



2022

SUSTAINABILITY REPORT



ECOPNEUS

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This new edition of the Sustainability Report of Ecopneus describes, once more, the solidity, efficiency and quality of a system that carries on generating value for Italy. This value is delivered by efficiently managing ELTs carefully collected throughout the country, as well as through a strong commitment to research and development in support of the circular economy of ELTs. This approach is now facing important changes that are quickly paving the way to new possibilities for the whole sector of ELT management in Italy and Europe. Indeed, well-proven sports applications will no longer absorb large amounts of recycled ELTs. However, chemical recycling is offering new perspectives for ELT recycling, as well as the interconnection of industrial chain dynamics with international market scenarios. We have seen these challenges coming from afar and we are now ready to face them with actions that will continue to ensure that we reach those management targets we have always matched and noticeably exceeded. We feel that our stakeholders are supporting us in this journey. We are at their complete disposal with reference to their technical and institutional work to the advantage of our shared objective of serving our community. Our partners' mandate is still the same: assuring ELT management efficiency, supporting the activities of the spare part market with the aim of increasing the recycled rubber flow for strategic uses in Italy and with important financial savings at national level. This is a fundamental objective still focused on the spreading of the use of rubberised asphalts on Italian roads. It is a ready and useful solution for long-lasting, sustainable road infrastructures. Chemical recycling, instead, is now opening new opportunities for ELT valorisation. We have reacted to all current challenges with the same commitment and sense of duty we have always had. This is the way Ecopneus complies with the mandate the Italian citizens and the Public Institutions have bestowed upon us. We are open to collaboration and dialogue, as we are focused on the reaching of financial and environmental advantages and benefits for our community. With our activities, we also aim at reducing the national CO₂ emissions, thus contributing to the common effort to combat climate change – the real global challenge we all have to face.

FEDERICO DOSSENA

General Manager of Ecopneus

Within the scope of what Ecopneus has achieved since the beginning of its activities in full and rigorous compliance with DL 152/06, and in particular art. 228, we are currently heading towards new paths along the way to sustainability. We are being led to new approaches to sustainability that are paired with the effort of tyre producers to further develop sustainable products and technologies. At the same time, we are striving for ever better quality and efficiency at the service of the whole Tyre- ELT chain. After over 10 years, the work of Ecopneus is now fully operational and it has contributed to consolidate the national system of ELT management. The time has now come to face new perspectives for the use of the materials derived from ELT recycling. These new possibilities allow to obtain materials that can be reintroduced in the tyre production cycle. Processes such as pyrolysis have been made possible thanks to consolidated technologies and have already been implemented in many foreign countries. We, thus, have new opportunities for further growing professionally. They are a new vision for the companies of ELT treatment too. It is an important way forward for research and development that may lead to the full valorisation of recycled rubber – a sophisticated material with extremely high performances during its whole life cycle. Our commitment to supporting Italy's sustainability objectives and the Tyre circular economy remains unchanged. It is also the foundation of the effort made by Ecopneus and its shareholders. We are proud of it.

ALESSANDRO DE MARTINO
President of Ecopneus

**THE
ECOPNEUS
SYSTEM**

01

An abstract graphic consisting of numerous thin, light green lines radiating from a central point on the right side of the page. Each line terminates in a small, solid green dot. The lines and dots are arranged in a fan-like pattern, creating a sense of movement and expansion across the right half of the image.

THE ECOPNEUS SYSTEM.

The implementation of a real circular economy constitutes one of the crucial passages Italy must go through to achieve those global sustainability objectives the whole of Europe is urgently responsible for.

Ecopneus has always acted bearing in mind this objective, as the future of all companies and our society is based on it. It must lead to the development of new production and consumption modalities, as well as a new vision of both our present and future. Within this scope, the contribution of Ecopneus is to be the main body responsible for the management of End-of-Life Tyres (ELTs) in Italy. Since 2011, this system traces, collects and recovers about 400,000 tons of ELTs all over Italy every year. This amount corresponds to the weight of over 42 million automobile tyres, recovered from automobiles, motorbikes, trucks up to large vehicles for quarries and agriculture.

Within this frame, Ecopneus is responsible for the management of about 60% of the whole amount of ELTs legally sold on the Italian market during the previous solar year. This amount corresponds to what was produced by its partners.

Every year, Ecopneus has to trace, collect and recover 100% of the ELTs it is responsible for. In the course of the years, its efforts have always gone beyond its targets with a yearly tyre management average that is +8.2% higher than its legal obligations.

THE ELT COLLECTION IN THE ECOPNEUS SYSTEM 2011 - 2022 (t/year)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
LEGAL TARGET	66,453	227,566	221,245	222,190	222,957	226,255	235,480	224,774	210,434	196,501	167,118	193,145
Ordinary collection	72,468	240,145	241,196	252,059	241,328	245,722	241,485	240,539	220,421	189,569	200,491	231,727
Extraordinary collection, special projects and historical stocks	-	2,928	5,748	2,982	6,638	6,662	3,623	5,751	410	417	418	395
TOTAL OF COLLECTION	72,468	243,073	246,944	255,041	247,966	252,383	245,108	246,290	220,831	189,986	200,909	232,122
Extra-legal target collection	6,015	15,507	25,699	32,850	25,099	26,129	9,628	21,516	10,396	-6,516	10,289	38,977
EXTRA-TARGET PERFORMANCE	109%	107%	112%	115%	111%	112%	104%	110%	105%	97%	105%	120%

THE ORGANISATION

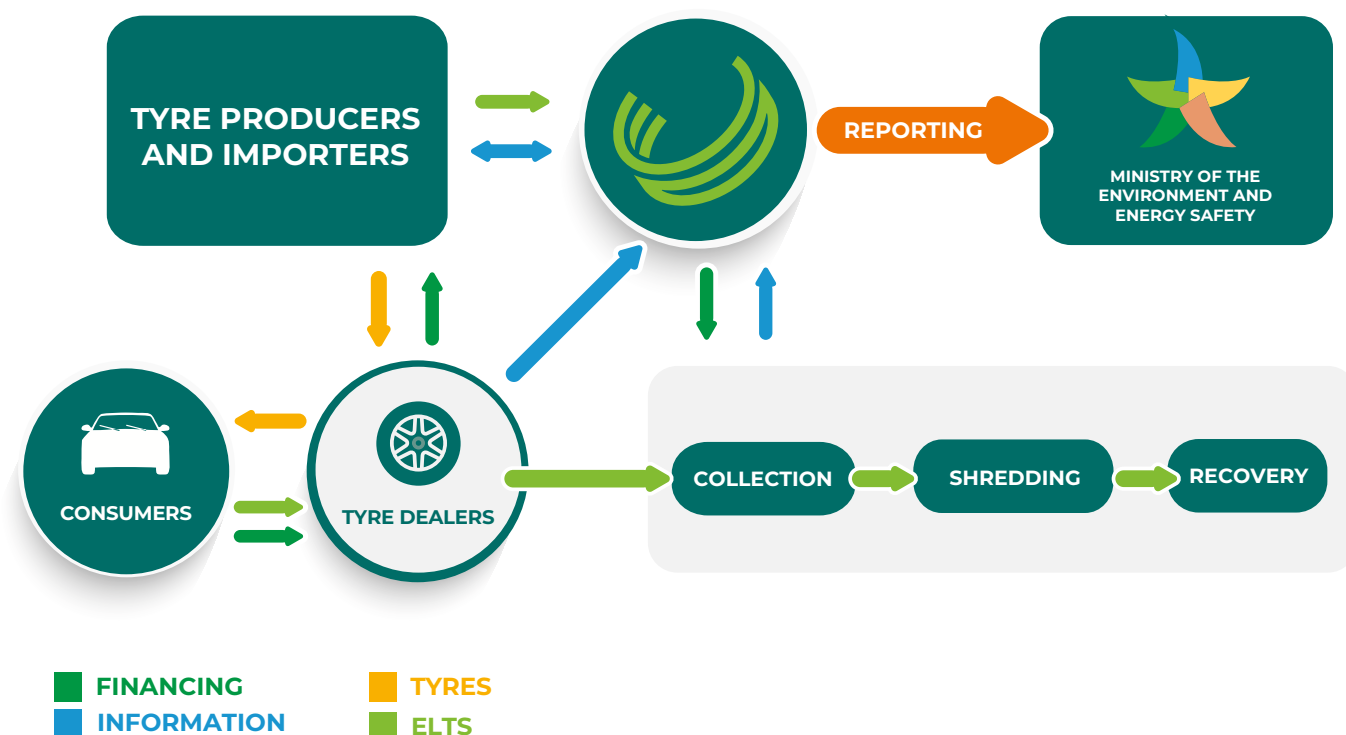
Ecopneus is a **limited liability non-profit consortium**. It was founded by the main tyre producers/importers in Italy. Many other companies have joined it in the course of the years.

The Ecopneus system is based on ELT collection activities from the spare part market operators, where drivers replace the tyres they cannot safely use anymore as per legal requirements (the Italian Highway Code sets out in detail the requirements that a tyre must meet in order to still be used). Once they have changed their tyres, they leave the old ones behind. These are subsequently classified as ELTs – i.e. waste.

The tyre dealer or the operator of the workshop or service station enters every single ELT into the virtuous cycle that collects and recycles them. It is a system with several players (drivers, collection companies, treatment and recovery plants) and Ecopneus is its supervisor and “director”. Indeed, Ecopneus ensures the full recovery of every single ton of ELTs they are responsible for, starting from the moment when tyres are replaced in the workshop until they are recovered in specialised plants in Italy.

This mechanism is financed through an eco-fee paid by the drivers for each tyre they purchase. These eco-fees are used to cover all system management costs. It is a virtuous management system that ensures the collection and recovery of all tyres legally stored in each operator’s workshop for free. The Ministry of the Environment and Energy Security is the control body of Ecopneus and all the bodies responsible for the management of ELTs in Italy. The does this through the documented reporting of companies’ activities. It is also responsible for what concerns the ELT flows as well as the flow of money linked to ELTs.

ECOPNEUS IN THE NATIONAL ELT MANAGEMENT SYSTEM



THE VALUES

The activities and daily commitment of Ecopneus are inspired by its awareness of managing financial resources paid by the citizens upon their purchasing of tyres. Ecopneus is responsible for giving citizens a service of careful management and valorisation of a type of waste composed of precious materials that can have a new life, avoiding the use of virgin raw materials at the same time.

It is an important objective whose results benefit our society, cities, the national financial balance sheet and, above all, environmental protection. For this reason, the efforts of Ecopneus are based on values that remind them every day of the ultimate goals of their work.



REGULATORY FRAMEWORK

- **ART. 228 OF D.L. 152/2006**
Tyre producers and importers are to provide for the management of an amount of ELTs that corresponds to the tyres sold during the previous solar year, net of 5% tread consumption and exports. This applies the principle of Extended Producer Responsibility. The latter is an organisational model supported by the European Commission and applied by the majority of the Member States.
- **M.D. 82/2011**
Established the nationwide system for the management of ELTs and every implementation modality of art. 228.
- **M.D. 182/2019**
Published in the Official Gazette on 8th April and in force since 23rd April 2020, this Decree has updated and replaced MD 82/2011. Indeed, it has improved certain aspects that had been identified as areas of improvement of the legislation in force. The Decree entered into force on 1 st January 2021.
Its main news make reference to:
 - Regulation of online tyre sales directly from abroad to Italian consumers (B2C from abroad) that have significantly grown in the last decade
 - Better definition of the subjects that can take on responsibility in a consortium – both for that concerns the founding bodies and the associated ones
 - More accurate definition of the obligations of the bodies authorised to work all over the national territory and of all typologies of ELTs. Similar quotas per geographical areas have been established that provide for tyre collection based on request sequence and without any link with brands and sales activities. This has assured the total separation of tyre sales and ELT management
 - Clearer and fairer identification of the bodies that operate in the national ELT management system.

THE ECOPNEUS CHAIN

The crucial strength of the results Ecopneus has achieved in the course of time is the work of an **external, independent and specialised** network of companies. These are entrusted with the activities of collection, transportation and recovery of ELTs all over the Italian territory. The Milan-based staff of Ecopneus ensures the management of processes and the traceability of the ELTs managed during all collection activities, as well as their recovery as material or energy.

The companies of the chain are selected through online tenders every three years. This allows Ecopneus to enter into agreements with companies that are able to provide the required services with the best quality, reliability and efficiency standards with regards to the system management needs. Such requisites are periodically verified in order to make sure the companies comply with the System based on specific protocols for ELT management quality, workers' safety and environmental protection. Moreover, Ecopneus also strives to stimulate the companies of the chain, so that they do not only collect ELTs, but they also become promoters of initiatives aimed at starting virtuous processes for the whole system towards an ever greater use of recycled rubber. The activities in support of the Ecopneus partner companies are many. Consultancy and assistance tools aim at constantly improving the Ecopneus chain with the aim of achieving an ever greater quality of the product leaving treatment plants. This makes reference both to Vulcanised Rubber Granules (VRG) used in sports applications, and to shreds used for energy recovery in cement factories.

In the course of time, Ecopneus has developed analysis products and tools to support its partner companies and the development of the market of recycled rubber. Among these, sector studies have been carried out to analyse the internal and external dynamics of the Ecopneus chain to support the future vision of its companies. Among these studies is the report: "The Ecopneus Effect. Innovation, development, and quality of the ELT chain". Published in 2019, this report written by the Symbola Foundation analyses how the management and development system set up by Ecopneus has led to growth, development and better quality among its partner companies in the course of time. Upon the release of this document in June 2023, a new updated version of this Report has been published. We shall here present an excerpt of it.

THE ECOPNEUS EFFECT.

INNOVATION,
DEVELOPMENT,
AND QUALITY
OF THE ELT
CHAIN

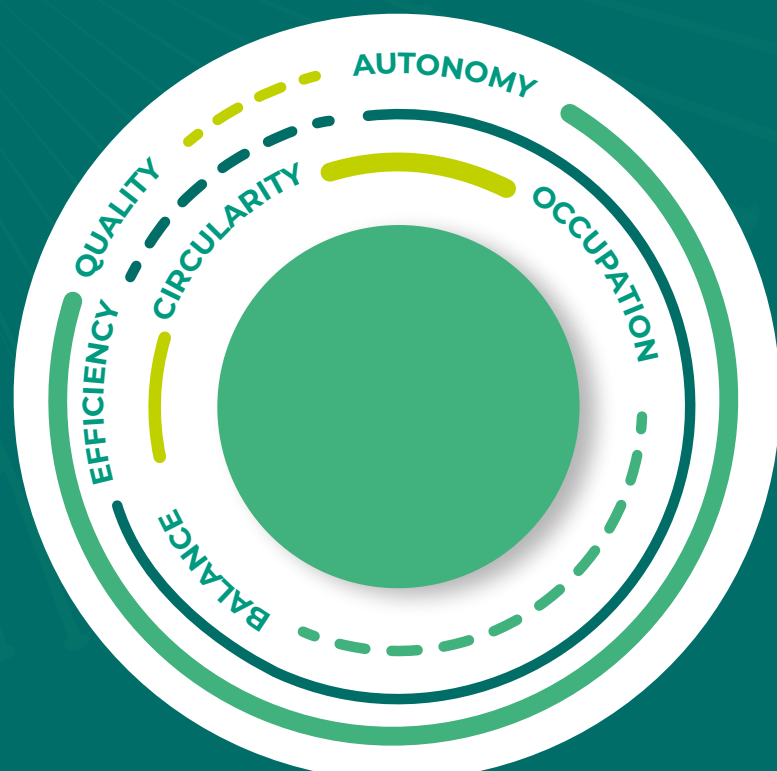
The first report on the Ecopneus Effect was published in 2019. The Symbola Foundation used this expression to identify the results of the operating model adopted by Ecopneus. Indeed, this model provides for indirectly working on the industrial front by the means of a network of qualified companies located all over the Italian territory. This report is the result of complex and in-depth work aimed at reconstructing data since Ecopneus was first set up in 2011. Its objective was to verify how changing had taken place on the network of companies from the setting up of the activities until the 2016-2017 two-year period.

The new report has taken into consideration the period going from 2018 to 2021. Its results have demonstrated further changing for the Ecopneus system. The first period showed “quantitative growth” (occupational growth in primis, but also in terms of turnover). This was analysed in the first report (2011-2017). The various parameters used to evaluate the subsequent phases, instead, showed “qualitative growth”.

We are, thus, talking about an **increase in productivity**. The invoicing per employee ratio for the companies partners of Ecopneus almost doubled in the period from 2016 to 2021 with a 14.7% increase, compared to an estimated 7.6% increase in the previous period. An **increase in efficiency** was demonstrated, with a +6.0% increase up to the year preceding the pandemic-induced crisis. An **increase in autonomy** was observed: the ratio between the value of the ELT-derived products sold on the market and the total turnover of ELTs grew by almost two percentage points. Moreover, between 2017 and 2021, the circularity index went up. It was calculated as the median recovery parameter for material and energy and was quantified at +12.1%. In addition to this, **quality increased** as well. The G1 granule production went from 28% of the total in 2011 to 44.7% in 2017 and reached 58.2% in 2021. Above all, **an ever greater balance of the system was found**. Between 2017 and 2021, the index calculated according to the reduction of differentials among companies of the ratio between turnover and input for the total of ELT production grew by 1.6 times. It is said that “a chain is strong as its weakest link”. The objective of Ecopneus has been to align all companies to high quality standards.

THE ECOPNEUS EFFECT.
*Innovation, Development,
and quality in the ELT chain.*
Symbola, Foundation for
Italian quality 2023.

The indicators of quali-quantitative nature the “Ecopneus Effect” was based on in the Symbola Report are shown in the table on the right

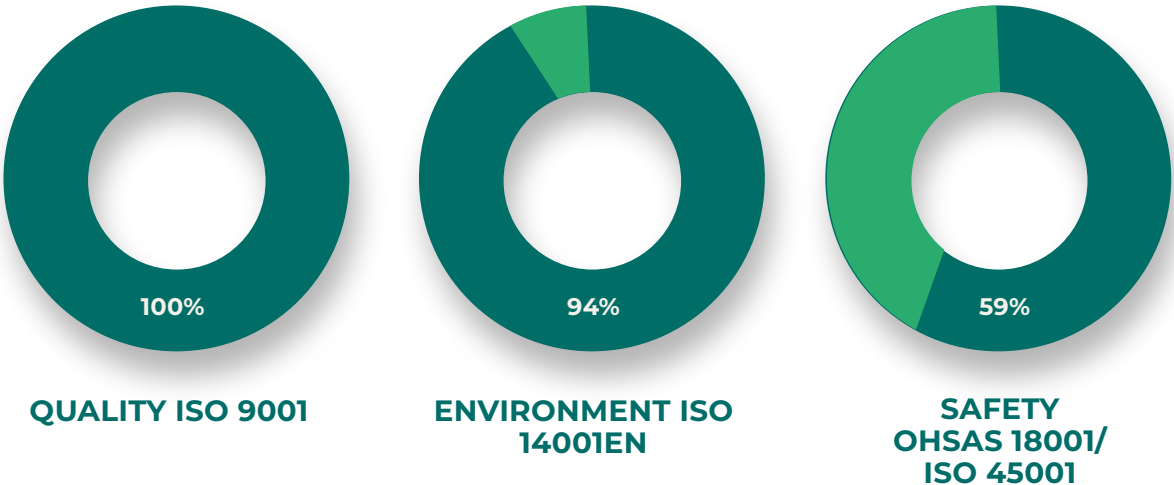


Finally, the path of development followed by the partners of Ecopneus has seen a constant growth in the number of quality, environment and safety certifications. In particular, the ISO 9001 has been widely implemented for what concerns quality management; whilst the ISO 14001 standard has been adopted for the environment.

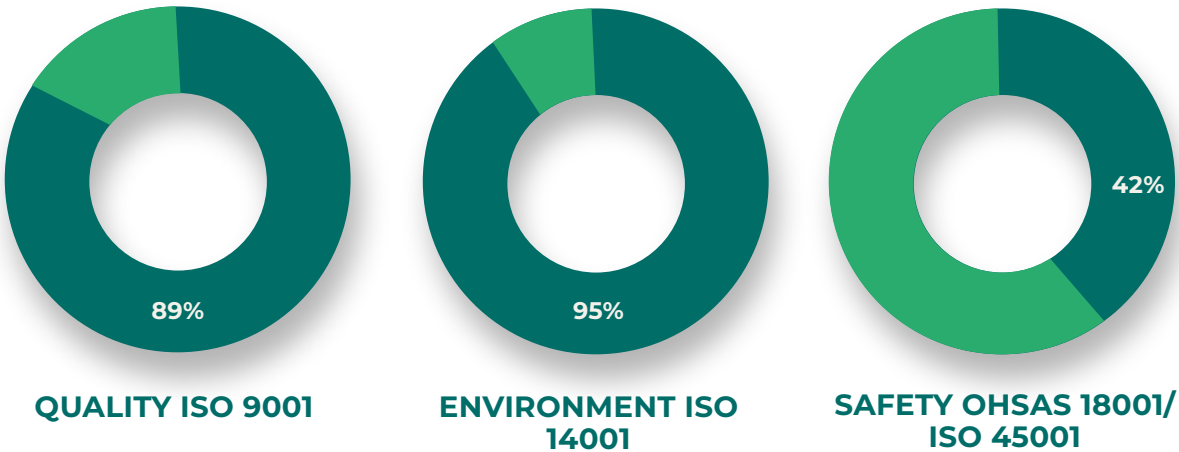
THE CERTIFICATIONS OF THE PARTNER COMPANIES OF ECOPNEUS

Certification		Company
QUALITY	ISO 9001	89%
ENVIRONMENT	ISO 14001	95%
SAFETY	OHSAS 18001 / ISO 45001	42%

Collection Companies

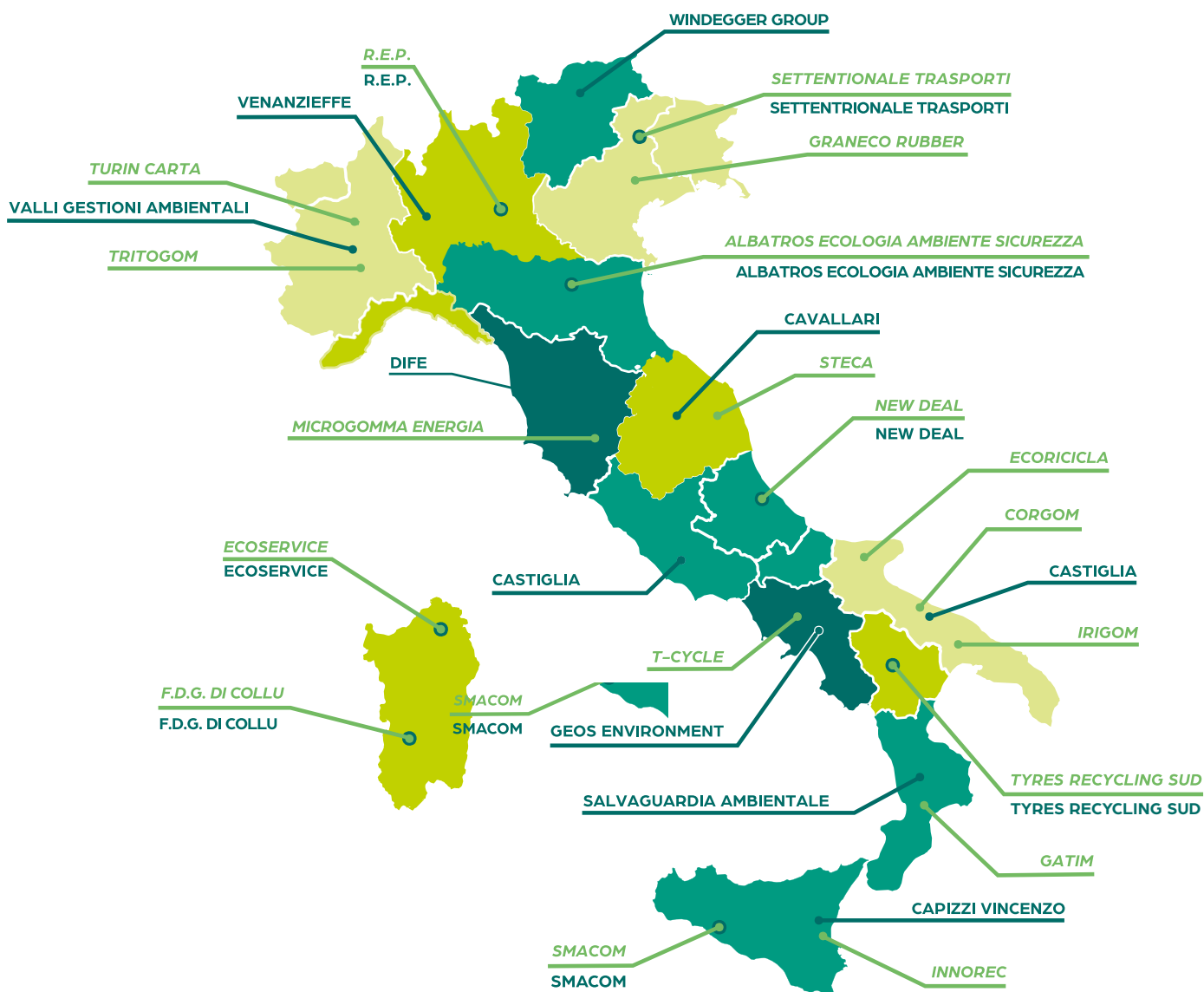


Shredding Plants



THE PARTNER NETWORK.

