's population and market, the default expectation will be that either a single accredited scheme per priority product, or a clear platform for cooperation between schemes for efficient materials handling, will be part of the design. | Tyrewise is likely to be the single accredited scheme for ELTs within scope of being declared priority product. However, the Product Stewardship Organisation is set up so that it can be a governance platform for additional scheme(s) to join should that eventuate. |
| **4. Non-profit status** | a) | Given the prominence of expected net public good outcomes, the default expectation is that all priority product stewardship schemes will be operated by non-profit entities representing key stakeholders. | Tyrewise will be governed by the Product Stewardship Organisation (PSO) which is a not for profit trust representing industry. A strong social enterprise model is also built into the Tyrewise Stewardship Scheme itself to maximise opportunities for employment particularly in regional areas. Tyrewise will be operated by contracted service providers sourced through a normal tender process. |
| **5. Competition** | a) | The scheme will clearly provide for transparent, non-discriminatory and competitive procurement processes for downstream services, such as collection, sorting, material recovery and disposal. | Tyrewise policies and procedures and the purpose of the scheme itself includes for a clear and transparent tender process for all contracts to deliver the services of the scheme including scheme management, collection sites, transport and materials recovery via any number of processing opportunities. This will be managed by the PSO and its Scheme Manager (where appropriate) and its policies and processes will be available on the scheme website for viewing at any time. |
| | b) | The scheme will ensure that no collectors and recyclers (whether existing, new entrant or social enterprise) are unfairly excluded from participation. This includes making service packages of suitable scale (whether geographically, by material or other measure) to allow both large and small providers to compete fairly. | As Tyrewise relies on the provision of regional services feeding into a hub and spoke model of processors and end users, to be successful, the scheme will be reliant on regional service providers provided by social enterprises, community collection sites, collectors and recyclers within all regions. It will also rely on the participation of garages and outlets owned or aligned to Brand Owners who have a direct relationship with the consumer purchasing the tyre whether wholesale or retail. |
| | c) | Multiple accredited schemes will be considered if the net community and environmental benefit (including cost-effectiveness and non-monetary impacts) is likely to be improved. | This is understood. |
| | d) | Provision will be made for regular independent audit of agreements among competitors. | This is part of the PSO function and written into the Trust Deed and will also be transparently provided as part of the initial scheme audit for accreditation as well as subsequent audits of the operational functions of the scheme at any time. Written into the contracts for service providers will also be the ability to undertake audits across a range of areas not least of which is Health and Safety as the PSO, and the Scheme Manager will be PCBU's in most instances. |

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| | e) The design process for the scheme will have adhered to guidelines on collaborative activities between competitors as issued by the Commerce Commission, including, but not limited to, applying for collaborative activity clearance from that commission (eg, Commerce Commission, 2018a, 2018b, 2018c and 2019). | The scheme design process was guided by the Commerce Commission guidelines using an independent scheme designer, and the provision of legal counsel for the establishment of the Not for Profit Trust deed and writing the roles of the Chair and Trustees. It is recommended that legal counsel is retained on the PSO. |
| **6. Stakeholder engagement and collaboration** | a) The scheme will specify how wider stakeholders will be involved in decision-making by governance group (eg, use of stakeholder advisory groups). | Covered in 3 (b) above – the scheme design complies with this design feature. |
| | b) The scheme will have been designed with the active engagement of stakeholders currently involved in the product end of life (eg, collectors and recyclers). | Tyrewise was been designed with the active engagement of all stakeholders and can be evidenced by the minutes of the working group meetings and consultation/presentations made with and by collectors and recyclers from 2011 to current day. A website contains all of the project reports and key information, an e-news is sent regularly to keep all stakeholders informed of progress, and open door policy is in place for any stakeholders currently involved in the management of end of life tyres, and those proposing to be, to discuss scheme interactions with the current project manager and/or the governance group. |
| | c) The scheme will specify how use of existing collection and processing infrastructure and networks will be maximised and new infrastructure and networks co-designed and integrated between product groups. | Tyrewise will be funded to pay providers who already offer collection sites and for the establishment of new sites. A high level of collaboration with existing infrastructure providers will be required and that includes local government. New infrastructure requirements will be understood when Expressions of Interest for commercial tender for the services to collect, transport and process end of life tyres are advertised during the implementation phase Year 0, and a picture of who wishes to participate and where they wish to participate is formalised. The financial model for the scheme allows for a gradual investment in all key areas of delivery of Tyrewise. |
| **7. Compliance** | a) The scheme will have a clear means of enforcing compliance of all participants and reporting liable non-participants to the government enforcement agency. | The PSO will be able to report non-payment of the advanced disposal fee for any distributor of product in scope (should this become a regulated scheme) to the appropriate authorities.<br>The scheme design and financial model includes for all providers to be registered with the scheme against its guidelines and for the scheme managers to be able to audit performance against those guidelines and |

