End of life tyres

A valuable resource with growing potential

2011 edition

ETRMA
EUROPEAN TYRE & RUBBER manufacturers' association

Content

This ETRMA report presents the situation of end of life tyres (ELTs) in Europe for 2010 and sets out to demonstrate the progress that has been made over the last decade by the European tyre manufacturers to address, in a responsible manner, the challenges posed by the end of life tyres, which include:

- *No landfill option as from 16 July 2006;*
- *Guaranteeing an ecological treatment of the entire chain;*
- *Promoting efficient and sustainable economical solutions.*

>> I. ELT recovery in Europe

1. Worldwide ELT arisings and recovery trends

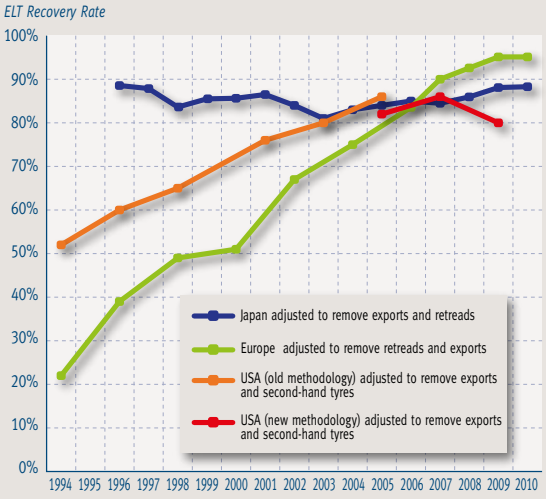
The global tyre output is estimated at 1.5 bn units[1] and subsequently just as many will fall into the category of end-of-life tyres.

Over the last 17 years recovery rates for ELT have dramatically increased in Europe, Japan and the US. At the same time, the cost of recycling to the consumer has decreased 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.

In 2010 the enlarged Europe was faced with the challenge of managing, in an environmentally sound manner, about 3.3 million tonnes of used tyres (including tyres for retreading and reuse/export), the same quantity as in 2008 and up 2.2% compared to 2009.

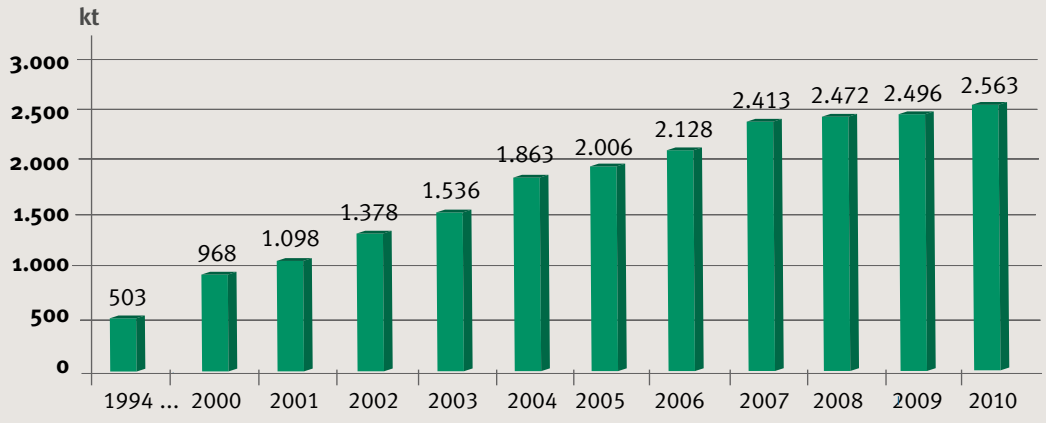
1. IRSG, "The World Rubber Industry Review and Prospects to 2020", December 2010

Historical recovery rates estimates for ELTs



Sources: ETRMA, JATMA & RMA figures, adjusted to calculate harmonised ELT recovery rates

EU Evolution of ELT recovery over the last 17 years

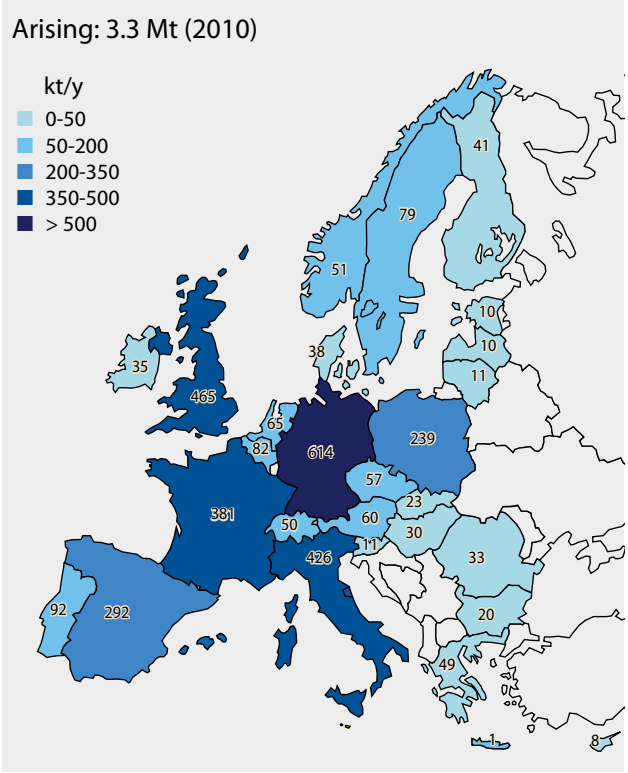


After sorting, an estimated 2.7 million tonnes of ELTs remained on the EU market for recovery and recycling. This represents a five-fold increase of the recovered quantities over the last 17 years.

In Europe, the estimated annual cost for the management of ELTs is estimated at € 600 million.

