



TYRE LIFE

THE COMPREHENSIVE GUIDE TO MANAGING AUSTRALIAN TYRES

BY DAVE WEST



SUPPORTED BY



ABOUT THE AUTHOR

Dave West has worked for almost every major environment group in Australia in a career spanning some 20 years of environmental advocacy. Dave's experience in the ENGO sector is complemented by 12 years working in the private sector including senior management positions in some of Australia's largest transport and logistics companies. There, he had carriage for the management of line haul and pick and delivery fleets; including the selection of tyres and review of tyres safety performance and fuel efficiency.

Dave has studied the environmental impacts of tyres (particularly waste tyres) for 10 years. His research has seen him travel to China, Vietnam and Malaysia where he witnessed the appalling consequences from Australia's dumping of waste tyres on our neighbouring developing nations. He has personally inspected the operations of some 88 waste tyre facilities across Australia, along with a further 42 illegal dump sites.

ABOUT THE BOOMERANG ALLIANCE

The Boomerang Alliance was established in April 2004 by Dave West and Rob Kelman, initially to co-ordinate the diverse opinions of Australian environment groups on the issue of packaging waste. Since that time, Boomerang Alliance has grown to become the leading community voice on waste and recycling in Australia, representing 31 groups, and our campaigns have attracted the support of more than two million Australians. We work collaboratively with an informal network of international groups across 15 countries to ensure our advocacy is reflective of international best practice.

Hosted by Total Environment Centre, the Boomerang Alliance is led by Jeff Angel and Dave West who are two of Australia's most experienced environment advocates. Jeff and Dave's work has led campaigns that have resulted in the introduction, and increase, of levies on the generation of waste and drawn attention to the need for the government to recognise the important contribution the waste and recycling sector make to the Australian workforce and economy. They have also played key roles in the adoption of extended producer responsibility, the introduction of the first e-waste recycling scheme in Australia, the Northern Territory's container deposit scheme, the tightening of regulations to halt large scale illegal dumping and, of course, regulatory action on waste tyres.

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Authority, Fire & Rescue NSW, the Australian Department of the Environment, the Victorian Environment Protection Authority, Sustainability Victoria, Standards Australia and the World Business Council for Sustainable Development. The depth and scope of this publication would be much poorer without the public information they have provided regarding the stewardship of tyres.

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INTRODUCTION

End of life tyres (ELTs) have been in the spotlight in Australia. The Boomerang Alliance's campaign to shut down dangerous and unlawful collection practices started the ball rolling. It attracted the support of brand leaders Bridgestone, Bob Jane T-Marts, Beaurepaires, Jax, Kmart Tyre and Auto and, most recently, Sumitomo's retail chains Summit Tyres, City Discount Tyres and Ian Diffen Tyres – lifting ELT recycling in Australia of passenger and truck tyres from a paltry 17% to around 54% as at the end of 2014.

Following closely, the Australian Tyre Industry Council's (ATIC) much anticipated Australian Commonwealth sponsored Tyre Stewardship Scheme (TSS) finally commenced in January 2014, attracting the support of the Australian Motor Industry Federation (AMIF), and major brands Bridgestone, Continental, Goodyear Dunlop Tyres, Michelin, Pirelli, Toyo Tyres, Tyrepower and Yokohama.

Disappointingly, major tyre brands Apollo, Cooper, Hankook, Khumo and Maxxis are (at the time of printing) amongst the few market leaders yet to make an adequate public commitment to ensure their ELTs are properly collected and processed.

Both the NSW and Victorian governments have also released tough new regulations aimed at closing down the rogues that have created widespread damage and increased the risk of disease by reckless and negligent practices. However, the future is now looking bright for the management of ELTs.

Importantly, the focus on waste has also allowed key community and government stakeholders to become better informed about the Australian Tyre Industry. Is there any other industry that has been more undermined than tyres? Dodgy underground operators proliferate at nearly every point along the tyre supply chain:

- » Parallel importers bring in millions of tyres each year. Many unrated for Australian roads, few in compliance with Australian laws which protect us from fires and the spread of vector-borne disease, and none covered by manufacturer's warranties.
- » Cheap, poor performing and sub-standard imports proliferate and are posing substantial threats to road safety.
- » Rogue retailers pedal seconds and retreads that are commonly improperly tested for reliability and often don't meet the Australian vehicle design standards.
- » While there has been a dramatic improvement in the management of ELTs the practice of stockpiling in fleet, agricultural and mine sites remains problematic. Just

2.7% of heavy industrial tyres (known as off the road tyres) are recovered and processed in Australia.

- » The industry, government and community face a tough challenge to recover more than 50 million ELTs that have been illegally dumped across the country.
- » Consumers have little ability to identify which tyres are properly managed and are safe to fit to their vehicle.

These challenges are substantial. Dodgy operators enjoy substantial savings by ignoring the essential standards of preserving human health, road safety and environmental protection. In NSW alone there were over 322 fires involving tyres between 2008 and 2013 and the incidence of vector-borne diseases (Dengue Fever, Ross River Fever, Barmah Forest Virus etc.) has skyrocketed from an estimated 3,000 cases in 2002 to nearly 11,000 in 2013.

While the costs to properly manage tyres are increasing, rogues typically undercut the market by between \$20-40 a passenger tyre. Around 60% of this discounting comes by avoiding legitimate environment, safety and regulatory compliance costs.¹

Similarly, environmental and financial savings delivered by legitimate retreaders like Bridgestone's Bandag operation are being undermined by backyard retreaders. Last year Goodyear Dunlop was forced to close its tyre tread manufacturing plant in Ballarat as a result.

Clearly the legitimate tyre sector is an industry under siege. Government, community groups and large fleet users need to do more to ensure that honest operators do not face unfair and unethical competition.

Accordingly, Boomerang Alliance felt it was important to produce Tyre Life. Its purpose is to outline not just the management of waste tyres, but be a broader guide that both identifies the key challenges to the industry and provides guidance for any tyre business to ensure it meets the best practice standard.

Recognising that the author had limited experience regarding the issues faced by retailers, importers and retreaders, we sought advice and direction from a number of leading industry players. In particular we extend our thanks to the Australian Tyre Recyclers Association, Bandag, Bridgestone Australia, the NSW Fire Service, Jax and Tyrecycle who unselfishly shared their knowledge and patiently worked through our inexperience. This book would be much poorer without their help.

INTERVENTION IS NECESSARY

The first priority for the legitimate tyre industry is to come together to embrace a uniform high standard and develop a way to communicate the importance of safety, performance and environmental protection to build consumer awareness of the issues. The recently formed Tyre Stewardship Scheme (TSS) is the obvious starting point. While established for the purpose of managing

Australia's waste tyre problems, the TSS can develop a broader stewardship agenda over time and will be implementing important audit, research, product integrity and communications programs that are a vital step forward. A summary of the TSS in its initial incarnation is outlined later in Tyre Life.

At government level, the Australian Commonwealth needs to cease its excessive focus on free trade, which in the case of the tyre industry often comes at the expense of safety. It is one thing to want a competitive market but it's another thing to allow, even encourage, a business to ignore its responsibilities. Critical reforms are needed to ensure that:

- All tyres imported into Australia comply with Australian Design Rules (which to date have been largely unenforceable).
- All tyres sold should come with details of what, if any, warranty the seller makes and important public safety information regarding the testing of any seconds, blemishes and retreads offered for sale.
- Australia follows Japan and Europe's lead and introduces mandatory tyre labelling explaining a vehicle's wet weather and braking performance, fuel efficiency and noise ratings.

KNOW YOUR RESPONSIBILITIES

A core feature of Tyre Life is to provide simple, accurate and unbiased information for tyre operators and regulators across the entire

supply and disposal chain. The main areas we have focussed on are:

- Understanding the consequences of poor management of tyres and ELTs.
- The responsibilities of each stakeholder (including regulators) along the supply chain to ensure the responsible, safe and environmentally sustainable management of tyres.
- An understanding of Australian Commonwealth, state, territory and local government regulations as they apply to tyres.
- A description of the concept of product stewardship and a summary of the Tyre Stewardship Scheme introduced in Australia in January 2014.
- An understanding of ELTs and the proper methods of collection and recycling.

To this end, purchase of this book also provides access to an online resource where you can find original reference materials, hyperlinks to access different aspects of regulation and other responsibilities, along with some practical checklists and guides. Due to financial constraints, most of the information regarding safety in the workplace and the manual handling of tyres will be found online at www.tyrelife.org.au

UNDERSTANDING TYRES AND WASTE

Finally, we return to the issue of ELTs. It's easy to think that tyres are a simple product to

deal with once they end their life – nothing could be further from the truth. In fact, along with asbestos, ELTs are amongst Australia's most complex and dangerous waste product streams.

Tyres are, by far, the largest single component of all the hazardous, toxic and flammable materials that enter the waste stream each year. By way of comparison, it was estimated in 2009/2010 that some 412,000 tonnes of ELTs were generated compared to just 10,700 tonnes of electronic goods (e-waste) or approximately 162,000 tonnes of asbestos waste.

While tyres don't spontaneously combust, the hollow doughnut shape of a whole tyre traps oxygen and shields the fire from extinguishing agents – making a fire very difficult to manage.

ELTs left in stockpiles or dumped are also a primary cause for the spread and increased incidence of vector-borne diseases like Dengue Fever, Ross River Fever, Japanese Encephalitis, Chikungunya and Barmah Forest Virus. Tyres are an ideal breeding ground for mosquitoes. Urban stockpiles have the effect of both increasing the number of breeding sites and also bring the breeding grounds closer to larger residential and workforce populations.

Tyres are also problematic in landfill. Buried whole, the tyres float and often cause subsidence. Even shredded ELTs create a dangerous mix. Landfill gas, mostly methane, is highly combustible and vulcanised rubber

is almost impossible to extinguish. As recently as last year, one Brisbane landfill that accepted tyre waste components had a fire and the damage was such that the landfill was inoperable for nearly six months.²

In 2007 most nations in Europe and North America banned the export of whole waste tyres to the developing world, concerned about growing reports of the tyres' contribution to the growing global Dengue Fever epidemic. Rather than follow suit, Australia went in the opposite direction and a series of rogue operators opened for business by undercutting the price of legitimate collectors and recyclers. As a result, over 60 unlicensed and unlawful operations bloomed, with three out of four waste tyres being shipped into Vietnam for smuggling into energy hungry industrial sectors in China.

Under-priced, this boom or bust industry has no means of disposal when Vietnam periodically shuts the border. These rogues then often dump ELTs in bushland or abandoned warehouses. Boomerang Alliance estimates that there are now some 50 million tyres in our environment. To Australia's shame the home of the world's largest tyre dump is now next to the beautiful rural township of Stawell, Victoria where some nine million tyres threaten its continued existence.

The solution? It's simple. Retailers and other ELT generators need to ensure they use a licensed recycling service that is subject to

regular independent audits and has a planning permit to store and process tyres. The barrier? Some within the industry refuse to pay for a legitimate service despite the fact that the fees offered for the collection and recycling of tyres are among the lowest offered by specialist waste and recycling services.

We hope Tyre Life will accelerate the transition of the Australian tyre industry to one of the best practice industries in the world.



Above: Some of the more than 50 million ELTs that have been illegally dumped across the country.

¹ Estimate is based on a parallel import tyre being sold at an average \$30 less than a legitimate import. Non-compliance savings are estimated to be approximately \$18 per tyre and include issues like improper storage and lack of fire safety infrastructure at distribution points, no product warranties, unlawful disposal of waste tyres, underfunded WorkCover and insurances, and non-compliance with Australian Design Rules and Australian Standards.

² Please note some recycled rubber shred is used as a product in landfills to improve methane gas capture and extraction. This limited amount of tyre scrap is a product, not waste, and does not pose the same risks as described herein.

CONTENTS



INTRODUCTION	01	DISPOSAL OF WASTE TYRES	28
THE LIFE OF A TYRE	06	Waste Hierarchy for Tyres	29
An Indispensable Responsibility	07	Recycling Best Practice	39
Tyres in Australia	08	Safe Tyre Storage	41
Greenhouse Gas Impact of Tyres	09	Specific Considerations	44
End of Life Tyres (ELTs)	11	THE UNDERGROUND TYRE INDUSTRY	46
Tyre Associated Risks	12	Industry Rogues	47
STEWARDSHIP AND SUPPLY		THE MARKET	53
CHAIN OBLIGATIONS	14	The Market and End of Life Tyres	54
Stewardship Principles	15	Tyre Recyclers – Ready and Able	55
Stakeholder Responsibilities	19	The Real Cost of Recycling	56
Find Out More	22	Ecoflex: Civil Engineering	58
Stewardship of Tyres	24	Rubber Modified Asphalt	59
The Challenge for Tyre		Remote Area Power Plants	60
Stewardship in Australia	27	The Australian Tyre Recyclers	61

LIFE OF A TYRE

Source: Iulian Dragomir/Dreamstime.com

AN INDISPENSABLE RESPONSIBILITY

Today, transport systems link us physically like never before. Our society is built on our ability to move goods, services and ourselves virtually anywhere.

Transport has literally taken us from our isolated villages and moved us across cities, countries and continents. It drives our economy and delivers so many of the benefits we all enjoy. How could we function without it?

As cars, trucks, buses, bikes and planes have taken a bigger role in our lives, so have their tyres. These hoops of rubber and steel play a crucial role in transport efficiency, safety and passenger comfort.

Tyres have become indispensable.

Specialist tyre companies spend huge amounts of time and money to ensure those tyres that our transportation systems rely on are continually improving with better grip, longer life, superior ride and enhanced economy.

Better tyres reduce the environmental impact of transport by, among other things, improving fuel efficiency. They reduce accidents and injuries. They strengthen our transport systems by allowing vehicles to operate in an ever expanding range of locations and conditions.

But for most people tyres are so common they are not really thought of at all.

Which is something we have to change.

High quality, modern tyres are exceptionally good at what they do – but there is an environmental impact which needs wider acknowledgement and action.

Modern tyres, for example, use far less recycled rubber than tyres of 25 years ago. This makes programs to recycle and reuse all the more important.

Furthermore, when they are poorly managed, tyres can pose serious risks to individuals, communities and our wider environment.

A modern society absolutely needs tyres, but society also demands we manage tyres responsibly. It is the tyre industry's challenge to ensure the tyres it sells are safe and appropriate for Australian conditions, are stored and disposed of properly.

Only when these responsibilities are accepted by everyone in the supply chain – from manufacturers and importers, to retailers, users and recyclers – can we be confident in the social licence to operate.

HOW TYRE INNOVATIONS CAN IMPROVE SAFETY AND ENVIRONMENTAL PERFORMANCE: RUN FLAT TYRES – REDUCING CONSUMPTION

There are many examples of how innovation in tyres are delivering big improvements

in both the safety and environmental performance of motoring. One example is the development of run flat tyres (RFTs) which, along with improved passenger safety and their on-going development and wider acceptance, will lead to a significant environmental pay off along with improved driver and passenger safety.

Unlike traditional tyres, RFTs maintain their shape even when fully deflated, allowing the vehicle to stay on the road – albeit at a restricted speed for a limited distance. Each RFT has an individual pressure monitoring unit which alerts the driver to any problem.

Thicker reinforced sidewalls made of heat resistant rubber mean RFTs can carry the weight of the car and passengers even while they are uninflated. A stronger bead core ensures they remain attached to the rim at all times.

RFTs allow drivers to maintain control during a 'blow out', eliminate the need for risky manoeuvre to get out of traffic and remove the dangers of changing a tyre next to a busy road.

Environmentally, RFTs eliminate the need for spare tyres, reducing tyre demand by 20% per vehicle. As RFT technology becomes more widespread, this reduction will add up to millions of tyres. In terms of overall Australian tyre consumption, the elimination of a spare tyre could represent an annual saving of some 215,000 tonnes of greenhouse gases (CO₂e).

TYRES IN AUSTRALIA

All tyres – from passenger cars, trucks, planes, motorcycles and off-road vehicles etc. – result in end of life tyres (ELTs). In Australia, the bulk of ELTs come from cars, trucks and earth movers.

However, because one tyre can weigh as little as 0.3kgs (for a push bike) or as much as 20 tonnes (for a mine truck), talking only about tyre numbers can be misleading. Therefore, 'EPUs' (equivalent passenger units) have been created. Every tyre is worth so many EPUs depending on its weight and life cycle stage. For example, a 20 tonne tyre on a mine truck would equal 2285 EPUs. A bike tyre weighing 0.3 kg would be 0.034 EPUs.

According to official figures some 52.4 million tyres are sold into the three major tyre markets in Australia each year (no data is available for other tyres such as bikes, aircraft etc.) generating some 114.2 million EPUs currently in use across the country and an estimated 48.5 million ELTs each year.

WHAT ARE TYRES MADE OF?

A typical passenger tyre contains 30 types of synthetic rubber, eight types of natural rubber, eight types of carbon black, along with steel cord, polyester, nylon, steel bead wire, silica

and 40 different kinds of chemicals, waxes, oils and pigments. They typically contain 85% hydrocarbon, 10-15% iron (in the bead wire and steel belts) and a variety of chemical components.

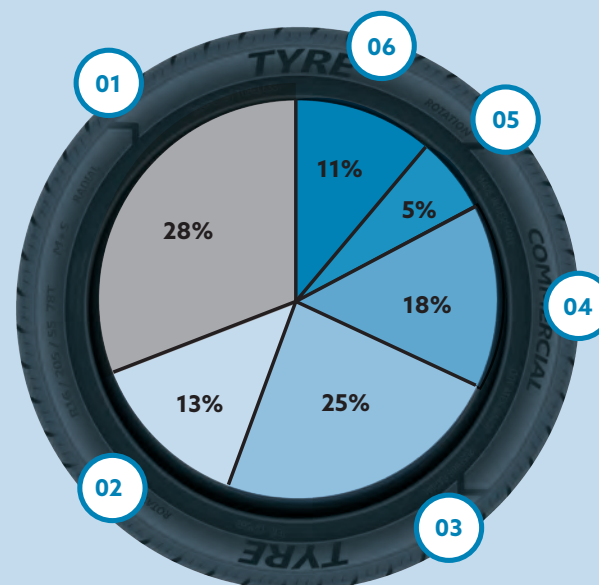
By 1995 new tyres included just 2% recycled material, due to vulcanisation (a technique for hardening rubber to make it more durable), the introduction of radial tires in the 1950s, and other advances including compound

revisions for greater durability and longer tread life.

Today, the use of recycled rubber in tyre manufacture is steadily decreasing further as the recycled rubber itself has a negative impact on tyre performance, for example on fuel consumption.

This means we face a global challenge to find end uses for recycled tyres.

WHAT ARE TYRES MADE OF?



01 Carbon black and silica are the basic tyre fillers providing the necessary 'structure' to the compound.

02 Other chemicals have various functions, like oils, zinc oxide or anti-degradants to protect the compound.

03 Synthetic rubber is added to natural rubber to achieve the desired elasticity.

04 Natural rubber has unique elastic properties and is an essential element of a tyre. Truck tyres have an even higher natural rubber content than passenger car tyres.

05 Passenger car tyres feature rayon or polyester cords radially disposed along the carcass ('radial tyres'), while nylon cords are placed under the tread or near the bead area.

06 High-strength steel cords are applied under the tread of passenger car tyres and in the carcass of truck tyres while other steel wires are located near the bead to assure adherence to the rim.