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| | | cease service provision with non-complying contractors following a remediation period.<br>Sanctions for serious breaches or continued breaches of Tyrewise compliance policies will occur. |
| | b) The scheme will have strategies to reduce 'leakage' of higher value end-of-life products (eg, 'cherry picking' of e-waste components by informal collectors). | Tyrewise will not make payment for services unless evidence of activity is made in accordance with the guidelines of the contract. There are some commercial entities that use end of life tyres (such as farmers for silage pit coverage) who could end up unintentionally holding tyres that may have a higher value elsewhere however that is not expected to occur until the scheme has been operational for some years and the commodity value of the tyre has changed from a negative to a positive.<br>All collections, transport and processing of ELTs will be tracked when they are made available to the scheme; no payments will be made unless the receipts and records reconcile.<br>Leakage of ELTs being stewarded would be those tyres which are deemed End of Life by the depositor and made available for collection, but on sold by the next stage in the supply chain either for reuse or another purpose. Tyrewise recognised that some tyres at end of life may look like they still have wear in them (or be warrantable) however they may have been involved in a vehicle accident or have some other defect which would render them unwarrantable but only to the trained professional. In this instance the provider could be sanctioned by the PSO. |
| **8. Targets** | a) All schemes will be expected to set and report on targets that have the following characteristics:<br>• significant, timely and continuous improvement<br>• benchmarked against and aspiring to attain best practice recovery and recycling or treatment rates for the same product type in high-performing jurisdictions<br>• a clear time bound and measurable path to move toward attaining best practice<br>• targets for new product and market development to accommodate collected materials. | The targets set for Tyrewise against a best practice benchmark taken from international schemes, include but are not limited to:<br>• EPUs recycled per year<br>• Diversion of ELTs to landfill<br>• Registration of Tyrewise programme participants (providers)<br>• Recovery of rubber, steel and textile from ELTs<br>• By proportion of the total fund, the amount set aside for payments made to specifically create demand pull through - % of total Tyrewise Fee (PSO portion) in year of measurement<br>• Amnesty funding and relative success |

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| | | • Education campaigns and their relative success<br>• Monitoring and measuring compliance against objectives<br>• Health and Safety KPIs |
| | b) Results against targets will be publicly reported at least annually. | An annual report will be published and available in accordance with the Charities Commission; the scheme Product Stewardship Accreditation report will also be published annually and publicly report. |
| | c) Material collection, recovery and disposal rates will be measured against one of the following:<br>• actual trend data, if the scheme has pre-existed as a voluntary scheme<br>• the average aggregate weight or count of products sold into the market in the previous three reported years<br>• another specified method where market entry information does not yet exist. | Mass balance data is currently available through use of some of the customs codes for import data and through NZTA for the tyres on vehicles. Work still needs to be done on loose tyre parallel imports and/or private imports which are not captured through customs however this is considered to be a minor volume of the overall percentage of tyres entering New Zealand.<br>As tyres come in a range of rim sizes and uses the measurement of an EPU as being an average tyre weight of 9.5kg (Equivalent Passenger Unit) has been used to calculate number of tyres; additionally, tyres once they are collected and definitely as they are processed are reported in weight as tonnes. |
| | d) Plans will be specified for review, adjustment and reporting on performance targets preferably annually and no less than every three years, taking account of changes in the market, natural events and technology. | The PSO will review Tyrewise annually which will include a review of all targets and objectives prior to setting operational budgets for the coming year. This informs any areas of performance that focus needs to be applied to financially and operationally and consider new technology becoming available, new operators or changes to operators in the market and impact of any acts of god. |
| | e) A clear distinction will be made between funding arrangements and market capacity to manage both potential high volume legacy and orphaned product collections in earlier years and ongoing continuous improvement of collection rates. | The Tyrewise financial model is based on an advanced disposal fee – the fee is paid for by brand owners / first importers upon the sale of the tyre or first registration of vehicle. Therefore, 100% of the funding comes into the programme in the initial years while less volume is available for recycling.<br>This funding is used to cover the implementation costs of Tyrewise and to support infrastructure investment where it is identified.<br>Tyrewise and the underpinning financial model have an implementation phase Year 0 – 3 which will enable a slower start-up of collection material while processing capacity comes to market. |

