



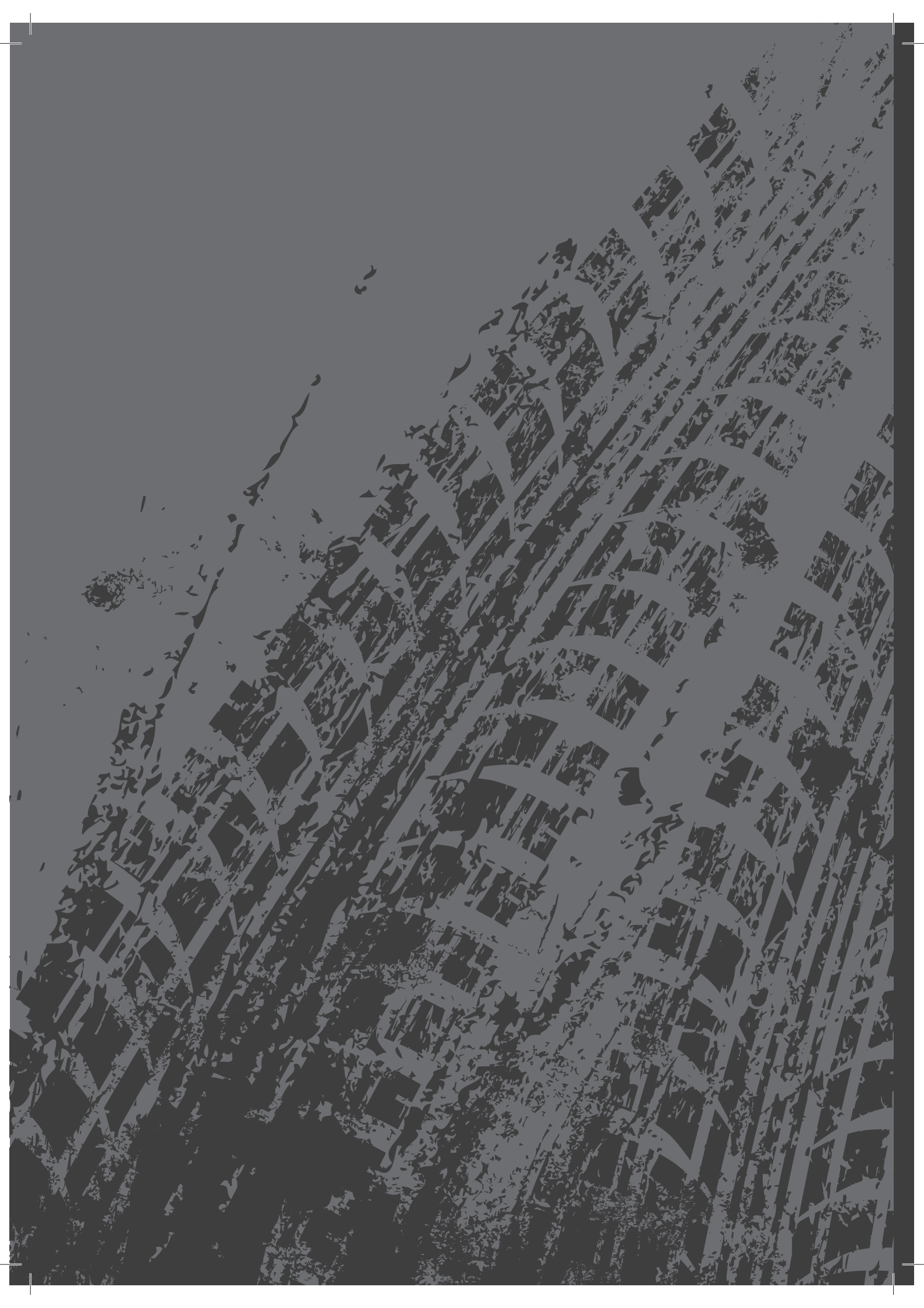
# The socio-economic impact of truck tyre retreading in Europe

The circular economy of tyres  
in danger

October 2016

The EY logo consists of the letters 'EY' in a bold, white, sans-serif font. A yellow diagonal line is positioned above the 'Y', extending from the top right towards the center.

Building a better  
working world



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# Foreword

Retreading is a re-manufacturing process for tyres, which consists of replacing the tread on worn tyres, and reintroducing them into the distribution circuit, in line with circular economy principles, with the benefits that ensue for the environment and local employment.

Retreading's main competitor today is the low-end non-retreadable\* tyre imported from Asia. Although the cost of retreaded tyres is competitive over time when compared to the number of kilometres travelled, cost-conscious customers with short term cash constraints have an increasing tendency to turn towards low-end non-retreadable tyres. The retreading market in the EU 5 (France, Italy, Germany, Spain and UK) is thereby down 20% since 2010.

The purpose of this study produced by EY, in partnership with representatives of the retreading industry, is to provide public and private stakeholders a quantified understanding of socio-economic and environmental issues at stake for Europe with regards to the industry's recent and foreseen developments. For example, retreading today supports over 19,000 direct, indirect and induced jobs in the EU 5; 3,200 jobs have been lost since 2010, a trend that is likely to accelerate in case the status quo is maintained.

The methodology of this study is based on the *Total Value* solution developed by EY, which includes models, databases, and algorithms for measuring socio-economic and environmental impacts, hence improving the quality of the dialogue between companies, their customers, investors, governments, and civil society around a broad vision of the value of economic activities.

*\* a tyre casing is hereby considered non-retreadable when the tyre industry observes no effective retreading.*

This study was conducted in partnership with:

- ▶ AER (Spanish tyre recycling association)
- ▶ AIRP (Italian retreading association)
- ▶ ANIRP (Portuguese retreading association)
- ▶ Autonrengasliitto
- ▶ BIPAVER (European retreading association)
- ▶ BRV (German retreading association)
- ▶ Dækbranchen Danmark (Danish tyre association)
- ▶ Groupe Michelin
- ▶ RMA (British retreading association)
- ▶ RS (Swedish retreading association)
- ▶ SVP CR (Czech retreading association)
- ▶ VACO (Dutch retreading association)
- ▶ WKO Fahrzeugtechnik



**Eric Mugnier**  
EY Partner  
Sustainable Performance  
& Transformation

“ The value of an economic activity increasingly depends on its contribution to society and to the transition towards a sustainable economy. As scientific and economic knowledge develops regarding the true cost of social and environmental “externalities”, it appears necessary today to conceive value beyond traditional financial indicators.

Properly consolidated and understandable information regarding socio-economic and environmental impacts however often remain absent from the dialogue between public authorities, investors and industrialists, preventing them from comprehensively evaluating the sustainability of a given activity, whether it be a whole industry, an investment or a product. EY has developed methodologies and proprietary databases enabling such assessments and improving the level of information for decision makers.

This is precisely the aim of this study on the impacts of the retreading industry (the circular economy of truck tyres), which is facing competition from low-end tyres imported from Asia. We provide stakeholders at European and national level a full picture of the industry's value in order to support their discussions on measures to be adopted. We encourage economic players to mainstream this approach, and gradually base their decisions on the societal impacts that are caused. ”



**François-Michel Lambert**  
Bouches-du-Rhône Deputy  
President and Founder  
of the French Circular  
Economy Institute

“ Retreading is an exemplary activity of the circular economy in terms of local wealth creation, optimal use of resources, and political challenges to face for engaging towards a sustainable path towards social prosperity. To promote the circular economy is also to defend existing virtuous models.

Retreading is an activity unknown to the general public, though it represents a large share of professional tyres. In 2015, 30% of truck tyres sold in the UE 5 were retreaded. However, plant shut-downs are multiplying, the industry is in danger, hit by competition from imported new tyres that have not been eco-designed and cannot be recycled.

Political levers do exist. In the US, the market is less sensitive to the dumping of non-retreaded and non-retreadable tyres as the Federal Vehicle Cost Savings Act encourages the use of remanufactured components for the government's fleet of vehicles. According to Gary Peters, the senator behind this text, this measure may have created up to 30,000 direct jobs.

