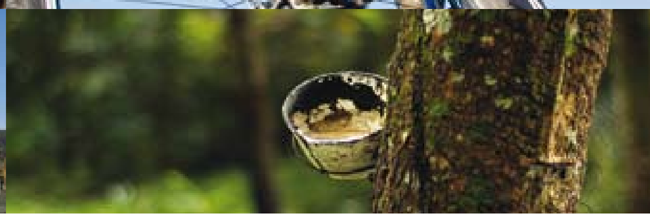
DEDICATED TO MAKING A DIFFERENCE

Managing End-of-Life Tires



Full report

World Business Council for Sustainable Development

Contents

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WBCSD Tire Industry Project: An introduction

Today, when people think of the environmental impacts of tires, they mostly focus on the management of tires at the end of their useful lives (end-of-life tires, or ELTs), as this topic usually draws the most public attention.

Globally, an estimated one billion tires reach the end of their useful lives every year. Disposal of ELTs in environmentally sound and productive ways continues to be a high priority goal of the tire business. Various regional efforts by governmental authorities, the tire industry and individual manufacturers are currently underway to address the issue of ELTs, and good progress is being made.

ELT recovery provides cost-effective and environmentally sound energy for several industries. It also provides innovative materials for civil engineering projects. ELTs can replace other limited natural resources.

The Tire Industry Project (TIP), under the auspices of the World Business Council for Sustainable Development (WBCSD), has put together this overview to explain what ELTs are, what environmental impacts they can have, and what has been and can be done to ensure they are properly managed.

ELTs have a variety of uses and they are increasingly being viewed as a resource instead of a waste. Environmental issues continue to be a driving force behind ELT recycling, and as the recycling industry develops with legislative and infrastructure support, it is becoming clear that there can be significant benefits.

A summary version of this report is available at www.wbcsd.org/web/tires or from tires@wbcsd.org

End-of-life tires: Fast facts

- One passenger tire per person is discarded each year in the developed world
- 1 billion ELTs are generated globally each year
- An estimated 4 billion ELTs are currently in landfills and stockpiles worldwide
- ELTs are a resource that can be used in place of virgin materials, reducing natural resource depletion and lowering environmental costs associated with natural resource exploitation
- ELTs can replace traditional fossil fuels in some applications and may reduce NOx, SOx and CO_2 emissions
- ELTs can also be used in civil construction projects as ground or crumb rubber, and as a substitute for coal in steel plants
- The ELT recovery rate is now more than 84% for Europe, the US and Japan

The life of a tire: Facts and trends

What are tires made of?

A typical passenger tire contains 30 types of synthetic rubber, eight types of natural rubber, eight types of carbon black, 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. Vulcanization (a technique for hardening rubber, making it more durable), the introduction of radial tires in the 1950s and other advances, including compound revisions for greater durability and longer tread life, meant that by 1995 an estimated 2% of recycled material was being used in tires. Today, the use of recycled rubber is gradually decreasing as the properties of recycled rubber have a negative impact on performance (for example on fuel consumption).

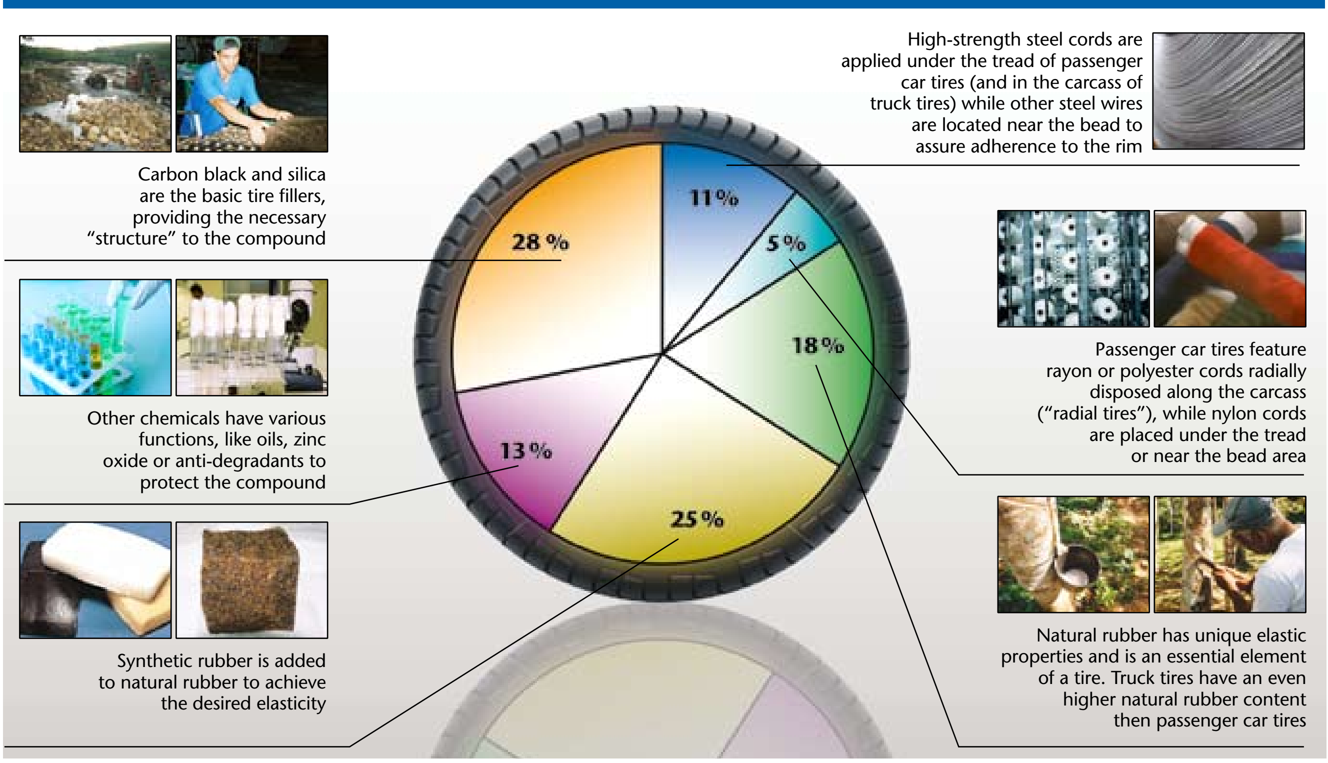
What is the environmental impact of a tire during its life cycle?