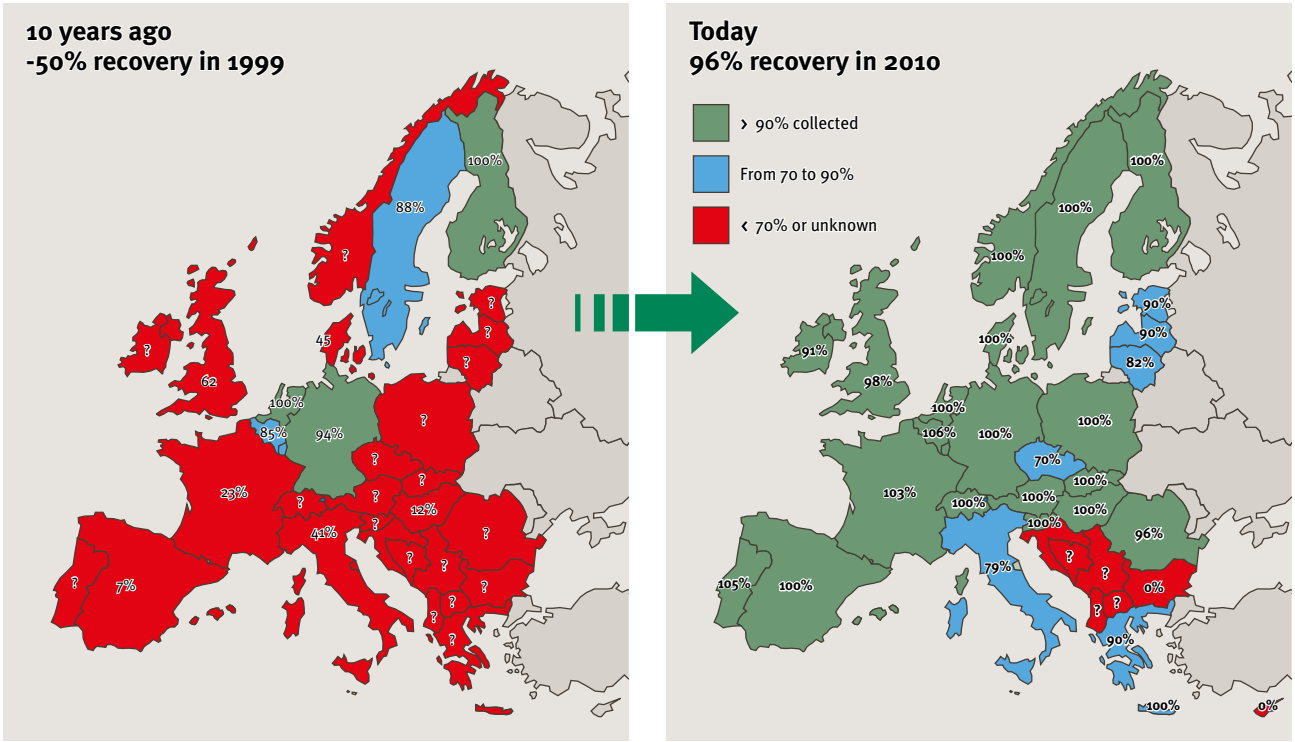
In addition, the EU has millions of used tyres that have been illegally dumped or stockpiled. The inadequate disposal of tyres may, in some cases, pose a potential threat to human health (fire risk, haven for rodents or other pests such as mosquitoes....) and increase environmental risks. The current estimate for these historic stockpiles throughout the enlarged EU stands at 5.7 million tonnes (1.73 times the 2010 annual used tyres arising).
Ultimately, the improved economic performance of the end of life tyre business should mitigate in favour of an earlier and more effective approach to tackling historic stockpiles.

The annual estimate for used tyres from end of life vehicles (ELV) amounts to 327,000 tonnes which represents around 10% of the annual used tyres arising.



II. National UT arisings and recovery rates

Not surprisingly the largest volumes of used tyres arising are in the biggest countries (Germany, UK, France, Italy,



P.S.: UT treatment > 100% : the quantity of Used Tyres treated can exceed the arising in some countries where Producer Responsibility is in place, because ELT management organizations may have collected more than their obligation

Spain and Poland) with a range between 250 and 600,000 tonnes per annum. All other countries have arising under 100,000 tonnes per annum and 6 countries have 15,000 tonnes or less.

In 2010, 23 of the EU27 countries (plus Norway & Switzerland) recovered 90% and more of their annual used tyre arising. 18 of those 23 countries recovered 100% while Italy and the Czech Republic are between 70% and 90%. Only Bulgaria and Cyprus are still depending on landfilling.

Countries where a producer responsibility system has been operating for over 10 years. (e.g. Nordic countries) have recovery rates of 100% and stockpiles have been eliminated.

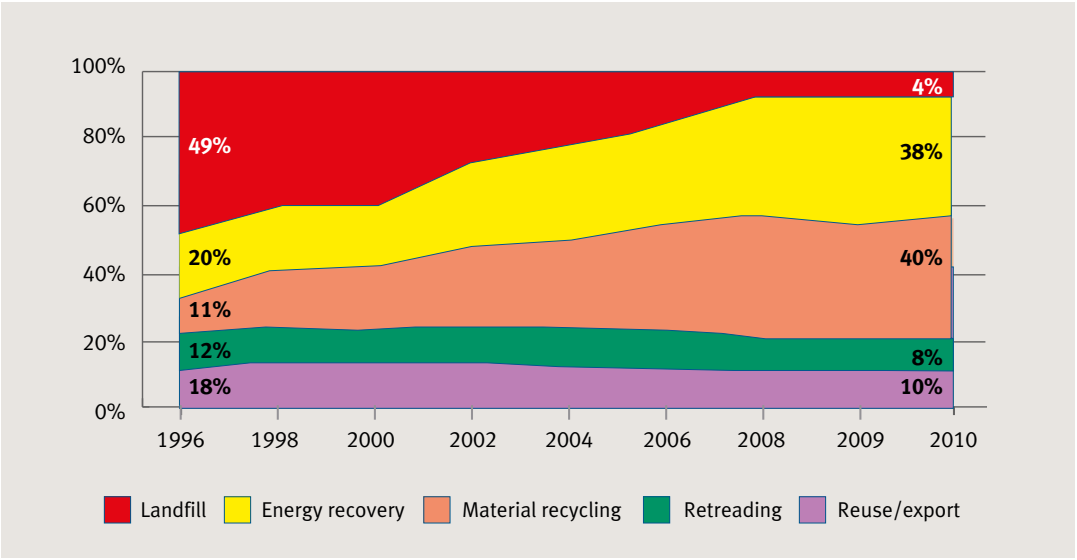
Despite the heterogeneous nature of these rates, in 2010 the EU27 (+Norway and Switzerland) had an average used tyre recovery rate of 96% which is remarkable when compared with the recovery rate of other sectors: 69 % for paper[2] and 58% for plastics[3] in 2010.

2. CEPI (Confederation of European paper industries) Sustainability Report 2011, Recycling rate (Recovered paper utilisation + Recovered paper net trade).

