# Draft Final Report

## Review of the Tyre Labelling Regulation

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**February 2016**

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With reference to Request for Services No. ENER/C3/2012-418-Lot2/07/2014-558, Review study on Regulation (EC) No 1222/2009 of the European Parliament and of the Council on the labelling of tyres with respect to fuel efficiency and other essential parameters.

In the context of Framework Contract reference ENER/C3/2012-418-Lot 2

Specific contract no.: ENER/C3/2012-418-LOT2/07/2014-558/SI2.707241

# Executive summary

**Review study of Commission Regulation (EC) 1222/20009 on the labelling of tyres with respect to fuel efficiency and other essential parameters**

Tyres, mainly because of their rolling resistance, account for 20-30 % of the fuel consumption of vehicles. Therefore, a reduction of the rolling resistance of tyres could contribute significantly to the energy efficiency of road transport and thus to the reduction of emissions.

Tyres are characterised by a number of parameters which are interrelated. Improving one parameter, such as rolling resistance, may have an adverse impact on other parameters, such as wet grip, while improving wet grip may have an adverse impact on external rolling noise.

In 2009, the European Parliament and the Council adapted the Tyre Labelling Regulation (Regulation (EC) No 1222/2009). The Regulation entered into force on 1 November 2012. The energy label includes information about fuel efficiency class, wet grip class and external rolling noise of tyres. The intention of the label was i.a. to encourage the manufacturers to optimise relevant parameters beyond the standards already achieved and to influence end-users' purchasing decisions in favour of safer, quieter and more fuel-efficient tyres.

According to the Regulation, the need for a revision must be assessed, and the results of the assessment must be presented to the European Parliament and the Council no later than 1 March 2016. An important aspect is to assess the end-users' awareness and understanding of the label and the possibilities to extend the labelling scheme to include additional types of tyres and new tyre parameters.

In that sense, and in the context of the Framework Contract Lot 2: Review Studies and related technical assistance on ecodesign and energy labelling implementing measures signed on 23 January 2013 between Van Holsteijn en Kemna BV and the Directorate General for Energy (reference ENER/C3/2012-418 Lot 2), the Directorate General requested a proposal for an assignment aimed at carrying out a Review study on Regulation (EC) No 1222/2009 of the European Parliament and of the Council on the labelling of tyres with respect to fuel efficiency and other essential parameters.

The aim of the review study is to investigate the needs and possibilities for revision of the Regulation, assessing:

- the end-users' understanding of the label and the consumers' buying behaviour
- the sufficiency of the information provided by vehicle suppliers and distributors on tyre parameters
- the possibility to extend the labelling scheme to include retreaded tyres and mileage
- the possibility to adapt the labelling requirements to technical progress of the grip grading of tyres primarily designed to perform better in ice and/or snow conditions
- the possibility to improve the clarity of the Regulation, avoiding grey areas
- the ability of the Regulation to achieve market transformation
- the differentiation on the level of enforcement of the Regulation by the different Member States and a potential reinforcement of market surveillance
- any other relevant aspects that might require an adaptation of the Regulation, such as i.a. the handling of studded tyres or the possibility to establish a registration database

The methodology used to perform this review study is partially based on the MEErP methodology (stock modelling and scenarios), adding up surveys to consumers and stakeholders in the tyre supply chain and the assessment of market surveillance activities.

## Market transformation

The Tyre Labelling Regulation was implemented in November 2012. For all the performance parameters included in the scheme (fuel efficiency, wet grip and external rolling noise), it has been able to transform the market in a positive direction from 2013 to 2015, although the positive tendency is less obvious for external rolling noise than for fuel efficiency and wet grip.

Market data was purchased from two large databases, TOL[1] (Germany) and VACO[2] (Holland), and supplemented with information from industry associations to create a tyre stock model for use in scenario calculations. Analysis of the market data shows that The Tyre Labelling Regulation has driven an increased R&D and technology innovation effort, resulting in increased wet grip performance of tyres, as well as optimisation of fuel efficiency leading to decreased fuel consumption.

Two scenarios were modelled based on the market data: a Business As Usual (BAU) scenario and an Optimised Implementation (OI) scenario. The BAU scenario represents the tyre label as it is now with no further changes and is based on linear extrapolation of the development of the three label parameters in the period from 2013-2015. The OI scenario represents a faster market penetration of high performing tyres, achieved through actions taken to increase awareness and market surveillance efforts. With the BAU scenario, total CO2 emission savings of 5.4 Mton is expected compared to 18.2 Mton with the OI scenario.

Until now, the tyre labelling scheme has only utilised a minor part of the fuel saving potential, because only few tyres are labelled in the best fuel efficiency classes. The extent of future savings depends on how effectively the labelling scheme is implemented and enforced as well as manufacturers' and consumers' responses to the scheme.

## Survey of consumer awareness

Surveys were prepared and executed to assess the tyre buying behaviour of the end-users, and the end-user awareness regarding the tyre labelling scheme, including the need for further information on the label. Focus was put on a large C1 end-user survey with 6,000 private car owners in six EU countries[3], which was supported by information received from tyre suppliers and distributors.

The C1 end-user survey showed that around half of the private car owners in the surveyed countries are aware of the tyre label, and that most (64 %) have medium confidence in the labelling scheme. End-users answered that especially more market surveillance, including testing, is necessary to increase their confidence in the label.

The survey showed that when purchasing tyres, C1 end-users find wet grip the most important of the labelling parameters (62 % rated it "very important") followed by fuel efficiency (34 % rated it "very important") and lastly external rolling noise (21 % rated it "very important"). Regarding the need for further information on the label, 49 % found it "very important" to include snow and ice grip information, while 25 % found it "very important" to include mileage information.

[1] Tyres online and Energy GmbH, database extractions from year 2012-2015, Hämmerling Group, Germany. Dataset covering 2012-2015 with 30,000 tyres total

[2] Dutch Tyre and Wheel Trade Association, database extract from year 2013-2015, Vaco, Netherlands. Dataset covering top seven brands from 2013-2015, 2,500 tyre models total.

[3] 1000 car owners form each of the countries: Italy, Sweden, France, UK, Finland, Germany.

Regarding their last purchase of tyres, 85 % of the C1 end-users purchased tyres in a physical shop, while 12 % purchased them through the internet, with 56 % planning to buy tyres on the internet in the future. Only 36 % of those buying tyres in a physical shop saw the tyres displayed before the purchase. Industry and market surveillance authorities agreed with these findings. The assessment of whether the provisions in article 4(1)(b) are as effective as article 4(1)(a) is therefore obviated by the fact that end-users do not see the tyres. More focus should instead be on how to ensure proper provision of information to end-users prior to their purchase of new tyres.

Based on the findings in the surveys, the following is proposed in order to make it more likely that the consumers see the label or are informed about fuel efficiency class, wet grip class etc. before the purchase of new tyres:

- Online labelling. The label should be shown on the screen when tyres are offered for sale online (in webshops etc.) as is already implemented for energy related products labelled under the Energy Labelling Directive (2010/30/EU).
- Obligation of the distributor to show the label of all tyres suggested to the end-users during a tyre purchasing process.
- Inclusion of information about the label performance parameters in advertisements, including the now omitted advertisements in billboards, newspapers, and magazines.
- Labelling of tyres when placed in the stock of distributors, preferably obliging labelling of all tyres. This would also make market surveillance easier to perform.

Furthermore, it is recommended to conduct awareness campaigns to increase end-user knowledge of the labelling scheme. Especially C1 end-users are important to target, since C1 tyres constitute the largest share of the tyre sales. The campaigns could be run at national level by Member State Authorities, at EU level by the Commission or both. It is suggested that tyre suppliers and/or distributors are involved in the campaigns and that experiences from previous campaigns performed by Members States and others are taken into account.

### Information from suppliers

The information on tyre label parameters provided by the vehicle suppliers and distributors to end-users was specifically assessed. According to The Tyre Labelling Regulation, vehicle suppliers and distributors are obliged to provide end-users with information on tyre labelling parameters, if the end-users are offered a choice between different tyres to be fitted on the vehicle they are intending to acquire.

In the review study, it was found that most end-users are not offered a choice between different tyres when purchasing a vehicle, which was confirmed by both vehicle suppliers and distributors. According to market surveillance authorities (MSAs), market surveillance on this provision is complicated due to a lacking definition of when there is a choice, especially if the purchase of an extra set of tyres for the vehicle is considered a choice.

Based on the findings it is recommended to improve the regulation by obliging vehicle suppliers and distributors to always provide end-users with information on all tyres, including situations when the end-user is not offered a choice between different tyres to be fitted on the vehicle. The information should be shown in the technical promotional material given to the end-user, including a printed version of the label applicable for the specific tyres. This will make market surveillance less complicated, and will present end-users with knowledge of the tyre label.

## Extensions of the labelling scheme

The possibilities to extend the labelling scheme to include additional types of tyres and new performance parameters were assessed. The extension assessments included two tyre types; studded tyres and retreaded C3 tyres, and three performance parameters; ice/snow grip, mileage and abrasion. The assessments include collection of market data, analysis of the technical progress and possibilities, analysis of environmental impact (based on scenarios) and development of policy recommendations.

The inclusion of snow grip as a parameter is technically possible through existing standardised tests for snow tyre labelling (3-PMSF). It is recommended to include the 3-PMSF logo as an indicator for snow grip in the labelling scheme as additional information to the wet grip scale, on a voluntary basis. The test is applicable for all tyre types (C1, C2 and C3). Furthermore, it is recommended to use the upcoming "Nordic winter tyre" test and logo as additional information on ice grip performance for C1 tyres.

The assessment the inclusion of mileage as a parameter showed that external factors and use conditions affect tyre mileage significantly, limiting the effect of technological development. In addition, the only known test method (for C1 tyres only), which is currently only applicable in the USA, gives uncertain and non-reproducible results. The same applies to particle emissions from tyre abrasion, which is affected largely by external parameters, and no standard method for measuring the effects currently exists. It is therefore not recommended to include any of these parameters in the Tyre Labelling Regulation.

The assessment of the inclusion of retreaded tyres concerns only C3 retreaded tyres, since the market share of C1 and C2 retreaded tyres are below 2 %, while that of C3 retreaded tyres is around 45 %[4]. The main barrier of inclusion is the testing, since retreaded tyres are often produced in small series, and each new combination of carcass, tread and retreading technology gives different tyre characteristics. A tool has been developed in the ReTyre Project[5] for calculating rather than testing the performance of retreaded C3 tyres. There are opposing opinions in the industry of the applicability of the ReTyre tool for labelling purposes. It is therefore recommended not to include retreaded C3 tyres in the Labelling Regulation before technical issues with the ReTyre tool as well as questions about maintenance and availability of the tool for all retreading facilities are solved.

The assessment of studded tyres shows that the market share is very low in all but the three Nordic countries (Sweden, Norway and Finland), and the potential fuel saving is therefore very limited. Furthermore, the current test standards cannot be used for testing studded tyres, and it is therefore not recommended to include them in The Tyre Labelling Regulation.

## Market surveillance in MS

Due to the lack of a comprehensive overview of market surveillance activities in EU Member States regarding the tyre labelling scheme, such an overview was established in the review study. Interviews were conducted with MSAs in various Member States. The investigation showed that the market surveillance effort varies greatly throughout the EU, and in general, the only widespread activity is shop inspections. Technical documentation is rarely requested for market surveillance purpose and there is a severe lack of market surveillance testing due to a lack of resources and testing facilities.

[4] Bipaver, personal communication on email September 16th, with Ruud Spoijbroek.
[5] http://www.retyre-project.eu/

The low market surveillance decreases end-user confidence in the tyre label, and tyre dealers report that due to lack of market surveillance inspections, they have decreased their efforts to educate their employees in informing end-users of the labelling scheme. To reinforce market surveillance and improve enforcement of the Regulation, it is therefore suggested to:

- solve existing problems with inaccurate test conditions and methods for wet grip and include the corrections in the Regulation as soon as possible.
- increase the visibility of market surveillance activities carried out. MSAs should be obliged to publish results of inspections and make them available to industry and dealers, for instance in the proposed registration database.
- not extend the labelling scheme with new aspects that will significantly increase the costs for market surveillance. Extra cost will reduce the number of inspections, and fewer inspections could easily hamper the consumers', dealers' and industry's confidence in the label scheme.
- perform more joint action testing in line with the upcoming PROSAFE test programme.
- Establish a digital registration database, where all tyres should be registered prior to being placed on the European market. The database should be separated into a publically available section and a section only available to market surveillance authorities.

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# Introduction

The review study focuses on the European Parliament and the Council Regulation (EC) No 1222/2009[6] of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters[7] (from here on 'The Tyre Labelling Regulation'). The study began in May 2015 and the project website www.labellingtyres.eu was launched in June 2015. This website was the main information exchange platform between the study-team, the Commission and the stakeholders, giving all interested parties the opportunity to provide input to this study thereby creating a fully transparent and open process.

The Tyre Labelling Regulation was adapted by the European Parliament and the Council in 2009, at the same time as the Regulation of type-approval requirements for the general safety of motor vehicles[8] (From here on 'The Type Approval Regulation'). Both regulations were adapted to promote sustainable mobility in the light of the climate change challenges and the need to support European competitiveness. It was found that tyres of cars and trucks accounts for up to 20 % to 30 % of the fuel consumption because of their rolling resistance[9], and therefore represent a potential for reducing CO2 emissions by reducing the rolling resistance. Tyres are characterised, however, by a number of interrelated parameters, and by improving one parameter, such as rolling resistance, it can have an adverse impact on other parameters, such as wet grip, thereby decreasing road safety. Furthermore, the improvement of wet grip might have an adverse impact on external rolling noise, increasing noise pollution.

The Type Approval Regulation was adapted to set out minimum requirements for the rolling resistance, external rolling noise and wet grip performance of tyres, to remove the worst performing tyres from the market. The minimum requirements in the Type Approval Regulation is based on the minimum requirements set out by UNECE Regulation 117. For all three parameters technological development make it possible to optimise them significantly beyond the minimum requirements[10]. Therefore, the Tyre Labelling Regulation was adapted to encourage end-users to purchase more fuel-efficient tyres with low external rolling noise and high wet grip performance. The tyre labelling provides harmonised information about fuel-efficiency, wet grip and external rolling noise, enabling consumers to choose among the best tyres on the market. It was anticipated in the Regulation that demand for safer, quieter and more fuel-efficient tyres, would in turn encourage tyre manufacturers to optimise those parameters to pave the way for more sustainable mobility.

[6] Regulation (EC) No 1222/2009 Of The European Parliament And Of The Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters, L 342/64

[7] The assignment was informed by the European Commission as a Request for Services under the Framework Contract No. ENER/C3/2012-418-Lot2

[8] Regulation (Ec) No 661/2009 Of The European Parliament And Of The Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor

[9] Regulation (EC) No 1222/2009 Of The European Parliament And Of The Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters, L 342/64

[10] Regulation (EC) No 1222/2009 Of The European Parliament And Of The Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters, L 342/64

Fuel efficiency continues to be highly relevant, with the EU facing scarcity of resources and dependence on energy imports as well as the need to limit climate change. With the transport sector constituting one third[11] of the European energy consumption, increasing fuel efficiency of road transport plays an important role in addressing these challenges. Tyres account for 20-30 % of the vehicle fuel consumption, due to their rolling resistance. Decreasing rolling resistance is therefore important to increase fuel efficiency and decrease greenhouse gas emissions. A theoretical estimate of using only fuel efficiency class A tyres in the EU shows potential reductions in $CO_2$ emission of 42 Mton per year, and corresponding savings of 13 billion euros[12]. The same calculation shows that using only tyres with the best external rolling noise class in the EU could reduce the number of annoyed and sleep disturbed people as well, resulting in potential cost savings of up to 11 billion euros.

Tyres are an important part of road safety, being the only interaction between the vehicle and the road. The tyre safety parameter used on the tyre label is wet grip. Improved wet grip performance of tyres will result in fewer accidents and will reduce the number of killed and injured people. It is estimated that using only wet grip class A tyres in the EU could potentially reduce the number of people killed and injured in traffic accidents comparable to a saving of up to 10 billion euros[13]. However, wet grip rating does not indicate how suitable a tyre is for use in winter conditions[14]. Hence, there is a risk that end-users are misled by the label information, if the wet grip information affects their purchase of winter tyres[15]. There is currently no information on snow or ice grip in the tyre labelling scheme.

### Purpose of the study

The aim of the review study is to investigate the needs and possibilities for revision of the Regulation. This was achieved by assessing the efficiency of the regulation in terms of end-user awareness and achieved levels of market transformation, as well as possibilities to include new parameters and tyre types in the Regulation. Furthermore, the clarity of the Regulation was analysed, including identification of grey areas, and an overview was established of market surveillance activity in Member States.

The effectiveness of the Regulation depends i.a. on end-user awareness and understanding of the label and the provision of pre-sale information on the performance parameters included in the labelling scheme. The response of manufacturers is equally as important as the response of the end-users, since the labelling scheme places no obligation on manufacturers to improve the performance parameters. In addition, the response of distributors and dealers is very important, because they are the ones responsible for providing the label information to the end-users.

The review study on the labelling of tyres includes a consumer survey conducted among 18-70-year-old car owners in various Member States (in total 6051 respondents). Furthermore, surveys and interviews have targeted different actors in the tyre supply chain and market surveillance authorities on order to assess the effectiveness of the labelling scheme in general, the level of enforcement and the possibilities to improve the clarity of the regulation.

[11] European Commission, 2014, EU Energy Figures statistical pocketbook 2014, European Union
[12] TNO, Memorandum to Ministry of Infrastructure and Environment, “Potential benefits of Triple-A tyres in the EU”
[13] TNO, Memorandum to Ministry of Infrastructure and Environment, “Potential benefits of Triple-A tyres in the EU”
[14] Nokian Tyres, J. Sunnari, presentation:”Consumer information on tyre wet grip vs. Ice grip – implications in road safety in Nordic winter”, November 2015.
[15] VTT Technology 133, Comprehension of grip labels on unstudded winter tyres and tyre selection, 2013.

## Study approach

The findings of the study are presented in the chapters of the review study report as follows:

In the first chapter, the existing legislation according to Regulation (EC) No 1222/2009 including its amendments is described.

In the second chapter, the survey and interview methodologies are explained, including target group selection and an overview of the results.

In the third chapter, the focus is on the market transformation effects of the Regulation. The market transformation is assessed, by comparing market data of the three labelling performance parameters (rolling resistance, wet grip and external rolling noise) from before and after implementation of the regulation.

In chapter four, the future market development potentials are modelled based on the market transformation assessed in chapter three. A Business as Usual (BAU) and an Optimised Implementation (OI) scenario are established and compared to the developments anticipated in the original impact assessment on which the regulation is based.

In chapter five, the possibilities for extending the labelling scheme with new performance parameters are assessed. The performance parameters in question are snow/ice grip, mileage, and abrasion. The technical background and possible test methods for the suggested extensions are explained.

In chapter six, the inclusion of now omitted tyre types are considered. The assessments cover studded tyres and retreaded C3 tyres. The technical background and possible test methods for these tyre types are explained.

In chapter seven, an overview of market surveillance activities in the Member States is established.

Chapter eight deals with recommendations for improving the efficiency and clarity of the regulation as well as the market surveillance and enforcement.

Chapter nine puts the Tyre Labelling Regulation into perspective of the Better Regulation Framework[16], commenting on the relevance, effectiveness, efficiency, EU added value and coherence.

Chapter ten summarises the policy recommendations based in the findings of the entire study.

[16] Commission Decision of 16.12.2015 Appointment of Members of the Stakeholder group of the REFIT Platform, Brussels, 16.12.2015 C(2015) 9063 final

# 1 Existing legislation

This chapter introduces the existing Regulation (EC) 1222/2009, explaining the background, product scope, tyre classifications and performance measures, as well as responsibilities and market surveillance practices prescribed by the regulation.

## 1.1 Scope

According to article 2 of the Tyre Labelling Regulation, the scope relates to C1, C2 and C3 tyres, which are the tyre types defined in article 8 of the Type Approval Regulation. The definition of the tyre types is based on the vehicle weight and passenger capacity as well as the tyre load and speed indexes, as seen in Table 1.

*Table 1: Definition of tyre types included in Regulation (EC) 1222/2009.*

| Tyre type | Seats in addition to driver's seat | Vehicle weight | Load capacity index | Speed category symbol |
|---|---|---|---|---|
| C1 tyres | ≤8 | ≤3.5 t | Not applicable | Not applicable |
| C2 tyres | ≥8 | ≥3.5 t | ≤121 | ≥N |
| C3 tyres | ≥8 | ≥3.5 t | ≤121 | ≤M |
| | | | ≥122 | none |

C1 tyres can generally be said to be tyres for passenger cars, C2 tyres for light commercial vehicles (LCVs) and C3 tyres for heavy commercial vehicles (HCV's) [17].

If a tyre can be classified as two different types (e.g. C1 and C2), it is labelled based on the type with the highest demands for performance classification (i.e. C2 in this case).

The Regulation does not apply to:

- Re-treaded tyres
- Off-road professional tyres
- Tyres designed to be fitted only on vehicles registered first time before October 1990
- T-type temporary use spare tyres
- Tyres whose speed rating is less than 80 km/h
- Tyres whose nominal rim diameter does not exceed 254 mm or is 635 mm or more
- Tyres fitted with additional devices to improve traction properties, such as studded tyres
- Tyres designed only to be fitted in vehicles intended exclusively for racing

## 1.2 Classification and performance measures

In the current labelling Regulation, three tyre performance parameters are included: Fuel efficiency, wet grip, and external rolling noise class and measured value (in dB). The three performance parameters are specified in the Tyre Labelling Regulation, and are shown on the tyre label for C1 and C2 tyres, (see Figure 1). The label is restricted in design by Annex II of the regulation. For C3 tyres the label itself is not used, but information of the three performance parameters must be provided in technical promotional material.

Some of the classes defined in the Tyre Labelling Regulation are today, or will later be, empty, because they are below the minimum requirements set out in the Type Approval Regulation. The Type Approval Regulation implement rolling resistance minimum requirements in two stages, the first in November 2012 and the second in November 2016.

[17] Frequently Asked Questions document (Version 25/11/2014), available at: http://ec.europa.eu/energy/sites/ener/files/documents/faq_-_tyre_labelling.pdf

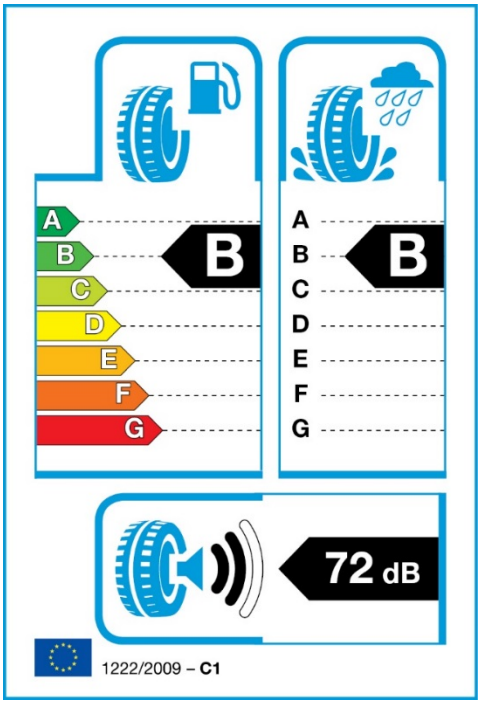


*Figure 1: The tyre label for a tyre with fuel efficiency class B, wet grip class B, and external rolling noise of 72 dB (equivalent to two "soundwaves" on the scale)*

### 1.2.1 Fuel efficiency class

The fuel efficiency of tyres is defined in terms of the *Rolling Resistance Coefficient*, RRC, given as kg resistance per ton of vehicle (kg/t). For each tyre type (C1, C2, C3), the energy labelling scale A-G refers to different intervals of RRC, as seen in Table 2. The fuel efficiency index is shown on the label as a marked letter on a coloured A-G scale, as shown in Figure 1.

*Table 2: RRC limit values for energy efficiency classes of the three tyre types C1, C2 and C3.*

| C1 tyres | | C2 tyres | | C3 tyres | |
|---|---|---|---|---|---|
| RRC in kg/t | Energy efficiency class | RRC in kg/t | Energy efficiency class | RRC in kg/t | Energy efficiency class |
| RRC ≤ 6,5 | A | RRC ≤ 5,5 | A | RRC ≤ 4,0 | A |
| 6,6 ≤RRC ≤ 7,7 | B | 5,6 ≤RRC ≤ 6,7 | B | 4,1 ≤RRC ≤ 5,0 | B |
| 7,8 ≤RRC ≤ 9,0 | C | 6,8 ≤RRC ≤ 8,0 | C | 5,1 ≤RRC ≤ 6,0 | C |
| Empty | D | Empty | D | 6,1 ≤RRC ≤ 7,0 | D |
| 9,1 ≤RRC ≤ 10,5 | E | 8,1 ≤RRC ≤ 9,2 | E | 7,1 ≤RRC ≤ 8,0 | E |
| 10,6 ≤RRC ≤ 12,0 | F | 9,3 ≤RRC ≤ 10,5 | F | RRC ≥ 8,1 | F |
| RRC ≥ 12,1 | G | RRC ≥ 10,6 | G | Empty | G |

The future minimum requirements for rolling resistance defined in the Type Approval Regulation are show in Table 3. The limits are given for normal tyres. For snow tyres the limits are increased by 1 kg/ton[18]. The minimum requirements implemented in stage 1 phase out C1 and C2 tyres in fuel efficiency class G and C3 tyres in fuel efficiency class F (G already empty). Stage 2 of the implementation will phase out C1 and C2 tyres in fuel efficiency class F, and C3 tyres in class E (plus half of class D). Hence only five fuel efficiency classes (A-E) will be available for C1 and C2 tyres, and only four for C3 tyres (A-D) from November 2016.

*Table 3: Rolling resistance requirements (fuel efficiency). For snow tyres the limits should be increased by 1 kg/ton*

| | Stage 1: November 2012 | | Stage 2: November 2016 | |
|---|---|---|---|---|
| | Limit value | Implementation | Limit value | Implementation |
| C1 tyres | 12 | November 2014 | 10,5 | November 2018 |
| C2 tyres | 10,5 | November 2014 | 9 | November 2018 |
| C3 tyres | 8 | November 2016 | 6,5 | November 2020 |

### 1.2.2 Wet grip class

Wet grip refers to the safety performance of tyres, i.e. it reflects the capacity of a tyre to brake on a wet road. The wet grip is applicable to all tyre types (C1, C2, C3), and is determined on the basis of the wet grip index (G) according to the A-G scale specified in Table 4. The value of the wet grip index should be calculated based on either the average deceleration in m/s-2 or the peak brake force coefficient, which is unit-less. The wet grip index is shown on the label as a marked letter on the A-G scale, as shown in Figure 1.

*Table 4: G limit values for wet grip scales of the three tyre types C1, C2 and C3*

| C1 tyres | | C2 tyres | | C3 tyres | |
|---|---|---|---|---|---|
| G | Wet grip class | G | Wet grip class | G | Wet grip class |
| 1,55 ≤ G | A | 1,40 ≤ G | A | 1,25 ≤ G | A |
| 1,40 ≤G ≤ 1,54 | B | 1,25 ≤ G ≤ 1,39 | B | 1,10 ≤ G ≤ 1,24 | B |
| 1,25 ≤ G ≤ 1,39 | C | 1,10 ≤ G ≤ 1,24 | C | 0,95 ≤ G ≤ 1,09 | C |
| Empty | D | Empty | D | 0,8 ≤ G ≤ 0,94 | D |
| 1,10 ≤ G ≤ 1,24 | E | 0,95 ≤ G ≤ 1,09 | E | 0,65 ≤ G ≤ 0,79 | E |
| G ≤ 1,09 | F | G ≤ 0,94 | F | G ≤ 0,64 | F |
| Empty | G | Empty | G | Empty | G |

Regulation 661/2009 sets out minimum wet grip requirements for C1 tyres only. For normal tyres the limit value is ≥1.1. For snow tyres (designed to perform better in snow conditions) the requirement is ≥1.0 if the maximum permissible speed is >160 km/h and ≥0.9 if the maximum permissible speed is <160 km/h. No future changes of wet grip minimum requirements are implemented in the Regulation. For C1 tyres the minimum requirements has phased out tyres in wet grip class F. The remaining classes on the label are A-E.

[18] Regulations Regulation (EC) No 661/2009 Of The European Parliament And Of The Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor, L 200/1.

### 1.2.3 External rolling noise class and measured value

The external rolling noise refers to the noise of the tyres experienced outside the car and hence not by the driver or passengers. The external rolling noise (N) is measured as dB, and the external rolling noise class is depicted on the label as a marking of 1 to 3 black "sound waves" according to the scale shown in Table 5 and Figure 1. The limit values (LV) which determines the external noise class of tyres are determined in Part C of Annex II of Regulation (EC) No 661/2009, and the absolute values vary between C1, C2 and C3 tyres.

*Table 5: N limit values for the external rolling noise class for all three tyre types (C1, C2 and C3)*

| External rolling noise (N) | External rolling noise class |
|---|---|
| N is 3 dB lower than limits in 661/2009 (N ≤ LV – 3) | 1 Sound Wave |
| N meets 661/2009 limits (LV – 3 < N ≤ LV) | 2 Sound Waves |
| N exceeds 661/2009 limits (N > LV) | 3 Sound Waves |

The limit values are given in the Type Approval Regulation as shown in Table 6. For C1 snow tyres, extra load tyres or reinforced tyres (Carcass designed to carry extra load than standard tyre[19]), the limits are increased by 1 dB(A). For C2 and C3 special use tyres, the limits are increased by 2 dB(A). For C2 traction snow tyres an additional 2 dB(A) are allowed. For all other C2 and C3 snow tyres an additional 1 dB(A) are allowed.

*Table 6: External rolling noise limit values according to Regulation 661/2009*

| C1 tyres | | C2 tyres | | C3 tyres | |
|---|---|---|---|---|---|
| Nominal tyre section width (mm) | Limit values in dB(A) | Category of use | Limit values in dB(A) | Category of use | Limit values in dB(A) |
| ≤185 | 70 | Normal tyres | 72 | Normal tyres | 73 |
| >185 ≤ 215 | 71 | Traction tyres | 73 | Traction tyres | 75 |
| >215 ≤ 245 | 71 | | | | |
| >245 ≤ 275 | 72 | | | | |
| >275 | 74 | | | | |

[19] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0661&from=EN

## 1.3 Test standards

This section provides an overview of the test standards at EU and Member State level for the tyre performance parameters referred to in the existing legislation regarding tyre labelling. An overview of the test standards, referred to in the Tyre Labelling Regulation, is shown in Table 7.

*Table 7: Overview of test standards used in Regulation 1222/2009 and Regulation 661/2009*

<table>
<tr><td rowspan="2">Performance parameter</td><td rowspan="2">Test method concept</td><td colspan="3">Type approval 661/2009</td><td colspan="3">Labelling 1222/2009</td></tr>
<tr><td>C1</td><td>C2</td><td>C3</td><td>C1</td><td>C2</td><td>C3</td></tr>
<tr><td>Rolling Resistance</td><td>Indoor: Machine test</td><td colspan="3">UNECE R117.02<br>ISO 28580:2009 w/o §10</td><td colspan="3">UNECE R117.02<br>+<br>EC Alignment procedure</td></tr>
<tr><td>Wet grip</td><td>Outdoor: Wet braking vs. reference tyre</td><td>UNECE R117.02/ reg. 661/2009/ Dir. 2001/43/EC</td><td colspan="2">No requirement</td><td>Reg. 1222/2009 Annex V</td><td colspan="2">ISO 15222:2011</td></tr>
<tr><td>External noise</td><td>Outdoor: pass-by test</td><td colspan="6">UNECE R117.02 an limit values from Reg. 661/2009</td></tr>
</table>

The Rolling Resistance Coefficient is determined by a test performed in accordance with Annex 6 of UNECE Regulation No 117 (referring to ISO 28580 standard), which is applicable for C1, C2 and C3 tyres. To ensure alignment of Laboratories, a laboratory alignment procedure is described in Annex Ivan of Regulation 1222/2009. Noise testing for labelling as well as for type approval, must be performed in accordance with UNECE Regulation No 117.

The wet grip class is determined based on the wet grip index (G), which is defined by a „relative“ test method measuring the peak brake force coefficient (unit-less), meaning that the wet grip index is expressed as a percentage of the performance of a reference tyre, tested under the same conditions. For C1 tyres, the wet grip test method is included in Regulation 228/2011 amending the Tyre Labelling Regulation. For C2 and C3 tyres, the test method is included in Regulation 1235/2011 (referring to ISO 15222) amending the Tyre Labelling Regulation. The wet grip testing methods for C1 tyres listed and described in appendix V of the Tyre Labelling Regulation, sets out different conditions for normal and snow tyre test conditions. The wetted surface temperature and the ambient temperature shall be between 2°C and 20°C for snow tyres and between 5°C and 35°C for all other tyres. Furthermore, the reference temperatures for calculations are 10°C for snow tyres and 20°C for all other tyres. The large allowed temperature intervals, among other reasons, cause large variations of wet grip test results.

## 1.4 Responsibilities

### 1.4.1 Tyre suppliers and distributors

It is the responsibility of the tyre suppliers (defined as importers and manufactures in Article 4 of the Tyre Labelling Regulation to provide C1 and C2 tyres with the tyre label, either as a sticker on the tread or as a label in printed format to accompany each batch of one or more identical tyres. For all tyres (C1, C2, C3) the tyre suppliers must state the tyre parameters in the technical promotional material and on their website. Furthermore, they must make the technical documentation available to market surveillance authorities on request. The documentation must be sufficiently detailed to verify the accuracy of the applicable tyre performance parameters.

The tyre distributors (defined as distributors and dealers in Article 5 of the Tyre Labelling Regulation are responsible for ensuring that at the point of sale, C1 and C2 tyres bear the label as a sticker on the tyre thread, or that label before the sale is shown to the end-user and is clearly displayed in the immediate proximity to the tyre. For sales where tyres are not visible to the end-user, such as internet sales, the tyre distributors must provide the end-users with information on the fuel efficiency and wet grip classes and the external rolling noise class and measured value. This does not apply to advertisements. The distributors are also responsible for stating the information on the bills delivered to end-users when they purchase tyres.

### 1.4.2 Vehicle suppliers and distributors

In the case of tyres sold on the Original equipment market, OEM, (Article 6, Regulation 1222/2009), vehicle suppliers and distributors shall, when the end-users are offered a choice between different tyres, before the sale provide the end-users with information on the fuel efficiency and wet grip classes and the external rolling noise class and measured value for each tyre. The information shall also be included in the technical promotion material.

### 1.4.3 Member States

Each Member State is responsible for the enforcement of the Tyre Labelling Regulation (Article 12), and must ensure that "the authorities responsible for market surveillance" verifies compliance with article 4, 5 and 6 of the Regulation. Member States must ensure in accordance with Regulation 765/2008[20] that the responsible Market Surveillance Authorities (MSA's) have the necessary powers, resources and knowledge to perform their tasks. Regulation 765/2008 describes the general rules with regard to market surveillance and controls of products entering the community market.

Regulation 765/2008 includes among others an obligation on MSAs to perform appropriate checks on the characteristics of products on an adequate scale, by means of documentary checks and, where appropriate, physical and laboratory checks based on adequate samples (article 19).

It is the responsibility of the appointed Market Surveillance Authorities (MSAs) described above. This include shop and storage inspections, to ensure that tyres are correctly labelled in accordance with the Regulation.

Article 8 of the Tyre Labelling Regulation states that "Member States shall assess the conformity" of the declared fuel efficiency and wet grip classes and external rolling noise class and measured value in accordance with the verification procedure in annex IV of the Regulation, which sets out a test procedure and sequence as well as tolerances for each performance parameter.

[20] Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products

# 2 Surveys and interviews

Surveys and interviews with different actors in the tyre supply chain were conducted as a part of the review study in order to get an overview of the label effectiveness and improvement potentials. In the first section of this chapter, the methodology applied for the surveys and interviews is explained and in the second section, an overview of the key results is presented.

## 2.1 Selection of target groups

An overview of the key stakeholders affecting the tyre label effectiveness is seen in Figure 2. The dotted line marks the stakeholder groups directly involved in the tyre supply chain. EU Member States and MSAs affect the effectiveness of the labelling scheme through their implementation and enforcement of Tyre Labelling Regulation. This chapter only deals with direct supply chain actors, whereas results from interviews with MSAs are described in chapter 7.

Six target groups were selected for surveys and/or interviews in order to cover the entire supply chain. These were: 1) Tyre suppliers 2) Tyre dealers 3) Vehicle suppliers and distributors 4) C1 end-users 5) C2 end-users 6) C3 end-users.

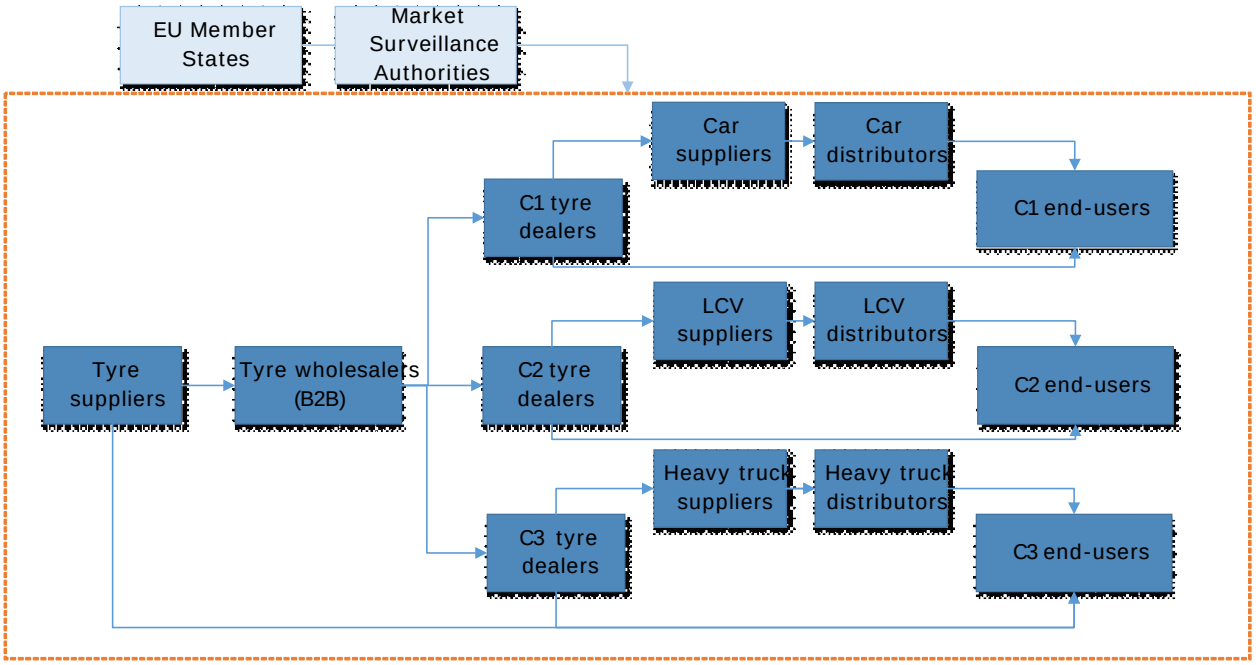


*Figure 2: Overview of the stakeholder groups directly and indirectly involved in the tyre supply chain of both OEM (Original Equipment Market) and replacement tyre market.*

In this context suppliers are defined as in the Tyre Labelling Regulation, Article 3; "'supplier' means the manufacturer or its authorised representative in the Community or the importer". The distributors defined in the Regulation as "any natural or legal person in the supply chain, other than the supplier or the importer, who makes the tyre available in the market", are in this context divided into wholesalers and dealers. The dealers are the most relevant to this study, since they have the direct contact with end-users, and therefore are important for disseminating of the labelling information.

### 2.1.1 Tyre suppliers (manufacturers and importers)

On the manufacturer side, the European Tyre and Rubber Manufacturers' Association (ETRMA) was identified as the key representative accounting for 76 % of the European C1 and C2 tyre markets and 83 % of the C3 tyre market[21]. ETRMA has 12 corporate members consisting of large tyre manufacturers, who were reached though online surveys.

On the importer side, the International Tyre Manufacturers' Association (ITMA) was identified as the key representative for non-ETRMA tyre manufactures importing tyres to Europe[22]. By targeting ETRMA and ITMA 90 %[21,22] of the European tyre market is represented. Interviews were conducted with contacts from key tyre importers provided by ITMA.

### 2.1.2 Tyre dealers

A large number of tyre dealers exist in the European market and in order to get as large a representation of the market as possible they were reached through tyre dealer organisations listed in Table 8. Dealers are in this study defined as those having direct contact with end-users with exception of the 'fleet solution services' used primarily for C3 tyres, where tyre suppliers manage contracts directly with fleet operators [23].