Almost all of the environmental impact of a tire occurs during the use phase, primarily as a result of vehicle fuel use and carbon dioxide emissions due to rolling resistance. Tire wear and road wear debris contribute to a lesser degree to the environmental impact of the use phase. Raw materials production and tire manufacturing account for the next greatest impact. While recovering and reprocessing end-of-life tires have a small environmental impact, it is a visible one, and of concern to many stakeholders. Distribution (transportation) has a small impact.

What is an end-of-life tire?

A tire is considered at the end of its life when it can no longer be used on vehicles (after having been retreaded or regrooved). All tires including passenger car, truck, airplane, two-wheel and off-road tires result in ELTs. However, the bulk of ELTs result from car and truck tires.

Figure 1: The composition of an average vehicle tire — Source: ETRMA 2001



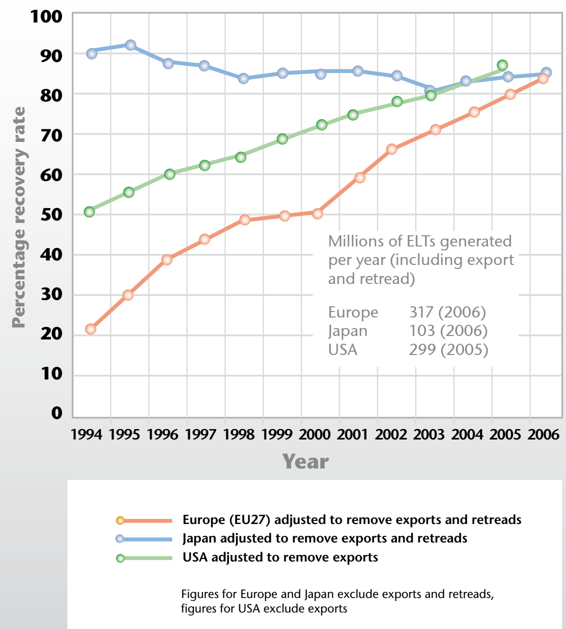
End-of-life tire generation and recovery worldwide

Over the last 15 years recovery rates for ELTs have dramatically increased in Europe, Japan and the US. Japan started recycling programs even earlier. 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 recognized as a valuable secondary raw material or an alternative fuel.

ELT generation and recovery rate estimations are not always available and not always uniform in content. Reuse and retreads are sometimes included in recovery rates. Stockpile abatement programs also affect the recovery rate. Country-to-country comparisons are therefore not always precise. However, for an idea of general trends and estimates, the following information may be useful. The WBCSD welcomes further information from interested parties to update this data.

