

# **Tyres in Europe**

## **Tightening of tyre limits and further suggestions for improvement**

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# 1 Introduction

Data behind the tyre label show significant benefits moving from G to A, see Figure 1. For a country or the EU as a whole better quality tyres would amount to big potential benefits. In 2014 the Ministry of Infrastructure and Environment in the Netherlands have had TNO and M+P investigate (Ref [2]) what benefits would evolve from using the best possible quality tyres, 'Triple A' according to the tyre label. The potential gains were such that the Netherlands decided to follow a two-track policy regarding car tyres:

1. Start an awareness campaign on better tyres, both for car drivers/owners and people working in the tyre retail business.
2. Promote stricter tyre limits in the EU and ECE.

Tyres are the only contact of cars with the road surface, and are, therefore, extremely important for safety, rolling resistance, rolling noise and other performances of the vehicle. Better quality tyres save lives, reduce fuel consumption, exhaust gas emissions (CO<sub>2</sub> and air pollution) and noise emissions. Furthermore, better tyres involve a reduction of the cost of ownership for the consumer. Better tyres are amply available and there is sufficient information to make a well-considered choice. In addition, the price of tyres is only a fraction of the price of (new) cars. Yet, many people base their choice of tyres solely on the purchase price, which may lead to the influx of inferior, dangerous and cost rising products. This influx is permitted under EU law, as the current tyre limits are significantly below the current state of the art. This is the main argument to tighten the tyre limits to the current state of the art on the short term. For the longer term it is proposed to tighten the tyre limits with the current best available technology as to keep on pace with the swiftly improving tyre technology. From these new limits, all EU citizens will profit.

EU citizens will also profit from keeping their tyres properly inflated. This will also reduce fuel costs, increase safety and reduce noise and tyre wear.

This paper is a background document to underpin the second track of the Dutch policy, the tightening of tyre limits. Besides tyre limits other aspects related to tyres and tyre pressure are addressed. In chapter 2, this background document first analyses current EU tyre limits and possible future limits in the short term and the longer term. In the second paragraph, the benefits of better quality tyres in general as well as connected to stricter tyre limits are discussed. The third paragraph of chapter 2 deals with the correlation between the quality of tyres and costs. Chapter 3 also has three paragraphs. The first two paragraphs analyse issues related to tyre quality and tyre pressure. The last paragraph gives suggestions for improving the situation on tyre quality and on tyre pressure.

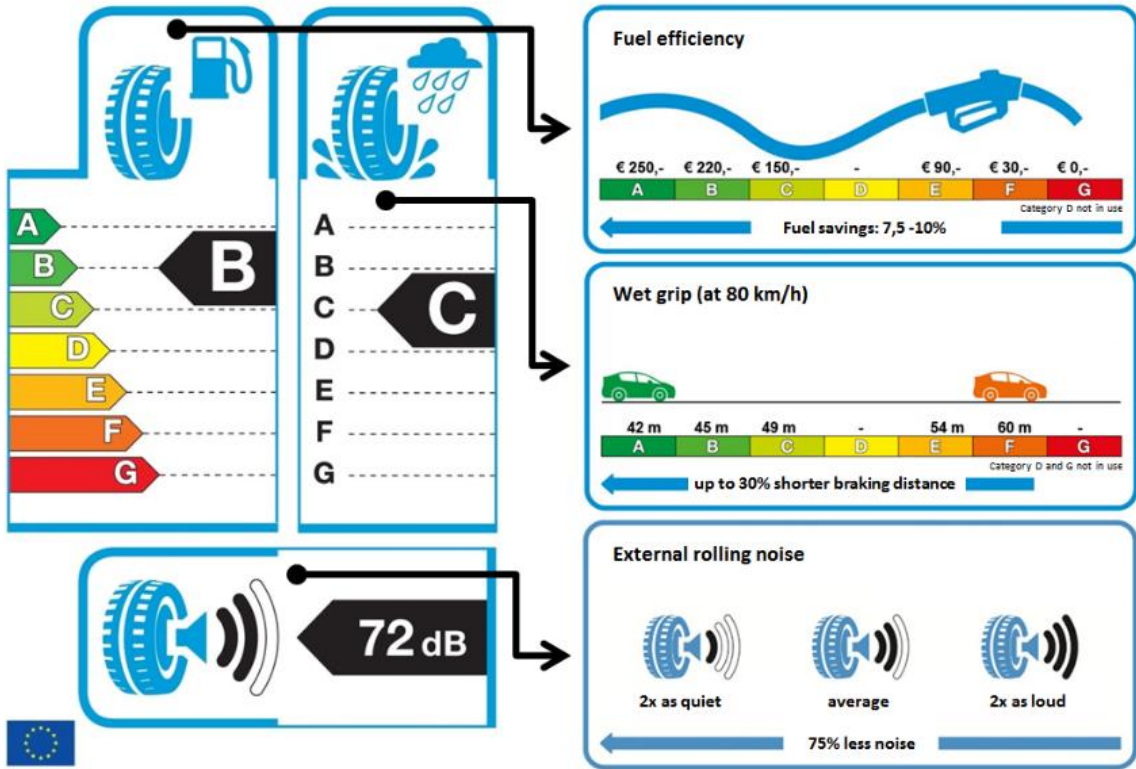


Figure 1. The tyre label explained graphically.

## 2 Tyre limits

Over the past years, the quality of sold tyres in the Netherlands has improved. This is partly due to autonomous development. The tyre label, in effect since November 2012, will have contributed significantly. This development gives room for improving the tyre limit values in EU and ECE regulations (Ref [20], [22]). The current limits were set in 2009 and introduced several phases. In 2020 the final step of Stage 2 of both EU and ECE Regulations will come into force. Therefore, it is time to consider further tyre limits for the future.

This chapter first explores new limits for the short and longer time. In the second paragraph, the potential benefits of better tyres have been calculated. The last paragraph shows that better quality tyres do not cost more, on the contrary.

### 2.1 Tightening of the EU tyre limit values

To explore what tyre limits would be possible M+P investigated the sales of tyres in the Netherlands and their tyre label values (Ref [1], [3], [5]), see figures 2.

In addition, a study was performed on the quality of tyres of new cars (OEM tyres) (Ref [10]). It was concluded that there is a significant spread in the performance of tyres. Most tyres perform much better than the limits. There is only a small group of products which perform close to the limit. Over 90% of the tyres on the streets belong to the top 6 or 'premium tyre brands'. These brands are mainly sold as OEM tyres. The average performance of these tyres is significantly better than the average performance of the rest of the brands. The average noise emission is 0,9 dB(A) lower and the number of A and B labels for Rolling Resistance and Wet Grip is twice as high.