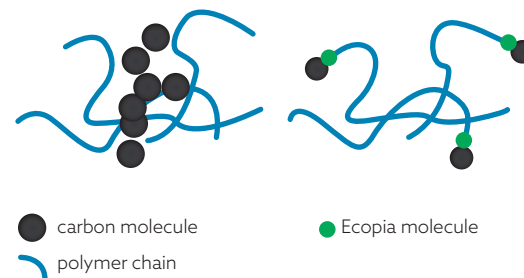
GREENHOUSE GAS IMPACT OF TYRES?

While there are many actions that can reduce the greenhouse gas footprint of a tyre, such as retreading a truck tyre or achieving the highest order of recycling when a tyre ends its life, there is no question that the biggest impact of a tyre in terms of CO₂e (carbon dioxide equivalent) is its use. The graph below is based on Bridgestone's internal emissions research and shows that 87% of a tyre's emissions come from its use.

How much does the type of tyre impact on the emissions you produce while driving? It's actually significant.

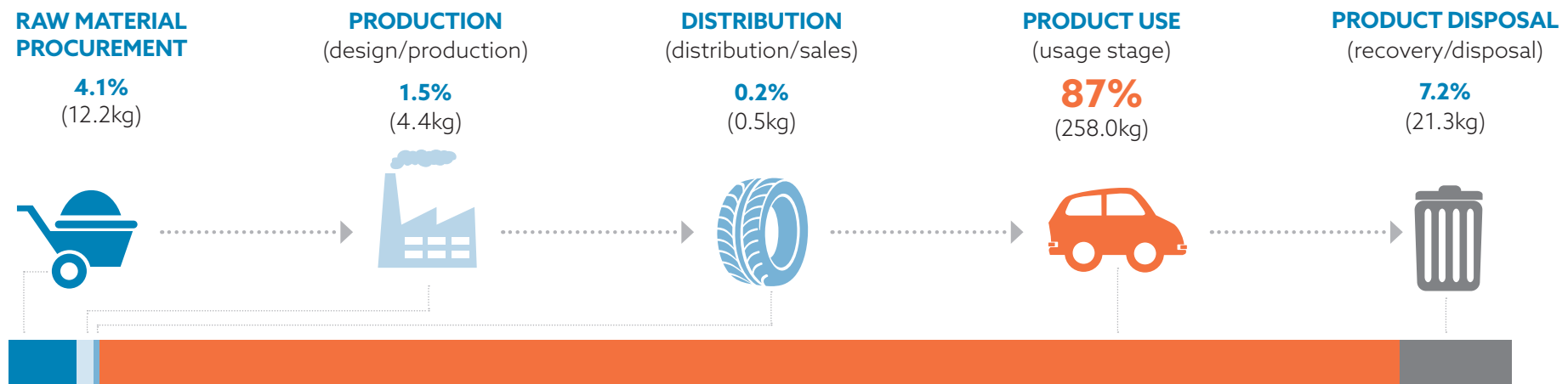
New low rolling resistance tyres have been developed by a number of leading manufacturer brands. Rolling resistance is the technical term used to identify the force needed to roll a tyre – by creating a tyre with less resistance, a vehicle uses less fuel to power and in turn less pollution is produced.

One example of a reduced rolling resistance tyre is the Bridgestone Ecopia – which reduces resistance through its unique polymer.



In conventional tyres, carbon molecules clump together causing friction and generating heat which affects rolling resistance. Ecopia's polymer technology keeps the carbon molecules dispersed, minimising energy loss, friction and rolling resistance.

Naturally, low resistance tyres also deliver safety and performance as well. For example, Ecopia's tread patterns feature rib-linked blocks for enhanced rigidity, high-angle side grooves to evenly distribute dynamic forces when braking, 3D cut ribs for lateral strength, and silent AC blocks for a quieter ride.



Source: www.bridgestone.com/responsibilities/csr/report/2011/topics/index.html, accessed 17/12/14



Above: Bridgestone Ecopia EP850.

Independent testing undertaken in accordance with Australian Design Rule 81/02 (Fuel Consumption Labelling for Light Vehicles) showed that the Ecopia EP100 range can reduce fuel costs by up to 5.7% when compared with standard tyres. Consequently the reduction in greenhouse gas emissions is around 5.8% over a tyre's life.¹

The technology is not limited to passenger cars, but is also offered to the heavy vehicle market where the proven fuel savings are considerable.

Other greenhouse gas savings that can be made via the proper management and disposal of tyres include:

- » The recovery and disposal of tyres which can reduce its greenhouse gas impact by a further 3%.
- » Retreading a truck tyre using a quality process like Bandag which reduces the greenhouse gas impact of the tyre by a further 3.9%.

While each step is a small benefit, the combined impact of a comprehensive stewardship program – like that adopted by Bridgestone Australia – can be significant. The graphic to the right compares the GHG footprint of a retreaded Ecopia tyre that is properly disposed of when removed, with that of a cheap no-name import used once and inappropriately discarded.²

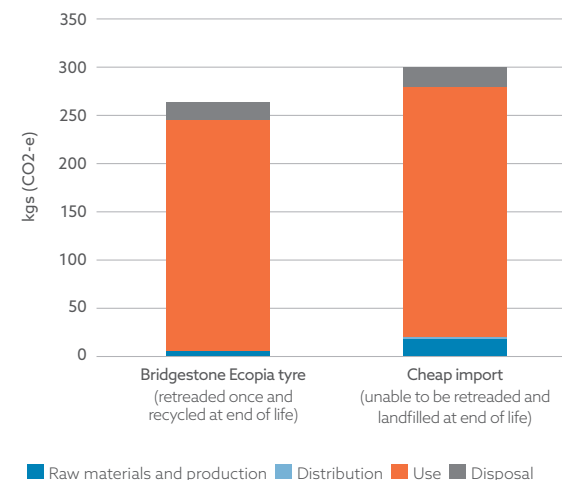
Calculations have been based on the Ecopia truck range but converted into an EPU to better illustrate the benefits.

This clearly demonstrates the value of stewardship across a tyre's entire life.

On one hand, we have market leaders like Bridgestone and others, who take responsibility to reduce a tyre's footprint in its manufacture, use, reuse and ultimate disposal. This approach allows Bridgestone to deliver a product that has a greenhouse profile of as little as 260kgs of CO₂e over its life. On the other hand, a cheap import sold via a retailer with no stewardship program can easily be as much as 300kg.³

The value of stewardship

The environmental benefits of how a market leader (Bridgestone) manages a tyre through each stage of its life, compared to how a cheap import is managed.



¹ Emissions savings are slightly higher than fuel savings due to the range of greenhouse gases emitted from a vehicle's exhaust.

² The 'cheap tyre' used for comparison is a tyre that would be category G under the fuel efficiency aspect of the EU regulation on labelling of tyres.

³ Based on a tyre travelling 40,000 kms over its life.

END OF LIFE TYRES (ELTs)

In Australia, a tyre is considered to be at the end of its life when it is removed from a vehicle and has completed its current use. Along with tyres that have entered the waste cycle, ELTs include tyre casings for retreading (until the new tread has been applied) and second-hand tyres destined for reuse on another vehicle (until it has been fitted).

ELT GENERATION AND RECOVERY

Over the last 20 years recovery rates for ELTs have grown dramatically across the world. At the same time, the cost of recycling to the consumer has decreased in some areas due to both increased efficiency in management structures and new recovery routes. This shift shows that ELT-derived products can legitimately be recognised as a valuable secondary raw material or an alternative fuel.

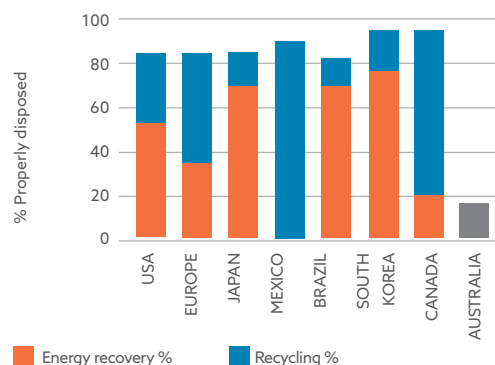
It is also clear that Australia is lagging well behind the developed world, as well as many developing economies, when it comes to tyre recycling.

It's important to recognise progress and congratulate effort. The Boomerang Alliance campaign partnership with the Australian Tyre Recycling Association (ATRA) has had a sharp and immediate effect in improving performance.

After more than 15 years of being frustrated by government, the Australian Tyre Industry Council's (ATIC) voluntary Tyre Stewardship Australia (TSA) program is finally off the ground. Leading tyre brands and retailers no longer have any excuses.

Reports prepared by Hyder Consulting for the Council of Australian Governments' Standing Committee on Environment and Water identified that in 2009/10 there were more than 48 million ELTs generated across Australia, with a recycling rate of between 13% and 26% depending on whether export of whole tyres into developing nations is considered legitimate disposal or simply dumping.

Tyre recycling 2009/10 Australia vs the world

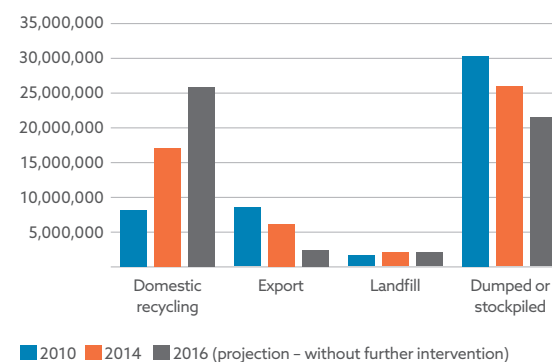


Recent actions by ATRA and the Boomerang Alliance working with retailers to improve their disposal practices have seen a major shift in the market. Nine major chains – Bridgestone Select, Bridgestone Services Centres,

Beaurepaires, Bob Jane T-Marts, Jax Tyres, Kmart Tyre and Auto, Summit Tyres, Ian Diffen Tyres and City Discount Tyres – are all ensuring every store's ELTs are collected by a verified collector that properly disposes of all tyres. These efforts alone have seen the Australian recycling rate now lift to nearly 50%.

Furthermore, with the Tyre Stewardship Australia (TSA) program finally up and running, importer-controlled franchisees and licencees – such as Dunlop Super Dealers, Goodyear Autocare, Michelin Service Centres, Tyres & More, Tyre Plus, Tyre Power and Yokohama – should be using a legitimate service when independently verified.

Australian tyre disposal



It was estimated in 2021 that 68% of used tyres in Australia were recovered for an "environmentally sound use".
<https://crm.tyrestewardship.org.au/static/uploads/files/tsa-annual-report-2021-wfpyuwgqtvus.pdf>

TYRE ASSOCIATED RISKS

While tyres are a safe and reliable product when used properly, poor management systems can result in tyres creating major health and environmental hazards.

The risks increase dramatically when key functions across the supply and recovery chain are handled without suitable equipment – such as water capture facilities, and safety/inspection equipment. Risks also surge when local government planning and state government regulatory approvals are ignored.

However, these risks are negligible when the system is managed by a suitably trained and licensed professional.

For example, NSW Fire records show that there were approximately 322 fires involving tyres between 2008 and 2013, yet not one premises carrying an EPA licence for the storage of tyres experienced a fire.

FIRE

Tyres are not subject to spontaneous combustion, though they do have the ability to absorb and retain radiant heat. Unfortunately, this feature makes tyre fires very difficult to extinguish. In addition, a tyre's hollow doughnut shape traps oxygen and

shields the tyre from the extinguishing agent. This, combined with the fact that tyres are water repellent by nature, means that most extinguishing agents like water and foam are ineffective.¹

The pile composition has a major influence on the rate, spread and direction of the fire. Whole tyre piles will burn down the middle of the pile where air pockets provide sufficient oxygen, whereas fires occurring in shredded and crumbed tyres are much easier to manage as they tend to spread across the surface of the rubber.

Open-air tyre fires also generate thick black smoke, carbon dioxide, volatile organic compounds (VOCs) and other hazardous air pollutants, such as arsenic, cadmium, zinc, mercury, chromium, vanadium, dioxins, and benzene. These compounds pose a great threat to both human and environmental health.

In a fire, each passenger tyre can release up to 7.6 litres of pyrolytic oil which, along with other pollutants, can leach into soils and nearby waterways if it is not contained by adequate infrastructure, such as bunding around the tyre storage area and storm water shut off valves.

SPREAD OF VECTOR-BORNE DISEASE

Tyres have been identified as a major contributor to the spread of vector-borne diseases, such as Dengue Fever and Ross



Above: Tyre fires create major health and environmental hazards.

River Virus. The shape of the tyre allows for water to collect and become stagnant, therefore providing the perfect habitat for disease-carrying mosquitoes to live and breed. Generally these mosquitoes have a limited reach. However, the international transportation of tyres is allowing them to cross national boundaries and spread rapidly. In fact, since Australia started exporting millions of tyres to Vietnam the incidence of Dengue Fever there has nearly doubled in three years, from an estimated 68,532 cases in 2007 to 128,831 in 2010.²

INFESTATION OF VERMIN

Like with mosquitoes, the shape and size of tyres provides an ideal habitat for vermin – resulting in infestations in both urban communities and natural environments.



Above: Boomerang Alliance ambassador Laura Wells visits one of the many thousands of children suffering from Dengue Fever in Ho Chi Minh Children's Hospital.

Not only does this create a health hazard for humans, it also has the potential to disrupt natural ecosystems.



Above: Inappropriate storage of tyres creates a habitat for mosquitoes, spreading vector-borne disease.

RELEASE OF TOXINS TO LAND AND WATER

For every tonne of tyres that is burnt or sent to landfill, approximately 91kg of toxic material is leached into the environment, including dioxins, polychlorinated biphenyl (PCBs), arsenic, lead and mercury. These toxins can also be leached into the environment during a tyre fire, through pyrolytic oil, causing widespread land and water contamination.⁴ Furthermore, some of these substances can present delayed impacts on biotic systems by means of bioaccumulation or other toxic effects.

DAMAGE TO PROPERTY

Unlicensed and back door operations often undertake 'industrial dumping' where they lease a property, overstock it with tyres and then abandon the site. In 2014 alone Boomerang Alliance identified 30 of these sites. The well documented dump site at Pinkenba in Queensland was a classic example, where clean-up costs and property repairs cost the property owner some \$500,000.³ While estimates are fairly simplistic, we have been able to identify more than \$10 million in property damage across just a handful of identified sites.

LOSS OF NATURAL RESOURCES

With three out of four Australian tyres not recovered for recycling or energy use, Australia wastes an estimated 288,000 tonnes of natural resources each year.

In energy terms alone, every 75 passenger tyres recycled in Australia represents the equivalent of taking a passenger car off the road for one year. Annually, properly recovering and reprocessing all our tyres would have the same effect as removing 480,000 cars from Australian roads.⁵

¹ State of California Office of the State Fire Marshal, 'Rings of Fire Revisited: Tire Fire Prevention and Suppression'

² World Health Organisation – DengueNet

³ Personal communication with property owners

⁴ Basel Convention: Technical Guidelines of the Environmentally Sound Management of Used Tyres

⁵ Extrapolated from Commonwealth Department of Data information 7/10/14: <http://www.environment.gov.au/archive/settlements/publications/waste/tyres/national-approach/tyres6.html>

TYRE DUST / CRUMB

Since the publication of Tyre Life there has been increasing concern about the contribution of tyres to microplastic pollution from roadwear (tyre dust) and use of tyre crumb in outside facilities such as playgrounds and sporting fields. See - <https://www.theguardian.com/environment/2020/jul/14/car-tyres-are-major-source-of-ocean-microplastics-study> - <https://www.ausmap.org/post/rubber-crumb-research-released> - <https://www.planning.nsw.gov.au/Policy-and-Legislation/Open-space-and-parklands/Synthetic-Turf-Study>

STEWARDSHIP AND SUPPLY CHAIN OBLIGATIONS

Source: TOPSHOTS/AFP PHOTO/YASSER AL-ZAYYAT

STEWARDSHIP PRINCIPLES

The best solution for problem waste is the development of an Extended Producer Responsibility Program (EPR) and/or Product Stewardship (PS) scheme. These have been deployed to great effect in Europe, Canada and the US.

With many Australian tyre importers having responded to Boomerang's campaign and others adopting the Tyre Stewardship Australia (TSA) standard, there is cause for optimism about improving our historically poor performance.

Product stewardship is an environmental management strategy which requires the producer to take responsibility for minimising the product's environmental impact throughout all stages of the product's life cycle, including end of life management. However, all parties within the supply chain have roles.

The key objective is a long-term solution to manage waste products by shifting the responsibility for collection, transportation and management of such products away from local governments to the manufacturers. Sustainable businesses that wish to adopt stewardship standards need to recognise that

obligations don't just stop with managing their waste – good stewardship extends to managing a triple bottom line approach (social, environmental and economic impacts) to a product's manufacture, distribution, sale, recovery and disposal.

The Boomerang Alliance uses 10 principles of product stewardship to assess whether a scheme is effective and equitable. This approach has been informed by a number of principles developed across North America and Europe over many years. In particular, Boomerang Alliance acknowledges the fine work of both the Product Stewardship Institute (PSI) and North West Product Stewardship Council.

The Boomerang Alliance's 10 Principles of Product Stewardship are:

01 PRODUCER RESPONSIBILITY AND SHARED COMMITMENTS

Producers are required to design, manage and finance programs for the safe and environmentally responsible manufacture, distribution, sale, use and end of life management of their products and packaging. Programs need to cover an entire sector's products in a given category, as opposed to individual company approaches. The program should include dealing with products from companies no longer in business and from companies that cannot be identified and/or legacy products and allied

wastes from earlier times.

For Australian tyres the 'producer' would be regarded as a manufacturer based in Australia or the person/entity importing tyres for sale in the Australian market.

While Boomerang Alliance advocates that product stewardship requires the producer to be ultimately responsible for the management of a product across its life cycle, it also acknowledges and encourages distributors, retailers, fleet consumers and members of the public to accept shared responsibilities with the producer. However, for a producer to be regarded as a genuine steward who manages the 'triple bottom line' adequately, they must enshrine and enforce these responsibilities as a condition of supply to the retail chains and ensure individual and corporate customers are aware of appropriate disposal outlets.

Equally, good product stewards will also pass on any costs they incur throughout their supply chains in a transparent manner.

Finally, custodians within the supply chain (e.g. retailers, distributors and fleet managers) should seek to only sell products supplied by responsible producers if they wish their social, environmental and safety claims to be credible.

While many tyre importers make significant efforts to manage their tyres well, it is important to note that at the time of publishing only Bridgestone met this definition of producer responsibility in Australia.

02 A LEVEL PLAYING FIELD

Stewardship inevitably comes at a cost and it is difficult for any company to be a responsible steward if they have to compete with rogue traders who can gain a price advantage over legitimate business. To this end, it is the obligation of federal and state government agencies to ensure a level playing field.

Unfortunately, the Australian tyre industry is populated by rogue operators who undermine the viability of legitimate business at every step of the supply chain and jeopardise our community well-being and environmental health. Two examples of rogue operators are parallel importers and 'backyard' retreaders:

» Parallel importers are non-manufacturing importers who bring a product into Australia without the manufacturer's permission. Despite parallel importing being commonly cited as causing trademark and intellectual property disputes, the government has traditionally supported the practice as, in theory, it increases competition and reduces prices to the consumer. However, this fails to recognise that a parallel imported tyre may look the same as a product manufactured for Australian conditions but is often not designed to meet Australian conditions or even comply with Australian Standards.