*Table 8: European tyre dealer organisations interviewed*

| | | |
|---|---|---|
| **NTDA** | National Tyre Dealers Association (UK) | 200 member companies representing over 2000 retailers |
| **VACO** | Industry association for the tire and wheel industry (NL) | 350 member companies representing over 730 retailers |
| **FEDERTYRE** | Association of tyre specialists of Belgium (BE) | representing companies buying, selling and servicing tyres, rims & wheels |
| **BRV** | Federal Association of tyre trade and vulcanisation craft (DE) | 800 member companies representing over 3,400 retailers |
| **DRF** | Trade organisation for Swedish tyre, rim and service (SE) | |

### 2.1.3 Vehicle suppliers and distributors

Tyres sold on the Original Equipment Market (OEM) (i.e. with a new vehicle) constitutes 25 % of the tyre production in Europe[24]. This part of the tyre market is small compared to the replacement market, but still considered important in terms of which tyres are used on European roads. Interviews were therefore conducted with key representatives of the vehicle suppliers and distributors, which were identified as the European Automobile Manufacturers Association (ACEA) and the European Council for Motor Trades and Repairs (CECRA). ACEA represents the 15 Europe-based car, van, truck and bus makers and has close relations with the 29 national automobile manufacturers' associations in Europe[25]. CECRA brings together 24 national professional associations representing the interests of motor trade and repair business, and 12 European Dealer Councils representing vehicle dealers[26].

[21] ETRMA statistics 2014, available at http://www.etrma.org/uploads/Modules/Documentsmanager/20150408---statistics-booklet-2014-final-(modified).pdf
[22] http://www.itma-europe.com/2014/11/europes-importers-show-the-way/
[23] Information provided by ETRMA. 'Solution services' are services provided by the tyre suppliers where tyres are leased directly to fleet owners/operators charging a price per km driven.
[24] Braungardt et al. (2014). Impact of Ecodesign and Energy/Tyre Labelling on R&D and Technology Innovation. Available at: http://www.ecofys.com/files/files/fraunhofer-ecofys-2014-impact-of-ecodesign-energy-labelling-on-innovation.pdf
[25] http://www.acea.be/about-acea/who-we-are
[26] http://www.cecra.eu/page/about

Tyres bought on the OEM are not the key product that is purchased, but only a minor part of the vehicle, which is the main product. However, the vehicle distributors are still in direct contact with the end-users, and therefore important for the general label awareness and understanding.

### 2.1.4 C1 end-users

The C1 tyre market is by far the largest in terms of tyre sales, constituting 77 % of the tyre sales in 2013[27]. C1 end-users include consumers defined as private persons buying tyres for their own private cars, as well as leasing companies buying tyres for their lease cars.

The main difference between the two segments is that private consumers hold all costs for both tyre purchase and tyre usage, and hence are affected by both the purchase price and the fuel efficiency. The leasing companies on the other hand, holds only the purchase costs, whereas the lessee holds all costs for fuel.

#### *Consumer survey*

The C1 consumer survey was carried out as an online questionnaire with user-panels of 1000 respondents in six European countries. All respondents were owners of passenger cars who were responsible for the purchase of tyres. The six countries were selected based on the number of registered cars[28], the access to user panels, and the presence of large tyre suppliers in the country. Furthermore, it was based on the geographical coverage, to have answers from both southern and central Europe and from Nordic countries, where the use of snow tyres is more predominant than in the rest of Europe[29]. Based on these considerations, the following countries were chosen:

- Germany (~42 million cars)
- England (~29 million cars[30])
- France (~32 million cars)
- Italy (~37 million cars[31])
- Sweden (~4,5 million cars)
- Finland (~3 million cars[32])

The results of the C1 end-user survey was supplemented with results from a survey conducted in Poland by the Polish Tyre Industry Association (PITA) on end-user awareness[33]. The main purpose of the consumer survey was to assess the effectiveness of the label in terms of consumer awareness and understanding of the label, and to assess the tyre buying behaviour of the consumers. Furthermore, the perception of the consumers of extending the labelling scheme to include mileage, performance on ice/snow conditions, and to cover retreaded tyres was captured by the survey.

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[27] Van Holsteijn en Kemna B.V. - VHK (2014). Ecodesign impact accounting – Part 1, Status Nov. 2013.
[28] From 2012 statistics provided by the ODYSSEE-MURE project, co-ordinated by ADEME with the technical support of Enerdata, Fraunhofer, ISIS and ECN (see http://www.odyssee-mure.eu/publications/efficiency-by-sector/transport/)
[29] Winter tyre Market's segments evolution in the Nordic countries (2015). Presentation by Lennart Lomaeus, Chairman of the Swedish Tyre, Rim & Accessories Suppliers Association.
[30] Data provided for England (not for the whole UK) was retrieved from statistics published by the UK government at https://www.gov.uk/government/statistics/vehicle-licensing-statistics-2012
[31] For Italy, statistics for 2012 were retrieved at http://ec.europa.eu/eurostat/statistics-explained/images/0/0d/Number_of_passenger_cars_per_1000_inhabitants,_2012.png
[32] For Finland, statistics for 2012 were retrieved at http://ec.europa.eu/eurostat/statistics-explained/images/0/0d/Number_of_passenger_cars_per_1000_inhabitants,_2012.png
[33] Polish Tyre Industry Association, PITA, "Public opinion survey: awareness of impact of tyres on safe driving and environmental protection", Millward Brown for the Polish Tyre Industry Association, October 2013.

### *Leasing companies*

According to Lease Europe[34], the leasing companies represent around 25 % (2010[35]) of the European carpark. Ten companies were identified as key players in the European car leasing market, and an attempt to establish contact for potential interviews was done. Most of the companies did not show any interest in answering questions about the EU-tyre labelling scheme. Therefore, interviews have only been made with a few leasing companies in Denmark.

The main purpose of interviewing leasing companies was to identify any significant differences in tyre purchasing behaviour and use of the tyre label compared to private consumers.

### 2.1.5 C2 end-users

C2 end-users are the purchasers and users of C2 tyres, used for light duty vehicles (LDV's). The C2 end-users can be individuals or companies who own or rent LDV's. The main difference is that LDV owners are affected by both the tyre purchase cost and the tyre fuel efficiency (in terms of fuel cost), whilst lessees of LDV's holds only the costs for fuel.

### 2.1.6 C3 end-users

The C3 end-users are primarily truck fleet owners and operators. Existing truck fleet surveys were used in this study to reach a larger amount of truck fleet operators than would otherwise have been possible. The two main studies applied were performed by M2 Conceal (on behalf of Goodyear)[36] and by Commercial Motors Trucking Britain[37]. Since it was not possible within the frame of this study to make an equally thorough survey with fleet owners, results from these two surveys were used for information on C3 end-users.

## 2.2 Results of surveys and interviews

### 2.2.1 Tyre suppliers

The surveys with tyre suppliers showed that 53 % of them believe that their customers (distributors and fleet operators) are aware of the tyre label, while they believe that only 25 % understand it. Most suppliers provide the label for C1 and C2 tyres both as a sticker and a printed label (47 %), others provide it only as sticker (33 %), while 20 % did not answer the question.

Regarding customer priorities, the suppliers indicate that of the three labelling parameters they experience most focus on wet grip followed by fuel efficiency in the C1 and C2 markets. The request for information on the proposed new performance parameters are shown in Table 9.

*Table 9: The request for information experienced by tyre suppliers in the market*

| | Tyre distributors | Fleet operators (C3) |
|---|---|---|
| **Snow grip information** | 40% | 13% |
| **Mileage information** | 20% | 40% |

For retreaded C3 tyres, 60 % of the manufacturers supply them (ETRMA members), while none of the importers reported to do so (ITMA). In total 46 % of tyre suppliers think retreaded tyres should be included in the labelling scheme, 7 % do not, and 47 % do not know.

[34] Lease Europe represents about 92 % of the entire European leasing market (http://www.leaseurope.org/uploads/documents/ranking/Leaseurope %20Ranking %20Survey %202013_public.pdf)
[35] http://www.leaseurope.org/uploads/documents/events/seminar_for_lessors/2011/Jurgita %20Bucyte_WEB.pdf
[36] http://www.fleetfirst.eu/ff_home_en/news/goodyear-fleet-survey-reveals-growing-influence.jsp
[37] http://archive.commercialmotor.com/article/10th-october-2013/32/the-ronseat-approach

Regarding efficiency of the market surveillance, only 13 % answer that it is sufficient to some extent, as seen in Figure 3.

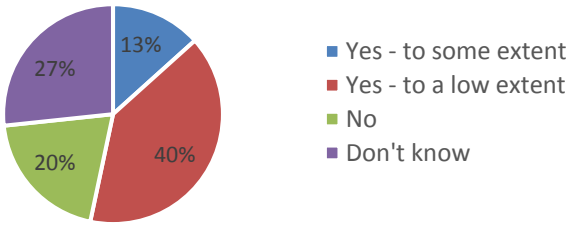


*Figure 3: Tyre suppliers' response to the sufficiency of market surveillance*

### 2.2.2 Tyre dealers

When dealer associations were interviewed, they said that all dealers know about the label, and that they have a good understanding of it. However, most dealers think that market surveillance is either very poor or insufficient. The dealer associations agree that more frequent surveillance campaigns and tests are needed form the authorities. Initially (when the labelling scheme was implemented) they put a lot of focus on the label and education of their members, however, since they found market surveillance insufficient and interpreted it as lack of interests in the label from the authorities, most stopped these efforts.

All tyre dealers sell the largest part of tyres with a tread sticker, and use the printed label when tyres are in storage. All deliver the label information on invoices.

The dealers do not have an overview of end-user awareness of the label, but only a few report that their customers request label information on their own initiative. According to the dealer associations, the end-users focus primarily on safety aspects, followed by price, durability and to some extent fuel efficiency. This is in accordance with the findings form the C1 end-user survey.

Most tyre dealers experienced requests on snow grip from end-users, most prevailingly in Sweden of the interviewed countries, which is as expected. Only the Swedish and German dealer associations (of the interviewed) had a clear opinion that including snow grip in the labelling scheme would be an advantage. Four of the dealer associations experienced demand for mileage information from end-users.

### 2.2.3 Vehicle suppliers and distributors

Contacted vehicle suppliers and distributors were well aware of the tyre label, and all answered that they pass on the label information to their customers. However, the tyre label is not one of their focus areas. Vehicle suppliers purchase tyres directly form tyre suppliers, and often the vehicle distributor (the dealer), have no influence over with which tyres the car is sold. However, end-users are often offered to purchase an additional set of tyres with the vehicle.

### 2.2.4 C1 end-users

#### *Consumer survey*

The entire consumer survey questions and answers are included in Appendix 1.

**Label awareness and understanding**

More than half of the car owners in the investigated countries were not aware of the label before they began the survey. The awareness was the highest in Germany (48 %) and Italy (45 %) and the lowest in Sweden (34 %) and Finland (36 %). A Polish survey from 2013[38] showed that only 16 % of the Polish car drivers knew about the European energy labelling of tyres[39], which indicates that the consumer awareness might be lower in other countries than the ones included in the survey.

When comparing the awareness to when the users last purchased new tyres (Figure 4), the data shows that the more recently the consumers last purchased tyres, the higher was the awareness, indicating a continuous positive progress.

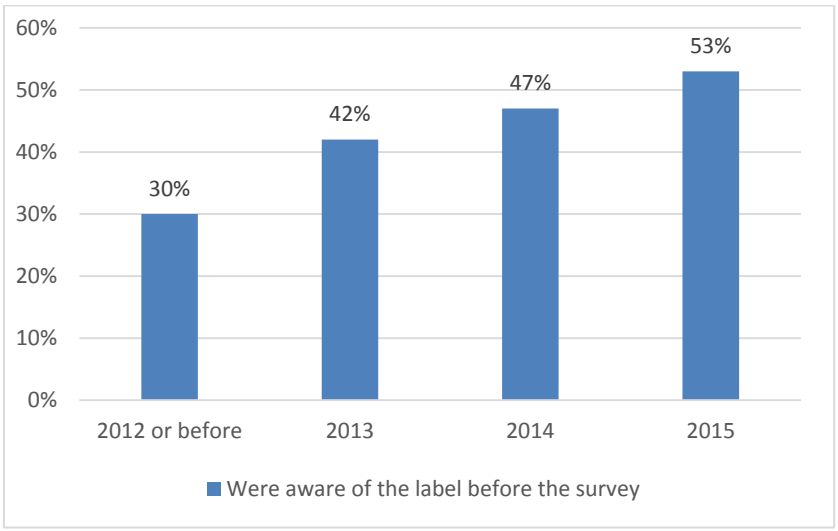


*Figure 4: User awareness of the label based on the year they last purchased tyres*

Danish consumer statistics for the European and Nordic Ecolabels, "The Flower" and "the Swan", showed that 89 % of consumers recognised the Swan in 2013[40]. This is very high compared to the tyre label, which was recognised by only 41 % when the survey was conducted, three years after the tyre label was implemented. This could have something to do with the Swan logo being used on everyday products (especially personal hygiene products), which are purchased much more often than tyres. However, the Flower (European ecolabel) was only recognised by 34 % in 2013, even though it is used on the same products as the Swan. The primary reason for this difference is that the European ecolabel logo was changed in 2010, which caused the recognition rate to drop from 60 % to 29 %.

Since the tyre logo has only been implemented since 2012, and tyres are purchased less frequently than the products labelled with the European Ecolabel, the 41 % recognition is considered as a good result so far. However, as mentioned before it could be lower in other countries than the countries included in the survey.

[38] Polish Tyre Industry Association, PTIA, 2013, Public opinion survey: awareness of impact of tyres on safe driving and environmental protection, October 2013.
[39] Public opinion survey: Awareness of impact of tyres on safe driving and environmental protection. Polish Tyre Industry Association. October 2013.
[40] Miljømærkning Danmark (Ecolabel Denmark), "kendskab til Mærkerne", link: http://www.ecolabel.dk/da/blomsten-og-svanen/kendskab-til-maerkerne

**Understanding of the label**

In general, the consumers' comprehension of the tyre label is good. When presented with the label, the consumers were able to understand the information given, even though they were not familiar with it beforehand. For each label performance parameter the consumers were asked which of six different options presented, they thought the icon indicated. The consumers were also asked if they found the information on the label easy to understand for all the three parameters fuel efficiency, wet grip and external rolling resistance. The answers for both questions are shown in Table 10.

*Table 10: Share of respondents choosing the correct answer for the three label pictograms and who found the pictograms easy to understand*

| | **Fuel efficiency** | **Wet grip** | **External rolling noise** |
|---|---|---|---|
| Correct answer when presented with pictograms | 71% | 86% | 83% |
| Finding the pictogram easy to understand | 71% | 79% | 58% |

From Table 10 it can be seen that the respondents understood the wet grip pictogram best, which was also the one most respondents rates as 'easy to understand'. For the noise pictogram, a large share chose the correct answer, but significantly fewer rated it as easy to understand. That might be because respondents found it easy to see that the pictogram indicated noise, but were not sure whether it was external noise (as heard outside of the vehicle) or internal noise (heard by drivers and passengers).

**Importance of the information on the label**

The consumers were asked how important they found each of the performance parameters on the label as well as the price and the brand of the tyre. The share of the consumers who answered 'very important' or 'important' is shown in Table 11.

*Table 11: Share of C1 end-users finding each parameter very important or important*

| **Country** | **Parameters** | | | | |
|---|---|---|---|---|---|
| | **Price** | **Brand** | **Fuel efficiency** | **Wet grip** | **External rolling noise** |
| UK | 93 % | 60 % | 89 % | 93 % | 63 % |
| Sweden | 92 % | 39 % | 84 % | 96 % | 76 % |
| Italy | 97 % | 74 % | 92 % | 97 % | 70 % |
| Germany | 96 % | 56 % | 90 % | 96 % | 65 % |
| France | 94 % | 75 % | 82 % | 95 % | 68 % |
| Finland | 94 % | 49 % | 83 % | 95 % | 78 % |
| All | 94 % | 59 % | 86 % | 96 % | 70 % |

The most important parameters for the consumers were wet grip and price followed by fuel efficiency. Especially for wet grip a large share of the consumers answered that they found the parameter 'very important' (62 %) and to some extent the price (49 %).

The consumers were also asked which of the tyre performance parameters on the label they weighted as most important. Also in this case, the largest share found the wet grip most important (42 %). However, a relatively large share found all of the parameters equally important (37 %). Only 13 % found the fuel efficiency most important. This is in line with the results of a Dutch consumer survey performed by GfK, where wet grip was rated most important followed by fuel efficiency and lastly noise[41].

**Usefulness of the label**

In general, the consumers rated the label as useful (90 %), 38 % answering they found it 'very useful' and 52 % that they found it 'useful'. Only 3 % thought that the information was not useful, while the remaining 7 % answered that they did not know.

When asked whether they were missing any information on the label, 90 % answered 'no'. However, when asked if they considered it important to include additional information on the label regarding mileage and grip on snow and ice, a larger share answered that they found these parameters important, as seen in Table 12. Especially the consumers in the Nordic countries Sweden and Finland considered it very important to include information about grip on snow and ice (60 % in Sweden and 56 % in Finland). Hence, they had to be asked about specific parameters before stating that they were missing the information in the label.

*Table 12: Share of C1 end-users finding it important to have mileage / snow and ice grip on the label*

| | Very important | Important |
|---|---|---|
| **Mileage** | 25 % | 53% |
| **Grip on snow and ice** | 49 % | 39% |

**Confidence in the label**

A major part of the consumers have high or medium confidence in the information provided by the label as seen in Figure 5, and only 5 % have low confidence. However, the share having medium confidence was by far the largest, with Sweden as the country with the lowest share having high confidence (15 %). Limited confidence might discourage some consumers to use the tyre label actively when purchasing tyres.

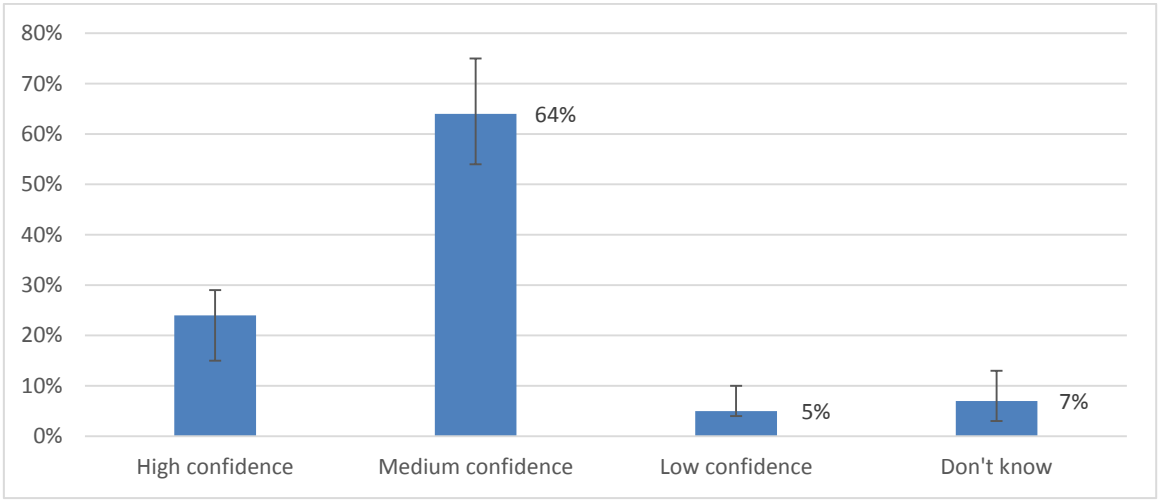


*Figure 5: Share of the interviewed consumers answering that they have high, medium or low confidence in the information on the label. Error bars indicating the spread between countries*

[41] GfK, Dutch consumer survey with 1185 participants, summer 2015.

In addition, the consumers were asked how their confidence could be improved and many answered that more market control and more sanctions towards non-compliance would increase their confidence, as seen in Table 13. This is in accordance with the answers from both tyre manufacturers and dealer associations, who also requested more market surveillance. In addition, many consumers request more information in the form of independent testing by consumer associations or authorities or a public database with the tyre data from the labelling scheme. Half of the consumers (51 %) answered that they would use such a database, and 37 % answered that they maybe would.

*Table 13: How consumer confidence in the label could be improved*

| **Suggestions** | **Share of interviewed consumers selecting the answer** |
|---|---|
| Setting up a public available database with information about the parameters on the label | 37 % |
| Opportunities for authorities to punish non-compliant manufacturers (with fines etc.) | 32 % |
| More market control | 29 % |
| More independent information from consumer associations, authorities etc. | 38 % |
| Opportunities for authorities to punish non-compliant dealers that do not show the label | 23 % |
| More test results in car magazines etc. | 25 % |
| Other (please specify) | 2 % |
| My confidence cannot be improved | 5 % |
| Don't know | 12 % |

**Tyre purchasing behaviour**

When purchasing tyres, safety is the prevailing concern among consumers, and most consumers therefore find wet grip the most important of the labelling parameters[42] (Figure 6), while also a large share find the label parameters equally important. When considering other non-labelling parameters as well, wet grip is still the most important followed by the price. Leasing companies (of C1 and C2 vehicles) are more concerned about the tyre brand and generally buy what they call 'premium brands' (the large well-established brands), due to the signal value. They are less concerned with the label parameters, but mention 'safety' in general as an important parameter.

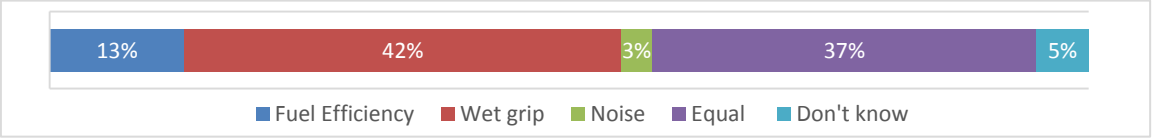


*Figure 6: Share of consumers who find each label parameter most important*

[42] Consumer survey with C1 end-users in selected European Countries, Viegand Maagøe, fall 2015

The largest share of the consumers bought tyres through the traditional channels, tyre shops and car workshops the last time they purchased new tyres. However, the variation was quite large from country to country as seen in Figure 7.

The share of respondents who made their latest tyre purchase on the internet is 12 %, but this share is expected to increase. When asked for future expectations 21 % of the respondents claim that they will buy tyres on the internet in the future and 35 %, that they maybe will do so. This shows the importance of showing the label online.

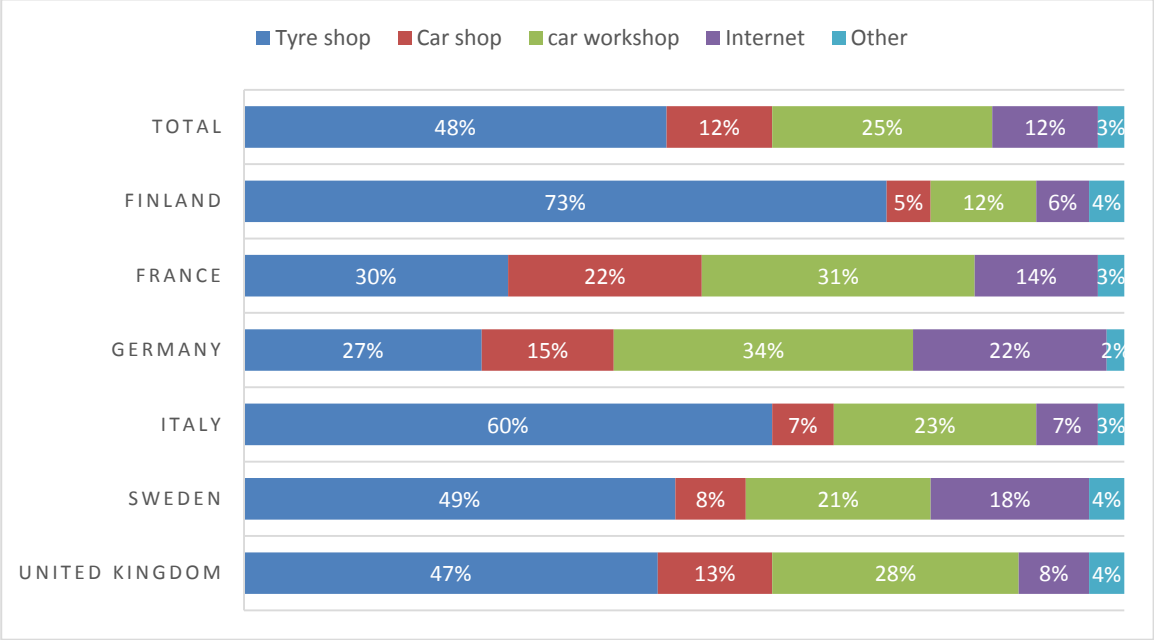


*Figure 7: Where C1 users bought their last set of tyres*

Of the consumers purchasing tyres in a physical shop, two thirds did not see the tyres displayed before purchasing, while one third did see them, and 5 % do not remember. The consumers who saw the tyres displayed in a shop were asked whether they noticed the label. To this question 50 % answered that they did notice the label, 30 % answered they did not notice the label, and 20 % answered that they could not remember. Of those who noticed the label, 64 % saw it placed as a sticker on the tyre tread, 30 % as a label placed near the tyre, and 8 % in a brochure or in promotional material. The remaining part could not remember where they saw the label.

When seeking additional information prior to a tyre purchase, most consumers found it at the place where they purchased tyres and on the internet. 34% did not look for additional information at all.

**Sticker or printed label**

According to the Regulation, the tyre label should, at the point of sale, be placed as a sticker on the tyre tread or as a printed label near the tyres. A majority of C1 end-users preferred the label to be placed on the tyre tread (47 %), 23 % preferred the printed label, and 19 % had no preferences. A few percent had other proposals and 9 % did not know (Figure 8).

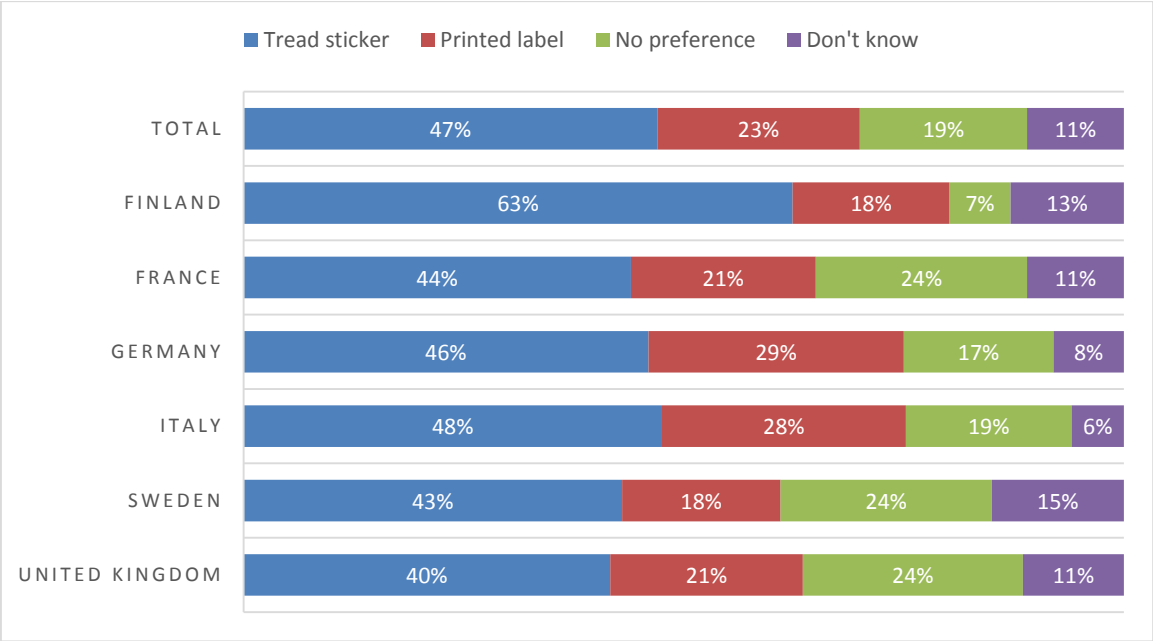


*Figure 8: How consumers prefer the label shown*

### *Leasing companies*

Leasing companies of C1 and C2 vehicles mostly purchase tyres from tyre dealers, while a few buy the C2 tyres directly from tyre suppliers. When buying new cars for their fleet, they have no choice of which tyres are fitted on the car from the beginning. Tyres bought directly from suppliers are not seen by the leasing companies since they are bought through a centralised tender, and therefore labelling is not relevant. However, according to the leasing companies, the tyres they buy from tyre dealers are equipped with tread stickers of the label, or there is printed information on the label values.

When purchasing tyres the leasing companies primarily focus on buying what they refer to as "premium brands", which are the large tyre manufacturers with long market presence. By buying the premium brand tyres, they assume that they automatically get high quality tyres, and they send an important signal to their customers. The second most important factor is the tyre price, and for some the safety, i.e. wet grip. However, according to the leasing companies interviewed, the label information is not a crucial parameter. The interviewed leasing companies were aware of the tyre label, but were uncertain regarding the understanding of the parameters.

### 2.2.5 C2 end-users

Large C2 fleet owners purchase tyres through a tender process, much like C3 fleet owners. Owners of only one or a few C2 vehicles purchase tyres more like the C1 end-users in tyre shops. Of the C2 fleet owners interviewed, all were aware of the tyre label, but did not entirely understand the three performance parameters. They all claimed to receive the tyres with stickers on the tread and label info on the invoices.

Their number one priority is what they in general refer to as tyre "quality", closely followed by the price. The quality, from their point of view, meaning tyre mileage/tread wear and the tyre brand. The interviewed C2 end-users were form Scandinavia, and therefore tyre performance in winter conditions (snow grip) were important to them as well.

### 2.2.6 C3 end-users

Fleet owners and operators often procure their tyres through a solution service as an alternative to buying and owning the tyres. Solution services are usually offered directly by the tyre manufacturers to the fleets, and is a rental or leasing system. The truck tyres are subject to a rent or lease contract, based on replacement after a certain number of kilometres driven or upon request by the user. Especially medium to large-size truck fleets prefer the solution services, as they enable them to outsource tyre management[43]. The solution services cover all predictable tyres costs over the agreed contract period, and includes frequent tyre inspections and 24/7 roadside assistance. Solution services may or may not include retreading and/or regrooving of the tyres as part of the solution[44].

The results of the Goodyear survey[45] showed that 55%of the 500 fleets knew the Tyre Labelling Regulation, while 26 said, they needed a better understanding and 19 that they had never heard of it. Also 54% said that the tyre label influenced their choice of tyres, while 46% said it did not.

Regarding the label criteria, 66% thought fuel efficiency was the most important, and 30% that it was the wet grip. Most of the respondents wanted some kind of wear-related information on the label (86%), while 20% wanted ret readability to be indicated on the label.

[43] ETRMA position paper on circular economy, Brussel, September 2015
[44] ETRMA meeting (September 28th) and supplier web pages.
[45] http://www.fleetfirst.eu/ff_home_en/news/goodyear-fleet-survey-reveals-growing-influence.jsp

# 3. Market transformation achieved with existing legislation

This chapter assesses the ability of the Tyre Labelling Regulation to achieve market transformation by looking at the development of the three performance parameters rolling resistance, wet grip and external rolling noise. Note that the type approval Regulation (EC) No 661/2009 and the development of minimum requirements herein also affect the tyre market. Hence, the observed market transformation is a combination of the effect of both regulations.

## 3.1 Data

Since no complete database exist on EU level for the tyre market, data from two large databases are used. The first is the German Tyres Online (TOL) database[46]. Germany is the largest EU-28 country and the location of many tyre producers and importers, ensuring a good representativeness of the data in the database. The data contains the 29 largest tyre brands in all sizes for the years 2012 to 2015, in total there is data on almost 30,000 tyres. The data from 2012 contains a limited number of tyres models, since the Tyre Labelling Regulation was implemented (mandatory) in November 2012, and the labelling parameters were not logged in the database prior to that. The 2012 numbers are thus not considered representative of the market and are omitted from calculations.

The other is the database from the Dutch Tyre and Wheel Trade Association (VACO)[47]. A large part of European tyre trade goes through Holland, and most of the tyres in the database are sold in other European countries. The data from VACO is for the years 2013 to 2015 and includes the top seven brands (Michelin, Continental, Bridgestone, Goodyear, Dunlop, Pirelli, Hankook, Vredenstein) in the seven most sold sizes. In total, the VACO dataset contains data of around 2,500 tyre models.

The data from both databases is tyre model counts (number of tyre models on the market), and includes both summer and winter tyres. It has not been possible to find any sources that could provide sales weighted data. However, the ecodesign and energy labelling review study on household refrigeration[48] concludes that sales weighted figures only differ a few percent from model counts, being a little lower in efficiency classes. It is therefore assumed that the database model count is representative for the tyre market in Europe.

## 3.2 Market transformation on fuel efficiency (Rolling Resistance)

Both datasets show improvement of the average rolling resistance from 2013 to 2015 as illustrated in Figure 10. Improvements are especially seen for C1 and C2 tyres, whereas the rolling resistance for C3 tyres only increased little in this period. Analysis of the data reveals that the market transformation is primarily caused by a shift in label classes from class F (E for C3 tyres) to C and B. This shows that the tyre label has affected the market to shift towards better fuel efficiency classes than the lowest permissible according to the minimum requirements. However, for tyres with the best fuel efficiency classes, A and B, the market penetration is still very low (0-1 % for all tyre types), which indicates that there still is a large improvement potential.

[46] Tyres online and Energy GmbH, database extractions from year 2012-2015, Hämmerling Group, Germany.
[47] Dutch Tyre and Wheel Trade Association, database extract from year 2013-2015, Vaco, Netherlands.
[48] VHK and ARMINES, November 2015, "Ecodesign & Labelling Review Household Refrigeration" Preparatory/ review study Commission Regulation (EC) No. 643/2009 and Commission (Delegated) Regulation (EU) 1060/2010.

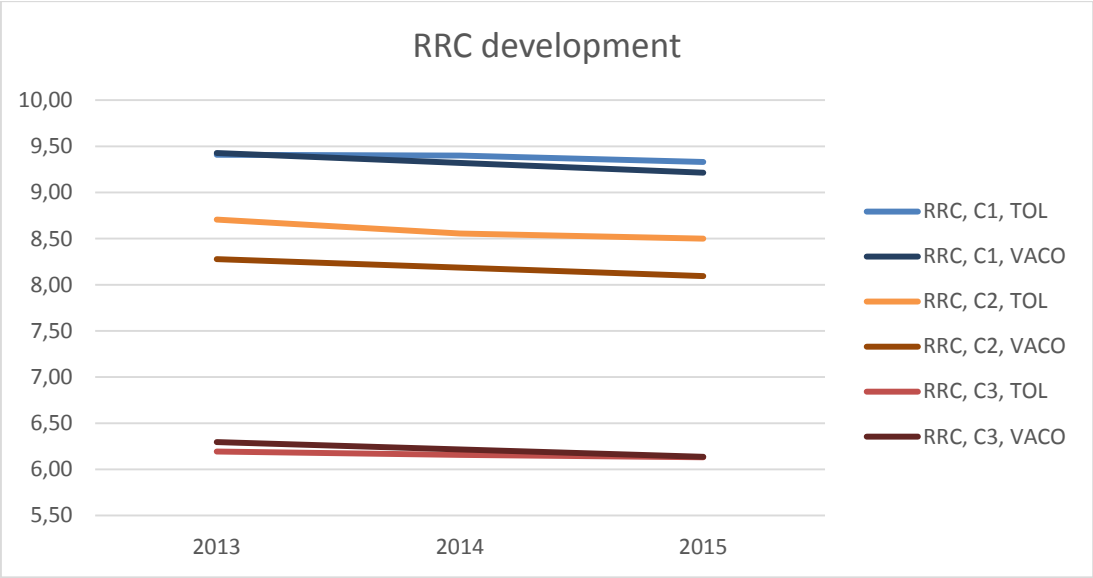


*Figure 9: Market transformation on average rolling resistance for all tyre types according to the TOL and VACO datasets*

A clear difference is observed between the three tyre types with C3 tyres having the lowest RRC and C1 tyres the highest. This is because rolling resistance is measured as kg resistance/ton vehicle, and since C1 cars are lighter than C2 and C3 a higher rolling resistance is allowed in both the Type Approval Regulation and the various fuel efficiency classes (see chapter 1.2.1).

The two datasets show a difference in the rates of change in RRC from 2013 to 2015, which are significantly higher for C1 and C3 in the VACO data (Table 15). This faster improvement of fuel efficiency is probably because the VACO database contains only what is generally referred to as 'premium brands', most of which are also the brands with highest R&D investments[49].

The average rolling resistance of models on the market in 2015 is compared to the forecasts from the original impact assessment report made in connection with preparation of the Tyre Labelling Regulation (EPEC,2008)[50], as seen in Table 14. The EPEC impact assessment included a no-label scenario, a slow pace and a fast pace dual label scenario. Dual labelling meaning that C1 tyres are labelled for both wet grip and fuel efficiency. For the comparison the most positive scenario, the fast pace implementation, from the impact assessment was used.

*Table 14: RRC predicted and observed market values for 2015*

| 2015 RRC values | C1 | C2 | C3 |
|---|---|---|---|
| Predicted, EPEC, fast pace | 10,52 | 9,17 | 6,08 |
| Corresponding fuel efficiency class | E | E | D |
| Observed, TOL and VACO average | 9,27 | 8,30 | 6,13 |
| Corresponding fuel efficiency class | E | E | D |

[49] http://www.rubbernews.com/article/TB/20110901/STATISTICS/121019921/rd-spending-trends
[50] European Policy Evaluation Consortium (EPEC), 2008, "Impact Assessment study on possible energy labelling of tyres", Brussels, July 2008.

The comparison shows that the observed RRC values in 2015 is lower for C1 and C2 tyres than predicted, though they still fall into labelling class E. For the C3 tyres, the observed RRC is slightly higher than the predicted value, but the class is D for both (very close to C, which starts at 6.0 kg/ton). Based on these observations the market development has been more positive than foreseen. However, when looking at the annual change in rolling resistance, shown in Table 15, the market data shows very low changes in RRC from 2013 to 2015, especially the data from the TOL database. Hence, the lower rolling resistance in 2015 is not due to faster changes in 2013-2015, but due to a lower starting point in 2013, than anticipated in the EPEC impact assessment. This suggests that an improvement if the yearly change rates does not improve, it will result in a very slow market transformation not giving the anticipated fuel savings[51].

However, as noted in the EPEC impact assessment, the uptake of products with higher energy efficiency take several years, with the market penetration of A labelled products being low in the first years after implementation. In these years, the price premium for A labelled products is still high, as is also observed on the tyre market, and the consumer awareness of the label and the cost savings it provides is still developing. Hence, rolling resistance change rates are likely to increase during the coming years if the implementation is continuously supported.

According to the Triple-A study by TNO[52], the current market distribution with relatively few A-labelled tyres can be explained by low consumer awareness. The low awareness makes end-users reluctant to pay extra for A-labelled tyres, because they are not aware of the benefits it might bring.

*Table 15: Change rates in percent per year for RRC in observed data compared to EPEC scenarios*

| | Database market data | | EPEC scenarios (dual labelling C1) | | |
|---|---|---|---|---|---|
| | **TOL** | **VACO** | **No labelling** | **Slow pace** | **Fast pace** |
| **C1** | -0.4 % | -1.1% | -1.7 % | -2.5% | -2.7% |
| **C2** | -1.2 % | -1.1% | -1.8 % | -3.0% | -4.3% |
| **C3** | -0.5 % | -1.3% | -2.0% | -2.6% | -5.0% |

## 3.3 Market transformation on wet grip

Both datasets show an increase of the wet grip from 2013 to 2015 (Figure 10), however the improvement is more clear for the VACO data than the TOL data, which probably is because the VACO data contains only the so-called premium brands. This is also seen by the wet grip change rates in Table 16, which are higher for the VACO data.

The market transformation is primarily caused by a shift in label classes from class E and C (only C for C3 tyres) to A and B. Hence, also for wet grip it is not only the minimum requirements in the Type Approval Regulation (661/2009) that are responsible for the market transformation. The tyre market is shifting towards the two highest wet grip classes from the middle categories, showing the influence of the label. The market share of the wet grip class B is high for all tyre types (41 %-46 %) whereas the share of class A is still rather low and more differentiated with 3 % for C3, 8 % for C2, and 16 % for C1 tyres. This makes wet grip the parameter with highest percentage of A and B ratings. However the number of AA labelled tyres (A in both wet grip and fuel efficiency), is between 0-1 % for all tyre types. Therefore, it is considered premature to revise the labelling scale requirements for both wet grip and fuel efficiency.