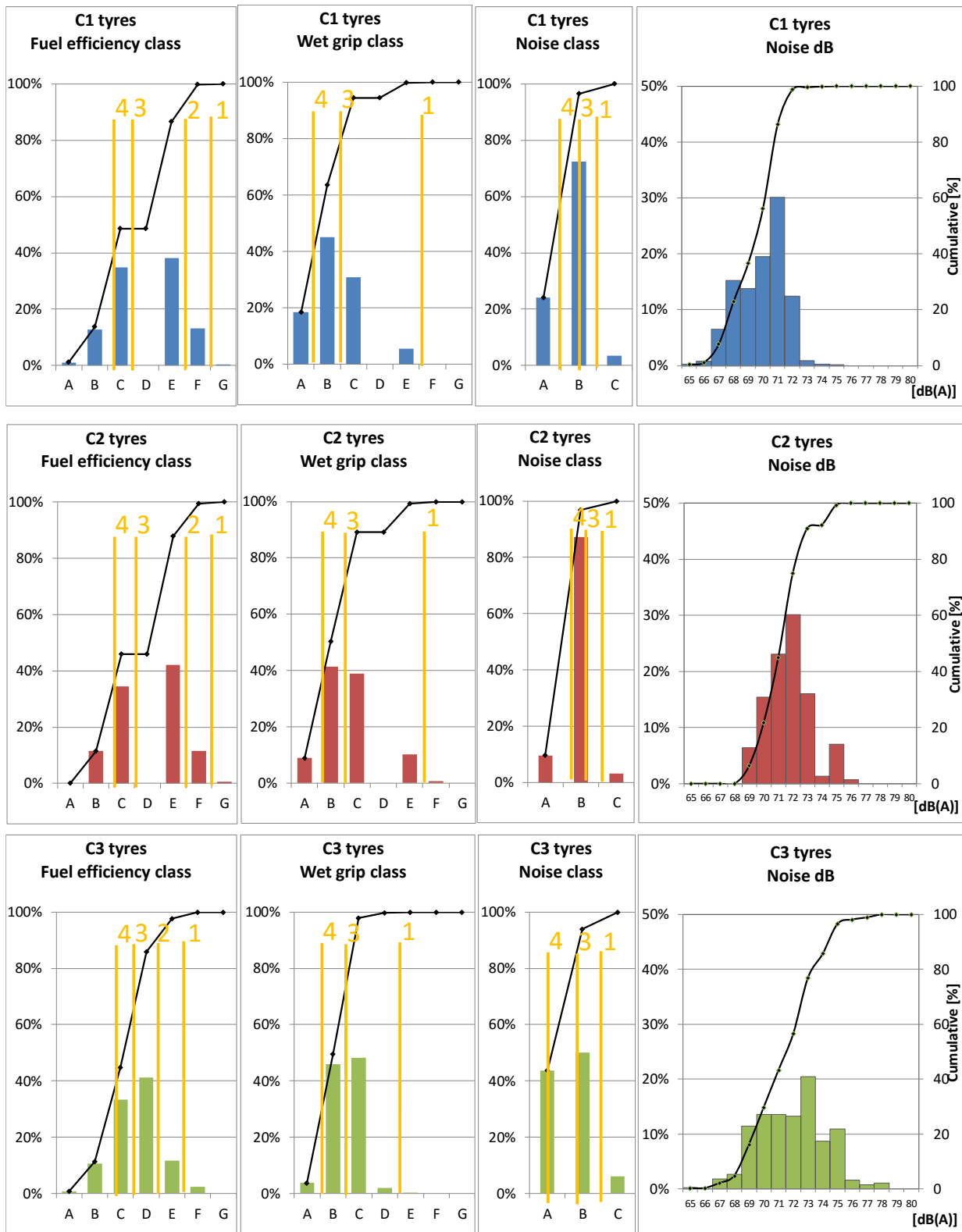


Figure 2. Statistics of label values of C1, C2 and C3 tyres, based on 2016 data (Ref [15]). The yellow lines represent the existing (1 and 2) and suggested limit Stages (3 and 4) following table I, table II and table III. Stage 2 does not exist for all tyre classes.

Based on the outcome of these research projects one could imagine two further stages of tightening the tyre limits. The suggested limits for the short term could be set such that around 50% of the tyres sold in 2016 would comply with the limits as given in Stage 3. One could say that Stage 3 limits would follow technology. The top 20% of the tyres sold in 2016 would be the basis for the suggested limits for the longer term as given in Stage 4. Stage 4 limits would push technology. These percentages are taken from the data analysis of 2016 tyre label data (see figure 2). The affiliated percentage of compliant tyres, following Dutch statistics<sup>1</sup>, are given in table I, table II and table III.

table I Rolling resistance. Suggestion for future Stage 3 and 4 limits for standard tyres<sup>a,b</sup>

Tyre type	Current limit			Stage 3 Short term (e.g. 2020)				Stage 4 Longer term (e.g. 2030)			
	Data analysis			Data analysis			Suggested limit (kg/ton)	Data analysis			Suggested limit (kg/ton)
	Limit (kg/ton)	compliant label values	% tyres compliant	label values analysed	connected limit (kg/ton)	% tyres compliant		label values analysed	connected limit (kg/ton)	% tyres compliant	
C1	≤10.5	A,B,C,E	89%	A,B,C	≤ 9.0	59%	≤ 9.0	A,B	≤ 7.7	19%	≤ 8.0
C2	≤9.0	A,B,C,E	96%	A,B,C	≤ 8.0	65%	≤ 8.0	A,B	≤ 6.7	19%	≤ 7.0
C3	≤6.5	A,B,C,D	96%	A,B,C	≤ 6.0	60%	≤ 6.0	A,B	≤ 5.0	15%	≤ 5.5

<sup>a</sup> Special/winter/traction tyres may have different limits and different allowable label values

<sup>b</sup> percentage compliant tyres is based on 2016 tyre label data of “top 6” brands (91% of sales in NL)

table II Wet grip. Suggestion for future Stage 3 and 4 limits for standard tyres<sup>a,b</sup>.

Tyre type	Current limit			Stage 3 Short term (e.g. 2020)				Stage 4 Longer term (e.g. 2030)			
	Data analysis			Data analysis			Suggested limit (G)	Data analysis			Suggested limit (G)
	Limit (G)	compliant label values	% tyres compliant	label values analysed	connected limit (G)	% tyres compliant		label values analysed	(G)	% tyres compliant	
C1	≥1.1	A,B,C,E	100%	A,B	≥ 1.4	79%	≥ 1.45	A	≥ 1.55	26%	≥ 1.6
C2	≥0.95	A,B,C,E	100%	A,B	≥ 1.25	65%	≥ 1.25	A	≥ 1.4	14%	≥ 1.35
C3	≥0.80	A,B,C,D	99%	A,B	≥ 1.1	59%	≥ 1.1	A	≥ 1.25	5%	≥ 1.2

<sup>a</sup> Special/winter/traction tyres may have different limits and different allowable label values

<sup>b</sup> percentage compliant tyres is based on 2016 tyre label data of “top 6” brands (91% of sales in NL)

<sup>1</sup> Note: although the used statistics are Dutch, the market in the Netherlands reflects the European market. The data are in agreement with data from Denmark (Danish Road Safety Agency, 15<sup>th</sup> July 2016, reaction to the Commission after the 132<sup>nd</sup> meeting of the WGMV, 5th July 2016))

table III External Noise. Suggestion for future Stage 3 and 4 limits for standard tyre<sup>a,b</sup>.