3. PlasticsEurope - "Plastics – The facts 2011" – An analysis of EU Plastics Production, demand and recovery for 2010.

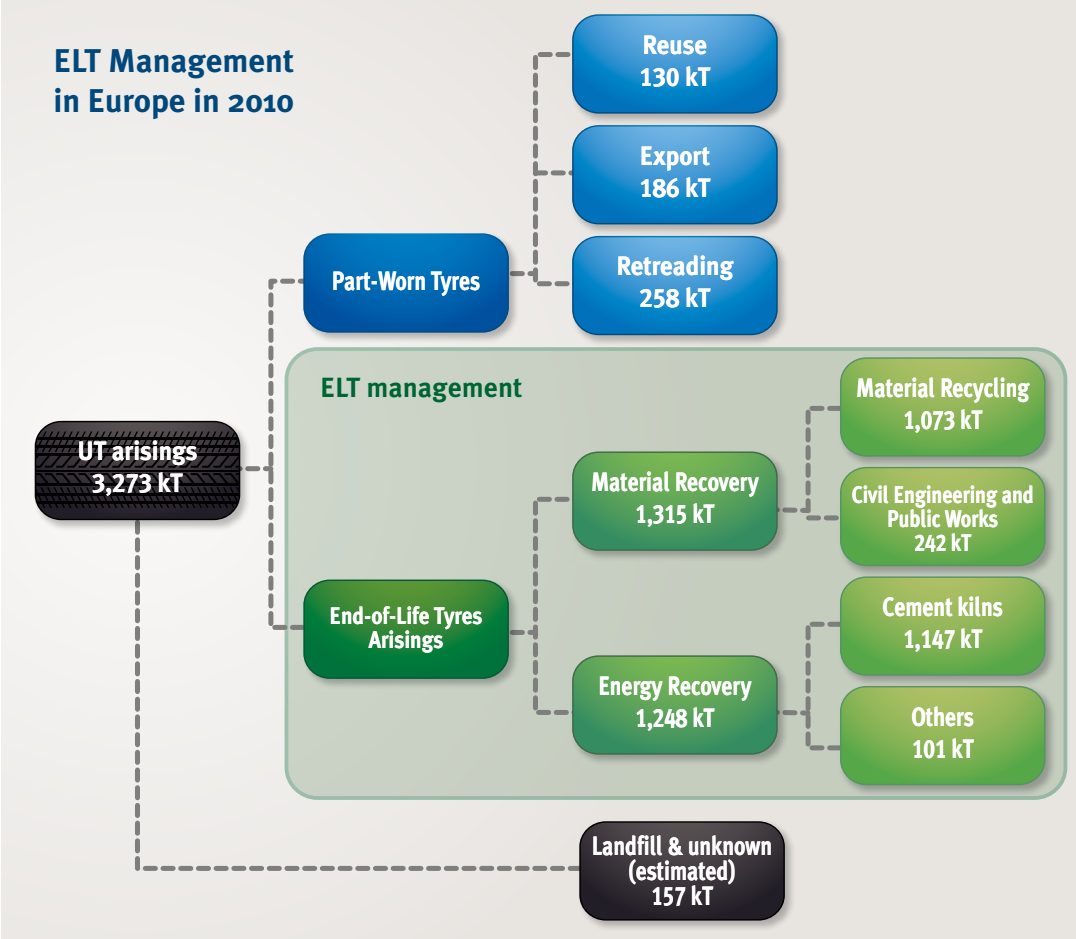
III. Evolution of recovery routes since 1996

Since 1996, more than 24 million tonnes of ELTs have been recovered either through energy or material recovery. This has led to a considerable decline in landfilling over time; a phenomenon which has been accelerated since 2000 further to the implementation of the Landfill Directive and due to the proactive industry initiative of establishing national Producer Responsibility schemes. As a result, only 4% of the used tyres arisings are tipped today in landfills or have unknown recovery routes while recycling, recovery, reuse and retreading now contribute to a substantial 96% of used tyres recovery.



In the last decade, tyre industry, dealers and ELT operators have substantially improved ELT utilization. Europe has built up a real experience of 3 types of ELT management schemes, i.e. Tax model, although very limited, Free market model and Producer responsibility model. The rapid improvement of the performance of the ELT management has been reached through a sustained deployment of the Producer responsibility model.

In 2010, about 3.3 million tonnes of used tyres were managed in an environmentally sound manner. This represents 2% increase in arisings compared to 2009. After sorting out the data of those tyres going for reuse or retreading, an estimated 2.7 million tonnes of end-of-life tyres (ELTs) were left to be treated.



This material flow went into a variety of recycling applications, public works and civil engineering or was used as a fuel substitute in cement kilns, boilers and power plants.

An interesting observation in 2010 is the shift in trend, i.e. growth in material recovery (+10%) and a reduction in energy recovery (-3%). In numbers, this means that 1.3 million tonnes of ELTs went to material recovery and 1.2 million tonnes in energy recovery. As compared to UT arisings, material recovery is now the main recovery route (40%) followed by energy recovery (38%).

Within material recovery, recycling of ELTs as tyre rubber granulate and powder in various applications is the main recovery route (80%), followed by the use of ELTs in civil engineering applications and public works (18%), as dock fenders, blasting mats (<2%) and as a reducing agent in steel mills and foundries (<1%). As regards energy recovery, the main user of ELT shreds or whole tyres remains the cement industry (92% in volume), whilst district heating- and power plants absorb the remainder.

>> II. ELT Management Systems in Europe

What are the issues facing the tyre industry in the realm of end of life tyres?
EU Member States have to be in compliance with the EU legislation in transposing the Directives into local legislation. They are free to set national initiatives to reach the EU targets. In regard to the development of waste management policies at national level, the landfill of waste Directive[4] has been a major driver for setting ELT management systems in Europe.

4 EC Directive 1999/31 on the landfill of waste of 26 April 1999, which bans whole tyres from landfill from July 2003 and shredded tyres from July 2006

Tyre manufacturers are also facing growing environmental pressure from the general public and other stakeholders concerning illegal dumping and historic stockpiles.

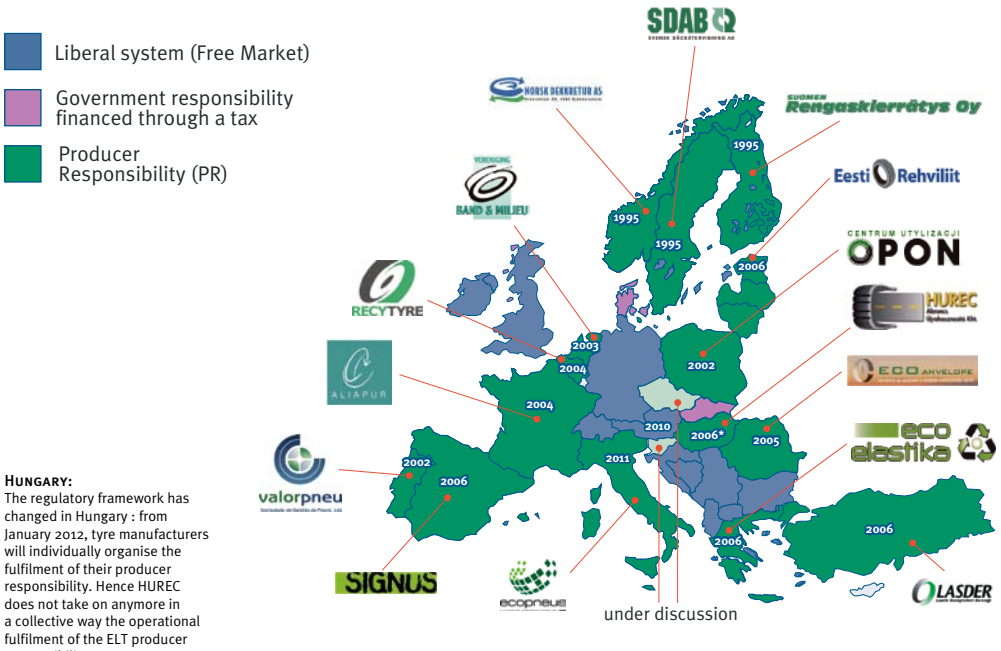
For all these reasons it is in the interests of the tyre industry to continue being proactive and take responsibility collectively for end of life tyres.