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| | | Currently, market research shows there is enough capacity to meet nearly 50% of the volume of ELTs by weight, with future capacity coming on line over the ensuing one - three years, critically in the South Island and Lower North Island.<br>As capacity comes on line the collection rates can increase as result of marketing activities; there is known legacy and orphaned ELTs in high volumes nationally and these will be managed region by region as capacity comes on line. |
| | f) Performance targets will include measures for public awareness of scheme participant satisfaction and a record of response by the scheme to concerns raised. This will be made available to scheme auditors. | This is understood and an essential indicator for the PSO for operational delivery excellence. |
| **9. Timeframes** | a) The timeframe within which an application for accreditation or reaccreditation of the priority product scheme is expected to be made after declaration of priority product is as follows:<br>• priority product categories with existing accredited voluntary schemes (eg, refrigerants, agrichemicals, farm plastics, packaging): within one year from the date of priority product declaration<br>• priority product categories with accreditation proposals that have been developed through a multi-stakeholder consultation process including, as a minimum, producers, local authorities, major users, existing collectors and recyclers (eg, tyres): within one year from the date of priority product declaration or the date of proposal completion, whichever comes later<br>• other priority product categories: within three years from the date of priority product declaration. | Tyrewise is an industry designed and led product stewardship scheme ready to submit its accreditation under the new regulatory guidelines once tyres are declared priority products.<br>A refresh of the financial model and cost benefit analysis that underpins the design of Tyres is currently being undertaken and this will inform what the quantum of the advanced disposal fee will be required at launch.<br>Tyrewise will be operational within 12 months of submitting the accreditation application. |
| | b) Within the accredited seven-year period, at least one full review will be undertaken of scheme costs and effectiveness. The results of reviews and proposed scheme amendments to improve cost effectiveness will be reported via the annual reporting process. | This is anticipated and the full review is recommended/likely to occur at three-year intervals. |
| **10. Market development** | a) The scheme will have a research and development budget to develop new recycled products, encourage transition to circular product and recycled product materials design, and cooperate with other stakeholders to enhance onshore infrastructure. | 3.5% of the advanced disposal fee is initially proposed to be set aside for research and development. There is nothing to suggest that % could not increase over time as markets for material use establish. It will have guidelines around the distribution of the fund and could be a |