Parallel importers are generally of a smaller scale and often fly beneath the regulatory radar. Consequently, they often work from

premises that do not have the necessary firefighting infrastructure (sprinkler systems, fire hydrants, water supply systems, bunding and storm water shut off valves) of a major importer. Given that such infrastructure can cost as much as \$5 million, this provides the parallel importer with a significant price advantage over responsible stewards while placing the community at increased risk.

» Retreading the right tyre, with the right process, can create significant advantages to society by providing a reliable, low cost product. Yet it is also important to note that responsible retreaders, like Bandag, use advanced (and often expensive) imaging and ultrasound technologies to inspect the casing and ensure the retreads will be able to withstand any Australian road conditions.

However, 'backyard' retreaders who operate across Australia undertake little more than a visual inspection before fitting a new tread to a casing which increases the risk of tread separation and blow outs. Additionally many of these retreaders are also unlicensed, despite most states requiring a retreading operation to hold a licence for waste tyre storage and/or non-thermal processing. This allows the illegitimate operation to have a substantial pricing advantage over the legitimate industry.

Dangerous disposal of waste tyres has become a major problem over the past six years, with



Above: Dangerous stockpiles at retreader.

three out of four tyre retailers using unlicensed and often criminal operators to collect and dispose of their ELTs. By avoiding the insurance payments, OH&S requirements and onsite firefighting infrastructure costs required of the legitimate collector and/or recycler, these operators can offer 'disposal' services at less than half the price of the licensed and legitimate industry while also illegally dumping, causing major fires, and the spread of vector-borne diseases both here in Australia and across Southeast Asia.

03 INTERNALISED COSTS

All product lifecycle costs – from extracting resources, to reducing health and environmental impacts throughout the production process, to managing products at the end of life – should be included in the total product cost.

This places the financial burden of managing the environmental impacts of product manufacture, use, and end of life management on the consumer of the product, rather than a tax or ratepayer based model where those individuals who do not consume a product unfairly share the same burden as a heavy user.

In the medium to long term this also creates a direct financial incentive for manufacturers to redesign their products to reduce their impacts on the community and environment.

04 TRANSPARENCY AND INTEGRITY

Effective product stewardship requires producers and operators across the supply chain and schemes to commit to high levels of transparency and integrity, including information on:

- » Any charges to manage and implement the stewardship program;
- » How the stewardship scheme operates and its results;
- » How products are managed at the end of their life (and who manages this);

- » Any penalties or regulatory infringements and corrective actions;
- » The content of relevant meetings (minutes published on a website); and
- » Any rules or policies that restrain trade to ensure compliance with the scheme.

No organisation that participates in a product stewardship scheme should be allowed to make any performance claim unless it is operating in a manner consistent with the scheme's policies and guidelines, or use any symbols or logos that denote stewardship without being independently verified that it is compliant.

05 ACCOUNTABLE

Producer Responsibility Organisations (PROs) must ensure they remain credible by being publicly accountable and transparent. This requires clear goals and targets being regularly published; periodic reporting on progress to meet these goals; plans for the future; handling of specific complaints from the community in a prompt timeframe; and audited and published annual accounts.

06 EQUITABLE GOVERNANCE AND PARTICIPATORY DECISION MAKING

Producer responsibility and product stewardship schemes need to ensure equitable representation from the supply chain as they can often over-represent polluters who then use the PRO to manipulate

market outcomes or 'green wash' efforts and results. This is also important to ensure staff members are able to act professionally and not be 'captured' by particular interests.

To achieve schemes that are fair and equitable, different stakeholder bodies should be equally represented at the board level and all participants and stakeholders should be fully briefed and provided with the same information.

To eliminate any 'pilfering' of confidential information collected by the scheme, no individual who is 'in the trade' should have access to any information regarding sales, pricing or market segmentation information.

07 GOVERNMENT INDEPENDENCE

Government should not participate in the running of product stewardship schemes or be represented on their governing bodies. It is critical they remain impartial rather than become co-opted. Rather, government should:

- » Ensure that governance structures are to a high standard and facilitate both independent and community representation within the governance structure;
- » Conduct independent reviews and undertake regular broad consultation to ensure stakeholders have opportunities to air and consider any grievances regarding the PRO;
- » Ensure all claims made are honest and based on verified information and that all

participants have earned the right to call themselves product stewards; and

- » Conduct audits to see whether the scheme is meeting its targets and community expectations.

Under no circumstance should government extinguish its right to further regulate or impose penalties on participants – when necessary – as this is an abdication of its responsibility to protect the public interest.

08 RESULTS ORIENTATED AND FACTUALLY BASED

Obviously, the success or failure of any producer responsibility scheme is based on genuine results. It is paramount that any stewardship scheme has clear time-bound targets that reflect the public's expectations and ensure protection of the environment. Regular milestone (quarterly) reporting is needed to allow success to be reviewed in a timely manner.

09 KNOWLEDGEABLE

Responsible stewards and PROs should clearly understand the potential environmental, health and safety risks of their products and actions. In addition, they should know how other participants in the product's lifecycle impact on that risk. The biggest burden for developing knowledge of a product's hazards falls on the manufacturer because it defines the product's content and potential to cause damage.

10 INDEPENDENTLY VERIFIED

It is well established that the community is sceptical of both industry and government claims regarding environmental health and community safety. To this end it is important

that any claims be independently verified by a credible third party which has no financial connection with any members of the scheme itself.



Above: Australia's failure to manage ELTs has seen millions of tyres discarded, presenting a dangerous fire threat to local communities. Stawell, Victoria.

STAKEHOLDER RESPONSIBILITIES

IMPORTERS

Tyre importers have two distinct areas of responsibility.

DIRECT RESPONSIBILITIES

Appropriate products: When tyres are brought into the country an importer should ensure they are compliant with Australian Standards:

- » Vehicle Standard (Australian Design Rule 23/00, 23/ 01, 23/02 – Passenger Car Tyres 2007)
- » Vehicle Standard (Australian Design Rule 42/04 – General Safety Requirements 2005)
- » AS/NZS 2230:1999 – New pneumatic tyres for light trucks and trucks/buses

Quarantine: Imported tyres represent bio-security risks particularly with their potential to introduce non-native mosquito species. For example, the Asian tiger mosquito was introduced into the United States in tyre casings imported for recapping. In fact, the movement of tyres and casings has spread the species to more than 20 US states since 1985.¹

To manage these risks, a Quarantine Entry must be lodged for each consignment, including a specific customs declaration from

either the manufacturer, exporter or supplier of the new tyres stating that ‘the tyres are dry, free of mosquito eggs and larvae, free from contamination or bio-security concern and that they have been stored under cover until the time of export’. The declaration must reference the invoice and/or container numbers.

Planning consent: All tyre storage premises require local government planning consent which will outline conditions for operation, including site infrastructure and plans. It is an offence to operate a facility without planning consent.

Fire safe storage: Importers must ensure distribution centres hold tyres in a manner consistent with state fire safety guidelines and require fire management plans approved by the relevant fire authority. For example, Fire and Rescue NSW, Fire Safety Guideline, Guideline for bulk storage of rubber tyres, Version 3, 2014.

Fire management and evacuation plans:

All jurisdictions typically require any storage facility with fire risks to have an approved plan to manage fire incidents and evacuations. These plans include requirements for infrastructure such as sprinklers, fire hoses, extinguishers and hydrants, water storage, site access points, site security and fencing, fire alarms, site evacuation and firefighting procedures, signage and incident reporting.

INDIRECT RESPONSIBILITIES

Supply chains: When tyre importers don’t have good standards of stewardship at the point of sale, they put their reputations at risk. For example, being publicly exposed for using unlicensed collectors who illegally dump tyres. This reputational risk increases for retailers who use the importers’ brands and/or logos but do not comply with their regulatory obligations, including management of ELTs.

¹ Illinois Department of Public Health



Above: This Sydney based parallel importer was observed to have completely ignored the regulations for the storage of tyres – creating a major fire hazard.

RETAILER/FITTERS

Appropriate products: Tyre retailers/fitters must ensure the tyres they sell are consistent with Australian Standards:

- » Vehicle Standard (Australian Design Rule 23/00, 23/ 01, 23/02 – Passenger Car Tyres 2007)
- » Vehicle Standard (Australian Design Rule 42/04 – General Safety Requirements 2005)
- » AS/NZS 2230:1999 – New pneumatic tyres for light trucks and trucks/buses

Planning consent: All premises selling and/or fitting tyres require local government planning consent which will outline conditions for operation, including site infrastructure and plans. It is an offence to operate a facility without planning consent.

Waste disposal: In most Australian states ELTs are defined as waste and must be disposed of at a lawful waste facility or licensed recycling premises. Retailers can be penalised if they do not ensure waste collectors are licensed and/or keep records of their waste collections.

Record keeping: In most states waste generators (in this case tyre retailers) are required to maintain records to show how they disposed of their ELTs.

Casings: If a tyre store sells retreads it must ensure the tyres are prepared with the AS (1972-1993 'Pneumatic tyres – Passenger car,

light truck, and truck/bus – retreading and repair processes'.)

Retailers selling casings or seconds should also inspect casings to ensure they are free of mosquito eggs and/or larvae.

Fire management and evacuation plans: All jurisdictions typically require any storage facility with fire risks to have an approved plan to manage fire incidents and evacuations. These plans include requirements for infrastructure such as sprinklers, fire hoses, extinguishers and hydrants, water storage, site access points, site security and fencing, fire alarms, site evacuation and firefighting procedures, signage and incident reporting.

TYRE COLLECTORS AND TRANSPORTERS

Driver and vehicle safety: This is a critical and often neglected aspect of collecting and transporting tyres. In Australia, road accidents account for nearly half of all work-related deaths each year and are estimated to cost business and the community \$2 billion annually.

- » All vehicles used for tyre collection must have current registration and compulsory third party insurance;
- » Trucks should be in good condition and roadworthy;
- » Like any transporter it is important that each vehicle has appropriate equipment to deal with a road side emergency, for example



Above: Would a legitimate collector pick up tyres in an orange juice truck?

hazard warnings (reflective triangles), fire extinguishers, a torch, first aid kit, hi-vis vests;

- » Because many tyres weigh more than the safe manual lifting limits identified by WorkCover authorities, transporters should either undertake collections with two people and/or have mechanical lifting equipment such as a tailgate loader; and
- » All trucks should be fitted with appropriate cages to contain the tyres as well as tarps to keep the tyres dry on wet weather days.

The Victorian Transport Association has a series of guides on transport safety.

Some of these can be found in our web link pages which can be accessed following the purchase of this book. See www.tyrelife.org.au

Insurances: It is important that tyre collectors and transporters properly protect their customers from litigation risks. To this end, all collectors and transporters should have comprehensive insurance including public liability and workers compensation. Failure to maintain these policies can create liabilities for the waste consignor.

Licensing: In most states there is a requirement for the transporter to hold some form of EPA licence. Tyre collectors and transporters are also obliged to ensure all ELTs collected from retailers and other outlets are passed to accredited domestic tyre recyclers for environmentally sound uses.

Record keeping: In most Australian states collectors and transporters are required to maintain records to show how they dispose of ELTs.

Where a collector consolidates tyres at a premises they will generally require:

Planning consent: All tyre storage premises require local government planning consent which will outline conditions for operation, including site infrastructure and plans. It is an offence to operate a facility without planning consent.

Fire safe storage: Collectors must ensure storage centres hold tyres in a manner consistent with state fire safety guidelines and have required fire management plans approved by the relevant fire authority. For

example, Fire and Rescue NSW, Fire Safety Guideline, Guideline for bulk storage of rubber tyres, Version 3, 2014.

Fire management and evacuation plans: All jurisdictions typically require any storage facility with fire risks to have an approved plan to manage fire incidents and evacuations. These plans include requirements for infrastructure such as sprinklers, fire hoses, extinguishers and hydrants; water storage requirements; site access points; site security and fencing; fire alarms; site evacuation and firefighting procedures; signage and obligations regarding incident reporting.

RECYCLERS

Licensing approval: Facilities that actually recycle the ELT (i.e. destroy the tyre and create a new product) will generally require an EPA licence for either 'non-thermal processing' or 'thermal processing' depending on their recycling system.

Additionally, in most states a recycler will also store a significant volume of ELTs and accordingly will need to hold an EPA licence for tyre stage and other approvals.

Planning consent: All tyre storage premises require local government planning consent which will outline conditions for operation regarding site infrastructure and plans. It is an offence to operate a facility without planning consent.

Fire safe storage: Ensure distribution centres hold tyres in a manner consistent with state fire safety guidelines and have required fire management plans approved by the relevant fire authority. For example, Fire and Rescue NSW, Fire Safety Guideline, Guideline for bulk storage of rubber tyres, Version 3, 2014.

Fire management and evacuation plans: All jurisdictions typically require any storage facility with fire risks to have an approved plan to manage fire incidents and evacuations. These plans include requirements for infrastructure such as sprinklers, fire hoses, extinguishers and hydrants; water storage; site access points; site security and fencing; fire alarms; site evacuation and firefighting procedures; signage and incident reporting. Note: When a recycler collects ELTs themselves (i.e. doesn't use a third party collector) they will also need to comply with the obligations outlined for 'Tyre Collectors and Transporters'.

TYRE RETREADERS AND SECONDS STORES

Tyre retreaders and second-hand tyre operations have the same obligations as those of a recycler and often a collector and transporter. Where the retreader/second-hand tyre dealer also sells direct to the consumer they will need to comply with the responsibilities of a tyre retailer/fitter. Stores must ensure they are receiving ELTs from accredited tyre collectors and transporters.

Casings: Retreaders must ensure the tyres are prepared with AS 1972-1993 'Pneumatic tyres – Passenger car, light truck, and truck/bus – retreading and repair processes'.

Retailers selling casings or seconds should also inspect casings to ensure they are free of mosquito eggs and/or larvae.

Seconds: Selling second-hand tyres is generally a dangerous practice. At the minimum any second-hand tyre should be consistent with:

- » Vehicle Standard (Australian Design Rule 23/00, 23/ 01, 23/02 – Passenger Car Tyres 2007)
- » Vehicle Standard (Australian Design Rule 42/04 – General Safety Requirements 2005)

The producers of this book do not support the sale of any used tyre and or casing that has not been inspected with advanced (and often expensive) imaging and ultrasound technologies to ensure the second life tyre will be able to withstand any Australian road conditions.

INDUSTRY AND PRODUCER RESPONSIBILITY ASSOCIATIONS

Associations that represent the motor trade and tyre recycling and waste management sectors are established to assist their members to meet professional standards and reflect their members' views to government and the public. Given the potential serious

reputational damage that dangerous and inappropriate practices can cause to individual stores and the industry as a whole, these associations also have a responsibility to ensure their sector is fully aware of its legal obligations and best practice.

Producer responsibility groups are similarly under public, media and regulator scrutiny and should champion the best practice standard. This includes having the financial and staffing resources to meet ambitious targets, market development, information supply, transparency and reporting standards.

THE CONSUMER

The purchaser of a tyre places a great deal of trust in the seller and reasonably assumes that government regulation is ensuring safety and protecting the environment. We encourage consumers to take what action they can to ask questions about the practises of tyre dealers, in particular about their legitimate recycling efforts, and consult information made available by regulators and credible groups concerned about effective stewardship.

THE REGULATOR

It is clear from the recent record that regulators have either lacked resources or adequate powers to ensure the safe storage and environmentally responsible recycling of ELTs. Governments should undertake all efforts to provide sufficient resources and legal powers to protect the community and

environment (with recent decisive action in NSW and Victoria the notable exception). Also, it is not appropriate to place the bulk of protection and compliance activity on local councils, which have many other responsibilities and limited resources.

FIND OUT MORE?

It is sometimes difficult to find information from government agencies, particularly for smaller businesses without dedicated legal and environmental staff. While Boomerang Alliance cannot provide professional advice regarding what liabilities any business may have regarding tyres, we have tried to assist by:

- » Identifying the regulatory aspects that apply to different parts of the tyre supply chain;
- » Providing contact information for the agencies which oversee aspects of responsibility.

The following table highlights which responsibilities typically apply to tyre operations:

	Importers and distributors	Retailers	Fleet operators	Collectors and recyclers
Customs	✓			
Development consent	✓	✓	✓	✓
Tyre storage	✓	✓	✓	✓
Fire equipment	✓	✓	✓	✓
Environmental licencing				✓
Waste tracking		✓		✓

Customs: Any tyres imported to Australia are subject to both quarantine controls and customs declarations. For information about customs contact the Australian Customs and Border Protection Service on 1300 363 263 or visit their website www.customs.gov.au

Quarantine: For information regarding quarantine contact the Australian Department of Agriculture or follow the link to import conditions found at www.tyrelife.org.au

Development consent: Also known as a Development Approval (DA) or planning permits, development consent is managed by the local council where your business operates. Development consent is an approval process that ensures activities are consistent with the local zoning and are managed appropriately.

Generally, contacting the planning department at your local council is the best first step in obtaining the relevant permits and licencing required as they will often have a checklist of what you will require from other agencies (e.g. a fire management plan and/or environmental licencing).

Tyre storage: The standards for tyre storage are developed by the state/territory fire authority but are also governed to some extent by environmental agencies which identify thresholds for the amount of tyres onsite.

An outline of best practice fire storage standards can be found at www.tyrelife.org.au. Links to each state or territory fire authority's guidelines can also be found on the website. You can contact your local fire authority for more information.

Firefighting and preventative equipment: Facilities that store significant quantities of tyres require substantial infrastructure to manage fire incidents. This includes access to fire hydrants, hoses and extinguishers, security systems, fencing, and evacuation plans. The Australian Building Code identifies the required infrastructure.

The type and amount of equipment required will be determined by the size of the operation and activities undertaken.

Environmental licencing and waste tracking: Nearly every state and territory requires waste tyre facilities to have a licence or permit. Most states also require waste generators (tyre retailers/fleet managers etc.) to track their waste and ensure ELTs are disposed of in a lawful manner. State and territory environment agencies can supply you with information regarding whether your collector is licensed and whether they have been prosecuted in the past.

A detailed directory of web links to state or territory regulations, and guides to check licencing and prosecutions can be found at www.tyrelife.org.au. Contact phone numbers for environment protection agencies can be found below. The first point of contact for each agency is usually the 'pollution hotline', but they can refer you to the waste management section.

ACT: 13 22 81

NSW: 131 555

NT: 1800 064 567

QLD: 1300 130 372

SA: 1800 623 445

TAS: 1800 005 171

VIC: 1300 372 842

WA: 1300 784 782

STEWARDSHIP OF TYRES

The Tyre Stewardship Scheme (TSS) is a government endorsed industry framework to reduce the environmental, health and safety impacts of ELTs in Australia. It has a target of increasing recycling to 50% in five years, which may need review given this goal has been reached via the actions of market leaders to support Boomerang Alliance's campaign efforts.

While Boomerang Alliance is not a participant in Tyre Stewardship Australia (TSA), and maintains its independent right to praise or criticise any organisation on its environmental performance, it is important to acknowledge the TSS program of work and guidelines. We believe they represent a best practice approach consistent with the standards Boomerang Alliance and ATRA advocate.

The TSS is still being established but has already secured the support of leading importers, retailers and industry groups including Bridgestone, Continental, Goodyear Dunlop, Michelin, Pirelli, Toyo Tires, Tyre Power, Yokohama and the Australian Motor Industry Federation.

It is important that all stakeholders consider whether the financial, governance,

representational and operational arrangements proposed by the TSA to manage the TSS are acceptable to themselves and their associates.