Today within the EU there are three different systems for managing end of life tyres:

- Producer responsibility
- Tax system
- Free market system

Some countries are currently in the process of moving from one system to another one or have recently moved to a Producer Responsibility scheme.

Country specific implementation and ELT management companies



Hungary:
The regulatory framework has changed in Hungary : from January 2012, tyre manufacturers will individually organise the fulfilment of their producer responsibility. Hence HUREC does not take on anymore in a collective way the operational fulfilment of the ELT producer responsibility.

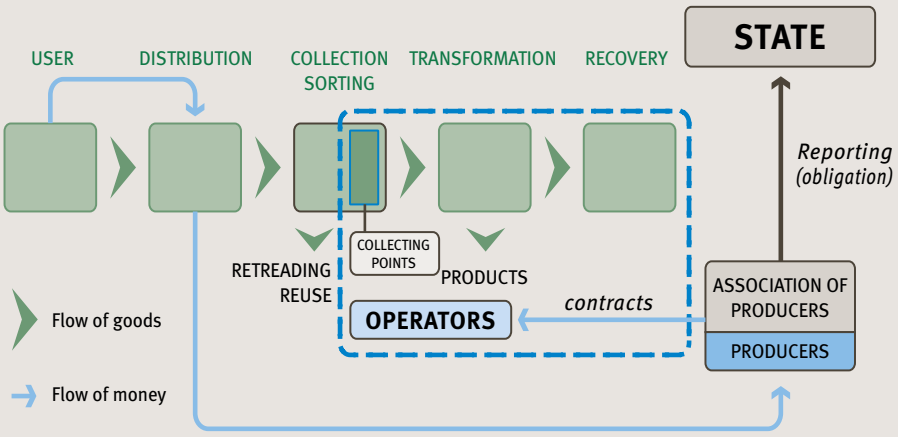
In Italy, Ecopneus, an ELT management organization, has started operating from September 7th 2011 as a collective PR scheme, replacing the previous Italian free market system. In terms of UT arisings, the Italian market is the third most important one in Europe behind Germany and the UK.

In the Czech Republic, the Association of producers and importers of tyres in the Czech Republic has been created in 2011 and will set up a collective Producer Responsibility Scheme, which might be starting its operations in 2013.

I. Producer responsibility

The law defines the legal framework and assigns the responsibility to the producers (tyre manufacturers and importers) to organise the management chain of end of life tyres.
This led to the setting-up of a not-for-profit company financed by tyre producers aiming at managing collection and recovery of end of life tyres through the most economical solutions. A reporting obligation towards the national authorities provides a good example of clear and reliable traceability. In addition, these companies are able to develop high-level knowledge on technologies and build up additional R&D capacities. The annual investment in R&D is around € 5 million. For the end user, this system guarantees transparency of costs through a visible contribution, clearly indicated on the invoices.The members of these companies usually include the national manufacturers and the main importers. For example in Portugal, Continental is the national tyre manufacturer and all other companies are importers.

Producer responsibility scheme



This system appears to be the most suitable and robust for addressing and resolving end of life tyre arisings, in a sustainable manner for the long term, and to achieve a 100% recovery rate, in the most economical way. On the whole the tyre manufacturers have demonstrated a clear preference for this system and have deployed determination and commitment to take this route. In 2011, the network is including 15 countries and other EU Member States are set to follow in the near future.

Countries: Belgium, Estonia, Finland, France, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden and Turkey.

Despite a still quite heterogeneous situation in Europe the remarkable progress that has been achieved is due largely to the proactive attitude of the profession. Even prior to the passing of the Directive on the landfill of waste in 1999, the industry had been active in taking action to organise the different players in the recovery chain with the creation of ELTs management companies/associations at national level.

The national associations, voluntary consortia, joint companies and boards that were set up jointly by tyre producers/importers to take responsibility for end of life tyres are financed in different manners according to the legal system prevalent in the country and these organisations in turn organise and manage the end of life recovery chain in different ways.

By professionalising the service providers – collectors, sorters and reprocessors – the goal is to significantly improve the recovery rate and traceability and develop applications with added value which utilise the full potential of the properties of rubber.

Promoting Producer Responsibility

Country arisings and recovery rates demonstrate that producer responsibility achieves more robust results than the purely market driven approach as well as the ultimate objective of 100% recovery whereby not only the annual arisings are recovered but the historic stockpiles are also progressively eliminated.

In 2010, EU countries operating under Producer Responsibility scheme represented 44% of EU used tyres arisings. This ratio has risen to 57% in 2011 as a consequence of Italy joining the number of countries under PR scheme.

ELT management companies set up by the tyre manufacturers are mandated to collect and organize the treatment of an equivalent amount (according to the principle 'one new tyre sold one worn tyre recovered') of the volumes of tyres sold collectively by these companies. The process is financed through an environmental fee generally applied to the product price, regardless of the location of the collection point. Thanks to the success of the scheme, this fee has decreased over time. The chain is managed by the ELT companies, from collection to recovery or recycling, with the support of a reliable and transparent traceability or auditing system.

II. Tax system

Under the tax system each country is responsible for the recovery and recycling of the end of life tyres. It is financed by a tax levied on (tyre) production and subsequently passed on to the customer. This is an intermediate system whereby the producers pay a tax to the State, which is responsible overall for the organisation and remunerates the operators in the recovery chain.

Countries: Denmark, Slovak Republic

III. Free market system

Under this system, the legislation sets the objectives to be met but does not designate those responsible. In this way all the operators in the recovery chain contract under free market conditions and act in compliance with legislation. This may be backed up by voluntary cooperation between companies to promote best practices.

Countries: Austria, Bulgaria, Croatia, Germany, Ireland, Switzerland. Although operating under a free-market system, United Kingdom features an hybrid system as collectors and treatment operators have to report to national authorities, hence could be named as "managed free-market" system.

III. A host of end markets for ELTs

I. Almost an infinite number of potential applications

The tyre is a complex and high-tech safety product representing a century of manufacturing innovation, which is still on-going. The tyre comprises many materials, the very best the metallurgical, textile and chemical industries can produce. There is no room for even the slightest defect and it is an extremely complex process to develop and manufacture the product.
From a materials point of view, the tyre is a mixture of synthetic and natural rubber, to which are added a range of specific substances to ensure performance, durability and safety. These include mineral oil, reinforcing fillers (carbon black and silica) and vulcanising agents (sulphur) which act as catalysts to accelerate the vulcanization process.

These characteristics contribute in many ways to enabling the development of a variety of recovery routes and end markets.