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| | | mix of contestable funding, scholarships and direct contracts with infrastructure providers. |
| **11. Performance standards, training and certification** | a) The scheme will have clear means for ensuring adequate training and certification of all people recovering and managing a product throughout its life cycle, to ensure best practice in prevention and reduction of harm to people and the environment. | This will be built into the contract of the Scheme Managers who will be responsible for ensuring that all providers are adequately trained for the provision of the contract. This will include compliance with Health & Safety Legislation as a PCBU, dangerous goods certificate and handling (should that be required) and environmental management plans for collection, transporting and processing sites. |
| | b) Any relevant standards for best practice will be referenced in training, supplier accreditation and monitoring (eg, AS/NZS 5377 for e-waste collection and processing). The scheme will participate in the development and revision of relevant standards. | This is expected. |
| | c) The scheme will have clear chain of custody arrangements for monitoring processing of materials and reduction of harm, both onshore and offshore, including annual reporting of findings. | This will be clearly articulated in the providers contracts and monitored and enforced by the Scheme Manager. This will be reported on quarterly to the PSO and annually as part of the accreditation report. |
| **12.Liability and insurance** | a) The scheme will have clear chain of custody arrangements for monitoring receipt and processing of materials and reduction of harm, both onshore and offshore, including annual reporting of findings. | This will be clearly articulated in the providers contracts and monitored and enforced by the Scheme Manager. This will be reported on quarterly to the PSO and annually as part of the accreditation report. The PSO will also be insured commensurate with the liability exposure of its Trustees. |
| | b) The scheme will ensure that liability of parties is clear for each stage of product and materials handling, and adequate insurance for liability is in place at each stage of the process. | The financial model accounts for the appropriate insurance cover for liability of the PSO. Contracts with providers will include evidence of liability insurance and this will be monitored by the Scheme Manager. |
| **13. Design for environment** | a) The scheme will contain financial or other incentives for diversion of collected products to highest and best resource use, weighted for applications higher up the 'waste hierarchy' (in priority order: reduction, reuse, recycling or composting, energy recovery, safe treatment and disposal). | Yes, reference Design Feature 1 (b) and (c) |

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| | b) The fees paid by a producer to a collective scheme will, as far as possible, be linked to actual end-of-life treatment costs of their products, such as through variable or modulated fees. | The financial model is built from a ground up basis from information and evidence provided by existing collectors, transporters and processors and those that procure their services. The advanced disposal fee quantum has taken into account all costs for collection, transporting and processing of ELTs with respect to how different rim sizes are managed. Tyrewise is a "push" and "pull" model which stewards the tyre through the supply chain with incentives placed at all points within the chain to facilitate this. |
| | c) The scheme will facilitate good communication, feedback and incentives between designers, manufacturers, sales and marketing teams, distributors, retailers, consumers, collectors, recyclers and end disposal operators, to inform improved design of products and systems. | A communications plan has been written for Tyrewise. It identifies the comprehensive marketing and communication activities required to successfully create and maintain awareness of a product stewardship programme for ELTs throughout the supply chain. |
| | d) The scheme will fund initiatives to improve circular resource use by reducing the 'end-of-life' components of the product(s) and improving design for reusability and recyclability of the priority product(s). | The circular economy principals are incorporated into the hierarchy of value for the treatment and processing of ELTS. As tyres are manufactured offshore the scheme will be limited in how it can influence improved design for reusability and recyclability. However, it is understood that this is a global challenge and New Zealand will certainly participate in this as result of the Brand Owners responsibilities and influence. |
| **14. Reporting and public accountability** | a) The scheme will provide for clear, regular and open reporting and communication with stakeholders. | This is planned for and already occurring. The Tyrewise website hosts material about the previous projects, a regular e-news keeps interested parties updated on progress both in New Zealand and material news from offshore, the stakeholder working group are in regular communication and opportunities to talk about stewardship of ELTs are taken up in every instance. |
| | b) Annual reports will be made public. These will include measurement of outcomes and achievement of targets, fees collected and disbursed, and net cash reserves held as contingency. | The Tyrewise annual report will include this information as will the website transparently disclose achievements against objectives and targets. |
| | c) Provision will be made for regular independent financial, compliance, enforcement and environmental audits of scheme performance. | The PSO will be responsible for appointing an independent auditor to audit compliance with their fiduciary duties and it is expected that as this will be a regulated scheme, the Ministry for the Environment will also appoint an audited. The PSO will audit (or make provision to audit) the Scheme Manager for performance of its contract which will include their oversight of contractor compliance with the scheme against contractors' guidelines and environmental management plans. |

**Tyrewise Product Stewardship Scheme:**
Comparison of **actual** Guidelines for the Scheme against **proposed** Guidelines for a Priority Product Scheme (regulated under the Waste Minimisation Act).