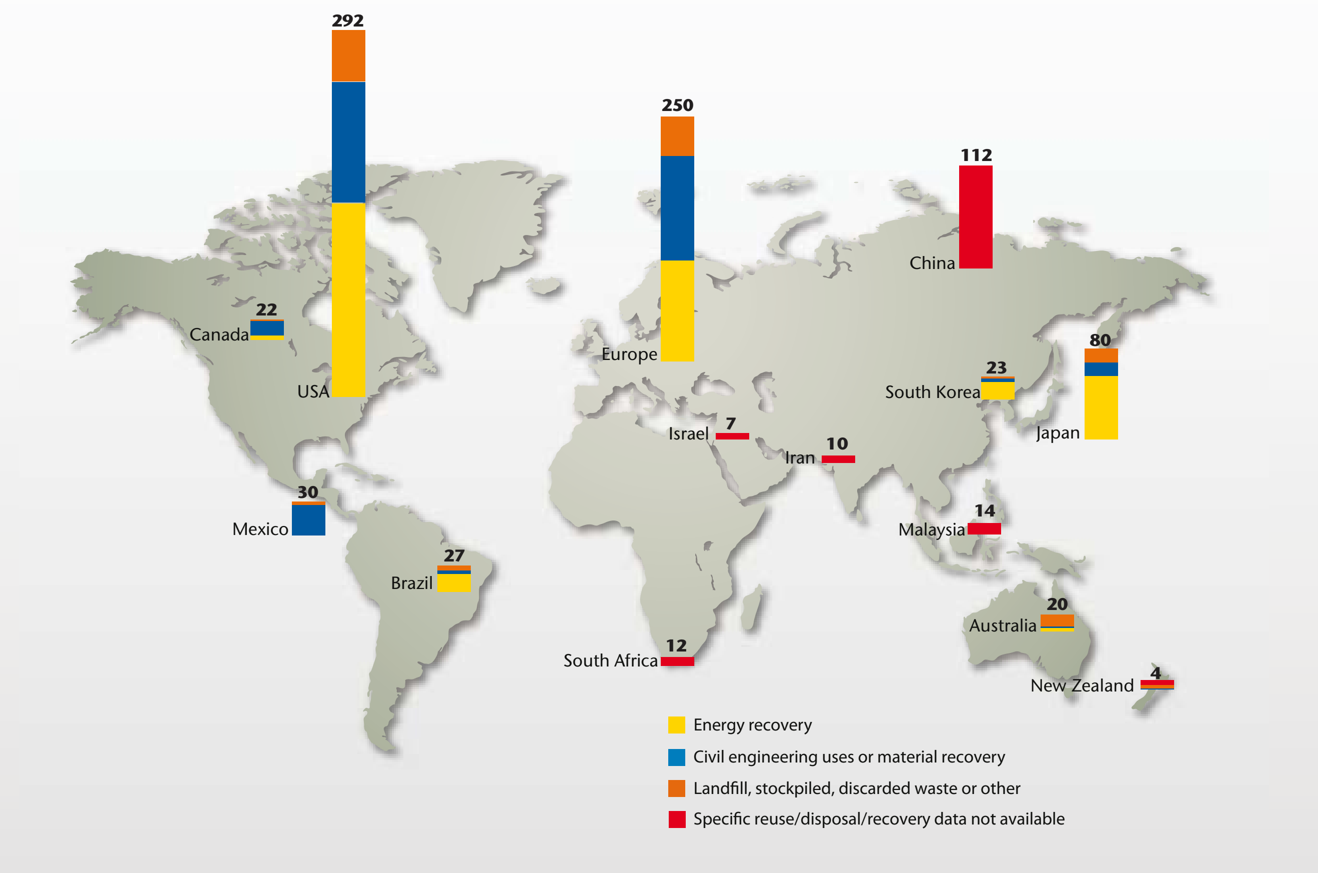
Figure 2: Historical recovery rate estimates for ELTs

Sources: Estimates based on data from European Tyre & Rubber Manufacturers' Association, Rubber Manufacturers Association and Japan Automobile Tyre Manufacturers Association Inc.