II. Material Recovery

Whole tyres used in civil engineering applications - Those applications vary from coastal protection, erosion barriers, artificial reefs, breakwaters, avalanche shelters, slope stabilisation, road embankments and landfill construction operations, sound barriers, insulation. This market is for the moment confined to single projects and therefore fairly small scale.

Shredded tyres - Whole tyres are mechanically sheared into shreds ranging in size from 25-300 mm. Tyre Derived Aggregate is used as foundation for roads and railways, as a draining material replacement for sand and gravels, landfill construction, subgrade fill and embankments; backfill for walls and bridges and subgrade insulation for roads.

Advantages of Tyre derived Aggregate
Tyre derived aggregate is lighter by 30-50%; drains 10 times better than well graded soil and provides 8 times better insulation than gravel.

Granulated and powdered rubber - After the removal of the steel and fabric components the remaining rubber is reduced to granular rubber.
Applications include moulded rubber products such as wheels for caddies, dustbins, wheelbarrows and lawnmowers, urban furniture and sign posts.
Granulated and powdered rubber are also to be found as flooring for playgrounds and sports stadiums, as shock absorbing mats for schools and stables, as paving blocks or tiles for patios and swimming pool surrounds as well as roofing materials.
Granulated rubber is also widely used in the construction of artificial turf for example in football fields.

Rubber modified asphalt takes advantage of the elasticity and noise absorbing characteristics of the rubber. Although this increases the life span of the road surface, reduces the noise pollution and increases safety in wet road conditions, it is still relatively underutilised (a few hundred kilometres of roads in total) despite its many advantages.

Electric Arc Furnaces – Shredded tyres can be used in steelworks equipped with electric arc furnaces as a substitute for anthracite and scrap metal. This application has been validated for industrial use in Belgium and in France where about 6,000 tonnes of end of life tyres are consistently used. This is encouraging as the application uses both the carbon and steel content of the tyres. Such use is already under development in the US and will most certainly follow a similar trend in Europe in the years to come.

The use of ELT derived products in steel plants confirmed that carbon and iron contained in tyres may be used partly or entirely to substitute the use of anthracite during the manufacturing of steel at 1,650 degrees. Indeed 1.7 kg of ELTs is equivalent to 1 kg of anthracite. The environmental impacts are positive regarding dust and gaseous effluents. Overall there are no significant differences in the total environmental impact due to the use of tyres or anthracite. The capacity is nearly unlimited.

Emerging opportunities

Pyrolysis/Thermolysis - Thermal treatment technologies – pyrolysis, thermolysis and gasification – are some of the emerging solutions for recovering value from end of life tyres.

Tyre pyrolysis involves the thermal decomposition of end of life tyres into intermediate substances such as gas, oil and char. The economic viability of this alternative route for high temperature resource recovery from tyres is hampered by the fact that the prices obtained for the by-products often fail to justify the process costs.
Under current market conditions the economic viability of these options has yet to be proved (there are few or no large-scale plants currently in operation) but they have the merit to offer scope for increasing recovery rates.

III. Energy recovery

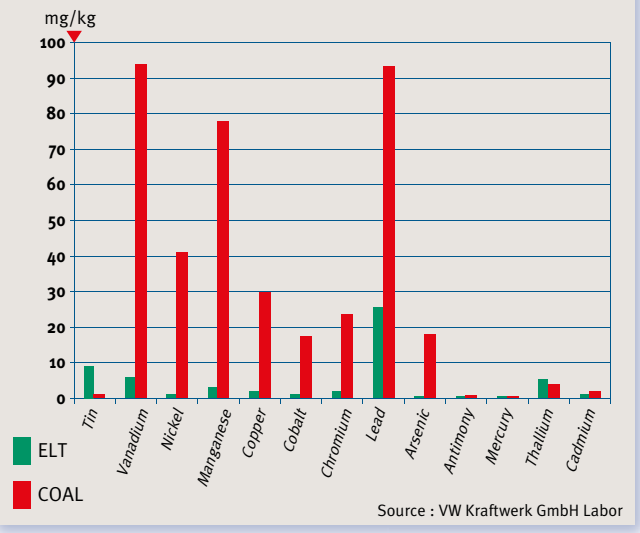
With a calorific value equivalent to that of good quality coal, end of life tyres are used as an alternative to fossil fuels. The increase in the price of oil and the necessity to preserve resources could favour the development of this type of application.

The specifications are:

- The calorific power of 1 passenger car tyre is equivalent to 7.6 litres of oil (lower sulphur content);
- ELT have a similar calorific value as a high quality coal, with the advantage that the emissions of (heavy) metals are much lower (see graph next page);
- The incineration residue can also be used as replacement for other raw materials (e.g. raw material in clinker for cement industry);
- The biomass effect on ELTs combustion:
  - 20% of the weight of ELTs is latex
  - Latex is polyisoprene (C_5H_8): it is composed of 88 Carbon atoms
  - for a complete combustion, 1 tonne of ELTs generates 647 kg of CO_2 from biomass

Energy Recovery

Heavy Metals in End-of-Life Tyres and Coal



Source : VW Kraftwerk GmbH Labor

Energy Recovery

"Biomass effect"
on ELTs combustion

- 20% of the weight of ELT is latex
- Latex is polyisoprene (C_5H_8) : it is composed of 88 of Carbon atoms
- 1 tonne of ELT generates 647 kg of CO_2 from biomass

For the complete combustion 1 tonne of ELT is equivalent to 647 kg of CO_2

Case study : ELTs Biomass Content and Calorific Value

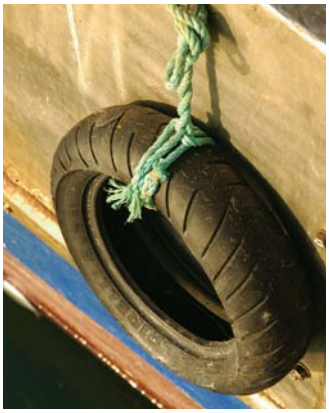
Comparable calorific value, Less CO_2 emissions than traditional fossil fuels

A three-year study by Aliapur, the French ELT management company, released in July 2009, has proven what the cement industry has known since the 1970s – used tyres as fuels have high calorific value with less environmental impact than traditional fossil fuels. Unlike coal and petroleum coke, used tyres when burned produce carbon-neutral CO_2 emissions due to their organic components, e.g. natural rubber, rayon, and stearic acid.
ELTs when burned emit less fossil carbon dioxide due to their biomass components. Used passenger car tyres, according to the study, have biomass fractions between 17% to 20% while used truck tyres are 29% to 30% biomass.