If, in a collective effort, we were not able to turn around the retreading industry, it would be a defeat for employment and a sign of lack of commitment to a transition towards a circular economy that is efficient in the use of natural resources. ”



**Pascal Canfin**  
General Manager  
WWF France

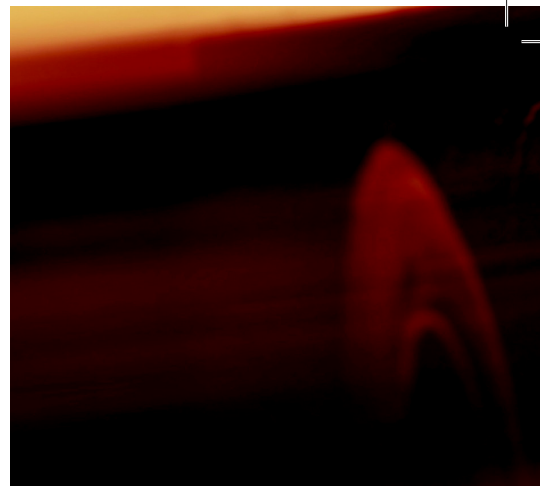
“ August 8 sounded the day of global overshoot where humanity had consumed its renewable resources for the year 2016, and began living on credit for the rest of the year. More than ever, saving on natural resources is a priority, in particular by promoting circular economy schemes which offer a way to reduce our environmental footprint. It is natural therefore that the WWF was interested in the approach of the retreading industry.

This technique, which consists of replacing the tread of a truck tyre which has been used up to 250,000 km, real benefits in terms of material consumption: 50 to 100 kg for a standard heavyweight tyre throughout its lifecycle. In addition to its environmental benefits, retreading is part of an economic model that is virtuous throughout the whole production chain. From upstream to downstream, the required technical skills tend to favour local employment.

The purpose of this study is to estimate the economic, social and environmental value of retreading, as opposed to the single-life nature of tyres imported from Asia. Favouring this process limits the environmental impact of tyres, which is more relevant than ever in a post-COP 21 world which seeks resource-efficient economic growth. ”

# Retreading

## a historical contributor to the circular economy



Retreading consists of replacing the tread on worn tyres, preserving the structure of the tyre, called the casing, and reintroducing it into the distribution circuit of truck tyres (the light vehicle market has too much dimensional variety for retreading processes to be applicable).

The industry has been economically sustainable since the 1950s, with post-war reconstruction in a context of rubber scarcity favouring its growth. The industry follows a circular economy scheme: end-of-life tyres are repackaged with efforts for minimal use of raw materials.

The main competitor of the retreaded tyre is the low-end tyre imported from Asia, which follows a linear mode of production: these tyres will not be retreadable, and offer a shorter lifetime.

The customer's choice between the two alternatives is based on his short-term versus long term cost sensitivity. Customers subject to strong short-term cash constraints increasingly tend to opt for non-retreadable tyres. Considering, however, the respective lifetimes of the two options, cost differences are significantly narrower. Customers less subject to short-term cash constraints and able to plan over the longer-term thus tend to remain loyal to retreaded tyres.

### The lifetime of a retreaded tyre compared to an imported tyre



A retreaded tyre can present the same performance as a new high-end tyre.

A premium tyre designed for retreading can be retreaded up to two times.

The lifespan of a tyre produced in Europe can be estimated at about **660,000 km**.

*N.B.: the figures presented herein are the result of a review by EY of information published by the tyre industry as well as European and Asian tyre distributors.*

## Key environmental characteristics of the retreading circular economy

### Eco-design

A tyre cannot be reused if it was not initially designed for retreading.

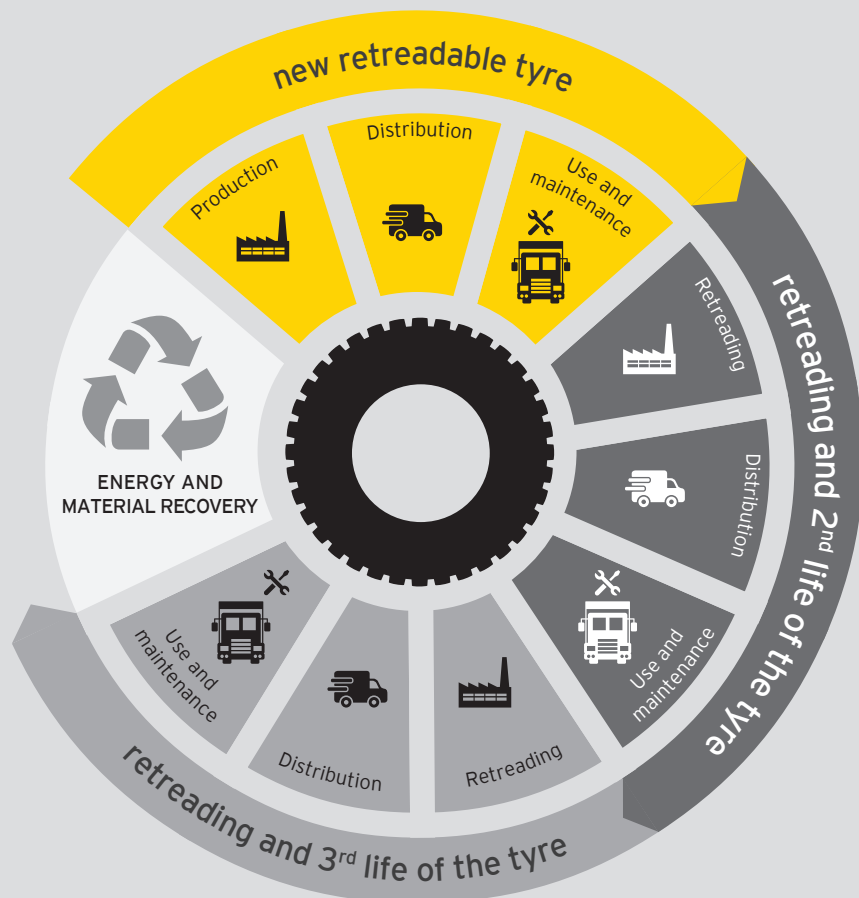
### Sustainable supply

The tyre industry represents 70% of global demand for rubber trees whose cultivation poses increasing issues of land use and biodiversity (impacts which will be quantified further in this study).

The tyre industry is therefore in a position to take action by encouraging its suppliers towards responsible production of this raw material. Retreadable new tyres and retreaded tyres in Europe meet such requirements.