AS OF
30/04/2023



KEY:

COLLECTION COMPANIES

SHREDDING AND
GRANULATING COMPANIES

SHREDDING AND
COLLECTION COMPANIES

**THE 2022
RESULTS**

A decorative graphic consisting of numerous thin, light green lines radiating from a central point behind the number '02'. Each line ends with a small green dot. The lines are arranged in a fan-like pattern, spreading outwards and downwards from the top left towards the bottom right.

02

THE RESULTS OF **ECOPNEUS** IN 2022.

The average annual collection target for Ecopneus is of about 200,000 tons of ELTs. In 2022, the collection target of Ecopneus set by the law was **193,145 tons of ELTs**.

As per legal obligations, such amount was calculated starting from the amount of new tyres sold on the spare part market by the shareholders of Ecopneus in 2021. From these, 5% in weight is to be deducted due to tread wear, as well as the amount of used tyres sold abroad during the same year.

In light of these legal obligations, the Ecopneus **ordinary collection** amounted to **231,727 tons of ELTs** in 2022. This extraordinary performance was over 20 percentage points above its legal target. It was made possible thanks to the daily work of a network of 100 companies located all over Italy that were selected by the means of transparent e-tenders.

Ecopneus welcomed the request of the Ministry of the Environment to collect an amount of ELTs between +15% and + 20% of their target for the year 2022 to face any eventual extra amounts of ELTs stored in the premises of the spare part market operators¹.

In order to comply with such request from the Ministry and to meet the needs of operators¹, Ecopneus provided for an operative and management plan that allows to manage an extra target collection of almost +20%. This corresponds to 38,581 tons collected above its legal obligation.

An **ELT collection quota deriving from extra-ordinary activities** is to be added to these amounts. These activities were carried out within the scope of the Memorandum for ELT collection in the Terra dei Fuochi area and amounted to **395 tons** in 2022.

The Memorandum for the Terra dei Fuochi was signed in 2013 by the then-Ministry of the Environment (now Ministry of the Environment and Energy Security), the Prefectures of the Cities of Naples and Caserta, the Municipalities of Naples and Caserta, and the Commissioner appointed to fight the burning of waste. Since then, this memorandum has overseen the interventions of collection and management of the ELTs dumped in the territory of the Provinces of Naples and Caserta, thanks to extra-ordinary funds paid by Ecopneus

The overall ordinary and extra-ordinary ELT collection of Ecopneus in 2022 amounted to **232,122 tons**. This figure saw some growth after the contraction recorded in 2021 due to the anomalous collection activities caused by the COVID-19 pandemic.

¹The collection obligations of consortia and the bodies in charge of ELT management that sell over 200 tons of tyres a year, calculated in accordance with M.D. 182/2019, were incremented (from +15% up to +20%) at the end of 2020 by the means of the MiTE Directive n. 103883 of 11/12/2020 whenever it was needed to recover greater amounts of ELTs than what stated in the M.D. 182/19.

2022 DATA HIGHLIGHTS.

23,177

GENERATION
POINTS SERVED

193,145 t

Collection target
as per M.D. 182/2019

231,727 t

ORDINARY ELT
COLLECTION

80,784

SATISFIED
COLLECTION
REQUESTS

+19.97%

Compared with
target set by law

38,581 t

EXTRA TARGET
COLLECTION

395 t

EXTRA-ORDINARY ELT
COLLECTION

232,122 t

OVERALL ELT
COLLECTION

228,171 t

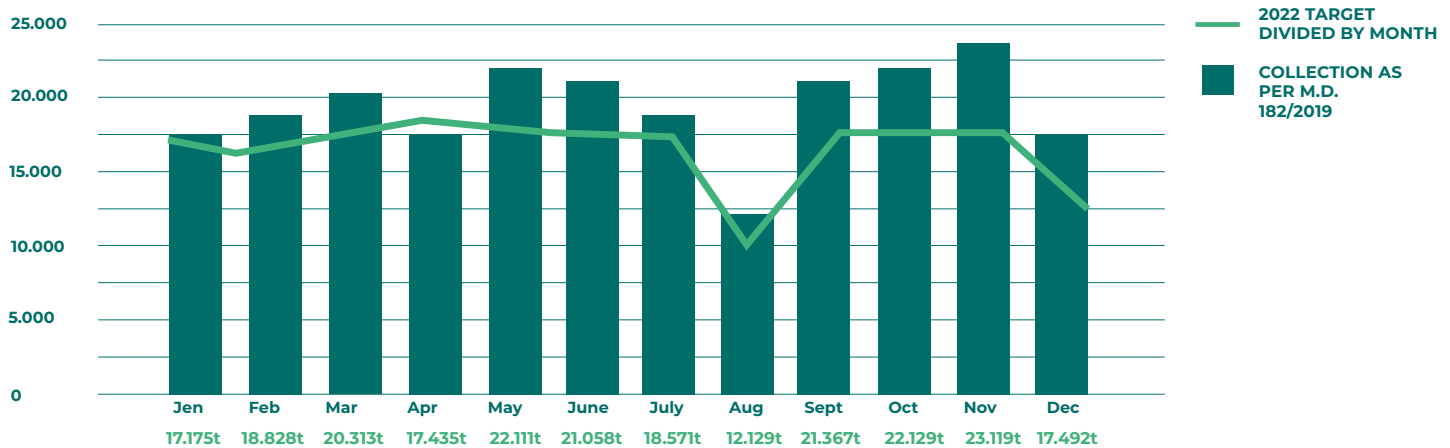
RECOVERED ELTS

COLLECTION MANAGEMENT

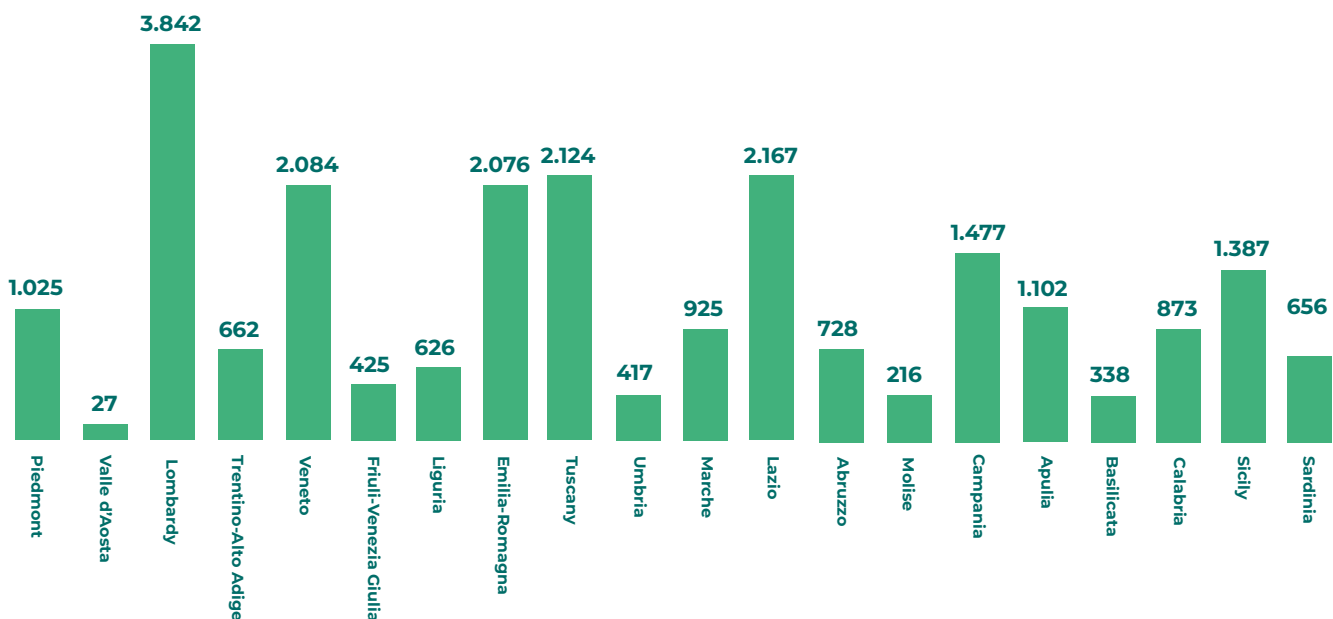
The ordinary Ecopneus ELT collection in 2022 amounted to **231,727** tons. This figure saw some growth after the contraction recorded in 2021 caused by the COVID-19 pandemic. 2022 saw the repetition of the great performance of 2021, with an **extra-target ordinary collection that amounted to 120% (38,581t collected extra-target in 2022)**. This extra collection aimed at recovering all tyres accumulated at dealers in compliance with the specific indications issued by the Ministry of the Environment and Energy Security. Such objective is the result of careful planning that modulates the collection activities and the use of the available financial resources on a monthly basis. The financial resources Ecopneus is responsible for come from the sales of new tyres and are used to finance the recovery of ELTs.

The progress of these activities is published on the website of Ecopneus on a monthly basis (www.ecopneus.it). This offers great transparency as it allows to verify the daily efforts of the consortium. The following graph shows the progression of the Ecopneus tyre collection for 2022. It is on a monthly basis and the annual target has been divided throughout the whole year in order to keep it under control.

COLLECTION AS PER M.D. 182/2019 - 2022 TARGET DIVIDED BY MONTH



NUMBER OF GENERATION POINTS SERVED PER REGION



The ordinary 2022 collection was carried out satisfying **80,784 collection requests** at **23,177 ELT Generation Points (ELTGP)** located all over the Italian territory (23,030 in 2021). This number grew compared to the previous year, when it was 65,508

The geographical distribution of the collection points served in the course of 2022 is an important indicator of one of the main distinctive elements of Ecopneus within the Italian national ELT management system. Indeed, its collection activities are far-reaching. This shows the effort Ecopneus puts into complying with all rules and regulations, as well as its efficient reaction to all collection requests received from all operators on the Italian territory – even in those areas of our Country that are logistically and, thus, financially, more expensive to serve. Also the geographical distribution of the amounts collected shows a widespread presence of the activities of Ecopneus throughout all Italian regions and provinces.

The data highlight the full compliance of Ecopneus with what is stated in M.D. 182/2019 with reference to the coverage of all Italian regions according to an allocation system based on percentages per geographical area. This scheme was set bearing in mind the collection requests coming from the various geographical areas. Although there is always room for improvement, this scheme shows the Legislator's aim to make sure that all Italian regions have access to an adequate ELT collection system. This also protects the environment from the risk of ELT dumping that is to be taken into consideration in the light of situations of ELT accumulation within the premises of the spare part operators.

The compliance with such Regulation is the main guideline for Ecopneus. This is shown in the table here-below. With reference to the amounts stated in the Regulation, a **10% deviation from the target values per geographical area** is allowed – notwithstanding the obligation of collecting 100% of the target.

COLLECTION TARGET PER GEOGRAPHICAL AREA AS PER M.D. 182/19 FOR THE CONSORTIA AND THE BODIES IN CHARGE OF ELT COLLECTION WITH YEARLY INPUT OF OVER 200 T/YEAR.

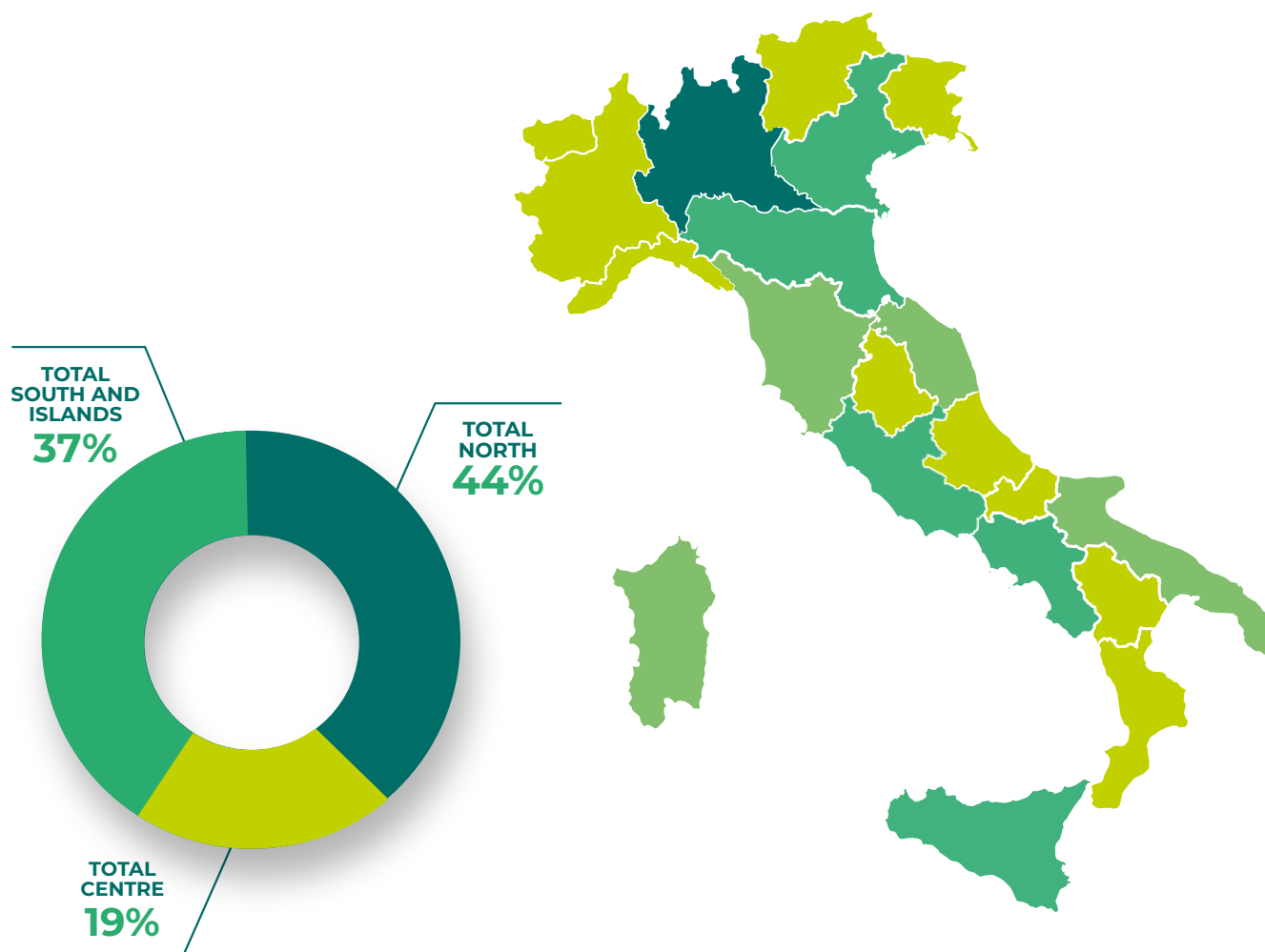
ALLOCATION BY LAW		ECOPNEUS COLLECTION	
		€	%
Piedmont - Valle d'Aosta - Liguria	11%	14,760	7.64%
Lombardy	15%	33,883	17.54%
Trentino-Alto Adige - Veneto Friuli-Venezia Giulia	12%	33,227	17.23%
Emilia Romagna	8%	20,418	10.57%
Tuscany - Marche - Umbria	11%	26,068	13.50%
Lazio - Abruzzo - Molise	13%	26,303	13.62%
Campania	9%	20,417	10.57%
Apulia - Basilicata - Calabria	10%	29,808	15.43%
Sicily - Sardinia	11%	26,791	13.87%
Total	100%		120%

44% of the total of ELTs collected as per ordinary management came from the North of Italy. It was a stable situation compared with 2021. 19% came from the Centre of Italy (21% in 2021) and 36.5% was recovered in the South and the Islands (35% in 2021). Compared with 2021, ELT collection in the three macro areas of the Italian Peninsula remained stable. It showed a minimum increase in the South with a few extra percentage points. The regions that collected the largest amounts of ELTs were Lombardy and Veneto in the North; Lazio in the Centre and Campania in the South. These data reflect the distribution of the generation points on the territory and of the vehicles circulating in Italy. They also reflect the number of resident citizens.

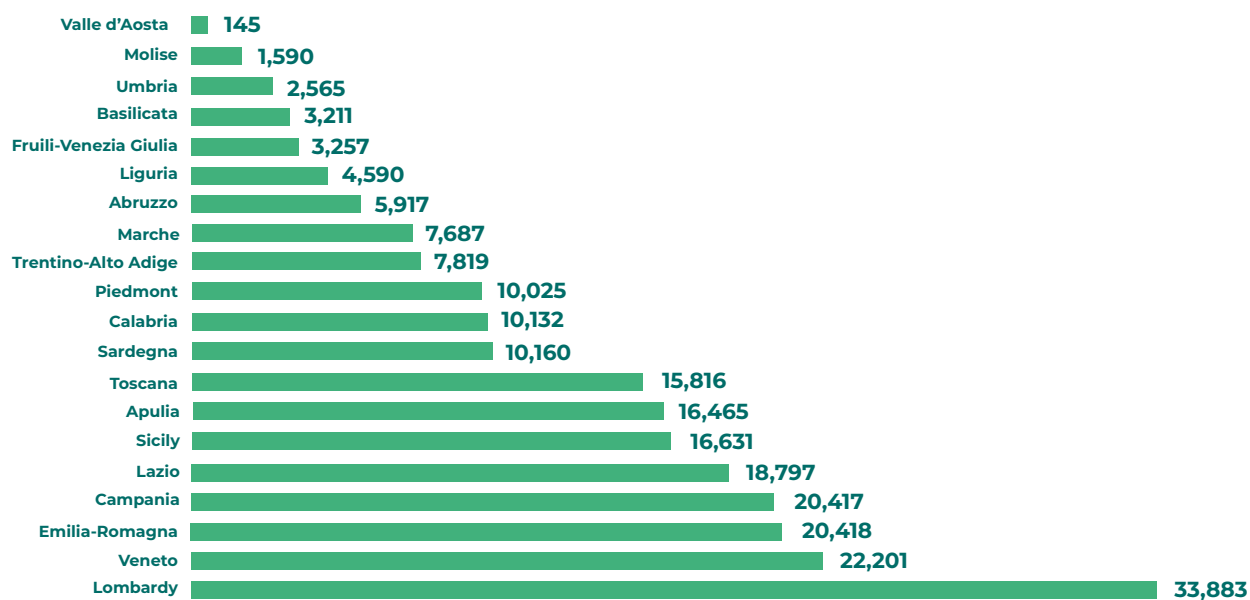
THE COLLECTION OF ECOPNEUS PER PROVINCE (t in 2022)

PIEDMONT	10,025	LIGURIA	4,590	MOLISE	1,590
Alessandria	1,739	Genova	2,499	Campobasso	1,150
Asti	425	Imperia	776	Isernia	440
Biella	796	La Spezia	703	CAMPANIA	20,417
Cuneo	2,672	Savona	612	Avellino	2,042
Novara	862	EMILIA-ROMAGNA	20,418	Benevento	1,411
Turin	2,779	Bologna	4,477	Caserta	3,234
Verbano-Cusio-Ossola	574	Ferrara	1,214	Napoli	8,853
Vercelli	177	Forlì-Cesena	1,262	Salerno	4,877
VALLE D'AOSTA	145	Modena	3,877	APULIA	16,465
Aosta	145	Parma	2,544	Bari	4,277
LOMBARDY	33,883	Piacenza	1,240	Barletta-Andria-Trani	1,620
Bergamo	2,539	Ravenna	1,254	Brindisi	1,317
Brescia	5,760	Reggio nell'Emilia	3,075	Foggia	3,949
Como	2,261	Rimini	1,475	Lecce	3,278
Cremona	1,595	TUSCANY	15,816	Taranto	2,025
Lecco	1,129	Arezzo	1,585	BASILICATA	3,211
Lodi	793	Florence	4,226	Matera	786
Mantova	2,112	Grosseto	1,499	Potenza	2,426
Milano	8,848	Livorno	1,087	CALABRIA	10,132
Monza e della Brianza	2,345	Lucca	1,656	Catanzaro	1,658
Pavia	1,681	Massa-Carrara	1,073	Cosenza	3,542
Sondrio	966	Pisa	674	Crotone	1,380
Varese	3,854	Pistoia	1,898	Reggio di Calabria	3,877
TRENTINO-ALTO ADIGE	7,819	Prato	986	Vibo Valentia	664
Bolzano	2,811	Siena	1,133	SICILY	16,631
Trento	5,008	UMBRIA	2,565	Agrigento	1,476
VENETO	7,819	Perugia	1,695	Caltanissetta	817
Belluno	568	Terni	870	Catania	4,854
Padova	4,812	MARCHE	4,357	Enna	853
Rovigo	1,259	Ascoli Piceno	1,040	Messina	1,644
Treviso	3,318	Ancona	2,290	Palermo	1,749
Venezia	2,622	Fermo	930	Ragusa	1,617
Verona	4,796	Macerata	1,567	Siracusa	1,692
Vicenza	4,826	Pesaro e Urbino	1,860	Trapani	1,928
FRIULI-VENEZIA GIULIA	3,257	LAZIO	18,797	SARDENIA	10,160
Gorizia	519	Frosinone	2,196	Cagliari	2,950
Pordenone	947	Latina	2,466	Nuoro	1,876
Trieste	490	Rieti	763	Oristano	784
Udine	1,301	Roma	12,504	Sassari	2,444
	2,622	Viterbo	868	Sud Sardegna	2,106
		ABRUZZO	5,917		
		Chieti	2,428		
		L'Aquila	1,345		
		Pescara	1,131		
		Teramo	1,013		

COLLECTED AMOUNTS (t/y)



ELTS COLLECTED BY ECOPNEUS PER REGION IN 2022 (T)

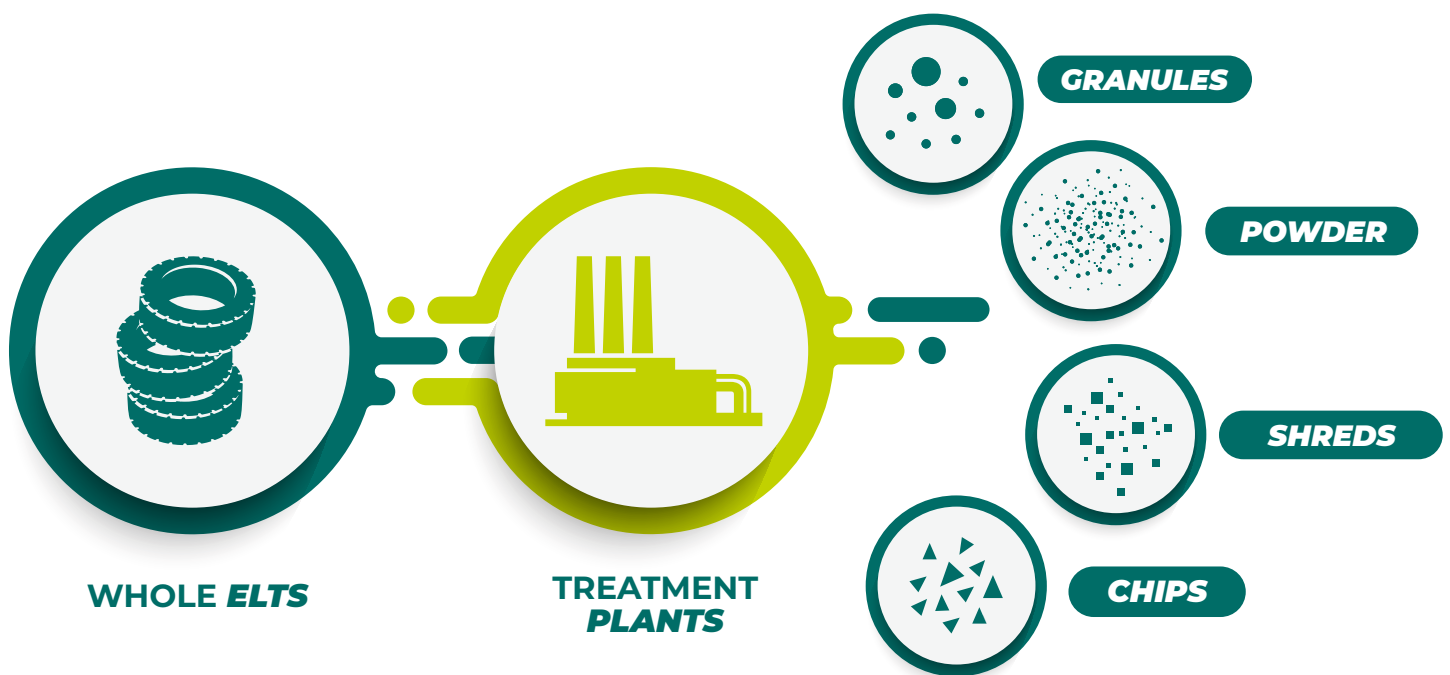


THE RECOVERY OF ELTS

Ecopneus is responsible for all the steps of the process up to the recovery of every single ELT as material or energy, as summarised in the diagram below. Following the collection activities carried out by the companies responsible for this process throughout Italy, the activities of recovery must comply with the these guidelines:

- compliance with the **recovery hierarchy** set out at European level, **prioritising material recovery** to energy recovery
- ELT recovery is to be done in authorised plants **in Italy**
- strong commitment to **the quality of the recycled rubber leaving treatment plants** and destined to be used in many applications.