Tyre type	Current limit			Stage 3 Short term (e.g. 2020)				Stage 4 Longer term (e.g. 2030)			
	Data analysis			Data analysis			Suggested limit (dB(A))	Data analysis			Suggested limit (dB(A))
	Limit (dB(A))	compliant label values	% tyres compliant	Change vs current limit	noise values analysed	% tyres compliant		Change vs current limit	noise values analysed	% tyres compliant	
C1 (A-E)	≤70-74	A,B	93%	-1dB	≤69-73	58%	≤69-73	-3dB	≤67-71	16%	≤67-71
C2	≤72	A,B	95%	-1dB	≤71	47%	≤71	-2dB	≤70	28%	≤70
C3	≤73	A,B	95%	-2dB	≤71	60%	≤71	-4dB	≤69	28%	≤69

<sup>a</sup> Special/winter/traction tyres may have different limits and different allowable label values

<sup>b</sup> Percentage compliant tyres is based on 2016 tyre label data of “top 6” brands (91% of sales in NL)

The suggested limits hold two stages of further tightening of the limits. Stage 3, for instance, could enter into force on the short term (e.g. by 2020) and Stage 4 should enter into force on the longer term (e.g. by 2030). Transitional provisions would allow for the sale of existing tyres for another 2 years (C1 and C2 tyres) or 4 years (C3 tyres).

The suggested limits in the tables I, II and III replace previous proposals from the Netherlands in the EU and ECE (Ref [3], [8], [11], [16]).

Interesting is the interaction between the three performance criteria on the tyre label. In the past, various researchers assumed a low correlation or even a negative correlation (e.g. high performance on rolling resistance means low performance on wet grip). In the latest statistics of the tyre label values, a new trend with frontrunners can be observed: they have high performance in all three label criteria. Assuming no correlation and 50% compliance on three criteria, the percentage of compliant tyres to all three criteria would be  $0.5 \cdot 0.5 \cdot 0.5 = 0.125$  or 12.5 percent. In reality, however, 21% of tyres already complied in 2016 with all three Stage 3 limits.

## 2.2 Benefits of tightening tyre limit values

After the study on the potential benefits of triple A tyres in the Netherlands (Ref [2]) also these potential benefits have been calculated for the EU (Ref [6], [7]). These benefits are given in table IV.

Starting point for the calculated benefits given in table IV is the average tyre label in the Netherlands, D/E for Fuel Efficiency, C for Wet Grip and B for Noise. For the suggested Stage 3 limits, the potential benefits would be around half of the calculated benefits in table 4 since approximately the label values C, B and A would form the limit (see table VII for the calculated potential benefits of Stage 3 limits). For the suggested Stage 4, the benefits would lie close to the calculated benefits in table IV.



table IV Potential Benefits<sup>a</sup> of Triple A tyres in the EU.

Potential benefits	Energy	Safety	Noise	TOTAL
Annual fuel savings [billion l]	17	-	-	
Annual CO <sub>2</sub> reduction [MtCO <sub>2</sub> ]	<b>42</b>	-	-	
Reduced number of fatalities	-	<b>2567</b>	-	
Reduced number of slight/ serious injuries	-	<b>19631/ 12353</b>	-	
Reduced number of annoyed people [millions]	-	-	<b>13</b>	
Reduced number of sleep disturbed people [millions]	-	-	<b>6</b>	
Annual cost savings [billion €]	13	10	11	<b>34</b>

<sup>a</sup>Fuel costs savings are calculated from a societal perspective, excluding taxes. The potential benefits for correct tyre pressure are given in table V.

Besides the advantages on safety (improved braking distance on a wet surface) and production of noise (also detectable inside the vehicle), all consumers would profit from better quality tyres because they would save fuel and thus money. A calculation for various vehicle types, based on the updated Triple A study done for the Netherlands in 2016 (Ref [4]), is given in table V.

table V Potential benefits<sup>a</sup> of tyres with an A label for fuel efficiency, including proper tyre pressure. The savings for keeping the tyres of the vehicles at the proper tyre pressure are given separately between brackets.

Vehicle type	Km/year	Fuel savings/year [l]	Cost savings/year [€]
Passenger car (Petrol)	17.000	84 (19)	121 (27)
Passenger car (Diesel)	35.000	138 (31)	151 (34)
Delivery van (D)	35.000	183 (41)	201 (45)
Delivery truck (D)	60.000	388 (70)	427 (78)
Heavy duty truck (D)	130.000	2150 (414)	2365 (456)
Bus (D)	50.000	789 (155)	868 (171)

<sup>a</sup>The benefits are calculated from an end-user perspective, including taxes.

The calculated savings for keeping the tyres at the proper tyre pressure are independent of the quality of the tyres. Improving the tyre pressure will give a direct benefit. Changing tyres to better quality ones, when they are worn, would give the additional benefits.

### 2.3 Tyre quality and price

The question rises whether tyres with better labels are more expensive. To investigate this M+P made an analysis of tyres sold in the Netherlands and correlated the various aspects of the tyre labels with the price of the tyres (Ref [8]). Figure 3 gives these correlations. Surprisingly, M+P found a slight negative correlation ( $R^2 < 5\%$ ). This means that the correlation between label value and price is very low and better tyres are a little cheaper. Tyres with good label values and a reasonable price are amply available. This is true for 'premium tyre brands'. Cheaper tyres are available but usually have lower quality. Any price difference between tyres is more than recovered by the financial benefits of better fuel economy due to better label values for rolling resistance (see Figure 1)