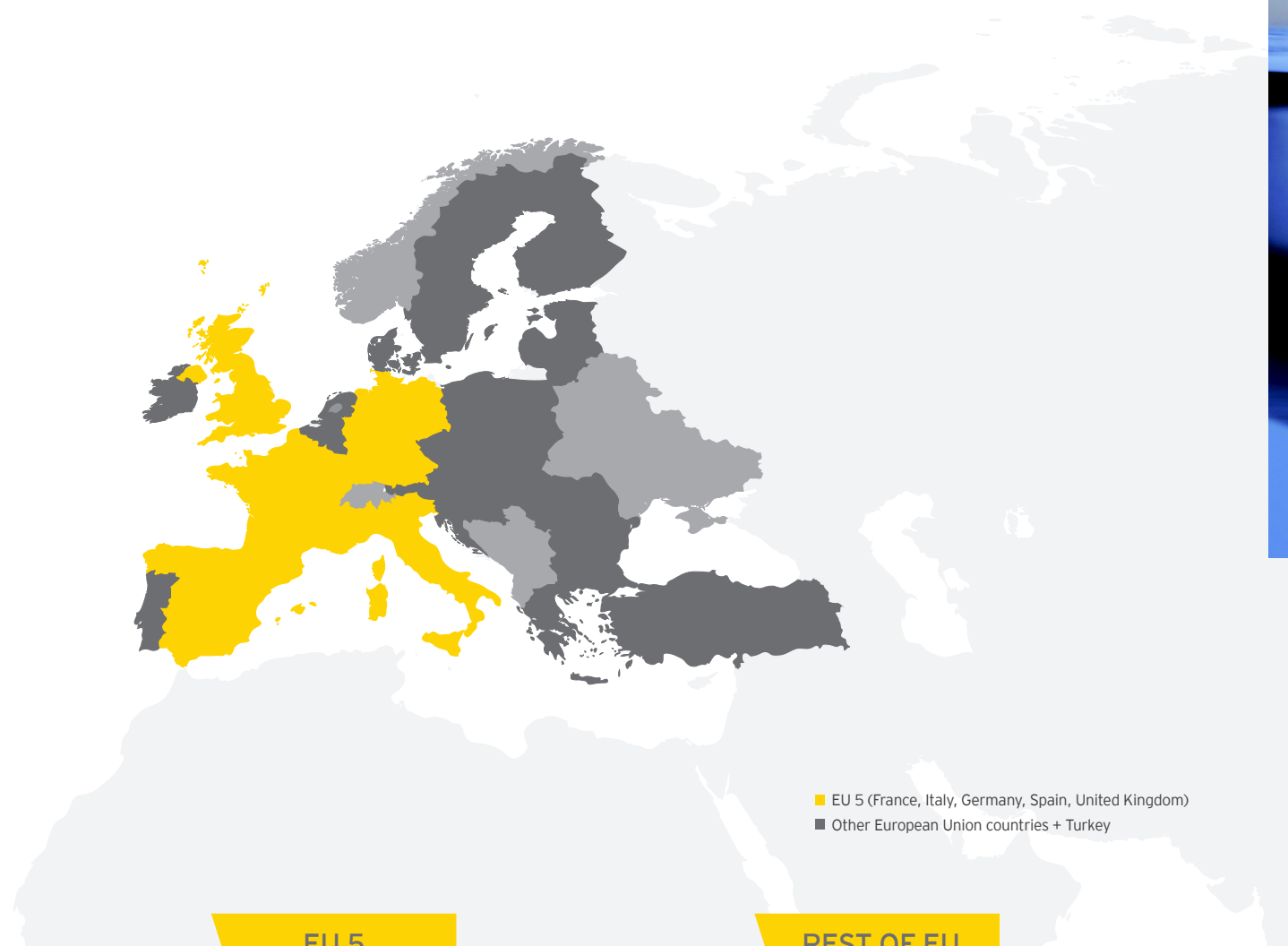
### Reuse

The new tyre - retreaded tyre combination reduces the use of raw materials by 70% compared to a non-retreadable low-end tyre (Source: *Life Cycle Assessment of tires - Comparison of environmental impacts of different truck tires scenarios, Life Cycle Analysis conducted by Groupe Michelin in February 2016, certified ISO 14040: 2006 and ISO 14044: 2006 by Quantis*).



# A market share of 30%

of truck tyres in 2015 in the EU 5



EU 5



30%

of the truck tyre market  
that is 3.2 million units

REST OF EU  
+ TURKEY



22%

of the truck tyre market  
that is 2.2 million units

Source: ETRMA (European Tyre & Rubber Manufacturers' Association)





## A circular economy local by nature

From the collection of worn tyres to their distribution and maintenance, retreading relies on short economic circuits and has a strong local component, thereby limiting dependence on imported raw materials.

Few circular economy schemes have so far managed to achieve such significant market shares compared to their counterparts in the linear economy.

### A testimony from a tyre distributor

*"Retreading is among the foundations of our business model. It allows us to offer, at affordable prices, tyres with the characteristics similar to new tyres, while ensuring optimal use of materials. From a commercial point of view, retreading allows us to build deeper relationships with our customers: they are conscious of the maintenance needs of their tyres for security reasons, but also for achieving low costs per kilometre driven. This type of relationship is more difficult to build if the customer opts for solutions where the tyre is discarded after one life."*

**Pascal Audebert**  
CEO of Profil Plus

## The retreaded tyre market in the EU 5 decreased by 20% over 5 years

Within the scope of the EU 5 (France, Italy, Germany, Spain and United Kingdom), retreaded tyres represented **30%** of truck tyre sales in 2015, against **37%** in 2010. This decline, mainly in favour of non-retreadable tyres imported from Asia, endangers the entire industrial fabric of retreading. The industry being largely based on local business, plant closures cause knock-on effects in terms of losses for neighbouring communities, often located in rural areas where the plant's activity supported an important part of the local economy.

# A market size of €1.2 billion in the European Union

of which three-quarters are produced locally

## A European market in large part rooted in the continent

The size of the retreading market (excluding distribution) in the EU 27 was € 1.2 billion in 2015. In each producing country, about three quarters of the market benefited domestic firms. The majority of the rest went to non-national European players.

The market has also enabled the payment of € 366 million in tax revenues to governments and social security bodies of the EU 27.

## Staff training adds human capital equivalent to € 50 million

The specific technical requirements of retreading necessitate a major training effort in order to develop efficient industrial processes. It is estimated that over € 50 million were cumulatively invested in the European Union to train employees to the skill level required by the industry.

## 50% of the retreading market goes to payroll

Retreading is a labour-intensive activity. 50% of the market flows directly to domestic employees and in the form of social security contributions.

The wages and taxes paid support household consumption as well as employment in the public sector, partly in the employment areas where the plants are located. These impacts, known as "induced", enable measuring the overall support of the industry to the economic fabric.

## The distribution of the EU 27 retreading market to its stakeholders



€95m

of benefits for retreading firms



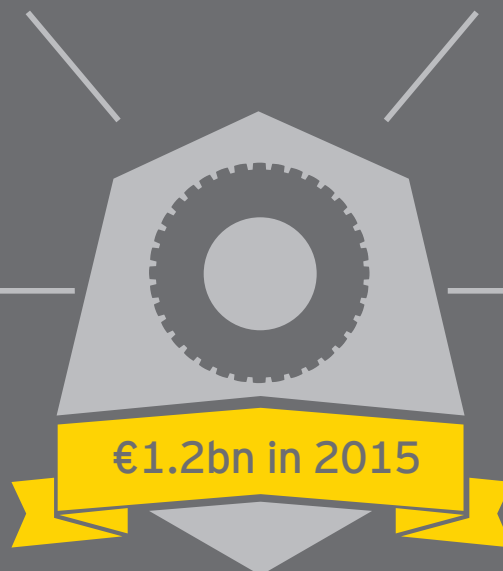
€331m

of purchases from countries  
outside the producing countries



€168m

of tax revenues for governments



€198m

of contributions to social  
security bodies



€396m

of net wages paid to  
the industry's employees

Source: EY calculations from financial data provided by Pneus Laurent on a sample of plants across the EU 5 countries. Extrapolation to EU-27 produced by EY from market data provided by ETRMA.

# 32,000 jobs supported in the EU

of which 19,000 in the EU 5



## Definitions

This study measures the ripple effects of the retreading industry to the rest of the economy by estimating the direct, indirect and induced impacts. The methodology used by EY for the calculation of socio-economic impacts is described in the methodology section.

**Direct socio-economic impacts** (employment, GDP, taxation) result from the activity within the retreading plants, and from the distribution of retreaded tyres.

**Indirect impacts** result from the activity of suppliers of retreading plants.

Finally, **induced impacts** result from household consumption supported by the wages paid to direct and indirect employees, and from the activity supported within public administrations by the industry's tax payments.

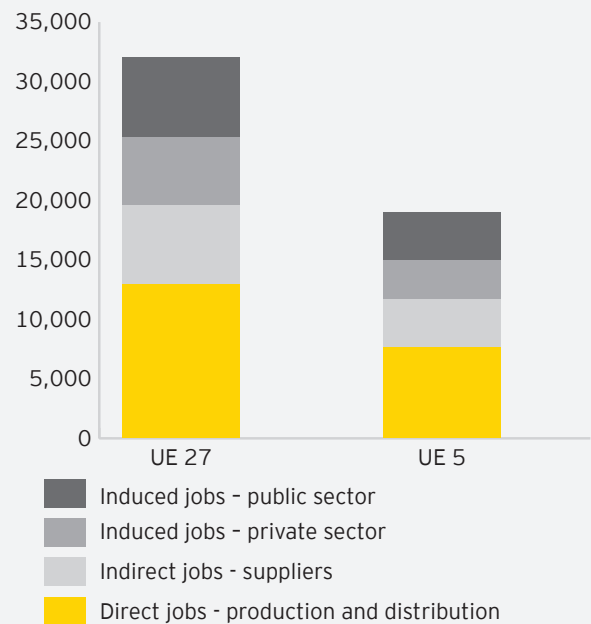
This study does not include maintenance activities induced for distributors, which are difficult to assess. However, it can be estimated that this activity at least compensates the fact that compared to retreaded tyres, more imported tyres are required for driving an equivalent number of kilometres.

## 32,000 jobs supported in Europe

The retreading market is mainly concentrated in the "EU 5" area consisting of France, Germany, Italy, Spain and the United Kingdom. 19,000 jobs are supported by the industry in these five countries, including:

- ▶ 5,700 in Germany,
- ▶ 5,500 in the United Kingdom,
- ▶ 4,000 in France,
- ▶ 2,200 in Italy,
- ▶ 1,600 in Spain.