| Design feature | Proposed Waste Minimisation Act 2008 (WMA) section 12 guidelines for priority product scheme accreditation | Guidelines for Tyrewise Product Stewardship Scheme |
|---|---|---|
| | d) Scheme plans will address the following: data availability, especially when several PROs (also known as a PSO) are in competition; materials' traceability; precise definition for data collection and reporting (eg, recycling rates and operational costs). | Policies and procedures are in place for the methodology of the collection of mass balance data, all data will be available in aggregated form to ensure that there is no breach of the Commerce Act. Materials traceability will be delivered by the Waste Management software. Should there be multiple PROs/PSO's then a data sharing agreement would be a logical provision to have in place. |
| | e) The scheme will have mechanisms in place to protect competitive information relating to detailed operational costs (eg, 'black box' data collection by third party with aggregate reporting). | The PSO will appoint an independent financial provider to receive sales declarations for product within scope of the scheme and invoice the advanced disposal fee and collect funds as a result of this declaration. They will also manage the funds and provide aggregated data to the PSO and the Scheme Manager. |
| | f) Scheme performance measures will be harmonised between schemes as far as possible. | At this stage it is not envisaged to have multiple stewardship schemes for the collection, transport and processing of ELTs within scope however should there be, then performance measures would be put in place by the PSO. |
| **15. Public awareness** | a) Branding and clear information on how and why the scheme operates will be easily available at point of distribution (intercompany) and purchase (consumer), point of waste product collection and online, and a link to the online information will be on the product or product packaging. | Tyrewise has a communications strategy for publication and raising awareness of the Programme to ensure that audiences are aware of why a stewardship programme for ELTs is necessary that Tyrewise is widely supported and driven by the industry itself, and how to engage with Tyrewise either as an industry member or a consumer.<br>It will utilise the relationships that Tyrewise has with major industry participants, leveraging their own channels wherever possible to maximise penetration and resource efficiency. |
| | b) The scheme will provide for transparent product stewardship fees at point of purchase. | Tyrewise will require transparent disclosure of product stewardship fees. It recognises that this may take different forms whether it is a B2B relationship, wholesale transaction or retail transaction. It will be enforced by the PSO. |
| | c) The scheme will ensure that consumer labelling standards for the product are complied with (eg, under the Hazardous Substances and New Organisms Act 1996 for hazardous substances). | The labelling guidelines will comply with any relevant standards and regulations for the industry per product. |
| | d) The scheme will regularly measure and report on public awareness and scheme participant satisfaction, and improvements made accordingly. | Baseline surveys undertaken by the Scheme Manager for the PSO will be undertaken regularly as one of the tools to evaluate effectiveness against campaigns. Brand Owners themselves will also be involved in |

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| | | the public awareness of their scheme and it is likely they will be involved in satisfaction surveys with their own customers. |
| **16. Monitoring, compliance and enforcement** | a) The scheme will have a clear means of enforcing compliance of all participants and reporting liable non-participants to the government enforcement agency. | Covered in 3 (c) above. The scheme will be able to respond to this more fully when the process for reporting to the government enforcement agency is understood. |
| | b) The scheme will have strategies to reduce 'leakage' of higher value end-of-life products (eg, 'cherry picking' of e-waste components by informal collectors). | Covered in 7 (b) above. |
| | c) The Government will enforce WMA regulations. | This is understood, agreed with and ties in with 16 (a) above |
| | d) Revocation of accreditation is possible under WMA section 18 if reasonable steps are not being taken to implement the scheme, and the scheme's objectives are not being met or are not likely to be met within the timeframes outlined in the scheme. | This is understood and agreed with |
| **17. Accessible collection networks** | a) The scheme will provide for an end-of-life product collection system that is reasonably accessible for all communities generating that waste product, whether metropolitan, provincial or rural. | Tyrewise will facilitate and work with a range of collection systems relative to where the ELTs are made available for collection (rural, commercial, garages, at home, at large generation sites such as Fonterra). |
| | b) Collection will be free to the public (fully funded by the scheme) for all products covered by the scheme. | Collection of the ELTs in scope of the scheme are fully funded by the Tyrewise and will be free to the public (and in fact all consumers whether commercial or public). |
| | c) Collection will be based on the product, not proof of purchase. | Collection is based on the product |
| | d) Collections will, as far as possible, share infrastructure and public information with other collection schemes in the area. | Yes, covered also in 2 (b) and 6 (c) above. As well, some of the brand owners, garages and generators may share collection services within their regions especially in smaller, rural areas as this reflects the desire to put the consumer at the top of the process. |