Parameter	Used Passenger Car Tyres	Used Truck Tyres	Coal	Petroleum Coke
Biomass	17-20.3% **(µ 18.3%)**	28.6-29.7% **(µ 29.1 %)**	**0%**	**0%**
Carbon	67.5 – 70.1% **(µ 69.0%)**	59.7-62.6% **(µ 61.1%)**	**64-68%**	**84-97%**
NCV (MJ/kg)	29.5 – 30.6 **(µ 30.2)**	26.1 – 26.7 **(µ 26.4)**	**26**	**32**

The biomass fraction of the used tyres was quantified through ASTM D6866, which is a standard method based on radiocarbon dating techniques. ELTs were also characterized by measuring their calorific values (amount of heat released during combustion) and carbon, hydrogen, oxygen, nitrogen, sulphur, chlorine, fluorine, and bromine content.

The study aimed to establish reference values and provide details on the chemical properties of used tyres. Results are used by France's State Department for the Environment as reference for calculations of CO_2 emissions from cement plants. As a result, industrialists that use tyres as an alternative source of fuel take advantage of reductions in their declarations of CO_2 emissions.



Cement kilns - The cement sector is the main application for energy recovery and new kilns are increasingly equipped to use end of life tyres as supplementary fuel. This is not astonishing since ELTs offer a high net calorific value comparable to petroleum coke and even higher than coal.

Energy-intensive industries use ELTs to reduce their fuel expenses and comply with air quality and pollution control regulations. ELTs are cheaper than coal and petroleum coke; thus, ELTs use generates savings. Many countries around the world now require companies to annually report their CO_2 emissions. Using ELTs as fossil fuel alternative enables companies to report lesser fossil CO_2 emissions. Moreover, companies participating in cap-and-trade schemes like the European Union Emissions Trading Scheme can also obtain carbon credits when they have low fossil CO_2 emissions. Carbon credits have monetary value and can be sold or traded.

Assuming all ELTs that were energy recovered in 2010 would be co-incinerated in cement kilns, 1.83 million tonnes of CO_2 equivalents would be saved annually.

The cement sector requires 30 million tonnes of fuel equivalent per annum and the total annual arising of ELTs is 2.7 million tonnes! Even if all Europe's ELTs were sent to cement kilns they would only represent about 10% of the total amount of fuel required by the cement industry.

Thermal power stations - This particular application is underdeveloped in the EU but much more widespread in the US.

Pulp and paper mills - Again the elevated cost of energy could create openings for use of tyre derived products in this sector. At present this application is not developed in Europe but it is quite common in the US (this represents 13.8% of US 2009 ELT generated tonnage[5]).

Market outlook for tyre derived products

The various market segments face different challenges and the rising cost of energy will no doubt remain a critical factor and stimulate market growth for tyre derived products used as an alternative fuel.

5. US Scrap Tire Management Summary, 2005-2009 , Rubber manufacturers Association, (October 2011)

>> IV. Towards end of waste status for ELT derived materials

The European tyre manufacturers have been active over the years to make the intrinsic qualities of end of life tyres recognized to obtain eventually end of waste status for their derived products.

The Waste Framework Directive (2008/98/EC) introduces the concept of end of waste, by which selected waste streams could cease to be considered as waste if they comply with end of waste criteria.

- A market or demand for ELT derived materials should exist (see Part III A host of end markets for ELTs)
- ELT derived materials should be commonly used for specific purposes and meet related technical requirements (see Part III A host of end markets for ELTs)
- ELT derived materials should meet existing legislation and standards applicable to products
- The use of ELT derived materials should not lead to overall adverse environmental or human health impacts

I. Characterization of ELT derived products through standards

The on-going development of quality standards for ELT derived materials at CEN level (TC366) together with high ELT recycling and recovery performance achieved throughout Europe is a major step towards getting the end of waste status for ELT derived products.

The benefits expected from this TC will be to allow the field of ELTs to become reliable, long lasting, industrially and economically balanced and to respond to the needs of industry standardizing relevant physical and chemical properties of tyre derived materials.

Furthermore, the development of EU standards contributes to a significant increase of the level of quality of tyre derived products while opening the market to new applications, promoting technology exchanges and access to know-how and innovation and protecting the environment.

A case in point is the publication in May 2010 of CEN TS14243 “Materials produced from end of life tyres – Specification of categories based on their dimension(s) and impurities and methods for determining their dimension(s) and impurities”. This Technical Specification aims at characterizing the different materials derived from end of life tyres in terms of dimensions (ELT cuts, shreds, chips, granulates and powders) and impurities (steel & textile) using harmonized methods of sampling and testing.

A new Business Plan for CEN TC366 is currently being elaborated to convert CEN TS14243 into an EN standard.

II. Better knowledge of environmental and health impacts of ELT recovery routes

The use of Life Cycle Assessment, a method for assessing the overall environmental impact of a product from cradle to grave, and the development of leaching studies has led to a better knowledge of the environmental and health impacts of ELT recovery routes.

It is expected that this will also contribute to qualify those ELT derived products with the end of waste status by demonstrating that their use does not lead to overall adverse environmental or human health impacts.

Case study – Aliapur's LCA of 9 recovery methods for end-of-life tyres

At a time when several used tyre recovery methods have achieved a certain maturity, Aliapur performed a comparative environmental evaluation of 9 recovery alternatives for end of life tyres.

The 9 selected routes, that are representative of the main recycling & recovery routes are:
- Recovery in Civil engineering applications (public works): Retention & infiltration basin
- Energy recovery route: Cement kilns and urban heating
- Material recycling: Steel works, foundries, moulded objects, synthetic turf, equestrian floors.

In addition to comparing the different alternatives, this environmental evaluation aimed at identifying the strengths and weaknesses of each recovery method, and of the management of used tyres as a whole. This evaluation was based on the Life Cycle Assessment approach and conformed to the methodological prescriptions developed in ISO 14040 and ISO 14044 standards. It was carried out by PricewaterhouseCoopers Ecobilan in 2009, a consulting firm specialising in life cycle assessments, and was reviewed by a committee of European LCA experts and interested parties.

Parameter / Indicators	Synthetic turf	Moulded object	Cement works	Steelworks	Urban heating	Equestrian floor	Retention basin	infiltration basin	Foundry
Emissions of greenhouse gas of fossil origin (direct, 100 years) (in kg eq. CO_2)	-3,217	-2,703	-1,466	-672	-1,275	-342	-448	-11	-1,193

Source: ALIAPUR 2010

THE MAIN CONCLUSIONS OF THE STUDY

Globally positive results
The LCA made it possible to identify that, under present conditions, all the recovery methods studies provided net environmental benefits, regardless of the environmental impact considered.

Justified investment in the preparation stages
The study also revealed that the impact of the collection, sorting and shredding/granulation stages is secondary in relation to the benefits obtained from the recovery process.

The hierarchy of recovery methods brought into doubt
The LCA shows that the environmental assessment of material recycling methods is not systematically better than that of energy recovery ones. End use applications must be assessed on a case-by-case basis.
Hence the recovery routes for ELTs are both economically and environmentally relevant and play a role in changing the status of end of life tyres from waste to products.