ELT TREATMENT

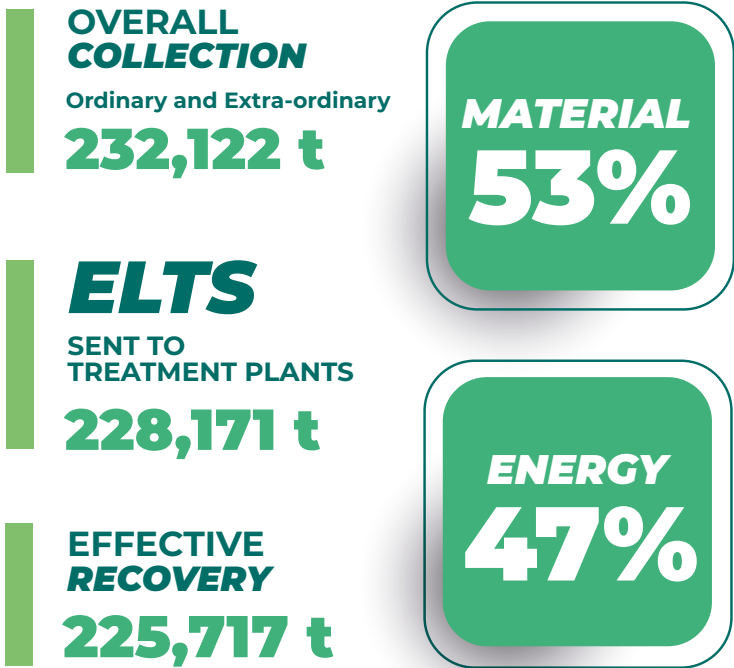


Through a mechanical treatment process, ELTs are subject to progressive shredding until they reach a smaller and finer size depending on the end use they are destined to.

Indeed, materials with different dimensions are obtained from such process:

- **Rubber Powder** (0-0,8 mm)
- **Granules** (0,8-18 mm, even if mainly <6 mm)
- **Chips** (up a 35 mm)
- **Shreds** (up a 350 mm)

In 2022, the Ecopneus System managed the following flows of ELTs:



Comparing the data of the 2022 management with the ones of the previous year, a **14%** increase of the treated amounts can be noticed and **over 15%** for what concerns the recovered amounts.

With reference to the effective material recovery, a **+5% was recorded compared with 2021**, to the detriment of energy recovery, which showed a reduction by the same amount.

2021		2022	
EFFECTIVE MATERIAL RECOVERY	EFFECTIVE ENERGY RECOVERY	EFFECTIVE MATERIAL RECOVERY	EFFECTIVE ENERGY RECOVERY
48%	52%	53%	47%

2021/2022 EFFECTIVE MATERIAL RECOVERY

+5%

For the purposes of calculating the amounts of ELTs recovered, the following is considered as material recovery:

- granular vulcanised rubber from ELT treatment (it is considered as recovered upon its production at the recovery plant as per the End-of-Waste M.D. 78/2020).
- steel deriving from ELT shredding recycled in steel factories.
- whole or shredded ELTs used as material for engineering use .

For the purposes of calculating the amounts of ELTs recovered, the following is considered as energy recovery:

- whole or shredded ELTs (shreds, chips) used in cement factories
- whole or shredded ELTs (shreds, chips) used in plants for the production of electrical power
- textile waste deriving from ELT treatment used in cement factories.

As already said, **228,171 tons** of ELTs were recovered in plants located in Italy within the frame of the Ecopneus System in 2022.

In detail, such amount of ELTs has been calculated as follows:

- **215,524 tons** were sent to **shredding plants** for being prepared for their recovery as material or fuel in 20 plants located in Italy
- **12,598 tons** were used as fuel for the production of **electrical power** in 2 plants in Italy
- **49 tons** were destined to other uses as **material in engineering works**

DELIVERY OF WHOLE ELTS TO TREATMENT PLANTS (T / 2022)

	t/2022
WHOLE ELTS RECOVERED	12,647
As fuel	12,598
For engineering use	49
WHOLE ELTS SENT TO SHREDDING PLANTS	215,524
TOTAL OF DELIVERY	228,171

The treatment process allows to separate the different materials End-of-Life Tyres are composed of: rubber, steel, textile fibres. By the means of market dynamics, these materials are subsequently recovered in other chains (rubber, steel) or are used for energy recovery (textile fibres). In particular, the ELT-derived rubber is treated according to the modalities, quality control and monitoring systems described in the **“End of Waste”, M.D. 78/2020**. Once it leaves its treatment plants, this rubber is known as **“Granular Vulcanised Rubber”**. This raw material derived from recycling is used in a number of important applications. The publication of the “End-of-Waste” Decree was the result of a long and complex process with many technical and institutional checks and verifications. It **represented an important moment for the valorisation of rubber recycled from ELTs and it greatly supported the market of this material with many possible applications** in the world of sports, in rubberised asphalts, for anti-vibration and sound proofing systems, and much more.

THE “END OF WASTE” DECREE FOR GRANULAR VULCANISED RUBBER - M.D. 78/2020

The Decree n. 78/2020 issued by the then Ministry of the Ecologic Transition (now the Ministry of the Environment and Energy Security) has significantly boosted the market of recycled rubber. Indeed, it has set the conditions and the characteristics that define recycled rubber as material. This national Regulation has allowed to overcome all potential uncertainties and different interpretations of local laws.

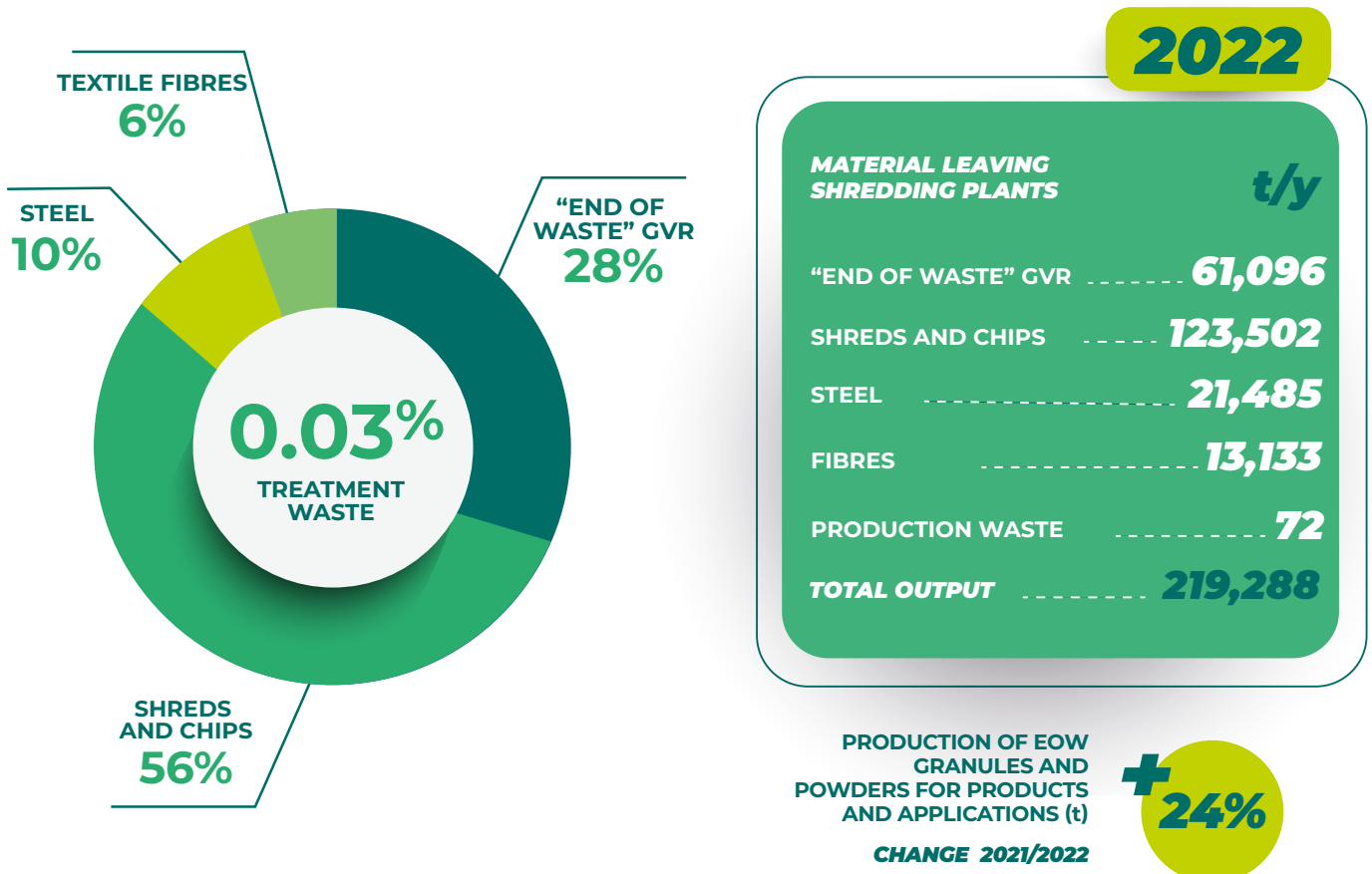
As a matter of fact, the recycling plants now are sure about how the recycled material leaving their plants will be defined, thanks to these new common guidelines. At the same time, the companies that use rubber granules and powders can now rely on a certification for every single material batch. This ensures the quality, characteristics and safety of the product.

In detail, among the main operative updates introduced are:

- Only non-contaminated and/or materials from tyre retreading (buffing) are allowed
- The plants are to implement verification and selection procedures as well as a washing system to remove all possible external contamination (mud, cobbles etc.).
- They must also provide for sampling and analyses carried out on the recycled material they have produced.
- Producer's certification on every production batch. In the Decree, the material is defined as “Granular Vulcanised Rubber” and no longer recycled rubber
- Vulcanised rubber must comply with certain technical criteria listed in Attachment 1 of the Decree.
- Granular Vulcanised Rubber (EoW) can be solely used for the purposes stated in Attachment 2 of the Decree.

The 20 Italian plants – 13 in the South, Islands included, 2 in the Centre and 5 in the North – produced the materials listed in the following table in 2022. The difference between the amounts treated and the products of the recycling process depends on the extra amounts of ELTs that are stocked in the shredding plants upon year end and are recycled during the year taken into consideration.

MATERIAL LEAVING THE ELT SHREDDING PLANTS

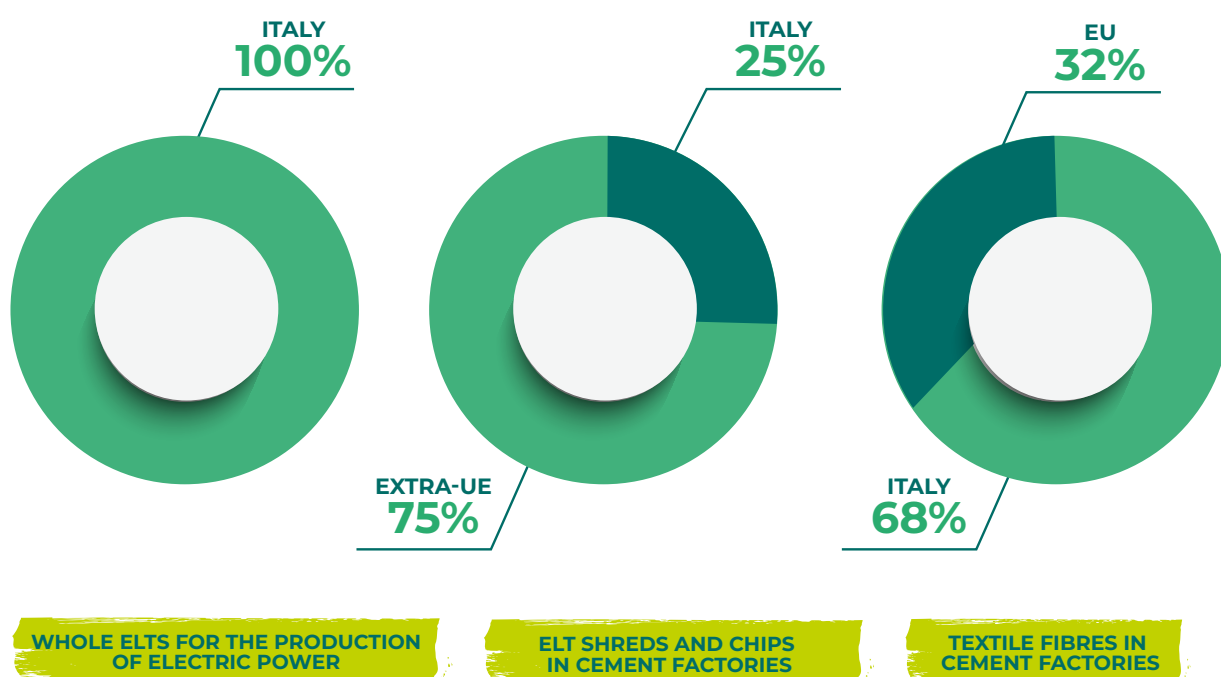


OVERALL DATA ABOUT ELT RECOVERY IN 2022 (t/year)

MATERIAL RECOVERY	
EoW granules and powders for products and applications	61,096
Steel recycled in steel factories	21,485
Whole ELTs used in engineering works	49
Total of material recovery	82,630
ENERGY RECOVERY	
Whole and shredded ELTs for the production of electrical power	15,198
Shredded ELTs for cement factories	109,071
Textile fibres for cement factories	12,599
Total of energy recovery	136,868
SHREDS SENT TO INDIA FOR GRANULATION	
	6,219
Total of recovery	225,717

For what concerns the territorial distribution of ELT-derived fuel, energy recovery was mainly carried out in cement factories in 2022 (**121,670 tons**). **25%** of them are located in Italy, **75%** in Turkey. The recycling of **whole and shredded ELTs for the production of electrical power** is 100% done in plants located in Italy.

Textile fibres are recycled as fuel in cement factories, of which: **68%** are located in Italy and **32%** abroad (in the EU, namely Austria and Hungary).



THE EFFECTIVE RECOVERY

In order to calculate such effective recovery, it is to be considered that solid residues are produced in the processes of combustion and co-combustion of ELTs aimed at energy recovery. These solid residues can be used as materials in some cases. In particular, during the co-combustion process in cement factories, a portion of the material is mixed in cement in addition to what is recovered as energy. They are: steel, ashes and metal oxides. Based on literature data, Susdef and Ecopneus have made an estimate of the contribution of the combustion residues to the mix that composes cement, starting from the composition of ELTs.

Equally, solid waste is produced during the processes of combustion for the production of electrical energy. This can be partially recovered. The final values deriving from the re-collocation of these activities help to complete the picture of the effective recovery of ELTs of the Ecopneus management. In 2022, the total of ELTs managed amounted to 221,817 tons, net of the quantities of combustion residues of ELTs for the production of electrical power. Of these, 116,905 tons were recovered as material; whilst 104,913 tons were turned into energy. Moreover, **the effective material recovery** from ELTs was greater than energy recovery, above all, thanks to the recovery of Granular Vulcanised Rubber carried out in plants located all over the Italian territory. For what concerns **energy recovery**, this process was mainly performed abroad, in European and non-European states (mainly in Turkey). This was caused by the fact that there is little request for ELT-derived fuel from Italian cement factories.

The 2022 material recovery rate, thus, seems to have caught up with the performances of the years preceding 2020. Thus, it seems to be a sign of recovery of the market of granular vulcanised rubber for products and applications, especially after the contraction caused by the Covid-19 pandemic.

EFFECTIVE RECOVERY PERFORMANCE	2016	2017	2018	2019	2020	2021	2022
Material Recovery	56%	51%	56%	57%	47%	48%	53%
Energy Recovery	44%	49%	44%	43%	53%	52%	47%



MATERIAL RECOVERY
(GRANULES, STEEL,
WHOLE ELTS,
RESIDUES OF
COMBUSTION IN CEMENT)

53%

EFFECTIVE
RECOVERY
MATERIAL AND
ENERGY

2022

ENERGY RECOVERY
(SHREDS, CHIPS,
WHOLE ELTS,
TEXTILE FIBRES)

47%

**RUBBER
RECYCLED
FROM ELTS**

03

A decorative graphic consisting of numerous thin, light green lines radiating from a central point behind the number '03'. Each line ends with a small, solid green dot. The lines are arranged in a fan-like pattern, spreading outwards and downwards from the top left towards the bottom right of the page.

RUBBER RECYCLED FROM ELTS.

From the European sustainability objectives to ONU's Sustainable Development Objectives. To reach these ambitious goals, it is of uttermost importance to head towards a model that matches environmental sustainability with the social and financial one. Within this scope, Ecopneus has become a promoter of dynamics that go beyond the sole collection and recovery of an end-of-life product. They are to trigger virtuous mechanisms, where sustainability becomes the key for strategic development and a central driver of companies' business choices. This creates qualified occupation, supporting research and development activities towards an ever greater use of recycled rubber. A constant commitment founded on ethics and legality to the advantage of the environment, the citizens, the companies of the chain, and its stakeholders.

ELT-derived rubber preserves those characteristics of elasticity and resistance that make tyres exceptionally performing objects. Nowadays, there are many applications that can valorise the excellent characteristics of this material and the added value it offers: ready-to-use and widely tested solutions that are still little used in Italy. Indeed, Italian companies are unable to absorb all the recycled rubber that would be possible to obtain from recovered ELTs. An example of such technologies is asphalt made with recycled rubber powder. It can last for up to three times longer than conventional asphalts, it reduces the noise of the passing vehicles and offers greater security thanks to its resistance to pots and cracks. Despite these great advantages, rubberised asphalt is still struggling to enter the Italian market.

Ecopneus carries out constant and important research and development projects in Italy. This research aims at developing new applications that may bring the characteristics and the advantages of recycled rubber to new sectors. Tyre producers are also constantly working on reintroducing recycled rubber in the production cycle of new tyres. This is a crucial objective to close the circle of ELT recycling. However, the process of vulcanisation has been a problem so far. Another important chemical application is the process of chemical recycling (pyrolysis). Starting from ELTs, it allows to obtain pyrolysis oil and carbon black, important elements for the production of new tyres. Such technology is being taken into serious consideration and many European countries are already investing in it.

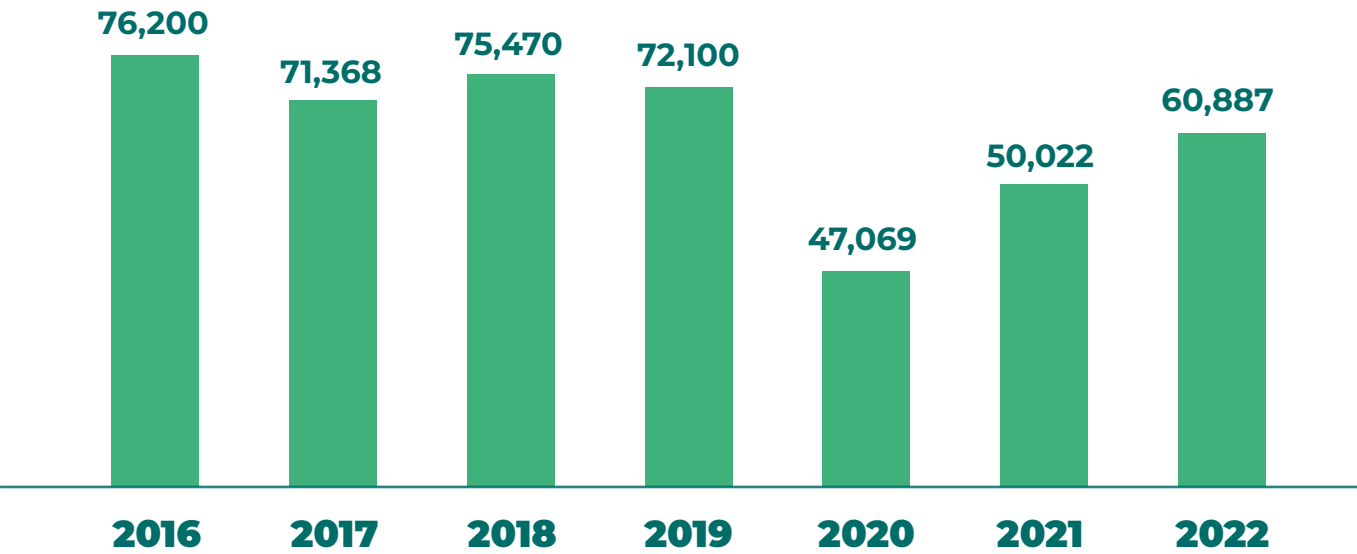
Aiming at the development of the market of ELTs and recycled rubber, Ecopneus is further studying the potentialities of these opportunities, because Italy may take part in the most advanced and interesting dynamics of ELT valorisation. However, this perspective will need to go hand in hand with the evolution of the current legislation, so that the latter may provide for the innovation generated from the research carried out on the new technologies of ELT recycling.

**THE MARKET OF GRANULAR VULCANISED RUBBER
PRODUCED BY THE ECOPNEUS CHAIN.**

In 2022, 60,887 tons of granular vulcanised rubber (GVR) were sold on the national and international market within the scope of the Ecopneus system. In the shape of granules and powder, this product saw an increase by almost +22% compared with the previous year (50,022 tons sold in 2021).

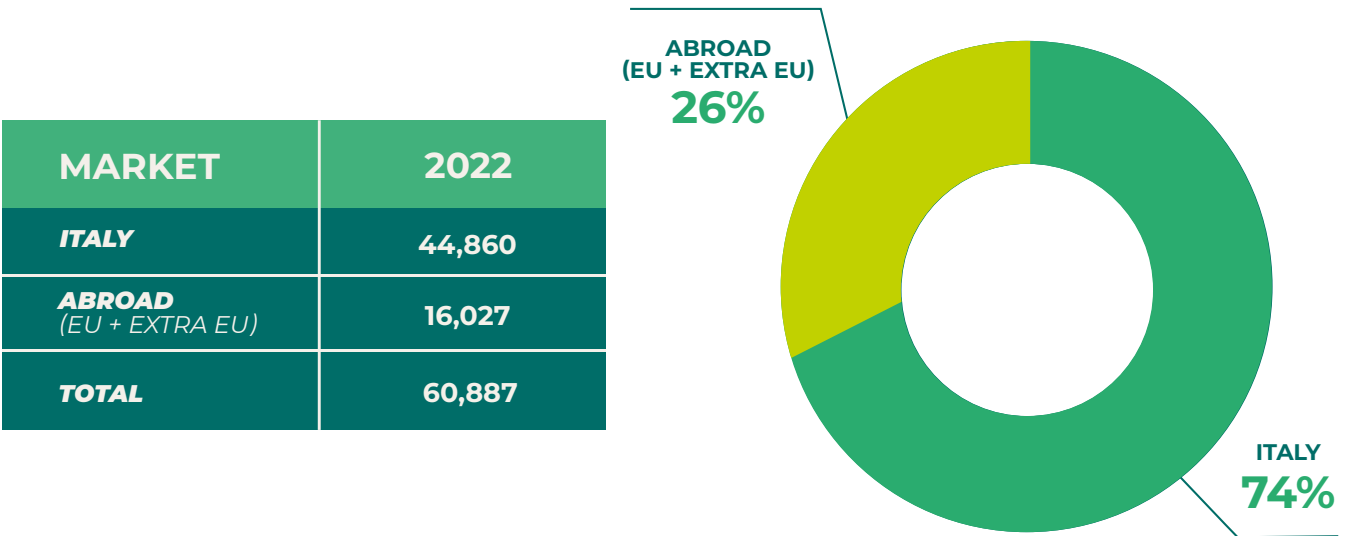
Compared with 2021, such amount is more aligned with the over 70,000 tons sold in the years preceding the Covid-19 pandemic. As such, it shows the market has recovered following such negative phase.

SALES OF GVR IN THE ECOPNEUS SYSTEM 2016 - 2022 (t/y)



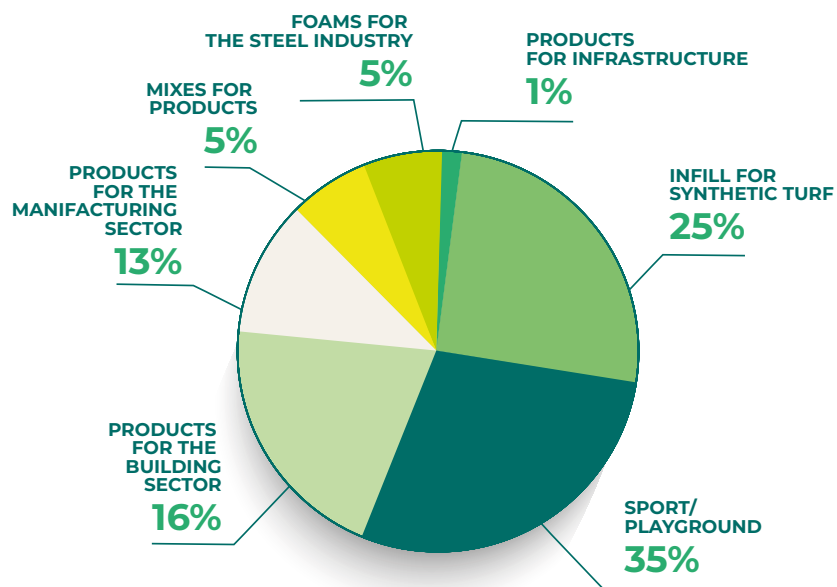
For what concerns the output markets, the Italian market remained the main one for the companies of the Ecopneus system: 74% of production was sold and used in Italy, whilst 26% abroad (EU and extra EU).