Facts and trends

Figure 3: Millions of end-of-life tires generated each year



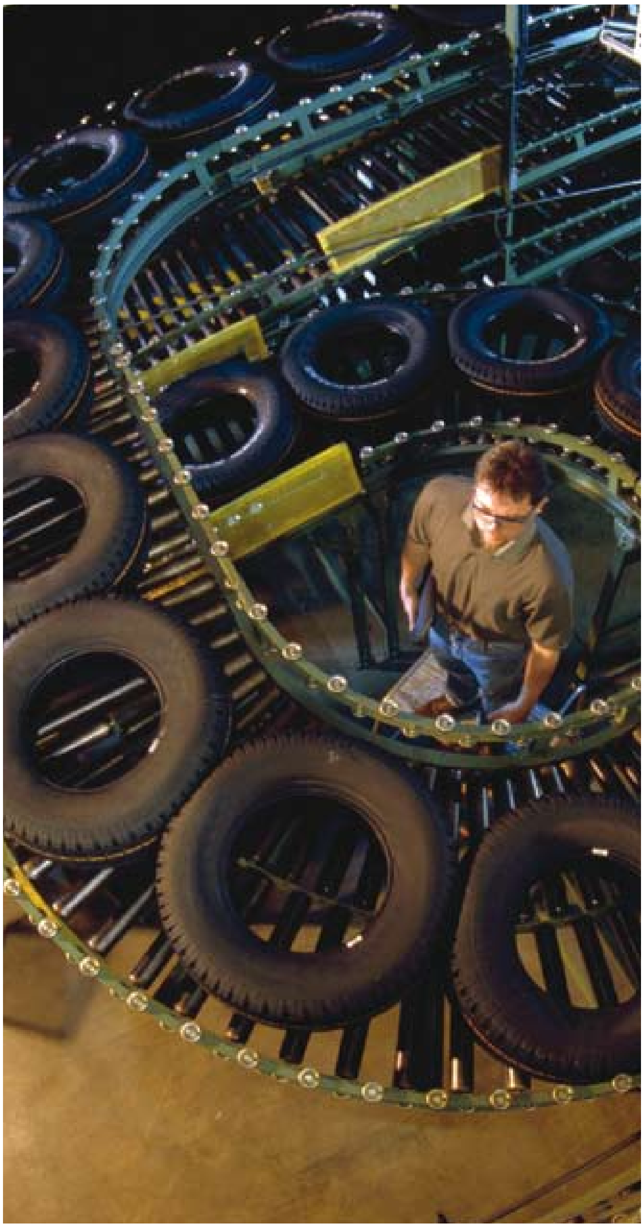
	Millions of ELTs generated per year (excluding export and retread)	Of those tires that do not go to export or retread, they are destined for: Energy recovery (%)	Civil engineering uses or material recovery (%)	Landfill, stockpiled, discarded waste or other (%)	Specific reuse/ disposal/ recovery data not available	Year	Sources
USA	**292**	53	33	14	n/a	2005	Estimates based on data from Rubber Manufacturers Association (RMA)
Europe	**250**	41	43	16	n/a	2006	Estimates based on data from European Tyre & Rubber Manufacturers' Association (ETRMA) Europe (EU 27 plus Norway and Switzerland)
China	**112**	n/a	n/a	n/a	100		Various newspaper articles including Recycling Today and Hong Kong Trade Development Council
Japan	**80**	70	15	15	n/a	2006	Estimates based on data from Japan Automobile Tyre Manufacturers Association Inc. (JATMA)
Mexico	**30**	0	90	10	n/a	2004	"Mexico pays cement industry to burn scrap tires" www.ecoamericas.comm/en/story/.aspx?id=569
Brazil	**27**	69	13	18	n/a		Associação Nacional da Indústria de Pneumáticos (ANIP), Instituto Brasileiro de Geografia e Estatística (IBGE)
South Korea	**23**	77	16	7	n/a	2003	Korea Tire Manufacturers Association (KOTMA)
Canada	**22**	20	75	5	n/a	2003	Pehlken A. and E. Essadiqi, Scrap Tire Recycling in Canada, 2005.
Australia	**20**	22	8	70	n/a	2006	URS, Market Failure in End-of-life Tyre Disposal, report for the Department of Environment and Heritage, September 2006 (see also www.environment.gov.au/settlements/waste/tyres/index.html).
Malaysia	**14**	n/a	n/a	n/a	100		What to do with old tires? Lim J.
South Africa	**12**	n/a	n/a	n/a	100	2003	"Fixing a Tyred Environment", Die Burger, 6 April 2003
Iran	**10**	n/a	n/a	n/a	100	2006	Iran daily newspaper online (/www.iran-daily.com/1385/2586/html/focus.htm)
Israel	**7**	n/a	n/a	n/a	100	2003	Ministry of the Environment, Israel "Waste Tires : A Case Study", Environmental e-bulletin September 2003, Issue 2 (see also www.sviva.gov.il)
New Zealand	**4**	0	15	85	n/a		Estimates taken from "Product Stewardship Case Study for End-of-Life-Tyres" by URS for the Ministry of the Environment (NZ) 2006

For USA, Europe and Japan, ELTs destined for export and/or retread are excluded from the volume of ELTs generated per year.



Facts and trends

In Europe, the End-of-Life Vehicle Directive sets targets of 95% recovery/reuse of vehicles by 2015. Because of the high value relative to recovery cost, many European countries are already achieving recovery rates of 75 to 84%. Scrap metal tends to be recovered most often. Vehicle manufacturers are also encouraged to fulfill their tire recycling obligations according to these targets. In 2007, the European Commission adopted the Report on the Implementation of Directive 2000/53/EC on End-Of-Life Vehicles for the period 2002-2005 (www.ec.europa.eu/environment/waste/elv_index.htm).



How does the end-of-life tire recovery rate compare with other goods?

Waste generation in the EU is estimated to stand at over 1.43 billion tons per year and is increasing at rates comparable to those of economic growth. ELTs make up about 0.2% of this waste (ETRMA Annual Report 2007). Recycling and recovery rates for ELTs are generally far higher than for most other consumer goods.

Table 1: ELT recovery rate compared with other goods

Material	Recycling rate Europe (%)	Recycling rate US (%)	Recycling rate Japan (%)
Tires	84[1]	86[2]	85[3]
Glass	65[4]	22[5]	90[6]
Car batteries	90 (UK)[7]	99[8]	–
Steel containers	63[9]	63[10]	87.5[11]
Aluminum beverage cans	52[12]	52[13]	92[14]
PET bottles	39[15]	24[16]	66[17]
Paper/cardboard	64[18]	50[19]	66[20]

Recovery rates for tires are estimated on the basis of ELTs generated excluding ELTs destined for export and retreat

"For over ten years, we have been committed to setting up a structured, efficient management system for ELTs. In Western Europe, recovery rates increased from 65% in 2001 to almost 90% in 2005. There are increasingly numerous applications for recovered tires: in some countries where we did not know what to do with ELT a few years ago, now we do not have enough to meet the demand of the reprocessors."

Serge Palard, Chairman and CEO of Aliapur

End-of-life tire uses: Numerous possibilities, existing and under development

Why use end-of-life tires and for what purposes?

ELTs can be a low-cost source of fuel when located near a major fuel consumer, such as a power plant or cement factory. They can also be readily processed for a diverse range of construction projects. Substituting ELTs in place of new raw materials reduces associated environmental and economic costs, such as:

- Exploration and mining for fossil fuels and other virgin raw materials, and the associated land-use impact
- Transportation requirements (as tires are usually plentiful everywhere)
- Most or all processing requirements for many applications (as tires can often be used whole or shredded).