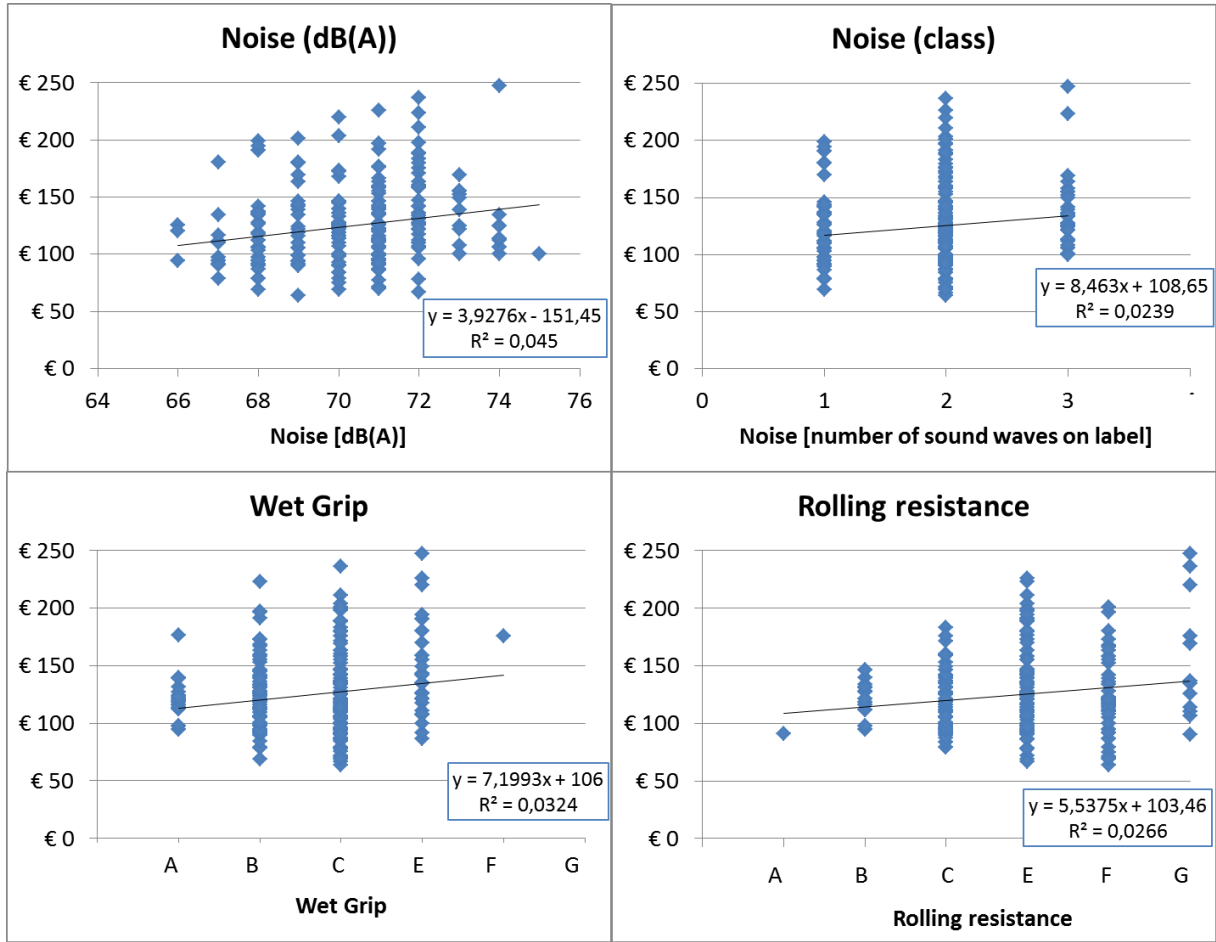


Figure 3. Aspects of the tyre label versus the advice sale prices of car tyres in the Netherlands. Internet sales the Netherlands, 472 tyres size 205/55R16, <http://www.autobandenmarkt.nl/index.html>.

### 3 Related tyre issues

Besides stricter tyre limits one could do much more to improve the performance of cars driving on the roads and thus reduce further fuel consumption, exhaust gas emissions (CO<sub>2</sub> and air pollution), noise emission and wear. The information in this chapter comes to a large extent from experiences gathered in the awareness campaign 'Kies de Beste Band' in which the ministry works together with many stakeholders. This chapter analyses some issues in a first paragraph on tyre quality and a second paragraph on tyre pressure. Paragraph three gives suggestions for improvements to harvest many benefits.

#### 3.1 Tyre Quality

##### Tyre Label

In 2013 fewer than 10% of Dutch car drivers were aware of the EU tyre label. In 2016 the situation in the Netherlands has improved to almost 20% (Ref [24]). Yet, most of this 20% were unable to identify what the letters A-G and the colors Green-Red on the label stand for. Even for many people working in the tyre retail sector **the label is more or less a 'black-box'**. The label as it looks now does not invite consumers and people working in the tyre retail sector to enter into a discussion which would be the best possible tyres for the car of the owner.

**The grip indicator on the tyre label** indicates wet grip and is the same for all types of tyres. Winter tyres have the same three tyre label indicators as summer tyres. This is all right for fuel efficiency and external noise but not for grip. Winter tyres should have an indicator for grip on snow/ice. In addition, when looking at a tyre label it is **unclear if the tyre is a summer, a winter or an all season tyre**. One should distinguish between different types of tyres such as summer tyres and winter tyres.

It is the interaction between tyres and road surfaces that determine to a large extent the performance of cars. Both tyre manufacturers and road builders argue that safety, fuel efficiency, noise and wear is a complex issue where much could be gained when tyres and road surfaces would be dealt with together. Both worlds agree that **tyres and road surfaces should be more aligned**.

The quality of the tyre label strongly depends on the responsibility of the tyre producers. Article 9.2 of the Regulation on the Labelling of Tyres (Ref [21]) leaves the **control and maintenance of the labels of tyres to the Member States**. They may require suppliers to provide technical information in accordance with article 4.4 but only if they have evidence that labels and product information does not comply with the Regulation. Most tyre manufacturers will, of course, comply with the Regulation and accurately put the right quality of their tyres on the label. However, tyre tests as performed by European automobile clubs such as ADAC show that not all tyres perform as their labels indicate.

##### State of the Tyres

Unawareness of the importance of tyres, contributes to poor **maintenance by car owners**. In the Netherlands the VACO (branch organization for tyres and wheels) regularly researches the 'State of the (quality of) Tyres', see table VI (Ref [17]). In the EU 26,000 people are killed in traffic every year and almost 1.5 million are injured. Bad tyres and underinflated tyres are estimated to be the cause of 2.5% of these fatalities and injuries. For the EU this means that 650 fatalities and almost 40 thousand injuries are caused by tyres.

table VI State of the Tyres in the Netherlands, 2015.

Passenger cars with at least one tyre	Percentage	Total NLs <sup>a</sup> (million)
Irregular wear or damage	41	3,35
Damage	25	2,04
Irregular wear or damage	10	0,82
(Ageing) little cracks or tear	26	1,12
Danger to traffic safety	9	0,74
Underinflation	>60	5

<sup>a</sup>In the Netherlands there are 8 million passenger cars.

### Tyre wear

Tyres wear slowly, by physical abrasion and chemical reactions induced by UV and ozone. Tyre wear is dependent on many factors, such as tyre and road characteristics, vehicle weight, tyre inflation and wheel alignment and driving style. In the Netherlands tyre wear accounts for 17.3 kton or approximately 1 kg per capita per year. Extrapolating the figures for the EU, tyre wear particle emission would be around 0.5 Mton a year. This accounts for approximately 40% of the total microplastics originating from plastic debris, pellets, paint particles, microbeads in cosmetics and abrasive cleaning agents. Microplastics might have a link with health as they are found in seafood and air. The attention for tyres as a major source of microplastics is not restricted to the Netherlands. The OSPAR Commission has recently adopted an assessment document on different land-based sources of microplastics including tyres. Furthermore, under the European Marine Strategy Framework Directive (Ref [23]), the EU is preparing a European Plastic Strategy to be finalized at the end of 2017. Measures to reduce microplastics emissions from several sources, including tyres, are investigated by the EU at this moment as part of this strategy.