[51] European Policy Evaluation Consortium (EPEC), 2008, "Impact Assessment study on possible energy labelling of tyres", Brussels, July 2008.
[52] TNO, Memorandum To Ministry of Infrastructure and Environment, "Potential benefits of Triple-A tyres in the EU"

According to the tyre industry, the high wet grip performance is linked to their focus on developing tyres with better wet grip to increase road safety, while maintaining (or when possible increase) fuel efficiency. This is supported by the findings from a study made for the European Commission in 2014[53], which found that the main technological developments were related to advanced material compositions to achieve high wet grip and fuel efficiency simultaneously.

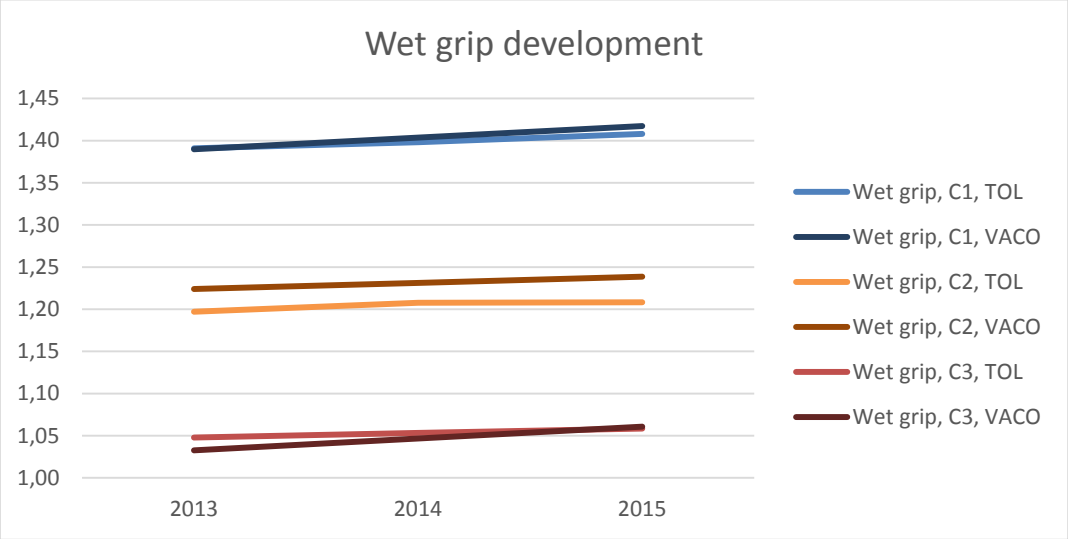


*Figure 10: Market transformation on average wet grip for all tyre types*

*Table 16: Observed wet grip values for 2015 and change rates in the two datasets*

| | C1 | C2 | C3 |
|---|---|---|---|
| Wet grip on market, TOL and VACO average | 1,41 | 1,22 | 1,06 |
| Corresponding label class | B | C | C |
| Change rates in wet grip (% pa) – TOL | 0.6% | 0.5% | 0.51% |
| Change rates in wet grip (% pa) – VACO | 1.0% | 0.6% | 1.3% |

## 3.4 Market transformation on external rolling noise

The external rolling noise is shown on the tyre label both as a measured value in dB and as noise classification. The market transformation on external rolling noise, shown in Figure 12, is based on average measured values. For all tyre types, the changes in external rolling noise from 2013 – 2015 are quite small, all below 1 % pa (Table 17). Furthermore, the rates are not explicitly positive or negative, which appear from Table 17. This is in accordance with findings from the consumer survey showing that external rolling noise is the one of the three labelling parameters that consumers rate as least important (see chapter 3.2.4), and also the parameter rated least important by C3 end-users.

As opposed to the rolling resistance and wet grip, the external rolling noise is not as clearly differentiated between the tyre types. The C2 and C3 average performance is similar, as seen in Table 17. For the C2 and C3 tyres, the change rates of noise levels are also similar for the two datasets as shown in Table 17. For C1 tyres, however, there is a large difference in the two datasets and the rates are quite different. This is ascribed to the VACO dataset containing only the so-called premium tyre brands.

[53] Braungardt et al., 2014, "Impact of Ecodesign and Energy/Tyre Labelling on R&D and Technological Innovation", 23 may 2014. Project number DESNL13606.

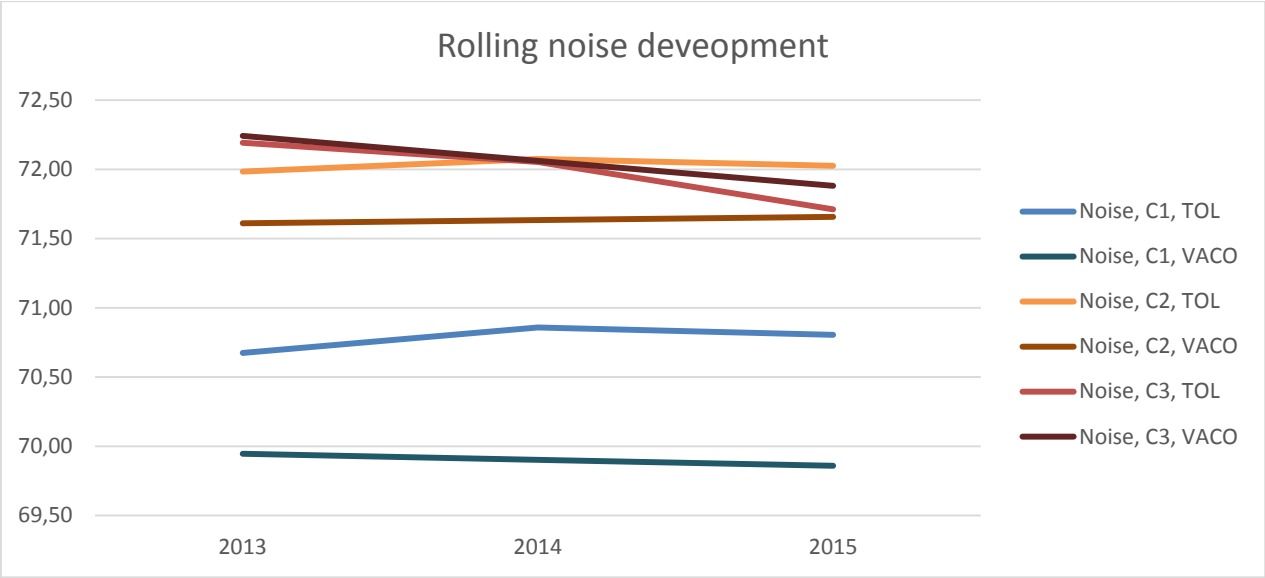


*Figure 11: Market transformation on average external rolling noise (average measured values) for all tyre types*

*Table 17: Average external rolling noise values and change rates in the TOL and VACO datasets*

| | C1 | C2 | C3 |
|---|---|---|---|
| Noise on market, TOL and VACO average | 70.3 dB | 71.8 dB | 71.8 dB |
| Change rates in noise (% pa) – TOL | 0.09% | 0.03% | -0.33% |
| Change rates in noise (% pa) – VACO | -0.06% | 0.03% | -0.25% |

# 4. Market development potentials

In this chapter, the potential market development until 2030 is estimated for each of the labelling performance parameters. Future development until 2030 are estimated for a business as usual scenario, BAU, and an optimised implementation scenario, OI.

- **The BAU scenario**[54] is defined as a baseline for how the tyre labelling scheme is predicted to affect the market without further interventions, and is forecasted as a linear extrapolation of the market change observed in the TOL data from 2013-2015.
- **The OI scenario** is based on faster market penetration of high performing tyres, leading to higher market averages by 2030 than what the BAU scenario yields.

The TOL dataset has been used for the analysis, since it contains a wider range of tyre brands and are therefore a better representative for the market compared to the VACO data, which contains only the premium brands.

## 4.1 Modelling

A stock model was developed based on tyre sales data provided by ETRMA[55]. From 2016 the tyres sales were extrapolated with a 1 % p.a. increase until 2030, which was considered realistic by industry. The expected tyre sales were combined with expected tyre lifetimes to calculate the stock (number of tyres in use in the EU). An extract of the model can be seen in Table 18. The fuel consumption for each vehicle type was forecasted for the period as well, taking into account the expected reductions in fuel consumption from technology development of cars, based on numbers from ETRTO and CARS 21[56]. This was used together with the stock model to estimate fuel savings on EU level and hence the environmental improvement potential.

*Table 18: Extract of the tyre stock model, number of tyres in use (thousands)*

| (Thousands) | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|
| C1 | 611.276 | 620.136 | 657.064 | 690.581 | 725.807 |
| C2 | 28.925 | 30.015 | 31.547 | 33.156 | 34.847 |
| C3 - New | 9.735 | 11.407 | 12.173 | 12.782 | 13.430 |
| C3 - Retreaded | 8.798 | 9.615 | 9.920 | 10.438 | 10.975 |

Table 19 summarises the assumptions used in the stock model, which are based on information from the EPEC impact assessment[57] and data from TOL and VACO.

*Table 19: Basic assumptions used in the stock model*

| | Average tyre mileage | Km/year/ vehicle | Average tyre lifetime | TOL RRC, 2015 | Fuel saving potentials |
|---|---|---|---|---|---|
| C1 | 40,000 km | 16,000 km | 2.5 years | 9.33 kg/ton | 1.5% per kg/ton |
| C2 | 40,000 km | 22,000 km | 1.8 years | 8.50 kg/ton | 1.5% per kg/ton |
| C3 | 100,000 km | 60,000 km | 1.7 years | 6.13 kg/ton | 5% per kg/ton |

[54] Not to be confused with the original BAU scenario in the EPEC study. This 'Business-as-Usual' scenario is an intermediate assessment of the continued effect of the measure.
[55] ETRMA (European Tyre and Rubber Manufacturers Association), European Tyre and Rubber Industry Statistics, edition 2014.
[56] Impact Assessment Study on Possible Energy Labelling of Tyres, EPEC, 2008, SEC(2008) 2860
[57] Impact Assessment Study on Possible Energy Labelling of Tyres, EPEC, 2008, SEC(2008) 2860

## 4.2 Rolling resistance development

The tyre labelling scheme has until now utilised only a minor part of the fuel saving potential, and with the BAU scenario the average fuel efficiency would be class C for all tyre types in 2030. The OI scenario is based on the assumption that the average fuel efficiency will be class B in 2030. The extent of future savings depends on how effectively the labelling scheme is implemented and enforced as well as manufacturers' and consumers' response.

In the Figures below the BAU and OI scenarios regarding the RRC development are compared to the three scenarios from the EPEC impact assessment. The three scenarios from EPEC are the 'No labelling' scenario, and the two dual labelling[58] scenarios 'fast pace' implementation and 'slow pace' implementation. Dual labelling meaning that C1 tyres is labelled with both fuel efficiency and wet grip. These scenarios are in the EPEC report based on the market shares of various label values. To allow comparison the values are for the analysis in this study converted to average RRC values. Furthermore, the EPEC scenarios were only established until 2020. These numbers were therefore extrapolated until 2030 under the assumption that the RRC change rate would decrease after 2020 due to technical limitations. The calculations are shown in Appendix 2.

The BAU and OI scenarios together with the EPEC scenarios of the RRC development are shown in Figure 12, 13 and 14 for C1, C2 and C3 tyres, respectively.

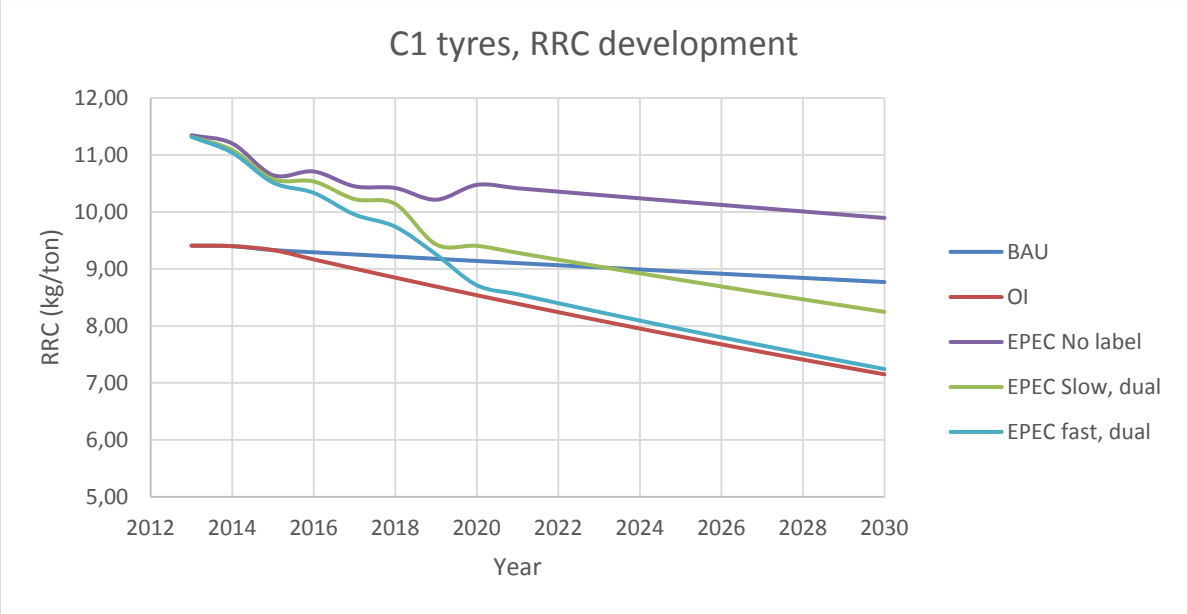


*Figure 12: Average market RRC development for C1 tyres*

[58] Dual labelling: both RRC and wet grip labelling for C1 tyres. In the EPEC scenarios, wet grip for C2 and C3 was not forecasted, and neither was external rolling noise levels.

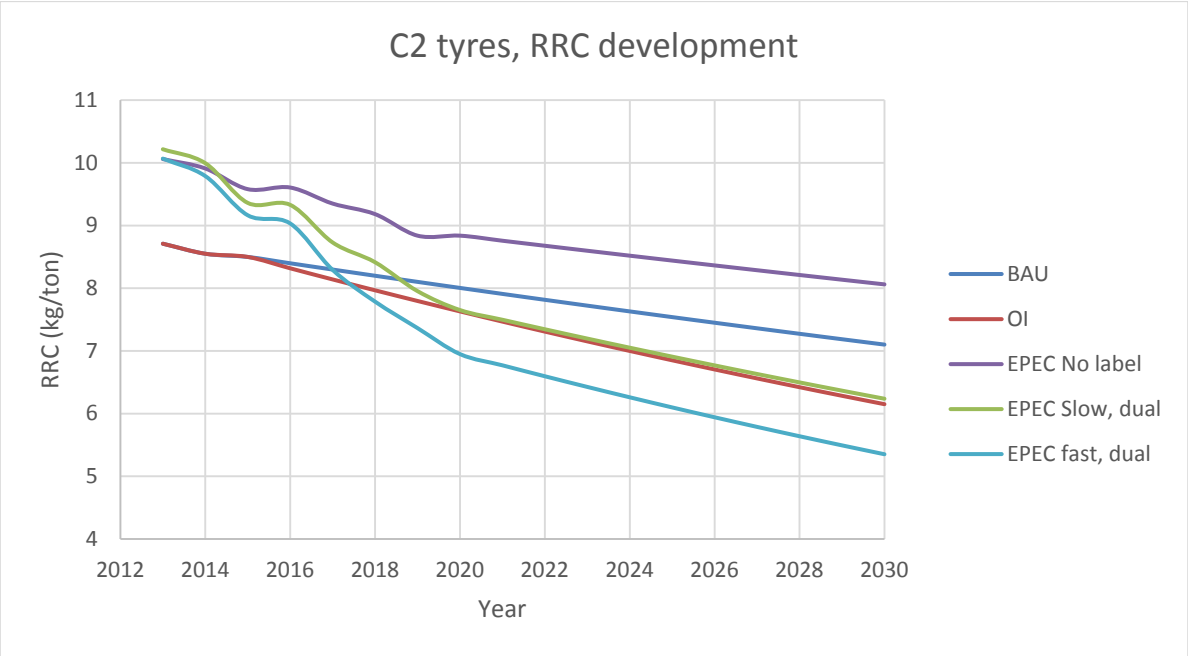


*Figure 13: Average market RRC development for C2 tyres*

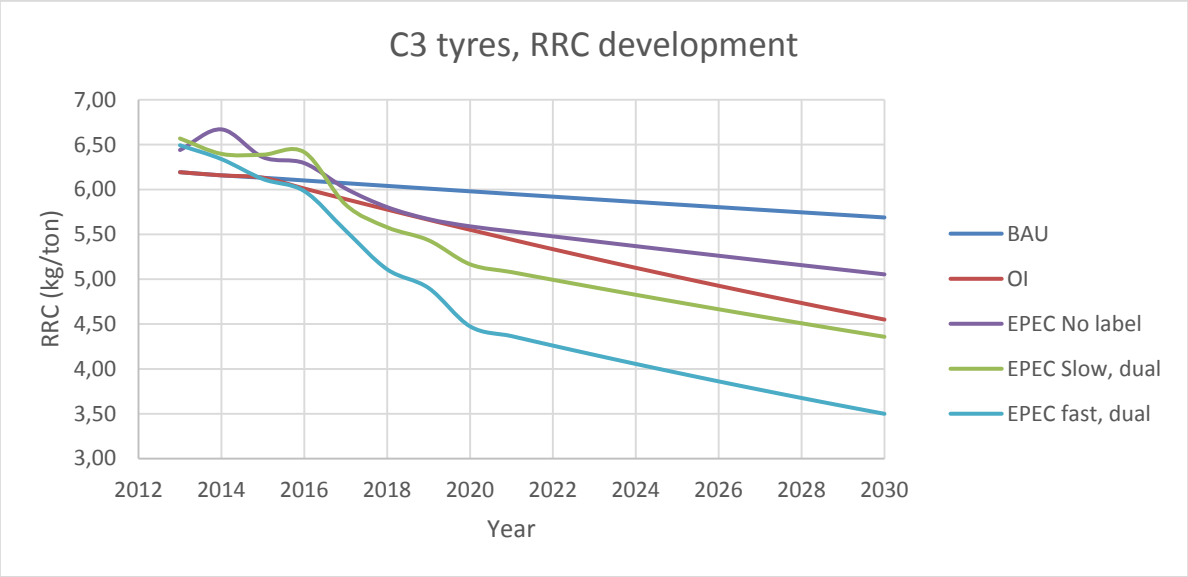


*Figure 14: Average market RRC development for C3 tyres*

The data from the TOL database shows that the average rolling resistance of tyre models on the market in 2015 are lower than estimated in the EPEC scenarios, especially for C1 and C2 tyres. The TOL data does not include all low-priced tyre brands and the average rolling resistance might therefore be a few percent lower. Furthermore, the EPEC scenario are based on estimations, since no market data existed prior to implementation of the labelling, and hence the starting point might have been lower than expected.

The lower RRC in 2015 for C1 and C2 means that the BAU scenario, despite its slower decreasing rate, yields lower RRCs than the EPEC No labelling scenario in 2030. Hence, the tyre label as it is now has provided a market improvement compared to no labelling. This is not the case for C3 tyres, where the 2015 RRC are more similar, and the faster change rate in the EPEC No label scenario therefore implies a market improvement, that cannot be observed in the real-life market data. Even for C1 and C2 tyres, the BAU scenario would result in average fuel efficiency class C in 2030, which is also the result of the EPEC No label scenario, indicating only a minor improvement.

The BAU scenario does not provide the savings anticipated in any of the EPEC labelling scenarios, due to the slow decreasing rates of RRC. This indicates that a more efficient implementation of the labelling scheme is necessary. The possible effects of a more efficient implementation is illustrated in the OI scenario. Since the technology already exists, the realisation of the OI scenario depends highly on user awareness and efficient enforcement (see chapter 8). For C1 tyres, the OI scenario gives close to the same market improvement as the EPEC fast implementation scenario. For C2 and C3 tyres the OI results are closer to the EPEC slow implementation scenario.

### 4.2.1 Energy savings

The BAU scenario results in a total fuel of saving (C1, C2 and C3) of 75 PJ in 2030 (5.4 Mton $CO_2$)[59], whereas the OI scenario results in saving of 252 PJ in 2030 (18.2 Mton $CO_2$). This corresponds to 0.6 % and 2.2 % respectively of the annual road transport consumption[60]. Hence, the OI scenario results in more than three times the fuel saving as the BAU scenario in 2030.

For the average fuel efficiency to be class A by 2030, a change rate of -3.5 % pro anno is required, and the resulting savings would be 393 PJ in 2030 (28.4 Mton $CO_2$), corresponding to 5 % of annual road transport consumption. This result is similar to that obtained in a study by TNO[61] on triple-A tyres in EU, which also showed savings of 5 % of the total $CO_2$ emissions from road transport in the EU in 2030.

## 4.3 Wet grip development

Wet grip is the labelling parameter with the highest classification according to the A-G scale used in the labelling scheme, and with the BAU scenario, the average wet grip would be class B for all tyres types in 2030. The OI scenario for wet grip is based on the assumption that the average wet grip will be class A in 2030, which would require faster market penetration of high performing tyres.

Wet grip labelling of C2 and C3 tyres were not included in the EPEC impact assessment, and wet grip was forecasted only for C1 tyres. The EPEC scenarios included a 'No labelling' scenario, where the wet grip was not expected to change, and the 'dual labelling' scenario, where wet grip was included in the label for C1 tyres. These scenarios were described in the report as marked shares of various label values, and were therefore interpreted into average wet grip to allow comparison. Furthermore, the forecast was only provided until 2020, and these numbers were therefore extrapolated until 2030 under the assumption that the wet grip change rate would remain constant. The calculations can be seen in Appendix 2.

[59] CO2 emissions factors: Covenant of Mayors, Technical annex to the SEAP template instruction documents: Emission factors (http://www.eumayors.eu/IMG/pdf/technical_annex_en.pdf )
[60] European Commission, EU transport in figures, statistical pocketbook 2014. (http://ec.europa.eu/transport/facts-fundings/statistics/doc/2014/pocketbook2014.pdf )
[61] TNO, Memorandum To Ministry of Infrastructure and Environment, "Potential benefits of Triple-A tyres in the EU"

The BAU and OI forecasts together with the EPEC scenario forecasts of the wet development are shown in Figure 15 for C1 tyres and Figure 16 for C2 and C3 tyres.

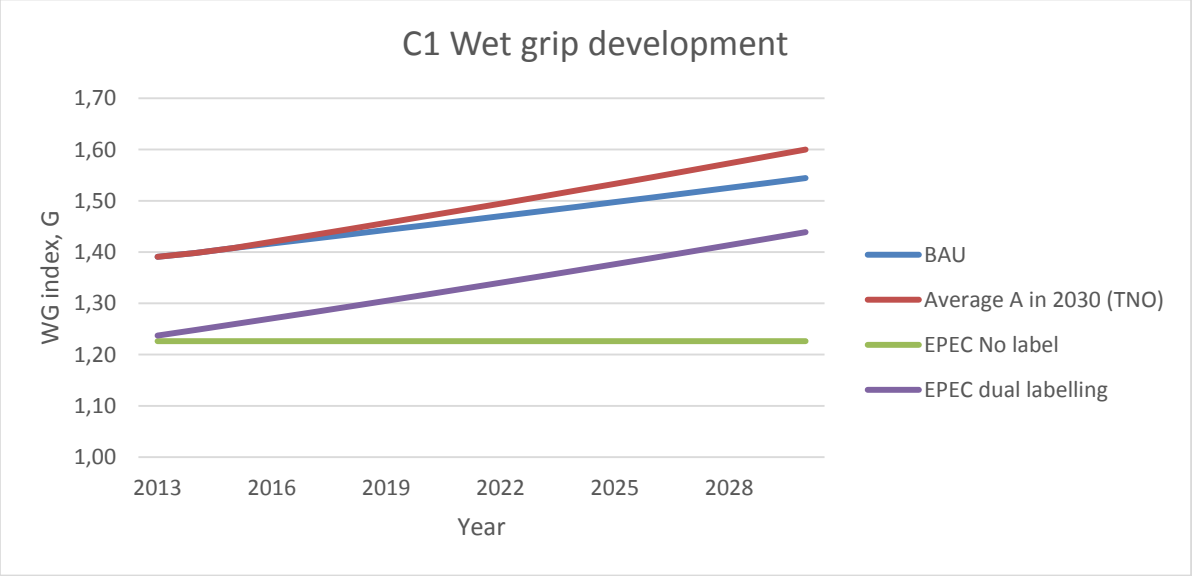


*Figure 15: Wet grip market development for C1 tyres, including scenarios from EPEC, 2008.*

The wet grip market average in 2015 for C1 tyres was 1.40 according to the TOL data, which corresponds to class B (borderline to class C). This is one class higher than the 1.23 (class C) expected in the EPEC impact assessment for 2015. This difference in 2015 expectations and actual data might be caused by a combination of different factors. First, the numbers in the EPEC impact assessment is based on market estimations, since no actual data existed prior to the labelling scheme implementation. These estimations might have been too conservative. Second, the TOL data does not include some of the low-priced tyres brands, which most likely have lower wet grip ratings, thus the actual wet grip average might be a few percent lower. Third, the wet grip is the parameter that has received most attention regarding technology development, and it is possible that an improvement happened up to the labelling implementation from 2009-2012.

Despite the higher starting point in the BAU scenario, the slower market change (0.6 % pa) means that the average wet grip would remain in class B (borderline to A) until 2030. This is more positive than the EPEC no label scenario, where no change in wet grip was expected without the label. However, when comparing the BAU scenario to the EPEC dual labelling, both would result in average label class B by 2030.

The BAU result in a slightly higher average wet grip (G=1.54) compared to the EPEC dual label scenario (G=1.44) by 2030, but only due to the higher starting point, since the change rate in the EPEC dual label scenario (0.9 % pa) exceeds that of the BAU scenario. Indeed, the change rate needed to achieve the OI scenario (average wet grip class A by 2030), is 0.9 % pa.

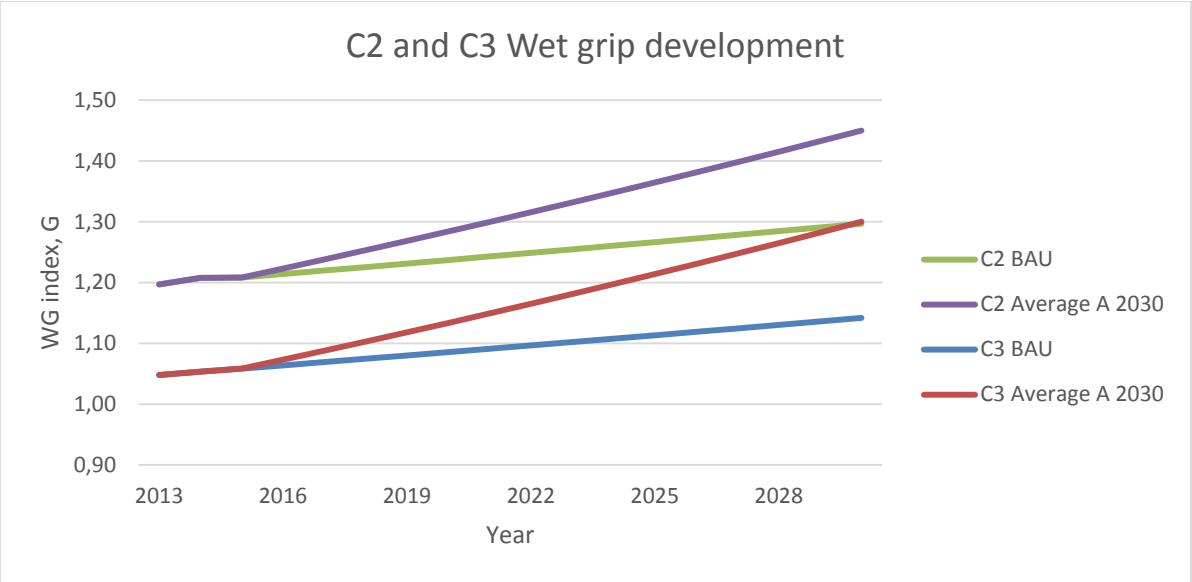


*Figure 16: Wet grip market development for C2 and C3 tyres*

As seen in Figure 16 the wet grip is generally higher for C2 than for C3 tyres (which are both lower than for C1 tyres). The change rates of wet grip is also lower for C2 (0.47 % pa) and C3 tyres (0.51 % pa) than for C1 tyres, which would result in average label class B for both by 2030 in the BAU scenario.

To achieve the OI scenario of wet grip class A as average by 2030, change rates of 1.2 % pa and 1.4 % pa would be required. According to the TNO study[62], the use of triple-A tyres would entail that "Yearly, 2,567 less people would be killed in traffic accidents, the number of serious injuries would be reduced by 12,353 and the number of slight injuries would be reduced by 19,631".

## 4.4 External rolling noise development

The external rolling noise is the labelling parameter where least market improvement can be seen, and the average measured noise values are decreasing only for the C3 market, as seen in Figure 17. The external rolling noise development is estimated using the measured values in dB, and the OI scenario is based on an average external rolling noise of 68.0-68.5 dBA by 2030. There are no forecasts in the EPEC impact assessment of external rolling noise.

According to industry, C1 end-users[63], and a study on the innovation impact of the tyre labelling scheme[64], the external rolling noise receives less attention than wet grip and fuel efficiency. This explains the increasing rates for C1 (0.09 % pa) and C2 tyres (0.03 % pa), i.e. an increase in external rolling noise levels, which is the opposite of the intention. Only the C3 tyre market shows an improvement in the BAU scenario regarding external rolling noise levels, which decreases with 0.33 % pa. This results in an average external rolling noise level of 68.2 dBA for C3 tyres by 2030.

[62] TNO, Memorandum To Ministry of Infrastructure and Environment, "Potential benefits of Triple-A tyres in the EU"
[63] C1 end-user survey of label awareness. Useneeds on behalf of Viegand Maagoe A/S, 2015.
[64] Braungardt et al. (2014). Impact of Ecodesign and Energy/Tyre Labelling on R&D and Technology Innovation. Available at: http://www.ecofys.com/files/files/fraunhofer-ecofys-2014-impact-of-ecodesign-energy-labelling-on-innovation.pdf

Since the rolling noise limit values in Regulation 661/2009 is generally higher for C3 tyres, it is expected that the rolling noise of C1 and C2 tyres can be decreased to at least the same value as for C3 tyres by 2030. The OI scenario is therefore based on the assumption that the external rolling noise for C1 and C2 tyres will be 68.5 dBA on average in 2030, and 68.0 for C3 tyres. This would require change rates of -0.27 %, -0.38 %, and -0.35 % per year for C1, C2 and C3 tyres, respectively. These change rates are close to the one actually seen for C3 tyres from 2013-2015 (the BAU scenario), and it is therefore considered realistic to reach this despite of the external rolling noise apparently having lowest priority.

For C2 and C3 tyres the external rolling noise in the IO scenario would be more than 3 dB under the limit values given in Regulation 661/2009 (for normal tyres), and thus result in the lowest noise class (one sound wave). For C1 tyres the noise limits depend on the tyre size, but 68.5 would be 1.5 dBA below the limit value for the smallest tyres (70 dBA), and more than 3 dBA below the limit value for the largest tyres (74 dBA) (see Table 6).

According to the TNO triple-A study[65], decreasing the noise to the lowest class would entail that "the number of annoyed and highly annoyed people by road traffic would be reduced by 8.3 and 13 million respectively. The number of sleep-disturbed and highly sleep-disturbed people would be reduced by 3.4 and 6.1 million respectively".

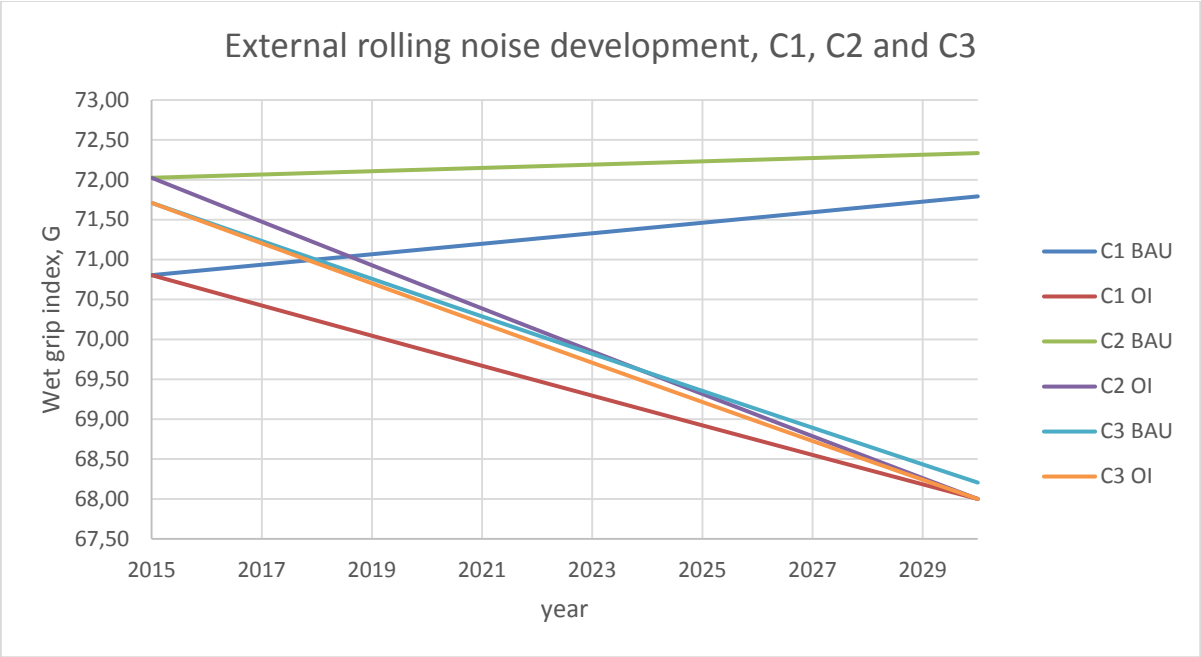


*Figure 17: External rolling noise development for C1, C2 and C2 market for BAU and OI scenarios*

[65] TNO, Memorandum To Ministry of Infrastructure and Environment, "Potential benefits of Triple-A tyres in the EU"

# 5. Inclusion of new performance parameters

In this chapter, the possibilities to include three new tyre performance parameters in the tyre labelling scheme are discussed. The three performance parameters are ice and snow grip, mileage, and abrasion.

## 5.1 Ice and snow grip

The tyre labelling scheme does not distinguish snow tyres from other tyres, and there is no mentioning of snow grip on the label. For all tyres, the wet grip index is used as a measure for safety. However, this carries a potential risk of misleading consumers purchasing winter tyres, since tyres designed to perform better on snow and ice, often have a poorer wet grip than standard reference test tyres (SRTT). This is also reflected in the Type Approval Regulation (661/2009), where the wet grip minimum requirements for C1 tyres are less strict for snow tyres (i.e. lower wet grip is allowed). According to the Danish Traffic Agency, a snow tyre has 10-15 % longer braking distance than non-snow tyres on dry or wet road, but 40-45 % shorter braking distance on snow and ice than normal tyres[66]. The inclusion of snow and ice performance in the labelling scheme is a matter of safety and provision of clear information to consumers.

### 5.1.1 Definitions of Snow tyres

Many different terms are used for tyres designed to perform well on snow, of which some are used in regulatory context and others are purely marketing terms. The marketing terms include “summer tyres”, “winter tyres” and “all season tyres”. Since there are no definition of what these terms cover, the regulatory definitions will be used in the following to avoid confusion.

UNECE Regulation 117[67] defines a ‘snow tyre’ as “a tyre whose tread pattern, tread compound or structure is primarily designed to achieve in snow conditions a performance better than that of a normal tyre with regard to its ability to initiate or maintain vehicle motion”. This definition applies to all tyre types (C1, C2, C3). Snow tyres can be labelled with the M+S (Mud + Snow) marking on the tyre sidewall as mentioned in UNECE Regulation No 30[68] and 54[69]. M+S is a manufacturer declaration stating that the tyre tread compound and pattern are intended for mud and/or snow conditions with no further requirements or tyre performance tests.

M+S tyres also include tyres made for terrain driving, which are made of rubber types that are not applicable for winter conditions. In Sweden and Norway the M+S symbol is used to define winter tyres, but only as long as the tyres are “designed specifically for winter conditions”[70], which is defined in those countries by the Scandinavian Tyre and Rim Organisation, STRO. Every year STRO issues a list of approved winter tyres based on the technical information of the tyres[71]. This list is necessary, since the M+S label includes no requirements for tread compounds, and the marking therefore does not ensure better performance at low temperatures or on snow and ice, hence STRO choose only to put tyres on the list that are made of specific rubber compounds.

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[66] http://www.trafikstyrelsen.dk/DA/Presse/Nyhedsarkiv/Syn-og-koeretoejer/2009/10/T %C3 %A6nk-over-d %C3 %A6kvalg-og-hastighed.aspx

[67] Addendum 116: Regulation No. 117, ” Uniform provisions concerning the approval of tyres with regard to rolling sound emissions and/or to adhesion on wet surfaces and/or to rolling resistance”, United Nations, February 2014.

[68] Addendum 29: Regulation No. 30, Revision 3, ”uniform provisions concerning the approval of pneumatic tyres for motor vehicles and their trailers”, United Nations, March 2007

[69] Addendum 53: Regulation No. 54, ” Uniform provisions concerning the approval of pneumatic tyres for commercial vehicles and their trailers”, United Nations, March 2013.

[70] https://www.transportstyrelsen.se/sv/vagtrafik/Fordon/Fordonsregler/dack/Vinterdack/

[71] http://stronordic.com/information-2/winter-tyres/

The UNECE Regulation 117[72] defines a 'severe snow tyre' ('snow tyre for use in severe snow conditions') as "a snow tyre whose tread pattern, tread compound or structure is specifically designed to be used in severe snow conditions and that fulfils the requirements of paragraph 6.4 of this Regulation". Paragraph 6.4 refers to a performance requirement of the tyre based on a snow performance test[73] defined in Annex 7 of the same Regulation. This definition is applicable for all tyre types (C1, C2, and C3). Tyres fulfilling the performance requirements based on the snow performance test can be labelled with the 3-PMSF (3 Peak Mountain Snow Flake) marking, seen in Figure 18, on the sidewall of the tyre on a voluntary basis. The 3-PMSF marking is also referred to as the "alpine symbol".


*Figure 18: Alpine symbol (3-PMSF) used for marking severe use snow tyres according to UNECE Regulation No 177.*

### *Nordic winter tyres*

Another category of tyres is the so-called "Nordic winter tyres", which are non-studded tyres designed for ice and wet ice conditions rather than snow. There are currently no legal definition of Nordic winter tyres, but an ISO standard for an ice performance test is currently being prepared, and is expected to be ready for 2017[74]. The ice performance test is applicable for C1 tyres only.

The test standard was proposed by the "Informal Working Group for Snow and Ice conditions of Tyres" founded in 2012. The ice performance test is a braking test similar to the snow performance test used for severe snow tyres (3-PMSF). The requirement for Nordic winter tyres could be a minimum threshold of the grip performance on ice, since a scaling is not possible due to the low range and level of dispersion of the ice tests[75]. The industry is committed to work on a relevant threshold based, which could be the basis for consumer information on the label. The purpose of the ice performance test is to distinguish the Nordic winter tyre (which often have the lowest wet grip values) from 3-PMSF tyres (which in general terms have middle-range wet grip values), to avoid that wet grip is misleading the consumers in their choice of the best winter tyre. 90 % of consumers find it 'important' or 'very important' to have snow grip performance on the label[76].

Since winter conditions vary a lot throughout Europe, different types of snow tyres (snow, severe snow, and Nordic winter) are appropriate for different geographical areas. Hence, a separation into the severe snow tyre category and the Nordic winter tyre category can help the users choosing the best snow tyre for their specific use conditions. Nordic winter tyres have a dominant position in the Nordic countries, representing 75 % in Sweden, 90 % in Finland and 95 % in Norway of the studless winter tyre segment for C1 tyres.

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[72] Addendum 116: Regulation No. 117, " Uniform provisions concerning the approval of tyres with regard to rolling sound emissions and/or to adhesion on wet surfaces and/or to rolling resistance", United Nations, February 2014.
[73] Annex 7 of Regulation No. 117, " Uniform provisions concerning the approval of tyres with regard to rolling sound emissions and/or to adhesion on wet surfaces and/or to rolling resistance", United Nations, February 2014.
[74] Informal Working Group for Snow and Ice conditions of Tyres "Status of Ice Test Method Development of Tyre Industry, ETRTO", December 2014
[75] Michelin, "Background information on snow and ice tyres", received at meeting 20th of October 2015.
[76] Consumer survey with C1 end-users in selected European Countries, Viegand Maagoe, fall 2015

### *Overview of snow tyre definitions and tests*

An overview of the snow tyres used in Europe is given in Table 20. The market shares of the different snow tyre types are based on ETRMA data for C1 tyres from 2010. The total number of C1 tyres sold in 2010 was 257 million. It is important to notice that the studded tyres is a subgroup to the Nordic winter tyres.