1) Energy recovery

Tire derived fuel (TDF), one of the leading options for ELTs, is mainly used in cement kilns, but also in thermal power stations, pulp and paper mills, steel mills and industrial boilers. In Europe, the cement sector is the main use of TDF. Kilns are increasingly being equipped to use ELTs as supplementary fuel and still be in compliance with the 2008 atmospheric emission standards. Tires have a high energy content and are an equal or better source of energy than many other solid fuels. This, alongside rising energy costs and increased environmental awareness in recent years, has led to an increase in use of TDF. The infrastructure exists, and with sufficient support and recognition of TDF as a viable alternative, the development of the industry has significant potential. TDF is currently the biggest use for ELTs in the US and Japan, and energy recovery is about equal to material recovery in Western Europe and the US.

Figure 4: Current uses for ELTs

Energy recovery
- Alternative fuel (mainly for cement kilns, paper/pulp mills, thermal power stations, industrial boilers, etc.)
- Substitute for coal in steel plants (for example, electric arc furnaces are an emerging use)

Material recovery
- Construction material
- Crumb or ground rubber applications (including molded products when combined with thermoplastics)

Factors affecting the use of ELTs include:
- The ELT recovery and management structure in place
- Standards and restrictions on ELT use and disposal
- Infrastructure available to allow reuse
- Reliability of supply
- Transport needs and cost

Table 2: ELT usage as tire derived fuel (TDF)

Sources: European Tyre & Rubber Manufacturers' Association, Rubber Manufacturers Association and Japan Automobile Tyre Manufacturers Association Inc.

	Total ELTs (excluding export and retread)	TDF usage	Facilities with TDF utilization
Europe	**250 million**	41% (2006)	Cement kilns
Japan	**80 million**	70% (2006)	Cement kilns, paper mills, tire factories
US	**292 million**	53% (2005)	Cement kilns, paper/pulp mills, boilers

Tires sent for co-processing in a cement plant where both fuel value and materials are recovered

Table 3: Tire company furnaces fueled by TDF in Japan — Sources: Japan Automobile Tyre Manufacturers Association Inc. (JATMA)

Company	Factory	Incinerator type	Purpose
Bridgestone Corp.	Tochigi plant Amagi plant	Fluidized-bed incinerator Grate incinerator	Power generation Heat source for boiler
Yokohama Rubber Co., Ltd.	Mie plant	Grate incinerator	Heat source for boiler
Sumitomo Rubber Industries, Ltd.	Nagoya plant Shirakawa plant Miyazaki plant	Grate incinerator Pyrolysis incinerator Grate incinerator	Cogeneration Heat source for boiler Heat source for boiler
Toyo Tire & Rubber Co., Ltd.	Sendai plant Kuwana plant	Grate incinerator Grate incinerator	Cogeneration Heat source for boiler

The advantages of TDF

Tires have a high energy content and TDF is an equal or better source of energy than other fuels:

Table 4: Energy content and CO_2 emissions from fuels

Source: Greenhouse Gas Protocol Initiative, WBCSD CSI CO_2 Emissions Inventory Protocol, Version 2.0

Fuel	Energy (Gigajoule/tonne)	Emissions	
		$kgCO_2$/tonne	$kgCO_2$/Gigajoule
Tires	32.0	2,270	85
Coal	27.0	2,430	90
Pet coke	32.4	3,240	100
Diesel oil	46.0	3,220	70
Natural gas	39.0	1,989	51
Wood	10.2	1,122	110

"TDF can be used successfully as a 10-20% supplementary fuel in properly designed fuel combustors with good combustion control and add-on particulate controls, such as electrostatic precipitators, or fabric filters. Furthermore, a dedicated tire-to-energy facility specifically designed to burn TDF as its only fuel has been demonstrated to achieve emission rates much lower than most solid fuel combustors."

EPA Research Paper, Air Emissions from Scrap Tire Combustion, 1997

■ Reduced emissions

TDF emissions, when tires are burned in a controlled environment, are no greater than those produced by other fuels. The carbon content per unit of energy is less than coal and petroleum coke, offering potential reductions in greenhouse gas emissions. In some situations, using TDF instead of virgin fossil fuels reduces nitrogen oxide, sulfur oxide and carbon dioxide emissions. Natural rubber content in tires (25% or more) is regarded as carbon neutral, as rubber plantations sequester carbon from the atmosphere during their life time. Any ash created generally contains fewer heavy metals than ash from coal combustion. In cement kilns the rubber provides energy and the iron and sulfur are incorporated into the cement. (Iron is normally added to the cement-making process; sulfur is absorbed and converted to sulfates.)

■ Lower cost

The cost of TDF is significantly lower than that of fossil fuels such as natural gas, coal and petroleum coke, especially when exploration, development and transport costs of virgin materials are taken into account.

Provided that quality and supply can be maintained, users can incorporate TDF into long-term planning such that significant economic advantages can be obtained. Tires are frequently a low-cost fuel source for cement factories. Weight and volume limit transport distance and availability.