Jobs supported by the retreading market in 2015



Source: input-output model developed by EY based on data provided by the industry (cf. methodology note)



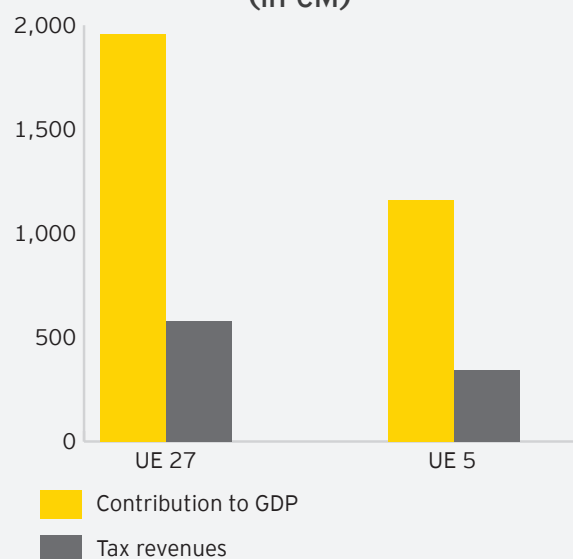
## € 1.9 billion GDP and € 600 million in tax revenue in the European Union

Economic benefits are measured in terms of contribution to wealth creation, with about € 1.9 billion GDP across the EU 27\*. The limited use of imported raw materials enables maintaining a large share of production within European borders.

Tax revenues (including social security contributions) enable financing public services for € 600 million.

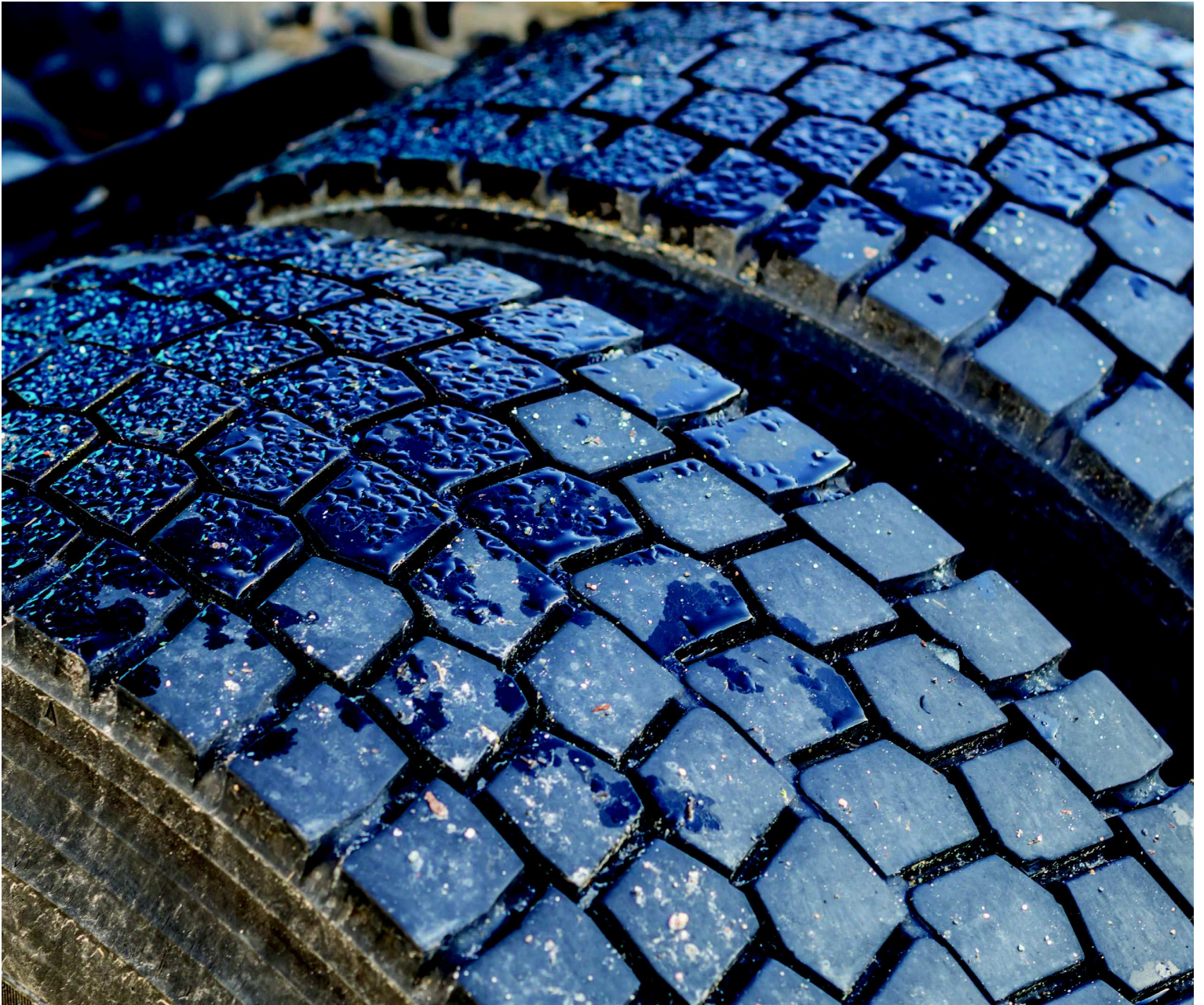
\* GDP (Gross Domestic Product) is the monetary value of all the finished goods and services produced by production units within a given territory (here the EU 27) in a specific time period. It is not to be confused with the size of the retreading market. GDP as measured here is the sum of the contribution of four types of production units: retreaded tyre producers and distributors (direct GDP), suppliers of retreading plants (indirect GDP), companies and businesses benefiting from the consumption of direct and indirect employees (induced GDP - private sector), and finally the government for the share of their activity that is supported by tax payments from the retreading industry (induced GDP - public sector).

Direct, indirect and induced contribution to GDP and tax revenues, including distribution (in €M)



Source: input-output model developed by EY based on data provided by the industry (cf. methodology note)

# *Socio-economic advantages* of retreading



## At equivalent use, a retreaded tyre supports 4.3 times as many jobs as a non-retreadable imported tyre

This study simulates the socio-economic impacts of three types of tyres at equivalent use (excluding distribution of tyres). The base case is the retreading market in the EU 5 (France, Italy, Germany, Spain and UK) in 2015.

The New Premium case simulates a full replacement of that market with new tyres produced within the EU 5. Similarly, the Imported case simulates the full replacement of retreaded tyres with new single-life tyres imported from Asia. An adjustment is made to account for equivalent use: 1.8 times more tyres need to be imported to allow running for the same number of kilometres as in the Retread base case.

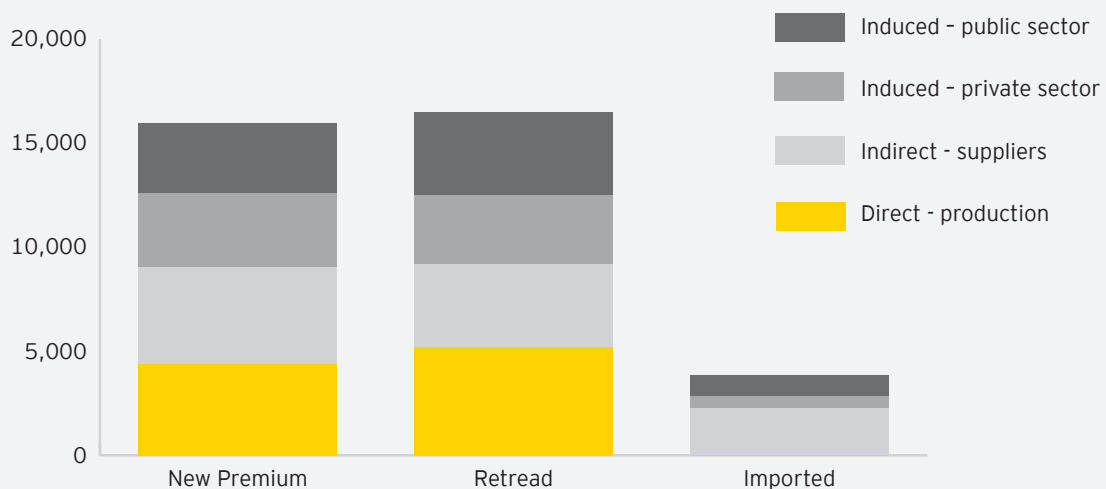
Retreaded and new premium tyres present equivalent contributions to employment. The slight difference observed in the graph below is negligible in view of the uncertainties in the data and the calculation model.