GVR MARKET IN THE ECOPNEUS SYSTEM - 2022 (t/year)

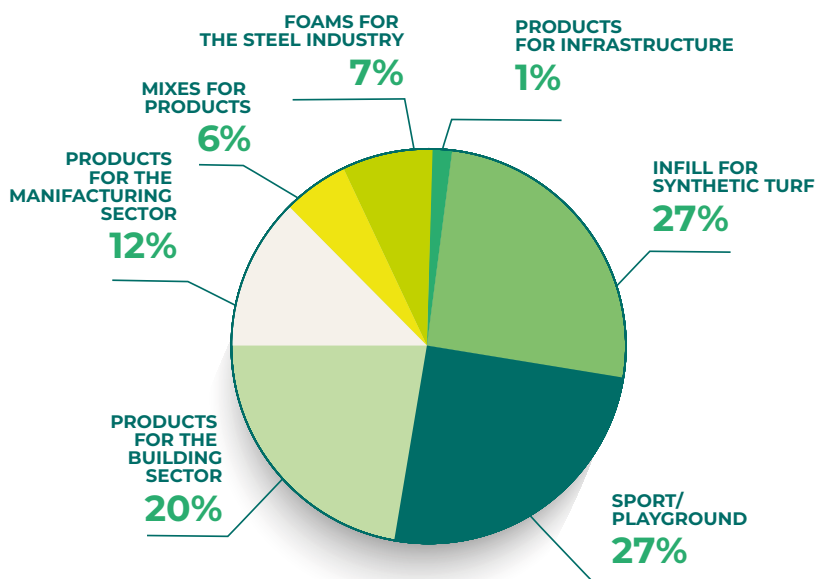


In line with the previous year, about 60% of the GVR sold was used for the production of sports surfaces, as well as infill for synthetic turf pitches. The total amounted to **36,331 tons mainly consumed in Italy**. In that respect, it is important to highlight that **15,050 tons** were used as infill for synthetic turf pitches. This is **almost 25% of the market of the recycled rubber chain**. In the light of such figures, it must be highlighted that such use is currently being banned by the EU within the scope of a general ban on microplastics. This risks to jeopardise the sector of the production of infill for synthetic turf pitches, thus affecting the chain of ELT recycling. The amounts of GVR used for the production of manufacts for the building sector (mainly soundproofing panels), for the manufacturing sector as well as – to a smaller extent – the sector of infrastructure are given here below. All this amounted to **17,718 tons in 2022, which is about 30% of the market of the chain taken into consideration**. Also in this case, it was mainly utilised in Italy. Finally, GVR was also employed in mixes for products (**3,365 tons**) and foams for steel factories (**3,161 tons**). **Only 312 tons were destined to the production of bitumen/asphalts and bituminous conglomerates**. Thus, the usage of ELT-derived GVR was still very limited for the production of rubberised asphalts in 2022. Rubberised asphalt is one of the most interesting applications for the future development of the market of recycled rubber, in the light of the aforementioned ban on the production of synthetic turf pitches. Considering the data and what has been said above, it is of utmost importance to incentivise this market at national level. First of all, by activating the legislative tool of the Green Public Procurement and by issuing a Ministerial Decree on the Minimum Environmental Requirements for road design, building and maintenance.

USE OF GVR IN THE ECOPNEUS SYSTEM IN 2022 - NATIONAL AND INTERNATIONAL MARKETS



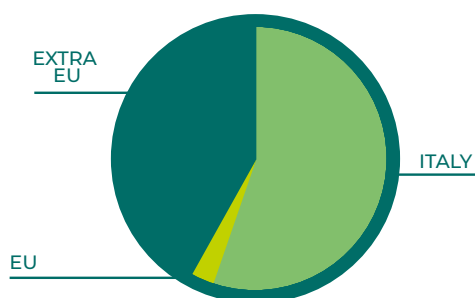
USE OF GVR IN THE ECOPNEUS SYSTEM IN 2022 - NATIONAL MARKET



USE OF GVR IN THE ECOPNEUS SYSTEM IN 2022 (t/y)

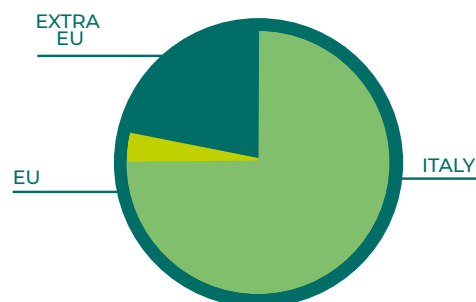
SPORT/PLAYGROUND

21,281 t



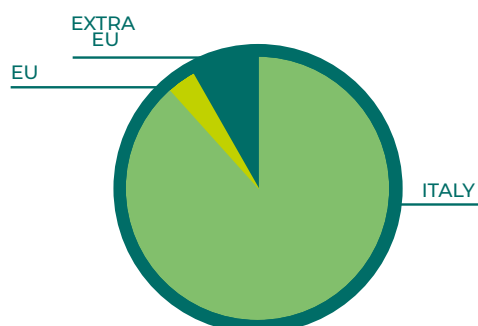
SYNTHETIC TURF INFILL

15,050 t



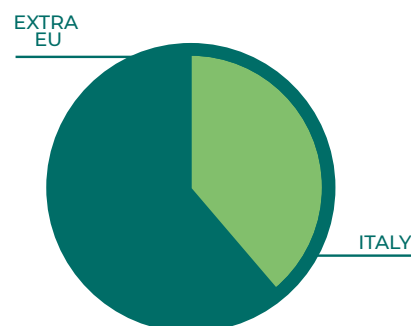
PRODUCTS FOR THE BUILDING SECTOR

9,600 t



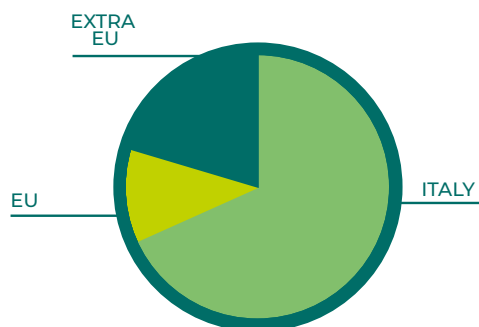
PRODUCTS FOR INFRASTRUCTURES

463 t



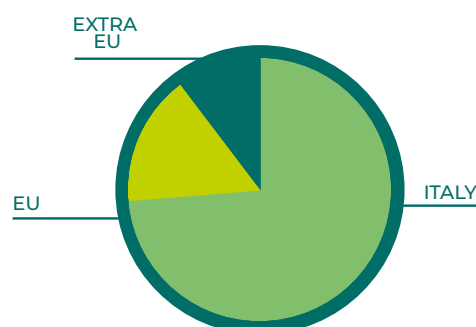
PRODUCTS FOR THE MANUFACTURING SECTOR

7,655 t



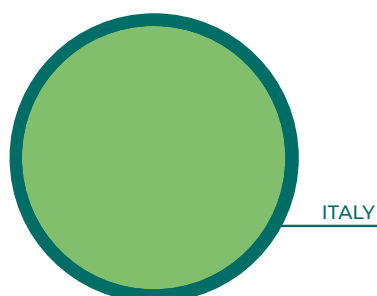
MIXES FOR PRODUCTS

3,365 t



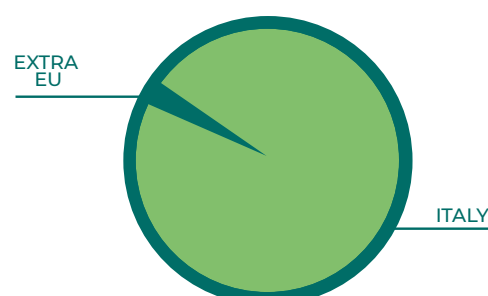
BITUMENS/ASPHALTS/CONGLOMERATES

312 t



FOAMS FOR STEEL FACTORIES

3,161 t



The effort of Ecopneus for the valorisation of recycled rubber on the Italian market complies with some underlying assumptions:

- apply the EU hierarchy for waste management, prioritising material recovery and supporting the stages leading to reuse and reconstruction
- support the consolidation and development of the companies of the sector for an ever better quality of the material leaving their plants
- promote output markets for the available material, prioritising the Italian market and leaving the foreign markets as a secondary option.

These aspects go beyond waste management. They affect the whole chain, promoting new jobs, creating new markets and developing the existing ones. Moreover, they consolidate a segment of the circular economy that may feed itself on a sole market logic. The effort of promoting ELT-derived material recovery providing for energy recovery as the second option has suffered from the effects of the Covid-19 pandemic. Indeed, the latter affected market demand for recycled rubber for products and applications, thus effectively bringing the realisation of installations to a halt.

The financial crisis linked to the war in Ukraine has further impacted the sector, as it has affected the production costs of plants and, as a consequence, the price of rubber granules, powders and, of course, the end products.

2022 saw a recovery and an increase in production of rubber granules and powders compared with 2021

THE BRANDS OF THE MAIN SECTORS OF APPLICATION.

Within the scope of the effort of Ecopneus for promoting the applications of rubber recycled from End-of-Life Tyres, three brands have been developed. They support the spreading of the applications of recycled rubber and highlight its main sectors of use. They are a useful tool to support the work of communication and awareness-raising towards the Public Administration, the technicians, and the public opinion.



It identifies sports surfaces made with ELT-derived rubber. They are highly-performing surfaces. They last for long and can adapt to every sport and performance level: from professional players to the local playground. It is a consolidated market that could further expand to sectors that are still under-exploited, such as horse riding, sailing, or livestock farming, offering great advantages for animals' wellbeing.



It makes reference to the innovative compounds born out of the combination of ELT-derived rubber powder with thermoplastic materials. Adequately mixed by the means of specific compatibilisers, the rubber powder transfers the characteristics typical of rubber to the polymeric matrix. Examples of such characteristics are the absorption of both vibrations and sound. This improves and modifies the functionality of polymers. These materials are used in the automotive, building, livestock farming, sports and urban furniture businesses, as well as in road infrastructure.



It identifies the ELT recovery flows in the production of cement and electrical power in Italy and, above all, abroad. This market is the recipient of those amounts of ELTs that cannot be recovered as material in Italy. Ecopneus pays equal attention to the quality and management sustainability of this application. In this case, ELTs represent excellent fuel, destined to qualified and reliable plants. It possesses high quality standards.

RECYCLED RUBBER IN SPORTS.

Rubber recycled from End-of-Life Tyres has ideal characteristics for the realisation of **Sports surfaces**: it has an **excellent elasticity**, it **resists to all weather conditions**, and has great **shock absorption skills**. In the form of granules, powders, or prefabricated rolls or mats, recycled rubber is widely used for the realisation of **synthetic turf football pitches**, indoor and outdoor **athletic tracks**, **multipurpose surfaces** for **basketball, padel, table tennis and volleyball**, as well as **antishock surfaces** for gyms and playgrounds all over the world. In collaboration with highly skilled experts in biomechanics and sports as well as many companies of the sector, Ecopneus constantly supports research activities for the development of surfaces that may valorise athletes' performances and safety in several sports disciplines. Hence, the development of innovative surfaces that satisfy athletes' needs and valorise recycled rubber and its characteristics at the same time. Within this frame, Ecopneus has set up partnerships with high-level sports professionals.

FOOTBALL

Nowadays, about 90% of European synthetic turf football pitches use ELT-derived rubber as infill and to create the layers underneath the play surface. These pitches allow both professional players and amateurs to safely practice sports on sustainable pitches. As of today, the market offers no material that can replace recycled rubber for quantity, performances and environmental benefits.

Rubber granules give elasticity to the surface, facilitating energy restitution to athletes. They also drain rain water. Finally, management costs for this type of pitches are 50% lower than natural turf. The Legislation regulating this application is currently being revised at European level. For this reason, the chain has started some research with the contribution of Ecopneus. They aim at understanding how to adapt this application to the new legislation and carry on assuring environmental protection and valorisation of recycled rubber at the same time.
(for further information, please visit: www.ecopneus.it).

In Italy, several professional football clubs have implemented this technology in their sports centres. In some cases, the projects were developed in collaboration with Ecopneus. Atalanta BC has created a state-of-the-art synthetic turf football pitch for their sports centre in Zingonia-Cesarano (Bergamo). Bologna FC 1909 has chosen a synthetic turf football pitch with recycled rubber and organic material infill for their own sports centre in Casteldebale, in Bologna. This pitch is also used for rehabilitation. Udinese Calcio has chosen the Tyrefield football pitches with recycled rubber for their sports centre and for the renovation of the side lines of the Dacia Arena.



BASKETBALL AND 3X3 BASKETBALL

In basketball sports surfaces, the mixes used for the superficial layer are specifically designed to obtain excellent shock absorption and elastic energy return. This ensures a perfect solution for athletes' biomechanical needs. Moreover, it reduces muscular fatigue; it alleviates micro shocks and contributes to an overall better sports performance. Their resistance to all weather conditions make these surfaces the ideal solution for outdoor and 3x3 basketball courts. Born in the 1980s, 3x3 basketball has grown in popularity until it debuted at the Tokyo Olympics in 2021.



PADEL

Padel has grown in popularity recently. This sports discipline has benefited from the advantages offered by the Tyrefield surfaces. By appropriately modulating the characteristics of the surface layer with the thickness and the physical properties of the underlying layer made with recycled rubber, it is possible to satisfy the vast majority of the needs of athletes, sports installation managers and even the most demanding coaches. Studies carried out by Prof. Mauro Testa, an international expert in biomechanics, and his team of Biomoove have demonstrated how the Tyrefield surfaces for Padel allow to reduce (micro) shocks to muscles and articulations thanks to their particular and specific composition. Moreover, they reduce muscular fatigue thanks to a better response to athletes' biomechanics needs.

ATHLETICS

ELT-derived powders and granules have been mixed with polyurethane resins to create athletics tracks. Thanks to appropriate design, it is possible to obtain surfaces with specific characteristics studied for all needs. From a more rigid surface fit for those athletes looking for top sprint, to a base package equipped with greater elasticity for training and cool-down phases. Ecopneus is particularly committed to identifying sustainable and innovative sports surfaces, promoting research aimed at health protection and preventing accidents in the athletics sector.





HORSE RIDING

Surfaces made with recycled rubber in horse riding centres and stables ensures comfort, safety and hygiene to animals. The use of Recycled rubber instead of sand in outdoor training fields allows to drastically reduce dust dispersion in the air and its related risks for horses' and riders' health. In collaboration with the Department of Veterinary Studies of the University of Perugia and Uisp (Italian Association of Sport for All), Ecopneus is testing innovative solutions made with recycled rubber for outdoor fields and for the walkways of stables and horse boxes. In the course of time, some interventions have been carried out in Horse Riding Centres in Orvieto (TR) and Todi (PG); in the Military Veterinary Centre of the Italian Army in Grosseto and in Palermo's "Lancieri d'Aosta" barracks.

SAILING AND NAUTICAL SPORTS

The Tyrefield slabs made with rubber recycled from ELTs are a highly performing material that satisfy the needs of the sailing sector operators. They are a concrete response to the needs of safety and protection of both professionals and sea enthusiasts. The Tyrefield surfaces are used in all areas where safety is needed: outdoor walkways, technical areas, slipways. They offer great boat protection upon approaching hard surfaces such as maintenance areas. They are also very safe for people, thanks to their grip that reduces the risk of slipping even in wet conditions. These innovative solutions have been tested at Genoa's Yacht Club and in Trieste. The first prototype of fender for boats made with recycled rubber is currently being finalised: yet another step towards the full circular economy of ELTs.



PLAYGROUND

Rubber recycled from ELTs is an excellent material for producing antishock playgrounds for children thanks to its capacity of softening the consequences of accidental falls. Moreover, they last for long. It is an application widely used in public parks. As such, it has been used in Leolandia, a theme park dedicated to children in the province of Bergamo. The "Fulvio Bernardini" Sports Centre in Rome and the National Centre for Sustainable Development "Il Girasole" set up by Legambiente in Rispescia (Grosseto) have profited from this technology too. "Il Girasole" (the Sunflower) is an outdoor showroom dedicated to the many uses of recycled rubber from ELTs.



ANTI VIBRATION AND ACOUSTIC INSULATION

Recycled rubber is used to produce manufactures used for sound proofing lofts. This prevents the noise from spreading to the various floors of a building (the so-called “footfall noise”). It is also used for intervening in the cavities between walls to avoid the transmission of sound waves between adjacent rooms. It is excellent for making anti-vibration bases for machinery and installations, air conditioning units and boilers. These properties make recycled rubber a highly performing and competitive material compared to other ones present on the market. This is true both for what concerns new buildings and renovations and/or requalification interventions, such as the one carried out at the “Toscanini” Auditorium in Parma. Indeed, The Arturo Toscanini Foundation, Ecopneus, Genesis and the architecture firm A+C completed an important acoustic requalification in the Gavazzeni Room at the Musical Production Centre “Arturo Toscanini”. The Gavazzeni room is the largest rehearsal room of the structure, being it 400 sqm by 5 m high. 960 sqm of panels containing over 3,330 kg of ELT-derived recycled rubber were used for this project.



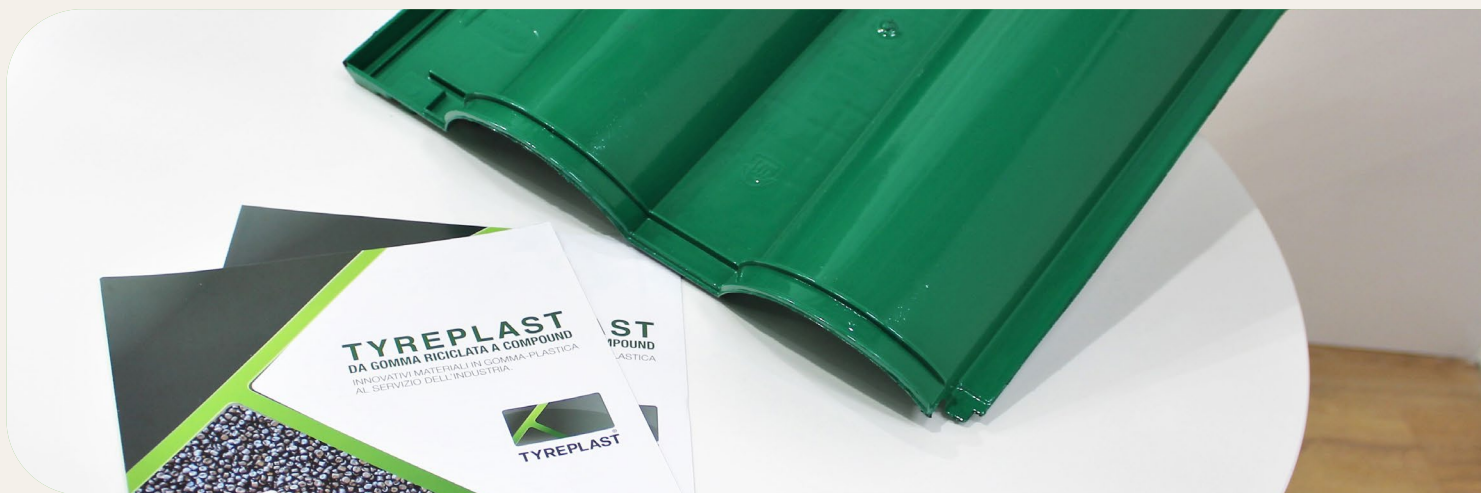
NEW TYREPLAST APPLICATIONS

Born out of the combination of thermoplastic polymers with rubber recycled from ELTs, the Tyreplast materials represent a resource and a solution recently introduced in the sports world thanks to the research and development activities of Ecopneus.



INNOVATIVE AND REMOVABLE SPORTS SURFACES

The Tyreplast materials are used in the world of sports for the creation of temporary or removable sports surfaces for practicing several sport disciplines, from traditional to 3x3 basketball, up to volleyball. It assures the best performances at top level. The surfaces made with Tyreplast slabs offer many advantages: greater elasticity and softening of micro shocks; excellent playability in all weather conditions and a reduction of athletes' muscular fatigue.



AUTOMOTIVE, BUILDING SECTOR, LIVESTOCK FARMING, URBAN ENVIRONMENT

There are many other sectors where these compounds are used, such as the automotive industry. In the building sector, they are used to create highly performing sound proofing and vibration-dampening items, such as walkways and surfaces.

In livestock farming, instead, it is possible to create shoes for animals' hoofs.

For what concerns urban furniture, the Tyreplast compounds are used to produce several objects, such as benches and flower beds.

RUBBERISED ASPHALTS.

Rubberized asphalts are a potentially strategic application for recycled rubber in Italy. They allow to invest in infrastructures with sustainable, long-lasting asphalts that noticeably reduce the rolling noise caused by vehicles.

By adding rubber powder to bitumen or bituminous conglomerates, road surfaces are obtained that comply with the best building standards and allow to:

- reduce tyre noise by an average of 3/5 types of rubberised
- obtain long-lasting surfaces; exceptional resistance to ageing. International experience shows that these surfaces last for up to three times longer than traditional asphalt.
- greater surface resistance to cracks of all types. This implies less maintenance interventions and a reduction of the inconvenience caused by road works and their related costs.
- greater safety, thanks to excellent grip.

This solution allows to comply with the national and European sustainability goals. At the same time, it assures a highly performing surface and allows to better spend the money at the disposal of the Public Administration and Management Bodies.

Cassa Depositi e Prestiti has appreciated the technical and environmental value of rubberised asphalts. Thanks to a more efficient management of the resources available, it sponsored a requalification project in Robbio (PV) and the end of 2021.

In Italy, the use of this technology has consolidated in the course of time, thanks to the constant effort of Ecopneus. On the one hand, it has supported new interventions and monitoring campaigns. On the other hand, it has raised the awareness and spread technical information and scientific data on this important application of recycled rubber. This work has led to the publication of a number of technical dossiers in collaboration with Universities and research centre (**available on: www.ecopneus.it/riciclo-pfu/pneumatico-fuori-uso/asfalti-modificati**). These manuals deal with technical aspects, case histories, formulations and performances of the various types of rubberised asphalt in a scientific way.

Their objective is to favour the circulation of technical information and updates among all subjects of the Italian asphalt chain, so that it may lead to a large-scale use of this valid solution for Italy's roads.

As of today, over 680 km/lane of road surface have been made with rubberised asphalt in Italy, thanks to the effort Ecopneus has made to stimulate this sector. Some interventions were made about 10 years ago. Despite this, the road surfaces are still in excellent condition, thus confirming the quality of this technological solution. However, the spreading of rubberised asphalt is still marginal compared to the potential of the national network, even where its characteristics would be greatly beneficial, i.e.: the regions of the North subject to greater temperature variations. A legislative framework ought to be drafted and consolidated with this respect. It ought to promote and support the use and the spreading of this application that would allow to progressively renovate the national road infrastructure in the medium and long term. At the same time, it would assure greater safety and a return on investment deriving from the savings on maintenance.



**OVER
680 km**

OF RUBBERIZED
ASPHALTS IN ITALY.

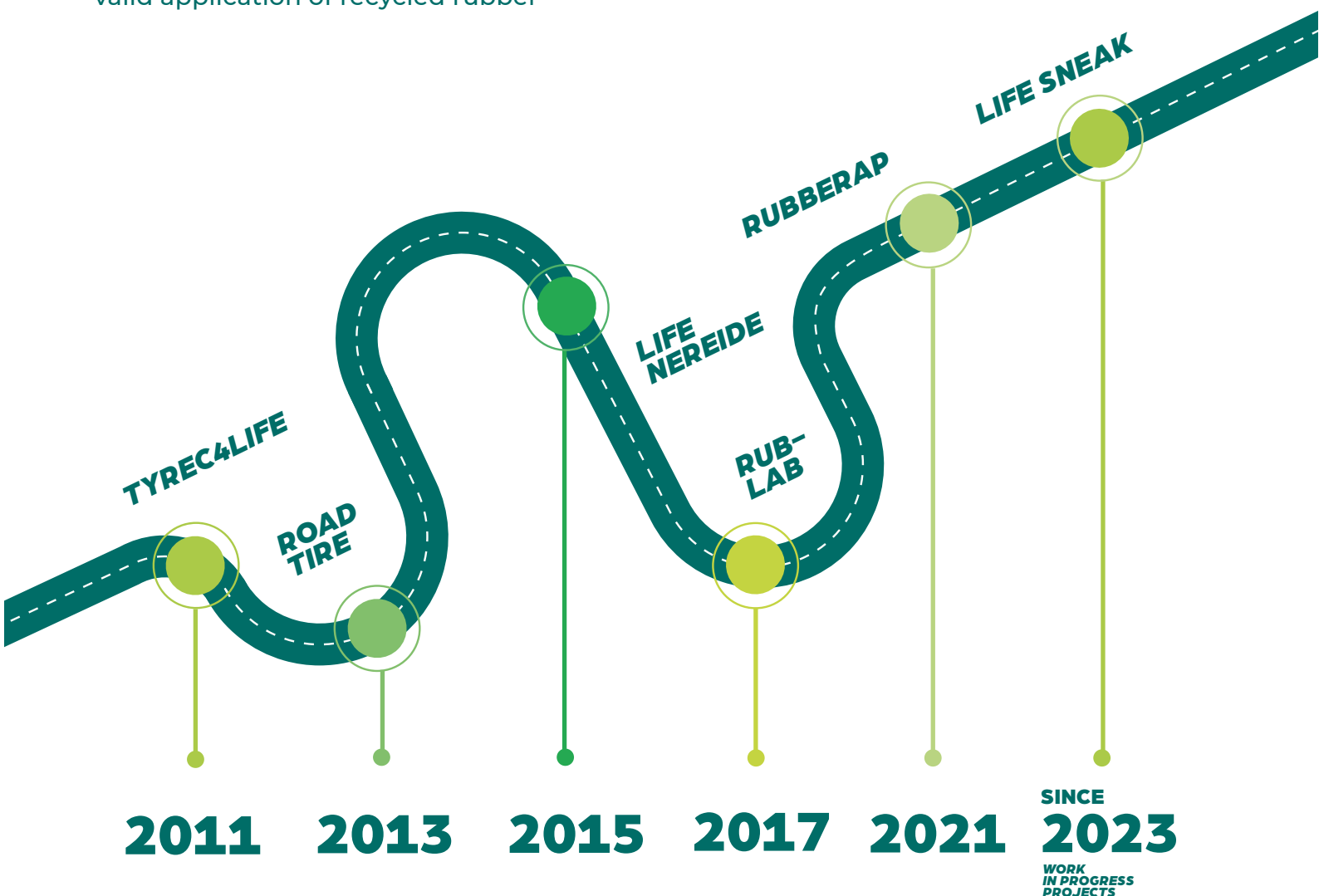
KM/LANE,
PER PROVINCE

**AS OF
30/04/2023**

RESEARCH AND NETWORKING.