Cement kilns are able to use either whole or shredded tires. For other uses of TDF, such as in pulp and paper mills, the steel belts often need to be removed to allow the ash waste to be resold. However, even then, the recycled steel is a valuable by-product.

TDF can be a good use for stockpiles of contaminated tires covered in dirt and water. These tires cannot generally be used for ground rubber and so TDF or construction projects are better options.

Caption: Scrap tire incineration power generation system at Bridgestone Tochigi plant in Japan.

2) Material recovery

▪ Civil engineering uses

Whole or shredded tires are successfully used in a variety of civil engineering projects such as embankments, backfill for walls, road insulation, field drains, erosion control/rainwater runoff barriers, wetlands and marsh establishment, crash barriers and jetty bumpers. Tires are excellent materials for such uses because they are lightweight, permeable, good insulators, shock absorbent, noise absorbent and durable.

Anti-scree wall in the Hautes Alpes, France
Source: Aliapur, DR

ELTs can also be converted into ground or crumb rubber that can then be used for rubber-modified asphalt (resulting in reduced traffic noise), running tracks, sports fields, ground cover under playgrounds, molded rubber products, and mulch in landscape applications. Ground rubber is produced either by ambient grinding or cryogenic (freeze) grinding, the latter producing finer particles by using liquid nitrogen to cool the tires before processing.

▪ Ground rubber

It is likely that ground rubber use will expand with further research and development. For example, methods of blending recycled rubber with polymers to create molded goods are improving, as are techniques to improve rubber use in asphalt in varied climates. Asphalt pavements made with ELTs are in common use in the developed world and beneficial properties include longer life spans and reduced noise. In the US, ground rubber is blended with asphalt to favorably modify the properties of the asphalt. This market has expanded in the US and Europe, and is anticipated to grow in the

Artificial turf on playing field, France
Source: Michelin

future. For example, several Canadian provinces are conducting research that could lead to further expansion of this market.

The Japan Asphalt Rubber Research Group has led research and development into rubber-modified asphalt. Trial pavements have been laid showing ELTs to be an effective recycling technology and an environmentally friendly, cost-effective pavement material. Growth in this industry is projected.

In most uses, tires present a low pollution risk. When compared with other alternative materials, using ELTs can help minimize a project's environmental impact. In some cases leaching may possibly occur; however this is not reported as a widespread problem.

3) Other innovative and emerging uses for end-of-life tires

Other innovative uses for ELTs are emerging as more research and development is carried out in this area. The following technologies are in development or already used in special circumstances.

- **Electric arc furnaces**

  Steelworks equipped with electric arc furnaces provide an almost closed loop recycling possibility for ELTs. The method involves applying a quantity of scrap metal into an electric arc furnace, followed by a quantity of tires (shredded or whole), to convert carbon monoxide gas to carbon dioxide in the furnace. In the US, about 1.3 million ELTs are used in this way per year, and a market also exists in Japan. More recently this application has been validated for industrial use in Belgium, France and Luxembourg, and it has the potential for growth in Europe.

- **Devulcanization**

  Devulcanization (the process of breaking down and recycling rubber) methods include thermal, mechanical, ultrasound and bacterial, and it can be used to make molded rubber products from ELTs. Although devulcanization is usually cost prohibitive, some applications have been developed and research is continuing.

- **Pyrolysis**

  Pyrolysis is the thermal decomposition of organic material in the absence of air, and is a potential way of generating materials from tires. Limited pyrolysis facilities currently exist and large-scale development is not currently economically viable.

ELTs being shredded for reuse

Management systems for collecting and recovering end-of-life tires

End-of-life tire management approaches vary. Three main frameworks, or combinations, are usually used.

1) Tire industry responsibility

Tire manufacturers (often in collaboration with distributors and retailers) take responsibility under stewardship systems for the recovery and recycling or disposal of ELTs, and finance these according to the number of units sold within that country. Such systems are typically administered by a not-for-profit body. Most often a separate fee is charged at the time of original sale, which increases public awareness of the program and funds the activities.

In some regions tire manufacturers have promoted ELTs as a resource and consequently have proactively pursued producer-responsibility systems. Most countries in Europe now have these systems, accounting for over 50% of European ELT volume. ELT management companies organize collection and recovery, participate in research and development activities for new recovery routes, liaise with local authorities, comply with reporting obligations and promote the introduction of product standards. In addition, the European Tyre and Rubber Manufacturers Association (ETRMA) has established "The Used Tyres Group" to promote the principle of ELTs as a resource and to propose regulations and directives for their proper management.

In Japan, based on "The Fundamental Law for Establishing a Sound Material-Cycle Society", the Japan Automobile Tyre Manufacturers Association Inc. (JATMA) promotes the 3Rs – Reduce, Reuse and Recycle – with its committees to coordinate ELT collection and recovery, and to encourage further research and development. JATMA has also implemented a program for the removal of illegal legacy stockpile sites.

In Korea manufacturers and importers pay a deposit fee that is refunded if they collect the ELTs. Brazil requires importers to demonstrate the disposal of 20% more tires per annum than they import. Stewardship systems (often with government environment agency involvement) also exist in South Africa and about half of the Canadian provinces. Nigeria and Turkey have also begun stewardship systems and Russia is currently considering proposals.