Boomerang Alliance takes the opportunity in describing the TSS in this section of Tyre Life to urge all to consider the importance of a uniform approach to finally eliminating the devastating effects that ELTs have had on our environment and community. Negotiations are continuing to bring the industry together and we urge all tyre and ELT recyclers and collectors to seek a common position that delivers the best outcome for the community, customers and the environment.

The following is an extract from the TSS Guidelines:

OVERVIEW

The published objectives of the TSS are to increase resource recovery and recycling, as well as minimise the environmental, health and safety impacts of ELTs generated in Australia, and develop Australia's tyre recycling industry and markets for tyre-derived products.

The TSS aims to achieve these objectives through participation at all levels of the tyre supply chain and with the support of government. The TSS places a small, ACCC-authorized levy on all members at the point of import (by all member groups) to provide for both the scheme's viability and an economic

foundation for new uses for properly recycled end of life tyres.

The TSS is administered by TSA, a non-profit company with an independent chairperson, and six other directors appointed by stakeholder bodies. TSA's role is to implement the TSS, administer participant accreditation, audit and report on the scheme, undertake education, awareness and information activities, and support market development and early stage research in the field of ELT utilisation for the benefit of the industry.

The scheme is designed to deliver a range of benefits. These include:

- » An increased use of a resource stream currently being disposed of as waste;
- » A reduction in the number of tyres not going to an environmentally-sound use;
- » An enhanced Australian recycling industry and sustainable markets;
- » An increased capacity to handle ELTs in Australia;
- » The creation of new markets for ELTs and products through research and development;
- » An improved business environment, particularly for tyre collectors and recyclers;
- » An increased consumer awareness of the impacts of end of life tyre disposal; and

- » Enhanced credibility for the tyre industry through demonstrated leadership in environmental management and the adoption of corporate social responsibility strategies.

The TSS will also establish the Tyre Stewardship Research Fund to undertake early-stage through to proof-of-concept research and development for the utilisation of ELTs. The objectives of the fund are to:

- » Advance innovative technologies by supporting collaborative research in priority technologies;
- » Retain Australian expertise and attract further expertise in technologies related to ELTs;
- » Support the growth of skills and capacity in Australia in technologies related to ELTs for the domestic and international markets; and
- » Share the results of that research with the wider industry as appropriate.



THE TSS GUIDELINES

The TSS Guidelines require that ELTs are put to environmentally sound use as follows:

Environmentally sound uses	Not environmentally sound uses
Recycling into tyre crumb, shred, chips, granules, steel and other tyre components	Disposal through dumping, landfill, direct incineration or burning
Use as a fuel (other than in direct incineration) or other energy generation	Stockpiling as an end point
Production of tyre derived products, including tyre derived fuel	Unsustainable burning for energy recovery
Civil engineering	Export of baled tyres for the above

GENERAL COMMITMENTS FOR ALL PARTICIPANTS

All participants that join the TSS agree to both a series of general commitments shared by all member organisations and specific commitments relevant to their role along the supply chain. All participants in the scheme commit to:

- » Support the objectives of the scheme;
- » Deal transparently and ethically with others in the tyre supply chain, including consumers;
- » Promote the scheme to the community, other businesses and organisations;
- » Use the scheme's branding and logo and adhere to the conditions set out in the TSS Guidelines;

- » Comply with relevant laws and practices; and
- » Co-operate with surveys and audits as instigated by TSA.

All participants in the scheme also commit to contribute to:

- » The environmentally sound use of end of life tyres;
- » The elimination of the inappropriate export of baled tyres from Australia;
- » The elimination of the illegal dumping of end of life tyres; and
- » The elimination of disposal of ELTs tyres to landfill (where practicable).

COMMITMENTS FOR IMPORTERS AND MANUFACTURERS

- » Contribute funding to support the administration and activities of TSA;
- » Provide data to TSA on the types and numbers of tyres sold in each reporting period;
- » Only import tyres that are compliant with the relevant Australian Standards, whether the tyres are imported as loose replacements or fitted to new vehicles; and
- » Promote participation in the scheme to businesses and other organisations to which they supply tyres, including through the development of an action plan.

SPECIFIC COMMITMENTS FOR TYRE RETAILERS

- » Take responsibility for the environmentally sound use of end of life tyres left with retailers when consumers purchase tyres;
- » Deal only with collectors and recyclers accredited by TSA as participants in the scheme when disposing of ELTs; or where dealing with a non-accredited collector, ensure that ELTs are provided to an accredited tyre recycler; and
- » Deal ethically and transparently with consumers, specifically in relation to the fees and charges associated with the environmentally sound use of ELTs; and
- » Undertake regular reviews of arrangements with collectors and recyclers.

SPECIFIC COMMITMENTS FOR FLEET OPERATORS

- » Take responsibility for the environmentally sound use of the ELTs they generate;
- » Deal only with collectors and recyclers accredited by TSA as participants in the scheme when disposing of ELTs. Or, when dealing with a non-accredited collector, ensure that all ELTs are provided to an accredited tyre recycler; and
- » Undertake regular reviews of arrangements with collectors and recyclers.

SPECIFIC COMMITMENTS LOCAL GOVERNMENT

- » Take responsibility for the environmentally sound use of the ELTs they generate through their own operations;
- » Deal only with collectors and recyclers accredited by TSA as participants in the scheme when disposing of ELTs. Or, when dealing with a non-accredited collector, ensure that all ELTs generated are provided to an accredited tyre recycler; and
- » Undertake regular reviews of arrangements with collectors and recyclers.

SPECIFIC COMMITMENTS FOR COLLECTORS

- » Ensure all ELTs collected with a recycling gate fee are passed to domestic tyre recyclers accredited by TSA as participants in the scheme; and
- » Deal ethically and transparently with retailers and other outlets, specifically in relation to the fees and charges associated with disposal of end of life tyres.

SPECIFIC COMMITMENTS FOR RECYCLERS

- » Guarantee that all ELTs received from participants go to an environmentally sound use; and
- » Provide data to TSA on the number and fate of tyre equivalent passenger units (EPUs) processed and sold.

SPECIFIC COMMITMENTS FOR MINERS

- » Contribute funding to support TSA, in particular funding to improve the logistics and technology required to recycle end of life tyres generated by miners;
- » Provide data to TSA on the types and number of tyres imported in each reporting period; and
- » Promote participation in the scheme to businesses and other organisations.

ACTION PLANS

In addition to making the specific commitments listed above, participants are expected to develop and submit annual action plans. These plans outline a timeline to meet their commitments and set out the steps and actions the organisation will take to promote the scheme.

Participants must report on their action plan progress, keep specific records regarding tyre movements, and be prepared to be audited by TSA or its representative.

THE CHALLENGE FOR TYRE STEWARDSHIP IN AUSTRALIA

Tyre Stewardship Australia (TSA) has been progressing, with most major tyre brands, retailers and recyclers joining the Commonwealth Government backed stewardship scheme. This is significant, and Boomerang Alliance offers its congratulations.

Yet the success of stewardship is not judged by participation alone. Delivering real advances in waste tyre recycling and establishing processes to ensure participant integrity, like the stewardship principles described on page 15 of this publication, will be the real test of the Tyre Stewardship Scheme's (TSS) success. The TSA strategy, of first recruiting key stakeholders and after a cursory due diligence process beginning to develop audit and reporting regimes, is becoming a major challenge.

The TSS guidelines require participants to exclusively use the services of other members where possible. In authorising the TSS, the Australian Competition and Consumer Commission (ACCC) granted the TSA protection from legal action for conduct that might otherwise breach the Competition and Consumer Act 2010, as the public benefit

derived from the scheme would outweigh any public detriment.¹ Yet the ACCC also "considers the delivery of this public benefit is dependent upon the Scheme operating in the way ATIC describes and ultimately, the effective and transparent administration of the Scheme, including the adoption of robust monitoring and reporting procedures."

How then, does TSA welcome new participants before it has ensured their operations reflect the TSS objectives, performance and subsequent public benefit? The ACCC also effectively placed the TSS in a trial phase stating, "there is still insufficient certainty about the implementation of the independent review and annual reporting obligations by TSA. In these circumstances, the ACCC considers it appropriate to impose conditions of authorisation in order to ensure that a robust and independent review of the Scheme will be conducted in the future."

TSA's first step – a cursory due diligence to ensure participants are 'legal' – is a good initial one, but it needs to be understood that 'legal' is more than a licence. For example, in Queensland tyre storage regulations have been shifted to the fire authority. While there are five operators who have a Department of Environment and Heritage Protection Permit, in the last six months, four sites occupied by authorised operators have been subject to notices by the Fire Commissioner to reduce a fire risk and two face substantial local government prosecution.

Similarly, allowing the TSS logo and its slogan 'we say no to waste tyres' to be published by members, without appropriate audits and investigations regarding their actual performance and tyre disposal arrangements, has the potential to mislead tyre buyers. Again, the ACCC has issued very clear advice that "businesses must not mislead or deceive consumers, or make false or misleading representations specifically around claims of waste and recycling." Premature use of TSA logos by retailers, without evidence to support its authorisation, represents a risk to the scheme's future and the integrity of all participants.

The solution isn't simple, but perhaps the best way forward is to allow a wide church to join the TSS while withholding actual participant status or benefit from commercial activities within the TSS membership until such time that they are able to face an audit. The audit would serve to prove their bona fides and capacity for ongoing high levels of environmental responsibility.

Boomerang Alliance welcomes TSA's progress but urges all parties to ensure independent verification, transparency of decision-making and an equitable governance process before undertaking or directing changes in the tyre market.

¹ ACCC Authorisation A91336 & A91337; Australian Tyre Industry Council

DISPOSAL OF WASTE TYRES



WASTE HIERARCHY FOR TYRES

01 REUSE

Unacceptable for road safety reasons.
1.5 million EPU reused tyres are sold by tyre retailers per annum.

02 RETREADING

Only acceptable when complying with Australian Standards.
Retailers and collectors provide 5.5 million EPU tyres for retreading per annum.

03 RECYCLING

The best fate for a waste tyre.
7 million EPU tyres are recycled to produce new rubber products per annum.

04 FUELS

Excludes incineration of whole tyres.
10 million EPU tyres are processed into fuels for energy production per annum.

05 LICENSED LANDFILLING

Only acceptable in remote locations.
2 million EPU tyres are landfilled per annum.

06 EXPORT OF WHOLE TYRES

Creates biosecurity and dumping risks.
4 million EPU tyres continue to be exported to developing countries per annum.

07 INCINERATION

Unacceptable. Toxicity is a major issue.

08 STOCKPILING AND DUMPING

Unacceptable. Creates major safety and environmental hazards.
Nearly 26 million EPU tyres are stockpiled or dumped per annum.

This waste hierarchy, modified for ELTs in Australia, should be a key guide used to develop government policy and regulation for waste and resource recovery. A number of processes that are normally environmentally favourable can be inappropriate for waste tyres as they can cause other hazards – for example, second-hand tyres have been known to cause serious motor accidents.

01 REUSE

Potentially, partly worn tyres can and are reused without further treatment. A second fitting of a used tyre has environmental benefits associated with maximising the life of the tyre. In fact, it is often argued that used tyres do not fit within the definition of waste since they will continue to be used for their original purpose even though they are no longer on the original vehicle. This is an important distinction – environmental regulators define used tyres as waste until they are fitted back onto a vehicle because they present the same fire, vector-borne disease and contamination risks when stored. Further, defining a second-hand tyre as 'waste' also extinguishes regulatory loopholes exploited by unscrupulous operators who designate all waste tyres as 'casings' or seconds in an attempt to avoid compliance and safety costs.

While the reuse of tyres is obviously beneficial, the risks associated with fitting a potentially defective tyre to a vehicle, and in turn reducing

driver safety, outweighs any natural resource savings. Equally, the practice of importing used or surplus tyres creates safety concerns about whether the tyre is suitable for Australian road conditions. For this reason, pursuing a second life for waste tyres is not a preferred action within the tyre industry.

In Australia, used car yards and waste tyre collectors are the major generators of second-hand tyres. While data is weak regarding this sector, an analysis of our audit reviews across 14 recyclers indicates approximately 3-5% of recovered tyres are resold as seconds. Additionally, Hyder Consulting estimated in 2010 that some 500,000 used tyres are imported into Australia per year, based on ABS figures. No clear breakdown of these used tyre imports is available.

The implication is that tyres with little or no residual useful life are entering the country and adding to the waste tyre management problem – and there is no robust estimate of the consequent impacts.

02 RETREADING

Of rather more importance than the direct reuse of partly worn tyres is retreading. Retreading is a general term that includes a range of technologies to replace the wearing surface of the tyre. The types of retreads are described below.

Of all beneficial uses of waste tyres, retreading has the potential to extract the greatest value.

The process of retreading involves the removal of the residual tread (which has no further value in relation to the tyre function) while retaining the full value of the casing. Casings do not wear out due to friction, as with the tread, but they are subject to fatigue which can ultimately render the casing unserviceable. They also suffer from traumatic damage due to impacts. It is important to note that due to the smaller diameter of a passenger tyre, its casing is likely to suffer fatigue failure/damage at a greater rate than a truck or bus casing. This is one of the reasons that truck tyres tend to be able to be retreaded more often than passenger tyres and are the best focus area for increases in Australian resource recovery.

The Australian Government estimates that about 900,000 truck tyres (4.5 million EPU) and about one million passenger tyres (of which the taxi industry are the major users) are retreaded each year. Some 50-70% of all new truck tyres are suitable for retreading when their tread is worn to below legal limits. Prices for retreaded tyres are about 20% less than those for the cheapest new tyres, though the price differential varies considerably. Many truck operators utilise a lower cost option by retreading their own casings, and this saves about 30% of the retreading cost. It is noteworthy that an increasing number of low-cost truck tyres are not suitable for safe retreading and government policy and procurement should consider ways to create incentives for the use of more robust truck tyres.

METHODS USED IN RETREADING

- » Cold capping – a pre-cured new ‘tread’ is bonded to a prepared casing. The tread can be either a strip, which is joined to the tyre, or a ring, which is stretched over the casing.
- » Hot capping – a new ‘tread’ is moulded by placing a prepared casing in a mould with new rubber compound. This is then heated under pressure causing the new tread to vulcanise and bond to the casing.
- » Remoulding – similar to hot capping but involves resurfacing the tyre from ‘bead to bead’, including a veneer on the sidewalls.

All retreads fitted to vehicles are required to comply with the provisions in the Australian Standard AS 1973-1993 “Pneumatic tyres – Passenger car, light truck, and truck/bus – Retreading and repair processes.” However, anecdotal evidence suggests that the quality of retreads varies significantly – ranging from retreads which are equal to a new tyre in relation to safety and life performance, through to inferior retreads on poorer quality casings which do not meet the Australian Standard.

Of particular concern is the noticeable trend for small scale passenger retreading operations to be operating in partnership with waste collection operations that are illegally dumping and/or smuggling baled tyres into China via Vietnam.

While market acceptance is a major barrier to an enhanced rate of retreading (at least

in the case of passenger tyres), industry representatives suggest that the greatest constraint is the availability of suitable casings. Currently approximately 70% of truck tyres are suitable for retreading while only 15-20% of passenger tyres are suitable for retreading. The significant difference in the rates of retreading is due to differences in design and maintenance – truck tyres constitute a substantial proportion of the costs of operating a truck fleet and tend to be maintained to a much higher level than passenger tyres.

There seems to be a marked difference between the acceptance of truck retreads and passenger retreads by both customers and the tyre and transport industries. It has been remarked that the truck industry would find it difficult to survive without the availability of retreads, with truck tyre casings being imported to meet the demand. Some new tyre dealers actually offer a guaranteed buy back price for the casing at the end of a tyre's tread life.

On the other hand, passenger tyre retreads have limited acceptance. The uncertainty associated with retread quality suggests that the buyer would need to be 'knowledgeable', and this is a major reason why fleet owners have a high representation in the retread market. Tyre manufacturers have expressed concerns about their brand remaining on retreaded tyres in view of the association of their name with a possibly inferior product over which they have no control and the possibility of product liability implications.

TRUST YOUR RETREADS - BANDAG



Financially and environmentally, retread tyres can be an excellent decision.

It takes around 83 litres of crude oil to produce one new truck tyre – it only takes 26 to make a retread. Given Australia's trucking industry uses about one million retreaded tyres annually, that's a saving of around 60 million litres of oil every year.

Retreading also uses 70% less energy than making a new one, reuses approximately 75% of the original tyre material and obviously reduces the number of tyres in the disposal chain.

It also significantly cuts operating costs. High quality truck or bus tyres can now be efficiently and safely retreaded as many as

three or more times and each retread costs significantly less than a new tyre.

However, retreads come with a number of potential pitfalls, which is why many individuals and organisations use a trusted specialist such as Bandag Australia, which has 50 year's experience in delivering cost effective, safe and reliable retread tyres.

A crucial issue is the quality of the tyre itself. Some tyres, particularly low cost tyres, are not built with a strong enough casing to allow retreading.

Then there's the quality of the retreader. Low cost and/or 'backyard' operators don't have the expertise or equipment to ensure the tyre they are retreading is strong and free from damage. High quality operators, like Bandag, do – and they work to a strict procedure.

Used tyres are first thoroughly inspected to make sure there are no issues or weaknesses. The remaining tread is then precision lathed off, leaving only the casing which is then scanned ultrasonically. Bandag's ultrasonic casing analyser provides a non-destructive inspection of the tyre for damage that is hidden from normal visual examination.

Approximately 10% of tyres are rejected due to specific damage or general weakness.

Once the casing is approved, a new tread is applied using the cold process retreading technique which ensures the new bond between the tread and the casing is stronger than any other bond within the tyre.

With rubber, high temperature is the enemy as anything above 118°C can negatively affect the adhesion of the tyre casing rubber to the casing material. This becomes an issue when some retread processes involve bonding temperatures of up to 156°C.

By contrast, Bandag's cold process retreading technique operates at just 99°C which produces a superior bond between the new tread to the tyre case while using less energy.

Every tyre is then thoroughly inspected before it leaves the factory.

IDENTIFYING SAFE RETREADS

When considering the purchase of a retread, consumers need to be aware that there are significant differences in the quality and reliability of retreads on the market. Do you know whether the original casing was appropriate to retread? How many times it's been retreaded? Or the method by which the tread was applied? These factors make a big difference, both

in the life expectancy of the retread and its performance on the road.

Retreads can be confidently purchased from responsible operators who ensure all tyres comply with Australian Standard AS 1973-1993 "Pneumatic tyres – Passenger car, light truck, and truck/bus – Retreading and repair processes." Ask your retailer if their casings are retreaded in line with these standards and what warranty comes with the purchase. Further, to have confidence in the product, only buy a retread if it is stamped with a recognised retreader's branding.

While there is no industry standard to identify a quality retread, it's worth knowing that a professional reputable operation will typically scrape off one letter from the brand name on the tyre's sidewall. For example, a Bridgestone truck tyre retreaded for the first time would have the B erased from the brand name. When it is retreaded for the second time, the R would be erased.



03 RECYCLING

Recycling is the use of the materials in the waste tyres for different purposes which may be, but are not necessarily, tyres themselves. The very characteristics of rubber that make it so suitable for use in tyres (strength, flexibility, chemical stability and durability) are also the source of many of the difficulties in recycling waste tyres. Rubber is vulcanised during manufacture, making it relatively inert and difficult to bond or combine with other substances.

For convenience, the recycling practices outlined below have been structured along the path of the preliminary process used to break the tyre down into an end or intermediate product.