Also for car owners, the durability of tyres would be an interesting indicator to consider when they buy new tyres. Now, there are ***no limits in the EU for tyre wear.***

## 3.2 Tyre pressure

### Under inflation

In the Netherlands more than 60% of the vehicles have underinflated tyres (ref [18]). There is reason to believe that the situation in the EU might be worse for the Netherlands have relatively many air pumps available for cars compared to other countries. In 2016 TNO calculated the effects related to under inflation for the Netherlands (Ref [4]). Using these figures and extrapolating these figures for the EU results in significant benefits for tyres from the current situation (***60% of the cars with tyres that are underinflated***) to the situation in which tyres would be properly inflated. For CO<sub>2</sub> alone the reduction in the EU would be 12 Mton CO<sub>2</sub> per year. This adds to what could be gained with better quality tyres for fuel efficiency: a total potential reduction of 54 Mton CO<sub>2</sub> (see table IV and table VII) .

table VII Potential Benefits<sup>a</sup> of Triple A tyres, Stage 3 limits and Benefits for proper tyre pressure in the EU.

	Triple A tyres	Stage 3 limits	Proper tyre pressure
Annual fuel savings [billion l]	17	8	5
Annual CO2 reduction [MtCO2]	42	21	12
Reduced number of fatalities	2567	1300	140 <sup>b</sup>
Reduced number of slight/ serious injuries	19631/ 12353	10000/ 6000	1100 <sup>b</sup> / 7000 <sup>b</sup>
Reduced number of annoyed people [millions]	13	6	1.5
Reduced number of sleep disturbed people [millions]	6	3	0.6
Annual cost savings [billion €]	34	17	6

<sup>a</sup>Fuel costs savings are calculated from a societal perspective, excluding taxes.

<sup>b</sup>The reduced numbers of fatalities and injuries as a result of improved inflation of tyres have been estimated by multiplying EU fatality rates with 0.5% (The 0.5% figure is used by SWOV, Foundation for scientific research for traffic safety in the Netherlands). UK TyreSafe estimates that 40% of the accidents attributed to tyres (2.5% of the total number of accidents) are caused by underinflation, which would triple the numbers of reduced fatalities and injuries in the last column of table VII. (<http://www.nickfreemansolicitors.co.uk/40-car-fault-accidents-caused-inflated-tyres/>)

Under inflation is a significant source of tyre wear. It unnecessarily adds to the emission of microplastics. 60% of the cars in the Netherlands have underinflated tyres and 19% even have at least one tyre with an under inflation of 30% (Ref [18]). **Under inflation increases tyre wear.** A 30% under inflation will increase wear with 50%.

The cause of under inflation is that **tyres deflate 3-5% a month**. This is a natural process independent whether the tyres are filled with air or pure nitrogen. Car owners should regularly inflate their tyres, preferably once every 1-2 months. Regrettably, user manuals of many car brands give poor information on tyres and tyre pressure. In the Netherlands the tyre awareness campaign 'Kies de Beste Band' (English translation 'Choose the Best Tyre') (Ref [13], [29], [30]) advises car drivers to check their tyre pressure at least every 2 months (see Figure 4).



Figure 4. Text on a digital route information panel to remind car drivers to check their tyre pressure every 2 months.

Under inflation of tyres has been addressed in the EU. Since November 2014, all cars must be equipped with a tyre pressure monitoring system (TPMS) (Ref [20]). Unfortunately, the majority of these TPMS only have a warning light that gives a signal when one of the tyres is heavily underinflated (>20%) or reaches 1.5 bar. **TPMS with just a warning light had better be called TLA (Tyre Leak Alert)** for they do detect dangerous situations but do not really monitor tyre pressure. Although these TPMS are a good first step, many car drivers interpret TPMS with just the warning light in such a way that they do not inflate their tyres unless the warning signal lights up. This is counterproductive: it would lead to more under inflation and would be the cause of more unsafe driving, more fuel use and tyre wear.

**Tyres should be inflated when they are cold.** A major cause of under inflation is that most car drivers do not account for the increase of tyre pressure when the tyres have been warmed up. This already happens after approximately 5 km or 15 minutes of driving. What occurs is that many drivers check their tyre pressure when they fuel their car and tyres have warmed up. The increased pressure might be 0.3 bar. As a result many car drivers will deflate to the value they read on the tyre pressure stickers or in the user manual. In the tyre awareness campaign in the Netherlands stickers will be pasted on air pumps at gasoline stations on motorways to warn drivers to increase the advised tyre pressure with 0.3 bar when the tyres have warmed up (see Figure 5). Ideally, people checking their tyre pressure should not deflate their tyres when they are checking the tyre pressure. In the Netherlands there are tyre air pumps which take into account warmed up tyres ([Ref 18]).



Figure 5. Sticker developed in the Dutch awareness raising campaign 'Kies de Beste Band'. The sticker will be pasted on air pumps at gasoline stations along motorways this summer.

### 3.3 Suggestions for improvements on tyre quality and tyre pressure

This paragraph will give suggestions to improve the issues analyzed in the paragraphs 3.1 and 3.2.

#### Tyre label

Communication should not be left to automotive experts alone. The current tyre label is a perfect example of this statement. The tyre label as it stands may be correct, but only gives an indication and practically no information. Many of the issues discussed in paragraph 3.1 can be addressed by adjusting the tyre label. The most important thing to do is to **add information that is relevant for car owners and people working in the tyre retail sector**. Of course, the information that can be added on the label is limited but already some information would boost the discussion between car owners and people working in the retail sector. A more informative tyre label should also **distinguish between summer, winter and all season tyres**. The **Grip indicator for summer tyres and winter tyres should differ**: Wet Grip for summer tyres and Snow/Ice Grip for winter tyres. By adding Snow/Ice grip to the tyre label one can compare the different tyre types and it would generate more consciousness of how important tyres are. Figures 6 and Figure 7 show the present label and suggestions for more informative tyre labels for summer, all season and winter tyres. Besides giving more information a striking difference would be the addition of Snow/Ice Grip on the label of all three tyre types. For summer tyres this may not seem logic because summer tyres are not meant for use in winter conditions. It would also mean that summer tyres should be tested for Snow/Ice Grip, which would mean extra costs for the tyre manufacturers. The advantage would be that car owners realize that summer tyres are dangerous in real winter conditions and possibly decide to go for winter tyres in the winter. Of course they may also decide not to buy winter tyres and not use the car when there is snow or ice on the roads.