Source : Lifecycle analysis of 9 ELT recovery routes, Aliapur R&D, June 2010

v. Conclusions

Resource-Efficient Europe thanks to Producer Responsibility

On the one hand, ever-spiralling energy and raw material costs could have a positive impact on the further development of the end of life market, especially for tyre-derived products used as secondary raw materials, as the tyre industry uses 70% of all natural rubber produced worldwide and estimates for the next 30 years predict that consumption will double, whilst the availability of natural and synthetic rubbers may become problematic in the coming years.

Consequently, there will be an increased pressure for the sector to better manage that source of secondary raw materials in a sustainable way and all applications that recycle or recover rubber will help to preserve this valuable resource.

Significant improvements in resource efficiency can be met by removing bureaucratic policies regarding recycling and re-utilisation of materials and articles. At present, end of life tyre-derived products have to be managed as waste, even if they are going to be recycled or remanufactured.

This is a burden, which adds significant cost over disposal and in many cases act as a barrier to improved resource efficiency. This may be resolved through pragmatic end-of-waste criteria measures as foreseen in the EU Waste Framework Directive.

On the other hand, ETRMA is very concerned about national developments triggered by economic and financial considerations which endanger the sustainability of the very model of collective producer responsibility established in Europe.

This model, widely used in Europe, has largely proved its economical and environmental efficiency as demonstrates the continuous decrease of the ELT eco-contribution over the years in the countries with Producer Responsibility schemes and concomitant increase of the ELT recovery performance.

The most recent case being Italy, the third biggest tyre market in Europe, that has shifted from a free-market system towards a collective producer responsibility system. As a matter of fact, Ecopneus, a collective ELT management scheme created by tyre manufacturers, started its operations in September 2011.

A case in point is Hungary where the government has recently set a tax-based system aiming at replacing several existing collective Producer Responsibility schemes which were operating for years, of which ELTs. In a situation of economic turmoil, such move might have a cascading effect on neighbouring countries and endanger the very existence of the collective PR model sustainably implemented.

The industry is increasingly earmarking resources to get a better knowledge of the environmental benefits of its various recovery routes and better quantify the various recovery markets. Results of recently conducted Life cycle assessments (LCAs) demonstrate that under present conditions, the substitution of traditional materials by ELTs proved to be environmentally positive in most of the scenarios considered.

Furthermore, the determination of representative reference values (net calorific value, emissions and biomass fraction) for tyre derived fuels help positioning ELTs favourably amongst other traditional solid fuels. As a result, industrialists that use tyres as an alternative fuel source reduce their energy bills whilst declaring less CO_2 emissions.

Finally, the future adoption of a new Business Plan for CEN TC366 (Materials obtained from ELTs) will contribute to a significant improvement of the level of quality of tyre derived products while opening the market to new applications, promoting technology exchanges and access to know-how and innovation and protecting the environment.

To conclude, ETRMA members are committed to pursuing the promotion of their efficient strategy traceable down to the supply chain to encourage the development of the best available techniques for the recycling and recovery of end of life tyres in the EU Member States and beyond and will remain vigilant to avoid the development of national regulations which might impact the sustainability of the Producer responsibility model for ELTs in Europe

Brussels, 31 January 2012

Annexes

Annex I: Used Tyres recovery in Europe (EU27, NO+CH) in 2010

UT/Part Worn Tyres/ELT's Europe - Volumes Situation 2010

National figures (tonnes)	Used Tyres (UT) Arising	Reuse of Part-worn tyres			ELT Arising	ELT recovery				Landfill/ Unknown	Total UT recovery	UT treated
		Reuse	Export	Retreading		Material			Energy			
	(A)	(B)	(C)	(D)	(E)= A-(B+C+D)	Civil engineering[1] (F)	Recycling[2] (G)	Total[3] (H)=(F+G)	Energy recovery (I)	(J)	(K)=(B+C+D+H+I)	(L)=K/A[4]
Austria (est.)	60 000	0	7 000	3 000	50 000	0	20 000	20 000	30 000	0	60 000	100%
Belgium	82 000	1 000	2 000	10 000	69 000	1 000	56 000	57 000	17 000	0	87 000	106%
Bulgaria (est.)	20 000	0	0	0	20 000	0	0	0	0	20 000	0	0%
Cyprus (est.)	8 000	0	0	0	8 000	0	0	0	0	8 000	0	0%
Czech Rep. (est.)	57 000	0	0	2 000	55 000	0	9 000	9 000	29 000	17 000	40 000	70%
Denmark	38 000	0	0	1 000	37 000	0	37 000	37 000	0	0	38 000	100%
Estonia (est.)	10 000	0	0	0	10 000	0	5 000	5 000	4 000	1 000	9 000	90%
Finland	41 000	0	0	1 000	40 000	40 000	0	40 000	0	0	41 000	100%
France	381 000	36 000	0	43 000	302 000	38 000	128 000	166 000	147 000	0	392 000	103%
Germany	614 000	10 000	84 000	45 000	475 000	0	215 000	215 000	260 000	0	614 000	100%
Greece	49 000	0	0	2 000	47 000	0	27 000	27 000	15 000	5 000	44 000	90%
Hungary	30 000	0	0	1 000	29 000	5 000	10 000	15 000	14 000	0	30 000	100%
Ireland	35 000	3 000	2 000	2 000	28 000	8 000	17 000	25 000	0	3 000	32 000	91%
Italy	426 000	0	12 000	43 000	371 000	20 000	80 000	100 000	180 000	91 000	335 000	79%
Latvia (est.)	10 000	0	0	0	10 000	0	5 000	5 000	4 000	1 000	9 000	90%
Lithuania (est.)	11 000	0	0	0	11 000	0	5 000	5 000	4 000	2 000	9 000	82%
Malta (est.)	1 000	0	1 000	0	0	0	0	0	0	0	1 000	100%
Netherlands (PC only)	65 000	0	13 000	2 000	50 000	1 000	39 000	40 000	10 000	0	65 000	100%
Poland	239 000	0	0	20 000	219 000	0	51 000	51 000	168 000	0	239 000	100%
Portugal	92 000	1 000	2 000	18 000	71 000	0	50 000	50 000	26 000	0	97 000	105%
Romania	33 000	0	0	0	33 000	0	1 000	1 000	32 000	0	33 000	100%
Slovak Rep. (est.)	23 000	0	0	1 000	22 000	0	21 000	21 000	1 000	0	23 000	100%
Slovenia (est.)	11 000	0	0	0	11 000	0	6 000	6 000	5 000	0	11 000	100%
Spain	292 000	31 000	0	27 000	234 000	8 000	114 000	122 000	112 000	0	292 000	100%
Sweden	79 000	0	1 000	0	78 000	12 000	19 000	31 000	47 000	0	79 000	100%
UK (est.)	465 000	44 000	54 000	32 000	335 000	75 000	149 000	224 000	102 000	9 000	456 000	98%
Norway	51 000	1 000	1 000	0	49 000	34 000	4 000	38 000	11 000	0	51 000	100%
Switzerland	50 000	3 000	7 000	5 000	35 000	0	5 000	5 000	30 000	0	50 000	100%
EU27+NO+CH (2010)	**3 273 000**	**130 000**	**186 000**	**258 000**	**2 699 000**	**242 000**	**1 073 000**	**1 315 000**	**1 248 000**	**157 000**	**3 137 000**	**96%**
Turkey	188 000	0	0	0	188 000	0	39 000	39 000	33 000	103 400	72 000	85%[5]