PRODUCTS MADE FROM ELTS

More than 48 million (EPU) tyres reach their end of life in Australia each year. In the quest to decrease the number of tyres entering the waste stream and landfill, tyre recyclers are continually working to discover new applications for scrap tyres.

Recyclers shred recovered ELTs to extract the steel and nylon (which are sold to reprocessors) and then process the vulcanised rubber to produce a range of raw materials and products. The following are an example of the products made by Tyrecycle shred:



ATHLETIC TRACKS

Recycled rubber granules are mixed with polyurethane and then painted to produce running surfaces that

assist with impact absorption, increased performance and injury reduction.



BRAKE PADS

Rubber crumb is used in asbestos-free brake pads, reducing noise, improving wear and minimising dust output.



BUILDING INSULATION

Mixed with polyurethane, recycled rubber is rolled into noise-reducing insulation and used in floors and walls in apartments and units.



CIVIL ENGINEERING

Whole and chipped tyres are used as underbase and drainage aggregates in the construction of roads, drains and also embankments, reducing weight and outward pressure compared to other traditional products.



MATTING SURFACES

A variety of matting products for commercial and domestic use, both internal and external, are made from recycled rubber including mats for workshops and kitchens. They are hard wearing, don't rot and can be washed easily.



MARINE NON-SLIP SURFACES

Recycled rubber granules are added to paint to provide grip on potentially slippery surfaces such as boat walkways and the edges of stairs.



NEW TYRE MANUFACTURE

Recycled rubber is mixed with uncured rubber to make passenger tyres, solid forklift tyres and even wheelie bin tyres. As a filling compound it reduces the use of new materials in the manufacturing process.



PLAYGROUND SURFACES *

Recycled rubber is used in soft-fall surfaces, such as children's playgrounds, to lower the force of impact and reduce injuries. The surfaces are durable, low-maintenance and porous to perform in harsh weather conditions.



ROAD SURFACES

Used in the construction of road surfaces, recycled rubber enhances performance, reduces noise and increases the effective lifespan of roads.



SPORT SURFACES *

Recycled rubber is used under synthetic grass in sporting grounds for softness.



TILE ADHESIVES

Recycled rubber is used in tile adhesives to obtain the flexible properties of cured rubber, which prevents cracking from building movement and provides water-resistant properties.

* Both these uses are now in the frame for causing significant microplastic pollution and should be avoided.

CRUMBING

Crumbing is the production of fine powder, granules or larger particles of rubber mostly associated with careful separation of the tyre's rubber from the steel and fabric components. The distinction between shredding and crumbing for larger particles is simply a different step in the process.

Several means of producing crumb have been developed including wet and dry grinding, high-pressure water sprays and freezing followed by crushing. A review of the literature and discussions with industry representatives suggest that several other new crumbing processes are being developed and it appears that this is quite an active area of research as part of continual attempts to improve the economics.

In addition to dedicated crumbing processes, a significant source of crumb is from retread 'buffings' – rubber removed from the tyre cases to prepare them for retreading or during finishing of the tyres after the retreads are applied. There are significant variations in the properties of rubber crumb sourced from each of these processes and, within limits, the properties can be tailored for specific end uses.

The process of making rubber crumb is quite capital intensive. Indicative up-front costs are up to \$8 per tyre of annual capacity and the economies of scale demand an operation processing a substantial number of tyres – no less than 50,000 to 100,000 per year. The

process is also energy and labour intensive and generates noise and dust. Viable market opportunities are limited by a number of factors, including:

- » Separation of the tyre components into rubber, fibre and steel, if required for certain applications;
- » Production of components in a form that is suited to a specified market, has a significant market value and can be varied in accordance with market demand; and
- » Handling, transport and processing costs.

Nevertheless, there are substantial quantities of rubber crumb produced in Australia and recent investments have resulted in significant increases in capacity. This trend is projected to continue, with further investments in NSW and Queensland. In addition, a Chinese delegation has shown interest in establishing a plant in Australia to make ultra-fine rubber crumb for which there is reported to be considerable demand worldwide, with a projected capacity of 1.5 million tyres per year.

Rubber crumb is traded internationally and Australia both imports and exports crumb.

The market value of crumb is determined by its size and purity. As a general rule, the production costs of rubber crumb increase with decreasing particle size and increasing purity (removal of metal and fabric).

Within each of the markets for rubber crumb products there is competition. Market



Above: Fine rubber crumb from ELTs has a range of valuable uses in manufacturing and roadworks.

penetration is limited due to factors such as price and market acceptance of reprocessed products. The ability of the Australian market to recycle the number of waste tyres generated annually is also considered to be limited. However ATRA claims that, combined with tyre derived fuels, there is both sufficient processing capacity and markets to service existing demand.

In no country, with the exception of the special case of India, has the number of tyres used for rubber crumb exceeded 20% of the total waste tyre volume – though this should not be considered an inherent limitation. Licensed Australian recyclers currently produce around 30,000 tonnes of

crumb each year, the overwhelming majority is processed domestically and used in asphalt and adhesives. Based on international trends and current developments there is significant scope for expansion.

A loose material rubber granule has a number of applications and it is here that the distinction between crumb and shred becomes blurred. Applications include:

- » 'Soft fall' in children's playgrounds;
- » Garden mulch;
- » Soil and aggregate augmentation (resists compaction);
- » Composting media;
- » Leachate drainage channels;
- » Oil and organic capture material; and
- » Explosives and explosive stemming.

As the requirements for particle size and purity of loose granule are generally lower than is the case for other applications, this represents a lower cost application for waste rubber. Total use of loose rubber granule in Australia is unknown, though proposals have been put forward in all of the areas listed above.

One recent application in Australia is explosive stemming on mine sites and in quarries. Trials of rubber crumb have been described as very promising, both technically and economically. The potential for rubber crumb consumption is considerable. As an example, one mine quoted that it consumes in the order of

6,500 tonnes of stemming material per year. Savings could be achieved if the rubber is sourced from waste tyres generated on the mine site, though the processing equipment would then need to be brought to the mine. On the financial side, it is understood that this application would require a 'gate fee' of the order of \$2.50 per tyre to make it competitive with the use of aggregate as a stemming agent. The downside is that the rubber crumb cannot be reused and essentially ends up being landfill in the mine, albeit in a widely dispersed manner and at very low overall concentrations.

The potential applications of rubber crumb in road construction include:

- » As fill material;
- » In asphalt (wet or dry);
- » As a crack sealant; and
- » In repair membranes.

As a fill material, rubber has the advantage of being lightweight, which can reduce the costs of some civil structures, particularly on slopes. The occurrence of fires in a number of such applications in the US has prompted some concern over this application, but investigation of the fires suggests that, while the tyres provided the fuel, they were unlikely to be the source of ignition.

The use of rubber asphalt has been shown in tests to increase its economic life by a factor

of two or more for a number of reasons, including reduction in the occurrence of cracking, bleeding and ageing. The surface is also more skid resistant and less noisy. Crumb can be used in asphalt in, so called, wet or dry methods. It should be noted that these general terms cover a range of similar and proprietary processes, and different authors use various terminologies.

In the wet method, fine crumb is mixed with the asphalt prior to mixing with the aggregate. Here the crumb acts as a binder with the asphalt.

In the dry method, crumb of large and small size is blended with the hot aggregate just before it is blended with the asphalt. Here the crumb acts both as a binder (small particles) and as a flexible aggregate (large particles).

Crack seals and repair membranes utilise the flexibility of rubber to provide improved road maintenance performance.

In the US some states have mandated minimum levels of waste tyre use in road works, though there have been delays in implementing this due to legal challenges from the road construction industry. Despite this, considerable quantities of rubber crumb are used in US roads.

04 FUELS

Tyres have a relatively high specific energy content, making them a popular fuel source.

Globally, ELTs are used in a variety of waste to energy applications, namely:

- » Dirty waste incinerators which burn a variety of wastes for a marginal energy gain while producing significant pollution;
- » In pyrolysis plants to convert rubber and polymers into bunker fuels, carbon black and recycled steel; and
- » Use of the first stage ELT recyclate, rubber chip, as a fuel known as tyre derived fuel (TDF) as a lower emission solid fuel replacement to thermal coal.

So far, the global market for rubber recyclate is limited to around 50% of the amount of ELTs generated, meaning energy recovery options are inevitably in the mix of any scheme to manage the entire ELT waste stream without considerable stockpiling.

It is also important to recognise that waste to energy approaches remain a significant point of public debate with Boomerang Alliance member groups, including Greenpeace Australia Pacific, Friends of the Earth and the National Toxics Networks, concerned about both the potential for waste managers to pursue lower orders of energy recovery over the best practice approach of recycling ELTs into new products, and possible release of toxic pollution from any hot or 'thermal' waste to energy process.

To this end, when considering the best pathway for ELT disposal, recycling should always be the preferred option over waste to energy. When forced to consider energy recovery approaches there are a number of critical policy responses to ensure ELTs are robustly managed:

- » Whole tyres should never be used in incinerators, furnaces or boilers.
- » ELTs are only suitable as a coal replacement in energy plants specifically designed for the use of chipped recycled rubber.
- » TDF and the first stage of reprocessed ELTs, rubber crumb, are effectively the same thing and consequently cannot be identified as a different application until the material is sold. Consequently, recyclers should demonstrate their pursuit of recycle markets such as rubber crumb and granule markets with chip and TDF being targeted for the surplus and residual output.
- » There is no universal standard for tyre pyrolysis. Some are sophisticated operations representing as much as AU\$50 million in capital investment, while others are little more than a backyard operation akin to cooking rubber on an open fire with little to no pollution control. To date the only safe and sustainable pyrolysis operations have been focussed on producing high grade recycled carbon black and steel. Those operations seeking to produce fuel only should be viewed with some suspicion.

At the time of publication there are 12 tyre 'chipping' plants in Australia with three operating crumbing lines (though it should be noted that one of these plants also services five chipping operations) and only one pyrolysis 'test' plant in operation.

TYRE DERIVED FUEL

Tyres have a relatively high specific energy content, making them a valuable fuel source. Tyre derived fuel (TDF) is mainly used in cement kilns, thermal power stations, steel mills and industrial boilers. Tests suggest that the use of fuel derived from waste tyres in the place of coal can result in lower greenhouse gas, nitrogen and sulphur oxide emissions. The main difference between TDF and incineration fuels is that the furnace design and operation of TDF plants allows for materials to be sorted and toxic compounds removed or better dealt with. As a result, any ash created generally contains fewer heavy metals than ash from incineration.

PYROLYSIS

Pyrolysis involves heating the tyre (usually shredded) in the absence of oxygen. The thermal decomposition of tyres produces a range of products, such as oil, carbon black gas, steel and inorganic ash. The gas from the process is generated in sufficient quantities to meet the heating requirements for pyrolysis, requiring little or no external energy. The resulting pyrolytic oil is similar to diesel and can

therefore be used as a fuel. Carbon black is another main product of pyrolysis. Carbon black comprises approximately 20% of tyres and can also be used in a wide range of applications.

Markets exist for all of the products of pyrolysis but the quality of the end product limits its potential. There are many pyrolysis plants operating around the world. However, the economic gain appears to be marginal due to considerable costs from competing with coal, oil and gas. Further development is occurring which may reduce costs and improve quality to increase market competitiveness.

05 LICENSED LANDFILLING

Legal landfilling (which in most states requires the cutting and/or shredding of an ELT) is generally the least desirable fate for any resource. In the case of tyres, legal landfilling is a preferred outcome to exporting whole tyres, incineration, illegal dumping, stockpiling or the sale of seconds. It is, at least, a relatively safe form of disposal.

06 EXPORT OF WHOLE TYRES

The export of whole tyres presents significant dangers both in Australia and overseas. The operators must stockpile in order to export, which creates fire risks. They are also creating environments where mosquitoes can breed, as the stockpiled tyres are generally held outdoors and exposed to weather. The mosquitoes can then hatch and spread at their import destinations.

Furthermore, tyre collectors can barely guarantee that the tyres will be sent to their proposed destination, let alone what will happen to the tyres once they reach their destination. Many ATRA members have baled and exported in the past and freely admit their consignments were re-directed by freight forwarders and agents.

It is not reasonable for Australian businesses (both tyre retailers and collectors) to choose a waste disposal service that will end up in a developing nation, without the necessary regulatory standards and safety infrastructure to manage them. In Vietnam there are reports that literally hundreds of abandoned containers full of tyres now proliferate along the banks of the Song Gam, Song Lo and other rivers used to smuggle ELTs across the border.

Customs records show that whether ELTs are consigned for reuse as casings or baled – the reality is they are most likely dumped or smuggled into nations that do not accept waste tyres, like China.

Obviously in limited and special circumstances, the export of whole tyres may be the only viable way to manage their disposal responsibly and reduce a fire risk. For example, when a tyre ends its life in the north-west corner of Australia or when it's necessary to manage back logs caused by clean ups of large dump sites. In those instances ELT collectors should respect the guidance on waste tyres – that is to only export to nations where the receiver can show

a written notice from the local government authority authorising the activity. **The Australian Government has now banned the export of whole tyres from December 2021, unless licensed.**

07 INCINERATION

Incinerators burning tyres produce a variety of toxic discharges to the air, water and land, including dioxins and chlorinated organic compounds. Many of these toxins have the potential to enter the food chain and bioaccumulate, resulting in impacts on human health and the environment. In addition to the toxic discharges, incinerators create ash or slag that is incredibly toxic as it contains heavy metals and other pollutants. Due to being too toxic to reuse, the ash must then be landfilled.

Incineration, unlike constructed fuels (TDF, pyrolysis), does not control the mix of materials burnt. This increases the toxicity risks and often does not achieve the highest order of resource conservation.

08 STOCKPILING AND ILLEGAL DUMPING

It is common for tyres to be illegally dumped in Australia and, unfortunately, they are often disguised by unscrupulous collectors as being a stockpile waiting to be processed. Any large stockpile of tyres presents a risk, whether of fire or the spread of disease. The longer the pile is left undealt with, the greater the risk.

Boomerang Alliance estimates that there are more than 50 million ELTs dumped or

stockpiled across Australia – in fact we have found over 15 million ELTs in sites. Stockpiles can be huge. Australia currently has the single largest known illegal dump of tyres in the world (nine million EPUs in Stawell, Victoria), but piles of just a few hundred tyres can also have a huge impact tying up firefighting resources when they are needed to combat bush fires. As an example, one small stockpile (around 50 square metres) caught fire in Numurkah, Victoria in May, 2013. The blaze required 23 firefighting vehicles and more than 100 firefighters to contain it.



Above: One of the many illegal dumps around Australia.

UNDERSTANDING TYRE DERIVED FUELS - THE TYRECYCLE PERSPECTIVE

With increasing international pressure on reducing greenhouse gas emissions, many of the biggest energy consumers are exploiting the utilisation of alternative waste-derived fuels to achieve improved environmental performance. Recent drops in the Australian dollar and commodity prices for oil and coal are proving to be cost prohibitive on the use of tyre derived fuel (TDF) as an alternative fuel, resulting in pressures on recyclers processing ELTs in Australia.

The negative stigma of burning waste, rightfully drawn from the extensive health and environmental hazards caused by unregulated and uncontrolled tyre fires, often taints the concept of utilising waste tyres as an energy source. It is important to differentiate between the construction of a fuel from waste – and incineration, where unprocessed waste is simply burnt without screening to ensure it is free of contaminants or ensuring a consistent level of energy per tonne (a fuel's calorific value).

The facts are that TDF, when produced to specification and utilised by industry equipped with a dedicated plant for processing this fuel type is a cleaner and more efficient fuel than brown coal. The very high temperatures and long fuel residence

time in industrial kilns allow complete combustion of the TDF.

Best practice companies such as cement producers LaFarge and Holcim and paper producers Oji Paper and Nippon Paper have harnessed the benefits of tyre derived fuel for many years. Domestically, both Adelaide Brighton Cement (using a waste derived fuel produced by SITA-ResourceCo) and Visy have been using waste derived fuels to reduce their emissions for a number of years.

These users of TDF importantly, demand strict product specifications and quality control procedures from their suppliers including testing for sizing distribution, wire protrusion, total steel content, calorific value and ash.

As part of its Sustainability Ambitions, LaFarge has targeted a 33% reduction in CO₂ emissions per tonne by 2020, which will involve replacement of 50% of conventional fuels with fuels sourced from industrial and household waste (Sustainability Report, LaFarge, 2013).

In its Sustainability Report for 2013, Holcim also reinforced that use of alternative fuels "improves the environmental footprint of our operations by limiting the use of fossil fuels and lowering emissions" and "with the full recovery of waste in the combustion process, Holcim mitigates the risk of rising

energy costs, improves energy security and reduces the consumption of natural resources".

COMPARATIVE EMISSIONS TDF VS COAL		REDUCTION
CO ₂	↓	10-25%
DUST	↔	0%
NO _x	↓	5-0%
SO ₂	↓	0-50%
DIOXIN & FURAN	↓	0-30%
TOC	↓	0-17%



Above: Waste to fuel processing plant – Ipoh, Malaysia.

RECYCLING BEST PRACTICE

While it is important to establish minimum standards for the collection, recycling and disposal of tyres, Boomerang Alliance believes it is critical to also establish the best practice standard. For this reason, Boomerang Alliance has asked Tyrecycle to outline what is required. Tyrecycle's operations, along with a handful of others, are the best practice standard.

COLLECTION SAFETY

Collection of tyres within Australia is a labour intensive process. Collection can occur in high traffic areas with tight access. Therefore the occupational health and safety of personnel is vital. Tyrecycle complies with the Australian Standard AS/NZ 4801, which establishes a benchmark to assess Occupational Health and Safety management systems.

Vehicles collecting tyres should be fitted with tail gate lifters to reduce the occurrence of lifting injuries, which are the most common accidents around tyre fitters, automotive workshops and for transport workers. Vehicles should also have front and rear cameras to ensure safety during collection.

Tyrecycle provides all collection vehicles with the Tyrecycle 'Safe Work Collection Pack', which consists of the following:

- » Collections Safe Work Method ready to present to customer on request and to refresh as a guide to driver/jockey regarding the process;
- » Material Safety Data Sheets for generic waste oil and battery acid;
- » Various customer induction records;
- » Incident reporting and emergency response procedures;
- » Hazard ID forms and process;
- » Contacts list;
- » Fatigue management information;
- » Log books; and
- » Pre-operational checks for truck and trailer.

Jockeys are used to provide additional labour support. They assist vehicle collections in tight areas where they guide the vehicle into the collection position, or if the vehicle cannot park directly next to the collection. Tyrecycle ensures all personnel are trained to the Tyrecycle Collections Safe Work Method Statement and Standard Operating Procedures for the collections process. Tyrecycle is also a certified member of the Victorian Transport Association (VTA) and conducts monthly truck and trailer audits.



Above: Safe Work Collection Pack.

TRACKING AND RECONCILIATION

In most jurisdictions, tyre retailers have legal responsibilities to ensure their waste is taken to a lawful premises for storage, reprocessing and/or disposal.

GPS devices for tracking are fitted to all Tyrecycle vehicles with their movements tracked to ensure ELTs cannot be diverted. The introduction of a capability to deliver mobile invoicing systems allows for easy reconciliation, and comprehensive reporting assists customers to more efficiently manage their operations.