Indirect effects of retreaded tyres are lower than those of new premium tyres, mainly because of lower needs for supply of raw materials and industrial machines. However, direct effects of retreaded tyres are higher, retreading being a more labour-intensive activity.

At equivalent use, retreading supports 4.3 times as many jobs as imported tyres, socio-economic impacts of imported tyres being limited to the logistics associated with delivering the tyres to the retailer. It must be noted that if distribution activities were included in the analysis, this would not diminish the socio-economic benefits of the retreading business, since the sale of retreaded tyres generates additional maintenance activities, which are not estimated here.

These simulations were also conducted within the scope of each country in the EU 5, and each time provided results that are comparable in their proportions between the three cases.

Number of jobs supported in the EU 5 by the equivalent of a year of consumption of retreaded tyres



Source: input-output model developed by EY based on data provided by the industry (cf. methodology note)

# Environmental advantages

of retreading

The environmental impacts of retreaded tyres, depending on the criteria, are 19% to 70% lower than those of non-retreadable low-end tyres

The results below come from a Lifecycle Analysis produced by Groupe Michelin, certified ISO 14040:2006 and ISO 14044:2006 by Quantis. The figures take into account the full lifecycle of the tyres and are based on a use phase of 220,000 kilometres, which corresponds to the average lifespan of a retreaded tyre.

The use phase of 600,000 kilometres corresponds to the average lifespan of a truck tyre in Europe.

*Corporate Social Responsibility is growing.*

*The European Directive 2012/27/EU on energy efficiency will require large companies to carry out regular energy audits of their activities. Companies with a large number of vehicles can conduct a specific audit of their fleet, and thus achieve financial savings in the medium and long term.*

*In the aftermath of the COP21, all economic players will be required to reduce their greenhouse gas emissions with stronger national policies and incentives, and through greater consumer awareness with regards to social responsibility of their purchases.*

WITH IMPORTED RATHER  
THEN RETREADED TYRES...

An SME with a fleet of 100 trucks



will cause  
every  
600,000 km







Compared to non-retreadable tyres, retreaded tyres generate 70% material savings thanks to material recovery and a longer lifespan.

This saving induces further savings on the consumption of natural resources (oil, water) required for the production of those materials. The natural rubber economy also uses less land, and decreases pressure on rubber crops, which today are devoted 70% to the tyre industry. As 12% of rubber today is grown on areas deforested since the mid-90s (cf. methodology), retreading helps reducing deforestation.

Finally, with lower rolling resistance compared to non-retreadable imported tyres, retreaded tyres can reduce air pollution from particulate matter, as well as CO<sub>2</sub> emissions.

Compared to a low-end non-retreadable tyre,  
**a retreaded tyre enables saving...**



**1.3 tons**  
of additional  
**particulate matter**



**5,400 tons**  
of additional CO<sub>2</sub>  
equivalent to emissions  
of 700 French for a year



**11 hectares**  
of avoided deforestation  
in South-East Asia

**70%** natural  
**resource extraction**  
(ore, oil...), mainly because of the avoided  
consumption of steel casings

**29%** land use  
or growing hevea

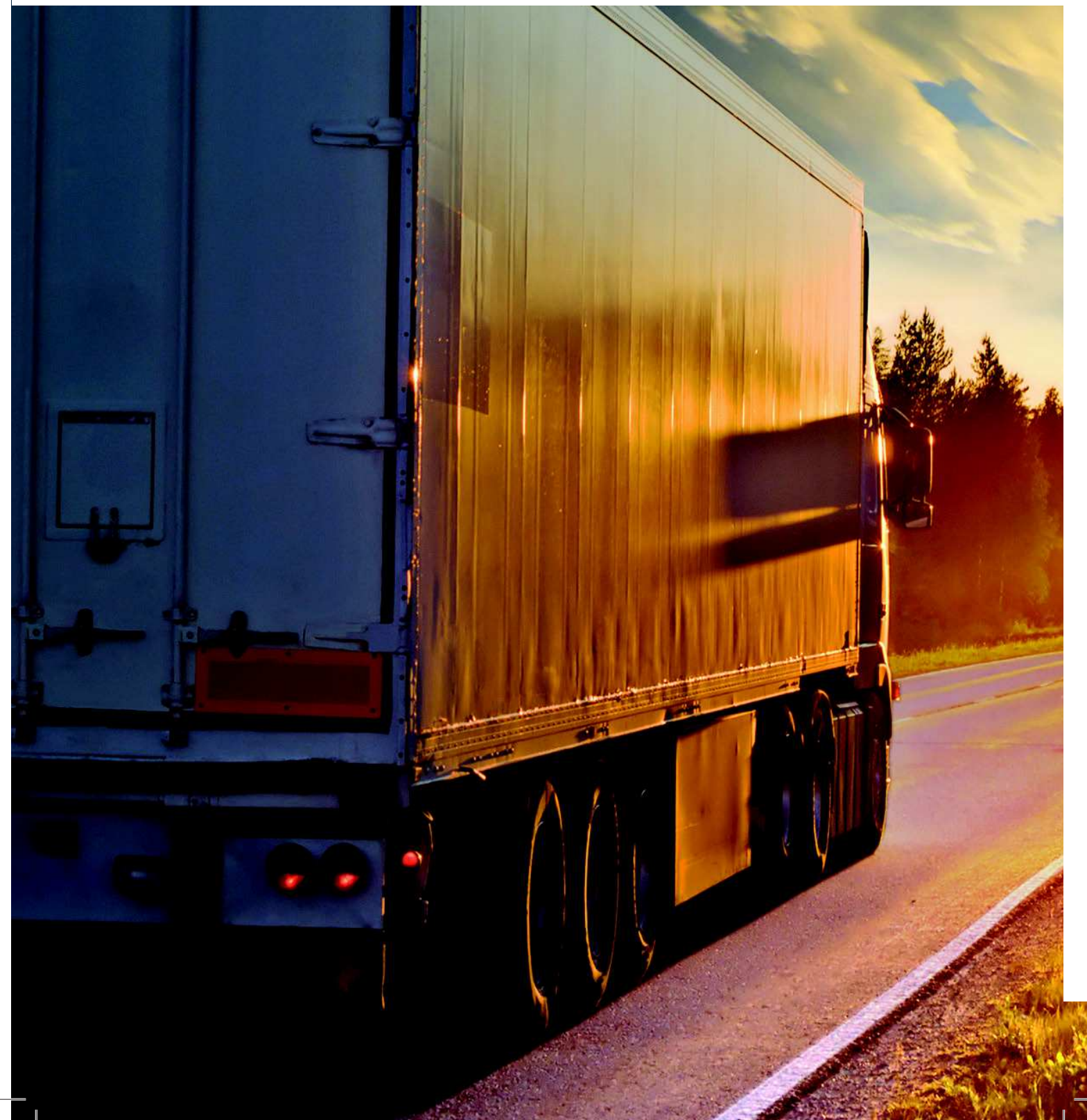
**24%** CO<sub>2</sub> emissions

**21%** air pollution,  
as measured by particulate matter emissions

**19%** water consumption

*Retreading creates twice  
as much local value  
for society*

as imported tyres



## The concept of “societal value” here includes the selling price as well as a monetary translation of socio-economic and environmental impacts

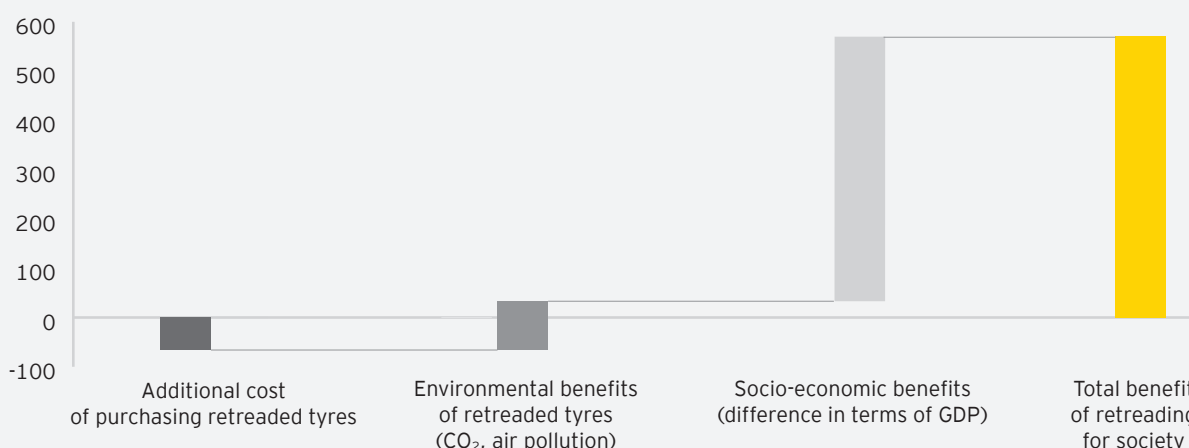
This study measures the wider value of retreading by monetising and summing the main criteria representing value in the eyes of society: the purchase cost, but also the socio-economic impacts and environmental externalities. This approach allows translating criteria of different natures into a common unit, and comparing them in their proportions (with the necessary precautions related to methodological limitations inherent to monetisation).