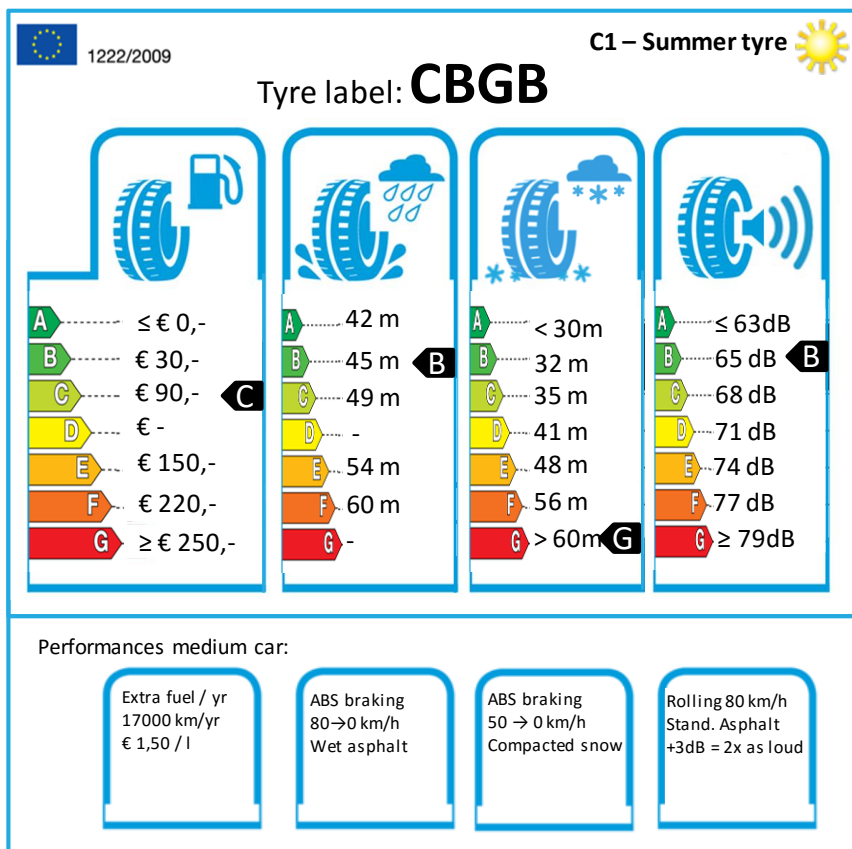
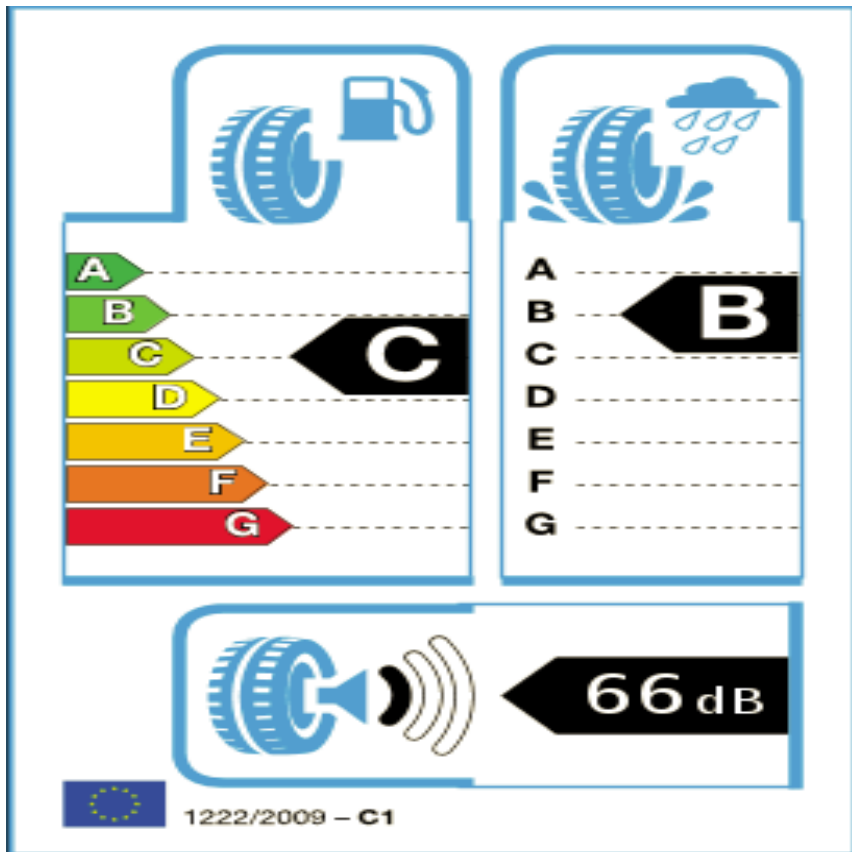


Figure 6. Present label (upper) and a suggestion for a tyre label for a summer tyre (lower), including more and intriguing information for car owners and people working in the tyre retail sector.



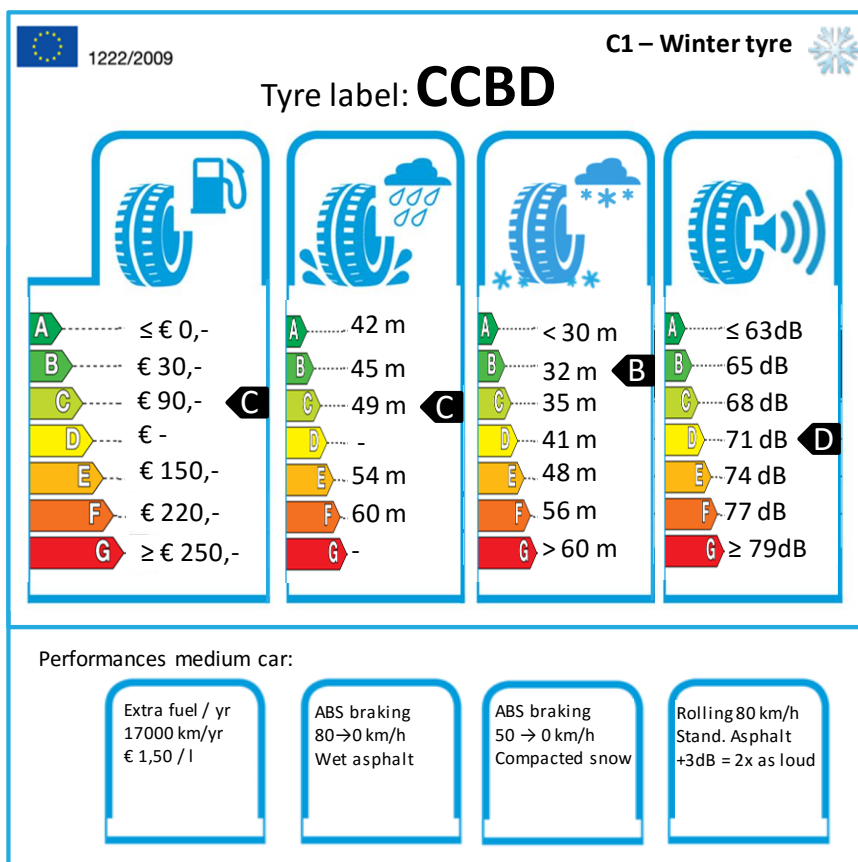
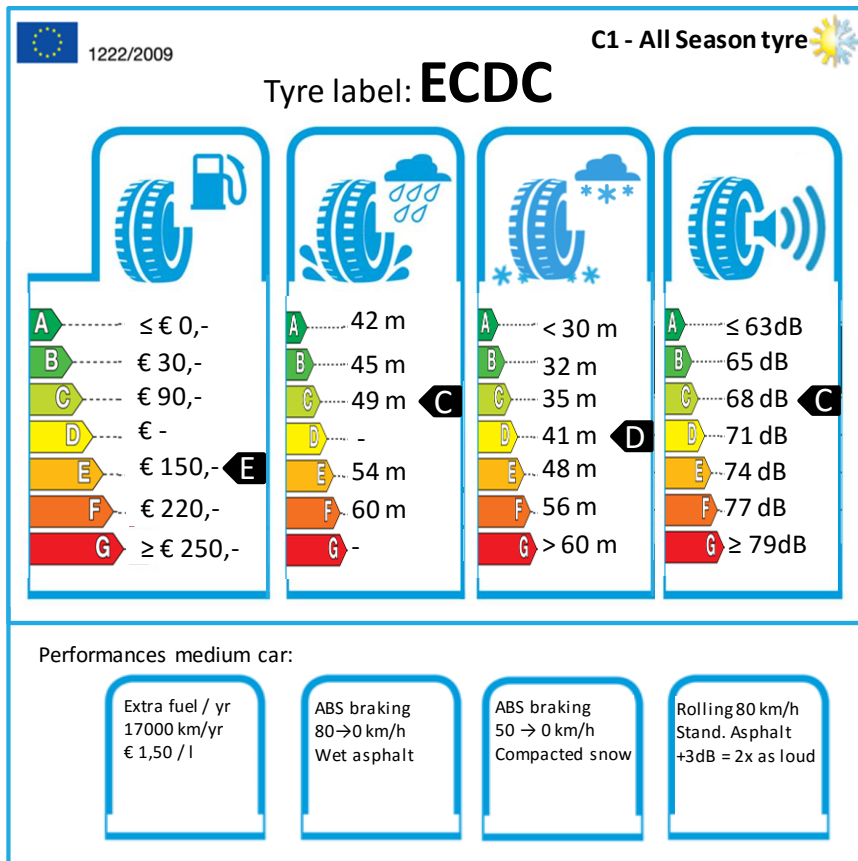