ITALY HAS BECOME A HUB FOR RESEARCH AND INNOVATION: THE CONTRIBUTION OF ECOPNEUS FOR THE USE OF RECYCLED RUBBER IN ASPHALTS.

At international level, Italy is a leader in the research of rubberised asphalts made with recycled rubber powder. Thanks to its many and interesting research projects, Italy has become a technological hub and a point of reference for Europe. Indeed, many studies have carefully analysed technical aspects and case histories and have experimented new formulations for different technologies used to produce rubberised asphalt. Ecopneus has always been committed to the promotion of an academic culture on the topic of rubberised asphalts. By the means of technical training sessions, advantages and information on the use of ELT-derived rubber powder among all the players of the Italian chain, **Ecopneus aims at supporting a large-scale choice of this valid solution for Italy's roads.** To favour an ever greater use of rubberised asphalts in Italy, Ecopneus has supported several research studies aimed at spreading the necessary information and greater knowledge about this valid application of recycled rubber



THE LIFE NEREIDE PROJECT.

Noise Efficiently REDuced by recycleD pavEments

The LIFE NEREiDE project tested the performance of new low-noise emission surfaces made with recycled asphalt mills and ELT-derived rubber powder. Based on the research carried out during the Leopoldo Project, the LIFE NEREiDE project continued this research and allowed to develop 12 bituminous mixes made with low-noise recycled asphalt mills. The latter were then tested in the Provinces of Arezzo and Lucca.



THE LIFE SNEAK PROJECT

Optimized Surfaces against Noise And vibrations produced by tramway track and road traffic

LIFE SNEAK is a European project Ecopneus is partner of. It studies the reduction of road traffic noise and the vibrations of trams by using low-noise emission road surfaces as well as sound proofing panels to be applied on trams – all made with recycled materials.



THE RUBBERAP PROJECT

The **Rubberap** project aims at investigating specific aspects such as the **recyclability of asphalt mills made with recycled rubber power (Rub-RAP)**. Thanks to this project promoted by Ecopneus, **a specific engineered powder made with rubber recycled from ELTs** has been tested (ECR: Engineered Crumb Rubber). This new material improves the compatibility of powder with bitumen. This project aims at stimulating the research Ecopneus has developed in collaboration with the University of the Studies of Palermo and the French University "Gustave Eiffel". Moreover, it has involved local companies, such as: **Smacom Srl**, the start-up **Rub-Lab Srl** and **DS Asfalti Srl**.



AN ANAS DEVICE FOR THE PROTECTION OF BIKERS MADE WITH RECYCLED RUBBER COMPOUNDS

Anas, the Italian company responsible for the construction and maintenance of motorways and highways, has successfully tested a new eco-friendly prototype to protect bikers made with ELT-derived recycled rubber compounds. Thanks to the elasticity and the shock absorption properties of the compound made with recycled rubber, the new ANAS prototype assures **great safety** in case of impact with bikers' bodies **limiting serious injuries and reducing maintenance interventions to zero**. All this thanks to the properties of rubber to go back to its original shape after an impact.

The ***D.s.m.U Ecofriendly Anas project*** has been developed and designed in-house by Anas, in collaboration with the **Department of Industrial Engineering of the University of the Studies of Florence**, the company **Proge Plast** and **Ecopneus**. In detail, the Department of Industrial Engineering dealt with the testing of the functioning of the end product; Proge Plast was responsible for the realization of the prototypes and Ecopneus offered the recycled materials. Their aim was to ensure **total safety for bikers** and, at the same time, comply with the need of **making the Italian infrastructure network more sustainable and performing**. Thanks to the combination of **design and ELT-derived recycled rubber compounds**, this device offers many advantages: it is **flexible and modular; it can be adapted to the road bending radius; it is easy to install** thanks to a system that hooks it onto the mast of the road barrier. Moreover, it ensures **road continuity** thanks to the interlocking system present on the various blocks. Finally, it **does not require maintenance interventions** following an impact, thanks to the elasticity of recycled rubber that allows the device to go back to its original shape. This brings maintenance costs down to zero. The research activities of ANAS are continuing with the validation of the new prototype installed on discontinuous road barriers according to the tests of the EN 1317 Regulation.

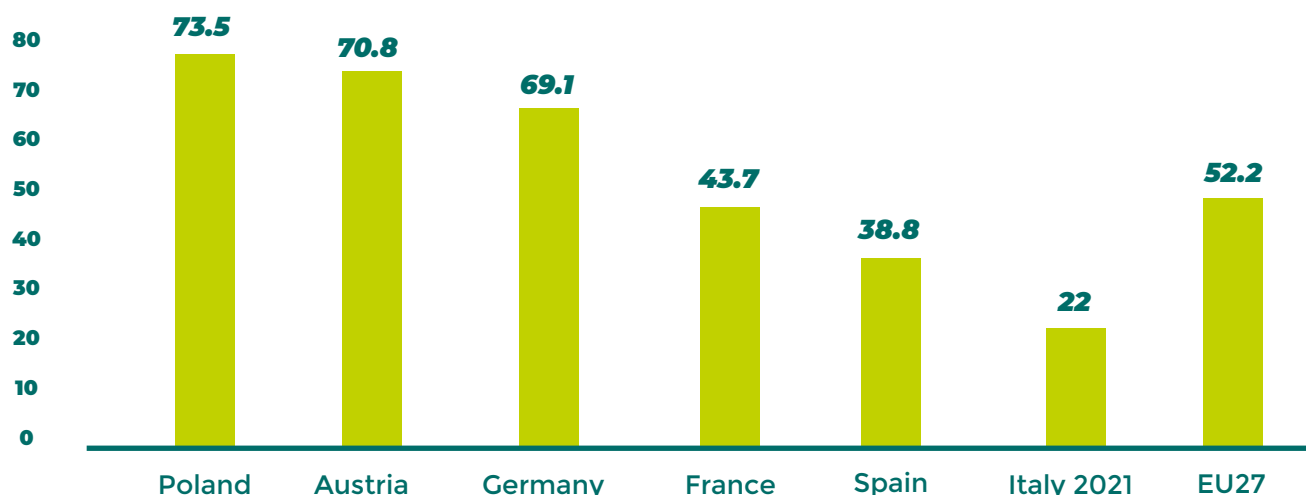




COMBINED ENERGY AND MATERIAL RECOVERY FROM ELTS IN CEMENT FACTORIES

Ecopneus is constantly dedicated to the development of the market of the applications of recycled rubber and the increase of the quota of ELTs recycled as material. However, it pays equal attention to the preparation of ELTs as derived fuel for the production of energy, i.e. Tyrefuel. **Also the Action Plan for the Circular Economy of the European Commission admits that the recovery of the energy potential is to be preferred during the transition phase to the circular economy whenever it is not possible to prevent or recycle waste.** Indeed, it is a key element to close the cycle of ELT recovery in Italy due to an internal recycled rubber market that is still not mature enough to absorb all the available material and the legislative obstacles that do not favour its full development. The energy recovery of ELTs is mainly carried out in cement factories as it allows to better exploit the high calorific power of rubber that is comparable to the one of pet-coke. Moreover, it allows to recover the residues of combustion, steel and ashes, that are included in the end-product. This allows to avoid using raw materials, thus benefiting both companies and society from a financial and environmental point of view.

ALTERNATIVE FUEL REPLACEMENT RATE



Alternative fuel replacement rate: % on thermal energy for the production of clinker- 2020 data.

This combined process of energy and material recovery is known as co-processing. Nowadays, it is used all over Europe and contributes significantly to sector competitiveness. In Italy, the use rate of alternative fuel to hydrocarbons went up to **22%**, thus **increasing by 1.1 percentage points compared with 2020**. This confirms a growing trend – even though it is still far from the European average of **52.2%**. The amount of alternative fuel used increased too **(467,355 tons as opposed to 385,661 tons in 2020, with a +21.2%)**.

In Austria and Poland, the active plants recover over 70% of the produced thermal energy from alternative fuels. In Germany, the amount is about 69%; in France it involves a little more than 4.3% of the total, whilst, in Spain, it is 38.8%

Notwithstanding the environmental advantage of recycling compared to any form of energy recycling, an LCA study carried out by the Sustainable Development Foundation in collaboration with Enea* shows that the complete replacement of fossil fuel (pet-coke) with ELT-derived fuel in the cement production process allows to avoid the emission of **1 ton of CO₂ equivalent and the consumption of 210 kg of mineral and fossil virgin raw materials**. Despite this double environmental and financial advantage, from the point of view of sector competitiveness, less than half of all ELTs generated in Italy in a year are energetically recovered in Italian cement factories. The majority is sent abroad, thus transferring an important share of value to competing countries and chains.

ELT PYROLYSIS: AN OPPORTUNITY FOR MATERIAL RECOVERY

Pyrolysis is a thermo-chemical process that causes the breaking of the chemical bonds of a complex organic material (e.g.: a polymer), thus creating simpler hydrocarbons. The process happens at a controlled temperature and in absence of oxygen. Thus, pyrolysis transforms the incoming material into products that, in their turn, can be recovered as second virgin raw materials (recycling) or used as fuel for the production of energy (energy recovery). In general, the products that derive from pyrolysis are divided into a volatile part (syngas), a liquid part (synoil) and a solid part (char). Thanks to the greater homogeneity of the composition of ELTs compared to other waste, it is possible to optimise the process parameters to maximise the recovery of large amounts of Carbon Black (CB) and of Tyre Derived Oil (TDO). The char derived from the pyrolysis process can be further refined to obtain recovered Carbon Black (rCB). This material can be used in the production of mixes for the rubber and tyre business, as specified in the technical regulation ASTM D8178.

For what concerns pyrolysis oil, its chemical composition offers a high concentration of aromatic hydrocarbons. Separated by the means of fractional distillation, they can be used from the chemical industry for the production of several items, among which: solvents, plastics, bases for lubricating oil, as well as phytosanitary products, drugs and cosmetics. These opportunities stimulated the interest of BASF. In 2020, it extended the scope of its Chemcycling programme for the chemical recycling of plastics mixed with ELT-derived pyrolysis oil. BASF announced new partnerships and agreements with European operators of the sector of ELT pyrolysis for the purchasing of TDO to use in their plants. From an environmental and climate point of view, a study of IVL – The Swedish Environmental Research Institute - carried out on a special plant with a technology of pyrolysis gas recirculation in the reactor (Carbonisation by Forced Convection, CFC) has shown that the production of rCB allows a saving of up to 80% on the life cycle emission compared to its virgin production.

**THE
ENVIRONMENTAL
BALANCE**

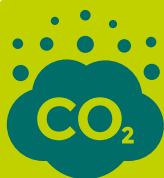
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An abstract graphic consisting of numerous thin, light green lines radiating from a central point on the right side of the page, extending towards the left edge. The lines are of varying lengths and angles, creating a fan-like or sunburst effect. Some lines end in small green dots.

THE ENVIRONMENTAL BALANCE.

CARBON FOOTPRINT

In 2022, the balance of the life cycle of the emissions generated by the activities of collection, treatment and recovery and those saved thanks to the replacement of virgin raw material with ELT-derived fuel and products amounted to about **368,000 tons of CO₂ equivalent (tCO₂eq)**. This is equivalent to the emissions of **220,000 automobiles travelling 10,000 km in 1 year**. For what concerns the emissions generated (231,000 tCO₂eq), the main contribution can be ascribed to the combustion of the ELTs used for producing energy in cement factories and electrical power plants. In 2022, it generated the emission of almost 187,000 tCO₂eq – about 81% of total emissions. To these, one must add the emissions deriving from the activities of logistics and treatment of ELTs, responsible for 44,000 tCO₂eq. The generated emissions are compensated with almost 600,000 tCO₂eq of avoided emissions thanks to energy recovery and the co-processing of derived fuels as well as the recycling of materials derived from ELTs. Of these, 419,000 tCO₂eq can be ascribed to the use of ELT-derived fuel replacing other fossil fuels (in particular: carbon and pet-coke used in cement factories). Their overall life cycle impact – from their production to their combustion – is by far higher than the one of ELT-derived fuels. In addition to this, the recycling of rubber granules and powders avoids the primary production of equivalent materials. As such, it has determined a saving of further 142,000 tCO₂eq (24% of the total). To these, another 37,000 tCO₂eq of saved emissions are to be added thanks to the recycling of steel and other materials in their respective chains.



1 t of ELTs collected, treated and recovered =
-1,89 t of avoided CO₂eq emissions.
Ecopneus system in 2022:
-368,000 tons of CO₂eq, equal to the
emissions of 220,000 automobiles driving
10,000 km in a year

AVOIDED EMISSIONS (t)	TOTAL	PER 1 t ELTS
	-367,991	-1,89
GENERATED EMISSIONS	t CO₂ EQUIVALENT	%
LOGISTICS	22,426	9.7%
TREATMENT	21,461	9.3%
COMBUSTION IN ELECTRICAL POWER STATIONS	16,398	7.1%
AND CEMENT FACTORIES	171,078	73.9%
TOTALE EMISSIONI GENERATE	231,363	100.0%
AVOIDED EMISSIONS	t CO₂ EQUIVALENT	%
RECYCLING OF ELT GRANULES AND POWDERS	-142,390	23.8%
RECYCLING OF STEEL AND OTHER MATERIALS	-37,489	6.3%
AVOIDED ELECTRICAL POWER VS. NATIONAL MIX FROM ELTS ENERGY RECOVERY	-14,138	2.4%
AVOIDED THERMAL ENERGY VS. PET COKE FROM ELTS TO ENERGY RECOVERY IN CEMENT FACTORIES	-405,337	67.6%
TOTAL OF AVOIDED EMISSIONS	-599,354	100.0%

MATERIAL FOOTPRINT

In 2022, the balance of the life cycle between the consumption of natural resources associated with the activities of the chain of recovery of ELTs and of those non consumed thanks to their re-use in the place of virgin raw materials showed a **net saving of 336,000 tons of mineral and fossil resources**. This amounts to the weight of **687 Frecciarossa 1000 high-speed trains** with 8 cars plus locomotive. In detail, the impact of the life cycle generated by the activities of collection, transport, treatment and recovery of ELTs amounts to about 57,000 tons of used natural resources.

This contrasts with 394,000 tons of saved resources.

For what concerns the total of used resources, the main impact is linked to logistics (55%). This is due to the fuel consumption of the vehicles involved in ELT collection and transport, as they drive millions of km every year. The relevance of this information is striking when compared with the information recorded by the carbon footprint indicator: in it, logistics is “limited”, as it represents less than 10% of the total generated emissions. This confirms the usefulness of an overall evaluation of all impact indicators when decisions are to be made to increase system efficiency. The Material Footprint indicator shows that 60% of benefits can be ascribed to rubber and steel recycling from ELTs, as opposed to 30% recorded by the analysis of carbon footprint.



The Ecopneus System in 2022:
-336,723 tons of saved materials.
This is equivalent to the weight of 687 Frecciarossa 1000 high-speed trains composed of 8 cars with locomotive

BALANCE OF SAVED RESOURCES (t)	TOTAL	PER 1 t ELTS
	-336,723	-1,731
USED RESOURCES	t OF RESOURCES	%
LOGISTICS	31,429	55.1%
TREATMENT	9,450	16.6%
COMBUSTION IN ELECTRICAL POWER STATIONS	1,412	2.5%
COMBUSTION IN CEMENT FACTORIES	14,734	25.8%
TOTAL OF USED RESOURCES	57,025	100.0%
NON USED RESOURCES	t OF RESOURCES	%
RECYCLING OF ELT GRANULES AND POWDERS	-129,330	32.8%
RECYCLING OF STEEL AND OTHER MATERIALS	-105,392	26.8%
ELECTRICAL POWER AVOIDED VS. NATIONAL MIX FROM ELTS TO ENERGY RECOVERY	-6,225	1.6%
AVOIDED THERMAL ENERGY VS. PET COKE FROM ELTS TO ENERGY RECOVERY IN CEMENT FACTORIES	-152,801	38.8%
TOTAL OF NON-USED RESOURCES	-393,748	100.0%

WATER FOOTPRINT

In 2022, the management of ELTs in the Ecopneus system allowed to **save about 1.5 million m³ of water**. This amount is equivalent to the **average daily consumption of about 6 million Italians or the quantity of water needed to fill 600 Olympic-sized swimming pools**. For what concerns the impact of the activities of the recovery chain, the water footprint indicator showed the use of about 528,000 m³ of water. Of these, 55% come from ELT combustion in the energy recovery process. The remaining part, instead, is divided between logistics (24%) and treatment activities (20%). The benefits of ELT recycling and recovery amount to over 2 million m³ of saved water that compensate the negative impacts.

The main contribution comes from the recycling of rubber granules and powders for a total of 796,000 m³ (39% of the total). In addition to this, there are a further 433,000 m³ deriving from the recycling of steel and other materials (21%). The remaining 39% is linked to the energy recovery of ELTs in cement factories and electrical power plants for the production of electrical power. Overall, as already pointed out by the carbon and material footprint indicators, also the water footprint indicator shows how the benefits per life cycle associated to the recycling of ELTs are by far greater than the ones associated with their recovery as fuel.



The Ecopneus System in 2022:
-1,5 million tons of m³ of water saved. This is equivalent to the daily average water consumption of 6 million Italians or the quantity of water needed to fill 600 Olympic-sized swimming pool.

BALANCE OF SAVED WATER (m ³)	TOTAL -1,498,910	PER 1 t ELTS -7,707
USED WATER	m³ OF WATER	%
LOGISTICS	126,488	23.9%
TREATMENT	108,213	20.5%
COMBUSTION IN ELECTRICAL POWER STATIONS	25,692	4.9%
COMBUSTION IN CEMENT PLANTS	268,042	50.7%
TOTAL OF USED WATER	528,435	100.0%
SAVED WATER	m³ OF WATER	%
RECYCLING OF ELT GRANULES AND POWDERS	-796,303	39.3%
RECYCLING OF STEEL AND OTHER MATERIALS	-433,424	21.4%
SAVED ELECTRICAL POWER VS. NATIONAL MIX FROM ELTS TO ENERGY RECOVERY	-71,290	3.5%
SAVED THERMAL ENERGY VS. PET COKE FROM ELTS TO ENERGY RECOVERY IN CEMENT PLANTS	-726,328	35.8%
TOTAL OF SAVED WATER	-2,027,345	100.0%

DECARBONISATION STRATEGIES OF THE TYRE BUSINESS

THE CONTRIBUTION OF THE TYRE BUSINESS TO CLIMATE CHANGE.

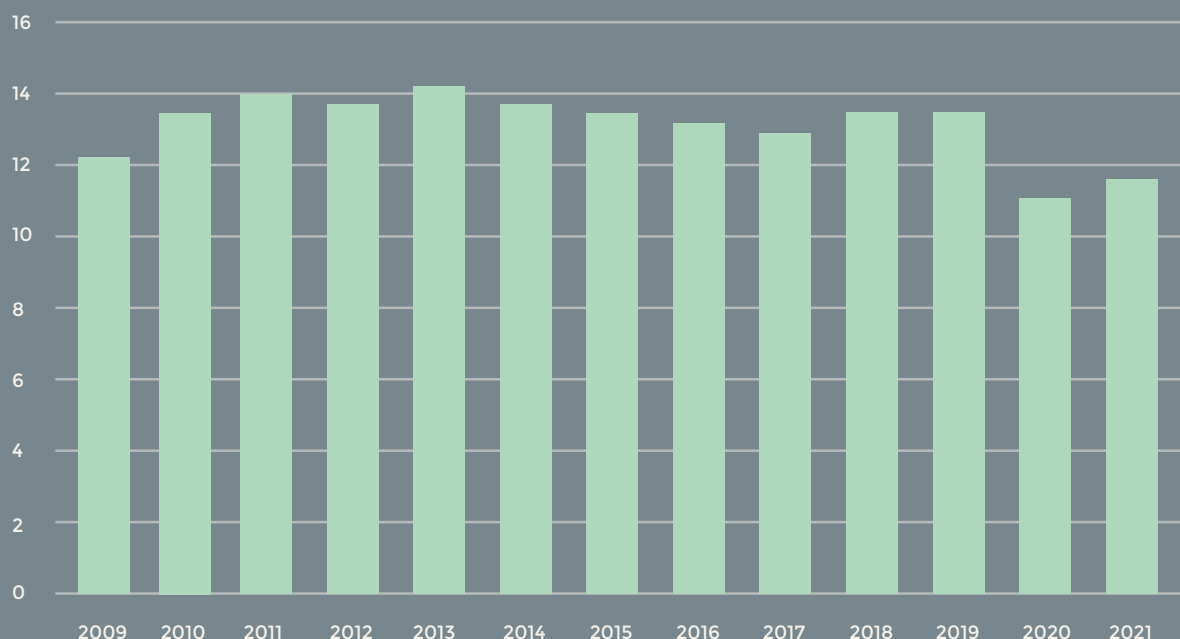
As of today, it is difficult to precisely quantify the impact of tyres on global emissions. The World Business Council of Sustainable Development is one of the most important initiatives set up by the world of business. By the means of the **Tire Industry Project** (here below: TIP), it has started a virtuous process heading towards this direction.

Started in 2005, the TIP is the **main global forum for the tyre business on sustainability issues**. It aims to identify and contribute to mitigate the potential impacts on human health and the environment linked to the life cycle of tyres.

In the course of time, it has released some reports and research studies that allow a first reconstruction of some impacts in terms, for example, of energy consumption or greenhouse gas emissions with reference to a very representative sample of the sector. Indeed, as of today, 10 leading companies of the tyre business have joined the TIP: Bridgestone, Continental, Goodyear, Hankook, Kumho Tire, Michelin, Pirelli, Sumitomo Rubber, Toyo Tires and Yokohama Rubber. Overall, this group of producers **represents about 65% of the global tyre production**.

The Environmental Key Performance Indicators for Tire Manufacturing 2009-2021” was published in 2022. In it, the trends of energy consumption and CO₂ emissions of this representative group of companies are analysed for the first time among other things.

EMISSIONS OF CARBON DIOXIDE OF THE COMPANIES THAT JOINED THE TIRE INDUSTRY PROJECT (MILLIONS OF TONS OF CO₂)



SOURCE: WBCSD-TIP, 2022

¹<https://www.wbcd.org/download/file/15553>

For what concerns energy consumption, the production processes of these 10 companies consumed about 3.9 million tons equivalent of oil in 2021. Compared with the 3.3 of 2009, this figure has grown mainly due to an increase in production (+35% in the period taken into consideration).

CO₂ emissions, the main greenhouse gas, reached their peak at 14.1 million tons of CO₂ in 2013. This amount is slightly higher than the emissions produced by Lithuania or 2 million Italian citizens. Differently from energy consumption, **the emissions of these 10 companies have gradually gone down and reached 11.5 million tons in 2021 (-5% compared with 2009).**

The figures analysed within the TIP project are, obviously, energy consumption and emissions linked exclusively to production processes. These are known as scope 1 (direct emissions deriving from the combustions of production plants) and scope 2 (indirect emissions mainly deriving from electrical power consumption of the production plants).

However, in order to understand what the real impact of a manufacturing sector is –as well as the one of a single company– all those emissions and consumption make reference to scope 3. They are generated, by way of example, in the production of the raw materials used, by transport and logistics; the end of life of the product etc. In reality, the consumption and emissions of scope 3 are (much) higher than the ones of scopes 1 and 2 combined connected to the production processes in all sectors.

The tyre business is no exception to this. Observing the analyses of the life cycle carried out by some large tyre producers, the emissions deriving from the productive processes represent 2% of the overall emissions as an average, with scope 3 being responsible for well over 98% of them.

Imagining that this report were valid, for the 10 producers of the TIP (some of which have carried out the analyses of the life cycle we have taken here into consideration) this would mean that, **in the face of the 11.5 million tons of CO₂ generated by production processes, we could reach over 550 million tons including also scope 3.** This value is in between Italy's and Germany's emissions.