The market share of winter tyres shown in Table 20 are aggregated European numbers, but the results from the C1 user survey shows that the share of car owners who have winter tyres for their car range from 8 % in some countries to 80 % in others. In a number of countries, use of winter tyres is mandatory part of the year[77].

*Table 20: Types of snow and ice tyres and their market share of the entire tyre market in 2010. Nordic tyres is a subgroup of 3-PSMF tyres and studded tyres is a subgroup of Nordic tyres.*

| Definition | Requirement | Scope | Market share in EU (2010) |
|---|---|---|---|
| Snow tyre (M+S) | None – Manufacturer declaration | C1, C2, C3 | Unknown |
| Severe snow tyre Alpine (3-PMSF) | Snow performance test (UNECE 117) | C1, C2, C3 | 58.8 mill.<br>22% |
| STRO list | M+S and/or 3-PMSF and approved by STRO | C1, C2, C3 | Unknown |
| Nordic winter tyres (studless) | ISO standard under way for ice performance test | C1 | 5.1 mill.<br>2% |
| Studded tyres | FI, NO, SE: restricted amount of studs and road wear | | 3.5 mill.<br>1% |

### 5.1.3 Including snow and ice grip in the labelling scheme

Based on the above considerations it is suggested to adopt the 3-PMSF and the forthcoming ice grip logo in the tyre labelling scheme to help end-users make a better informed choice when purchasing tyres. Since the variation between the worst and the best performing tyres is too small for division of the tyres into a performance scale (A –G) regarding both snow and ice grip, a threshold performance indicated by a pictogram on the label seems to be the most suitable option. It is important that the indications of snow and ice grip performance is based on tests and not solely on a manufacturer declaration of the tyre properties.

The 3-PMSF and ice grip logos should not replace the wet grip scale, but be a supplementary marking applicable for severe snow tyres. Wet grip will still be an important safety parameter for all tyres, since the driving conditions in most European countries will imply driving a large part of the time on asphalt, even in the winter season. The snow and ice grip performance should be applied on a voluntary basis to necessitate only testing of tyres designed for winter conditions. The 3-PMSF logo on tyre sidewall is also currently being used on a voluntary basis.

[77] European Commission, Winter tyres – calendar and other mandatory conditions, Link: http://ec.europa.eu/transport/road_safety/observatory/doc/wintertyres_rules.pdf

For snow grip performance, the most optimal solution is to use the existing 3-PMSF test and logo, which represents the tyre performance according to a threshold. The 3-PMSF is applicable for all tyre types (C1, C2, C3), and is already widely used in the tyre industry and recognised by end-users. It is therefore considered to be less costly to implement in the tyre labelling scheme. Showing the 3-PMSF logo on the label would give the end-users the same level of information as today. However, the information will be more visible compared to the Alpine symbol currently only being present at the tyre sidewall, and differentiate it from the M+S marking, which is not placed on the label.

Results from a user survey carried out by IPSOS on behalf of Goodyear in 2015 showed that 39 % of C1 end-users in continental Europe and 29 % in the Nordics recognised the 3-PMSF symbol. The survey also showed that a majority of those recognising the symbol properly knew its meaning.

For “Nordic winter tyres” the expected ISO standard on ice grip performance in combination with a threshold of performance and a pictogram currently under development, seems to be the optimal solution. It is suggested to include the ice grip performance in the labelling scheme in addition to the snow grip performance to provide a differentiation of the two categories for C1 end-users. This will allow consumers to choose the optimal tyre for their specific driving conditions.

While including snow and ice performance pictograms in the labelling scheme would allow consumers, especially in the Nordic countries, making better informed choices when purchasing tyres, there is a need to ensure that the pictograms are not misleading consumers in the rest of Europe. It is therefore of importance that consumer awareness campaigns are carried out to ensure that consumers understand the new pictograms and how to use them making an informed choice according to their individual needs.

### *Label design*

As mentioned above it is suggested to place snow and ice performance pictograms on the tyre label of C1 tyres, snow performance pictogram on labels of C2 tyres, and for C3 tyres the information should be shown in the technical promotional material. For C2 tyre labels, only the snow performance (3-PMSF) pictogram is relevant, whereas both snow and ice performance pictograms are relevant for the C1 tyre label. For all tyre types the pictograms should be shown where relevant to make the label information language-neutral, which is important for consumer understanding.

Regarding the exact design of the tyre label with the snow and ice performance included, a thorough assessment should be conducted to ensure the best user understanding of the label. It is important that the inclusion of snow and ice grip performance does not lead to confusion, and it is therefore important to investigate how the pictograms would affect consumers’ choice of tyre throughout Europe.

One of the questions that have been raised in this study is the number of pictograms to be allowed on the tyre label for C1 tyres. Hence, if a C1 tyre that performs within both the 3-PMSF and the ice threshold should have both, or only one of the pictograms. The various options can be seen in Figure 19.

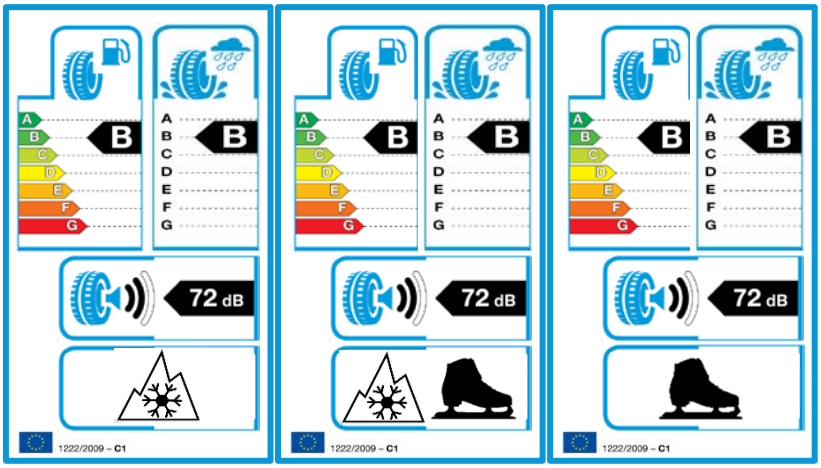



*Figure 19: (Left) Snow tyre label, (Middle) Ice tyre label 1, (Right) Ice tyre label 2*

According to an IPSOS survey performed on behalf of Goodyear[78], adding two logos on the label (one for snow performance and one for ice performance) will confuse the consumers. An example of such a label is shown in Figure 19 in the middle. In this case, 50 % of the users in continental Europe would wrongly buy an ice tyre, which is not fit for central European conditions due to the rubber compound. 86 % percent of consumers in the Nordic countries would choose the ice tyre. If only one logo was added to the label either the 3-PMSF or the Ice tyre logo as seen to the left and right in Figure 20, 74 % of central European consumers would choose the snow tyre, and 68 % of Nordic consumers would choose the ice tyre. It is the belief of VTI that a tyre that pass the ice grip threshold in general would have no problem passing the 3-PMSF threshold[79]. It is not certain, however, whether a Nordic winter tyre will perform as well in milder conditions above freezing point and with wet snow, as a tyre designed for the specifically.

Another design parameter that has been raised is whether so-called “summer tyres” should be recognisable from snow tyres (MS and 3-PMSF) through a “summer tyre” logo. However, the current lack of a strict “summer tyre” definition makes this difficult. It should be investigated through user surveys, whether this would be appropriate.

[78] Goodyear EMEA, ”Consumer Research on Winter Tire Understanding via the EU Tire Label”, Assessment of the final research carried out by IPSOS. June 2015.
[79] VTI, Statens väg- och transportforskningsinstitut, Sweden. M. Hjort, Researcher in Vehicle Technology and Simulations.

## 5.2 Mileage

Mileage is a common parameter used to express the durability of tyres as a distance in miles or in kilometres. In this study, the term mileage is used for expected tyre lifetime in kilometres. Article 14 of the Regulation 1222/2009 refers to mileage as one of the aspects that has to be considered in the present study.

### 5.2.1 Factors affecting mileage

The mileage of a tyre is directly correlated to the tyre wear factor (amount of tread material lost per kilometre), which is affected by several other parameters than the tyre itself. In order to assess the possibility of including mileage in the labelling scheme, the factors affecting tyre mileage and wear were identified as listed in Table 21[80]. The factors have been categorised as internal and external, where the internal factors represent inherent characteristics of the tyre, and external factors represent all impacts from the surrounding environment and use.

*Table 21: Internal and External Factors affecting tyre wear and subsequently tyre mileage.*

| **Internal factors affecting mileage** | **External factors affecting mileage** |
|---|---|
| Construction<br>- Even ground pressure reduces wear<br><br>Choice of material<br>- Influences tyre weight<br><br>Tread compound/chemical composition<br>- Silica tread reduces wear<br><br>Tread depth<br>- Thicker tread increases mileage, but might also increase wear rate<br><br>Tyre size (radius/width/depth)<br>- Larger tyres have larger contact surface and lower ground pressure, which reduces wear | Tyre pressure<br>- Both under –and over inflation increase wear<br><br>Wheel alignment<br>- Incorrect alignment increases wear<br><br>Tyre position<br>- Higher wear on the driven axle<br><br>Driving style<br>- Turning, high engine torque, acceleration and deceleration all increase wear<br><br>Road surface (material and texture)<br>- Coarser road surfaces can increase wear of up to 100%<br>- Wetness, porosity, maintenance<br><br>Speed and acceleration<br>- Higher speed cause higher temperature and increased wear<br><br>Load<br>- Higher loads increase wear<br><br>Climate<br>- Sunlight (UV), temperature*, ozone and precipitation all affect tyre wear<br><br>Vehicle characteristics<br>- Load distribution and weight<br>- Electronic braking systems<br>- Suspension type<br>- Engine power |
| *The chemical and physical properties of summer and winter tyres are optimized for their appropriate operating temperatures. At low temperatures (under 7°C), summer tyres wear more quickly. The same applies to winter tyres used at high temperatures. | |

[80] T. Grigoratos and G. Martini, 2014, "Non-exhaust traffic related emissions. Brake and tyre wear PM, Literature review", JRC European Commission.

No comprehensive studies exist that quantify the influence of each factor, however, Continental Tyres[81] have made a list of factors and weighted their influence on tyre wear on a "low-medium-high"-scale, which indicate that the external factors have high influence compared to the internal factors. Information from ETRMA has indicates that the user behaviour more than anything is determining for the tyre lifetime, with the internal factors playing a smaller, but not necessarily negligible role.

According to the C1 end-user survey (Figure 21), 38 % of car owners rate mileage as "very important" for their choice of tyres. This is less than for the wet grip (62 %), but higher than for fuel efficiency (34 %), which indicates that including mileage in the Tyre Labelling Regulation would add value to customers, and that it is a parameter that might affect C1 users' choice of tyres. A survey including C3 end-users (fleet operators) from 2013 shows that the mileage is even more important for fleets with 86 % indicating that they would like to have wear information in the labelling scheme[82].

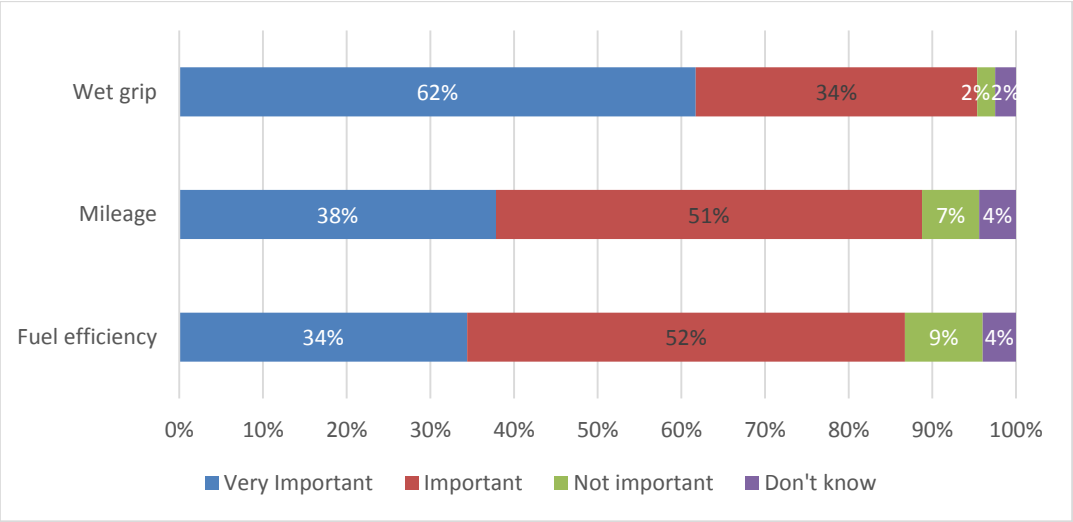



*Figure 20: C1 end-user rating of fuel efficiency, mileage and wet grip importance*

[81] http://www.continental-tyres.co.uk/www/download/tyres_uk_en/general/tech_services_uk/resource_library/bulletin_14_en.pdf

[82] Goodyear fleet survey, performed by MV2 Conseil with around 500 truck fleets from France, Germany, Italy, Poland and Spain in the summer 2013. Link: http://www.fleetfirst.eu/ff_home_en/news/goodyear-fleet-survey-reveals-growing-influence.jsp

### 5.2.2 Test standards for mileage

No European test standard exists for measuring the mileage of tyres. However, the National Highway Traffic Safety Administration, NHTSA, in the Unites States have made a suggestion for including tyre duration[83] on an American tyre label[84] based on test methods laid out in the Uniform Tire Quality Grading, UTQG[85] for measuring tread wear. The UTQG tread wear test does not provide an expected mileage directly, but rather uses a numerical index of how well a tyre wears in comparison to a reference tyre, more specifically a percentage of the NHTSA nominal tread wear value[86]. If the candidate tyre is graded 100 the tread wears with the same rate as the reference tyre, if it is graded 200 the tread wears with half the rate and is thus expected to last for twice as long as the reference tyre.

There are several barriers to use the UTQG tread wear test on the European Tyre label. First, the tyre wear grade is calculated based on a control tyre that is tested simultaneously with the candidate tyre, hence resulting index cannot be used to compare durability of tyres of different widths and diameters, or from different manufacturers. This would somewhat undermine the purpose of implementing it in the tyre labelling scheme.

Second, the test lacks reproducibility. This is due to both extrapolation of tread wear in the 7,200-mile test to tyre lifetime tread wear, and the large influence of external factors. As noted by NHTSA in the UTQG standard "The relative performance of tyres depends upon the actual conditions of their use, however, and may depart significantly from the norm due to variations in driving habits, service practices and differences in road characteristics and climate"[87].

Third, the UTQG test is performed on a specific 400-mile roadway course in Texas, established by the NHTSA[88]. Hence, the test is currently applicable only for American conditions, and should be adapted to European conditions in order to be used in Europe. Also other parameters, such as the vehicle tyres are tested on, are based on American conditions.

Fourth, the UTQG test is associated with high costs, since it entails driving in a convoy for 7,200 miles (11,600 km) and rotating tyre positions and carrying out measurements every 400 miles. Each test costs around 35,000 USD (32,000 EUR)[89]. Up to four different tyre models can be tested in one test run[90]. This might very well be a problem for manufacturers and especially market surveillance authorities, since the costs of testing current labelling parameters (around 3,500-4,000 Euros) is already a barrier for testing.

For C3 tyres specifically, the ETRMA members report that they collect mileage information to the extent that they are in contact with C3 end-users. The information is received directly from fleets using their tyres, who reports the mileage performance of tyres when they are worn out, and is therefore a real-life measurement of the C3 tyres. This information is used by the individual manufacturers to provide mileage information to customers, but only as a relative performance among the manufacturers' own tyres without giving absolute numbers.

[83] http://www.nhtsa.gov/cars/rules/import/FMVSS/#P575.104
[84] http://usdotblog.typepad.com/secretarysblog/2009/06/nhtsa-proposes-consumerfriendly-tire-efficiency-labeling.html#.VfqzvxHtmko
[85] (§575.104) **in** 49 CFR 575 **http://www.nhtsa.gov/cars/rules/regrev/evaluate/807805.html**
[86] http://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol7/pdf/CFR-2011-title49-vol7-sec575-104.pdf
[87] http://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol7/pdf/CFR-2011-title49-vol7-sec575-104.pdf
[88] http://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol7/pdf/CFR-2011-title49-vol7-sec575-104.pdf
[89] Continental Tyres, D. Collins, Director Public Affairs. Applus+ Idiada, D. Gallegos, General manager.
[90] Applus+ Idiada, D. Gallegos, General manager

### 5.2.3 Scenarios for increased mileage

The estimation of the environmental effect of increasing mileage is based on a lifecycle energy perspective. Estimations of energy savings are made for the three tyre types C1, C2 and new C3 (not retreated) separately, taking into account the production and waste treatment energy savings compared to the use phase energy.

The estimation is based on a gradual increase in tyre mileage up to a 10 % increase by 2030, "10 % increase" scenario. In the BAU scenario, it was assumed that the current tyre mileage would remain unchanged. Table 22 shows the tyre mileages and assumptions of distance travelled per year, for each vehicle type.

*Table 22: Mileage and travel distance assumptions. Numbers are based on Impact Accounting, 2013*[91]

| | **C1** | **C2** | **C3** |
|---|---|---|---|
| **Current mileage (BAU)** | 40,000 km | 40,000 km | 100,000 km |
| **Mileage by 2030 (10% increase)** | 44,000 km | 44,000 km | 110,000 km |
| **Km/year/vehicle** | 16,000 km | 22,000 km | 60,000 km |

It is assumed that the total travelled distances at EU level is similar in both scenarios. The difference between the BAU and the 10 % increase scenario is therefore the tyre stock (Table 23), and hence the tyre sales per year until 2030. When the tyres have higher mileage, less tyres are needed to fulfil the driving need, and hence the stock and the sales are lower. The 10 % increase in mileage until 2030 gives an annual change rate in mileage of 0.64 %. The tyre sales would decrease at this same rate. Energy savings arise from the lower production and lower amount of waste tyres (EOL energy).

*Table 23: Extract of the adjusted stock model. Stock (number of tyres) in thousands.*

| (Thousands) | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|
| C1 | 620,136 | 637,221 | 669,669 | 705,712 |
| C2 | 30,015 | 31,973 | 34,861 | 37,585 |
| C3 - New | 11,159 | 11,554 | 12,497 | 13,579 |

To calculate production and end-of-life energy, which are both measured as MJ/kg tyre, the tyre weights in Table 24 were used.

*Table 24: Weight of tyres and scrap tyres*[92]

| | C1 | C2 | C3 |
|---|---|---|---|
| New tyre weight, avg. (kg) | 8.6 | 11.0 | 62.7 |
| Scrap tyre weight (kg) | 7.0 | 9.4 | 56.0 |
| Difference (kg) | 18% | 14% | 11% |

[91] Van Holsteijn en Kemna B.V. - VHK (2014). Ecodesign impact accounting – Part 1, Status Nov. 2013.

[92] Sienkiewicz et al, 2012, progress in used tyres waste management in EU: A review; http://www.oponeo.co.uk/tyre-article/how-much-does-a-tyre-weigh ; http://www.michelin.ca/tire-selector/size/215/65/16/false/B/0/compare-tires

According to the industry, the approach to increase mileage would not only be to increase the volume (mass and thickness) of the tread, but rather to apply technological innovations such as different rubber compounds. Therefore, it is assumed that the weight of tyres will not change for tyres with increased mileage. According to a review study on waste management of tyres in EU[93], the end-of-life fate for European tyres is distributed as shown in Figure 21.

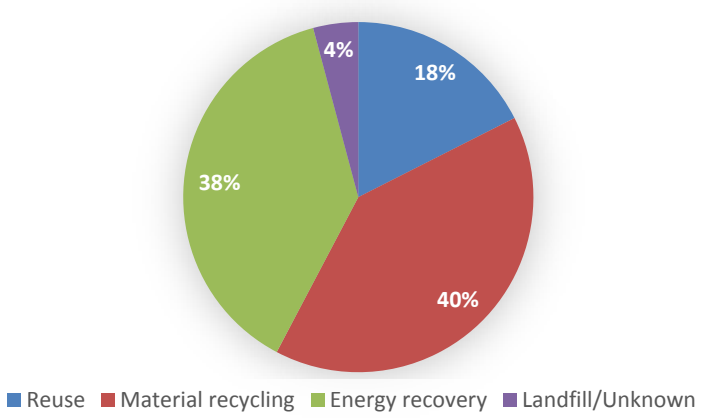



*Figure 21: Distribution of end-of-Life fate for European tyres*

The energy consumption for each of these end-of-life options can be seen in Table 25. The negative sign for tyres used for energy recovery indicates that the scrap is used to produce energy, which it is credited for, and hence it is subtracted from the life cycle energy, according to the consequential life cycle assessment (LCA) method[94]. The reuse of tyres means virgin material production is avoided, which causes energy savings that are credited to the reused tyre life cycle energy. There is still energy consumption related to handling the waste tyres, and therefore only around 1/3 of the production energy of a new tyre can be credited. This is also seen for the Landfill/Unknown fragment, which "costs" 40 MJ/kg due to transport and waste treatment. For material recycling (e.g. rubber grain from waste tyres) the credit and the energy savings almost cancel out.

For production energies an interval of 87-115 MJ/kg tyre were found in the review study by Sienkiewicz et al (2012)[95], and for all calculations the average of this (101 MJ/kg) was used.

*Table 25: Average energy assigned per kg scrap tyre for each end-of-life scenario[96]*

| | |
|---|---|
| New tyre production | 101 MJ/kg |
| Reuse | -33 MJ/kg |
| Material recycling | 3 MJ/kg |
| Energy recovery | -32 MJ/kg |
| Landfill/Unknown | 40 MJ/kg |

[93] Sienkiewicz et al, 2012, progress in used tyres waste management in EU: A review
[94] European Commission - Joint Research Centre - Institute for Environment and Sustainability: International Reference Life Cycle Data System (ILCD) Handbook - General guide for Life Cycle Assessment - Detailed guidance. First edition March 2010. EUR 24708 EN. Luxembourg. Publications Office of the European Union; 2010
[95] Sienkiewicz et al, 2012, progress in used tyres waste management in EU: A review
[96] Sienkiewicz et al, 2012, progress in used tyres waste management in EU: A review

Regarding the energy consumption of the tyres in the use phase, the original impact assessment[97] showed a relation between increasing tread wear and decreasing rolling resistance for selected tyres, but this correlation could not be quantified or generalised. The same is true for wet grip. In the calculation of the increased mileage scenario, it is therefore assumed that neither the rolling resistance nor the wet grip are affected.

### 5.2.4 Results of increased mileage scenarios

The effect of increasing mileage by 10 % is shown in Table 26 and compared to the savings obtained by the decreasing rolling resistance in the BAU scenario. The savings related to increased mileage are largest for C1 tyres due to the large sales volume. Also the relative saving, compared to savings from RRC, is largest for C1 tyres, since the yearly distance driven is lowest for C1 vehicles.

The total energy savings achieved by a 10 % increase of mileage is below 0.5 % of the total yearly energy consumption of C1, C2 and C3 vehicles in 2030. For comparison, the rolling resistance energy savings in the BAU scenario corresponds to 1 % of the annual energy consumption from C1, C2 and C3 vehicles in 2030.

*Table 26: Energy savings (TJ/year) at 10 % increase in mileage compared to energy savings from RRC in the BAU scenario*

| TJ savings per year | | 2020 | 2025 | 2030 |
|---|---|---|---|---|
| C1 | 10% increased mileage savings | 8,086 | 16,805 | 26,021 |
| | RRC savings (BAU) | 17,198 | 31,812 | 43,450 |
| | Total savings | 25,283 | 48,617 | 69,470 |
| C2 | 10% increased mileage savings | 690 | 1,456 | 2,223 |
| | RRC savings (BAU) | 5,368 | 10,399 | 15,073 |
| | Total savings | 6,058 | 11,856 | 17,296 |
| C3 | 10% increased mileage savings | 1,554 | 3,222 | 5,002 |
| | RRC savings (BAU) | 5,284 | 10,976 | 17,091 |
| | Total savings | 6,838 | 14,197 | 22,094 |

The energy savings from increasing tyre mileage is around half of the savings from decreasing rolling resistance. Hence, the energy savings obtained due to increased mileage are not negligible, especially for C1 tyres. The results, however, are based on the very uncertain assumption that the rolling resistance does not change. It is not possible to say how, or to what extent, the increased mileage will affect rolling resistance, but it is unlikely that it will not change at all. Since the savings from increasing mileage is smaller than those of decreasing rolling resistance, even slightly higher RRC (because of increased mileage) will be enough to offset the potential mileage savings.

However, energy is not the only environmental reason to increase the mileage of tyres. Also the solid waste amounts generated by end of life tyres (ELTs) is an important factor. Increasing the lifetime of tyres would increase the intervals of which they are replaced, and hence reduce the waste amounts. Table 27 shows the estimated waste reductions of the increased mileage scenario. The results show that this would lead to around 10 % less ELTs by 2030, when the tyre mileage are increased by 10 %.

[97] Impact Assessment Study on Possible Energy Labelling of Tyres, EPEC, 2008, SEC(2008) 2860

*Table 27: savings in ELT waste amounts in tonnes and percent for the increased mileage scenario*

| | 2020 | 2025 | 2030 |
|---|---|---|---|
| Total waste savings, ton | 75,134 | 162,694 | 246,437 |
| Percent savings | 3% | 7% | 10% |

### 5.2.5 Conclusions on mileage

Based on the considerations above, it is not recommended to include mileage as a performance parameter in the tyre labelling scheme. This is a combination of the lack of a reproducible test method and the uncertainty of the environmental impact.

The large effect of external parameters on the tyre mileage undermines the reproducibility of any current test standard. Using highly uncertain mileage estimations in the labelling scheme poses a large risk that the predicted mileage is not achieved in real life. This could severely affect end-user confidence in the label in general. Furthermore, it would make it impossible to perform market surveillance.

The uncertainty of how increased mileage would affect the rolling resistance and the wet grip), and the limited environmental benefits, makes it unlikely that including mileage in the labelling scheme would result in actual energy savings.

## 5.3 Abrasion

Abrasion, which is the removal of materials from the tyre when it interacts with the road surface, contributes to the particle air pollution with the so-called TRWP (Tyre Road Wear Particles). As pointed out in a letter to the European Commission[98], the relative importance of TRWP is likely to increase as other air pollution sources such as vehicle emissions are regulated.

### 5.3.1 Abrasion and particle emissions

Abrasion occurs when the tyre interacts with the road surface, which causes shear stress of the materials, and removes materials from both road and tyre. This removal of materials has been proven to contribute to the particle matter pollution, which is measured as $PM_{10}$ (particles <10µm) or $PM_{2.5}$ (particles <2.5µm). Due to interaction of tyre and road wear particles, it has proven difficult to distinguish the two sources[99], which is therefore reported collectively as "tyre and road wear particles", TRWP.

The relative contribution of TRWP to traffic related particle emissions can be seen in Figure 23, which is based on a literature review from JRC[100].

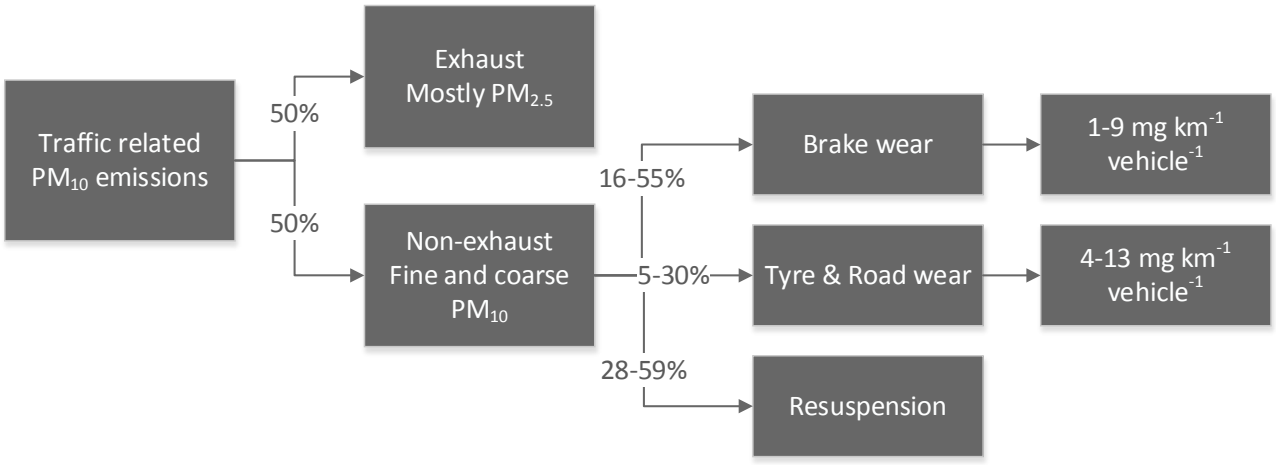



*Figure 22: The distribution of airborne traffic related $PM_{10}$ particles and emissions factors (mg/km/vehicle)*

According to the JRC report, the exhaust emissions and non-exhaust emissions contribute equally to the traffic related $PM_{10}$ emissions. It is noted that the relative importance of non-exhaust emissions is expected to increase, since the exhaust emissions are regulated (EC 715/2007), and therefore expected to gradually decrease.

[98] Letter: "Inclusion of additional parameters in the impact assessment study on the EU Tyre Label" addressed to Mr Hodson and Mr Moreno Acedo, may 18th 2015, by the AIR Group, ANEC, EUROCITIES and Transport & Environment.

[99] Page 29, JRC 2014

[100] T. Grigoratos and G. Martini, 2014, "Non-exhaust traffic related emissions. Brake and tyre wear PM. Literature review", JRC Science and policy report, European Commission, Joint Research Centre, Institute of Energy and Transport. EUR 26648 EN. ISBN 978-92-79-38302-1 (PDF). European Union, 2014.

The contribution of TRWP is very uncertain, with estimations varying from 5-30 % of non-exhaust particle emissions, and 0.8-7 % by mass of ambient $PM_{10}$ concentrations[101]. This is also seen in the emission factors (EFs) reported in literature, which ranges from 4-13 mg/km/vehicle. Besides the type and composition of the tyre itself, the variance in EFs is also influenced by the road surface type, speed and driving conditions[102]. Furthermore, various modelling and measuring technologies were used to determine the TRWP EFs, contributing to the variance as well.

### 5.3.2 Test standard for particle emissions

The JRC report shows that many different sampling and measurement methods are used to quantify particle emissions that do not give comparable results. A standard procedure for measuring non-exhaust traffic related particle emissions is needed. For this purpose, ISO standard TC 146 on air quality[103] has been mentioned as an option by the tyre industry[104].

Another option is the measurement method currently being developed by UNECE in the Particle Measurement Programme (PMP)[105]. In the programme the "normal driving pattern" is investigates, as well as most suitable measuring techniques. The results show that it is still not possible to distinguish particles coming from the tyre and the road surface, and the programme is therefore currently focusing on break wear emissions[106].

### 5.3.3 Environmental impact of Abrasion

Due to the lack of consistent measuring methods, the environmental impact of abrasion is difficult to determine. Not only is the amount of particle emissions from the tyre needed, but also the size distribution since this is an important factor for the human and environmental health. The literature provides no concordant results on this[107].

The chemical composition, which is equally important, is controlled by the European REACH Regulation (Regulation EC 1907/2006), and this aspect is therefore not relevant for the Tyre Labelling Regulation.

Abrasion is related to tyre mileage, since both are linked closely to the tyre wear. Just as for mileage the tyre abrasion depends on many other factors than the tyre itself, such as the vehicle characteristics, the vehicle operation (driving style), and the road surface characteristics (see Table 21). Abrasion is even more closely linked to the nature of the road surface, since the TRWP consist of compounds from both.

[101] Page 8, JRC 2014
[102] Page 39, JRC 2014
[103] http://www.iso.org/iso/iso_technical_committee %3Fcommid %3D52702
[104] ETRMA, 2015, "Q&A on PM emissions and Tyre and Road Wear Particles".
[105] https://www2.unece.org/wiki/pages/viewpage.action?pageId=2523173
[106] PMP, 38th session, PowerPoint presentation "PMP-38-04 PMP Non_Exhaust_emissions" https://www2.unece.org/wiki/display/trans/PMP+38th+session
[107] T. Grigoratos and G. Martini, 2014, "Non-exhaust traffic related emissions. Brake and tyre wear PM. Literature review", JRC Science and policy report, European Commission, Joint Research Centre, Institute of Energy and Transport. EUR 26648 EN. ISBN 978-92-79-38302-1 (PDF). European Union, 2014.

### 5.3.4 Conclusions on Abrasion

The contribution of TRWP to air pollution is very uncertain[108], and a standardised measuring method has not yet been developed. As with mileage, abrasion depends largely on external factors, and the tyre labelling scheme is therefore not appropriate at the moment for regulating the emissions of TRWP. Furthermore, the chemical content of tyres materials, which are important for the health effects of TRWP, is currently regulated through the REACH Regulation[109].

[108] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/non-exhaust-traffic-related-emissions-brake-and-tyre-wear-pm

[109] Regulation (EC) No 1907/2006

# 6. Inclusion of new tyre types

In this chapter the inclusion of the two new tyre types, retreaded C3 tyres and studded tyres, in The Tyre Labelling Regulation are discussed.

## 6.1 Retreaded tyres

Tyre retreading is a process used to extend the life of used tyres. When a tyre is retreaded, the worn-out tread is replaced with a new one, which can be repeated as long as the casing integrity is guaranteed. The market share of retreaded C3 is around 45 % in Europe, which corresponds to around 5 million tyres in 2012[110,111] while the market share of retreaded C1 and C2 tyres is below 2 % in Europe[35]. In some markets, i.e. in UK and eastern EU states, the C1 and C2 retreaded tyre market may be a little higher, however in western EU states it is close to zero[36]. This document only deals with retreaded C3 tyres, for which retreading and regrooving can be complementary strategies to extend the useful life of a tyre significantly.

### 6.1.1 Retreading process

In the retreading process, the worn tread (No 5, Figure 24) is replaced, reusing the existing casing (No 2, Figure 24). There are two types of retreading processes: The cold process and the hot process. In the cold process, the new tread is pre-moulded and vulcanized into the final shape and then attached to the old tyre casing. The hot process is more similar to the production of new tyres, where the tread compound is applied to the casing and then vulcanized in a tyre mould. The Hot process is higher investment cost for the equipment, and is therefore used mainly by big companies for large volume production[112]. The cold process has lower investment costs and offers greater flexibility for producing small series of tyre in various sizes and designs, and is more widespread between small and medium scale producers.


1) Bead
2) Casing/carcass
3) Sidewall
4) Sidewall rubber
5) tread
6) Belts

*Figure 23: Basic tyre components (figure from ETRMA and ETRTO)*

To ensure the quality and safety of retreaded tyres, the UNECE Regulation 109 applies as compulsory conditions for the placing on the market of retreaded tyres in Europe. It contains requirements on the casing condition, the retreading facility and the retreading process. Due to the innumerable combinations of casing, tread and retreading process, retreaded tyres are difficult to standardise and the Regulation therefore controls the process level rather than the final product. The trucks have at least three axles: front axle, drive axle and trailer axle.

[110] http://www.etrma.org/tyres/retreading
[111] BiPaver, Personal contact, e-mail September 16th 2015 with Ruud Spuijbroek
[112] http://www.etrma.org/tyres/retreading

Retreaded tyres are used mainly in drive and trailer axles on trucks[113], but can be used on all axles for e.g. busses[114].

Some retreaded tyres are sold through fleet solutions, which applies mostly to big C3 fleets, who pay per km driven and has the service of retreading of the original casings included in the price. Usually the fleet solutions include both retreading and regrooving of the tyres. Regrooving is a process where a new tread pattern is cut from the tread rubber, when the old pattern is worn, but sufficient rubber remains to cut a new pattern. For a typical truck tyre[115] being retreaded twice and regrooved 3 times, the lifetime will be nearly four times that of a new tyre[116], causing material and energy savings in production and end-of-life processes.

### 6.1.2 Test standards for retreaded C3 tyres

The performance of retreaded tyres is determined by the combination of casing, tread, and retreading process applied[117]. The major challenge of including retreaded tyres in the labelling scheme is the necessity to establish the three label performance parameters (fuel efficiency, wet grip and external rolling noise) for each combination of casing, tread and retreading process. Since retreaded tyres are produced in small series, the cost of testing each combination would make the retreading business economically unfeasible, especially for SMEs[118]. This is why the retreaded tyres were not previously included in the Tyre Labelling Regulation.

#### *ReTyre project*

In order to overcome the problem of testing every new combination of retreaded tyres, the partly EU-funded ReTyre project was carried out in 2012-2014. The goal of the project was to develop an Excel-based tool for calculating the three label performance parameters for retreaded C3 tyres, based on relevant input factors. This would eliminate the need for testing the tyres. During the project, more than a thousand tests (both laboratory and road) were performed in order to establish relationships and correlation between the several components and parameters. Results and analyses led to an algorithm necessary to create the predictive tool, which can be used to calculate the three labelling parameters rolling resistance, wet grip and external rolling noise for retreaded tyres. The alpha-version of this web-based tool is ready and made available for the European independent retreading industry on the Bipaver website (i.e. members of the Bipaver Member Associations).

Bipaver is the representative of the European independent retread industry and act as an umbrella organisation with members including both national associations and individual members. According to Bipaver, it was decided to continue further research after the ReTyre project, which ended in 2014. This was to improve the correlation of the rubber tread compound and the fuel efficiency (RRC) and wet grip performance. A thousand additional tests was performed to upgrade the predictive tool, which resulted in 95 % accuracy of the calculated results compared to the actual test results, in the beta version[119].

The formal ownership of the predictive tool lies with Stichting Kenniscentrum Leiden, executing the Bipaver secretariat and on behalf of Bipaver, and the SME-Associations participated in the project, have the IPR (Intellectual Property Rights). During the last General Assembly of

[113] ETRMA
[114] Bipaver, personal contact, e-mail,
[115] (315/80 R22.5 truck tyre weighing 70kg with a 15kg tread)
[116] Tyre company calculations according to ETRMA position paper on circular economy, Brussel, September 2015
[117] Boustani, A., 2007 “Remanufacturing and Energy Savings” B.S. University of California Berkely, Massachusetts Institute of Technology.
[118] http://www.retyre-project.eu/
[119] BiPaver, Personal contact, e-mail September 16th 2015 with Ruud Spuijbroek

Bipaver in May 2015, it was decided that the maintenance of the tool and its database, performing of additional testing in the future, updating the algorithm and the web-based tool, would be the responsibility of a separate legal body, where the relevant SME-Associations will be shareholders. Furthermore, it was proposed that the Steering Committee, active in the ReTyre Project would have an important technical and managerial role. Consequently, the predictive tool will also be marketed and made commercially available for non-EU retreading facilities[120].

There are opposing opinions in the industry of whether or not the ReTyre tool is accurate enough and includes all relevant parameters for calculating the label performance parameters for retreaded C3 tyres. According to Bipaver, much of the doubt arises from analysis of the now outdated alpha-version of the tool. One of the opposing views raised by ETRTO and ETRMA, is that the casing have more influence on the rolling resistance, than what is assumed in the ReTyre tool. ETRTO tested rolling resistance of casing without tread and after retreading, to measure the influence. The conclusion was that the casing alone has the ability to spread the rolling resistance result over three label categories.

However, the testing methods obtained by ETRTO are doubted by other organisations, e.g. Bipaver and Bandvulc tyres. For instance, the fact that the tyres were tested after buffing but prior to retreading gives rise to questions regarding the credibility of the results. In the tests made for the ReTyre programme by IDIADA on an aligned drum, it was shown that when matching different casings with different tread compounds, the rolling resistance was in every case largely determined by the tread[121]. A suggestion from Bandvulc tyres to get around the problem of the casing influence is that manufacturers put a casing rolling resistance on the tyre sidewall to use as input in the ReTyre tool.

A possible solution to clear out the oppositions within the industry is setting up a working group to make a thorough assessment of the results of all available studies. The working group should include all relevant stakeholders such as tyre industry, retreading companies, Member States, MSA's and relevant NGO's.

### *US EPA low rolling resistance verification*

Another approach to tackle the immense testing load has been taken by the US EPA. This approach applies to the rolling resistance only, and tyre manufacturers can get retreaded tyres verified by testing and demonstrating that a retreaded tyre model has a rolling resistance coefficient at or below prescribed target values[122]. This does not yield a scalable result (i.e. the A-G scale), but allows manufacturers to state that the tyre is a "low rolling resistance retread".

In the test process three new Yokahama tyres of a specific model and size are buffed and retreaded under "worst case" (temperature and time) conditions. The rolling resistance is tested using the ISO 28580 standard[123] (also used in UNECE Regulation 117). The average rolling resistance result must be below the prescribed target values to get an EPA verification.