Figure 7. Suggestions for a tyre label for an all season tyre (upper) and a winter tyre (lower), including more and intriguing information for car owners and people working in the tyre retail sector.

To address tyre wear one would need a standardized monitoring methodology. Once this has been agreed upon in the EU one could consider wear as a possible 4th or 5th indicator on the tyre label. A standard for tyre wear could build on the same monitoring method if an indicator for wear is desired. In dealing with tyre wear making a standard and/or placing an indicator on the label it is important to distinguish between wear and mileage. Definitions in this context are:

-Durability of a tyre refers to the tyre structure and is influenced by many factors, such as tyre pressure, driving behavior, load, etc.

-Tyre Tread Abrasion Rate (TTAR) is the total amount of matter removed from the tyre tread due to its normal use per unit distance, measured in grams/km.

-Tyre Wear Life (TWL) is the distance that a tyre can cover before reaching the legal limit for tyre tread, measured in km.

Using TWL as a the wear indicator on the label or as the wear standard might prove counterproductive. Tyre manufacturers may decide to increase the tyre tread which would score well on the label but would increase the emission of microplastics. Choosing Durability or TTAR as an indicator for the tyre label or for setting a limit for wear might be better. On the other hand, consumers would confuse such definitions with mileage. Furthermore, it is the debatable if such an indicator should be on a consumer label at all.

The introduction of wear on the tyre label and setting a limit for tyre wear is quite complicated and will therefore take some time to accomplish. It is not realistic to foresee the implementation within the next ten years. However, the European Commission might speed things up if Member States and the European Parliament prioritize the subject.

#### Market surveillance of tyre labels

‘Trust is good but check and maintenance is better’. This is more relevant than ever after the diesel fraud scandal. In the next evaluation of the Regulation on General Safety (Ref [20]) and Tyre label Regulation (Ref [21]) **market surveillance should be reinforced**. Tyre manufacturers should be obliged to give information on their test data behind the label value they put on their tyres, preferably using a standard format issued by the European Commission. The data should be publically available e.g. on the internet. In addition, the Commission should set up random sample tests to see whether labels comply with the indicator value put on the labels of the tyres. Finally, maintaining the quality of the tyre label should be the responsibility of the European Commission. This is much more efficient than leaving this to Member States, especially small Member States.

#### Clean Vehicle Directive

As stated in the introduction, the first track of the Dutch policy regarding car tyres is an awareness campaign on better tyres, both for car drivers/owners and people working in the retail sector. The two main messages of the campaign are:

1. Choose the best possible tyre when tyres are worn and one has to buy new tyres.
2. Keep the tyres at the advised tyre pressure.

In the campaign, many activities and actions have been undertaken. In the Netherlands car lease companies provide cars to companies, local, regional and national governments. They buy almost half of the total number of new cars bought in the Netherlands. They all are an important target group for the campaign. On request of the Ministry of Infrastructure and Environment TNO has calculated the potential benefits for the fleets of the Dutch National Road Authority and the municipalities of Amsterdam and Rotterdam (Ref [9]), see table VIII. With this information at hand the campaign made fleet owners a group to approach with the main messages of the campaign.

Table VIII Potential benefits<sup>a</sup> for car fleets using an A tyre for fuel efficiency and proper tyre pressure (proper tyre pressure).

Potential benefits	Dutch National Road Authority (RWS)	Amsterdam	Rotterdam
Number of vehicles	1575 <sup>b</sup>	781	1097
Vehicle average [ km/yr ]	26.000	17.200	17.300
Annual fuel savings (correct pressure) [ thousands ltr]	153.000 (26.500)	147.000 (33.000)	200.000 (45.000)
Annual CO2 reduction [ ton CO2]	388 (66)	379 (86)	514 (116)
<b>Annual cost savings [€]</b>	<b>237.500</b> <b>(42.000)</b>	<b>224.000</b> <b>(51.000)</b>	<b>303.000</b> <b>(69.000)</b>
<b>Annual cost savings per vehicle [€]</b>	<b>150 (36)</b>	<b>287 (65)</b>	<b>277 (63)</b>

<sup>a</sup> benefits are calculated from an end-user perspective, including taxes.

<sup>b</sup>the calculation could be done for 1170 cars.

We invite fleet owners and car lease companies to subscribe to a Declaration on Best Tyres (Ref [27]). The two main things the declarant subscribes to in the Declaration are exactly the two main goals the campaign tries to achieve. Currently, there are 30 subscribers to the Dutch ‘Verklaring Gebruik Beste Banden’. The city of Rotterdam initiated an English version of the Declaration (Ref [28]) meant for the 200 EUROCITIES. Rotterdam and Amsterdam are subscribers to this Declaration.