GDP (direct and indirect, as previously defined) reflects in monetary terms the socio-economic benefits within the EU 5. Environmental externalities hereby include air pollution from particulate matter, as

well as CO<sub>2</sub> emissions related to rolling resistance, which are higher with low-end non-retreadable tyres. These are also monetised so as to reflect their social costs in terms of health and climate change impacts (cf. methodology).

The graph below illustrates the difference in terms of “societal value” for the EU 5 between retreaded tyres and low-end non-retreadable tyres imported from Asia, over the entire lifecycle of tyres sold in 2015. Comparison to imported tyres is conducted at equivalent use, by considering the number of tyres necessary for running the same distance.

**Societal value of retreading for the EU 5 in 2015, compared to a fictitious situation of full replacement with low-end imported tyres (in €M)**



*Source: socio-economic benefits based on an input-output model developed by EY based on data provided by the industry; environmental benefits based on a life cycle analysis (cf. methodology note)*

## Societal value of retreading tyres compared to non-retreadable imported tyres

The cost of purchasing from the distributor the 3.2 million retreaded tyres sold in 2015 is about € 702 million, against € 636 million if imported tyres had been purchased instead.

Once domestic socio-economic value and environmental costs are included, retreading in the EU 5 creates, over a year, an additional “societal value” of about € 570 million compared to a fictitious situation of full replacement by imported tyres. A retreaded tyre creates twice as much societal value locally compared to an imported non-retreadable tyre.

The impact on land use is not included in the calculation of societal value for the EU 5, because the impacts occur mainly in countries producing rubber. The societal costs for those countries (loss of land use, biodiversity) would however be equivalent to € 155 million in the case of retreaded tyres, and € 364 million in the case of imported tyres (Source: EY calculations from a database provided by TEEB (*The Economics of Ecosystems and Biodiversity*) on the economic value of ecosystem services provided by the Indonesian rainforest: raw materials, food, water, tourism, carbon sequestration ...).

# An industry under threat at a crossroads

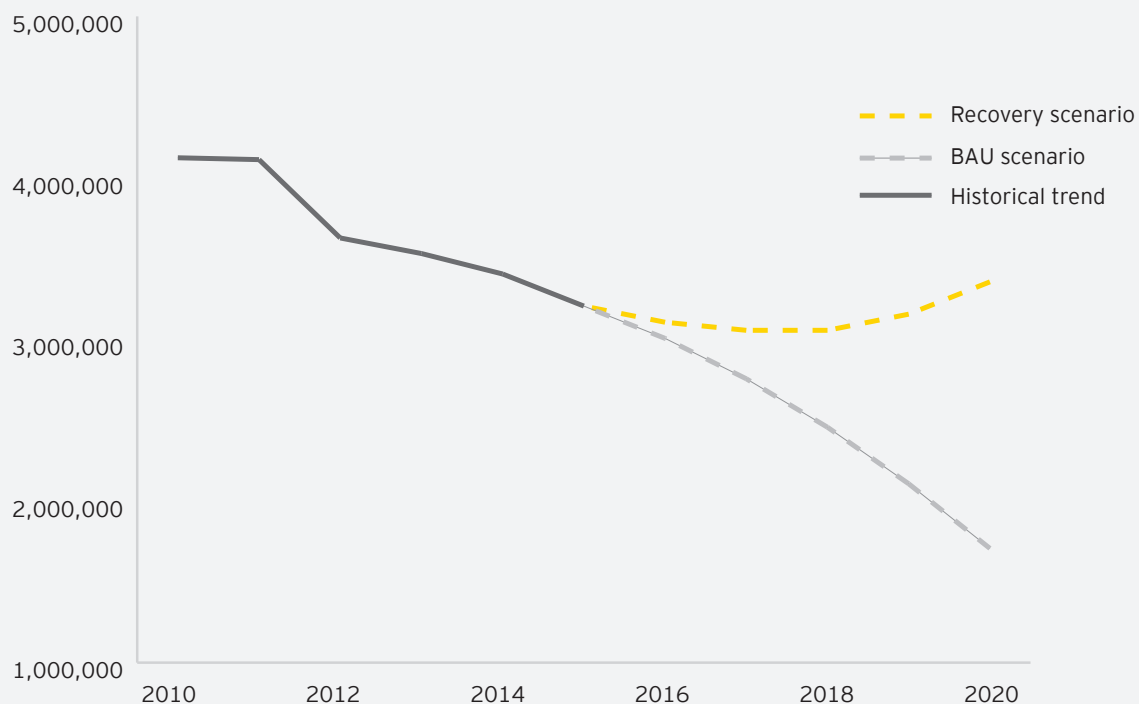
## Description of the 2020 scenarios analysed

This study measures the impacts of two scenarios on direct (excluding distribution), indirect and induced jobs in the retreading industry.

The Business-As-Usual scenario (BAU) simulates the continuation of the current situation, with a loss of market share of retreaded tyres in favour of imported tyres. The trend slightly accelerates compared to that observed since 2013.

The Recovery scenario supposes a series of measures, both internal and external to the retreading industry, which reverse the trend and resume growth so as to regain, by 2020, the level of 2014.

Evolution of units of retreaded tyres sold within the EU 5  
(France, Italy, Germany, Spain, UK)



*N.B.: the evolution of the market over 2010-2015 was calculated by EY from data provided by ETRMA. 2016-2020 scenarios were elaborated by EY in collaboration with representatives of the retreading industry involved in this study.*



## The characteristics of the recovery scenario

The scenario for recovering the competitiveness of the retreading industry supposes the following measures:

- ▶ New measures would be taken to ensure in terms of foreign trade a level playing field for the European Union, which is today one of the few markets in the world that absorbs products from excess production capacities.
- ▶ Public procurement would support the market and perhaps even enable finding economies of scale and reducing costs.