Producer Responsibility schemes / 15 countries (as per 31.12.2011)

[1] Civil engineering, public works & backfilling

[2] Recycling: includes granulation, use of ELTs in steel mills and foundries as well as use as dock fenders, blasting mats, …

[3] Material recovery

[4] UT treatment > 100% : the quantity of Used Tyres treated can exceed the arising in some countries where Producer Responsibility is in place, because ELT management organizations may have collected more than their obligation

[5] In Turkey, the 2010 national UT arising is estimated at 188,000 t. The producer responsibility obligation for 2010 is limited to collecting and managing 45% of that tonnage. This obligation is set at 50% in 2011 and will progressively increase in the following years.

Annex II: European legislation impacting tyre recycling

1993 **Regulation on supervision and control of trans-border shipment of waste** 259/93/EEC

1999 **Directive on the Landfill of Waste** - 1999/31/EC

- Ban on used tyres (whole tyres) in landfill starting July 2003
- Ban on shredded tyres in landfill starting July 2006

2000 **European Waste List** - 2000/532/EC and further amendments
End of life tyres are classified under code '16 01 03'

2000 **Directive on Incineration of Waste** - 2000/76/EC

- Fixes emission standards for all cement kilns starting in 2002
- Older cement kilns prohibited from burning end-of-life tyres after 2008
- From December 2008, new provisions apply to cement kilns co-incinerating waste including end of life tyres. The cement kilns currently burning ELT in Europe are already complying with this Directive.

2000 **Directive on End of Life Vehicles (ELV)** - 2000/53/EC

- 85% of scrap cars to be recovered starting 2006
- tyres to be dismantled from vehicles increasing ELT arising by 10%

2001 **EC Decision on EU list of wastes** - 2001/118/EC, end of life tyres are classified under **entry 16.01.03**. This text applies from 1st January 2002 in EU Member States.

2005 **EC Thematic strategy on prevention and recycling of waste** - COM(2005)666 final)

- provides an holistic analysis of the major achievements in the waste management area for the past 30 years. It stresses a need to further developing approaches for the determination of best environmental options and for the setting of targets for recycling and recovery of waste, taking into account the differences between products and materials and the possible alternative.
- encourages the principle of producer responsibility- strategy proactively applied by the tyre manufacturers since late 90's in anticipation of EU regulatory requirements.

2008 **Waste Framework Directive** - 2008/98/EC

- sets the basic concepts and definitions related to waste management and lays down waste management principles such as the "polluter pays principle" or the "waste hierarchy".
- introduces the concept of end of waste, by which selected waste streams could cease to be considered as waste if they comply with end of waste criteria.

Annex III: International bodies recommendations on tyre recycling

2004 **OECD Environment Policy Committee**
Improving Markets for Secondary Materials: Case Study Report on Rubber
(ENV/EPOC/WPNEP(2004)2, 30 April 2004)

2011 **UNEP Basel Convention**
Technical Guidelines on Environmental Sound Management of Used Tyres
(UNEP/CHW.10/6/Add.1/Rev1, Revised Final version adopted at COP10, 31 October 2011).

Annex IV: National ELTs management companies

Belgium	RECYTYRE	Chris Lorquet: www.recytyre.be
Estonia	Eesti Rehviliit	Kaur Kuurme: www.rehviliit.ee
Finland	Suomen Rengaskierrätys Oy	Risto Tuominen: www.rengaskierratys.com
France	ALIAPUR	Eric Fabiew: www.aliapur.com
Greece	eco elastika	Giorgios Mavrias: www.ecoelastika.gr
Hungary	HUREC Abronics Újrahasznosító Kft.	Andras Kovacs: www.hurec.hu
Italy	ecopneus	Giovanni Corbetta: www.ecopneus.it
NL	Vereniging Band & Milieu	Cees van Oostenrijk: www.recybem.nl
Norway	Norsk Dekkretur AS	Hroar Braathen: www.dekkretur.no
Spain	SIGNUS	Jesús María Núñez Imaz: www.signus.es
Poland	Centrum Utylizacji OPON	Grzegorz Karnicki: www.utylizacjaopon.pl
Portugal	valorpneu	Climénia Silva : www.valorpneu.pt
Romania	ECO ANVELOPE	Florin Brabete: www.ecoanvelope.ro
Sweden	SDAB	Lars Åman : www.svdab.se
Turkey	LASDER	Bahadir Ünsal: www.lasder.org.tr

About ETRMA

ETRMA is the Voice of European tyre and rubber manufacturers, representing 4,200 companies in EU27, employing 360,000 individuals, with an industry turnover exceeding of € 46 bn.

In 1989, a Used Tyres Group dedicated to the management of end of life tyres was set up under the strategic guidance of the ETRMA's Tyre Steering Committee. This Group is composed of experts from the main tyre manufacturers producing in Europe, which are **Apollo Vredestein, Bridgestone Europe, Continental, Goodyear Dunlop Tires Europe, Hankook Tire Europe, Marangoni, Michelin and Pirelli Tyre**.

The Used Tyres group mission is to:

Promote the environmentally and economically sound management (recovery and recycling) of end of life tyres in those countries where tyres are still diverted to landfill, and proactively pursue Producer Responsibility with a dedicated financing scheme;

Provide the necessary assistance in EU Member States in anticipating the achievement of the provisions of the EU Landfill Directive for end of life tyres from 2006;

Promote the principle that end of life tyres are a resource that can be used in a wide array of applications;

Propose a "downstream management" for tyres coming from end of life vehicles;

Develop procedures to ensure that end of life tyres exported do not go into illegal reuse.

The activity of the Used Tyres Group covers all the Member States of the EU, plus Candidate Countries such as Turkey and Croatia.

The European tyre industry is committed to assist in promoting environmentally and economically sound end of life management practices for its products. The industry continues to promote the development of appropriate markets for end of life tyres, provides technical and policy information regarding end of life tyres management, and advocates a legislative and regulatory framework that contributes to the achievement of these goals.

ETRMA undertakes action to host European, international and national conferences for authorities and advocates for sound EU programs to address end of life tyre issues.

ETRMA does not represent and does not have any vested interest in the processing of end of life tyres or in any product made from end of life tyres.

ETRMA promotes the principle that end of life tyres are a valuable resource with growing potential.

This edition is the **4th report** on end of life tyres management in Europe published by ETRMA as part of the tyre manufacturers' continued commitment to promote the best available techniques for the effective recycling and recovery of end of life tyres.

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