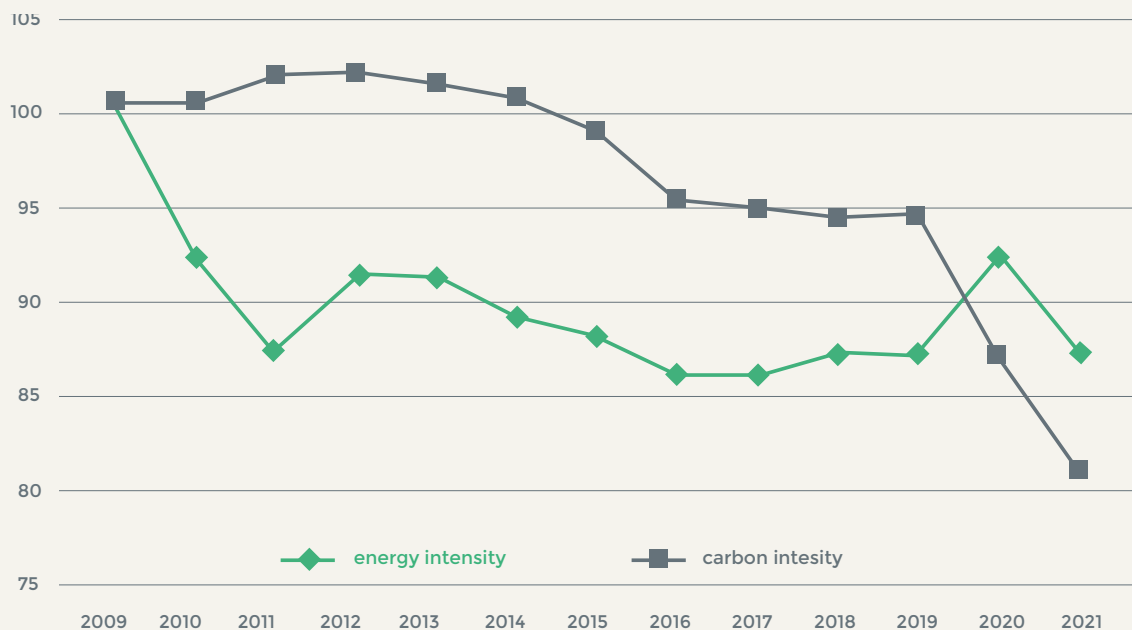
DECARBONISATION OF PRODUCTION PROCESSES

As mentioned here-above, **scope 1 and 2 emissions are those deriving from productive processes. They represent only between 1% and 3% of the overall emissions** generated by a company of this sector. Despite this, the companies are to intervene to try and reduce such emissions as much as possible.

Not only because they derive from their production plants, either directly or indirectly, but also because there are important measures that can be taken to try and reduce such emissions as much as possible. These measures can be traced back to **two types of intervention.**

On the one hand, the improvement of the **energy efficiency of the processes** can be achieved by implementing a production process that may produce the same quantity of end goods using less and less energy resources. On the other hand, it is possible to reduce the **specific emissions of energy consumption** improving the mix of primary sources. For example, it is possible to replace the most polluting fossil fuels with less polluting ones (e.g.: natural gas produces less carbon dioxide than coal) or increasing the amount of renewable energies.

ENERGY INTENSITY (TOE CONSUMED PER T OF PRODUCT) AND CARBON INTENSITY (T OF CO₂ PER CONSUMED TOE) OF THE COMPANIES THAT JOINED THE TIRE INDUSTRY PROJECT (INDEX VALUE, BASE YEAR: 2009=100)



SOURCE: SUSDEF ELABORATION BASED ON WBCSD-TIP DATA, 2022

For what concerns the energy efficiency of the production process, we can make reference to the WBCSD project once more, as well as the results recently achieved by its member companies by the means of the energy intensity indicator. This indicator measures the energy consumption per product unit (in this specific case, the tons of oil equivalent needed to produce a ton of tyres).

Between 2009 and 2021, the energy intensity of these companies went down by 12%, going from 0.25 to 0.22 toe per ton of product. This improvement, however, was all achieved during the first years of observation, whilst there has been no meaningful progress recently.

Goodyear is one of the most active companies in this sector. In 2021, it introduced measures of energy efficiency that involved strategies for heat recovery, the purchasing of new compressors, the installation of pumping systems for gas recovery etc. Thanks to such activities, Goodyear achieved a saving of 16 million dollars. Michelin widely invested in this sense too. Indeed, it managed to improve the energy efficiency of its processes by 18.3% compared with 2010 and set the objective of reaching 37% by 2030.

With reference to the energy mix “cleanliness”, the indicator of reference is the one of carbon intensity. It measures the quantity of emissions generated per every single toe of energy consumed. In this case, **the companies of the TIP reduced their carbon intensity by about 6% from 2009 to 2019, going from 3.6 to 3.4 tons of CO₂ released per every toe consumed.**

This mainly happened thanks to the replacement of fuel and some coal with natural gas, a fossil fuel with lower emissions.

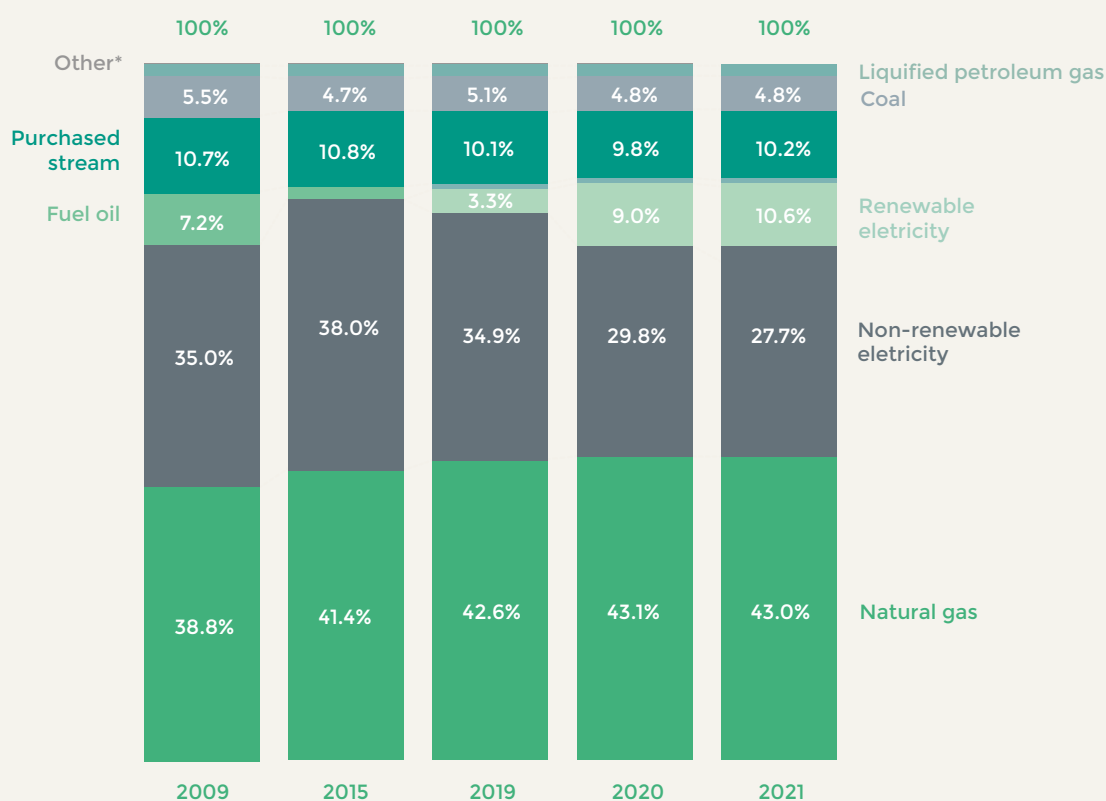
In the last two years of the time series, a meaningful reduction of emissions can be seen, with a 15% reduction and emissions below the threshold of 3 tCO₂/toe. This performance can be ascribed to a further reduction of the use of coal and, above all, to the increase of electrical power coming from renewable sources. Indeed, the latter now cover 10.6% of the overall consumption and almost 30% of the electrical ones.

However, it is to be noticed that such improvement derives mainly from the purchasing of certified green electricity by the means of the so-called guarantees of origin. This practice is followed by the majority of producers. The creation of new generation points, possibly within the production plants, is only marginally contributing to this improvement. Obviously, there are several positive exceptions to this. For example, Michelin has intervened on 21 owned plants, equipping them with installations for the generation of electrical power. In Europe, 33.3 MW have been installed, in Thailand 2 MW and in India 4.2 MW. Moreover, new plants are currently being upgraded to increase their power to 35 MW.

Even Bridgestone generates more than 2 MW in North America; Goodyear has 4.7 MW in the area of Pacific Asia and is committed to reaching a total of 7-10 MW in the near future.

The interventions related to heat are less common. Examples are: thermal solar plants, geothermic installations or biomasses.

EVOLUTION OF THE ENERGY MIX OF THE COMPANIES THAT JOINED THE TIRE INDUSTRY PROJECT



*Petrol, propane, biomass

SOURCE: WBCSD-TIP, 2022

MORE PERFORMING PRODUCTS WITH LESS EMISSIONS.

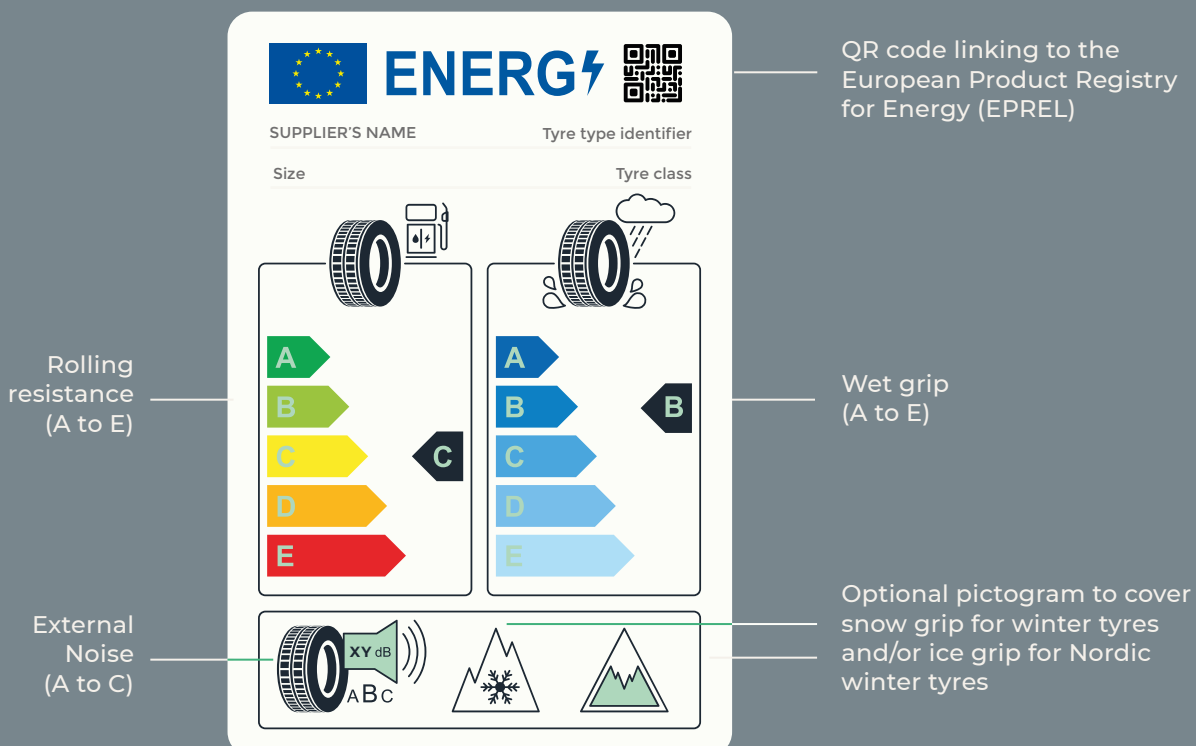
When looking at the whole life cycle of a tyre, the phase when the largest amount of emissions is released is, obviously, when it is used, due to vehicle fuel consumption. For example, in the case of Continental, the emissions generated by the use of tyres represent 78% of total emissions; whilst in Pirelli's carbon footprint, we go beyond 90%.

Of course, a tyre producer does not have many possibilities to intervene on this phase. By way of example, they can promote more efficient vehicles, cleaner fuel or the passage to electric cars. However, considering the extremely relevant weight of these emissions, several producers have developed – and are developing – strategies to intervene precisely on the use phase **working on the so-called tyre rolling resistance. This is the resistance of vehicle tyres when they are in contact with the surface.**

The main cause of this resistance is tyre deformation, tread and, of course, its friction on the road. The higher the rolling resistance, the more fuel a vehicle uses to move, the greater the emissions.

According to several studies, **tyres may be responsible for over 20% of the fuel consumption of a vehicle.** Of course, it is not possible to bring this figure to zero, but reducing rolling resistance may help also with regards to carbon footprint reduction. It is possible to act on this aspect by working on tyre design, tread, rubber mix and structure. All this, of course, by always keeping high safety standards and not affecting tyre grip.

THE NEW EUROPEAN TYRE LABELLING SYSTEM



²<https://www.michelin.it/auto/consigli/conoscenze-di-base-pneumatici/resistenza-al-rotolamento#:~:text=Come%20indica%20il%20nome%2C%20la,l'attrito%20con%20il%20suolo.>

Considering the growing importance of these aspects linked to financial advantages for the end users, an energy classification has been introduced . It is similar to the one for electrical appliances.

The new European Regulation on **tyre energy labelling** has identified **five energy classe** based on a rolling resistance coefficient. They go from A to E, whereby A is the most performing and E is the least performing. The sale of class F tyres was forbidden in 2018.

The passage to a higher tyre class should assure **fuel savings of over 0.1 litre per 100 km travelled**. For a medium-small car, this may turn into a 1-2% saving and a reduction of emissions for every class. Within this scope, all tyre producers are working towards the development of “green” tyre lines, such as: the “Enliten” by Bridgestone and the “Conti Green Concept” tyre by Continental. They promise a rolling resistance reduced by, respectively, 30% and 20% compared with today. Pirelli, instead, is committed to producing 70% of its own tyres in class A or B by 2025.

REDUCTION OF EMISSIONS DERIVING FROM THE USE OF RAW MATERIALS.

The **emissions deriving from the supply of materials are usually the second cause of carbon footprint for a tyre producer**, following, obviously, the use phase.

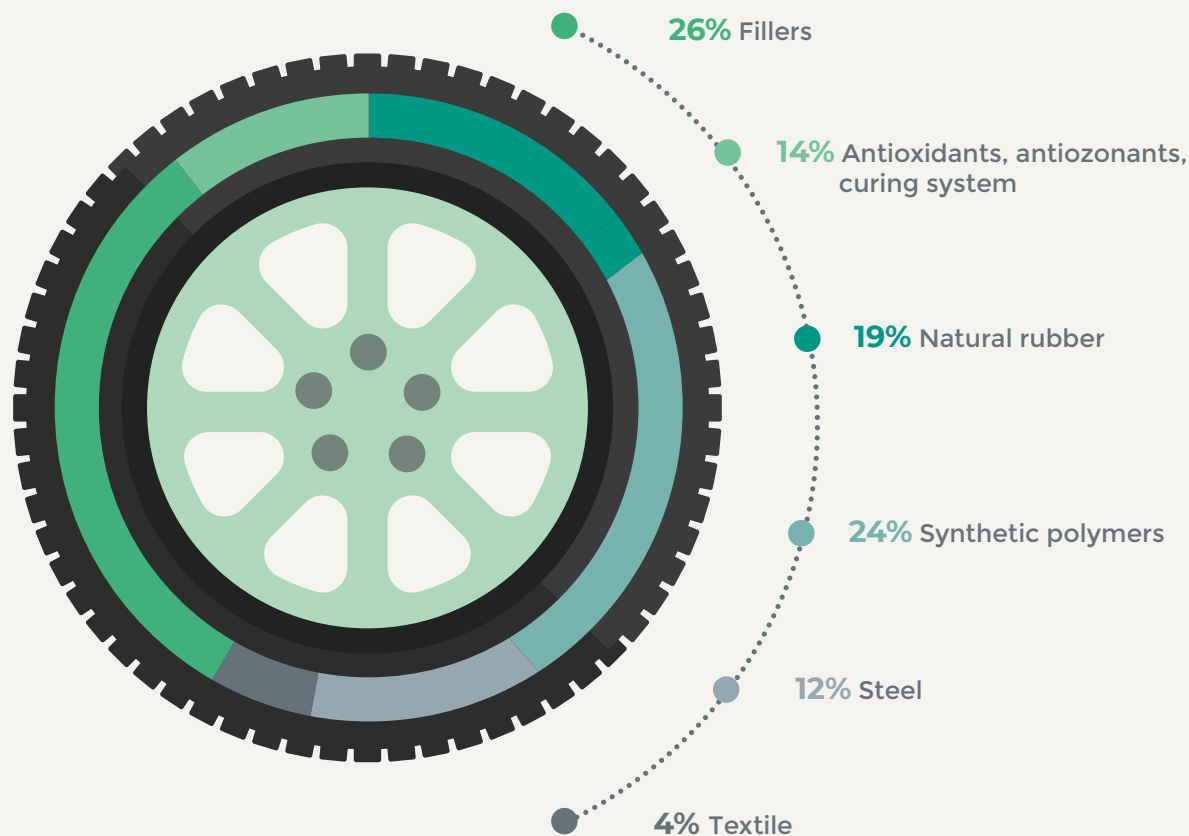
For example, for Pirelli, they represent 6% of total emissions. In the case of Continental, instead, an almost double figure is reached. They are the emissions generated to extract, work and transport virgin raw materials that will subsequently be used in the most disparate production cycles. Tyres are a fairly simple product but they involve several different materials and **several different supply chains**.

Natural and synthetic rubber represents an important part of the overall weight of a tyre. Even the weight of **steel threads** is important. These are used in several parts of the tyre to strengthen its structure and increase its performances.

There is also a non-negligible part of **textile fabrics** used to reinforce the structure of a tyre. It is usually composed of polyester, rayon, nylon and aramid fibre. There is also an extremely relevant component of **chemical products** such as fillers. Examples are: carbon black that reinforces the tyre structure, antioxidants and other necessary components for the process of rubber vulcanisation and for preserving the material.

³<https://www.ustires.org/whats-tire-0>

SCHEMATIC REPRESENTATION OF THE MAIN MATERIALS PRESENT IN AN AUTOMOBILE TYRE



*SOURCE: ADAPTATION OF DATA OF THE U.S. TIRE
MANUFACTURERS ASSOCIATION FROM THE PART OF WBCSD-TIP*

The producers that joined the TIP produce about 1.7 billion tyres a year. Of these, about 90% are dedicated to light vehicles and the remaining part is for heavy load ones. Considering the minimum but inevitable production waste, it is possible to estimate about 20 million tons of virgin raw materials used in a year.

Applying the composition of an automobile tyre to simplify things, even if we know that the percentages may meaningfully vary for other tyre typologies, it would mean to consume something like 5 Mt of synthetic rubber, 4 of natural rubber and over 2 of steel every year. Moreover, important amounts of several chemicals are to be added to these amounts only to support the production of the 10 manufacturers that joined the initiative of the WBCSD.

The producers have paid particular attention to **the natural rubber chain** for long. It represents a quarter of the weight of the end product. According to the World Business Council, this fact makes the tyre sector to be by far the largest world's user of this raw material.

⁴<https://www.wbcsd.org/Sector-Projects/Tire-Industry-Project/The-Global-Platform-for-Sustainable-Natural-Rubber>

The largest producers of natural rubber in the world are Thailand, Indonesia and Vietnam. However, the main problem for this raw material is not the reduction of greenhouse emissions. It is the contrast to deforestation to make room for the cultivation of the *Hevea brasiliensis* that may put the already endangered local biodiversity to greater risk.

There are several initiatives at global level that aim at intervening on these aspects. The most important one is the Global Platform for Sustainable Natural Rubber (GPSNR). Several stakeholders have joined this platform. Among them are tyre and automobile producers, the civil society and small land owners. The aim of the platform is to unite all interested parties to create a sustainable management strategy in the whole natural rubber value chain. This must pay attention to the social and financial conditions of workers and of the inhabitants of the areas of interest, as well as the environmental performance of the sector.

On top of promoting initiatives such as the GPSNR, several producers are trying to find a way to reduce the consumption of this material. For example, they are looking for alternative materials. The Bridgestone group is concentrating on the replacement of natural rubber with “Guayale” (*Parthenium argentatum*). This is a shrub that grows in the arid zones of the USA and Mexico; Continental, instead, is working on the roots of dandelions (*Taraxacum officinale*), with very reduced environmental and socio-financial impacts. More in general and not looking only to natural rubber, the **replacement of virgin materials with less impacting ones** represents a decisive step in the decarbonisation process of the tyre business.

Several attempts have been made to introduce even materials of vegetable origin in the tyre mix, so that they may integrate and partially replace the virgin raw materials linked to fossil fuels. For example, Continental is working on rice husks, a by-product of the food sector, for the production of the silicate compounds needed for tyre production. Also vegetable oils and waste resins from the paper and wood industry can be used as fillers in the manufacturing process of tyres.⁵

Pirelli will start using lignin in the production of vehicle tyres. This is a by-product of the biomass industry and will be used as anti-oxidant replacing synthetic materials of fossil⁶ origin. Goodyear is already using soybean oil as temperature stabiliser. This allows them to reduce the consumption of materials of fossil origin. The PET of plastic bottles is recycled and used by Continental, Goodyear and Michelin for the production of the textile fibres used in tyres⁷. Bridgestone, instead, has set the objective of reaching a 40% target of renewable /recycled materials in their products by 2030.

Of course, in order to reduce the carbon footprint of virgin raw materials, it is possible to work also on the **reduction of the quantities of virgin raw materials** used in tyre production acting on tyre weight (or, as we shall see further on, on its recyclability). For example, Bridgestone is committed to reducing tyre weight by 10% compared with standard summer tyres thanks to the Enliten technology.

⁵<https://www.continental.com/en/press/press-releases/20230214-sustainable-solutions/>

⁶<https://press.pirelli.com/pirelli-and-the-university-of-milan-bicocca-renew-partnership-in-corimav-for-research-into-eco-friendly-materials-and-processes/>

⁷<https://news.goodyear.eu/goodyear-develops-70-sustainable-material-tire-with-industry-leading-innovations/>

MANAGEMENT OF TYRES END OF LIFE.

The process of management of its end of life impacts noticeably on the overall footprint of a tyre. In general, it is greater than the same production process. For Continental, for example, it represents over 3% of overall emissions. Activating strategies of recovery, recycling or reconstruction and reuse can, thus, lead to important benefits for the whole chain.

For what concerns **energy recovery and recycling**, both strategies allow to reduce the greenhouse emissions avoiding to use both fossil fuels and virgin raw materials .

Ecopneus has calculated the environmental balance of several ELT management scenarios. According to this analysis, every ton of recycled ELTs allows to save 2.2 tons of CO₂ eq. The same energetically recovered ton of ELTs allows to save 1.09 tons of CO₂ eq.

Data going back to 2018 published by ETRMA⁸ show that in Europe 1,920,000 tons of ELTs were recycled out of a total of 3,260,000 tons of collected ELTs in 2018. On the other hand, 1,248,000, were energetically recovered.

For example, by applying the conversion factors related to each of the two applications, it is possible to **estimate that material recycling allowed to avoid the emissions of over 4 million tons of carbon dioxide. Energy recovery, instead, allowed a saving of about 1.2 million tons.**

“ In this field, the true challenge for tyre producers is to make their **tyres more easily recyclable** and allow to reintroduce the **recovered materials in the production cycle of origin** This challenge is particularly complex due to the vulcanisation process the virgin raw material is subject to during the tyre production process. ”

⁸<https://www.etrma.org/wp-content/uploads/2020/09/Copy-of-ELT-Data-2018-002.pdf>

Recycling rubber that underwent vulcanisation is difficult. For this reason, as of today, the most common recycling applications have involved the shredding of tyres and their end use is external to the tyre business. Thus, it is still not possible to use end-of-life tyres to produce new ones. However, all main manufacturers are involved in research projects to succeed in this goal. They are mainly focused on **the technology of pyrolysis**. For example, Pirelli already manages to obtain recycled carbon black from the pyrolysis of end-of-life tyres. This is subsequently re-introduced in the tyre production process.⁹

Another strategy to manage the end of life of a tyre is to **prevent the creation of waste**. This is in line with the EU waste hierarchy. It is possible to prolong the life of a tyre by **retreading** it. Basically, this process consists in the replacement of the worn tread, thus allowing the largest part of a tyre to carry on one or more useful cycles.¹⁰

The process can be hot or cold. In the hot process, temperatures of about 150-160°C are reached. An uncured tread compound is introduced in a vulcanising mould with the pattern that will be subsequently printed on the tyre. In the second case, instead, the tread is pre-printed and the process allows to vulcanise the product at 110°C¹¹.



⁹<https://www.pirelli.com/global/en-ww/life/an-eco-journey-inside-a-tyre>

¹⁰<https://eur-lex.europa.eu/legal-content/IT/TXT/HTML/?uri=CELEX:32008L0098>

¹¹<https://www.asso-airp.it/pdf/Circular-Economy-at-work/48/index.html> pagina 48-49

The environmental advantages of this technology seem to be significant. For example, Bridgestone estimates that a retreaded tyre uses 73% less resources than a new one¹². This value is very similar to the one stated by Continental, that talks about a 70% saving of resources .