By specifying the casing to be used beforehand, the influence of this variable is removed from the test results. At the same time this implies that the casing does not influence the rolling resistance more than the tyre is still a "low rolling resistance retreaded tyre".

[120] Communication with Bipaver
[121] Bandvulc tyres, comments on stakeholder meeting in Brussels, November 2015.
[122] United Sates Environmental Protection agency, office of air and radiation, June 2012, http://www3.epa.gov/smartway/forpartners/documents/verified/retread-perform-reg.pdf
[123] ISO 28570:2009 – Passenger car, truck and bus tyres – methods for measuring rolling resistance.

### 6.1.3 Scenarios for including retreaded C3 tyres

The assessment of the environmental effect of including retreaded C3 tyres in the labelling scheme is based on a stock model of retreaded C3 tyres seen in Table 28. In the stock model, it is assumed that retreaded tyres will continue to constitute 45 % of the C3 tyre market. The sales numbers have been adjusted to exempt the 1 % growth rate expected for the tyre market in general (see also Table 18), since the retreaded tyre sales are at the moment declining. In the stock model, it was assumed that the tyre lifetime was the same for retreaded as for new C3 tyres.

*Table 28: Extract of the tyre stock model, number of tyres in thousands, retreaded vs new C3*

| (Thousands) | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|
| C3 - Retreaded | 8.798 | 9.615 | 9.920 | 10.438 | 10.975 |
| C3 - New | 9.735 | 11.407 | 12.173 | 12.782 | 13.430 |

It is important to note the assumption that the sales (and stock) of retreaded C3 tyres is not expected to change whether retreated tyres are included in the labelling scheme or not. The only changes expected are in the labelling performance parameters; Fuel efficiency, wet grip and external rolling noise. This entails that energy savings in the production and end-of-life phases are not included in the scenario calculations, since they do not differ from the BAU scenario. Only if inclusion of retreaded C3 tyres in the labelling scheme changes the sales volume compared to the BAU scenario increased energy savings in production and waste treatment will be achieved.

The energy saving calculations are based on the expected decrease in RRC for retreaded C3 tyres if they are included in the labelling scheme, i.e. energy savings are only related to the use phase. According to the organisation Bipaver, retreaded tyres have the same average performance as new tyres. In the scenario, it was therefore assumed that the average RRC of retreaded tyres if included in the labelling scheme would follow the same linearly decreasing trend as new C3 tyres. However, since the retreaded tyres so far is not included, it is expected that the RRC was higher in 2015 for retreaded tyres than for new. The wet grip and external rolling noise development is based on the same assumptions.

### 6.1.4 Results of retreaded C3 inclusion

The forecasts of the three labelling parameters for retreaded C3 tyres are summarised in Table 29, Table 30 and Table 31. In the tables the development of new C3 tyres in the BAU scenario are compared to the development of retreaded C3 tyres in the "C3 – Retreaded inclusion" scenario. Since the same rate of change is assumed in the retreaded C3 inclusion scenario as for new C3 tyres, the retreaded tyres will continue to have a slightly lower performance.

As seen from the tables, it is expected that the performance of retreaded C3 tyres will not change if they are not included in the labelling scheme, i.e. in the BAU scenario for retreaded tyres. It should be noted, that in this approximation the "spill-over" effect from the new to the retreaded C3 market is neglected, i.e. the inherent improvement of retreaded C3 tyres that comes from improved casings and technology development of new C3 tyres.

*Table 29: RRC development for the scenario of including retreaded C3 tyres in the labelling scheme*

| RRC (kg/ton) | Average 2015 | Average 2030 | Change rate |
|---|---|---|---|
| C3 – new BAU | 6.13 | 5.69 | -0.5 % pa |
| C3 – Retreaded inclusion | 6.19 | 5.75 | |
| C3 – Retreaded BAU | 6.19 | 6.19 | 0 % pa |

*Table 30: Wet grip development for the scenario of including retreaded C3 tyres in the labelling scheme*

| Wet grip index | Average 2015 | Average 2030 | Change rate |
|---|---|---|---|
| C3 – new BAU | 1.06 | 1.14 | 0.51 % pa |
| C3 – Retreaded inclusion | 1.05 | 1.13 | |
| C3 – Retreaded BAU | 1.05 | 1.05 | 0 % pa |

*Table 31: External rolling noise development for the scenario of including retreaded C3 tyres in the labelling scheme*

| Noise (dBA) | Average 2015 | Average 2030 | Change rate |
|---|---|---|---|
| C3 – new BAU | 71.71 | 68.21 | -0.33 % pa |
| C3 – Retreaded inclusion | 72.19 | 68.66 | |
| C3 – Retreaded BAU | 72.19 | 72.19 | 0 % pa |

Based on the rolling resistance improvements in Table 29, the yearly energy savings from retreaded tyres was calculated. These are seen in Figure 25 along with the yearly energy savings from decreasing rolling resistance of new C3 tyres in the BAU scenario. The savings in the BAU scenario for retreaded tyres is zero, since there is no change in RRC.

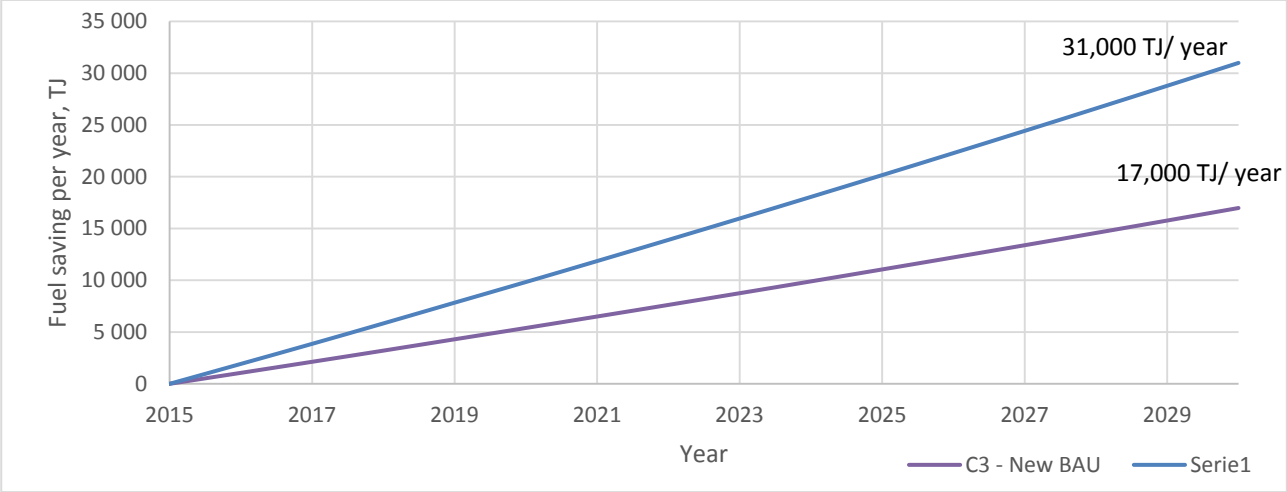



*Figure 24: Yearly energy savings in TJ of decreasing RRC of new tyres and retreaded C3 tyres*

The large market share of retreaded tyres on the C3 market (45 %)[124] results in a large fuel saving potential through decreasing rolling resistance. In total 14,000 TJ could be saved in 2030 by including retreaded C3 tyres in the tyre labelling scheme, compared to not doing so. This saving is close to the 17,000 TJ anticipated in the BAU scenario for new C3 tyres in 2030. Hence, by including retreaded C3 tyres, it is estimated that 31,000 TJ fuel could be saved per year in 2030.

[124] ETRMA, European Tyre and Rubber Industry Statistics, edition 2014.

### 6.1.5 Current savings from retreaded tyres

Even though production energy was not included in the above scenario, it should be noted that the production savings related to use retreaded tyres is significant. The production savings are already being realised with the current use of retreaded tyres. In Table 32, the production savings from using retreaded compared to only new C3 tyres is illustrated. In the calculation example, it is assumed that a tyre that is retreaded twice and regrooved three times has four times the lifetime of one new C3 tyre[125]. The materials and $CO_2$ emissions from tyre production is based on numbers from an information sheet by the ReTyre project[126].

In the Retreaded production material calculations, it is included that the first "lifetime" will be as a new tyre. In total raw material savings of more than 60 % and $CO_2$ savings of 66 % is realised by using retreaded tyres compared to only using new tyres. This is consistent with information from TRIB (Tire Retread & Repair Information Bureau) suggesting that retreading can reduce production energy demands by up to 66 %[127].

If the sale of retreaded tyres increases, the production energy and material savings will increase as well, compared to the current situation, whereas a decrease in retreaded market share will cause decreasing energy savings. However, there is a limit to the number of retreaded C3 tyres, since they require that casings of sufficient quality are available.

*Table 32: Energy savings for new and retreaded C3 tyres in the production phase*

| | C3 – New | C3 – Retreaded | Savings | %-Savings |
|---|---|---|---|---|
| Petroleum | 400 L | 160 L | 240 L | 60 % |
| Other raw materials | 240 kg | 90 kg | 150 kg | 63% |
| $CO_2$ emissions | 880 kg | 298 kg | 582 kg | 66 % |

Retreading of used casing will not only cause material and energy savings in the production phase, but also reduce the amount of tyre waste. Furthermore retreading contributes to the concept of circular economy by using the "waste" of one product (the casing) as raw material for a new product. This an approach to manage future scarcity of raw materials and ensure efficient use of resources.

### 6.1.6 Conclusions on retreaded C3 tyres

Retreaded C3 tyres should only be included in the labelling scheme if the ReTyre tool is accurate enough and includes all relevant parameters for calculating the label performance parameters, and if the continuous maintenance of the tool is secured. The availability of the ReTyre tool should be clarified and it should be ensured that it does not affect free competition in the retreading market. It is proposed to set up a working group to clear out the identified technical oppositions among stakeholders.

The energy calculations show that there is a large fuel saving potential by including retreaded C3 tyres in the labelling scheme and thereby ensure decreasing rolling resistance for retreated tyres as well as for new tyres. However, the calculated savings does not take into account the possible spill over effect from the new C3 technological development. A large part of the energy savings related to retreaded tyres lies in the production phase, and the reuse of casings is in line with the idea of circular economy.

[125] Tyre company calculations according to ETRMA position paper on circular economy, Brussel, September 2015
[126] VACO, Trade association for the tyre and wheel sector and ReTyre project, "Retreaded tyres – a matter of course", Netherlands, 2015
[127] TRIB, Tyre Retread & Repair Information Bureau, "Retread Facts", Link: http://www.retread.org/Facts/index.cfm/ID/225.htm

Including retreaded C3 tyres in the labelling scheme would provide end-users with necessary information to avoid trade-offs between purchase price and TOC (Total Cost of Ownership). Retreaded tyres are generally cheaper than new tyres of similar quality, with around 35-50 % lower purchasing price[128]. However, if the rolling resistance, and hence fuel consumption, is higher, it could offset the advantage in purchase price due to a higher TOC. Including retreaded tyres in the Labelling Regulation would minimise the risk of higher TOC through information.

## 6.2 Studded tyres

Studded tyres is a subgroup of Nordic winter tyres developed for sub-zero temperatures and ice and wet ice conditions. Only studdable tyres supplied without studs are currently covered by the Tyre Labelling Regulation. Studded tyres are primarily used in the Nordic countries (Finland, Sweden and Norway), where the market share is 25 % on average of the C1 tyre market[129], and more than 50 % of car owners in Sweden and Finland have studded tyres for their car[130]. In the rest of the EU, the market share of studded tyres is around 0.25 % (in 2010)[131]. In many Member States, the use of studded tyres is prohibited and in most others, the use is restricted to the winter months.

### 6.2.1 Testing of studded tyres

Testing rolling resistance and wet grip for studded tyres is not possible with the current test standards. In both the RRC and the wet grip tests there are a limited allowed roughness of the surface (road or machine drums), and the use of studs on these surfaces during the test will damage them to an extent that the surfaces no longer comply with the test standards. Hence, with the current test standards, including studded tyres is not possible.

If new test standards were developed for studded tyres specifically, the results would not be directly comparable to those of non-studded tyres, and there would be a large risk of misinformation, if comparisons were attempted on the same scales.

Since the test standards referred to in the Regulation cannot be used for testing studded tyres, the only data available regarding their performance is from tests made by independent organisations following approximations of the test standards. One such test is form the Finnish magazine Tekniikan Maailma[132] (English: World of Technology), who did a test of studded vs. non-studded “winter tyres”. The only two areas were studded tyres performed significantly worse than non-studded tyres were on noise (experienced by the driver as opposed to external rolling noise on the label) and the fuel economy, which can be seen in Table 33. However, for all tests on asphalt (wet or dry), studded tyres cause a high degree of road wear.

[128] VACO, Trade association for the tyre and wheel sector and ReTyre project, “Retreaded tyres – a matter of course”, Netherlands, 2015
[129] L. Lomaeus, DFTF, Tyre Manufacturers Association in Sweden, 2014 ”Winter tyre Market’s segments evolution in the Nordic countries”.
[130] C1 user survey
[131] ETRMA tyre statistics, 2010 numbers.
[132] http://tekniikanmaailma.fi/winter-tyres-2016

*Table 33: Results from Finnish test of studded tyres*

| Studded tyres perform significantly better | Studded tyres perform slightly better in general | Studded tyres perform significantly worse |
|---|---|---|
| - Handling on ice (subjective grade and lap time test)<br>- ABS breaking on ice<br>- Acceleration on ice<br>- Breaking on dry asphalt | - Handling on snow (subjective grade and lap time test)<br>- ABS breaking on snow<br>- Acceleration on snow<br>- Handling on dry asphalt (subjective grade)<br>- Handling on wet asphalt (subjective grade and lap time test)<br>- ABBS breaking on wet asphalt<br>- Directional stability | - Noise<br>- Fuel economy |

If applicable test methods were developed, and studded tyres were compared on the same scale as other tyres on the labelling parameters fuel efficiency and external rolling noise, there is a large risk that all studded tyres would perform in the lowest end of the scales, and it will not be possible to make a differentiation of them by using the current A-G scale.

### 6.2.2 Environmental impact of studded tyres

The main environmental problem arising from studded tyre use is the particle pollution from road wear. In the Nordic countries where studded tyres are primarily used, the efforts to decrease the use of studded tyres originate in the exceeding of particle limit values in cities, and the high particle emissions from road wear when using studded tyres[133],[134]. The three Nordic countries have made a decree on studded tyres, which focuses on limiting the number of studs per tyre and setting limits for the road wear measured in over-run tests[135].

Despite the efforts to limit the use and environmental impact of studded tyres, the Nordic countries acknowledging that studded tyres cannot be completely avoided due to safety reasons[136]. Since the studded tyres are chosen by end-users for safety reasons, and there is a trade-off between rolling resistance and snow/ice grip[137,138], it is questionable if including studded tyres in the labelling scheme will have any effect on the share of studded tyres or the demand for studded tyres with lower RRC. Due to the safety aspect, labelling studded tyres according to fuel efficiency, wet grip and external rolling noise, is likely to have only limited relevance and value to the end-users. This is also evident from the C1 user survey, where more users value the snow and ice grip as 'very important' (62 %) than the fuel efficiency (28 %) for studded tyres.

[133] Studded tyres and air quality in Norway, Eden Group meeting25th September 2015. K. Ottesen, K. I. Gjerstad and B. Snilsberg, Statens vegvesen Vegdirektoratet.
[134] http://www.vegvesen.no/Fag/Fokusomrader/Miljo+og+omgivelser/Forurensning/Luft/nyheter/Flere+pigger+gir+mer+svevest %C3 %B8v
[135] Over-run Task Force: Improvement of test method accuracy. EDEN-group meeting called by Statens vegvesen Vegdirektoratet Oslo, 25th of September 2015
[136] Studded tyres and air quality in Norway, Eden Group meeting25th September 2015. K. Ottesen, K. I. Gjerstad and B. Snilsberg, Statens vegvesen Vegdirektoratet.
[137] http://tekniikanmaailma.fi/winter-tyres-2016
[138] UNECE 117 and EU Regulation 661/2009. Difference in threshold for snow vs. Normal tyres on the RRC and noise scales.

Since rolling resistance of studded cannot be measured with the test standard referred to in the Tyre Labelling Regulation, it is not possible to compare rolling resistance test results to that of non-studded tyres. However, the approximate tests points toward significantly higher rolling resistance for studded tyres. The potential environmental benefit of better fuel efficiency for studded tyres is, however, limited due to the very small market share on EU level.

### 6.2.3 Conclusions on studded tyres

Due to the lack of comparable test methods and low saving potential it is recommended not to include studded tyres in the Tyre Labelling Regulation. The fact that studded tyres cannot be tested under the current test standards makes results incomparable to results of other tyres.

The low market share of below 0.25 % of C1 market in EU results in a low fuel saving potential by reducing RRC of studded tyres. In the Nordic countries with high market shares of studded tyres, their use is already being limited due to the particle pollution arising from driving studded tyres on asphalt. In many other European countries the use of studded tyres is prohibited.

# 7. Market surveillance

This section provides an overview of activities at Member State level including ADCO[139] activities in order to assess the level of implementation and enforcement of the labelling scheme (task 9).

The Market Surveillance Authorities (MSAs) are appointed by each Member State, and made responsible for the market surveillance of the Tyre Labelling Regulation within the national market. In order to optimise the implementation of the Tyre Labelling Regulation and harmonise different market surveillance activities, the "Expert Group on Tyres Labelling – Market Surveillance Administrative Cooperation (E02808)", ADCO, was formed. The members of ADCO are representatives from each Member State. In total four ADCO meetings have been held since 2012[140].The minutes from the ADCO meetings show that there are great variances in the market surveillance activities carried out in the various Member States for those attending the meetings[141].

## 7.1 Market surveillance activities in Member States

Market surveillance and enforcement play a central role regarding the effectiveness of the labelling scheme. Since there is no collective overview on EU-level of market surveillance activities regarding the Tyre Labelling Regulation, a number of MSAs were interviewed to provide the information.

The MSAs from Belgium, Finland, Germany (3 Regions), Estonia, Malta, Netherlands (mail), Sweden, United Kingdom, Hungary (mail), Poland and Slovakia were interviewed. Since it was not possible to reach all Member State MSAs, the interview results are not representative for the EU as a whole. However, they provide a good insight in the types of activities carried out, and the differences in how market surveillance is approached in the Member States.

The market surveillance activities in the Member States that were interviewed can be seen in Table 34, where the concrete information that could be gathered from ADCO minutes is listed as well. The MSAs count the inspection as either number of shops or number of tyres or tyres sets inspected, and therefore the units are not aligned.

Most Member States have one national MSA, whereas a few such as Germany, Hungary and Spain have regional market surveillance, and therefore regional MSAs. In five out of the 11 interviewed Member States, the MSA enforcing the Tyre Labelling Regulation, were also responsible for enforcing the Energy labelling Directive and it implementing measures.

[139] Expert Group on Tyres Labelling – Market Surveillance Administrative Cooperation (E02808),
[140] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2808
[141] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=17816&no=2

*Table 34: Market surveillance activities in the Member States where information was available*

| Member State | Surveillance activities | Number of inspections | Non- compliance |
|---|---|---|---|
| **Sweden** | Shop inspections including internet shops | >30 shops since 2012 | No non-compliance |
| | Document control | 10 that failed (no documents received) | |
| **Estonia** | Tyre documents and questionnaire regarding supplier responsibility | Around 100 tyre sets per year | |
| | Shop inspections (physical shops) | Around 5-10 tyre sets per year | Low non-compliance |
| **Netherlands** | Shop inspections | 760 shops since 2012 | <10 % non-compliance |
| | Information campaign by the ministry not the MSA itself | Targeting mainly end users | |
| **Poland** | Inspections at suppliers, importers, retailers | 135 entities since 2013, 640 tyre models | No or low non-compliance |
| | Technical documentation inspection | No specific number, but reports that it is many | No problems of receiving documentation |
| **Germany – Hesse** | Shop inspections including internet shops | 172 shops in 2014 | 19 shops with no labelling |
| | Technical documentation | Requested 5 documents | All received |
| | Laboratory testing | Send to Rhineland-Palatinate | |
| **Germany – Rhineland-Palatinate** | Shop inspections | 362 inspections in 2014<br>674 inspections in 2015 | 119 of the 362 inspections in 2014 |
| | Technical documentation inspection | For the tyres they test in laboratory | |
| | Laboratory tests | 4 models in 2014<br>8 models in 2015 | Problem with varying test results |
| **Germany – Baden Wüerttemberg** | Shop inspections | 174 models/41 shops in 2014<br>316 models/31 shops in 2015 | No non-compliance (2015 final numbers to be registered) |
| | Technical promotional material | 30 inspections | |
| **Finland** | Shop inspections (physical shops) | 150 shops since 2013 | Low non-compliance |
| **United Kingdom** | Awareness campaigns; tyre dealers, importers, car dealers | More than 500 visits in total since 2013 | Website monitoring, 2013: 62 tyre brands – 10 had not label, 18 had incomplete information |
| | Shop inspections | | |
| | Website monitoring | | |
| | Technical documentation control | Requested for 10 models | Received for 8 models |
| **Malta** | Information campaigns; end users, tyre dealers | Merged with energy labelling campaign | |
| | Shop inspections, including internet | 15 shops 1 internet store (87 tyre models) | Two tyre models not compliant |
| **Belgium** | Shop inspections | 76 shops since 2013 (only C1)<br>36 in 2013 and 40 in 2015 | In 2015: all showed the label* |
| | Technical documentation control | Requested for 10 C1 models | Only received some of them. Request again. |
| | Lab test | 2 C1 models currently tested | Test ongoing |
| **Portugal** | Have not yet implemented the national legislation to appoint a MSA | | |
| **Italy** | Reported that no inspection or other market surveillance activities were conducted | | |
| **Slovakia** | Shop inspections including internet shops | 70 dealers inspected in 2014 (solely based on complaints) | 4 were non-compliant |

* Nine did not have information on relevant documents. Three had non-compliant communication procedures.

The prevailing type of Market Surveillance in all Member States was the point of sales inspections. Some Member States inspected only physical shops, while many also inspected internet shops. In all Member States, the main task was to inspect the presence of the label, and that it was positioned correctly. In some cases, it was also checked that the tyre labelling information was shown on the bills/invoices as well, but most MSAs considered this point less important, because it relates to information given post-sale. A few MSAs mentioned inspection of correct communication of the label information from dealers to customers.

In general, the MSAs found high level of compliance regarding position of the label and information on bills and invoices. However, the actual level seemed to vary greatly, from 0 % non-compliance to 25 %, which seems to be due to differences in inspection procedures. The non-compliance occurred in various ways with the most widespread being the label entirely missing or positioned wrong. Germany found wrong label dimensions, because the label had been integrated into a larger sticker with additional information. In Estonia a single case of labelling of studded tyres was found, which was assumed to be false labelling. In all Member States, the procedure was to let the retailer correct the non-compliance issues, and all MSAs reported that this was usually done quickly.

Regarding document control, only four of the interview Member States had requested technical documentation from suppliers/importers. Both the Swedish MSA and the MSAs of the individual federal states of Germany reported difficulties in requiring the documentation due to lacking jurisdiction when suppliers/supplier representatives are located in other countries/Member States. The MSAs are appointed and empowered by national law in a specific Member State, and hence suppliers located in other Member States can claim they have no obligation toward the MSAs. However, some MSAs, including Germany, Belgium and United Kingdom succeeded in requiring the technical documentation from suppliers or through importers in their own area.

In most Member States, it was not attempted to require the technical documentation, since they were either aware of the problem of lacking jurisdiction, or because without laboratory testing, there were no frame of reference to verify the information in the technical documentation.

Only two of the interviewed MSAs, Germany and Belgium, performed laboratory tests to verify the label values. All Member States mentioned the high costs and the lack of test facilities to be the greatest barriers for laboratory testing. At the time of the interviews most of the interviewed Member States were awaiting the decision on a joint action tyre testing programme by the European test organisation PROSAFE. For most of the Member States, this is seen as the only likely way to make any laboratory tests on tyres, and all MSAs who were interviewed had sent their agreement on participating in the programme. The purpose of the programme is both to obtain more test data and to develop best practices for market surveillance testing.

## 7.2 National enforcement and sanctions

Most of the MSAs reported full empowerment with regards to perform inspections and apply sanctions in non-compliance cases. The only exception found was Portugal. Malta and Germany reported that national laws restricted them from applying sanctions directly. However, only few Member States had found reasons for sanctioning, since the high level of compliance at point of sales inspections and the lack of other inspection methods made sanctions redundant.

# 8 Improved regulation and implementation

## 8.1 Improved pre-sale information

Many C1 end-users claim that they do not see the tyres displayed in a shop before the purchase (59 %) and more and more consumer purchase tyres online[142]. Furthermore, MSAs carrying out shop inspections have observed that only a few tyre models are on display at the point of sale while the rest are placed in the stock. In some countries, up to 90 % of the inspected shops did not have tyres on display. This implies that customers often do not see the tyre, and hence not the label, before the purchase.

In Article 5 pt. 1 it is stated that the distributors shall ensure that *at the point of sale* the tyre either bear the label as sticker or the label is clearly displayed in immediate proximity of the tyre. In article 3 pt. 3 the *point of sale* is defined as "the location where tyres are displayed or stored and offered for sale". According to this definition, tyres in the stock at shops should be labelled as well.

However, this is somewhat opposed by Article 5 pt. 2, which states: "Where tyres offered for sale are not visible to the end-user, distributors shall provide end-users with information […] of those tyres". Since tyres in the stock (and therefore their label) are not directly visible to the customer, the seller should inform the customer of the labelling parameters.

Hence, there is a need for clarification of the Regulation regarding the responsibilities of tyre distributors (dealers). Furthermore, it is requested by MSAs and other stakeholders that the Regulation clearly states that information is to be given prior to the purchase. The information on the receipt or invoice does not help the consumer make an informed choice.

The following are proposed to make it more likely that consumers are given the label information prior to the purchase:

- Article 5.2 in the Regulation should be clearer; the label should be shown on the screen when tyres are offered for sale online (in web shops etc.), and not just information on the parameters. This provision is already implemented for energy related products labelled under the Energy Labelling Directive (2010/30/EU).
- The Regulation should clarify the tyre distributors' obligation to provide label information *pre-sale*, emphasising that information on receipts/invoices (post-sale) is not enough.
- The Regulation should be made more clear with regard the labelling requirements for tyres placed in storage facilities of distributors, preferably by making it mandatory to label that all C1 and C2 tyres in the stock of distributors. This would also make market surveillance easier to perform.
- The labelling obligation should be extended to cover all advertisements including the now omitted advertisements in billboards, newspapers, and magazines. The Energy Labelling Directive 2010/30/EU requires that any advertisement, where energy-related or price information is disclosed, should include a reference to the energy efficiency class of the product.

A complication when showing the label information in advertisements is that tyres of the same model with different dimensions often have different label values.

[142] Consumer survey

Labelling tyres in the stock will make market surveillance easier to perform, but end-users will not necessarily see the tyres with the stickers, if they are fitted on their car in the same place as the tyres are purchased. Hence, the tyre distributors (dealers) play an important role in providing end-users with label information. This is, however difficult for MSAs to inspect. Often the inspection of how retailers communicate the information to customers are solely based on retailers' statements on how they inform their customers (related to Article 5 pt. 2 and Article 6)

### 8.1.1 Vehicle suppliers and distributors

Vehicle suppliers and distributors are responsible for providing end-users with information on the tyre label parameters when they are offered a choice between different tyres to be fitted on a new vehicle they are purchasing.

According to the consumer survey, 31 % of the C1 end-users were offered a choice between different tyres at the purchase of a vehicle, while 56 % were not. Vehicle suppliers and distributors report that the tyres sold with new vehicles are chosen by car manufacturers; however, customers might be able to choose different tyres for an additional cost.

According to MSAs it is not clear from the Tyre Labelling Regulation when end-users are offered a choice between different tyres when purchasing a new vehicle (related to Article 6). For instance, it is not defined if it is a choice when there are various brand options of the same size, various size options of the same brand, or when an additional set of tyres is purchased. To avoid any doubts the following simplification of the Regulation is suggested:

- Vehicle suppliers and distributors should be responsible for always providing the tyre labelling information, including in situations where the tyres are fitted on a car offered for sale

As with the tyre distributors, it is difficult to inspect whether distributors are sufficiently communicating the tyre labelling information to the customers. The inspections are solely based on retailers' statements about how they provide the information.

### 8.1.2 Most efficient way to display the label

At the point of sale, the tyre label for C1 and C2 tyres can be shown either as a printed label in proximity to the tyre, or as a sticker on the tyre tread (Article 4.1). Regarding the effectiveness of the two methods, 47 % of C1 end-users in the consumer survey consider the tread sticker to be the most visible. However, the relevance of how the label is shown is undermined by the fact that most tyres are not on display. If it is required that the tyres should also be labelled in the storage facilities of the distributors (as mentioned above) the sticker might be a better solution than the printed label.

## 8.2 Registration database

The idea with establishing a digital registration database is that all tyres should be registered in the database prior to being placed on the European market. Such a database has also been suggested for products covered by the Energy Labelling Directive (2010/30/EU). According to the proposal, the database should be separated into a publically available section and a section accessible for market surveillance authorities only. Such a website structure currently exists on the ICSMS database[143]; however, the database suggested here is more extensive.

[143] https://webgate.ec.europa.eu/icsms/

The publically available sections should contain the label values and/or electronic versions of the tyre label for all tyre models sold in the EU. Furthermore, it should include also consumer information about the tyre label to facilitate general awareness. National websites exists that resembles what is expected of the publically available section. An example is the Danish "daeklabek.dk", which contains consumer relevant information about the label parameters as well as other relevant parameters when purchasing tyres-. Furthermore the site has an opportunity to search for tyres that fit your car by entering either tyre dimension or a specific Danish license plate. The tyre model in the search result can then be sorted based on the label values.

The section reserved for MSAs should contain technical documentation for all tyre models provided by the manufacturer, including specific test conditions and results behind the tyre's label values. Furthermore, the website should be a platform for MSAs to share information and test results etc. related to specific tyre models. Such information could be commercially sensitive, and therefore it cannot be publically available.

The registration database could provide market information for policy decisions, facilitate market surveillance and serve as a tool for consumer information. Interviewed market surveillance authorities generally agree that the establishment of a registration database is a good idea, since it could make market surveillance easier and give MSAs better access to technical documentation. It could also be a good tool to obtain more transparency regarding test methods and conditions used by manufacturers, which according to some MSAs is lacking.

For end-users, a registration database could provide pre-sale information on the labelling parameters. According to the consumer survey, 51 % of consumers would use the database to find information on tyres prior to purchase and 37 % would consider using it.

One of the biggest concerns regarding the database is that it might be difficult to get all tyres on the market in the database, especially for tyres imported from outside the EU. Another concern is that the workload of creating and maintaining the database might cause a decrease in the number of inspections made due to lack of resources. It is essential that the impact of better and easier market surveillance justify the workload of running the database. Furthermore, it should be thoroughly defined and assessed in terms of objectives, final users, workload, process etc.

### 8.3 Improved market surveillance and awareness raising

The relatively low level of market surveillance affects consumer confidence negatively, and many stakeholders state that to increase confidence, more market surveillance (including testing) and sanctions towards non-compliance is needed. Furthermore, retailers often or never experience that their shops are inspected, which has given them the impression that the tyre labelling is of low priority to the authorities. Based on this they have decreased their effort to educate their employees in advising consumers about the label parameters. The involvement of the dealers is considered as being of great importance for the consumer awareness and the actual use of the label, and it is therefore important to increase market surveillance efforts where it is possible.

The Tyre Labelling Regulation itself does not include detailed provisions with regard to market surveillance and enforcement. Instead, the Regulation refers to the provisions in Regulation 765/2008, which includes the general rules with regard to market surveillance and controls of products entering the community market. Each Member State is responsible for the enforcement of the Tyre Labelling Regulation and for implementing (EC) No 765/2008 in their national legislation.

Some MSAs report that the technical documentation is incomplete or lack transparency, especially regarding information on the specific conditions the tyres were tested at. Article 4.4 of the Regulation states: “The technical documentation shall be sufficiently detailed as to allow the authorities to verify the accuracy of information provided on the label with regard to fuel efficiency, wet grip and external rolling noise.”

A solution could be to define in the Regulation what parameters should as minimum be included in the technical documentation. Such a definition already exist in the various of the Regulations implementing the Energy Labelling Directive 2010/30.

### 8.3.1 Increased testing efforts

Only a very few laboratory tests of tyres have been performed by MSAs to verify label values. According to MSA’s high cost and the lack of test facilities are the greatest barriers for laboratory testing of tyres.

For most Member States the joint action test programme with the organisation PROSAFE (Product Safety Forum of Europe) is seen as the only likely way to make any laboratory tests on tyres. The purpose of the programme is both to obtain more test data and to develop best practices for market surveillance testing. The possible inclusion of new performance parameters in the labelling scheme might increase costs and thus the barriers of testing tyres.

The following is proposed in order to reinforce the market surveillance activities and to avoid redundant efforts by doing double work of testing and requesting documents for the same tyres in different member states:

- That Member States should be obliged to publish results of marked surveillance activities and making them available to industry and dealers. The purpose is to raise the awareness among industry and dealers on performed activities and exchange of results and experiences. Results could be included in the proposed registration database.
- That the labelling scheme currently is not extended to cover new aspects that will significantly increase the costs for market surveillance. Extra cost will reduce the number of inspections and fewer inspections could easily hamper the consumers and distributor confidence in the label scheme.

Furthermore, Member States should give priority to market surveillance activities including participation in the foreseen Prosafe test programme.

### 8.3.2 Awareness and label confidence

More than half of the consumers in the investigated countries are not aware of the label. Both industry, dealers and consumer organisations recommend campaigns promoting the label to increase the consumers’ knowledge of the label and explain its meaning in case new parameters and/or symbols are added. The target groups should be end-users in C1, C2 and C3 segments. However, awareness campaign targeting C1 end-users are the most important because they constitute the largest share of the tyre sale. In addition, C2 and C3 end-users often do not purchase tyres directly but as part of leasing contracts and fleet solutions.

In awareness campaigns, the information on fuel efficiency and road safety provided by the tyre label are already strong drivers for end-users. Combining this with information on other issues related to these parameters (such as keeping the right tyre pressure and checking tyres for wear regularly), would place the relevance of the label in a bigger perspective for end-users. This would be in addition to information on external rolling noise importance and meaning of potential new labelling parameters.

Awareness campaigns could also include reference to the existing fuel savings calculator on the EU Commission's webpage[144] to let end-users calculate their potential fuel savings from tyres.

The awareness campaigns could be run at national level by Member State authorities, at EU level by the Commission or both. It would be an advantage to include tyre suppliers and distributors in the campaigns to reach end-users most efficiently. Some Member States have already facilitated, or are planning to facilitate, awareness campaigns regarding the tyre label. Experiences and recommendations from these campaigns should be taken into account.

Another issue of awareness raising is related to the requirements regarding public procurement in the Energy Efficiency Directive. In order to promote the dissemination of energy efficient tyres, it is important that Member States ensure that their Central Governments are aware of the requirement to purchase tyres in the highest fuel efficiency class and to include this aspect in their tenders for service contracts in accordance with the requirement in Annex III of the Energy Efficiency Directive.

## 8.4 Improvement of test standards and conditions

Several sources indicate an incoherence between the labelled performance and the measured performance of a tyre[145],[146],[147] including tests performed by MSAs.

According to MSAs, a large part of this problem is due to different conditions for the tests, applying test methods incorrectly and a lack of transparency in which conditions were used for the tests for calculating label values. Especially the braking test on wet surface for measuring wet grip gives rise to large differences in test results. The industry generally agrees that there is a problem with too wide test condition allowances for the wet grip test[148].

### 8.4.1 Wet grip test standard

Due to the wide intervals of allowed test conditions, a number of correction factors were adopted for calculating the wet grip. It is especially the correction factors for the surface friction coefficient ('b' = μ/grip) and temperature ('a') that are not working as intended and have a large influence on the result. The industry and ETRTO report that especially the correction factor 'b' in many cases correct the candidate tyre in the wrong direction. Hence, there is a large difference in results if a tyre is tested at different conditions and corrections factors are used to make results comparable. A "quick fix" suggested by industry is to simply remove the 'b' correction factor, but of course a more viable solution would is to change the correction factor or introduce another, more correct equation. A third possibility is to narrow down the allowed variation in the test conditions, i.e. the temperature intervals etc. should be narrower.

[144] Fuel savings calculator (Excel file) available at: http://ec.europa.eu/energy/en/content/fuel-savings-calculator
[145] [CONS, 2014] http://www.consumentenbond.nl/actueel/nieuws/nieuwsoverzicht-2013/zomerbandentest/ (15.04.2014)
[146] [IN2, 2013] Kragh, J., Oddershede, J., e.a.: Nord-Tyre – Car labelling and Nordic traffic noise, 15.-18. September 2013, Internoise, Innsbruck
[147] ADAC Technik Zentrum, Summer tyre test 2015 in size 205/55 R 16 V, March 2015
[148] Regulation (EC) No 228/2011 amending the tyre labelling regulation (1222/2009) with regard to wet grip testing method for C1 tyres

Continental Tyres reports that when duplicating the test conditions on their indoor track, there is only a small spread of results. ETRTO are therefore investigating how the broad scope of allowed test conditions can be limited in a meaningful way. A possible limitation of e.g. the temperature range could be to allow temperatures between 10°C and 25°C instead of the current 5°C – 35°C. The ranges should in any case be limited enough to ensure better consistency between results, but not so much that it limits the number of days tests can be performed on outdoor tracks.

### 8.4.2 Rolling resistance and noise test standards

For the external rolling noise test, there is also challenges related to obtaining reproducible results, since there is a large spread of surfaces allowed in the test. The test method follows an ISO norm, and is performed as a track test. The industry is currently working on improvement suggestions for the noise test in addition to those for the wet grip test.

The rolling resistance test method follows and ISO standard, and as opposed to the wet grip test, the test is performed as a laboratory drum test rather than a track test. There is a process of alignment between measurement equipment in accredited labs, which has resulted in rather low variations in measured rolling resistance results. However, an expert group on laboratory alignment of tyre rolling resistance has suggested some improvements of the alignment methods. It is suggested that Annex IVa of the Tyre Labelling Regulation is amended according to these, in order to increase the accuracy and reproducibility if the rolling resistance tests. According to Bandvulc Tyres, the tyre pressure ascribed in the rolling resistance test is not always in accordance with the tyre pressure at which the tyre size normally is operated.

## 8.5 Other suggestions

### 8.5.1 Tyres for emergency vehicles

Some tyres are produced in very small amounts or the market in Europe is too small to cover the cost of labelling the tyres. This sometimes results in the tyres not being brought to the EU market. This has been mentioned by stakeholder for emergency vehicles such as ambulances in particular. Ambulances need special tyres with both high load index and high speed index.

Professional off-road (POR) tyres are already exempted from the tyre labelling Regulation, since their specific design for exceptional adherence performances in poor conditions and in all terrain, does not allow them to fulfil regulatory thresholds and significant grading levels.

Tyres for emergency vehicles such as ambulances are not covered in the POR category, but a similar exception could be made for them, if they can be specified properly.

### 8.5.2 Performance as function of wear

The performance of tyres, both in the Type Approval and the Labelling Regulation, is based on tests with new tyres. Hence, there is no information to end-users on how tyre performance change as the tyre is worn during the course of its life. It has been argued by some stakeholders that tyres are designed to perform well in the testing, but there are no incentives for manufacturers to produce tyres that perform well during their entire life.

Manufacturers agree that tyre performance changes when the tread is worn with a general trend of lower wet grip and rolling resistance the lower the tread pattern gets. However, it is not possible to determine beforehand how exactly the tyre will wear and thus how the performance will change or how fast. This is due to the many external parameters affecting tyre wear as discussed in chapter 5.2.1, which is highly dependent on user behaviour and driving pattern.

# 9. Better regulation

## 9.1 Relevance

The aim of the Tyre Labelling Regulation is to increase the safety as well as the economic and environmental efficiency of road transport by promoting fuel efficient and safe tyres with low external rolling noise. The Regulation provides a framework for the provision of harmonised information, allowing end-users to make an informed choice when purchasing tyres.

Increasing the fuel efficiency continues to be highly relevant with the EU facing scarcity of resources and dependence on energy imports as well as the need to limit climate change. With the transport sector constituting one third[149] of the European energy consumption, increasing fuel efficiency of road transport plays an important role in addressing these challenges. Tyres account for 20-30 % of the vehicle fuel consumption, mainly due to their rolling resistance. Decreasing rolling resistance is therefore important for increasing fuel efficiency.