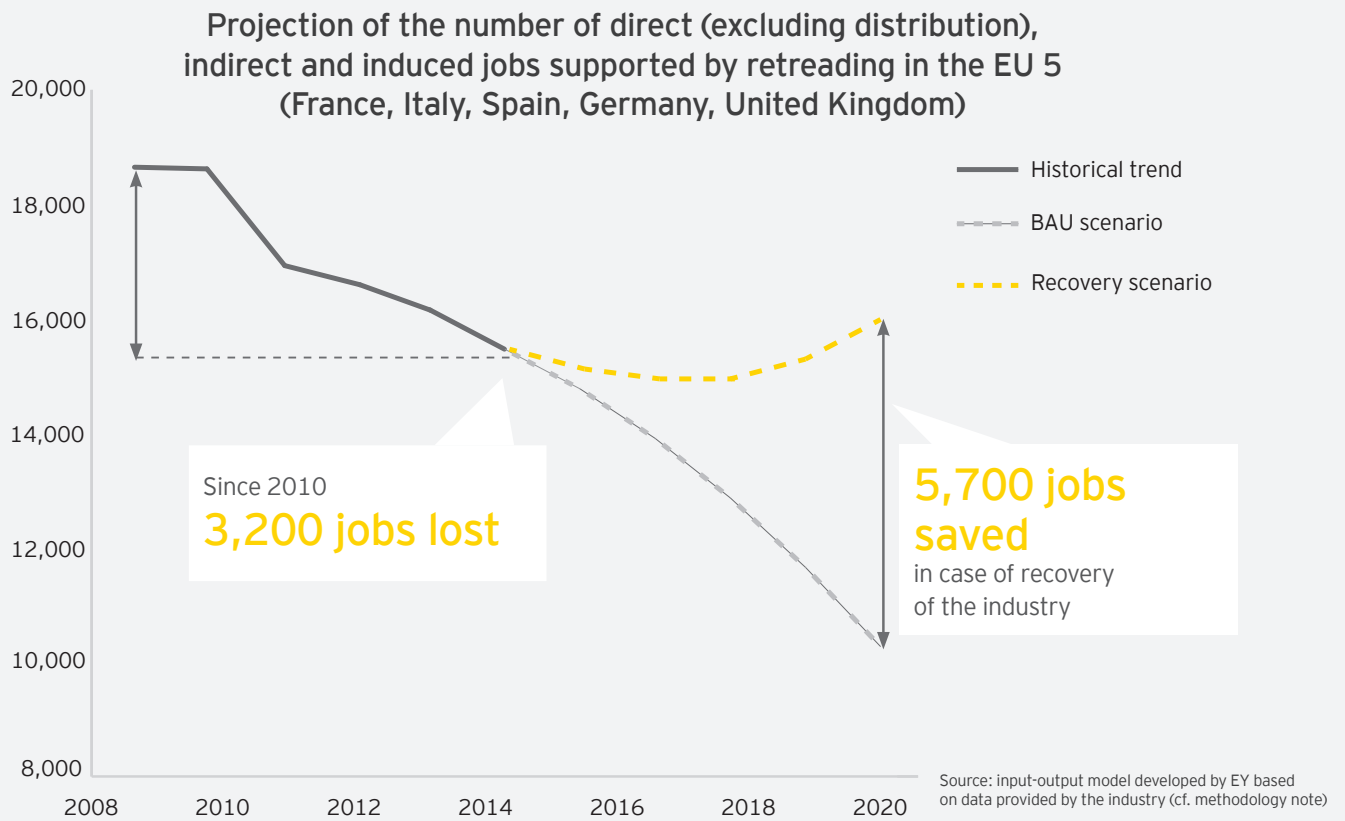
As part of current political dynamics in favour of resource efficiency and eco-design, supporting products that enable reducing material consumption would be achieved through different policy schemes:

- ▶ Public authorities could adjust the cost paid by producers for the management of retreadable casings: through the implementation of eco-modularity mechanisms, a retreadable tyre could generate a lower fee, which would be justified by an extended life-span.
- ▶ The implementation of a "retread" labelling scheme would open access to aids similar to those that currently exist for new tyres whose environmental performance is rewarded.



# 5,700 jobs are at stake

in the EU 5 by 2020



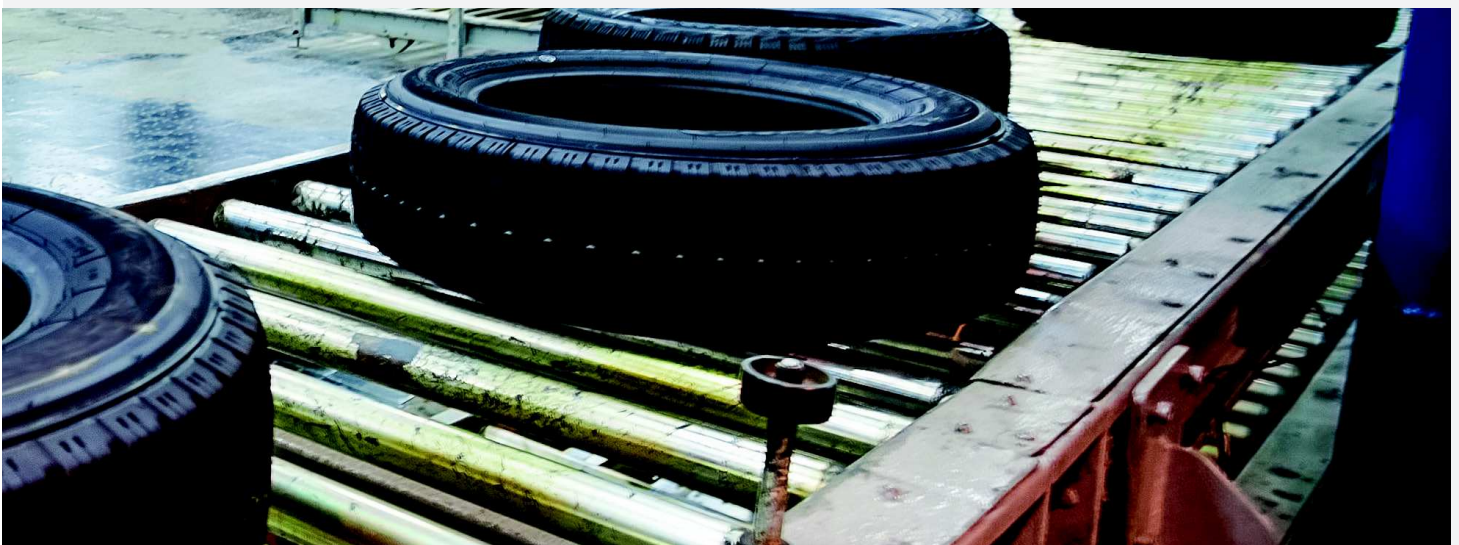


## *Under the current trend, 8,400 jobs would be lost between 2010 and 2020*

About 3,200 direct, indirect and induced jobs have been lost since 2010 across the EU 5 because of the decline of retreaded tyres. If the trend were to continue, 8,400 jobs would be lost over the decade. In the case of a recovery scenario, compared to *Business-As-Usual*, 5,700 jobs could be saved in the EU 5 by 2020, including:

- ▶ 1,700 in Germany,
- ▶ 1,600 in the United Kingdom,
- ▶ 1,200 in France,
- ▶ 700 in Italy,
- ▶ 500 in Spain.

These estimates are extrapolated across the EU 27, where 8,000 jobs would be saved in the *Recovery* scenario.







# Methodology

## I Economic impact modelling: employment, GDP, tax revenues

The retreading industry contributes to socio-economic development in the regions where it operates through local recruitment, business with domestic suppliers, and payment of taxes.

The analysis was based on HR data (workforce of representative plants) as well as financial data (payroll, procurement, taxes ...) extracted from Pneus Laurent's management control systems, from a sample of retreading plants across the five EU 5 countries.

Direct impacts are extrapolated to the entire market from the sample of retreading plants of the study. Indirect impacts (from purchases made by retreading plants) and induced impacts (from consumption expenditures of direct and indirect employees) are calculating with an input-output model, whose principle was developed by Nobel Laureate Wassily Leontief.

## I Exclusion of the tyre distribution activity

In some cases, the distribution activity is excluded from the analysis. Its environmental impact is indeed not significant. In terms of economic impact, distribution qualitatively creates more jobs per tyre sold on the retreading market (maintenance, service), however more imported tyres are necessary for running an equivalent distance. The impacts are deemed comparable.