At the moment the European Commission is revising the Clean Vehicles Directive (Ref [26]), a perfect moment to see that this directive takes up the content of **the Declaration on Best Tyres and includes tyres in the Directive.**

#### Road surface label

A first step to connect the worlds of tyres with that of road surfaces could be the **introduction of a road surface label**. A road surface label developed in the Netherlands (Ref [14]) has been presented at the 65<sup>th</sup> session Working Group on Noise of the UNECE, see Figure 8. At the 66<sup>th</sup> session in September 2017 the group that developed the label will present the methodology behind the label. The intention of the UNECE Working Group is to draft a voluntary guideline that can be followed. The draft road surface label consists of four indicators of which three correspond with the three items on the tyre label. Such a road surfaces label would increase transparency in road building, initiate innovation and allow for a better understanding between road builders and tyre manufacturers.

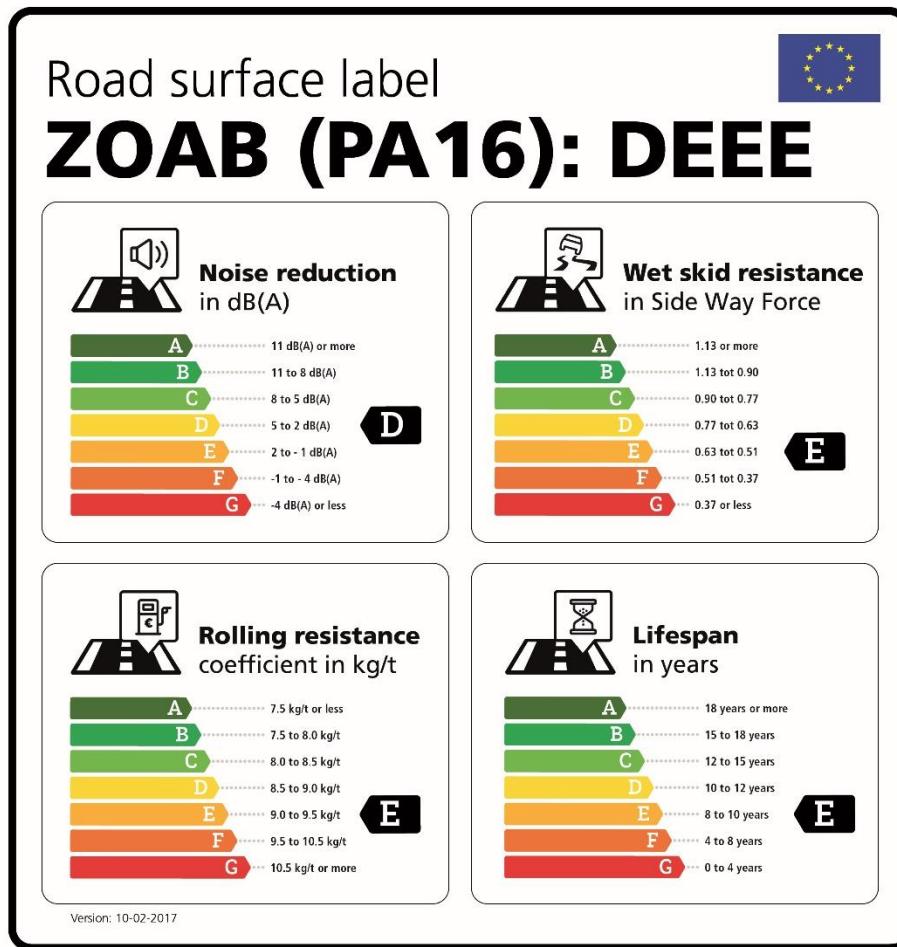


Figure 8. Example of a road surface label with four indicators including information relevant for road builders and municipal, regional and national road authorities. (Ref [14])

### Tyre pressure

In the evaluation of the Regulation on General Safety (Ref [20]) the **obligation to install TPMS should be evaluated and adjusted**. The ideal and preferred situation is that when starting a car (tyres have not yet warmed up) the driver will get a signal when one of the tyres has a tyre pressure below the advice pressure. On the dashboard a screen would pop up showing the tyre pressure of the 4 tyres with the pressure of the underinflated tyre in red and the rest of the tyres with the pressure numbers in green. Now, many cars with TPMS are equipped with a warning light. TPMS with just warning lights are a first step, mainly to indicate serious underinflated, possibly leak, tyres.

This situation can be improved considerably by making an active and accurate TPMS, as described, the standard. Only direct monitoring systems with digital displays on the dashboard presenting the actual tyre pressure per tyre should be made mandatory. The warning light should stay as a TLA, an emergency signal. A push up signal should appear when by starting the car one of the tyres would show 0.2 bar below the advice pressure; the pressure on that tyre in red and the others with sufficient pressure in green. Only these TPMS would qualify for the name TPMS (see illustration Figure 9). For cars currently equipped with a direct monitoring system and having just a warning signal (TLA) on the dashboard one could consider developing an app displaying the tyre pressure of all four tyres on the mobile phone of the owner. The direct monitored pressure should be programmed to send a signal to the mobile phone of the owner by e.g. blue tooth giving the same information as on the dashboard

screen of the cars with the appropriate TPMS. The app could be installed by the garage workshop or at the yearly periodic roadworthiness test.



Figure 9. Illustration of a direct TPMS with on board monitoring of all tyres. Left when tyres are cold and right when they are warm (after 100 km). Note: the tyre pressure is given in kPa (280 kPa=2,8 bar) (Photo Erik Roelofsen)

The situation of underinflated tyres would also improve considerably by **improving and harmonizing the information on tyres and tyre pressure in the user manuals in cars**. Now the information varies enormously. Most manuals repeat the information that is usually available in the car on ‘the tyre pressure sticker’, frequently at the side of the driver’s door or doorpost. Many manuals inform the car driver to inflate the tyres to the required pressure the tyres should be when cold, usually without information when tyres are considered to be cold. Hardly no manual advices when tyres have warmed up (after approximately 15 minutes or 5 km driving) or what to do when the tyres have warmed up. Expert advice is in that case to increase the advised tyre pressure by 0.3 bar. In addition, many car owners are not aware of the need to increase the tyre pressure when the car is heavily loaded (e.g. before a holiday). The information is on the sticker and in the manual but probably not prominent enough. The European Commission might take upon itself to harmonize, coordinate and improve the information in the car user manuals. See table VII for the potential benefits of proper tyre pressure and Figure 5 for the increase of tyre pressure when tyres have warmed up.

#### Periodic maintenance

Car tyres are probably the most important items of a car since they are the only contact of the car with road surfaces. Obviously, tyre inspection is part of the mandatory periodic roadworthiness tests in Member States. Strangely enough checking wheel alignment is not part of the test. Road safety and tyre wear would profit from a visual inspection of the alignment of the wheels. If a wrong alignment has been established the car owner should be advised to have this corrected at a station where this can be fixed. **This visual inspection of wheel alignment and if necessary advice could be included in the Regulation on periodic road worthiness tests** (Ref [19]).

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^All GRB documents can be found at:

[https://www.unece.org/trans/main/wp29/meeting\\_docs\\_grb.html](https://www.unece.org/trans/main/wp29/meeting_docs_grb.html)