Increasing road safety is highly relevant with more than 25,000 road accident fatalities in the EU in 2014. The Commission has adopted a road safety programme[150] to decrease road deaths between 2011 and 2020[151]. Tyres are an important part of road safety, being the only contact between the vehicle and the road. Providing consumers with information on tyre safety parameters is highly relevant as well, with the tyre safety parameter wet grip being a top-level concern for consumers along with price when purchasing tyres. However, the relevance of the Regulation would be further increased by including additional safety performance parameters such as tyre grip on snow and ice in addition to the wet grip parameter.

## 9.2 Effectiveness

So far, the tyre labelling scheme has shown efficiency. For all the performance parameters included in the scheme, it has been able to transform the market in a positive direction from 2013 to 2015, except for external rolling noise for C1 and C2 tyres. However, the effectiveness of the scheme is reduced due to relatively weak enforcement and consumer priorities. Furthermore, there is a trend towards larger tyres, which tend to increase the absolute fuel consumption.

The market transformation is in part due to the influence of the type approval Regulation (661/2009), removing the worst performing tyres from the market. The influence from the Tyre Labelling Regulation is evident from tyre performance increasing to higher classes than the lowest allowed performance. For the external rolling noise in particular the effectiveness of the Tyre Labelling Regulation is evident only for C3 tyres.

## 9.3 Efficiency

In terms of user awareness, the Tyre Labelling Regulation is generally efficient, but there is room for improvement. Around half of end-users were aware of the label before participating in the consumer survey. The efficiency of the labelling scheme can be increased by improving market surveillance in terms of inspections and testing. By increasing the relevance of the labelling scheme through inclusion of snow and ice grip performance, there is a large improvement potential in especially the Nordic countries. This improvement potential can be reached with very low additional costs by using already widely applied tests.

[149] http://ec.europa.eu/energy/sites/ener/files/documents/2014_pocketbook.pdf
[150] COM(2010) 389 final
[151] http://ec.europa.eu/transport/road_safety/specialist/statistics/index_en.htm

Not only the user awareness and response to the label is important for its efficiency, but also the response of manufacturers. Manufacturers are obliged to label the tyres, but not to improve the tyre performance parameters. However, the market transformation shows that manufacturers have adopted the labelling scheme as an important product-differentiating factor. This suggests that the extra investment needed to achieve higher efficiency levels has generally been outweighed by the benefits. This has also contributed positively to technical innovation on especially rubber compounds, making it possible to improve fuel efficiency and wet grip simultaneously.

## 9.4 EU added value

A harmonized regulatory framework on EU level provides added value to the EU compared to having regulations at Member State level. It reduces costs for manufacturers and allows them to enter the entire EU market with only one label, while ensuring energy efficient and safe tyres. This strengthens competitiveness EU-wide, which also benefits consumers in terms of lower prices.

## 9.5 Coherence

The Tyre Labelling Regulation is coherent with Type Approval Regulation of tyres. The same measuring methods and performance parameters are applied in both regulations, and often industry uses the results from the type approval tests to establish the labelling values. The two regulations are closely related and complement each other well. In addition, international UNECE test methods form the basis of the tests in both regulations. The use of globally recognized measurement standards also ensures coherence with international approaches.

The Tyre Labelling Regulation is coherent with the Energy Labelling Directive and its implementing measures (regulations) as well. The design of the label itself as well as the structure of the regulations is very similar. Inspiration is sought from the Energy Labelling Directive and its implementing measures regarding improvements for the Tyre Labelling Regulation in order to maintain coherence.

# 10. Recommendations - summary

With regard to the review of the tyre labelling regulation, it is recommended to focus on increasing trust and confidence in the current label, rather than making comprehensive changes, and including new environmental aspects that will raise the costs and complexity of the scheme. The recommendations are based on the review study, including dialogue with various stakeholders.

## 10.1 Recommended parameters

The following is recommended regarding the aspects addressed in the study:

**Snow and ice performance** should be included in the labelling scheme on a voluntary basis in order to avoid misleading consumers purchasing snow tyres and to improve road safety during winter periods. The 3-PMSF test and logo should be applied for C1, C2, and C3 tyres and the upcoming "Nordic winter tyre" test and logo for C1 tyres. For C1 and C2 tyres, the applicable logos should be shown on the label and where label information is currently shown. For C3 tyres, it should be shown in all technical promotional material. The new logos and label designs should be tested by the Commission for efficacy with consumers prior to decisions and implementation.

**Retreaded C3 tyres** should only be included in the labelling scheme if the ReTyre tool is accurate enough and includes all relevant parameters for calculating the label performance parameters, and if the continuous maintenance of the tool is secured. The availability of the ReTyre tool should be clarified and it should be ensured that it does not affect free competition in the retreading market. It is proposed to set up a working group to clear out the identified technical oppositions among stakeholders.

**Pre-sale provision of information** should be emphasised in the Tyre Labelling Regulation, to ensure that end-users are able to make an informed choice when purchasing tyres[152]. This implies that the label should be made more visible to end-users prior to their purchasing decision, and it is therefore suggested that the Regulation is extended with provisions for:

- Online labelling. The label should be shown on the screen when tyres are offered for sale online (in webshops etc.) as is already implemented for energy related products labelled under the Energy Labelling Directive (2010/30/EU).
- Obligation of the distributor to show the label of all tyres suggested to the end-users during a tyre purchasing process.
- Inclusion of information about the label performance parameters in advertisements including the now omitted advertisements in billboards, newspapers, and magazines.
- Labelling of tyres when placed in the stock of distributors, preferably obliging labelling of all tyres. This would also make market surveillance easier to perform.

**A digital registration database** should be established where all tyres should be registered prior to being placed on the European market. The database should be separated into a publically available section and a section available only to market surveillance authorities, as described in chapter 8.2. The registration database could provide market information for policy decisions, facilitate market surveillance and serve as a tool for consumer information to enhance provision of pre-sale labelling information.

[152] As reported on page 19, many consumers do not see the tyres displayed in a shop before the purchase, and surveillance authorities have observed that only a few tyre models are on display at the point of sale while the rest are placed in the stock.

**Market surveillance.** The market surveillance efforts vary greatly among Member States and cover mainly shop inspections. Low market surveillance decreases end-user confidence in the tyre label as well as retailers' efforts to disseminate knowledge of the label. To reinforce market surveillance, it is especially important:

- To solve the problems with inaccurate test conditions and methods for wet grip and as soon as possible include the corrections in the Regulation.
- To increase the visibility of market surveillance activities carried out. MSAs should be obliged to publish results of inspections and make them available to industry and dealers, for instance in the proposed registration database.
- That the labelling scheme currently is not extended to cover new aspects that will significantly increase the costs for market surveillance. Extra cost will reduce the number of inspections and fewer inspections could easily hamper the consumers', dealers' and industry's confidence in the label scheme.
- That Member States give priority to market surveillance activities, including participation in the foreseen PROSAFE test programme.

**Awareness campaign(s)** should be conducted to increase the C1, C2 and C3 end-users' knowledge of the labelling scheme and explain its meaning in case new parameters and/or icons are included. The campaigns could be run at national level by Member State Authorities, at EU level by the Commission or both. It is suggested that tyre suppliers and/or distributors are involved in the campaigns and that experiences from previous campaigns performed by Members States and others are taken into account. Awareness campaigns could probably also provide incentives for industry to innovate even better performing tyres and for dealers to promote the label more efficiently.

Awareness campaigns targeting C1 end-users is the most important because C1 constitutes the largest share of the tyre sales, and because C2 and C3 end-users to a greater extent purchase tyres as part of leasing contracts and fleet solutions.

In addition, Member States should be encouraged to ensure that their Central Governments are aware of the requirement to purchase tyres in the highest fuel efficiency class and to include this aspect in their tenders for service contracts in accordance with the requirement in Annex III of the Energy Efficiency Directive.

**Vehicle suppliers and distributors** should be obliged to provide the tyre labelling information for all tyres, including situations when the end-user is not offered a choice between different tyres to be fitted on a car offered for sale. The information should be shown in the technical promotional material given to the end-user, including a printed version of the label applicable for the specific tyres.

## 10.2 Rejected extensions

Due to uncertainties and lack of test methods, it is *not* suggested to extent the Tyre Labelling Regulation to the following:

**Mileage and abrasion** parameters should not be included. No suitable measurement methods exist for neither of the parameters, and it will not be possible to perform market surveillance at reasonable costs. Due to large uncertainties, there is a severe risk of providing mileage information to end-users, which is not consistent with the mileage experienced in real life.

**Studded tyres** should not be included due to a low market share in the EU, resulting in low fuel saving potential, and due to lack of a suitable measurement standard.

## Appendix 1 – Results from consumer survey

userneeds
Online fieldwork

# Viegand & Maagøe – EU tyre study

## Project specifications

**Target group:** The survey is conducted among 18-70 year old car owners in:
- Sweden
- Finland
- United Kingdom
- Germany
- France
- Italy

**Method:** Online survey, the survey is conducted in Userneeds' panels in Sweden and Finland and Userneeds' partner panels in United Kingdom, Germany, France and Italy.

**Number of interviews:** In total 6051 interviews have been completed.
- 1011 in Sweden
- 1015 in Finland
- 1002 in United Kingdom
- 1007 in Germany
- 1008 in France
- 1008 in Italy

**Average interview time:** 7,5 minutes

**Period of data collection:** 2nd of October 2015 to 19th of October 2015

userneeds

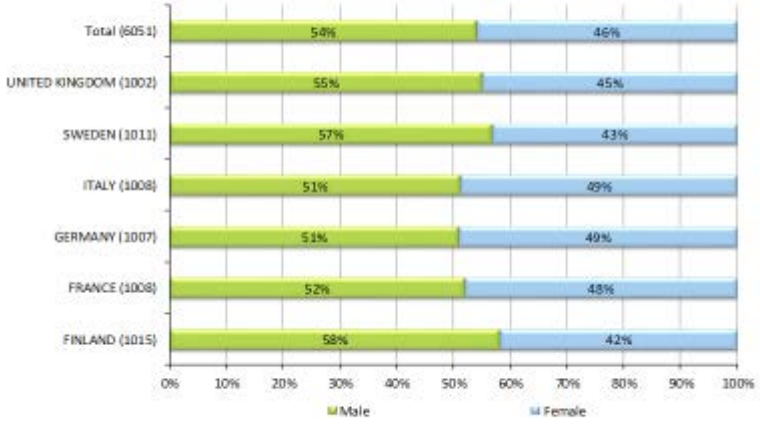
## Agenda

### Background

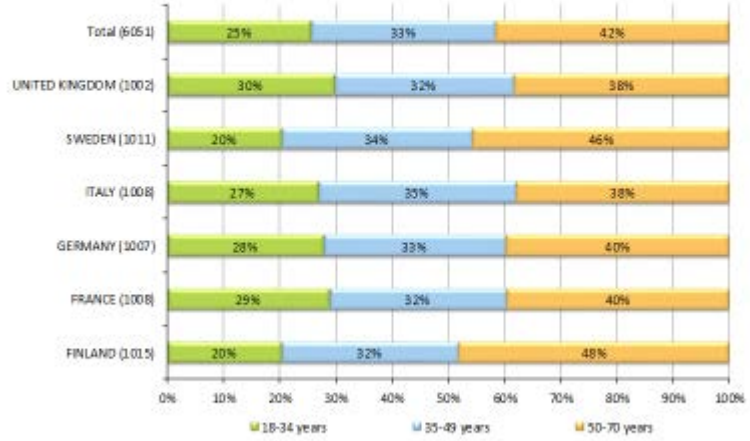
- All car owners
- Buyers of new tyres for passenger car 2013-2015
- Buyers of new (not used) passenger car 2013-2015



## What is your gender?



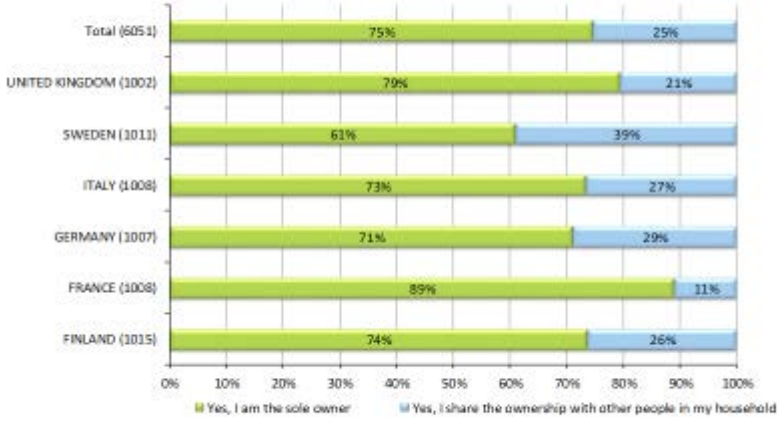
## How old are you?




usemeeds

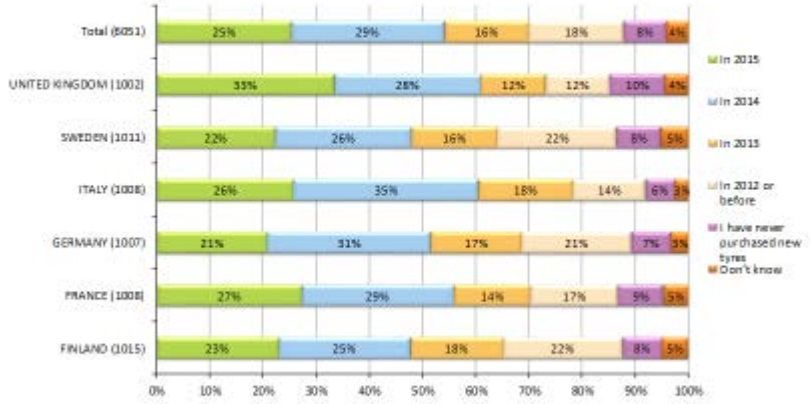
## Do you own a passenger car?

(Leased car, carpool and suchlike are NOT included)



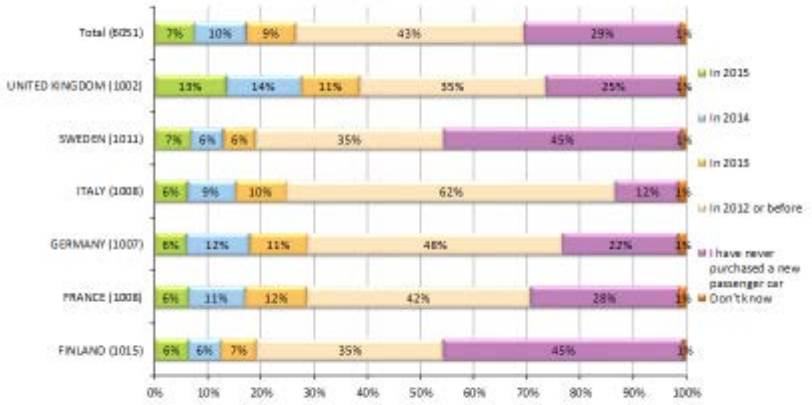

usemeeds

## When was the last time you purchased new (not used) tyres for a passenger car (without purchasing a car at the same time)?




usemeeds

## When was the last time you purchased a new (not used) passenger car?




usemeeds

## Agenda

- Background

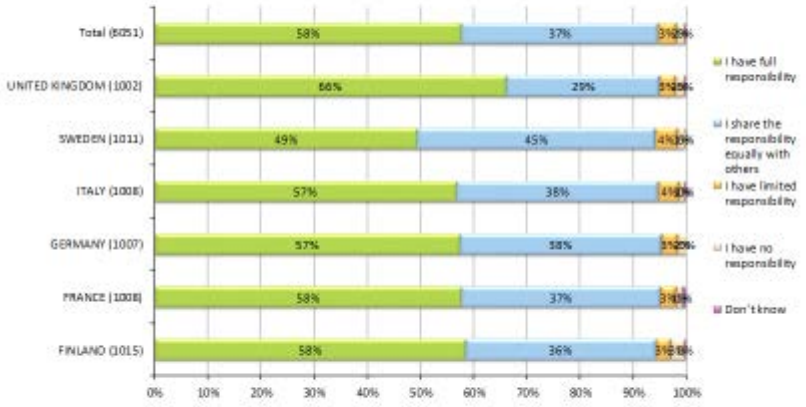
**All car owners**

- Buyers of new tyres for passenger car 2013-2015
- Buyers of new (not used) passenger car 2013-2015



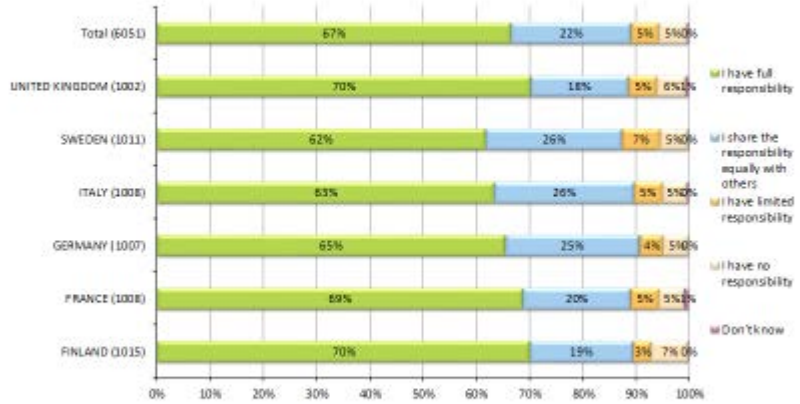
## What is your level of responsibility regarding the activities listed below?

### Purchase of car



## What is your level of responsibility regarding the activities listed below?

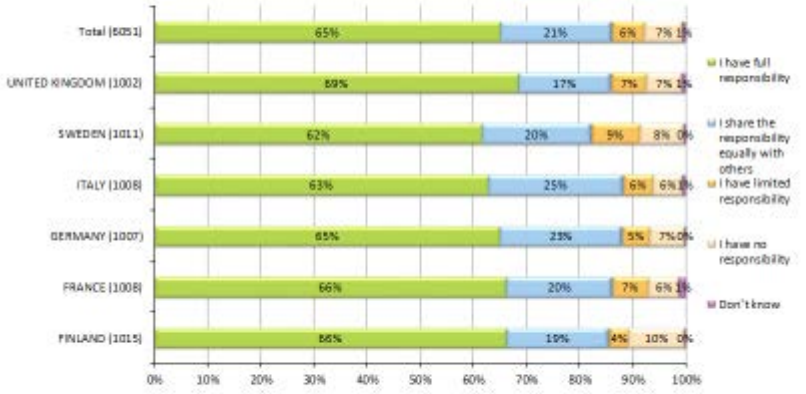
### Purchase of tyres




usemeeds

## What is your level of responsibility regarding the activities listed below?

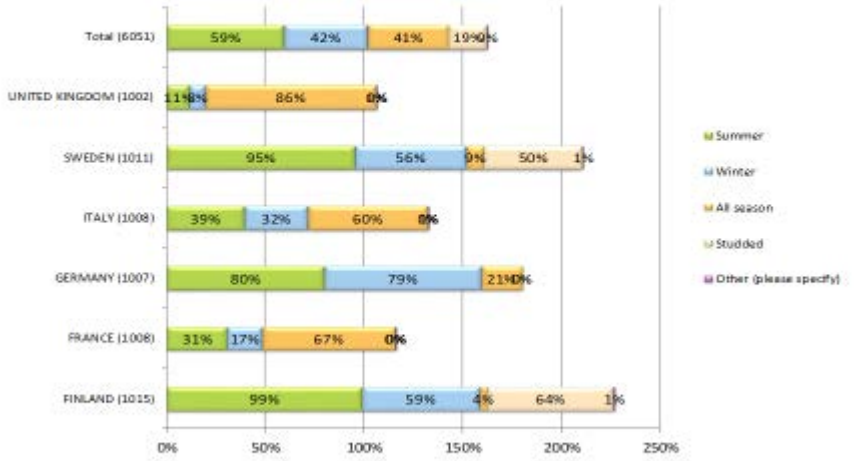
### General maintenance of tyres (for instance changing from summer to winter tyres and checking tyre pressure)




usemeeds

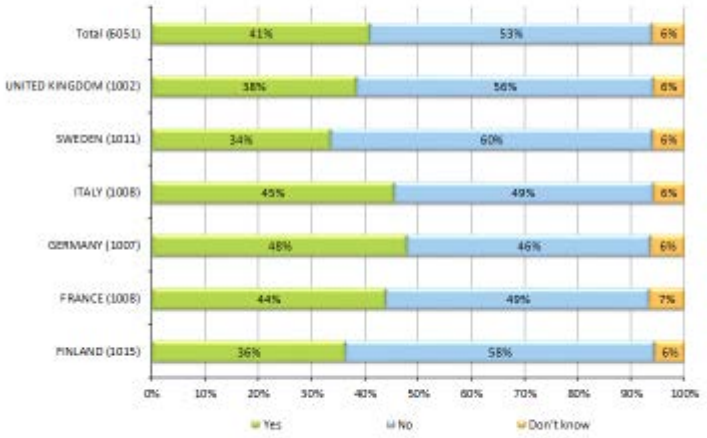
## Please specify all types of tyres you have for your car.

Please indicate all those that apply



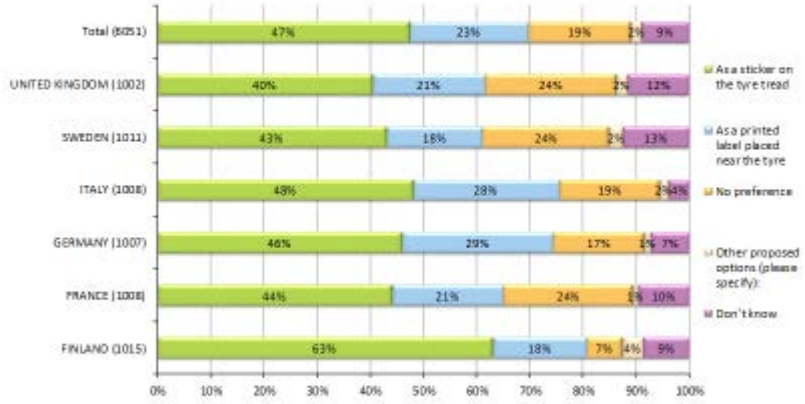

usemeeds

## Were you aware of the tyre label below before you began this questionnaire?



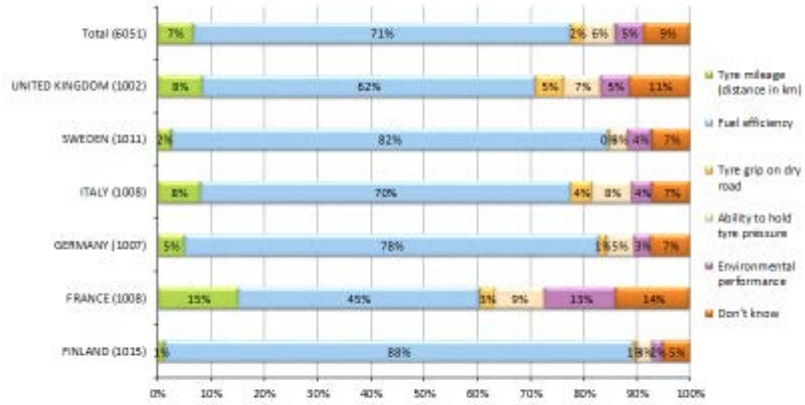

usemeeds

According to the rules, the label should be displayed in the shop as a sticker on the tyre tread or as a printed label placed near the tyres. Which way do you think the tyre label is most visible?



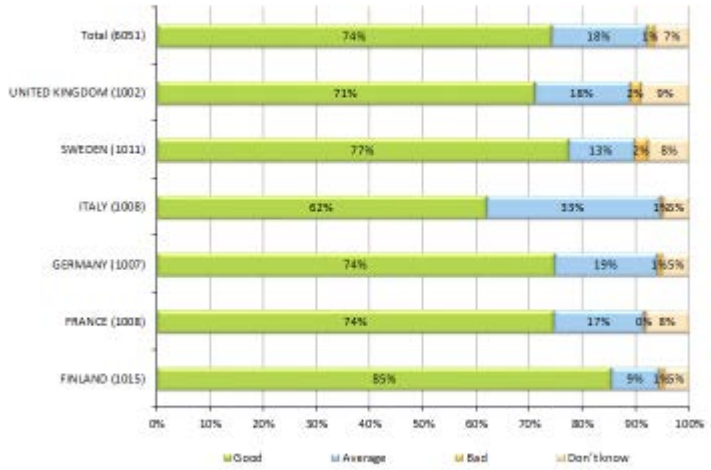

usemeeds

The label includes information about three basic tyre performance areas. Each of the performance areas are illustrated by a blue icon on the label. Please indicate what you think is meant by the blue icon in the picture below (Q3a).



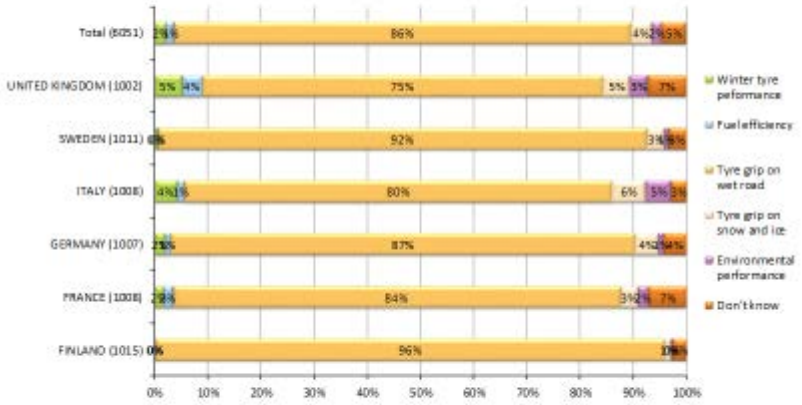

usemeeds

How well the tyre is performing with respect to the relevant performance area is indicated on a scale from A-G or by waves.
Please indicate how well you think the tyre is performing with regard to the performance area in question (Q3aa).



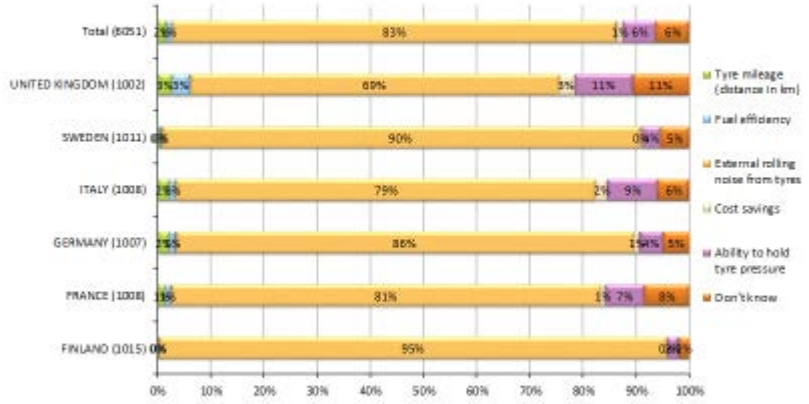

usemeeds

The label includes information about three basic tyre performance areas. Each of the performance areas are illustrated by a blue icon on the label.
Please indicate what you think is meant by the blue icon in the picture below (Q3b).



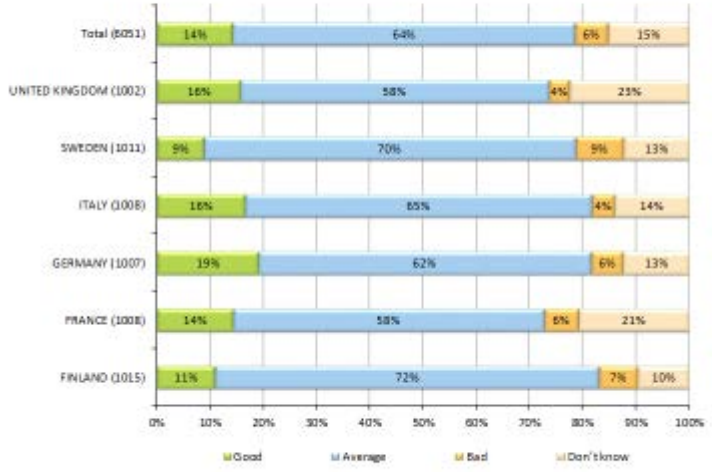

usemeeds

The label includes information about three basic tyre performance areas.
Each of the performance areas are illustrated by a blue icon on the label.
Please indicate what you think is meant by the blue icon in the picture below (Q3c).




usemeeds

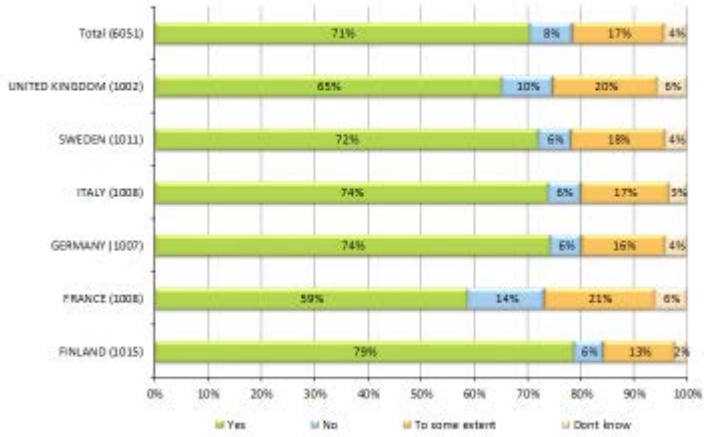
How well the tyre is performing with respect to the relevant performance area is indicated on a scale from A-G or by waves.
Please indicate how well you think the tyre is performing with regard to the performance area in question (Q3cc).




usemeeds

The icons refer respectively to fuel efficiency, tyre grip on wet road and external rolling noise. Do you find the icons and the information on the label easy to understand?

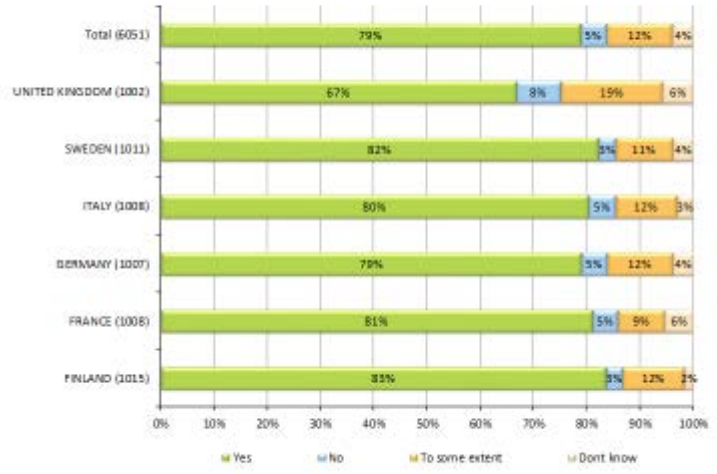
I find the information about fuel efficiency easy to understand




usemeeds

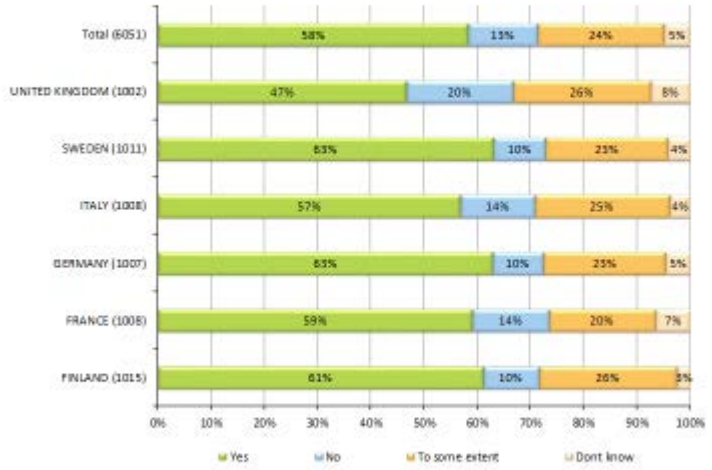
The icons refer respectively to fuel efficiency, tyre grip on wet road (wet grip) and external rolling noise. Do you find the icons and the information on the label easy to understand?

I find the information about wet grip easy to understand




usemeeds

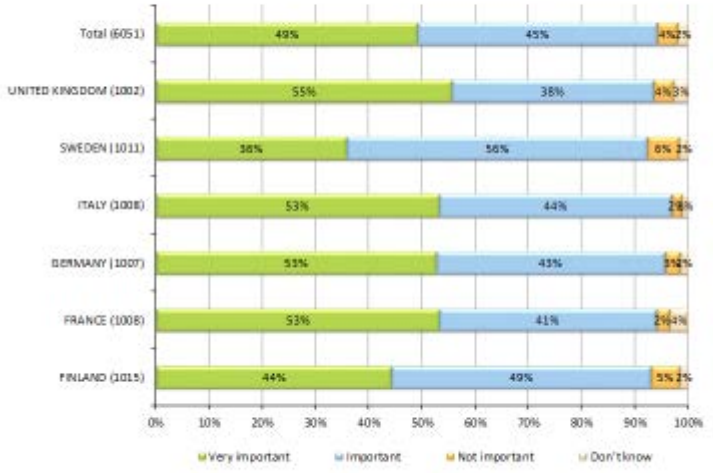
The icons refer respectively to fuel efficiency, tyre grip on wet road and external rolling noise. Do you find the icons and the information on the label easy to understand?
I find the information about external rolling noise easy to understand




usemeeds

How important would the following tyre performance areas be to you, if you were to buy new tyres?

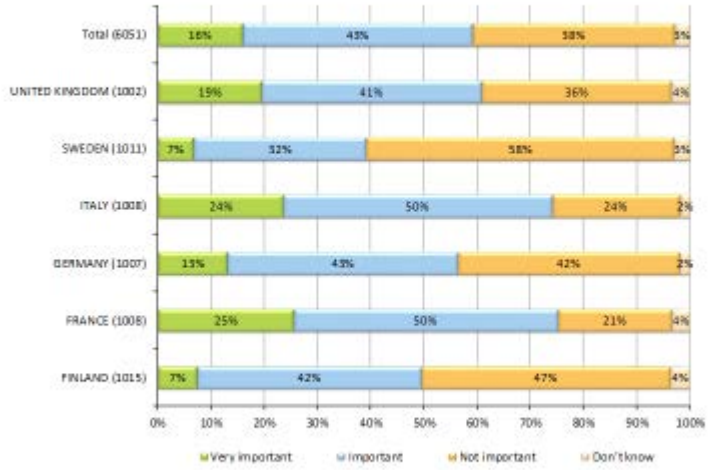
Tyre price




usemeeds

## How important would the following tyre performance areas be to you, if you were to buy new tyres?

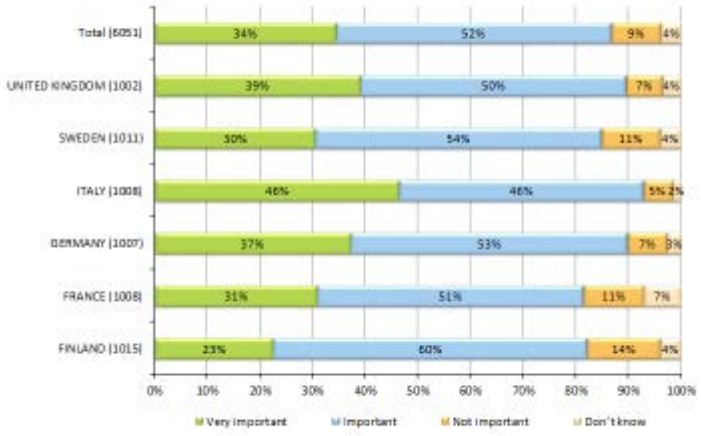
### Tyre brand




usemeeds

## How important would the following tyre performance areas be to you, if you were to buy new tyres?

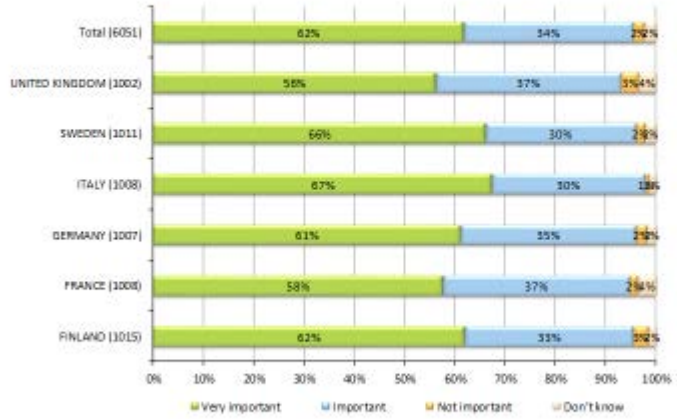
### Fuel efficiency




usemeeds

## How important would the following tyre performance areas be to you, if you were to buy new tyres?

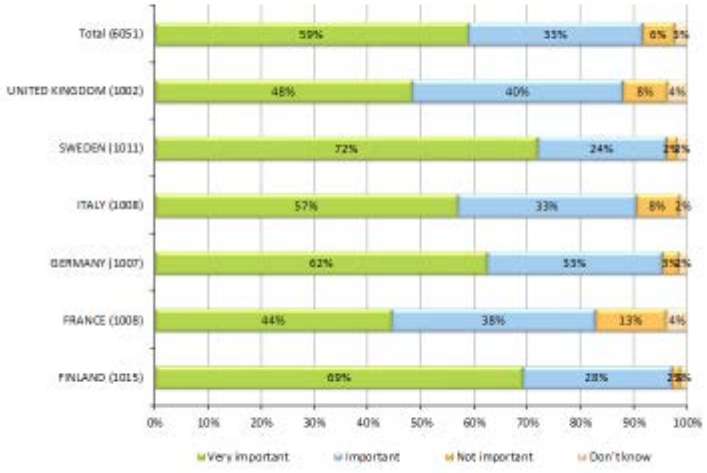
### Tyre grip on wet road




usemeeds

## How important would the following tyre performance areas be to you, if you were to buy new tyres?

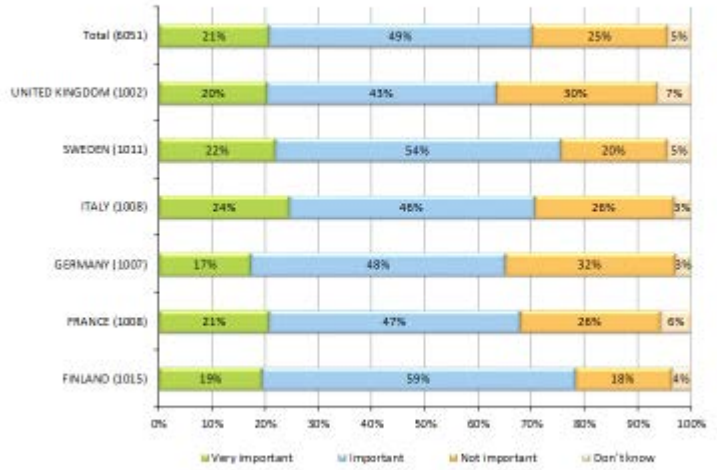
### Tyre grip on snow and ice




usemeeds

## How important would the following tyre performance areas be to you, if you were to buy new tyres?

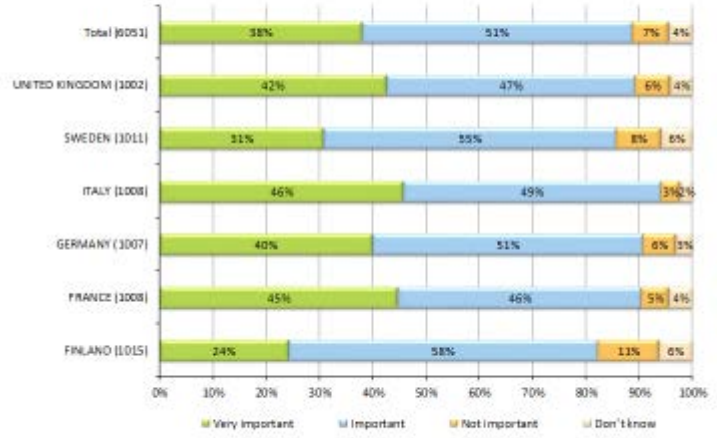
### External rolling noise




usemeeds

## How important would the following tyre performance areas be to you, if you were to buy new tyres?

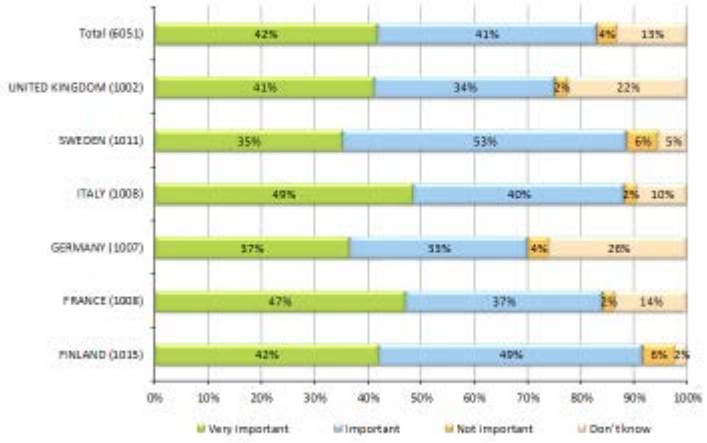
### Tyre mileage (distance in km)




usemeeds

How important would the following performance areas be to you, if you were to buy studded tyres:

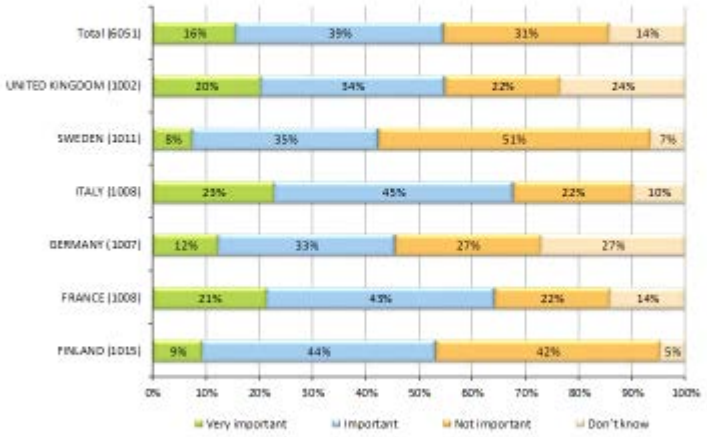
Tyre price




usemeeds

## How important would the following performance areas be to you, if you were to buy studded tyres:

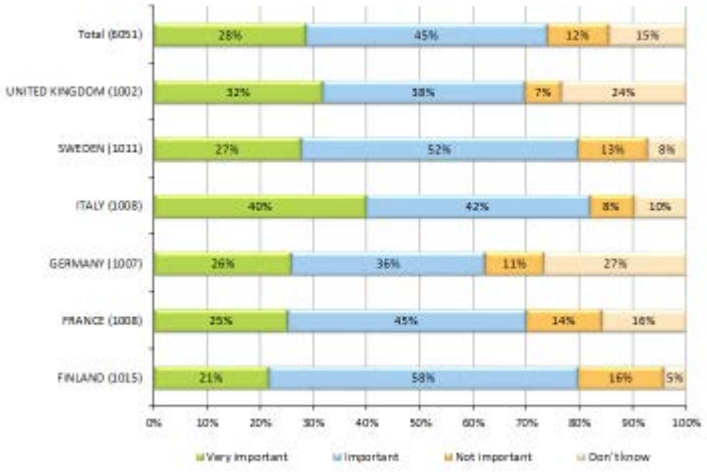
### Tyre brand




usemeeds

## How important would the following performance areas be to you, if you were to buy studded tyres:

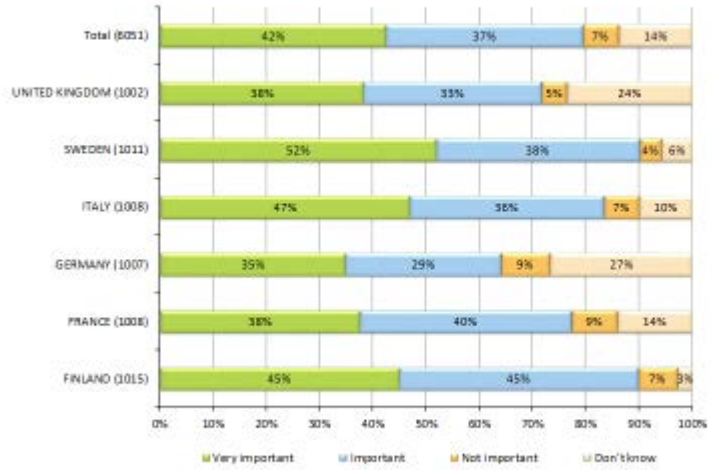
### Fuel efficiency




usemeeds

## How important would the following performance areas be to you, if you were to buy studded tyres:

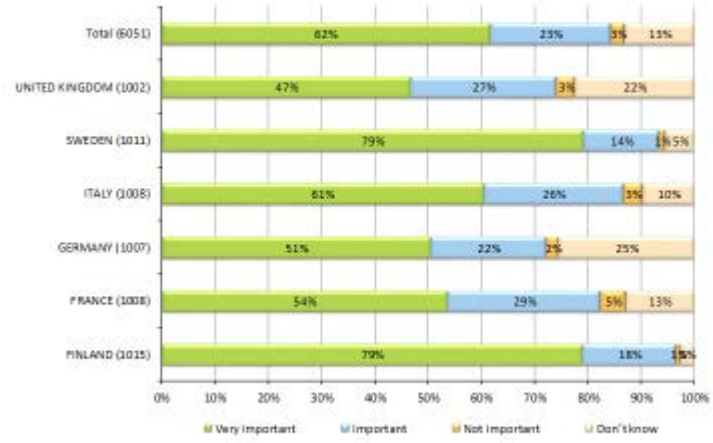
### Tyre grip on wet road




usemeeds

## How important would the following performance areas be to you, if you were to buy studded tyres:

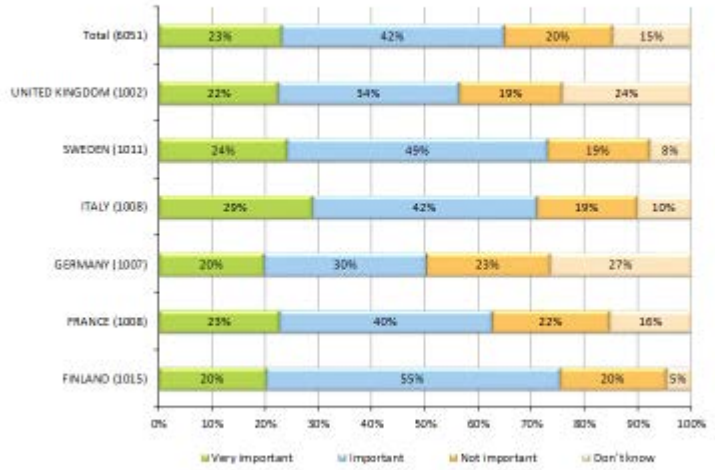
### Tyre grip on snow and ice




usemeeds

## How important would the following performance areas be to you, if you were to buy studded tyres:

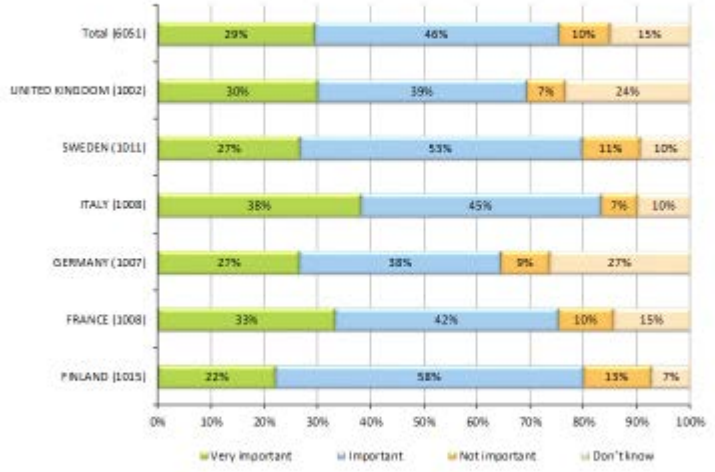
External rolling noise




usemeeds

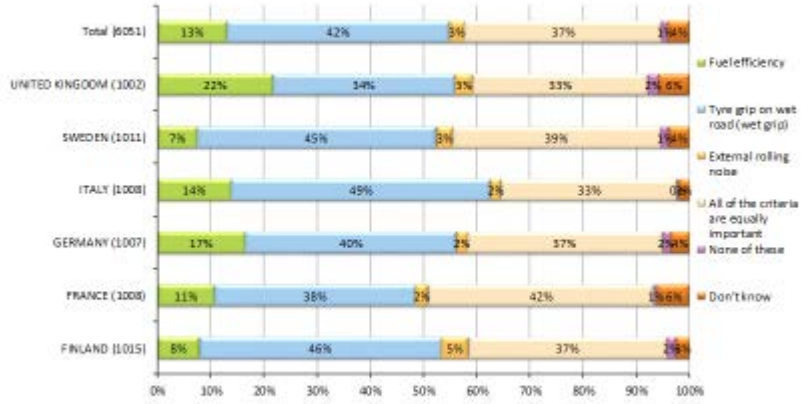
## How important would the following performance areas be to you, if you were to buy studded tyres:

Tyre mileage (distance in km)



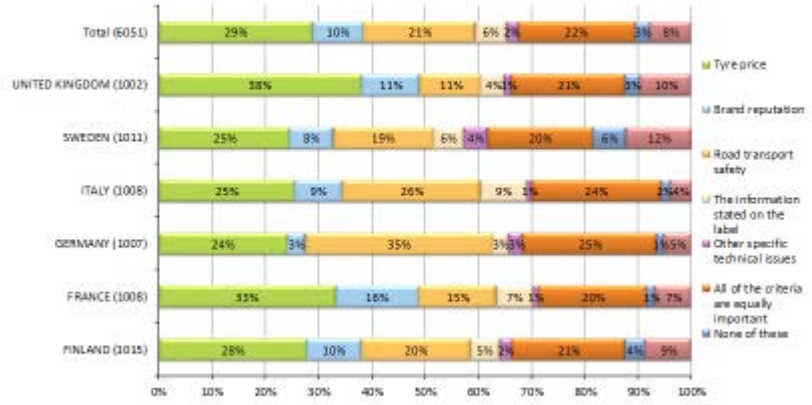

usemeeds

## Which of the tyre performance areas on the label is the most important for you?



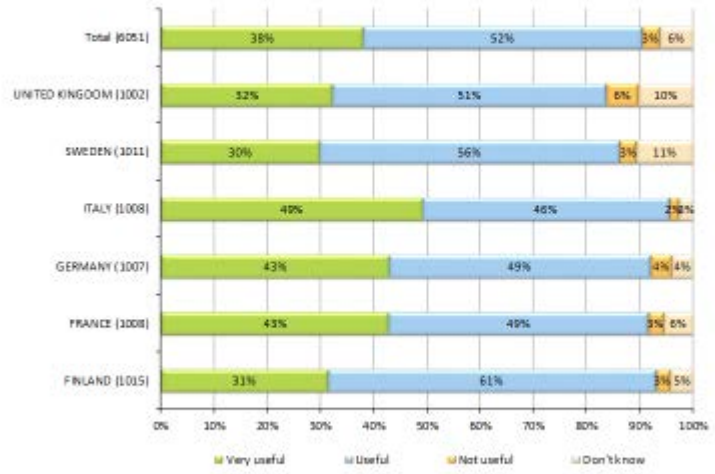

usemeeds

## At your last tyre purchase, what was the most important factor in your choice of purchase?



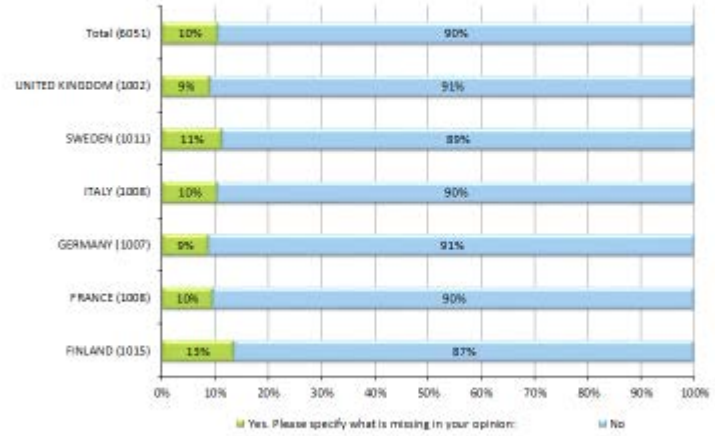

usemeeds

## How useful do you find the information on the tyre label?



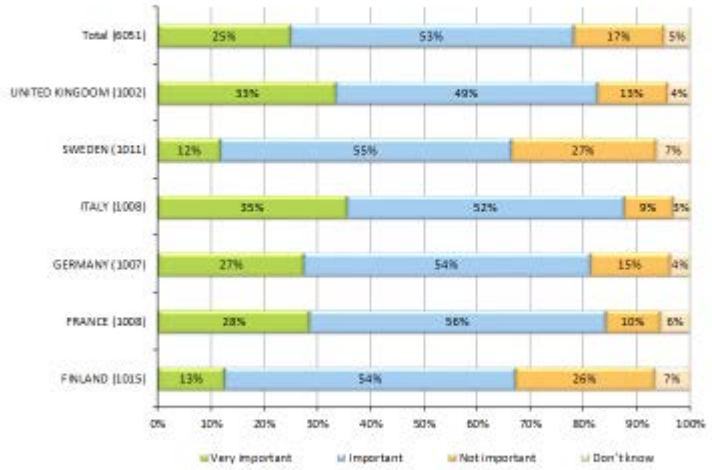

usemeeds

## Is there any information or are there any performance areas missing in the current labelling scheme in your opinion?



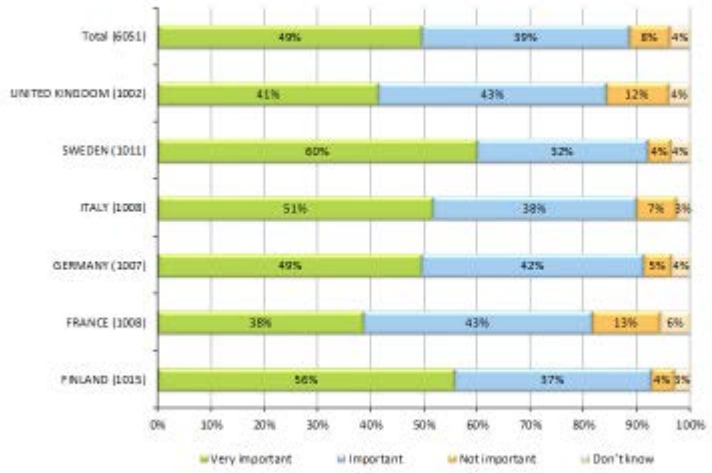

usemeeds

Today information about mileage (distance in km) and tyre grip on snow and ice is not currently shown on the label. How important is it for you to have this information on the label?
Information about mileage



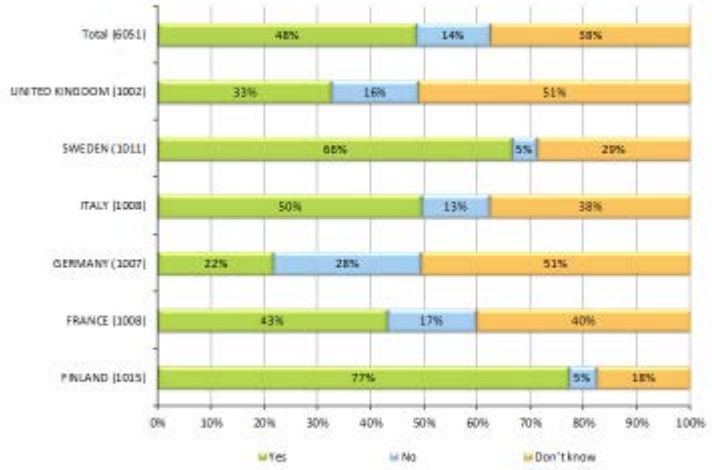

usemeeds

Today information about mileage (distance in km) and tyre grip on snow and ice is not currently shown on the label. How important is it for you to have this information on the label?
Information about grip in snowy or icy conditions



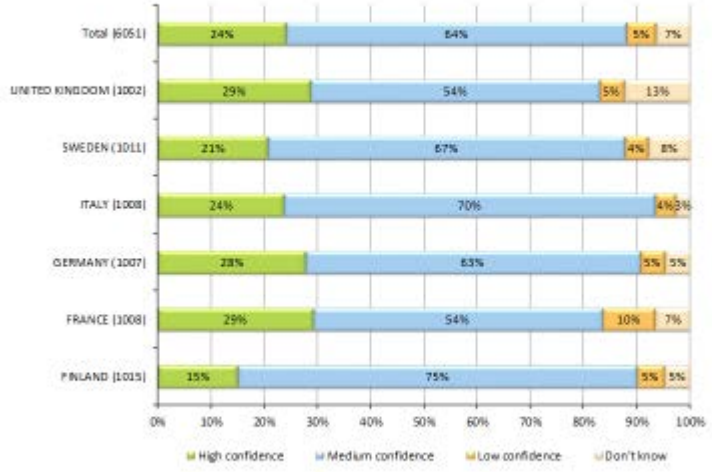

usemeeds

## Currently studded tyres are not covered by the labelling scheme (they are not sold with the label). Would you like to have studded tyres included in the scheme?



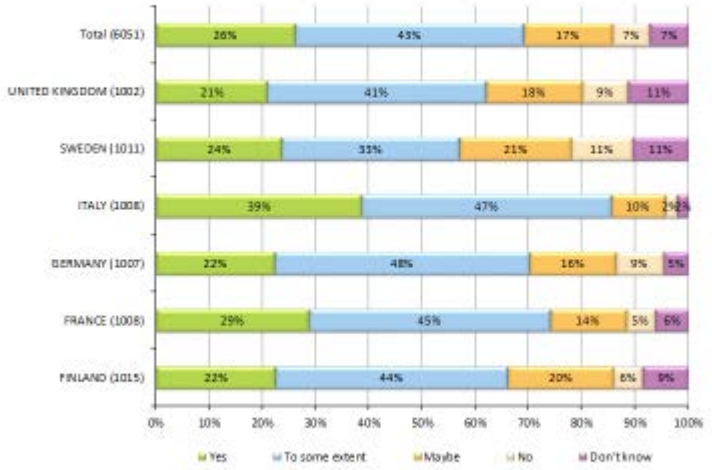

usemeeds

## To what extent do you have confidence in the information provided by the tyre label?




usemeeds

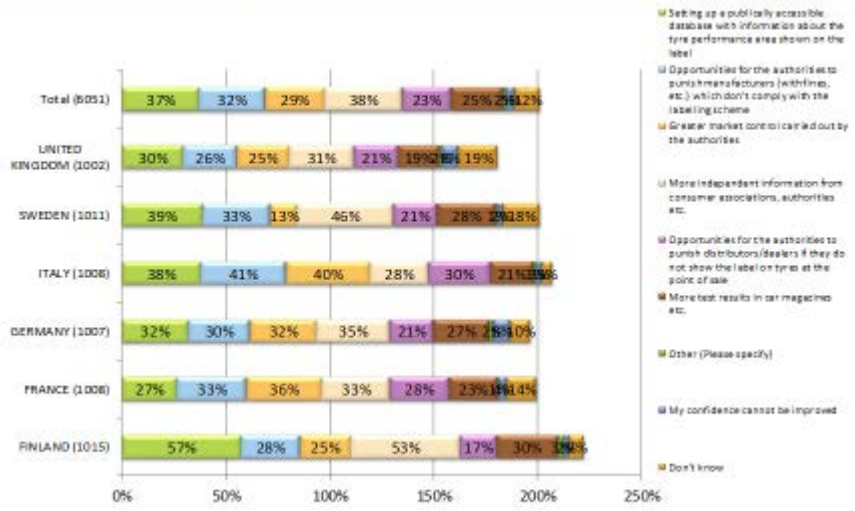
## If your confidence in the label were higher, would the label have more influence on your purchase decision?




usemeeds

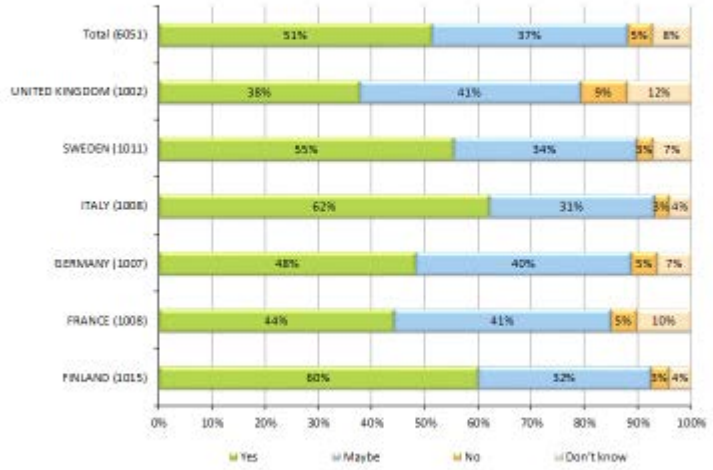
## How could your confidence in the labelling scheme be improved?

Please select all those that apply.



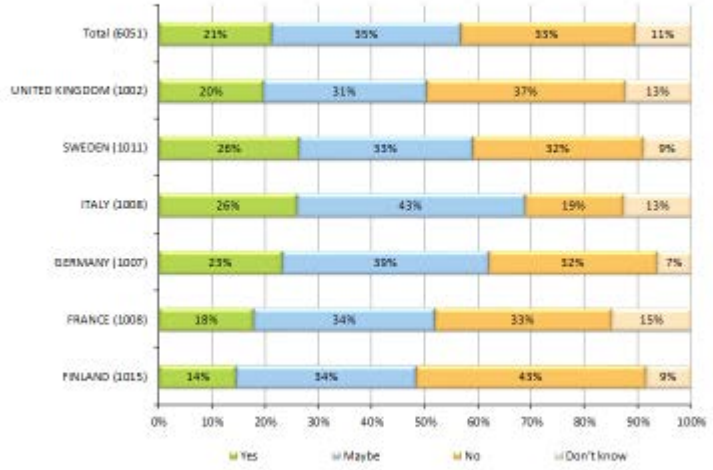

usemeeds

## If a public database were to be established with information on tyre performance areas shown on the label, would you use the database to search for information when purchasing new tyres in the future?




usemeeds

## Do you expect to buy tyres on the internet in the future?



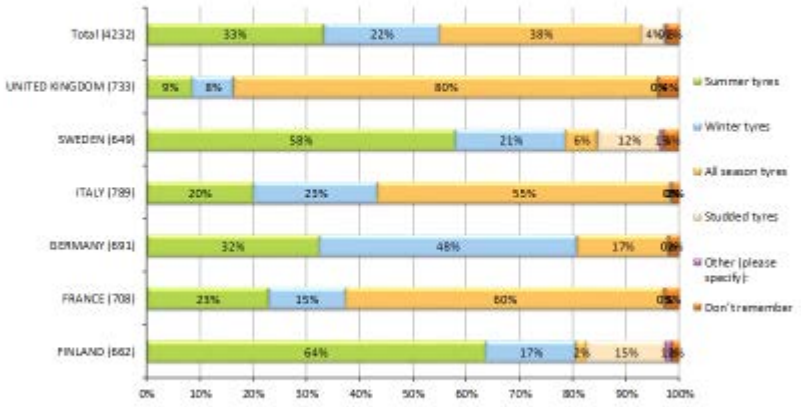

usemeeds

## Agenda

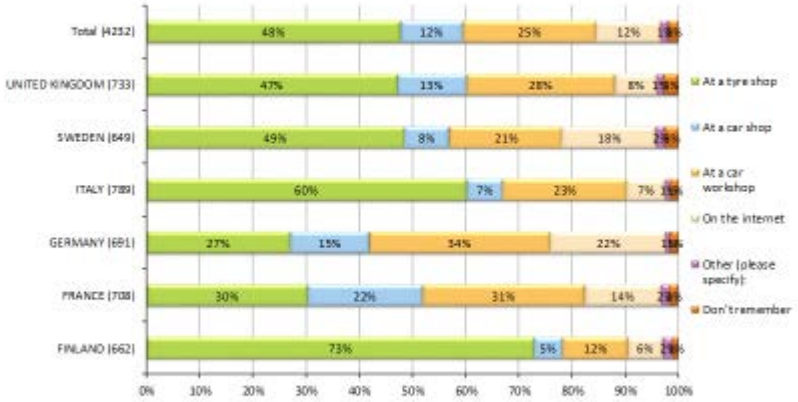
- Background
- All car owners
- Buyers of new tyres for passenger car 2013-2015
- Buyers of new (not used) passenger car 2013-2015



## What type of tyres did you buy?

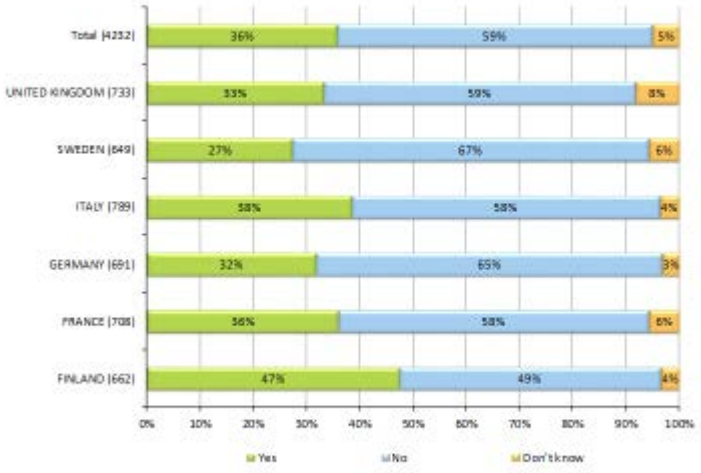


## Where did you purchase the tyres?



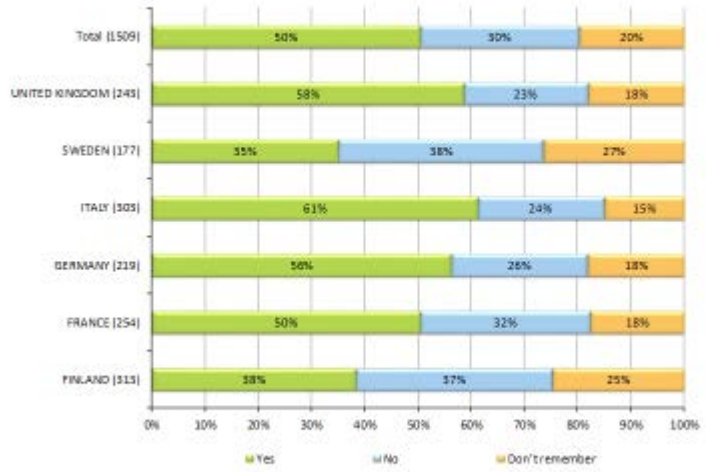

usemeeds

## Did you see the tyres displayed in a shop before the purchase?



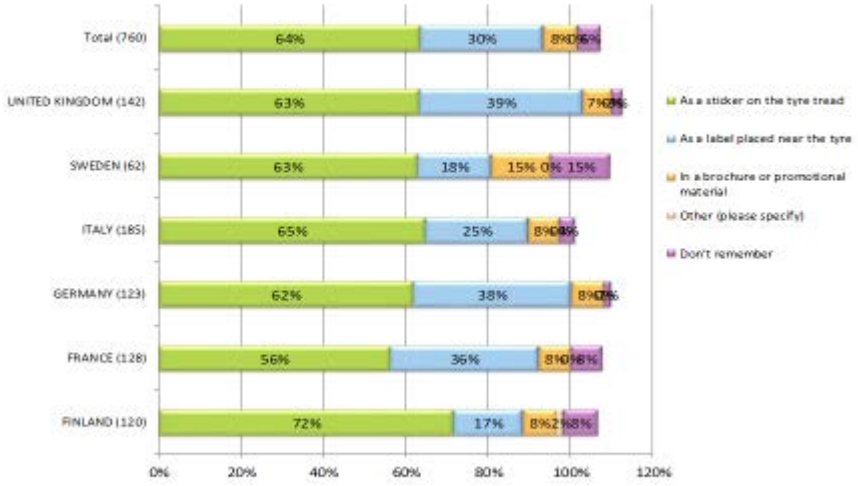

usemeeds

## Did you notice the tyre label when you were in the shop?



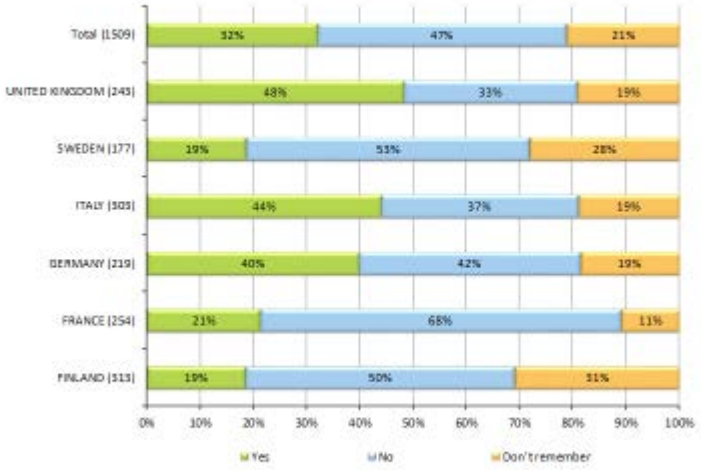

usemeeds

## Where was the tyre label placed?



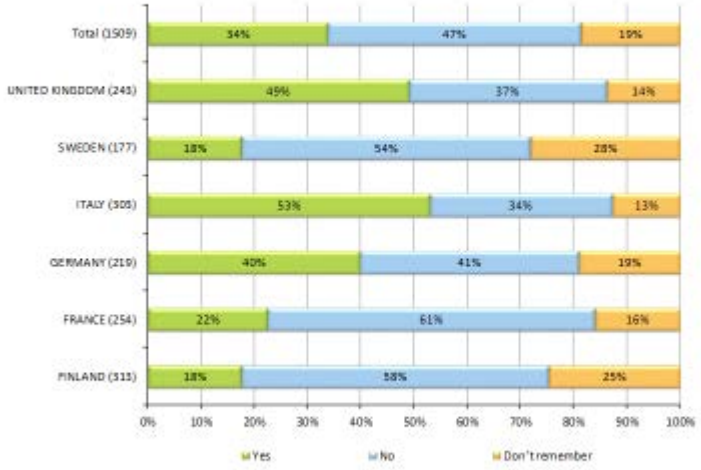

usemeeds

## Did the seller make you aware of the tyre label?




usemeeds

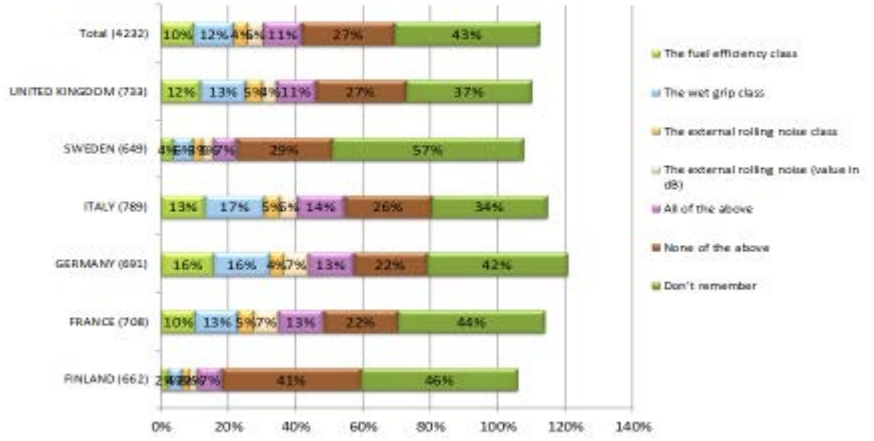
## Did you get help from the seller to understand the information on the tyre label?




usemeeds

## Was any of the following information stated on/with the bill, when you purchased the tyres?

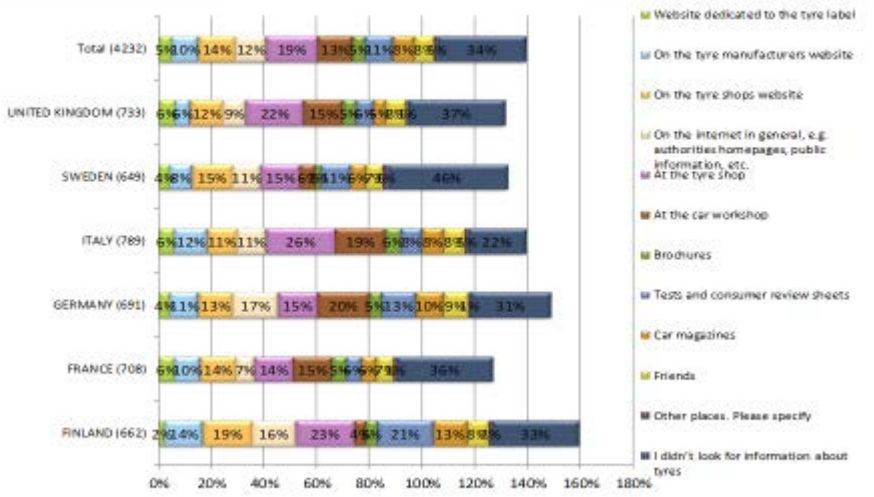
Please select all those that apply




usemeeds

## Where did you find information about the tyre label before you made your last purchase?

Please select all those that apply




usemeeds

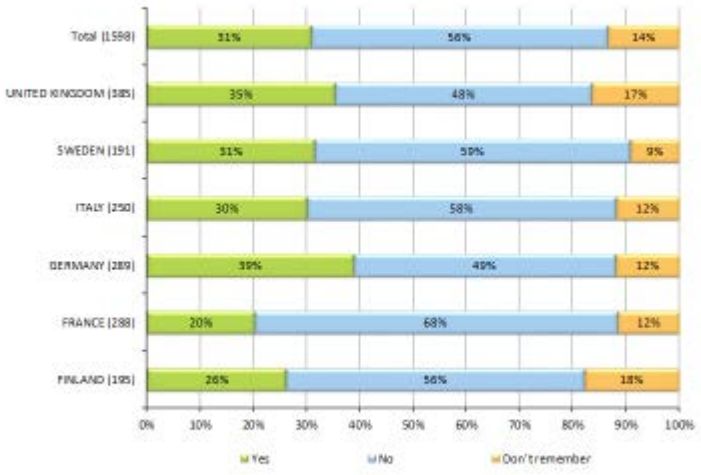
## Agenda

- Background
- All car owners
- Buyers of new tyres for passenger car 2013-2015

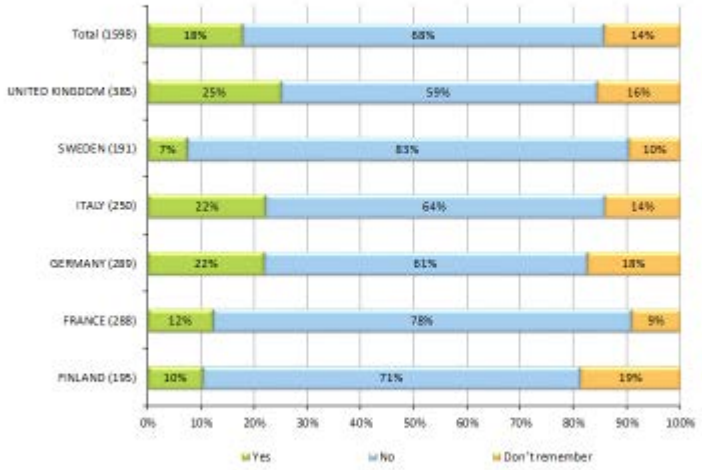
Buyers of new (not used) passenger car 2013-2015



At the point of sale (in a shop), were you offered a choice between different types of tyres when you purchased your last new passenger car?



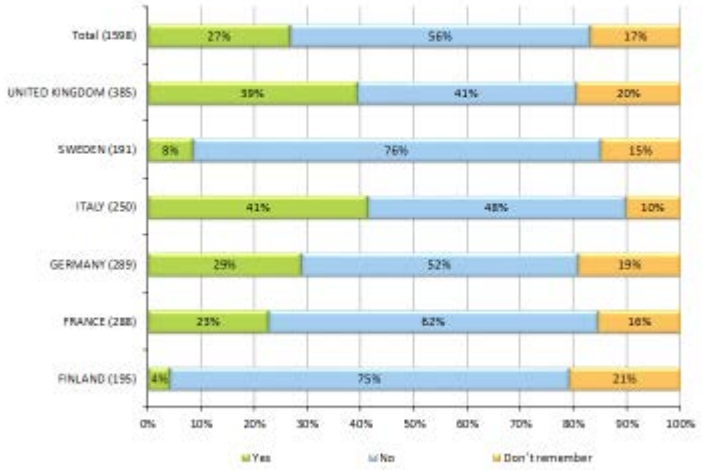
## Did the car retailer make you aware of the tyre label before the sale?




usemeeds

## Before the sale, did the car retailer provide you with information about each of the tyres offered for the following tyre performance areas:

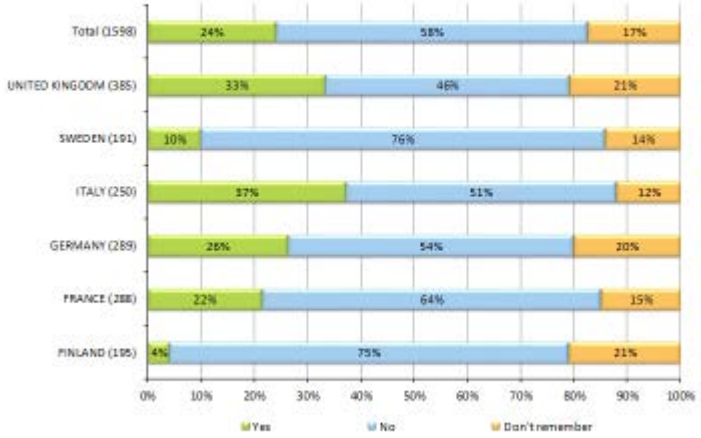
### The fuel efficiency class




usemeeds

Before the sale, did the car retailer provide you with information about each of the tyres offered for the following tyre performance areas:

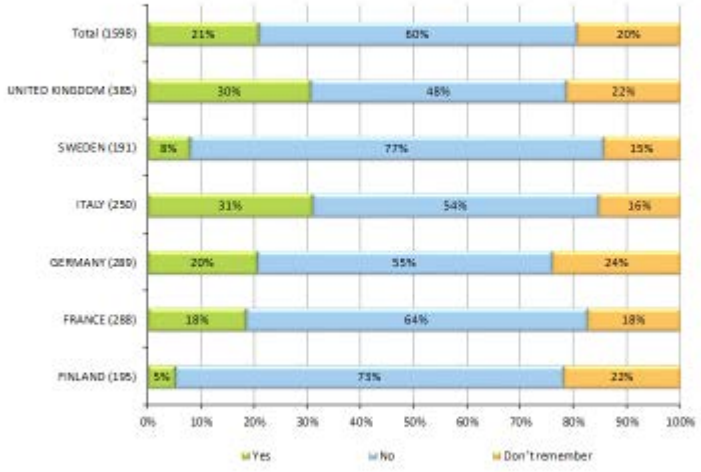
The wet grip class




usemeeds

Before the sale, did the car retailer provide you with information about each of the tyres offered for the following tyre performance areas:

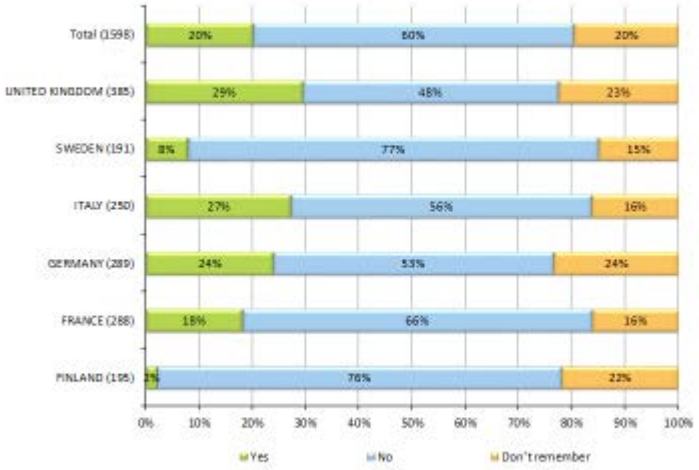
The external rolling noise class




usemeeds

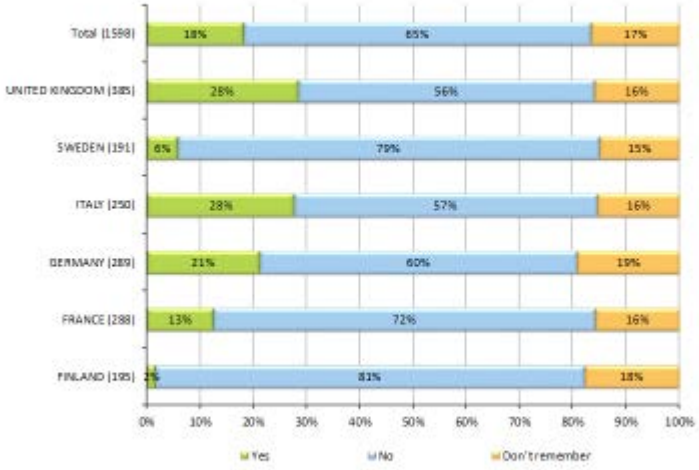
Before the sale, did the car retailer provide you with information about each of the tyres offered for the following tyre performance areas:

External rolling noise (value in dB)




usemeeds

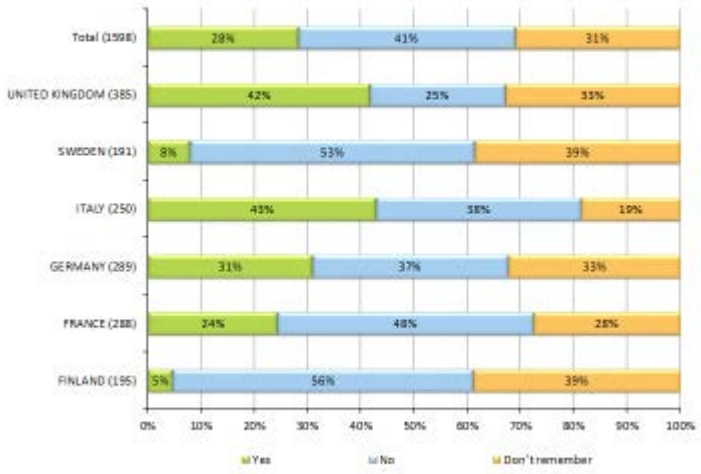
Did you get help from the car retailer to understand the fuel efficiency class, the wet grip class and/or the external rolling noise?




usemeeds

## Was the following information included in the technical promotional material?

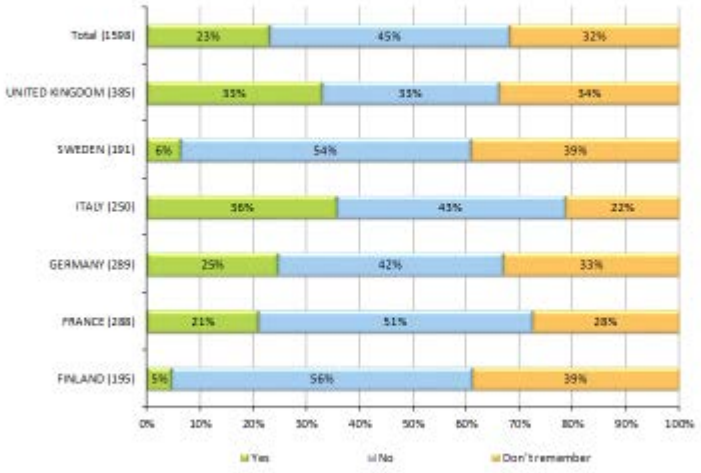
### The fuel efficiency class




usemeeds

## Was the following information included in the technical promotional material?

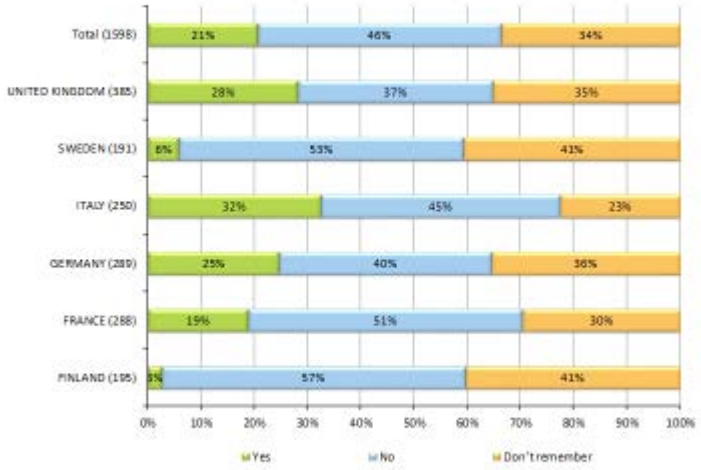
### The wet grip class




usemeeds

## Was the following information included in the technical promotional material?

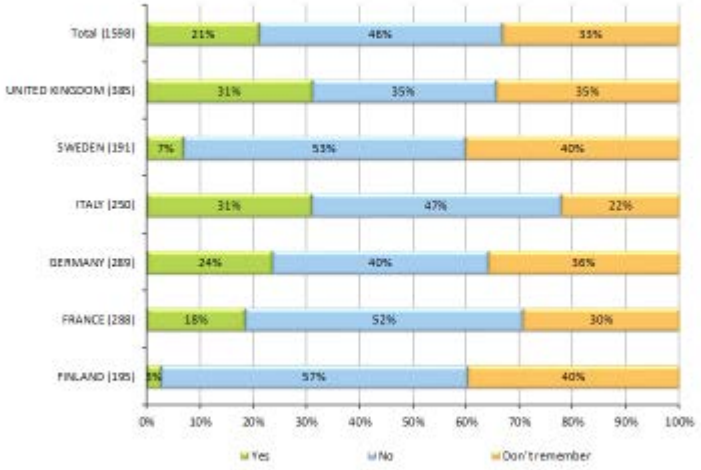
### The external rolling noise class




usemeeds

## Was the following information included in the technical promotional material?

### External rolling noise (value in dB)




usemeeds

# Appendix 2 – Calculations of EPEC market data

In this appendix, the RRC market distributions from the original EPEC impact assessment and the average RRC values derived from them are shown.