A recent study carried out by the *Fraunhofer institute*¹³ compared the environmental impact of retreaded tyres with new ones. Thanks to the savings in terms of virgin raw materials, retreading allows to save about 64% of the emissions compared with a new tyre.

As of today, the retreading activities concern mainly large expensive tyres such as truck, bus and agricultural vehicle tyres that can reach 200 kg in weight. However, this technology could be applied to (and in some cases it is so) automobile tyres that are the largest part of the market. According to the European Tyre Rubber Manufacturer Association, **16.7 million truck and bus tyres were sold in Europe in 2019 in Europe. Of these, about 25%, over 4.3 million, were retreaded tyres**¹⁴.

This percentage goes down to 4%, if one takes into consideration the amount of retreaded tyres on the total of tyres managed in Europe due to the overwhelming amount of automobile tyres.

Among the market leaders of the sector, the Italian company Marangoni produces pre-printed rings with the *Ringtread*¹⁵ technology. These rings can be applied directly onto the producers' tyre bodies. Thanks to this technology, it has been estimated that 50,000,000 tyres were retreaded between 1975 and 2022. Today, over 25% of cold retreaded tyres use the technology developed by Marangoni in Europe.

¹²<https://www.bridgestone.com/responsibilities/environment/resources/action02/index.html>

¹³<https://www.retreadingbusiness.com/latest-news/posts/2022/september/fraunhofer-institute-draws-positive-eco-balance-of-high-quality-retreads-v-comparable-new-tyres/>

¹⁴<https://www.etrma.org/wp-content/uploads/2021/12/20211215-Statistics-booklet-2021VF.pdf>

¹⁵<https://www.marangoni.com/retreading-systems/ringtread-system/>

**FINANCIAL
BENEFITS**

05

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THE FINANCIAL BENEFITS.

SAVINGS ON VIRGIN RAW MATERIAL IMPORTS

The activities of Ecopneus not only generate environmental and social benefits for Italy, but also financial ones. In 2022 alone, **Italy's savings on virgin raw material imports amounted to about 127 million euros, thanks to the use of the materials obtained from ELT recovery.** In general, the main savings are linked to the recovery of ELT-derived rubber polymer. This for what concerns both the amount of material and the difference in price of virgin rubber compared with other raw materials, such as, carbon coke. Indeed, the latter can be replaced with ELT-derived fuel in cement factories.

ESTIMATE OF SAVINGS ON THE TRADE BALANCE OF ELT RECOVERY

The Ecopneus System in 2022: **127 millions euros saved** on virgin raw material imports

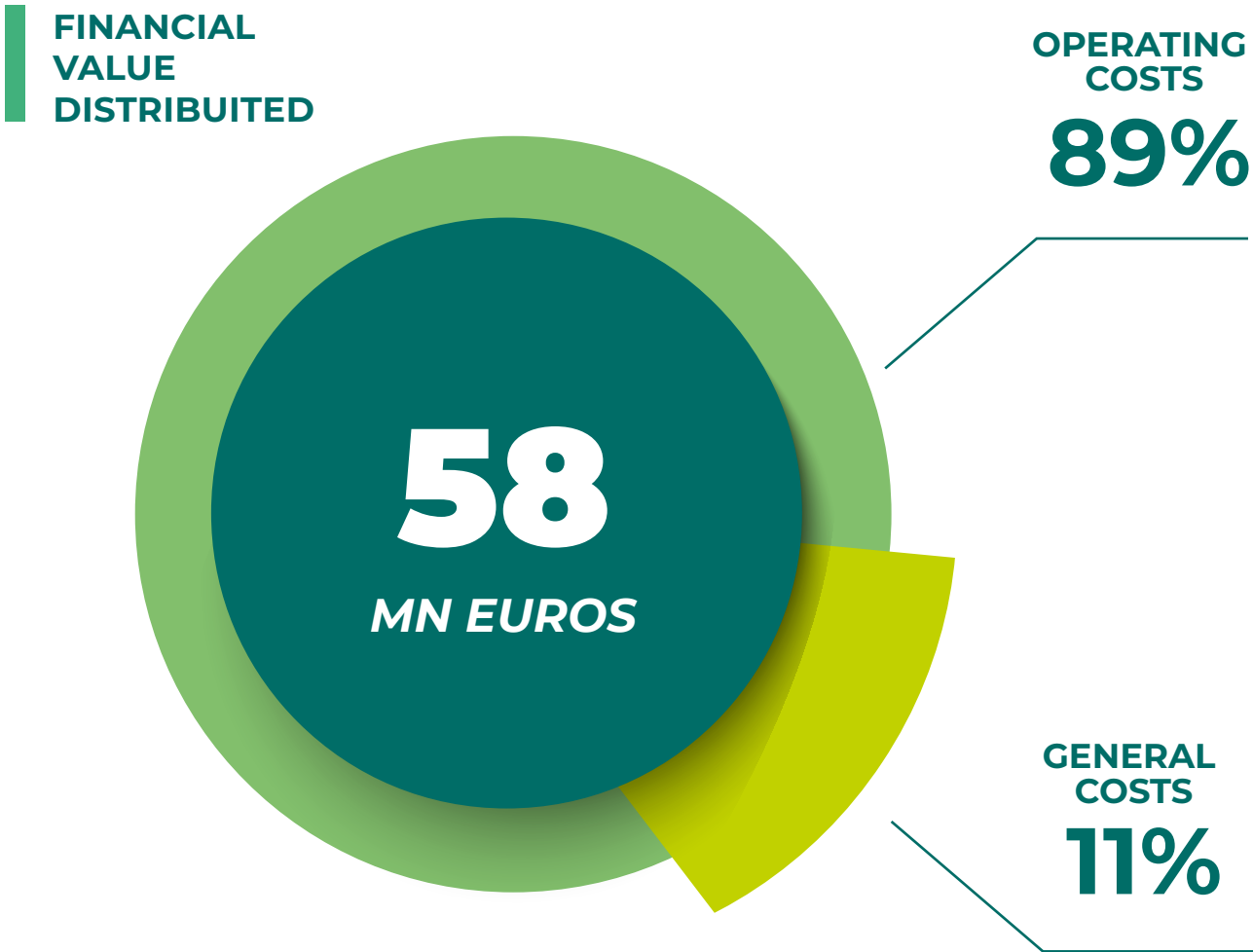
RAW MATERIAL REPLACED WITH THE RECOVERY OF ELTS	SAVING FROM RECOVERY IN ITALY (M€)
VIRGIN RAW RUBBER (RECOVERY OF GVG)	109
IRON SCRAP (RECOVERY OF STEEL IN STEEL FACTORIES)	4,3
COKE (RECOVERY OF FUEL DERIVED FROM ELTS)	12,7
IRON ORE (STEEL RECOVERY IN CEMENT)	0,83
Total	127

VALUE DISTRIBUTION

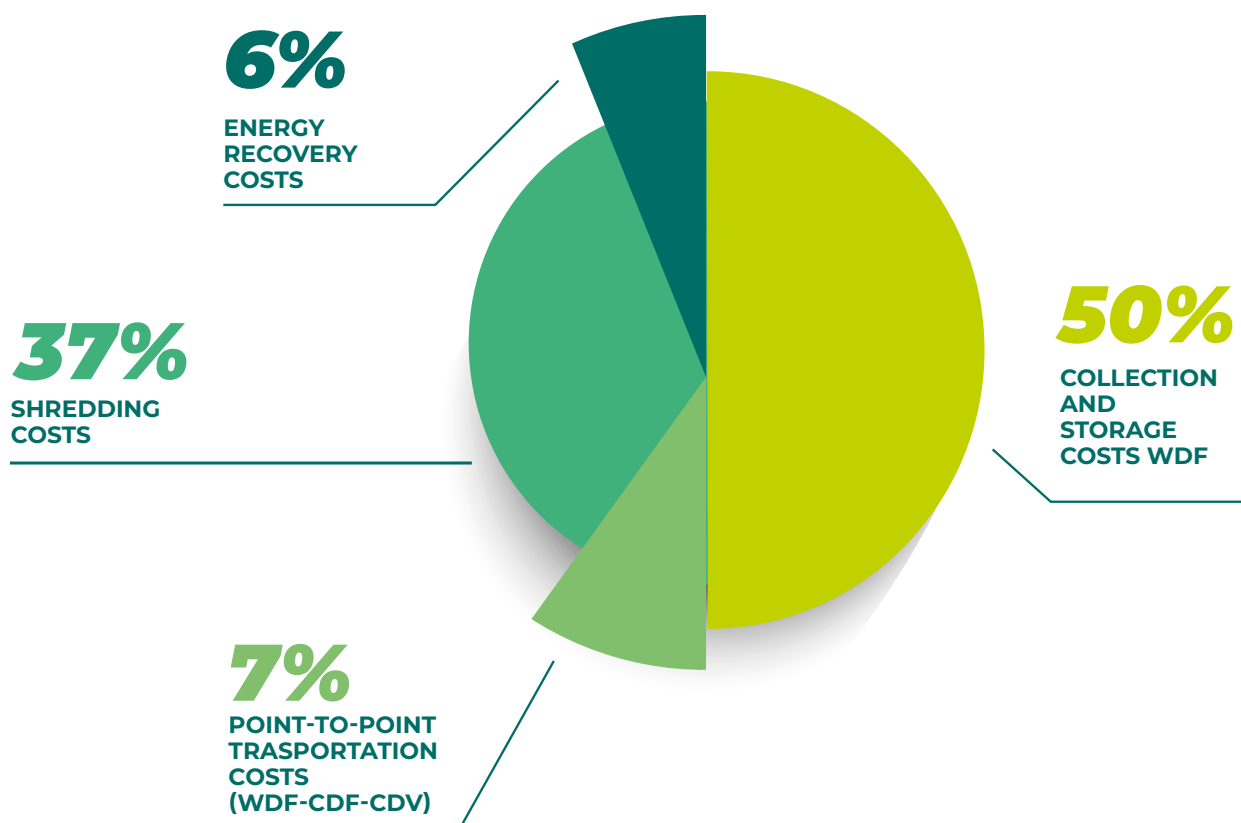
Ecopneus manages its finances carefully and thoroughly. This contributes to the stability of the companies of the chain. Indeed, they can rely on certain and regular payments on top of constant flows of materials to treat. The transparent use of such financial resources assures the compliance with the legislation and shows how Ecopneus takes its role as a non-profit company seriously. The amount of eco-fees is regularly checked and, eventually, adjusted with reference to the best system management, aiming at limiting this cost for consumers.

In 2022, the financial value generated from the consortium fees amounted to 59.8 million euros. Of this, 5 million euros derived from profits as per art 228 c3bis DL 152/06. This amount can be kept for the following years. The financial value distributed to cover all costs for system operativity amounted to 58 million euros. 51.7 million euros was spent to support the operative activities of collection, transportation and treatment of ELTs.

The financial value allocated to ELT management activities by the Ecopneus system represented almost **90%** (operating costs) of the expenditure: **51.7 million euros in 2022**. The remaining **10%** – amounting to **6.3 million euros** in – was spent to cover general costs, such as: members of staff, taxes and other costs, as well as communication activities and the many R&D projects promoted in support of the recycled rubber chain and market, as provided for by art. 228 of DL 152/2006.



DETAILS OF OPERATING COSTS IN 2022



In the last 5 years, the average management costs (collection, transportation and treatment) have increased for granulation, shreds and chips recovered in Italian cement factories. On the contrary, they have gone down for their recovery in cement factories abroad and for the recovery of whole tyres in Italy .

2022 ECOPNEUS AVERAGE MANAGEMENT COSTS (€/t)

	2018	2019	2020	2021	2022	Var 2022/2028
Granulation	233	244	236	236	258	11%
Shreds recovered in Italian cement factories	192	210	200	204	223	16%
Chips recovered in Italian cement factories	228	232	229	218	233	2%
Shreds recovered in foreign cement factories (transport by land)	192	210	200	204	233	16%
Shreds recovered in foreign cement factories (transport land + ship)	231	244	200	198	202	-13%
Chips recovered in foreign cement factories (transport land + ship)	261	257	224	212	210	-19%
Whole tyres energetically recovered in Italy	277	237	238	240	257	-7%

ECO-FEES

The system for ELT management is financed through eco-fees paid by the end users. Eco-fees were first applied on 7th September 2011. Every buyer has to pay these fees upon purchasing a new or second-hand imported tyre. Their value is proportioned to the type of tyre purchased and makes reference to the weight of the tyre itself. They can be clearly identified in the sales document under a specific entry. Eco-fees are used to assure the correct management of End-of-Life Tyres. The eco-fees applied by Ecopneus in 2022 follow the scheme laid out by the M.D. 182/2019. Indeed, the latter provides for 15 different tyre typologies based on their weight. In their turn, they are also divided into 3 other categories: **S=Small; M=Medium; L= Large.**

The table below shows the amount of eco-fees (subject to VAT) applied by the companies partners of Ecopneus in 2022. It remained unchanged compared with the previous year.

**TABLE OF ECOPNEUS
ECO-FEES
IN 2022 (€/t)**

CATEGORY	TPOLOGY	TYRE WEIGHT (kg)	ECO-FEE
S	1	0 - 4.999	1.00
	2	5 - 7.999	1.80
	3	8 - 12.999	2.60
	4	13 - 15.999	3.70
	5	16 - 24.999	4.70
	6	25 - 34.999	7.70
M	7	35 - 64.999	14.50
	8	65 - 104.999	18.70
	9	105 - 154.999	32.70
L	10	155 - 224.999	56.70
	11	225 - 314.999	79.30
	12	315 - 424.999	112.30
	13	425 - 554.999	148.00
	14	555 - 704.999	184.30
	15	> 705	266.60

When looking at the eco-fees applied by the consortium in 2011 upon their first implementation, a gradual reduction of the same can be seen for all categories involved. For example: typologies 2 and 3 of category S **(from 5 to 12.999 kg in weight)** were **76% of the tyres sold by the Ecopneus partners in 2022**. They can be compared with the previous category “B” of tyres: “Vehicles and their trailers”. In 2011, the average eco-fee applied to them was of 3 euros/piece. On the contrary, in 2022, the average value of eco-fees for this category was 2.2 euros/piece (-36%).

TABLE OF ECOPNEUS ECO-FEES IN 2011

CATEGORY	VEHICLES USED	MIN-MAX WEIGHT (in kg)	ECO-FEE (€/ tyre)
A	Motor cycles and motor vehicles (mopeds, motor cycles,	A1 (2-8)	1.50
B	Motor vehicles and their trailers (automobiles, company automobiles caravans, etc.)	B1 (5-18)	3.00
C	Trucks, Buses (trucks, articulated buses Semitrailers, trolley buses, etc)	C1 (20-40) C2 (41-70)	12.10 23.50
D	Farm equipment, heavy plant vehicles Industrial vehicles (tractors, excavators etc.)	D0 (44) D1 (4-20) D2 (21-40) D3 (41 - 70) D4 (71-110) D5 (111-190) D6 (191-300) D7 (oltre 300)	0.00 4.00 9.60 18.80 29.00 56.00 120.00 326.00

**RESEARCH,
QUALITY AND
INNOVATION**

06

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RESEARCH, QUALITY AND INNOVATION.

Since the beginning of its activities, Ecopneus has paid great attention to research, quality and innovation. To do so, it has worked with the companies of the chain to progressively improve the management of the quality of products and processes. It has also strengthened the several sectors of the applications of recycled rubber creating new job opportunities. In particular, **the activities of Research & Development carried out in the course of the years have aimed at consolidating the scientific knowledge** on the different possible uses of recycled rubber, both in mature sectors and in those subject to potential future growth.



THE MAIN AREAS OF RESEARCH AND INNOVATION OF ECOPNEUS

- Being part of national and European technical tables (UNI, CEN, Etrma, CAM)
- Research and testing projects of new rubber applications in several sectors (steel industry, sports installations, manufacts, mixes and asphalts)
- Analysis and study of the legal and technical regulations for an effective dialogue and collaboration with the companies that use the recycled rubber of the chain.

FROM RECYCLED RUBBER TO COMPOUND.

The research aiming at the use of **Tyreplast** constitutes an area of great commitment for Ecopneus with reference to the interest the solutions and prototypes currently being developed have raised. Tyreplast is a compound born out of the mixing of **rubber powder recycled from ELTs and thermoplastic materials** (even recycled ones). As already highlighted, this project is being carried out in collaboration with several partners that contribute to the project with their specific skills.

The Tyreplast project was born from an idea of **Ecopneus and Idea Plast**, a Lombard company specialised in the production of urban furniture and products made with recycled rubber. The Tyreplast compounds can be used in several sectors. For example, Tyreplast is used to produce vehicle finishing components in the automotive sector. In the building one, instead, it is a useful material for soundproofing and vibration dampening. In livestock farming, it is possible to create covers and prostheses to protect the animals from becoming lame. Moreover, the Tyreplast compound can be used in urban furniture to create flowerbeds and benches. The Tyreplast materials can be used also in the world of sports for the creation of temporary or removable sports surfaces.

GREATER SAFETY FOR MOTOR CYCLISTS ON THE ROAD

As already said on page 45, Anas, a company of the Italian Railway Group FS, has successfully tested a new prototype of eco-friendly safety device according to a certified test field as per UNI CENT TS 17342. This device assures great safety in case of impact with motorcyclists' bodies, limiting serious damage and reducing maintenance interventions to zero. The latter is due to the properties of rubber of going back to its original shape following the impact.

The Anas Ecofriendly D.s.m.U project has been studied and designed in-house by Anas, in collaboration with the Department of Industrial Engineering of the University of Florence for the testing of the finished elements, the company Proge Plast for prototype production and Ecopneus for the part concerning the materials used.





A NEW DIMENSION FOR BASKETBALL

Ecopneus has invested in 3x3 basketball for years in order to develop an innovative surface specifically developed for the peculiar needs of this discipline. 3x3 basketball debuted as Olympic discipline during the Tokyo 2020 Olympic Games. 3x3 basketball is the “street” version of basketball and is growing in popularity among basketball lovers and champions all over the world. Ecopneus is working on a specific removable surface using Tyreplast slabs made with the support of SP Plast. This solution allows to create temporary or removable courts that are as performing as permanent ones, even if they are not anchored to the ground. This project has seen the collaboration of Giacomo “Gek” Galanda, former basketball champion and currently a manager of the Italian Basketball Federation. Thanks to his great experience as a top player, he has helped testing the surfaces made with recycled rubber in order to constantly innovate and support athletes’ performances and safety.

INNOVATION FOR ANIMALS’ WELLBEING

Ecopneus, Ideaplast and AgriglobalServices have presented a cow shoe made with Tyreplast – a material composed of secondary raw materials deriving from plastic and End-of-Life Tyre recycling. This solution uses sustainable materials that assure comfort, flexibility and duration thanks to the specific properties of rubber. These cow shoes are used to treat the pathologies of cows’ hoofs that cause invalidating lameness. This project was born from the collaboration between Ecopneus and Idea Plast. Cow Shoes were first presented during the 2022 edition of EuroTier, the most important European trade fair of livestock farming held in Hannover. The project is currently being implemented at the Department of Veterinary Medicine of the University of Perugia. On top of CowShoes, the three partners presented also ElliptiCOW – self-blocking mattresses for cows’ boxes made with 100% recycled rubber from ELTs mixed with polyurethane resins. These mattresses were developed to allow greater comfort to animals when resting. Moreover, they allow to have tidier animals’ boxes and ensure greater hygiene. In turn, all this leads to less infections and injuries to animals’ legs.





AN INNOVATIVE MATERIAL FOR THE SAILING SECTOR

After carrying out thorough research in the yachting and sailing sector, Ecopneus has developed the prototype of a new Tyreplast fender in collaboration with its technical partners Idea Plast and SPPlast. The prototype is made with a compound containing 20% of rubber recycled from ELTs and is fully recyclable. Studies are being carried out to reach 50% of ELT-derived rubber. The fender weighs 1.8 kg and is highly modular. It can be assembled according to its use, boat dimension and spaces. It is currently being tested to be certified. Moreover, Tyrefield slabs have been installed at Genoa's Italian Yacht Club, the oldest in the Mediterranean Sea. They have been placed along the walkways, the 6x6 technical areas and the slipways of this prestigious club. It is a solution that assures great boat protection, as it annuls the problems linked to the boats approaching hard surfaces. Moreover, it offers greater safety for people, reducing the risks of slipping near water or in particularly wet area

THE IMPORTANCE OF CHEMICAL RECYCLING

Chemical Recycling is a fast-growing technology thanks to its possibility of maximising waste recycling. It permits to reintroduce ELT-derived secondary raw materials into the industrial cycle thus contributing to the overall sustainability of both products and processes. It is a sector with great growth potential both in Italy and in Europe thanks to the consolidation and the spreading of state-of-the-art technologies. In their turn, these can lead to greater environmental and financial benefits for companies and society. These benefits derive from the recovery of End-of-Life Tyres.

All legislative interventions and the definition of a national industrial strategy will be of uttermost importance in order to find new ways to recover ELTs for assuring a constant flow of recycled rubber towards its markets of use. The effort of Ecopneus is fundamental and strong in this sector.



THE ECOPNEUS CATALOGUE OF PRODUCTS MADE WITH RECYCLED RUBBER

In 2022, the Ecopneus catalogue of products made with recycled rubber was reorganised and relaunched in collaboration with Matrec. The aim was to raise the awareness of ELT-derived rubber applications. (<https://catalogopfu.ecopneus.it>).

The Ecopneus catalogue is a national point of reference for the sector. Its objectives are the following:

- **Raising the awareness of product made with ELT-derived rubber for the B2B sector**
- **Allowing architects and companies to interact with the catalogue to get know the products made with rubber recycled from ELTs present and nation level**
- **Raising the awareness about the characteristics and properties of ELT-derived rubber to give life to new proposals and design solutions**
- **Spreading projects and applications of products made with ELT-derived rubber at national and international level**
- **Animating the world of design with creative action for new applications that valorize ELT-derived rubber as a circular material**

The catalogue is a way to contact the Italian companies that have worked in the production of the material (powder/granules) and products for years. Moreover, it contains a “REPORT” section, where the technical manuals on the use of recycled rubber produced by Ecopneus are published.

The section “**DESIGN & INNOVATION**” supplies information about the characteristics of the material and the semi-finished products made with recycled rubber. It aims at identifying new solutions for the world of architecture and design.

Companies, architects, designers and any other interested subject can inform us about projects, tests, or initiatives from the world of ELT-derived rubber writing to ufficiostampa@ecopneus.it



ECOPNEUS

HOME COS'È PRODOTTI POLVERINO/GRANULO REPORT INNOVAZIONE&DESIGN CASE HISTORY

In collaborazione con
MATREC
Sustainable Materials & Trends

Il Catalogo dei prodotti realizzati con gomma riciclata dagli Pneumatici Fuori Uso



SCOPRI I PRODOTTI IN GOMMA RICICLATA



CASE HISTORY



**SPECIAL
PROJECTS**

07

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SPECIAL PROJECTS.

The efforts of Ecopneus are not limited to the reaching (and going beyond) its collection and recovery targets. It aims at creating added value for Italy with reference to environmental protection and the circular economy.

This objective is reached by the means of the many extra-ordinary projects Ecopneus has implemented all over the Italian territory.

THE MEMORANDUM FOR THE “TERRA DEI FUOCHI” (“LAND OF FIRES”)

Since 2013, Ecopneus has acted within the scope of a Memorandum of Understanding signed by the then-Ministry of the Environment (now Ministry of the Environment and Energy Security), the Prefectures of the Cities of Naples and Caserta, the Municipalities of Naples and Caserta, and the Commissioner appointed to fight the burning of waste in those areas. Ecopneus has carried out projects of collection and management of the **End-of-Life Tyres illegally dumped** all over the territory of the **Provinces of Naples and Caserta**.