2) Government/community responsibility

Specific taxes are levied on tire sales, or taxpayer-funded systems operate using general tax revenue. Governments have often taken a direct role in cleanup programs. In the US, many states have active programs to clean up existing stockpiles and eliminate the creation of new ones. Government-administered bodies responsible for ELTs have been established in the half of the Canadian provinces not covered by stewardship systems. Industry and other stakeholders are frequently involved.

Croatia, Denmark, Latvia and the Slovak Republic also have tax-funded systems.

3) Free market approach

ELT enterprises operate independently. Where suitable infrastructure exists, these companies can arrange recycling and recovery of ELTs with commercial benefits. Austria, Germany, Ireland, New Zealand, Switzerland, the United Kingdom and the US operate on free market principles. Such countries usually have laws regarding the transportation, use, disposal and storage of ELTs. Tire manufacturers and others involved in the industry voluntarily participate in systems.

In the US, tire manufacturers work together through the Rubber Manufacturers' Association (RMA) to promote responsible management of ELTs and to develop markets for ELTs.

In addition, technical assistance is provided to prospective users of ELTs to assist in getting necessary government approvals and to help new users get started.

Managing ELTs

Landfill and waste piles

Most, but not all, developed countries now view landfills (waste piles and dumps) as the least desirable option for ELTs. Tires are banned from landfills in the European Union. Eleven states in the US place a total ban; a further 31 states have restrictions requiring shredding or monofilling. Three Canadian provinces ban landfilling. Many other jurisdictions have set non-binding goals to reduce or eliminate landfilling, especially of whole tires.

In some situations, if municipal landfills are taxpayer-funded, and recycling taxes do not exist, then landfill fees can be less than recyclers' collection fees, for example in some parts of Australia. This provides a further incentive to recycle rather than landfill ELTs.

Legacy stockpiles of ELTs present different issues to annually generated ELTs, and therefore require different management practices. While owners sometimes consider an ELT stockpile to be an asset, they are also liabilities, due to the potential for fire and infestation (for example from disease-carrying mosquitoes). Stockpiled tires tend to remain in place until a government-initiated abatement program or enforcement efforts can be implemented.

Another major issue in managing ELT stockpiles is developing an accurate assessment of the actual number of ELTs in stockpiles. This is called stockpile mapping and has been undertaken in the US for example using satellite imagery.

- In the US, since 1994, ELT management programs in many states have focused on stockpile prevention and abatement. An estimated 188 million tires were in stock piles across the US in 2005, compared with 275 million tires in 2004 and 700-800 million tires in 1994.
- In Japan, a national support program for stockpile site restoration was established as part of strengthened illegal dumping measures in the 1998 revision of the Waste Management Law: 7.4 million tires were in stockpiles in February 2007, compared with 8.6 million tires in February 2006.
- Some Nordic countries, where producer responsibility systems have been operating for over 10 years, have recovery rates of 100% and stockpiles have been eliminated. Other European countries are implementing programs to eliminate existing stockpiles (e.g., France through public-private cooperation).

The problems with landfilling and waste piles of ELTs are three-fold:

1. Valuable resources are unused and therefore wasted when in stockpiles.
2. Tires may catch fire and such fires are notoriously difficult and costly to extinguish. In California, US$ 20 million was spent on the recently completed cleanup of the 1999 Westley tire fire when seven million tires burned. In 1990, 14 million tires burned in one of the biggest fires ever recorded, in Hagersville, Ontario.
3. In certain climates, stockpiles are ideal breeding grounds for mosquitoes. This can pose significant health risks as fatal diseases such as West Nile fever, dengue fever and malaria have been linked to such breeding grounds.

Fire and infestation risks can largely be overcome (at extra cost) if tires are shredded and/or buried. However, by doing this, potentially valuable usable resources still become unnecessary waste. Additionally, buried whole tires can often rise to the surface or "float" and reduce the future usability of a site.

End-of-life tire management in developing regions

While high recycling/recovery rates are achieved in major developed economies, the same is not true for many developing economies where land-use and disposal regulations are weak and infrastructure for collection is missing. In addition to domestic stocks, many areas also receive imported ELTs that add further to already problematic stockpiles of ELTs from local sources. South Africa is currently faced with an estimated 800 million tires in piles in the Western Cape region. In Mexico the number of tires is thought to be around 1-2 billion.

Most industry organizations in developed countries have ELT programs. Transferring expertise and know-how from these bodies to the developing world is key to encouraging better ELT management. Brazil has been particularly strong in assessing and working with ELT issues, and recent data shows a 40% recovery rate there.

What is the future outlook?

ELTs offer a significant opportunity for achieving sustainable development objectives. Widespread use in energy and material recovery applications is well-established as an alternative to virgin raw materials. The positive environmental impacts of using ELTs as a resource are significant, mostly derived from the accompanying reduction in virgin resource exploitation. Using ELT material in some products can also improve the properties of that end product.

Various efforts are currently underway in many countries where different legal systems exist to reduce the number of tires in landfills and waste piles and to find innovative, environmentally friendly uses for ELTs.