MANUFACTURING PROCESS

The stockpiling or delay in processing tyres leads to tyres holding dirt and water, which



Above: Adherence to a Safety, Quality and Environmental Management System ensures quality products are produced.

affects stock quality and leads to mosquitoes, vermin and vector-borne diseases, in addition to environmental damage. Tyrecycle commits to immediately process tyres received at any of its five chipping plants and within a minimum five day period when collected from remote locations. All materials are reduced to 32 pieces no matter the original dimensions to ensure product destruction and to alleviate health, environmental and safety issues.

Whole ELTs also create fire risks as the hollow doughnut shape of a whole tyre traps oxygen and shields the fire from extinguishing agents. Consequently, both the risk and management of fire is greatly reduced when tyres are chipped.

The environmental damage caused by the export of whole or poorly shredded tyres is well documented and is a major cause of Dengue Fever and other vector-borne diseases. While the export of whole tyres is banned in most developing nations, chipped tyres are a product/commodity that can be imported into countries with the strictest bio security regulations.

Tyrecycle ensures a clear chain of custody for all materials received, reporting on process controls to ensure product destruction, end destinations and the output from each plant to specific end-users. This reporting can include detailed stack emissions, demonstrating the environmental benefits achieved at the kiln with and without the use of TDF.

QUALITY STANDARDS

In addition to the safety standard AS/NZ4801, Tyrecycle adopts quality control standards that are accredited by local governments, ATRA and the various state environmental protection agencies (EPA). These standards extend to product testing with documented standards to ensure process variables are controlled and a premium grade product is produced.

Tyrecycle maintains engineering staff and workshops at each of its facilities to support the manufacturing processes with all plants secured by CCTV monitoring, sensor alarms and site patrols.

Tyrecycle is committed to global industry best practice and corporate social responsibility and they are currently undertaking national certification of 'ISO 14001 Environmental Management Systems' and 'ISO 9001 Quality Management System' to utilise a fully integrated Safety, Quality and Environmental Management System.



SAFE TYRE STORAGE

While each state and territory has slightly different guidelines for the safe storage and handling of tyres, the NSW standards are generally the highest. These storage guidelines are based on the Fire and Rescue NSW, Fire Safety Guideline, Guideline for bulk storage of rubber tyres, Version 3, 2014, and have been adjusted to set a consistent national standard (i.e. where another jurisdiction requires greater separations or smaller stacks they have been adjusted accordingly). However, please note that all stakeholders should check with their relevant fire authority to ensure they comply.

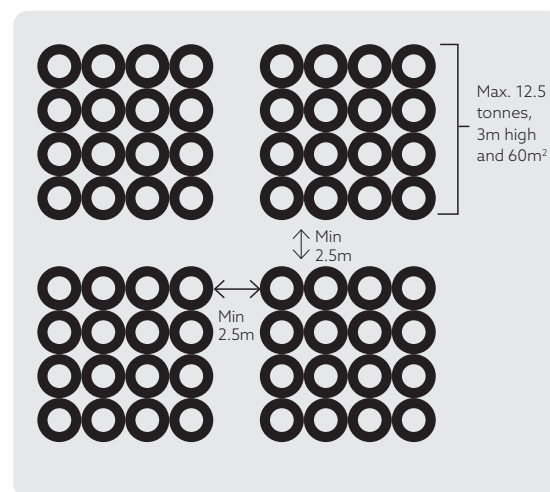
The guidelines for tyre storage in each Australian state and territory (where they exist) can be found at www.tyrelife.org.au

OUTDOOR (OPEN AIR) STORAGE

- » The storage area should be level and clear of all rubbish and combustible materials.
- » Tyre storage areas should not be used to store other combustible or flammable materials.
- » Tyre piles should be located at least 30 metres from any other combustible ignition source.
- » External storage areas must be enclosed by fences or walls at least two metres high and

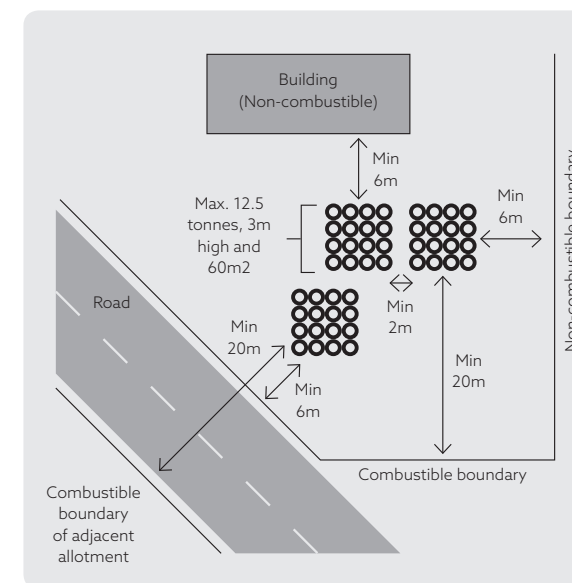
be constructed of non-combustible materials.

- » Facilities should provide at least two separate and opposing site access points for fire trucks and equipment, each being not less than four metres wide.
- » Individual tyre stacks should not exceed three metres in height, be no more than five metres in width and a total of 60m² in area and 12.5 tonnes in weight. A maximum of four small individual tyre stacks can be grouped into a stack pile (see illustration below). Where this approach is used, a minimum clear separation of 2.5 metres must be maintained between the base of each stack and the combined length of the stacks pile should be no more than 20 metres.



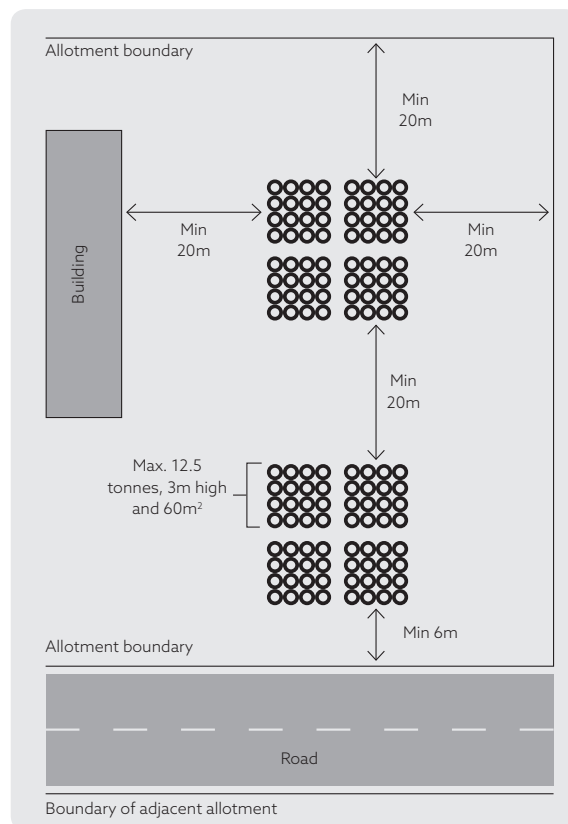
Minimum separation distances between stacks in pile (stack of four).

- » A minimum clear separation of 20 metres must be maintained between each stack pile of four small stacks.
- » At small tyre facilities (less than 50 tonnes or 5,000 EPU) – tyre stacks should be at least six metres from all non-combustible boundaries and buildings, and 20 metres from combustible boundaries or buildings. There is no provision for small tyre facilities in South Australian guidelines and licensing conditions commence for any facility storing in quantities exceeding five tonnes per year (approximately 500 passenger vehicle tyres). Please use the large facility guidelines detailed in this section or contact the relevant local fire authority.



Minimum boundary clearances for small tyre facilities.

- » At large tyre facilities (50 tonnes or more than 5,000 EPU) – tyre stacks should be at least 20 metres from any boundary or any building.



Minimum boundary clearances for large facilities.

INDOOR TYRE STORAGE

- » Buildings with a floor area of 2,000m² or more and containing more than 20 tonnes of tyres should have a sprinkler system complying with AS 2118.1.

- » Buildings with a floor area of 2000m² or more and containing more than 10 tonnes of tyres should have smoke and heat vents complying with specification E2.2c of the Building Code of Australia (BCA) – Volume One.

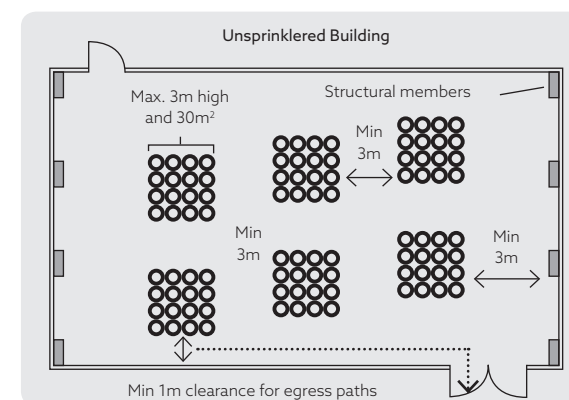
- » Individual tyre stacks within buildings should not exceed three metres in height and 30m² in area.

- » Stored tyres must remain at least one metre clear in all directions from the underside of the building's roof or ceiling, roof structural members, lights/light fixtures, and sprinkler heads.

- » A minimum clearance of one metre must be maintained along paths to required exits and firefighting equipment (e.g. hose reels, extinguishers, hydrants) and these paths must be kept clear and unobstructed at all times.

UNSPRINKLERED BUILDINGS

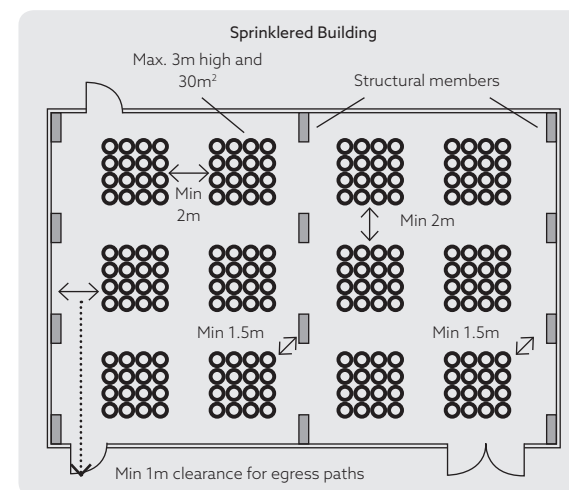
- » A minimum clearance of three metres should be provided between stacks.
- » A minimum clearance of three metres should be provided between tyre stacks and any building structural member.



Minimum clearance distances in an unsprinklered building.

SPRINKLERED BUILDINGS

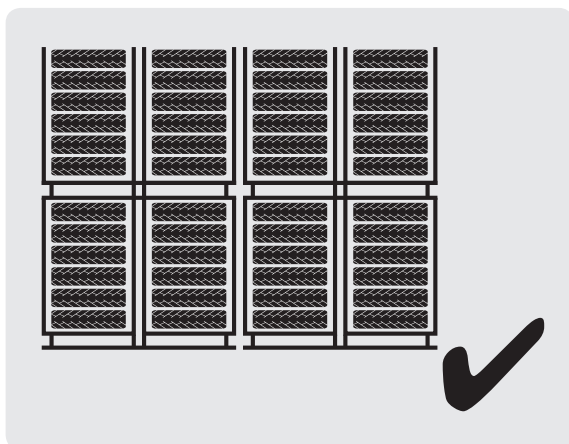
- » A minimum clearance of two metres should be provided between tyre stacks.
- » A minimum clearance of 1.5 metres should be provided between tyre stacks and any building structural member.



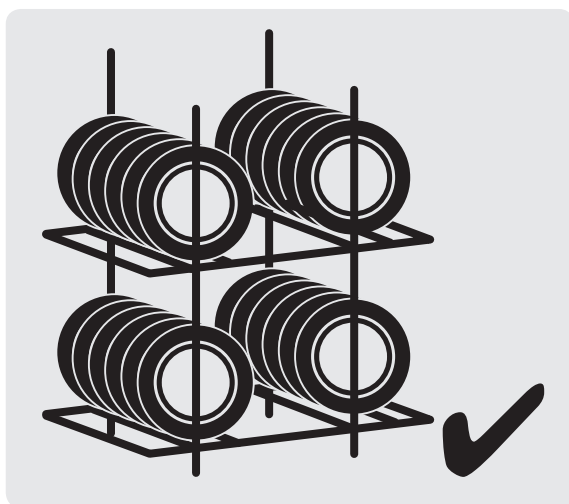
Minimum clearance distances in a sprinklered building.

SAFE STORAGE AND HANDLING

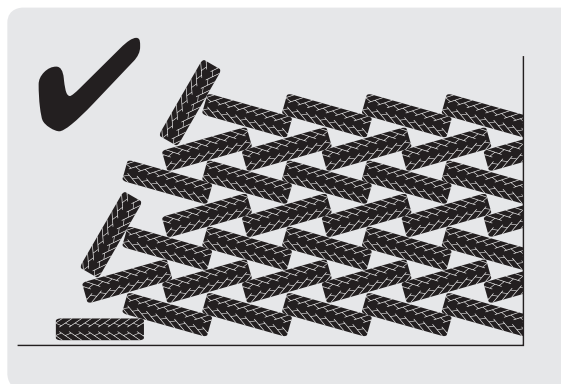
The following stacking methods and devices are acceptable:



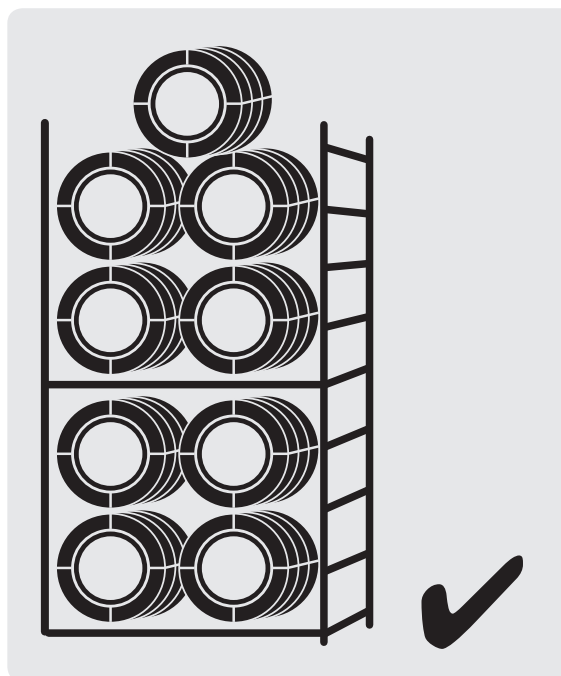
Tyres stacked by pallet system.



Horizontally stacked tyres.

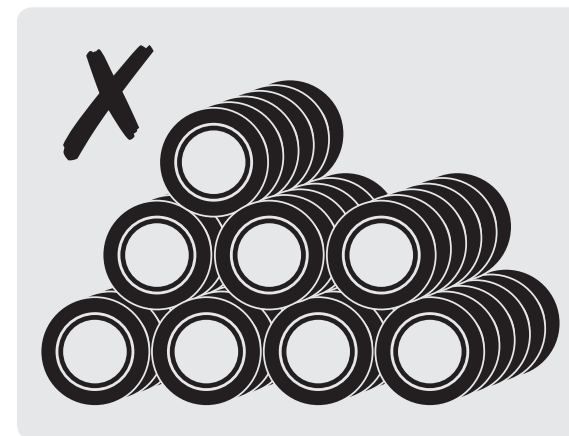


Tyres stacked in a lace arrangement (outdoors only).



Tyres bundled and stacked.

UNACCEPTABLE



Tread up storage.

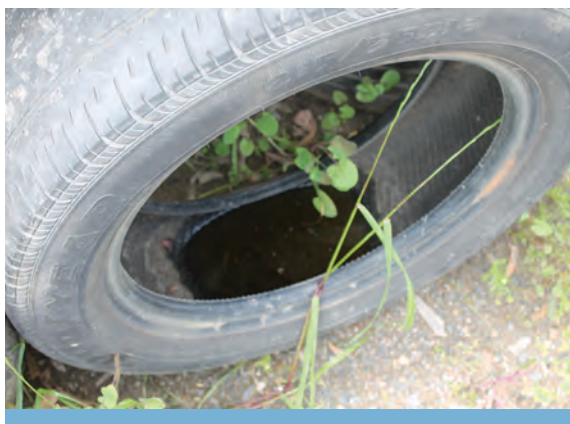
CONTAINMENT OF CONTAMINATED WATER RUN OFF

Provisions should be made for the retention of contaminated water runoff.

- » In unsprinklered facilities the minimum containment capacity should be calculated at three hydrants operating simultaneously at 10 litres/sec each, for a period of 90 minutes.
- » In sprinklered facilities the minimum containment capacity should be calculated on the basis of two hydrants operating simultaneously at 10 litres/sec each, plus the calculated maximum sprinkler design output, operating for a period of 90 minutes.

SPECIFIC CONSIDERATIONS

Risks associated with waste tyres, depending on both the location and the application for which the tyres are being used, require specific management regimes. One obvious example is the risk associated with the spread of vector-borne disease influencing the storage and disposal regimes of tyres collected in North Queensland. The summary to the right highlights escalated risks and suggests management regimes that waste generators and collectors should consider.



Above: Water captured by tyres increases the risk of vector-borne disease.

Area and issue	Risk activities	Possible hazard reduction strategies
Northern Australia Biosecurity (Dengue Fever)	Retailers displaying tyres outside	Eliminate potential for mosquito breeding by inspecting tyres whenever they are brought back into the store. Dry any wet tyres.
	Retailers / collectors storing ELTs outside	ELTs should be collected and shredded within seven days of collection. Any ELTs held for more than seven days must be inspected for water capture, stored under cover and, where held for longer terms, periodically fumigated.
Northern Territory, Tasmania There are no shredding plants in these jurisdictions. Consequently, ELTs are stockpiled for longer periods.	Lengthy storage of ELTs by collectors	While Dengue Fever is a focal issue regarding vector-borne disease, other mosquito-borne diseases like Ross River Fever and Barmah Forest Virus are prevalent across Australia. In jurisdictions where tyres cannot be shredded before transport, ELTs should be: - Shipped to a shredding facility within seven days of collection; and - Stored under cover to keep the tyre dry. Ensure stockpiles are stored in accordance with the best practice guide found in Tyre Life.
Rural and remote retailers Collection regimes are less regular and ELTs are stockpiled for longer periods	Lengthy storage of ELTs by collectors	Ensure ELTs are kept dry and stored undercover.
Proximity to wetlands Biosecurity risks Contaminated water capture	Retailers	Land reclamation and urban sprawl has resulted in many commercial and industrial precincts being located close to wetland areas where mosquitoes breed. Retailers should be aware of their proximity to a wetland and request more regular collections of ELTs to reduce biosecurity risks.
	Collectors	Ensure ELTs are processed within 48 hours of receipt to mitigate biosecurity risks. Ensure contaminated water storage is adequate so runoff will not contaminate nearby wetlands.

SECTORAL ISSUES

As the location of tyre stockpiles affects the management regime necessary to ensure safety, the activities where the tyres are used also create specific considerations, and relevant management responses need to be developed. Some specific sectoral considerations are:

MINING

Government studies indicate there were 82 mining accidents caused by tyre issues between 1978 and 2008. Incidents cover a range of areas including exploding tyres, compressed air issues, noise and manual handling issues. However, attention should also be given to fire and disease risks. There are a number of guides available describing approaches to the range of risks, a selection of which can be found in the online companion to this book at www.tyrelife.org.au

Specific considerations include:

1. Stockpiles of ELTs. Miners should consider the possible consequences of an outbreak of Dengue Fever or other vector-borne disease. The fly-in fly-out operation of many mines increases the likelihood of a returning worker carrying one of these diseases. Mosquito breeding grounds in ELTs stored on mine sites could devastate a mining workforce in just a few short weeks.
2. Flammable liquids. There are a number of flammable liquids used in mine sites that can be absorbed into tyre rubber and can

increase the potential for a mine truck tyre to ignite while in operation.