The calculations were made by multiplying the market share in each RRC average with the average RRC value of that interval.

The table numbers and names refer to those in the EPEC impact assessment and its appendices.

## C1 tyres

Table 4.11: Market Distribution of C1 Replacement Tyres (summer and winter) Reference case

| RRC kg/t | 6 to 7 | 7 to 8 | 8 to 9 | 9 to 10 | 10 to 11 | 11 to 12 | Above 12 | **Average** |
|---|---|---|---|---|---|---|---|---|
| Interval averages | 6,5 | 7,5 | 8,5 | 9,5 | 10,5 | 11,5 | 13,3 | |
| 2012 | 0% | 1% | 6% | 5% | 16% | 29% | 44% | **11.9** |
| 2013 | 0% | 1% | 7% | 6% | 19% | 37% | 29% | **11.3** |
| 2014 | 0% | 1% | 8% | 7% | 22% | 43% | 19% | **11.2** |
| 2015 | 0% | 1% | 9% | 8% | 27% | 54% | 0% | **10.6** |
| 2016 | 1% | 1% | 9% | 8% | 27% | 54% | 0% | **10.7** |
| 2017 | 1% | 1% | 11% | 12% | 39% | 36% | 0% | **10.5** |
| 2018 | 3% | 1% | 13% | 13% | 47% | 25% | 0% | **10.4** |
| 2019 | 6% | 2% | 17% | 17% | 63% | 0% | 0% | **10.2** |
| 2020 | 10% | 2% | 17% | 17% | 63% | 0% | 0% | **10.48** |

Table 4.13a: EU Market Distribution of C1 Replacement Tyres (summer and winter) by RRC – Dual Labelling (slow pace)

| RRC kg/t | 6 to 7 | 7 to 8 | 8 to 9 | 9 to 10 | 10 to 11 | 11 to 12 | Above 12 | **Average** |
|---|---|---|---|---|---|---|---|---|
| Interval averages | 6,5 | 7,5 | 8,5 | 9,5 | 10,5 | 11,5 | 13,3 | |
| 2012 | 0% | 1% | 6% | 5% | 16% | 29% | 44% | **11.9** |
| 2013 | 0% | 1% | 7% | 6% | 20% | 37% | 28% | **11.3** |
| 2014 | 0% | 1% | 8% | 7% | 22% | 42% | 19% | **11.1** |
| 2015 | 0% | 2% | 9% | 9% | 28% | 51% | 0% | **10.6** |
| 2016 | 0% | 2% | 9% | 10% | 30% | 48% | 0% | **10.5** |
| 2017 | 0% | 3% | 11% | 16% | 39% | 30% | 0% | **10.2** |
| 2018 | 1% | 4% | 12% | 19% | 41% | 23% | 0% | **10.1** |
| 2019 | 2% | 6% | 16% | 28% | 46% | 0% | 0% | **9.4** |
| 2020 | 2% | 8% | 18% | 31% | 40% | 0% | 0% | **9.4** |

Table 4.13b: EU Market Distribution of C1 Replacement Tyres (summer and winter) by RRC – Dual Labelling (fast pace)

| RRC kg/t | 6 to 7 | 7 to 8 | 8 to 9 | 9 to 10 | 10 to 11 | 11 to 12 | Above 12 | **Average** |
|---|---|---|---|---|---|---|---|---|
| Interval averages | 6,5 | 7,5 | 8,5 | 9,5 | 10,5 | 11,5 | 13,3 | |
| 2012 | 0% | 1% | 6% | 5% | 16% | 29% | 44% | **11.9** |
| 2013 | 0% | 1% | 7% | 6% | 20% | 37% | 28% | **11.3** |
| 2014 | 0% | 1% | 8% | 8% | 23% | 41% | 18% | **11.0** |
| 2015 | 0% | 2% | 9% | 11% | 30% | 47% | 0% | **10.5** |
| 2016 | 1% | 3% | 9% | 14% | 33% | 39% | 0% | **10.3** |
| 2017 | 1% | 5% | 12% | 22% | 38% | 21% | 0% | **10.0** |
| 2018 | 3% | 7% | 15% | 27% | 34% | 14% | 0% | **9.7** |
| 2019 | 6% | 11% | 22% | 34% | 28% | 0% | 0% | **9.3** |
| 2020 | 10% | 15% | 26% | 31% | 17% | 0% | 0% | **8.7** |

### C1 wet grip

Table 4.5a: EU Market Distribution of C1 Summer Replacement Tyres by RRC and WG – 2012 reference case

Table 4.5b: EU Market Distribution of C1 Summer Replacement Tyres by RRC and WG – 2020 reference case

Table 4.10a: Market Distribution for RRC and WG, passenger cars (C1) summer – 2020 – dual labelling case (slow pace)

Table 4.10b: Market Distribution for RRC and WG, passenger cars (C1) summer – 2020 – dual labelling case (fast pace)

| | A | B | C | D | **Average** |
|---|---|---|---|---|---|
| WG interval | >1.45 | 1.45-1.30 | 1.30-1.15 | <1.15 | |
| Interval averages | 1.46 | 1.32 | 1.17 | 1.1 | |
| Reference- 2012 | 4% | 27% | 59% | 11% | **1.23** |
| BAU - 2020 | 4% | 27% | 59% | 11% | **1.23** |
| | 1.55 | 1.4 | 1.25 | 1.1 | |
| slow - 2020 | 14% | 28% | 39% | 20% | **1.32** |
| fast - 2020 | 14% | 28% | 39% | 20% | **1.32** |

## C2 tyres

Table 6.7 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C2/summer) – Tyre Labelling RR only (slow pace)

| RRC kg/t | 5.5 to 6.5 | 6.5 to 7.5 | 7.5 to 8.5 | 8.5 to 9.5 | 9.5 to 10.5 | above 10.5 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 6 | 7 | 8 | 9 | 10 | 11,75 | |
| 2013 | 0% | 1% | 6% | 23% | 44% | 26% | **10.08** |
| 2014 | 0% | 1% | 7% | 26% | 49% | 17% | **9.87** |
| 2015 | 0% | 1% | 9% | 32% | 56% | 0% | **9.27** |
| 2016 | 0% | 2% | 11% | 34% | 52% | 0% | **9.28** |
| 2017 | 1% | 9% | 34% | 24% | 31% | 0% | **8.67** |
| 2018 | 2% | 14% | 38% | 27% | 18% | 0% | **8.37** |
| 2019 | 5% | 22% | 39% | 33% | 0% | 0% | **7.93** |
| 2020 | 8% | 25% | 38% | 26% | 0% | 0% | **7.61** |

Table 6.10 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C2/winter) – Tyre Labelling RR only (slow pace)

| RRC kg/t | 5.5 to 6.5 | 6.5 to 7.5 | 7.5 to 8.5 | 8.5 to 9.5 | 9.5 to 10.5 | above 10.5 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 6 | 7 | 8 | 9 | 10 | 11,75 | |
| 2013 | 0% | 0% | 0% | 9% | 37% | 52% | **10.62** |
| 2014 | 0% | 0% | 0% | 14% | 51% | 34% | **10.36** |
| 2015 | 0% | 0% | 2% | 24% | 73% | 0% | **9.62** |
| 2016 | 0% | 0% | 3% | 27% | 68% | 0% | **9.47** |
| 2017 | 0% | 5% | 32% | 21% | 41% | 0% | **8.90** |
| 2018 | 1% | 10% | 38% | 26% | 24% | 0% | **8.54** |
| 2019 | 3% | 19% | 42% | 35% | 0% | 0% | **8.02** |
| 2020 | 6% | 23% | 41% | 28% | 0% | 0% | **7.77** |

Table 6.8 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C2/summer) – Tyre Labelling RR only (fast pace)

| RRC kg/t | 5.5 to 6.5 | 6.5 to 7.5 | 7.5 to 8.5 | 8.5 to 9.5 | 9.5 to 10.5 | above 10.5 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 6 | 7 | 8 | 9 | 10 | 11,75 | |
| 2013 | 0% | 1% | 6% | 23% | 43% | 25% | **9.86** |
| 2014 | 0% | 2% | 9% | 28% | 45% | 15% | **9.64** |
| 2015 | 0% | 3% | 14% | 36% | 45% | 0% | **9.07** |
| 2016 | 0% | 6% | 19% | 38% | 36% | 0% | **8.96** |
| 2017 | 4% | 19% | 34% | 25% | 17% | 0% | **8.24** |
| 2018 | 12% | 27% | 32% | 21% | 7% | 0% | **7.76** |
| 2019 | 27% | 32% | 22% | 19% | 0% | 0% | **7.33** |
| 2020 | 48% | 23% | 20% | 9% | 0% | 0% | **6.90** |

Table 6.11 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C2/winter) – Tyre Labelling RR only (fast pace)

| RRC kg/t | 5.5 to 6.5 | 6.5 to 7.5 | 7.5 to 8.5 | 8.5 to 9.5 | 9.5 to 10.5 | above 10.5 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 6 | 7 | 8 | 9 | 10 | 11,75 | |
| 2013 | 0% | 0% | 0% | 11% | 38% | 50% | **10.67** |
| 2014 | 0% | 0% | 2% | 18% | 49% | 30% | **10.21** |
| 2015 | 0% | 1% | 6% | 32% | 60% | 0% | **9.43** |
| 2016 | 0% | 2% | 11% | 38% | 48% | 0% | **9.24** |
| 2017 | 2% | 15% | 33% | 27% | 22% | 0% | **8.44** |
| 2018 | 8% | 24% | 33% | 24% | 9% | 0% | **7.86** |
| 2019 | 24% | 32% | 18% | 26% | 0% | 0% | **7.46** |
| 2020 | 43% | 24% | 23% | 11% | 0% | 0% | **7.09** |

## C3 tyres

Table 6.13 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C3/summer) – Tyre Labelling RR only (slow pace)

| RRC kg/t | Below 4 | 4 to 5 | 5 to 6 | 6 to7 | 7 to 8 | Above 8 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 3,7 | 4,5 | 5,5 | 6,5 | 7,5 | 9,8 | |
| 2013 | 2% | 11% | 29% | 35% | 20% | 4% | **6.3** |
| 2014 | 2% | 12% | 29% | 35% | 20% | 2% | **6.2** |
| 2015 | 2% | 13% | 30% | 35% | 19% | 2% | **6.2** |
| 2016 | 3% | 14% | 30% | 35% | 19% | 2% | **6.3** |
| 2017 | 4% | 19% | 41% | 23% | 12% | 0% | **5.7** |
| 2018 | 8% | 25% | 45% | 15% | 7% | 0% | **5.4** |
| 2019 | 9% | 27% | 49% | 10% | 5% | 0% | **5.3** |
| 2020 | 13% | 32% | 45% | 6% | 3% | 0% | **5.0** |

Table 6.16 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C3/winter) – Tyre Labelling RR only (slow pace)

| RRC kg/t | Below 4 | 4 to 5 | 5 to 6 | 6 to7 | 7 to 8 | Above 8 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 3,7 | 4,5 | 5,5 | 6,5 | 7,5 | 9,8 | |
| 2013 | 0% | 2% | 11% | 32% | 40% | 15% | **7.2** |
| 2014 | 0% | 2% | 12% | 34% | 41% | 10% | **7.0** |
| 2015 | 0% | 3% | 14% | 36% | 41% | 6% | **6.9** |
| 2016 | 0% | 4% | 16% | 37% | 39% | 4% | **6.8** |
| 2017 | 0% | 6% | 23% | 45% | 25% | 0% | **6.3** |
| 2018 | 1% | 9% | 28% | 46% | 15% | 0% | **6.1** |
| 2019 | 3% | 13% | 33% | 43% | 8% | 0% | **5.9** |
| 2020 | 6% | 17% | 36% | 36% | 4% | 0% | **5.6** |

Table 6.14 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C3/summer) – Tyre Labelling RR only (fast pace)

| RRC kg/t | Below 4 | 4 to 5 | 5 to 6 | 6 to7 | 7 to 8 | Above 8 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 3,7 | 4,5 | 5,5 | 6,5 | 7,5 | 9,8 | |
| 2013 | 2% | 12% | 29% | 34% | 19% | 4% | **6.2** |
| 2014 | 3% | 13% | 30% | 34% | 18% | 2% | **6.1** |
| 2015 | 5% | 16% | 30% | 32% | 16% | 1% | **5.9** |
| 2016 | 8% | 19% | 31% | 29% | 13% | 1% | **5.8** |
| 2017 | 10% | 23% | 38% | 19% | 9% | 0% | **5.4** |
| 2018 | 19% | 31% | 34% | 11% | 4% | 0% | **5.0** |
| 2019 | 20% | 33% | 36% | 7% | 3% | 0% | **4.9** |
| 2020 | 38% | 36% | 21% | 3% | 1% | 0% | **4.5** |

Table 6.17 Market Distribution of Replacement Tyres Sold in the EU p.a. by RRC (C3/winter) – Tyre Labelling RR only (fast pace)

| RRC kg/t | Below 4 | 4 to 5 | 5 to 6 | 6 to7 | 7 to 8 | Above 8 | **Average** |
|---|---|---|---|---|---|---|---|
| Interval averages | 3,7 | 4,5 | 5,5 | 6,5 | 7,5 | 9,8 | |
| 2013 | 0% | 2% | 12% | 32% | 39% | 15% | **7.2** |
| 2014 | 0% | 4% | 15% | 35% | 38% | 9% | **7.0** |
| 2015 | 0% | 6% | 18% | 36% | 34% | 5% | **6.6** |
| 2016 | 0% | 10% | 22% | 37% | 28% | 3% | **6.5** |
| 2017 | 3% | 16% | 31% | 36% | 14% | 0% | **5.9** |
| 2018 | 10% | 23% | 35% | 26% | 6% | 0% | **5.5** |
| 2019 | 22% | 29% | 31% | 15% | 2% | 0% | **4.9** |
| 2020 | 40% | 31% | 22% | 7% | 0% | 0% | **4.5** |

# Appendix 3 – Stock model and calculations

The stock model is based on sales data received directly from ETRMA and from ETRMA Statistics Edition 2014[153].

## Sales data

| Sales x 1000 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 tyres | 212,574 | 224,748 | 232,239 | 238,794 | 243,477 | 234,112 | 235,985 | 257,210 | 273,105 | 234,706 | 237,017 |
| C2 tyres | 14,426 | 15,252 | 15,761 | 16,206 | 16,523 | 15,888 | 16,015 | 16,661 | 18,661 | 17,388 | 15,959 |
| C3 tyres - all | 11,500 | 11,600 | 11,500 | 12,500 | 14,000 | 11,200 | 10,100 | 11,463 | 12,330 | 9,712 | 10,640 |
| C3 tyres - retreaded | 5,175 | 5,220 | 5,175 | 5,625 | 5,800 | 5,193 | 4,561 | 5,605 | 5,567 | 4,978 | 5,251 |
| C3 tyres - New | 6,325 | 6,380 | 6,325 | 6,875 | 8,200 | 6,007 | 5,539 | 5,858 | 6,763 | 4,734 | 5,389 |

| Sales x 1000 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C1tyres | 249,566 | 252,061 | 254,582 | 257,127 | 259,699 | 262,296 | 264,919 | 267,568 | 270,244 | 272,946 | 275,675 |
| C2tyres | 16,583 | 16,749 | 16,916 | 17,086 | 17,257 | 17,429 | 17,603 | 17,779 | 17,957 | 18,137 | 18,318 |
| C3tyres-all | 12,294 | 12,416 | 12,540 | 12,666 | 12,792 | 12,920 | 13,049 | 13,180 | 13,312 | 13,445 | 13,579 |
| C3tyres-retreaded | | | 5,587 | 5,671 | 5,737 | 5,799 | 5,860 | 5,921 | 5,982 | 6,043 | 6,104 |
| C3tyres-New | | | 6,954 | 6,995 | 7,055 | 7,121 | 7,189 | 7,259 | 7,330 | 7,402 | 7,475 |

| Sales x 1000 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| C1tyres | 278,432 | 281,216 | 284,029 | 286,869 | 289,738 | 292,635 |
| C2tyres | 18,501 | 18,686 | 18,873 | 19,062 | 19,253 | 19,445 |
| C3tyres-all | 13,715 | 13,852 | 13,991 | 14,131 | 14,272 | 14,415 |
| C3tyres-retreaded | 6,166 | 6,228 | 6,291 | 6,354 | 6,418 | 6,482 |
| C3tyres-New | 7,549 | 7,624 | 7,700 | 7,777 | 7,854 | 7,932 |

[153] http://www.etrma.org/uploads/Modules/Documentsmanager/20150408---statistics-booklet-2014-final-(modified).pdf

## Stock model

The tyre lifetimes (in years) used in the stock model are similar to those used in the Impact Accounting study[154].

| Tyre type | C1 | C2 | C3 – new | C3 - retreaded |
|---|---|---|---|---|
| Lifetime, years: | 2.5 | 1.8 | 1.7 | 1.7 |

| Stock x 1000 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 tyres | 212,574 | 437,322 | 563,274 | 583,408 | 598,391 | 596,986 | 591,836 | 610,251 | 648,308 | 636,416 | 608,276 |
| C2 tyres | 14,426 | 26,793 | 27,962 | 28,814 | 29,488 | 29,106 | 28,725 | 29,473 | 31,990 | 32,317 | 29,869 |
| C3 tyres - all | 11,500 | 19,650 | 19,620 | 20,550 | 22,750 | 21,000 | 17,940 | 18,533 | 20,354 | 18,343 | 17,438 |
| C3 tyres - retreaded | 5,175 | 8,843 | 8,829 | 9,248 | 9,738 | 9,253 | 8,196 | 8,798 | 9,491 | 8,875 | 8,736 |
| C3 tyres - New | 6,325 | 10,808 | 10,791 | 11,303 | 13,013 | 11,747 | 9,744 | 9,735 | 10,864 | 9,468 | 8,703 |

| Stock x 1000 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 tyres | 603,936 | 620,136 | 631,426 | 637,740 | 644,117 | 650,558 | 657,064 | 663,634 | 670,271 | 676,973 | 683,743 |
| C2 tyres | 29,350 | 30,015 | 30,316 | 30,619 | 30,925 | 31,234 | 31,547 | 31,862 | 32,181 | 32,503 | 32,828 |
| C3 tyres - all | 19,742 | 21,022 | 21,231 | 21,444 | 21,658 | 21,875 | 22,093 | 22,314 | 22,538 | 22,763 | 22,991 |
| C3 tyres - retreaded | 9,429 | 9,615 | 9,498 | 9,582 | 9,707 | 9,816 | 9,920 | 10,023 | 10,126 | 10,230 | 10,334 |
| C3 tyres - New | 10,313 | 11,407 | 11,734 | 11,862 | 11,951 | 12,059 | 12,173 | 12,291 | 12,411 | 12,533 | 12,657 |

| Stock x 1000 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| C1 tyres | 690,581 | 697,486 | 704,461 | 711,506 | 718,621 | 725,807 |
| C2 tyres | 33,156 | 33,487 | 33,822 | 34,160 | 34,502 | 34,847 |
| C3 tyres - all | 23,220 | 23,453 | 23,687 | 23,924 | 24,163 | 24,405 |
| C3 tyres - retreaded | 10,438 | 10,544 | 10,650 | 10,757 | 10,865 | 10,975 |
| C3 tyres - New | 12,782 | 12,909 | 13,037 | 13,167 | 13,298 | 13,430 |

[154] René Kemna, Van Holstein en Kemna B.V. (VHK), for The European Commission. "Ecodesign Impact Accounting; Part 1 – Status Nov. 2013". Delft, May 2014.

# Appendix 4 – Summary of data from TOL and VACO databases

Data for the market label values from TOL and VACO was received form more than 30,000 tyre models from the years 2012-2013. The tables below summarised the average values found by counting the data.

## C1 tyres

Rolling resistance averages.

| RRC | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 9.69 | | | |
| 2013 | 9.41 | -2.94% | 9.43 | |
| 2014 | 9.40 | -0.09% | 9.32 | -1.13% |
| 2015 | 9.33 | -0.73% | 9.21 | -1.15% |
| **Average rate 2013-2015** | | **-0.41%** | | **-1.14%** |

Wet grip averages

| Wet grip | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 1.36 | | | |
| 2013 | 1.39 | 2.16% | 1.39 | |
| 2014 | 1.40 | 0.52% | 1.40 | 0.99% |
| 2015 | 1.41 | 0.71% | 1.42 | 0.98% |
| **Average rate 2013-2015** | | **0.62%** | | **0.99%** |

External rolling noise averages

| External rolling noise | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 70.81 | | | |
| 2013 | 70.67 | -0.20% | 69.95 | |
| 2014 | 70.86 | 0.26% | 69.90 | -0.06% |
| 2015 | 70.80 | -0.08% | 69.86 | -0.06% |
| **Average rate 2013-2015** | | **0.09%** | | **-0.06%** |

## C2 tyres

Rolling resistance averages

| RRC | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 8.54 | | | |
| 2013 | 8.71 | 1.88% | 8.28 | |
| 2014 | 8.55 | -1.73% | 8.19 | -1.11% |
| 2015 | 8.50 | -0.65% | 8.09 | -1.12% |
| **Average rate 2013-2015** | | **-1.19%** | | **-1.11%** |

Wet grip averages

| Wet grip | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 1.21 | | | |
| 2013 | 1.20 | -0.67% | 1.22 | |
| 2014 | 1.21 | 0.89% | 1.23 | 0.60% |
| 2015 | 1.21 | 0.06% | 1.24 | 0.60% |
| **Average rate 2013-2015** | | **0.47%** | | **0.60%** |

External rolling noise averages

| External rolling noise | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 71.93 | | | |
| 2013 | 71.98 | 0.07% | 71.61 | |
| 2014 | 72.07 | 0.13% | 71.63 | 0.03% |
| 2015 | 72.03 | -0.07% | 71.66 | 0.03% |
| **Average rate 2013-2015** | | **0.03%** | | **0.03%** |

## C3 tyres

Rolling resistance averages

| RRC | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 5.92 | | | |
| 2013 | 6.19 | 4.53% | 6.30 | |
| 2014 | 6.16 | -0.57% | 6.22 | -1.27% |
| 2015 | 6.13 | -0.43% | 6.14 | -1.28% |
| **Average rate 2013-2015** | | **-0.50%** | | **-1.28%** |

Wet grip averages

| | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 1.04 | | | |
| 2013 | 1.05 | 1.52% | 1.03 | |
| 2014 | 1.05 | -0.47% | 1.05 | 1.36% |
| 2015 | 1.06 | 0.49% | 1.06 | 1.34% |
| **Average rate 2013-2015** | | **0.51%** | | **1.35%** |

External rolling noise averages

| | TOL | rate % | VACO | Rate % |
|---|---|---|---|---|
| 2012 | 71.78 | | | |
| 2013 | 72.19 | 0.58% | 72.24 | |
| 2014 | 72.05 | -0.19% | 72.06 | -0.25% |
| 2015 | 71.71 | -0.48% | 71.88 | -0.25% |
| **Average rate 2013-2015** | | **-0.33%** | | **-0.25%** |

# Appendix 5 – Rolling resistance development

Scenario calculations for rolling resistance development

## C1 tyres

The change rates of RRC in the various scenarios:

| | New scenarios | | | EPEC scenarios | | |
|---|---|---|---|---|---|---|
| Scenario | BAU (TOL data) | OI | A 2030 | EPEC BAU: | EPEC slow: | EPEC fast: |
| % Rate | -0.4% | -1.8% | -2.9% | -0.6% | -1.3% | -1.8% |

Rolling resistance development for C1 tyres

| **year** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
|---|---|---|---|---|---|---|---|---|---|
| BAU | 9.69 | 9.41 | 9.40 | 9.33 | 9.29 | 9.25 | 9.22 | 9.18 | 9.14 |
| OI | 9.69 | 9.41 | 9.40 | 9.33 | 9.17 | 9.01 | 8.85 | 8.69 | 8.54 |
| Average A in 2030 | 9.69 | 9.41 | 9.40 | 9.33 | 9.06 | 8.80 | 8.54 | 8.29 | 8.05 |
| EPEC No label | 11.93 | 11.35 | 11.20 | 10.65 | 10.71 | 10.45 | 10.42 | 10.22 | 10.48 |
| EPEC Slow, dual | 11.93 | 11.32 | 11.09 | 10.58 | 10.54 | 10.23 | 10.14 | 9.43 | 9.41 |
| EPEC fast, dual | 11.93 | 11.32 | 11.04 | 10.52 | 10.34 | 9.96 | 9.74 | 9.26 | 8.72 |

| **year** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** |
|---|---|---|---|---|---|---|---|---|---|---|
| BAU | 9.10 | 9.06 | 9.03 | 8.99 | 8.95 | 8.92 | 8.88 | 8.84 | 8.81 | 8.77 |
| OI | 8.39 | 8.24 | 8.10 | 7.95 | 7.81 | 7.68 | 7.54 | 7.41 | 7.28 | 7.15 |
| Average A in 2030 | 7.82 | 7.59 | 7.37 | 7.16 | 6.95 | 6.75 | 6.55 | 6.36 | 6.18 | 6.00 |
| EPEC No label | 10.42 | 10.36 | 10.30 | 10.24 | 10.18 | 10.12 | 10.07 | 10.01 | 9.95 | 9.90 |
| EPEC Slow, dual | 9.28 | 9.16 | 9.04 | 8.92 | 8.81 | 8.69 | 8.58 | 8.47 | 8.36 | 8.25 |
| EPEC fast, dual | 8.56 | 8.40 | 8.24 | 8.09 | 7.95 | 7.80 | 7.66 | 7.52 | 7.38 | 7.24 |

## C2 tyres

The change rates of RRC in the various scenarios:

| | New scenarios | | | EPEC scenarios | | |
|---|---|---|---|---|---|---|
| Scenario | BAU (TOL data) | OI | A 2030 | EPEC BAU: | EPEC slow: | EPEC fast: |
| % Rate | -1.19% | -2.1% | -3.5% | -0.9% | -2.0% | -2.6% |

Rolling resistance development for C2 tyres

| **year** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
|---|---|---|---|---|---|---|---|---|---|
| BAU | 8.54 | 8.71 | 8.55 | 8.50 | 8.40 | 8.30 | 8.20 | 8.10 | 8.00 |
| OI | 8.54 | 8.71 | 8.55 | 8.50 | 8.32 | 8.14 | 7.97 | 7.80 | 7.63 |
| Average A in 2030 | 8.54 | 8.71 | 8.55 | 8.50 | 8.20 | 7.92 | 7.64 | 7.38 | 7.12 |
| EPEC No label | 10.13 | 10.06 | 9.91 | 9.58 | 9.61 | 9.35 | 9.18 | 8.84 | 8.84 |
| EPEC Slow. dual | 10.13 | 10.22 | 9.99 | 9.36 | 9.33 | 8.73 | 8.41 | 7.95 | 7.65 |
| EPEC fast. dual | 10.13 | 10.07 | 9.79 | 9.16 | 9.03 | 8.29 | 7.79 | 7.36 | 6.95 |

| **year** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** |
|---|---|---|---|---|---|---|---|---|---|---|
| BAU | 7.91 | 7.82 | 7.72 | 7.63 | 7.54 | 7.45 | 7.36 | 7.27 | 7.19 | 7.10 |
| OI | 7.47 | 7.31 | 7.15 | 7.00 | 6.85 | 6.70 | 6.56 | 6.42 | 6.28 | 6.15 |
| Average A in 2030 | 6.87 | 6.64 | 6.40 | 6.18 | 5.97 | 5.76 | 5.56 | 5.37 | 5.18 | 5.00 |
| EPEC No label | 8.76 | 8.68 | 8.60 | 8.52 | 8.44 | 8.36 | 8.29 | 8.21 | 8.14 | 8.06 |
| EPEC Slow. dual | 7.50 | 7.35 | 7.20 | 7.05 | 6.91 | 6.77 | 6.63 | 6.50 | 6.37 | 6.24 |
| EPEC fast. dual | 6.77 | 6.60 | 6.43 | 6.26 | 6.10 | 5.94 | 5.79 | 5.64 | 5.49 | 5.35 |

## C3 tyres

The change rates of RRC in the various scenarios:

| | New scenarios | | | EPEC scenarios | | |
|---|---|---|---|---|---|---|
| Scenario | BAU (TOL data) | OI | A 2030 | EPEC BAU: | EPEC slow: | EPEC fast: |
| % Rate | -0.5% | -2.0% | -3.7% | -1.0% | -1.7% | -2.4% |

Rolling resistance development for C3 tyres

| year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| BAU | 5.92 | 6.19 | 6.16 | 6.13 | 6.10 | 6.07 | 6.04 | 6.01 | 5.98 |
| OI | 5.92 | 6.19 | 6.16 | 6.13 | 6.01 | 5.89 | 5.78 | 5.66 | 5.55 |
| Average A in 2030 | | | | 6.13 | 5.91 | 5.69 | 5.48 | 5.28 | 5.09 |
| EPEC No label | 6.51 | 6.44 | 6.67 | 6.36 | 6.29 | 6.01 | 5.80 | 5.67 | 5.59 |
| EPEC Slow, dual | | 6.57 | 6.40 | 6.39 | 6.42 | 5.83 | 5.58 | 5.43 | 5.17 |
| EPEC fast, dual | | 6.49 | 6.34 | 6.12 | 5.98 | 5.54 | 5.11 | 4.90 | 4.47 |

| year | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|
| BAU | 5.95 | 5.92 | 5.89 | 5.86 | 5.83 | 5.80 | 5.77 | 5.75 | 5.72 | 5.69 |
| OI | 5.44 | 5.33 | 5.23 | 5.13 | 5.03 | 4.93 | 4.83 | 4.73 | 4.64 | 4.55 |
| Average A in 2030 | 4.90 | 4.72 | 4.55 | 4.38 | 4.22 | 4.06 | 3.92 | 3.77 | 3.63 | 3.50 |
| EPEC No label | 5.53 | 5.48 | 5.42 | 5.37 | 5.31 | 5.26 | 5.21 | 5.16 | 5.10 | 5.05 |
| EPEC Slow, dual | 5.08 | 4.99 | 4.91 | 4.83 | 4.74 | 4.66 | 4.59 | 4.51 | 4.43 | 4.36 |
| EPEC fast, dual | 4.37 | 4.26 | 4.16 | 4.06 | 3.96 | 3.86 | 3.77 | 3.68 | 3.59 | 3.50 |

# Appendix 6 – Wet grip development

Scenario calculations for rolling resistance development

## C1 tyres

The change rates of wet grip index in the various scenarios:

| | New scenarios | | EPEC scenarios | |
|---|---|---|---|---|
| Scenario | BAU (TOL data) | OI | No label | C1 dual labelling |
| % Rate | 0.6% | 0.9% | 0.0% | 0.9% |

Wet grip index development for C1 tyres

| year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| BAU | | 1.39 | 1.40 | 1.41 | 1.42 | 1.43 | 1.43 | 1.44 | 1.45 |
| OI | | 1.39 | 1.40 | 1.41 | 1.42 | 1.43 | 1.44 | 1.46 | 1.47 |
| EPEC No label | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 |
| EPEC dual labelling | 1.23 | 1.24 | 1.25 | 1.26 | 1.27 | 1.28 | 1.29 | 1.30 | 1.32 |

| year | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|
| BAU | 1.46 | 1.47 | 1.48 | 1.49 | 1.50 | 1.51 | 1.52 | 1.53 | 1.53 | 1.54 |
| OI | 1.48 | 1.49 | 1.51 | 1.52 | 1.53 | 1.55 | 1.56 | 1.57 | 1.59 | 1.60 |
| EPEC No label | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 |
| EPEC dual labelling | 1.33 | 1.34 | 1.35 | 1.36 | 1.38 | 1.39 | 1.40 | 1.41 | 1.43 | 1.44 |

## C2 tyres

The change rates of wet grip index in the various scenarios:

| | New scenarios | |
|---|---|---|
| Scenario | BAU (TOL data) | OI |
| % Rate | 0.47% | 1.2% |

Wet grip index development for C2 tyres

| year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C2 BAU | 1.20 | 1.21 | 1.21 | 1.21 | 1.22 | 1.23 | 1.23 | 1.24 | 1.24 | 1.25 | 1.25 | 1.26 | 1.27 | 1.27 | 1.28 | 1.28 | 1.29 | 1.30 |
| OI | 1.20 | 1.21 | 1.21 | 1.22 | 1.24 | 1.25 | 1.27 | 1.28 | 1.30 | 1.32 | 1.33 | 1.35 | 1.36 | 1.38 | 1.40 | 1.42 | 1.43 | 1.45 |

## C3 tyres

The change rates of wet grip index in the various scenarios:

| | New scenarios | |
|---|---|---|
| Scenario | BAU (TOL data) | OI |
| % Rate | 0.51% | 1.4% |

Wet grip index development for C3 tyres

| year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C3 BAU | 1,05 | 1,05 | 1,06 | 1,06 | 1,07 | 1,07 | 1,08 | 1,09 | 1,09 | 1,10 | 1,10 | 1,11 | 1,11 | 1,12 | 1,12 | 1,13 | 1,14 | 1,14 |
| OI | 1,05 | 1,05 | 1,06 | 1,07 | 1,09 | 1,10 | 1,12 | 1,13 | 1,15 | 1,17 | 1,18 | 1,20 | 1,21 | 1,23 | 1,25 | 1,26 | 1,28 | 1,30 |

# Appendix 7 – External rolling noise development

Forecast of development for external rolling noise measured values. External rolling noise was not forecasted in the EPEC impact assessment.

## C1 tyres

The change rates of external rolling noise measured values in the various scenarios:

| | New scenarios | |
|---|---|---|
| Scenario | BAU (TOL data) | OI |
| % Rate | 0.1% | -0.2% |

External rolling noise measured values development for C1 tyres

| year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 BAU | 70,67 | 70,86 | 70,80 | 70,87 | 70,94 | 71,00 | 71,07 | 71,13 | 71,20 | 71,26 | 71,33 | 71,40 | 71,46 | 71,53 | 71,59 | 71,66 | 71,73 | 71,79 |
| C1 OI | 70,67 | 70,86 | 70,80 | 70,65 | 70,49 | 70,34 | 70,18 | 70,03 | 69,87 | 69,72 | 69,57 | 69,41 | 69,26 | 69,11 | 68,95 | 68,80 | 68,65 | 68,5 |

## C2 tyres

The change rates of external rolling noise measured values in the various scenarios:

| | New scenarios | |
|---|---|---|
| Scenario | BAU (TOL data) | OI |
| % Rate | 0.03% | -0.3% |

External rolling noise measured values development for C2 tyres

| year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C2 BAU | 71,98 | 72,07 | 72,03 | 72,05 | 72,07 | 72,09 | 72,11 | 72,13 | 72,15 | 72,17 | 72,19 | 72,21 | 72,23 | 72,25 | 72,27 | 72,29 | 72,31 | 72,33 |
| C2 OI | 71,98 | 72,07 | 72,03 | 71,78 | 71,54 | 71,31 | 71,07 | 70,83 | 70,59 | 70,36 | 70,12 | 69,89 | 69,66 | 69,42 | 69,19 | 68,96 | 68,73 | 68,50 |

## C3 tyres

The change rates of external rolling noise measured values in the various scenarios:

| | New scenarios | |
|---|---|---|
| Scenario | BAU (TOL data) | OI |
| % Rate | -0.33% | -0.3% |

External rolling noise measured values development for C3 tyres

| year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C3 BAU | 72,19 | 72,05 | 71,71 | 71,47 | 71,23 | 71,00 | 70,76 | 70,52 | 70,29 | 70,05 | 69,82 | 69,59 | 69,35 | 69,12 | 68,89 | 68,66 | 68,43 | 68,21 |
| C3 OI | 72,19 | 72,05 | 71,71 | 71,49 | 71,27 | 71,06 | 70,84 | 70,62 | 70,41 | 70,19 | 69,98 | 69,77 | 69,55 | 69,34 | 69,13 | 68,92 | 68,71 | 68,50 |