Tire manufacturer programs play a key role in the development of ELT markets, as do government regulations, business norms, and standards. ELTs should be considered as a resource and not labeled as a waste. The involvement of tire companies, ELT management companies, scientific laboratories, government regulators and industrial partners is necessary in research and development programs to find new, effective and environmentally sound uses for ELTs.

Kwang Liak, TEO

Useful resources

Australia
Department of the Environment, Water, Heritage and the Arts:
www.environment.gov.au/settlements/waste/tyres/index.html

Basel Convention
The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (including draft technical guidelines on the management of ELTs):
www.basel.int/techmatters/index.html

Canada
Canadian Association of Tire Recycling Agencies: www.catraonline.ca
The Rubber Association of Canada (including links to Canadian provincial sites):
www.rubberassociation.ca/rubber_recycling.html

Europe
European Tyre & Rubber Manufacturers' Association (including links to individual country organizations): www.etrma.org
European ELT management companies:
- Aliapur www.aliapur.com
- Centrum Utylizacji Opon www.utylizacjaopon.pl
- Eco Anvelope www.ecoanvelope.ro
- Eco Elastika www.ecoelastika.gr
- Eesti Rehviliit www.rehviliit.ee
- Hurec www.hurec.hu
- Norsk Dekkretur AS www.dekkretur.no
- Recytyre www.recytyre.be
- ReysBERN www.recybem.nl
- Signus www.signus.es
- Suomen Rengaskierrätys Oy www.rengaskierratys.com
- Valorpneu www.valorpneu.pt

Japan
The Japan Tyre Manufacturers Association Inc.: www.jatma.or.jp

New Zealand
Final Report for the Ministry for the Environment, July 2004:
www.mfe.govt.nz/publications
Ministry for the Environment:
www.mfe.govt.nz/issues/waste/special/tyres/index.html

South Africa
South African Tyre Recycling Process Company (SATRP Co):
www.rubbersa.com

South Korea
Korea Tire Manufacturers Association: www.kotma.or.kr

Tire Industry Group Project, WBCSD
www.wbcsd.org/web/tires

USA
Rubber Manufacturers Association: www.rma.org
US Environmental Protection Agency: www.epa.gov/garbage/tires

Notes

[1] Estimates based on data from European Tyre & Rubber Manufacturers' Association (ETRMA), 2006.
[2] Estimates based on data from Rubber Manufacturers Association (RMA), 2005.
[3] Estimates based on data from the Japan Automobile Tyre Manufacturers Association Inc. (JATMA), 2006.
[4] Figures for 2005. OECD Environmental Data, 2007.
[5] Ibid.
[6] Ibid.
[7] www.guardian.co.uk/world/2006/may/05/qanda.recycling
[8] EPA Municipal and Solid Waste Generation Facts and Figures for 2006, p3, 2006. See also www.batterycouncil.org.
[9] Worldwide figure, Steel Recycling Institute, 2006.
[10] Ibid.
[11] Ministry of Economy, Trade and Industry (METI), Japan, 2003.
[12] Figures for 2005. EU 25 and EFTA, *Sustainability Report 2006*, European Aluminium Association, p26. Higher rates have been achieved in some individual countries, e.g., 93% in Norway, 88% in Finland, Switzerland (www.world-aluminium.org).
[13] Figures for 2006. Aluminium Association Inc. as reported in *2006 Minerals Yearbook*, US Department of the Interior (section 5.1). The EPA indicates 45% for aluminium cans (www.epa.gov/epaoswer/non-hw/muncpl/recycle.htm#figures).
[14] Global Aluminium Recycling committee report (www.world-aluminium.org).
[15] Petcore, 2006.
[16] Napcor Report, 2006. The US EPA indicates 31% for plastic soft drink bottles (www.epa.gov/epaoswer/non-hw/muncpl/recycle.htm#figures).
[17] Council for PET Bottle Recycling, Japan, 2006.
[18] Figures for 2005. OECD Environmental Data, 2007.
[19] Ibid.
[20] Figure for 2003. OECD Environmental Data, 2007.

Useful resources

This brochure was produced by member companies of the WBCSD Tire Industry Project

BRIDGESTONE | Continental | COOPER TIRES | GOODYEAR

HANKOOK | KUMHO TIRES | MICHELIN | PIRELLI

SUMITOMO RUBBER INDUSTRIES, LTD. | TOYO TIRES | YOKOHAMA

More information on tires can be found at
www.wbcsd.org/web/tires or from tires@wbcsd.org

About the WBCSD

The World Business Council for Sustainable Development (WBCSD) brings together some 200 international companies in a shared commitment to sustainable development through economic growth, ecological balance and social progress. Our members are drawn from more than 30 countries and 20 major industrial sectors. We also benefit from a global network of about 60 national and regional business councils and partner organizations.

Our mission is to provide business leadership as a catalyst for change toward sustainable development, and to support the business license to operate, innovate and grow in a world increasingly shaped by sustainable development issues.

Our objectives include:

Business Leadership – to be a leading business advocate on sustainable development;

Policy Development – to help develop policies that create framework conditions for the business contribution to sustainable development;

The Business Case – to develop and promote the business case for sustainable development;

Best Practice – to demonstrate the business contribution to sustainable development and share best practices among members;

Global Outreach – to contribute to a sustainable future for developing nations and nations in transition.

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