3. Toxic materials. Mines use a number of toxic and poisonous materials in the extraction and refining process. These materials can coat and/or be absorbed into tyre rubber when machinery is used around tailings dams, leaching operations and washing areas. These contaminants can cause toxic spikes if contaminated ELTs and/or their derivatives are later incinerated. Miners should identify tyres that may be contaminated and ensure they are identified when collected for recycling.
4. Fire. The recent Hazelwood coal mine fire inquiry highlights the dangers of large quantities of recycled rubber (conveyor belts and mining ELTs) located in or around coal and gas operations. The fire inquiry identified that five of the eight fire incidents at the mine involved the rubber conveyor systems. The low flash point of coal and gas, added to the difficulties presented by rubber in fires, is a dangerous combination. Extractive industries should ensure rubber is stored well away from any ignition source and that there is adequate extinguishing equipment located in the immediate vicinity of any rubber.

AGRICULTURISTS AND PASTORALISTS

Farmers often keep their ELTs to use on the property, e.g. in silage stacks and as tree guards. However, it should be noted that these approaches can increase fire risk, have the

potential to create mosquito breeding grounds when the ELT becomes wet, and increase the likelihood of vermin and snakes living and breeding on the property. Boomerang Alliance recommends that farmers properly dispose of their ELTs and use safer alternative materials.

MAJOR CIVIL ENGINEERING AND CONSTRUCTION PROJECTS

It is common to see quantities of ELTs littering major construction and civil engineering sites. Often these tyres sit on the edge of a site's waste area and are not dealt with for months. This creates significant fire and vector-borne disease risks. Major infrastructure projects should ensure any ELTs are collected weekly.

MOTORSPORT AND EQUESTRIAN FACILITIES

ELTs used as safety barriers and route markers are a common sight at almost any motorsport, motocross or equestrian event. This activity is high risk – increasing the likelihood of mosquito bites and possibly raising fire risks. For example, visits to the Phillip Island Grand Prix circuit and reviews of aerial photography indicate that thousands of ELTs proliferate around the track's edge. The site is in a wetland and is a known breeding ground for mosquitoes carrying Ross River Fever – creating a significant risk of transmitting serious disease to the hundreds of thousands of people who attend motorsport events at this site. Boomerang Alliance recommends that ELTs be removed from these sites or suitably sealed to ensure mosquitoes cannot breed.



THE UNDERGROUND TYRE INDUSTRY

INDUSTRY ROGUES



Above: Illegally dumped by rogue tyre collector. Pinkenba, Queensland.

Few industries are as badly affected by improper and illegitimate operators undermining sustainable business as the tyre industry. As a large industry, with many similarities to a fast moving consumer goods business, government approaches have had a strong focus on free-trade and de-regulation, perhaps without paying enough consideration to the complexities of a tyre or the importance of ensuring driver safety, environmental health and fire protection – which can only be managed with government standards and regulations.

As a result, a rogue or underground industry has flourished which mirrors each stage of the legitimate industry. Parallel importers and large retail/wholesale operations have become importers in their own right – but they often bring in tyres not rated for Australian conditions and flaunt fire safety guidelines for tyre storage.

Similarly, many independent retailers sell second-hand tyres not understanding the importance of inspection and testing regimes necessary to ensure each tyre is safe for reuse.

While a vital and professional retreading industry services the large Australian fleet market with great success, a backyard retreading industry enjoys substantial financial advantage by not capturing particulate pollution, ignoring fire safety standards and not having the necessary equipment to inspect casings properly.

On the waste front, in 2012 as many as three out of every four tyres in Australia were being collected and disposed of by unlicensed and non-complaint collectors who dumped, burnt or smuggled their waste.

This rogue industry has caused horrendous consequences with the incidence of fires involving tyres skyrocketing since 2008, and the incidence of vector-borne disease doubling over the same time period.

While there is little hard data on how many vehicles are driving on tyres that are seconds,

unrated, or poorly retreaded tyres, anecdotal evidence suggests they number in the millions and represent an unacceptable risk.

Government action is overdue. Regulations need to be developed that will support industry efforts like the Tyre Stewardship Scheme and eliminate opportunities for unethical operators to undercut legitimate pricing by lowering safety standards. At the same time, the industry needs to develop integrity standards that differentiate it from the rogue operators and build consumer confidence. Our standards are being undermined in numerous ways.

PARALLEL IMPORTERS

In general terms, parallel importing is the importation of genuine products into a country, without the permission of the incumbent authorised distributor. In other words, parallel importing is when an importer finds a cheaper price for a genuine product on the world market and imports that product to sell at a price that undercuts the existing local prices set by the owner and local distributor.

Within the tyre industry, this also sees the importation of genuine branded tyres which are not rated for Australian conditions and tyres imported without any manufacturer's warranty.

Parallel importing is sometimes undertaken by larger retail chains, which may have negotiated arrangements with manufacturers

to ensure compliance and warranty issues are managed, or by independent and rogue operations which often provide no consumer protection and fail to disclose the tyres do not carry the manufacturer's warranty.

Then there is the problem of identifying if a parallel import tyre actually meets the manufacturer's standards or is a 'blem'. Blem is the industry term for a 'blemished tyre' i.e. a tyre that does not meet the manufacturer's standards. Parallel importers often fail to disclose that a tyre is a blem and argue that the defect may only be cosmetic, for example the logo is tarnished or the tyre has some discolouration. This may be true, but it may also be the case that the tyre does not meet Australian Standards.

Another problem with parallel importation is the management of the tyre itself. Boomerang Alliance has inspected the distribution centres of a number of parallel importers and was deeply concerned to see:

- » No sign the premises had the infrastructure to deal with a fire;
- » Tyres left lying outside for weeks – many were full of water and showed signs of mosquitoes breeding;
- » Tyres strewn across the storage yard making a fire almost impossible to control;
- » Rubbish and other ignition sources mixed amongst the tyres – dramatically increasing the risk of a fire.

There is no question parallel importation can provide healthy competition for the large licensed importers, but it is equally important the importers of these tyres only make savings through proper business methods, not by undermining the legitimate safety standards relating to importation, storage, distribution and on-road performance.

In the simplest terms parallel import tyres must be viewed as potentially dangerous products until such time as they are sold with the manufacturer's warranty and a system of controls to ensure the tyre is responsibly managed across its entire life. We are yet to find a parallel importer that meets this standard.



Above: Cheap parallel imports undercut local prices and may not be suitable for Australian conditions.

CHEAP IMPORTS

In recent years, the Australian tyre market has seen the introduction of many new brands which are deliberately positioned as 'cheaper' alternatives. This has been cause for considerable concern because these brands also tend to be of significantly lower quality.

The Chief Executive of the Federal Chamber of Automotive Industries, Andrew McKellar, has raised issues surrounding the safety of cheap tyres on a number of occasions. In 2010 he said, "We don't want Australia to become a dumping ground for sub-standard tyres. Tyres are fundamental to vehicle safety and unfortunately in Australia the majority of the motoring public perhaps aren't aware of just how crucial that is. Having a good set of tyres can save your life."

A study undertaken by UK Car Magazine "What Car?" in 2010 compared the safety performance of three leading brands with three discount brands. All were fitted to the same vehicle and the results couldn't be clearer:

	Average: 3 leading brands	Average: 3 budget brands
Test 1 – stopping distances in dry conditions travelling at 70mph:	51 metres	53.2 metres
Test 2 – stopping distances in wet conditions travelling at 70mph:	62 metres	75.5 metres

Most alarming, the average budget tyre travelling at moderate speed in wet conditions took some 13.5 metres longer to stop.

Not only do lower quality tyres raise serious safety issues, they have to be replaced more often which drives up costs for the user and adds to Australia's tyre disposal burden.

The difference between high and low quality tyres is starkly obvious when they are closely inspected – for example, when examined ahead of possible retreading.

Cheaper imports fail this inspection at nearly three times the rate of high quality tyres such as Bridgestone tyres.

Over an eight month period in 2014, leading tyre retreader Bandag tracked failure rates by brand and cause. The study involved more than 43,000 tyres.

It found tyres from most of the established brands, including Bridgestone, were deemed Not Worth Repairing (NWR) at a rate of 4-7%.

Low quality imports failed at an average rate of 16% with some specific brands recording NWR rates of more than 20% or one-in-five.

By far the biggest fault found in low quality imports was belt edge separation, when the edge of the tyre's steel belt separates from the tyre casing. This happened some six times more often with low quality imports than with more established brands.

Worryingly, this belt edge separation was often not visible to the naked eye and was only detected by the shearography technology used by Bandag.

Inner liner issues, sidewall separation and simple casing fatigue were also found to be disproportionately common among the low quality imports. While this high failure rate has obvious financial implications, the more worrying aspect is the impact on safety.

Amid all the marketing, we should never forget that tyres play a fundamental role in keeping cars, trucks and buses on the road.

Cost should never be the sole determining factor when it comes to buying tyres because with tyres, quality and safety costs a little extra.

SECOND-HAND TYRES

Second-hand tyres should not be confused with retreads. A second-hand tyre is a tyre removed from a vehicle and sold again without any treatment. A retread is a second-hand tyre casing that has been inspected, repaired and had a new tread fitted.

Second-hand tyres – sourced from here and overseas – are actively sold across Australia. Based on a series of inspections and reviews, Boomerang Alliance estimates that as much as 5% of all passenger and truck ELTs that pass through recyclers' hands are then diverted for sale as seconds – either here or overseas.

The use of aged tyres and the subsequent risks associated with older tyres have been in the spotlight in the UK over recent years, with a high profile campaign and litigation surrounding the death of three people in a September 2012 accident in Surrey, England¹. The subsequent inquest found that the cause of the accident was a blown tyre fitted to a bus. The tyre in question was found to be a second-hand tyre that was still 'legal' in terms of tread depth etc., but was actually 20 years old.

There are a number of major problems with purchasing and using second-hand tyres:

- » There is no process which allows purchasers to verify where the tyres have come from. Buyers have to take the seller at their word and the sellers themselves often have little idea where the tyre originated. This means it is usually impossible for buyer to find out critical information such as: Are the tyres rated for Australian roads? What happened to the vehicle they were on? Has it been in an accident? How have the tyres been used? How many times has the tyre been fitted? Have the tyres been stored properly between uses?
- » To ensure a secondhand tyre is safe it should be physically inspected. This process should include a visual inspection, the use of x-ray and ultrasound devices to check for splits, cracks and blisters within the tyre, and the measurement of tread depth and even wear. Without this sort of detailed inspection and

certification, a tyre purchaser cannot have confidence the tyre will perform safely.

- » The use of a second-hand tyre also creates significant issues regarding warranty, insurance claims and liability if something does go wrong. Fleet owners and individual drivers have a responsibility to ensure they have fitted an appropriate tyre consistent with motor vehicles standards and Australian design rules. Fitting tyres to a vehicle that do not comply with the relevant standard can lead to an insurance claim being rejected or a driver/owner being found negligent.

The vast majority of people who buy second-hand tyres do so simply to save money, but they are ignoring the very serious safety risks which come with such a purchase. Tyres perform an absolutely vital role in keeping vehicles on the road and bringing them to a stop. Second-hand tyres put that performance at risk which is why most major tyre manufacturers recommend they are never used.

Second-hand tyres might save money up-front, but they aren't worth the risk.

¹ <http://www.mirror.co.uk/news/uk-news/bestival-coach-crash-families-demand-2057780>



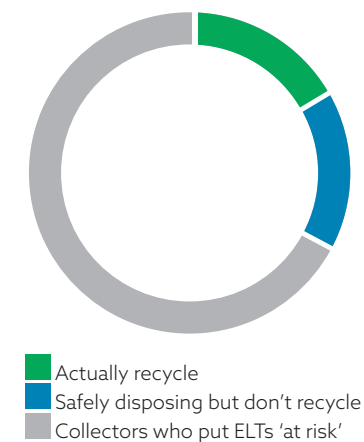
Above: Second-hand tyres pose serious safety risks.
Credit: © Alptraum | Dreamstime.com

ROGUE COLLECTORS AND RECYCLERS

Over the past five years the collection and recycling of Australian ELTs has become a major problem. At the time of publication, Boomerang Alliance had identified and reviewed the operation of some 88 tyre collection facilities around Australia.

Just 29 of these facilities collected and disposed of tyres in a manner that is safe and complies with relevant regulations and guidelines. Of these 29, only 15 actually reprocess the tyre (or deliver it to a recycler) for recycling in Australia.

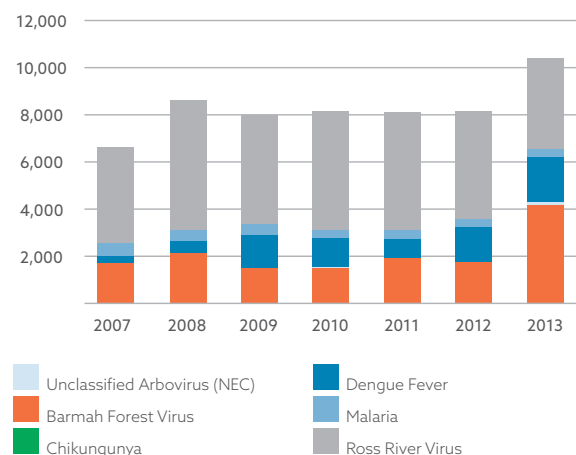
Australia's ELT collection facilities



Many of the 59 businesses which neither recycle ELTs in Australia nor safely dispose of them (e.g. to landfill) are simply 'balers'. They do little more than collect the tyres and then fill containers for export – creating substantial problems for our Asian neighbours and creating extreme risks here in Australia.

Both the rate and significance of tyre fires are on the rise. From 2008-2013 Fire Service NSW recorded some 322 incidents of fires involving tyres across the state. In a recent regulatory impact statement the Victorian Government noted that the cost to deal with a fire in the largest stockpiles of ELTs in Victoria (the nine million EPU in Stawell) could be some \$30 million. It estimated that smaller stockpiles could cost an average of \$320,000 each to combat and clean up.

Growth in incidence of vector-borne disease in Australia



ELTs left in stockpiles or dumped are also a primary cause of the spread and increased incidence of vector-borne diseases like Dengue Fever, Ross River Virus, Japanese Encephalitis, Chikungunya, and Barmah Forest Virus. Tyres are an ideal breeding ground for mosquitoes, and urban stockpiles have the effect of both increasing the number of breeding facilities and bringing the breeding grounds closer to more highly populated areas. US authorities are emphatic in identifying that the Dengue Fever carrying Asian tiger mosquito established itself in North America through the shipment of old tyre casings from South America.

The above chart shows that the incidence of vector-borne diseases in Australia has skyrocketed in recent years – growing from an estimated 3,000 cases in 2002 to nearly

11,000 in 2013. While the stockpiling of waste tyres is not the sole cause of this increase it is without question a factor that should be eradicated.



Above: Boomerang Alliance witnessed these Australian ELTs being smuggled from Vietnam into China.

SMUGGLING ELTs

In 2010, and again in 2013, Boomerang Alliance travelled to both Vietnam and China to witness first-hand how Australia's trade in ELTs was affecting those nations.

Not far from Haiphong (where most of Australia's waste tyres land) we visited a number of craft villages. There are estimated to be some 1,450 craft villages in Vietnam. These are rural villages in which craft and non-farming activities draw the participation of at

least 30% of all households and make up at least 50% of the village's total income.

Conditions were appalling – what they call recycling, we call a rubbish tip – with the villages surrounded by often toxic garbage. We saw children badly scarred by accidents involving the melting of vulcanised rubber and villagers told us of the terrible illnesses that affected their families.

The concentrated nature of the rubbish around these villages has an alarming impact – noise, light, vibration, humidity and temperature are all above standard. Institute of Environmental Science and Technology (INEST) figures show 95% of workers in craft villages are exposed to particles, 85.9% to heat, and 59.6% to chemicals. Health impacts are often more serious for women and include gynaecological diseases and backache. The rate of respiratory inflammation among children is very high at some 80-90% in waste recycling villages.

Nearby we saw container after container of tyres stretched for kilometres along the banks of the river. Many were simply abandoned, others were being madly loaded into dangerously overloaded long boats before departing to illegally cross the Chinese border at a rate of 22,000 ELTs a day. Every container was identified as Australian.

We then rode on one of the long boats. The crew was nervous about possible conflict with

border authorities but talked freely, outlining that their return cargo could be anything from people to drugs to illicit merchandise. The tyres themselves were routinely soaked, the air thick with mosquitoes. Our investigator arrived home with multiple strains of Dengue Fever and subsequently developed Haemorrhagic Fever. He was lucky, with modern medicine and treatment leading to full recovery; but those unfortunate enough to experience such illness in Vietnam are at dire risk, with hospitals reporting that as many as one in 20 die while in care.

With some 40 million Australian ELTs now dumped across Vietnam and China, and as many as 400 million cases of Dengue Fever predicted across the world, surely Australia can at least ensure we stop dumping our waste tyres on our vulnerable neighbours.

RETREADING

Good quality retreads are a good idea. Up to 70% of the original tyre is reused, which significantly reduces demand for raw materials, saves on energy used to make the tyre and decreases ELT waste.

With retreads costing less than a new tyre, they are in constant demand from both individual motorists as well as large fleet operators. The trucking and taxi industries are both major users of retreaded tyres. And where there is demand, there will be unscrupulous operators. Well credentialed

retreaders, like Bandag, abide strictly by the relevant Australian Standard AS 1973-1993 "Pneumatic tyres – Passenger car, light truck, and truck/bus – Retreading and repair processes."

However, there are numerous operators who flout the standard to produce a cheaper retread which is inherently less safe.

The new tread might not be suitable for the vehicle task or be up to Australian conditions. The bond between the new tread and the tyre casing has been known to fail under stress.

Furthermore, so-called "rogue" operators rarely make the necessary investment in high-tech equipment needed to judge if a tyre casing is strong enough to be retreaded. Casings often have hidden flaws, the result of heavy use or damage, which make the retreaded tyre dangerous.

The inherent design of modern tyre casings has led some companies, such as Bridgestone, not to recommend retreads for passenger vehicles.

This is because modern passenger tyres have a light-weight construction to provide better handling and a more comfortable ride. Built for high performance, these casings provide an excellent balance between grip and durability for one life – but not necessarily a second.

This is why some insurance agencies insist no retreads are used.

Quality truck and bus tyres, however, can be safely retreaded three or four times due to their more robust construction. They contain higher strength/more steel belts; their under-tread is deeper which allows a flat, even surface to be milled for the new tread to be applied; the cap and base compound balance protects the casing from heat damage; and a thick inner liner prevents oxidation of the casing's rubber and steel components.



Above: Low quality retreads can be dangerous.

THE MARKET



THE MARKET AND END OF LIFE TYRES

In recent years there has been a strong focus on market development for products and materials made from recycled rubber tyres. While, in general terms, this approach has merit especially given the current cost increases to export TDF it is important to clarify the capacity within the existing market, the extent of opportunities available and the impact improved markets will have on disposal costs faced by tyre retailers and other ELT generators.