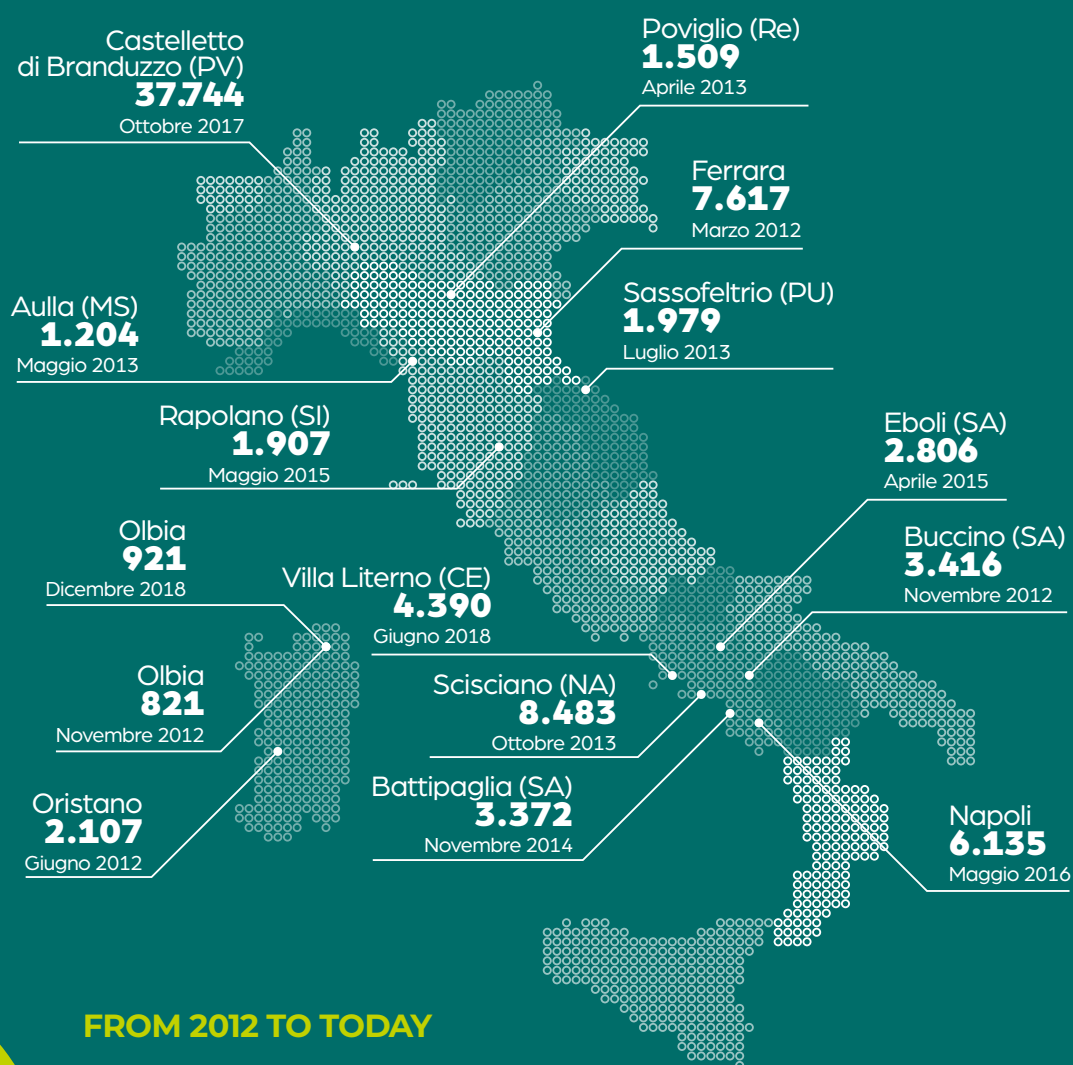
It is an extra-ordinary intervention aimed at fighting the phenomenon of toxic fires by the means of the collection of ELTs abandoned in those territories. ELTs are often used as starter and fuel for arsons. Information and education to legality are important components of this project. Indeed, they aim at fighting the off-the-books sales of tyres that are linked to the phenomenon of ELT dumping in the environment. Educational projects, public and school initiatives, contests open to citizens create culture but also transform the ELTs recovered from the territory into concrete symbols of environmental protection and commitment. Examples are the football pitch made with recycled rubber of Scampia's stadium or the one of Caserta's Vanvitelli neighbourhood, where children and teenagers can train both their legs and minds to legality.

THE FIGURES OF THE MEMORANDUM FOR THE “TERRA DEI FUOCHI”.

- 84 councils involved in the provinces of Naples and Caserta
- Over 22,779 tons of ELTs collected (2013-2022)
- Emptying of 3 historical stocks in Scisciano (NA), Naples, Villa Literno (CE)
- Extra-ordinary collection activities in the archaeological area of Cales, in the council of Calvi Risorta (CE) in 2015
- Over 1,000 students involved in training and awareness-raising activities on “environment and legality” from 2013 to 2018.
- Open-air initiatives and contests for citizens supported by the awareness-raising campaign “I choose the Right Way” (www.ioscelgolastradagiusta.it)
- Creation of the 11-a-side football pitch in Scampia's neighbourhood in Naples
- Multi-purpose playground in Caivano's Parco Verde neighbourhood (NA)
- 2 pitches made with recycled rubber in Caserta's Vanvitelli neighbourhood
- 1 basketball court made with recycled rubber made in the city of Caserta
- 1 5-a-side football pitch made on an area confiscated to the Camorra in Casapesenna (CE). 64

THE EMPTYING OF 15 HISTORICAL STOCKS FROM THE NORTH TO THE SOUTH OF ITALY.

Until 31st December 2018, the M.D.82/2011 obliged the bodies in charge of ELT management, such as Ecopneus, to allocate at least **30% of their financial surplus (if available) upon year-end for activities of removal and emptying of "historical stocks"**. These are large amounts of ELTs found in failed businesses, warehouses or in the environment linked to the lack of a national coordinated ELT collection and recovery system until 2011. Ecopneus concentrated its activities in the Campania Region with the emptying of 3 stocks within the special project for the so-called "Terra dei Fuochi". Among the several bodies in charge of ELT management in Italy, the great efforts of Ecopneus have led to the emptying of the large historical stocks in Italy.



TOTAL
84,413t

FROM 2012 TO TODAY

- Emptying of 15 historical stocks.
- Over 84,000 tons of ELTs equal to the weight of about 9.3 million automobile tyres.
- A volume that can fill over 80 Olympic-sized swimming pools.

THE OBSERVATORY ON THE ILLEGAL FLOWS OF TYRES AND ELTS IN ITALY.

Among the dynamics that put the correct management of ELTs at risk are the flows of illegal tyre sales in Italy. It is a phenomenon spread from the North to the South of the country with quite meaningful incidence data. For this reason, Ecopneus has promoted a round table of discussion and proposals on this matter since 2016. This phenomenon puts the correct management of ELTs at risk, because the tyre market is flooded with tyres that are not accounted for in the national total. As such, they are excluded from the collection amounts allocated to the various bodies operating in the sector. The initiative was supported by the main interlocutors of the tyre and ELT chain in Italy – a network of over 50,000 companies. **In May 2017, “CambioPulito” was launched. It was the first whistleblowing platform promoted by the private sector that saw such large participation. It aimed at collecting anonymous information on malpractices or illegal actions among companies that generate unfair competition in the sector, as well as the risk of ELT dumping.** At the end of 2019, the Observatory ended its activities and, thanks to the data collected with the CambioPulito platform, it estimated the illegal flows of ELTs in Italy: 30/40 thousand tons every year.

The following are to be added:

- **12 million euros: estimated loss of eco-fees for Tyre collection and recycling**
- **80 million euros: estimated VAT evasion**
- **Risk of dumping in the environment of ELTs deriving from illegal activities.**



The CambioPulito platform was active from June 2017 to 15th December 2019. It recorded 361 reports of illegal activities that involved 301 companies.

The reports were processed by Legambiente by the means of its lawyers of the Juridical Action Centres (Centri di Azione Giuridica - Ceag). Almost all of them were precise, detailed and equipped with supporting evidence. The result were 8 reports, whereby:

- **136 companies (126 Italian companies and 10 foreign ones) were reported to the Carabinieri for Environmental Protection. 35% of the operators were subsequently controlled and sanctioned**
- **14 websites were reported to the Italian Competition Authority, (5 Italian websites, 9 foreign ones)**
- **24 cases in Region Campania were reported to the Air and Sea Operative Department of Naples's Guardia di Finanza.**

About 80% of reports made reference to supposed violations of the rules of trade, free competition and labour market. Thanks to them, it was possible to understand the dynamics of the thefts of new tyres for their subsequent off-the-books sale (especially online).

OTHER INITIATIVES IN 2022.

RECYCLED RUBBER IS FASHIONABLE

Recycled rubber was the protagonist of the stage clothes of “Favole di Moda” (Fashion Tales). It was an event dedicated to the most famous tales written by Hans Christian Andersen, created by Stefano Dominella, President of Maison Gattinoni Couture, with the artistic direction of designer Guillermo Mariotto, in collaboration with Ecopneus. Recycled rubber went on stage at the Theatre of Villa Torlonia in Rome, as integral part of the clothes and the scenography designed for the show directed by Strabioli, and with the creations of emerging designers such as Italo Marseglia, Federico Fioldi and Yasmeen Concettini. They turned recycled rubber into an artistic element for the first time, in a context such as haute-couture, where creativity and the capacity of seeing the future managed to give it a new shape. Moreover, on 28th July, Ecopneus took part in “Roma è di Moda. Via Veneto Edition” (Rome is Fashionable. Via Veneto Edition). Promoted by Roma Capitale, also this event was created by Stefano Dominella with the artistic direction of Guillermo Mariotto. This show wanted to tell about how the fine Italian craftsmanship managed to unite the great Italian manufacturing tradition with sustainable fashion. Thanks to creativity associated with high fashion, in 2022, these initiatives brought the public’s attention to recycled rubber as an interesting resource with great potentialities even in innovative contexts. Indeed, recycled rubber is a versatile, elastic and resistant material with multiple possibilities of personalisation in shapes and colours.



ECOPNEUS SUSTAINABILITY PARTNER OF THE 2022 SPORTS FESTIVAL

In 2022 Ecopneus was, once more, a Sustainability Partner of Trento's Sports Festival, an event promoted by the sports newspaper Gazzetta dello Sport.

Many activities were planned on the several surfaces made with recycled rubber at the Festival. A volleyball and a basketball court, an athletics track and a padel court were set up thanks to Ecopneus and some of its partner companies. They were all made with rubber recycled from End-of-Life Tyres. It was an occasion to put these sustainable surfaces made with recycled rubber at the centre of the attention of national and international sport at the highest level.

RECYCLED RUBBER IS THE PROTAGONIST OF THE HORSE RIDING SPACES OF THE "CASCINO" BARRACKS OF PALERMO'S "LANCIERI DI AOSTA" REGIMENT

The Cascino barracks have a long tradition of commitment to social activities and greatly care about animals' and riders' wellbeing. The collaboration with Ecopneus has allowed to requalify the areas of horse riding and horse washing, as well as horses' stables using rubber recycled from End-of-Life Tyres and making these spaces more sustainable and safer. The great anti-shock properties of recycled rubber protect animals' articulations and soften any eventual rider's fall.

Moreover, rubber recycled from ELTs has many other advantages. It allows an overall improvement of the hygiene of the area and a reduction of maintenance costs. This makes it a financially sound and environmentally friendly choice.

RECYCLED RUBBER IS AT THE HEART OF FESTAMBIENTE, AMONG CULTURE, MEETINGS, SPORTS AND ENTERTAINMENT.

Thanks to the support of Ecopneus, since 2014 a city of recycled rubber has been gradually created at Festambiente, the event promoted by Legambiente. Football pitches, basketball courts, minigolf, the TuttinGioco inclusive playground, cycle lanes, an improvement of the acoustics of the meeting room, urban furniture, relaxation areas have all been made with rubber recycled from ELTs. They are all concrete evidence of the benefits linked to the recovery of recycled rubber. In 2022, the parking area was resurfaced with the use of rubberized asphalt made with Tyrexol – a rubber powder derived from End-of-Life Tyres and engineered specifically to improve asphalt workability. Smacom, a company partner of Ecopneus, Impresa Fratelli Massai and the company Rub-Lab contributed to the realisation of this requalification intervention.



INAUGURATION OF THE “CAMPO DEI MIRACOLI” IN CORVIALE

The President of the Italian Republic, Mr Sergio Mattarella, took part in the inauguration ceremony of the “Campo dei Miracoli” (Field of Miracles) – an 11-a-side football pitch in Rome’s Corviale neighbourhood. The project was promoted by CALCIOSOCIALE, an amateur sports club, and the Institute for Sports Credit with the contribution of Ecopneus. The initiative aims at implementing the activities of aggregation of children, teens and their families, improving the quality of the sports offer and, more in general, the socialisation opportunities at the disposal of the local community.

GREEN SPORTS INSTALLATIONS FOR THE CITY OF CHILDREN AND TEENS

Two multipurpose surfaces for basketball and volleyball made with ELT-derived rubber were sponsored by Ecopneus at the ONCR – Opera Nazionale per le Città dei Ragazzi di Roma (National Work for the Cities of Children and Teens of the city of Rome). This body operates in the training and full personal development of minors in need. The sports surfaces were created within a proper city with streets, squares, accommodation and services conceived for the most vulnerable children and teens. In it, they are welcomed and turned into the protagonists of a democratic and inclusive city life. Moreover, the ONCR wanted to give the opportunity to a group of their teens to attend a course to learn how recycled rubber can be used for creating new, sustainable, and circular products – just like the surfaces they will be able to train on and have fun. This training course provided for classroom lessons taken care of by Ecopneus and realized thanks to the support of Waterproofing, a company specialised in sports surfaces with ELT-derived recycled rubber. An initiative with great social value that falls within the formative path of ONCR.





A NEW BASKETBALL COURT IN PESARO

A new basketball court was made in Villa San Martino, Pesaro. It is the symbol of Pesaro's basketball history, created thanks to the efforts of the Council of Pesaro and the Basketball League with the support of Ecopneus.

An innovative, highly-performing surface whose design took part in a contest for professionals to personalise the playground with geometrical patterns and the "WePesaro – European Sports City" logo. The installed system complies with FIBA's requisites and will be subject to homologation. In this way, it will be able to host official international competitions. The court was created with an innovative performing mat produced by Progeplast and laid by Waterproofing, a specialized company that applied the superficial resins and the game lines.

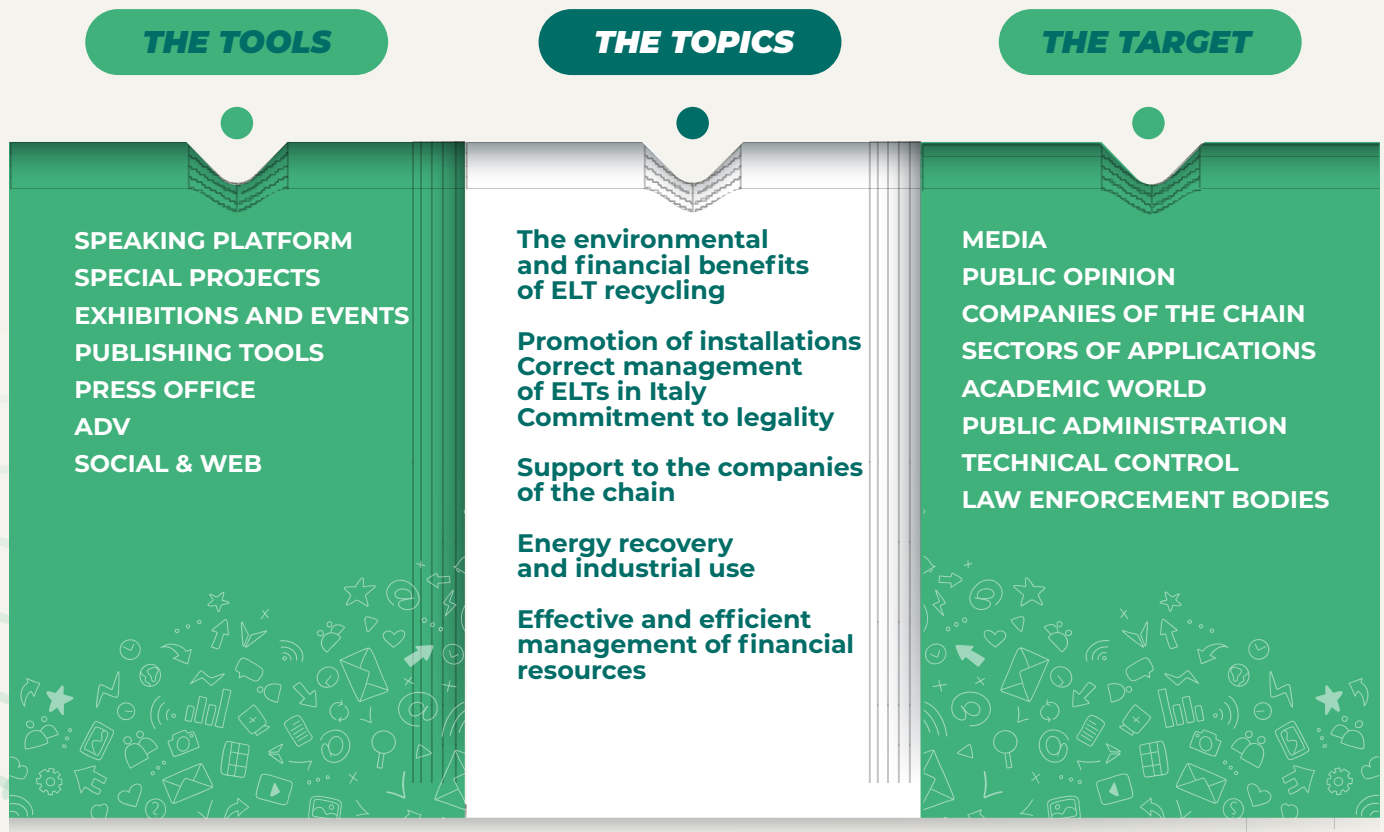
**COMMUNICATION,
EDUCATION,
TRAINING**

08

A decorative graphic consisting of numerous thin, light green lines radiating from a central point behind the number '08'. Each line ends with a small green dot. The lines are arranged in a fan-like pattern, spreading outwards and downwards from the top left towards the bottom right of the page.

COMMUNICATION EDUCATION, TRAINING.







All the activities that Ecopneus carries out in its sectors of competence are shown in its communication and awareness-raising initiatives. Their aim is to inform all the stakeholders of Ecopneus about the correct and transparent management of its activities at the service of citizens. They also promote all applications made with recycled rubber. Promoting a culture of recycling, ethics and legality, for a correct management of waste, creating fertile ground for an ever growing development of the various applications of rubber is a task the Legislator has entrusted Ecopneus with by the means of the M.D. 82/2011 first and now with the M.D. 182/2019.



Since the beginning of the activities of Ecopneus, the concept of circular economy has become very important. Indeed, it has gone beyond the limits of the environmental sector and has become the paradigm of reference for a diverse audience. In 2022, the new visual identity of Ecopneus was created with the aim of respecting the past, projecting the company into the future and innovating within the scope of continuity and recognisability. Clear, dynamic and marked lines represent the consolidation and the reputation Ecopneus has gained in 10 years, dynamically looking to the future.

DIGITAL COMMUNICATION.

In the course of time, the presence of Ecopneus on websites and the social media has grown in importance. In particular, it aims at intercepting and dialoguing with all members of the public interested in the activities of Ecopneus. It also responds to the community and supplies information and updates in real time on the activities of Ecopneus. The website, **www.ecopneus.it**, has always been a source of wide and detailed information on the activities of Ecopneus and the promotion of recycled rubber. It has naturally evolved in the course of time. By way of example, it has introduced an informative “dashboard”. By the means of graphs, maps and data, it allows to have a detailed picture of the activities of Ecopneus on its activities related to ELT management. The social media of Ecopneus have progressively been consolidated too. They are now a highly loyal community that follows and interacts. The effort of informing and raising the awareness on the applications of recycled rubber is strong towards this community. They also inform about the events Ecopneus has taken part in.

	www.ecopneus.it 69,072 users 100,979 sessions 166,892 visualised pages
	Facebook 10,3M content visualisations 7,8M users reached 69,072 users 100,979 sessions 166,892 pages viewed
	Twitter 1200 tweets e retweets 10,000 content visualisations
	Instagram 192 post & stories 5M content visualisations
	Linkedin 108 post 71,000 content visualisations
	Youtube 33,300 visualisations 928 hours video/views

TRAINING, THE CIRCULAR ECONOMY AND END-OF-LIFE TYRES: THE ECOPNEUS ACADEMY.

Launched in 2021, the Ecopneus Academy represents a moment of important training on topics linked to the circular economy of End-of-Life Tyres, from the correct management of recycling to the legislation of reference, up to the sectors of application of recycled rubber. The Ecopneus Academy comprises the many educational and training initiatives already implemented by Ecopneus, such as the ELT Academy and the Educational Project. It also includes all new planned initiatives. Through the sharing of knowledge and innovative tools, the Ecopneus Academy aims at constantly supporting a culture of sustainability, thus concretely contributing to a more sustainable growth for Italy and a better understanding of the dynamics of the sector.

THE ELT ACADEMY

It is a format of workshops focused on the regulatory background of ELT management – both the administrative and the regulatory aspects of it. It boasts the contribution of experts of the sector and is organised in collaboration with Legambiente and the support of ISPRA and the regional ARPAs. The ELT Academy is dedicated to the technical figures of Control and Law Enforcement Bodies and the Public Administration. Since 2013, it has organised 19 meetings with over 1,600 participants and thousands of technical informative publications distributed all over Italy. In 2020 and 2021, this initiative was suspended due to the Covid-19 pandemic. In 2022, the programme restarted with a new appointment in Cagliari, organised in collaboration with Arpa Sardinia.

19 STOPS
FROM 2013 TO 2022.



THE EDUCATIONAL PROJECT IN SCHOOLS.

In collaboration with Legambiente, Ecopneus has organised a training project for the students of high schools since 2013. So far, it has involved over 11,000 students in 11 regions from the North to the South of the Italian Peninsula. This project aims at raising the awareness and help the younger generations to get to know and understand the benefits deriving from the correct management of ELTs. Every citizen can and has to support these good practices by choosing to buy legal new tyres and reacting against the off-the-books sales of tyres that stimulate their illegal dumping in the environment. Every year, the project focuses on an Italian region, meeting the students in their classrooms, organising visits to ELT treatment plants, giving them information material and organising an event on legality and sustainability. Finally, there is also a competition.

A jury composed of representatives of Legambiente, the Ministry of Education, the Ministry of the Environment and of Energy Security and Ecopneus awards sport surfaces and objects made with recycled rubber to the schools of the winning classes every year. These awards are important messages of legality and environmental protection in the places where the new generations are formed. The 2022 edition was held in Lombardy. The winning schools were the Liceo Scientifico Scienze Applicate of the “Guglielmo Marconi” Institute of the city of Gorgonzola (MI) that won the competition; the “Valceresio” High School Institute of Bisuschio (VA) and the “Caravaggio” Liceo Artistico Statale of

THE DONATIONS TO THE SCHOOLS FROM THE ECOPNEUS EDUCATIONAL PROJECT



UNIVERSITY WEBINARS ON **ANIMALS' WELLBEING:** UISP, ECOPNEUS AND THE UNIVERSITY OF PERUGIA.

This initiative was born out of the consolidated relationship of scientific collaboration between the Department of Veterinary Studies of the University of Perugia, Ecopneus and Uisp. Since its first edition, it has raised great interest and wide participation. Four training modules were organised under the scientific coordination of Professor Francesco Porciello of the University of Perugia. They are freely accessible to all the Departments of Veterinary Studies and the students of Veterinary medicine and Animal Production. The subject of these meetings is animals' wellbeing. Particular attention is paid to the technical aspects and the innovative solutions recycled rubber can offer to the benefit of animals' health. They are 12 hours of seminars and 13 hours of study and in-depth analysis on training material freely offered by the organizers and the teachers involved in this project.



MAIN INITIATIVES AND PROJECTS IN 2022



THE RELATIONSHIP WITH THE MEDIA

The media are an important channel for Ecopneus to communicate with the outer world. They deal with all communication topics linked to the **Corporate and Marketing scopes of rubber applications**. In the course of 2022, the Ecopneus press office oversaw and consolidated the relationship with their interlocutors of interest in all the target sectors for communication, thus generating new **opportunities and awareness on Ecopneus** and the applications of recycled rubber.



1,081
PRESS
RELEASES



21
RADIO AND
TV REPORTS

THE NEWSLETTER OF ECOPNEUS

A tool for being constantly informed on the activities and projects of Ecopneus and the culture of recycling for all stakeholders.

In 2022:
12 distributed
newsletters,
1,129 registered
users.



THE PARTNERS OF ECOPNEUS AS OF 31/12/2022

A.R. PNEUMATICI SRL UNIPERSONALE
ARCA SRLS
ASPERTI PNEUMATICI SRL
AUTOGOMMA PEREGO SRL
B. R. PNEUMATICI SPA
BELLOTTO SPA
BRIDGESTONE EUROPE
CAMSO ITALY SPA
CATANIA GOMME SRL
CONTINENTAL ITALIA
D.P. COMMERCIAL TYRES SRL
DAST SRL
DEVALLE GOMME SNC
DRIVER ITALIA SPA
DRIVER SERVIZI RETAIL SPA
DROPMOTIVE SRL
DST SRL
EMMEGIEFFE SRL
EUROMASTER ITALIA SRL
EUROREIFEN MS SRL
FCA ITALY SPA
GEXPO SPA
GOODYEAR TIRES ITALIA
GOTTARDI SRL
GROUPE PSA ITALIA SPA
HARLEY - DAVIDSON ITALIA SRL UNIPERSONALE
IACOLARE REVISIONI
IDIO RIDOLFI E FIGLI SRL
JUST BUSINESS SRLS
KUMHO TIRE FRANCE SAS
MARANGONI
MARANGONI INDUSTRIAL TYRES SRL
MAZZON LEONARDO & C. SNC
MERCEDES BENZ ITALIA SPA
MICHELIN ITALIANA
NUOVA PNEUS VIGNOLA
OUTLET GOMME SRL
PARISE GOMME SNC
PERLA PNEUMATICI SIENA SRL
PICONE SRL
PIRELLI TYRE
PNEUS SERVICE ITALIA SRL
PROMETEON TYRE GROUP SRL
RE-TA GOMME SRL
ROSSI LAMBERTO SRL
S.A.R.A. PNEUMATICI SRL
SAVOIA PNEUMATICI SRL
STILGOMMA DI CAVUOTI PASQUALE E FIGLI SNC
TARGETROBOT SRLS
TYRE TEAM SPA
VOLKSWAGEN GROUP ITALIA SPA

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