## I Lifecycle Analysis and monetisation of environmental externalities

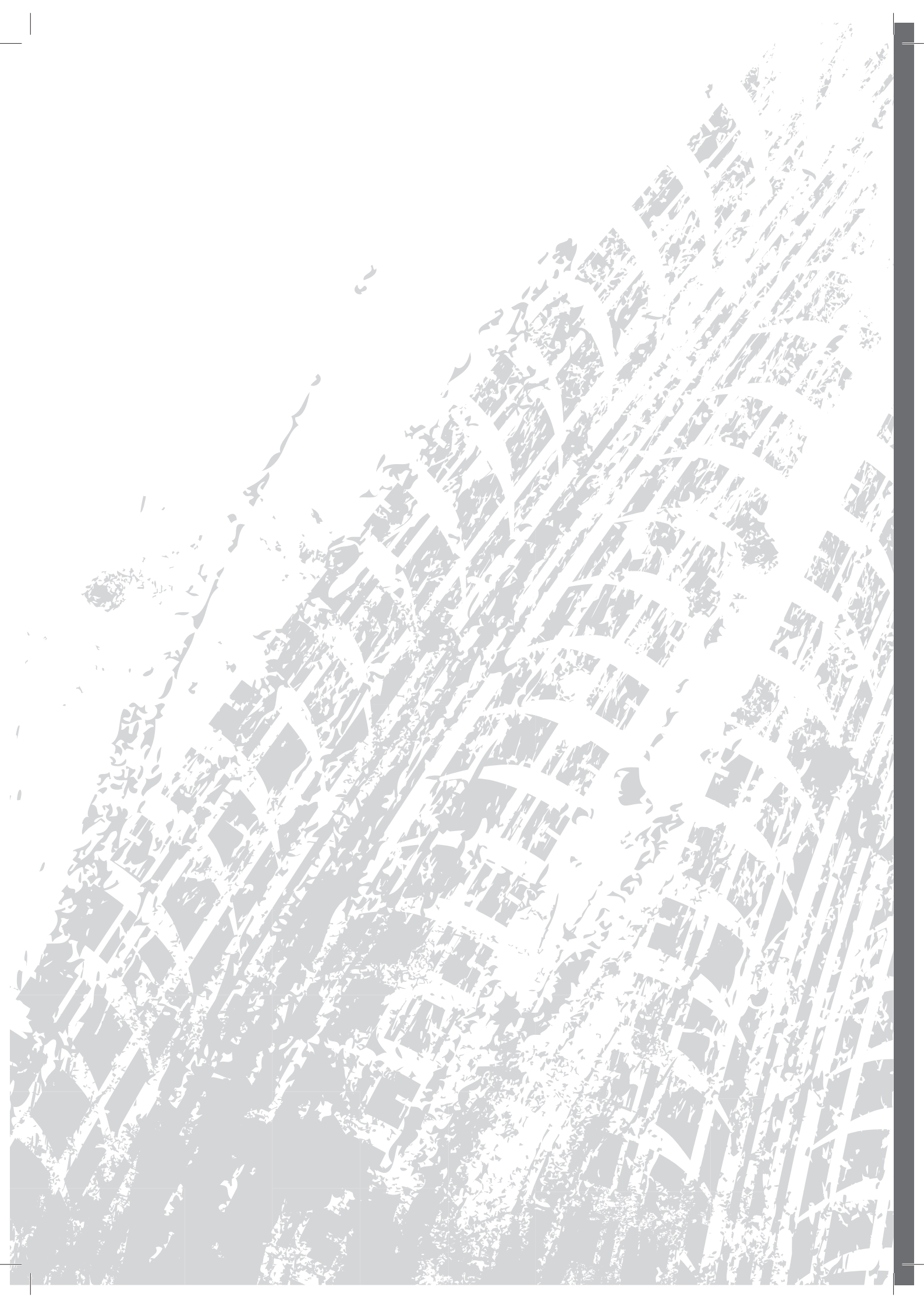
The life cycle analysis, certified ISO 14040, which allowed comparing retreaded tyres to tyres imported from Asia, was based on the characteristics specific to each type of tyre (energy mix of the production area, weight, rolling resistance ...). Rolling resistance coefficients, expressed in kg / t, come from attributed labels, given by a letter from A to F.

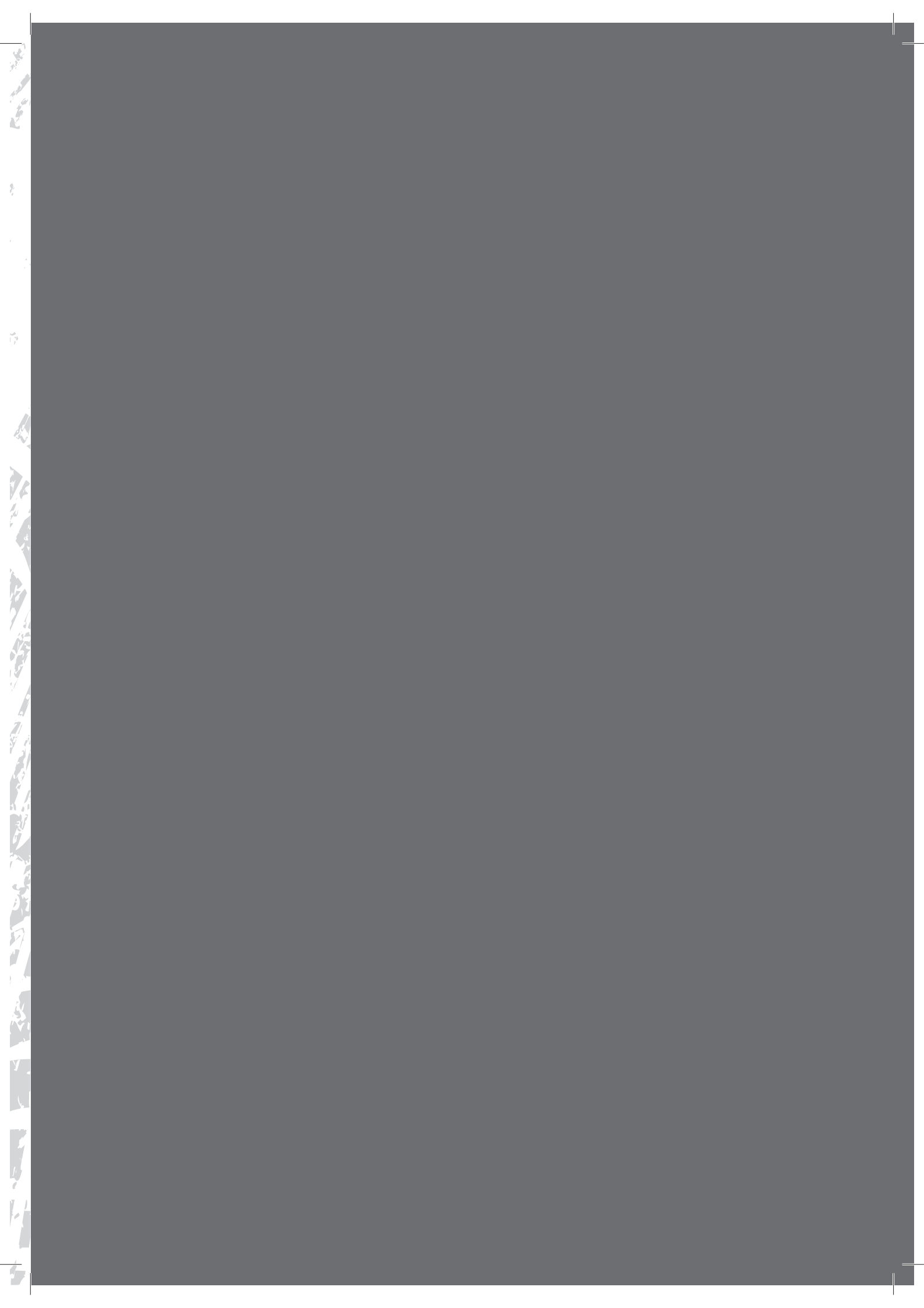
The social cost of CO<sub>2</sub> was set at € 7 per ton in this study, which is the average price on the European carbon market in the year 2015 and from 1 January 2016 to 31 May 2016. This is a very conservative reflection of the societal costs of climate change. For instance, a CO<sub>2</sub> cost of € 56 per ton is the 2020 target of France's Energy Transition law.

Air pollution is measured by emissions of particulate matter PM 2.5. The social cost per ton of PM 2.5 is sourced from the third hypothesis in the study *Service Contract for Carrying out Cost-Benefit Analysis of Air Quality Related Issues, in particular in the clean air for Europe*, published in 2005 by the European Commission - DG Environment. This hypothesis, which uses the VOLY approach (Value Of A Life) rather than VOSL (Value Of Statistical Life), was recommended by David Pearce (cf. *Valuing Risks to life and health, Towards Consistent Transfer Estimates in the European Union and Accession States*, 2000) for the assessment of health impacts of air pollution.

Impacts on deforestation were estimated based on the rubber industry in Thailand, described in *Greenhouse Gas Emissions from rubber industry in Thailand, Journal of Cleaner Production 18, 403-411*, published in 2010 by Jawjit et al. According to the *Société Internationale de Plantations d'Hévéas*, Thailand is the main natural rubber producer, with 37% of world production in 2015; the share of Asia is over 90%. Thailand is taken as a representative case for Asia, and therefore the world. From the total area cultivated for rubber in 2010 in Thailand, it can be estimated that 12% of natural rubber is grown in deforested areas. This fraction is calculated taking into account the specific increase in acreage for natural rubber as compared to the evolution of other cultivated land in Thailand since 1996.

Deforestation from the production of tyres was calculated based on the carbon deficit per hectare (equal to the carbon capture difference between a hectare of primary forest versus a hectare of hevea) related to tyre production, and applying the 12% ratio described above.





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Studio EY France - 1606SG864  
SCORE France N° 2016-046  
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Study produced by Eric Mugnier, Cyrus Farhangi, Sacha Kley, Vincent Aurez and Anaïs Chhang.

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