One area where market failure is strongly evident is where some importers/retailers have moved away from leading tyre brands to cheap alternatives, particularly in the truck and fleet markets. These tyres may be less expensive to purchase but not only do they reduce performance (particularly in wet weather conditions), they also have a shorter life increasing costs over a vehicle's life, and generating substantially more waste.

Further, while caution needs to be given to the use of retreads in passenger cars, retreading to a standard is a substantial opportunity for Australia with significant employment, economic and environmental benefits.

Many lower cost tyres imported into Australia are sub-standard casings when retreaded.

At Boomerang Alliance's second tyre waste summit in July 2014, Bridgestone Australia Managing Director Andrew Moffatt identified that one of the barriers to increasing output from high quality truck tyre retreaders, like Bandag, was accessing suitable casings.

This market failure represents an 'externality' where the actual cost of goods sold does not reflect the cost to the wider society i.e. the increased waste cost of the cheap import.

Embedding these hidden costs into the supply chain to create a bias towards quality tyres should be a major priority for the tyre industry. Government support is needed to target parallel importers who exploit legislative loopholes and poor regulatory enforcement to undermine the legitimate tyre industry.

Tyre retailers also need to recognise that despite assertions made by some senior executives from leading tyre brands, the actual costs charged by legitimate tyre collectors are low when compared to both the charges for recycling services experienced by other industry sectors and the typical waste costs faced by tyre retailers in Europe and North America. The development of recycled rubber markets will not reduce gate fees to tyre retailers – they will stabilize a volatile market and help protect a vulnerable business sector that cannot readily access capital under current conditions.

However, this does not mean market development and government procurement

issues should not be a priority. Boomerang Alliance has identified a number of areas where simple specification and procurement policies can have an immediate beneficial effect on tyre recycling in Australia:

1. Specification of recycled rubber in asphalt and bitumen and the removal of regulatory barriers currently in place.
2. Specification of ELTs for use in road works and civil engineering and the removal of regulatory hurdles.
3. Regulation to allow the controlled and transparent monitoring of substitution of coal with tyre derived fuels in power generation, to ensure effective and high standard emission controls.

These simple steps should be a high priority for government and industry.



Above: ELTs being shredded to produce rubber crumb and TDF.

TYRE RECYCLERS - READY AND ABLE

A STATEMENT BY AUSTRALIAN TYRE RECYCLERS ASSOCIATION

The year 2014 ended on a difficult note for the ELT recycling sector in Australia. With the drop in value of the Australian dollar, thermal coal prices (with which TDF competes), and finally the closure of pyrolysis operations in Malaysia (resulting in over supply of TDF), the value of Australian tyre shred has plummeted. This is causing major financial pressure on the disposal of Australian ELTs. Nevertheless, 2014 was very much a year of preparation for legitimate tyre recyclers with the strong Boomerang Alliance-led campaign on ELTs creating unprecedented opportunities.

Studies by Hyder Consulting for the Australian Commonwealth showed that in 2009-10 just 34% of ELTs were supposedly recycled; but the truth is that over half of these tyres were actually exported, whole (in baled form), with no local processing, into countries like Vietnam (and subsequently smuggled into China for incineration in sub-standard power plants).

But that's rapidly changing, with early adopters Bridgestone, Bob Jane T-Marts, Beaurepaires, Jax Tyres, Kmart Tyre and Auto, City Discount Tyres and Ian Diffen Tyres taking steps to ensure that 100% of their waste tyres

are collected by bona fide tyre recyclers like ATRA's members.

Where in 2012 there were just five operators processing Australian waste tyres, there are now 10 chipping facilities. This market shift will continue, thanks to the strong prospects for change from the newly formed Tyre Stewardship Australia program and improved regulation in NSW and Victoria.

ATRA estimates the new NSW and drafted Victorian regulations will see the legitimate tyre recycling industry continue its recent rapid growth. Already there are three exciting proposals for expanded tyre reprocessing being advanced in NSW, thanks to a sensible and streamlined waste regulatory package.

Importantly, the legitimate tyre recycling industry is already compliant with new NSW and Victorian regulations and has the production capacity needed for the expected growth. ATRA members now have the capacity to efficiently process some 27.5 million EPU – enough to handle every passenger and truck ELT in Australia. Planned investments and expansions will further boost capacity by another five million EPU p.a.

Processing location	Annual capacity (EPU)
Queensland	6 million
NSW	7 million
Victoria	10 million
South Australia	2.5 million
Western Australia	2 million
Total	27.5 million

With significant opportunities to add value to ELT recycling in key Australian markets like asphalt, civil engineering and use of tyre derived fuels within Australian, ATRA's membership can not only process these volumes – they have also secured markets for their current production capacity.

Tyre recyclers haven't been idly sitting by waiting for action. To give retailers and motorists confidence, ATRA has become the first waste and recycling body to demand it's activities be externally verified and sites monitored monthly.

The audit process – which was initially designed by Boomerang Alliance founder Dave West and is now managed by leading environmental and sustainability consultant Equilibrium – reconciles collection and disposal tonnages, undertakes snap site inspections, and utilises aerial surveillance to ensure the highest standards. It also allows for corrective action when challenges are disclosed but don't represent an immediate or significant threat.

ATRA and Australian tyre recyclers are ready for business – the challenge is now for the remnant retailers to start supporting the legitimate tyre recycling industry in Australia. ATRA also looks forward to working with the TSA to see this change occur in the market place.

ROB KELMAN
CEO, ATRA



THE REAL COST OF RECYCLING

There has been much debate regarding the cost of tyre recycling. This has been fuelled by the ridiculously low prices offered by those operators who enter the market with neither the necessary investment in appropriate safeguards nor any method of disposal other than exporting ELTs to countries when the returns are high.

Australian retailers have also, until recently, benefited from an offshore market that absorbed the vast majority of ELTs – TDF. These products were sold at between \$10-20 a tonne or about 16 cents per EPU. This market has now reversed and recyclers are now paying around \$30 a tonne or 25 cents an EPU to export this material. The Australian ELT recycling industry is now in a difficult financial position.

Most developed nations have banned the export of ELTs and many developing economies prohibit importation. Unfortunately, Australia does not ban the export of ELTs, operating a de facto policy that ignores the Basel Convention, the treaty governing waste exportation.

This approach comes at a high cost. The international market for waste tyres is fragile, with more than 90% of ELT exports bound for Vietnam – a gateway used by smugglers

to enter China. Both nations have requested export to their nations be stopped, a request the European Union acted on some five years ago. These tyres feed a desperate manufacturing sector which incinerates them for off-grid energy production with appallingly low safety standards.

When the Chinese authorities crack down on the border crossing, the tyres rapidly pile up (as happened in June 2014). The tyres are either abandoned along riverbanks outside of Haiphong and Mong Kai or they are dumped in and around the 2,800 local craft villages – creating widespread illness and poisoning.

Without appropriate customs controls in Australia, cheap collection fees have emerged. Retailers turn a blind eye to safety, redirecting some three out of four tyres into dangerous and unlicensed facilities. These unsustainable fees have created a boom or bust industry. When prices collapse in Vietnam (which happens several times every year), collectors can't afford lawful disposal. Consequently, Australian stockpiles rapidly increase, as does the incidence of fires and illegal dumping.

This means that many people in the tyre industry now have a false price expectation, believing that collection charges of around \$200 per tonne for ELTs are exorbitant when, if anything, they are under priced.

Boomerang Alliance has dissected the financial structure of Australian tyre recyclers and the results highlight that the low prices

offered by some can only be achieved by avoiding essential disposal, safety and regulatory compliance costs. The table below reflects typical costs incurred by a compliant Australian tyre recycler operating in Melbourne or Sydney.

Aspect of recovery	Appropriate minimum cost/ passenger tyre	Rogue operator's price behaviour
Collection and transport	\$0.80	- No jockey to driver assist loading (Work Cover standard) - No workers' compensation or superannuation for staff
Facilities	\$0.55	- Overstocking site (fire and disease hazard) - No insurance (insurance for a licensed site is as high as \$5 million p.a.)
Safety and licencing	\$0.15	- No fire, water or waste infrastructure - No government licenses or local government approvals
Initial processing	\$0.35	- Capital cost of shredders are five times that of a baler - Illegal operators dump whole tyres
Sale of product	\$0.26	- Until October 2014 legitimate operators received a financial benefit of 8.5¢ per EPU from the sale of product. Recent international developments have seen the market for TDF crash. As a result it now costs recyclers some 26¢ per EPU to dispose of their products
MINIMUM COST	\$2.11/tyre	- Illegal operators avoid around 85¢/tyre by operating in an unsafe and illegal manner

The \$2.11 appropriate disposal cost per tyre equates to \$247 per tonne – \$94 for collection and a 'gate fee' of \$153 for recycling. By way of comparison, the following table summarises research undertaken by Equilibrium environmental and sustainability consultants to show the typical costs of recycling other common materials in Melbourne.¹

Material	Collect and recycle cost per tonne
Agricultural and veterinary chemical containers	\$630 – \$680
E-waste	\$386 – \$566
Mattresses	\$980 – \$1450
Mixed construction and demolition materials	\$135 – \$155
Mixed commercial and industrial materials	\$250 – \$280
TVs and computers	\$335 – \$600
Timber	\$210 – \$230
Legitimate waste tyre recycling	\$194 – \$217
Range of fees paid to exporters of whole ELTs	\$106 – \$176

Tyres are more expensive to collect because they have a volume greater than their weight and are more complicated to process than other wastes. Yet Equilibrium's research clearly shows for ELTs, even with higher transport impacts, typical charges are much less than other specialised services and compare favourably with some of the lowest cost sectors of the recycling industry.

Equilibrium was also contracted to compare the cost of compliant tyre recycling in Australia with those of international schemes. Again the results showed that Australian costs are very low and suggest that the assertions by some tyre manufacturers – that introduction of producer responsibility schemes and/or development of markets will reduce the cost of tyre collection and recycling – is spurious.

Scheme	Cost per tonne (AUD\$)	Cost per EPU (AUD\$)
Ontario, Canada	\$634.29	\$5.39
British Columbia, Canada	\$568.12	\$4.83
Flanders, Belgium	\$453.59	\$3.86
California, United States of America	\$381.78	\$3.25
France	\$322.96	\$2.75
Spain	\$210.95	\$1.79
Australia (below + TSA levy)	\$276	\$2.36
Australia (metro collection and processing)	\$247	\$2.11

What those promoting the notion of lowered costs for tyre recycling misunderstand is that, while markets can and should be further developed to create a stable and well-resourced industry sector, recycle competes with virgin resources and requires complex industrial processing. For example:

1. Tyre derived fuel competes with coal. While TDF was attracting prices of around \$10-20 a tonne, recyclers are now paying \$30 a tonne to find a market for this material.
2. Similarly, high quality crumb can generate average sales revenue of some \$600 a tonne, which is a significant increase on the average. However this quality product creates residual waste that represents around 35% of the material collected. The costs to dispose of this residual in Sydney would be some 60 cents an EPU, reducing any savings made from increased yields.
3. During 2013 a major international pyrolysis operator sought to make an AU\$40 million investment into Australian tyre recycling, but even producing the highest grade of carbon black, they could only operate viably with better collection fees. In comparison to the US and Europe, Australian gate fees were just too low to make the investment attractive.

While this research is by no way comprehensive it clearly demonstrates that, if anything, the charges imposed to collect waste tyres should be higher – not lower.

¹ Equilibrium's research is based on 2014 prices offered publicly – to view the full report and the methodology used, see www.tyrelife.org.au

ECOFLEX: CIVIL ENGINEERING

The use of ELTs in civil engineering is a major market opportunity. One Australian company, Ecoflex Limited, has developed a world leading approach that can divert millions of ELTs annually by replacing traditional materials in sub-base for road works, retaining walls and the like.



Above: Lane Cove tunnel/John Holland project – Ecoflex E Wall.

A 'tried, tested and proven' approach, Ecoflex is a safe, cost effective method to recycle valuable tyre resources. The technology uses the inherent hoop strength of the tyre to create the Ecoflex containment system, innovative patented technology which incorporates their intellectual property in a revolutionary "Geomatrix Ground Stabilization Technology". This reduces the amount of aggregate needed in the underbase of roads by as much as

75% – substantially reducing the cost and environmental footprint of road works.

Ecoflex technology is an ideal base material for use in road sub-grade stabilization, access roads/pavements, above ground mine and underground mine roads, engineered retaining walls, tailing dams, erosion control, highway embankments, piling platforms, crane platforms, drilling platforms, matrix reinforcement layers, rail, national parks, wetlands, channel protection, storm water erosion, and protection of creek banks – to name just a few.

Ecoflex has an excellent track record, having completed more than 500 projects for some of Australia's leading blue-chip building and construction companies, and several government departments. Recent projects include:

- Sutherland Shire Council, Captain Cook Drive Widening; retaining wall, road stabilisation.
- Thiess, Hunter Expressway Alliance Project; retaining walls for access roads.
- Lend Lease, Kempsey By-Pass Project; crane platforms, access roads.
- Holland Constructions, Hunter 8 Rail Project; retaining walls, piling platforms, bridge abutments.

Ecoflex products have many benefits, including an extremely long life of 150 years. They require minimum maintenance,

have a substantial cost benefit over their competitors and are capable of demonstrating environmental savings of up to 70% CO₂e.

Boomerang Alliance has identified Ecoflex technology as the most viable solution to reduce the estimated 50 million ELTs illegally dumped across Australia and one of the few viable approaches to the recovery of ELTs at hundreds of mining sites across Australia. Ecoflex technology is portable, processing costs are low and can be rapidly deployed. The organisation carrying the liability to clean up a dump site (local councils and road authorities) or stockpile (miners) can offset their costs by reduced cost in road works and civil engineering.

Due to its wide range of applications the Ecoflex technology has the potential to generate many downstream businesses in all capital cities and throughout regional areas of Australia.



Above: Kempsey bypass project – Ecoflex E Pave.

RUBBER MODIFIED ASPHALT

Using recycled tyre rubber in asphalt and bitumen is the most immediate and largest market opportunity for ELTs in Australia. Rubber, derived from the processing of ELTs, has been used in road applications for decades, dating back to rubberised asphalt trials in Arizona during the 1960's.

The two main road surfacing applications for recycled rubber are:

1. Asphalt (hot, warm and cold mix)

Asphalt surfaces are typically smooth and utilised in high traffic areas such as freeways and metropolitan roads. They are formed from a blend of stone, bitumen and other ingredients that have all been mixed together prior to laying on the road surface.

2. Spray seal (or chipseal)

Spray seal is a rougher surface that is formed by spraying a layer of hot liquid bitumen and then covering this with a layer of aggregate of varying size depending on the road application.

The benefits of using rubber in roads include:

The increased temperature stability of rubber-modified asphalts and binders achieve longer lasting roads by reducing cracking

in cold temperatures and softening in high temperatures.

The addition of rubber also resists reflective cracking in asphalt and spray seal overlays, where the existing pavement base is cracked and/or prone to movement due to the local environment.

These two factors increase the time between resurfacing which substantially reduces the whole-of-life cost of roads.

Further, testing of rubber-modified asphalt pavements has demonstrated increased skid resistance over conventional asphalt pavements and been shown to reduce highway road noise by up to five decibels.

Using recycled crumb rubber in roads offers considerable environmental benefits, possessing a carbon footprint which is three to seven times less than the asphalt materials it replaces.

THE OPPORTUNITY

In Australia, 400,000 tonnes of bitumen binders are consumed annually in spray seals. At a typical rubber addition rate of 10%, this represents an opportunity of 40,000 tonnes p.a. Existing supply to the Australian roads market is just 8,000 tonnes p.a.

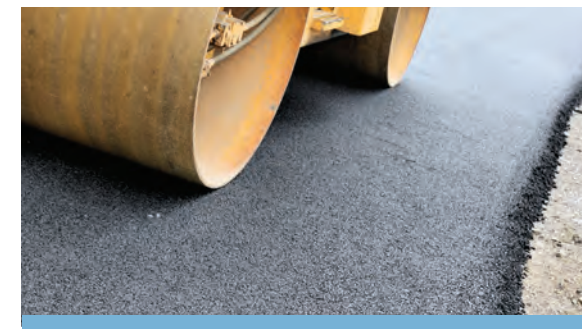
The asphalt market is approximately 6.4 million tonnes p.a. Adding just 2% rubber has considerable benefits. Even at this low add rate, the market represents 128,000 tonnes of crumb rubber – just 31% of the annual volume of ELTs.

THE BARRIERS

The benefit of crumb rubber in pavement design in Australia has seen it adopted successfully in spray seal applications throughout large areas of Victoria and NSW.

Some roads authorities are reluctant to specify crumb rubber, potentially due to short term budget views that prioritise immediate savings over whole-of-life costs. A lack of familiarity with rubber-modified pavement design and performance by some road engineers also restrict its adoption.

The use of crumb rubber is also tarnished by cheap imports and unlicensed local operators who produce contaminated sub-standard products. Unfortunately some users are still drawn to these suppliers by their low price point and then face the difficulties of short supply, downtime and safety concerns. Even SprayLine, a government owned company, has awarded consecutive supply contracts to unlicensed NSW operators.



Above: Using recycled tyre rubber in asphalt
Credit: ©Kesu01 Dreamstime.com – Paving Machine Photo

REMOTE AREA POWER PLANTS

As companies strive for greater protection against fluctuations in energy prices and look for more sustainable energy solutions, one option is self-generated power. This is more important now, as the drop in value of the Australian dollar and coal commodity prices see the increased need for local users of alternative fuels such as TDF.

Today, organisations are also attempting to upgrade their corporate social responsibility (CSR) profiles. One way they can do that is via reduced greenhouse gas emissions using alternate fuel and energy sources.

The energy source for remote area power plants where there is no grid connection available is generally natural gas and liquid fuels (principally diesel) with a small contribution from renewables. The consumers of the resultant electrical energy are mainly oil and gas production facilities, mining and mineral processing operations.

Data collected by the Australian Bureau of Resources and Energy Economics (BREE) shows the breakdown of the remote area power generation by energy source and user type.

BREE data on energy use for remote area power generation

Energy source	% Contribution to power generation
Natural gas	79
Liquid fuels (principally diesel)	19
Renewables	2

BREE data on users of off the grid power

User type	% Share of consumption
Residential, commercial and community	21
Energy and resources industry	77
Other	2

While there is a strong focus on increasing the share of renewables for remote area power generation, an overlooked opportunity is the energy available in the waste streams generated by these industries as a consequence of their operations in remote areas.

The energy-from-waste opportunity lies in reclaiming the calorific value of their used passenger, 4WD and truck/light truck tyres, not to mention off road tyres (OTR) and conveyor belting. These waste streams have a calorific value that is around 75% of natural gas and diesel. If these materials were considered

a resource rather than a waste, an industrial ecology model for supplying power to remote area energy and resources operations could be developed. Industrial ecology sees industry as a man-made ecosystem that operates in a similar way to natural ecosystems, where the waste or by-product of one process is used as an input into another process. The off-road and conveyor belt waste streams represent a significant resource that is currently dumped, posing potential long term environmental risks.

The implementation of a power generation scheme using off-road tyres and conveyor belts (properly prepared and stored) can be implemented using conventional fuel burning and power generation equipment with appropriate gas scrubbing. Fuel preparation would require the size reduction of the OTRs and conveyor belt and can be done within the existing infrastructure in the Australian tyre recycling market.

The economic viability of the opportunity will depend upon a case by case assessment of the available fuel quantity and costs of fuel preparation, the existing fuel cost, the local power demand and the capital cost for the fuel burning and power generation equipment.



