

ANALYSIS AND EVALUATION OF THE EFFECT OF STUDDED TYRES ON
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Abstract. In order to reduce a negative impact of studded tyres on the environment (i.e. emissions of fine (PM_{2.5}) and coarse (PM₁₀) particulate matter and noise) various scientific investigations are carried out to decide if the use of studded tyres shall be allowed or prohibited. This is especially topical for the countries belonging to the northern latitudes of the Earth's hemisphere where in winter months the air temperature drops below 0 °C, i.e. Scandinavia (Norway, Sweden, Finland), East and Middle Europe (Lithuania, Latvia, Estonia, Germany, etc.), also USA, Japan, Canada and Russia. Based on the scientific investigations that the use of studded tyres causes emissions of pollutants, especially of PM_{2.5} and PM₁₀ (Al, Si, K, S, Zn, W etc.), into the ambient air several tens of times higher than by the use of non-studded tyres and generates the increase in the noise emissions up to several tens of times, it could be stated that the use of studded tyres should not be obligatory. Thus, in "mild" Lithuanian winter when the air temperature often varies around 0 °C the use of studded tyres when travelling of icy and more rarely cleaned roads of Lithuania should be only recommended since the ice layer of the road pavement is effectively surmounted by the new generation winter tyres, i.e. less dangerous for the environment, manufactured from a more soft rubber mixture, containing a chemical element silicon.

Keywords: studded tyres, traffic emissions, fine (PM_{2.5}) and coarse (PM₁₀) particulate matter, noise, road wear, road dust.

1. Introduction

In winter road traffic, especially when using studded tyres, causes also a secondary pollution with particulate matter (PM). Studded winter tyres destroy road pavement, lift into the ambient air the remnants of destroyed pavement, the spread sand and salt mixture and not collected mud, and when using such tyres on "bare" road pavement (without ice or snow) – fine and very dangerous micro elements initiated during traction. For example, by the words of salespeople, the market of studded tyres in Lithuania makes 10% (sometimes even up to 15%) of the total sales of tyres. Thus, it could be stated that Lithuania, though not determines but contributes to the total pollution of urban air with (PM_{2.5}) and (PM₁₀) particulate matter and to the exceeded permissible noise level. Data of observations, carried out in several recent years, shows that in Lithuanian cities, like in many other European cities, pollution of ambient air with PM₁₀ remains one of the most important problems of environmental protection. In the year 2006, like in the previous 2004–2005, the average daily concentration of PM₁₀ in certain days exceeded the limit value in all the largest cities of Lithuania. In Vilnius, Kaunas and Šiauliai concentration of PM₁₀ at high-volume streets was

increased for more than 35 days per year, i.e. more often than this is allowed by the European Union (EU) Directives and Lithuanian legal acts.

In the recent 10 years emissions of fine and PM₁₀ in the EU and Lithuania will be limited by the newest and significantly more-binding EU and Lithuanian legal acts. A new *Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe* decided until the year 2020 to reduce the currently valid annual and daily limit values for particulate matter (with the permissible number of days of exceeded limit values), for example, the annual limit values for PM₁₀ will be reduced from 40 to 10 µg/m³, for PM_{2.5} – from 25 to 7 µg/m³. Correspondingly, the daily limit values for PM₁₀ will be reduced from 50 to 30 µg/m³, for PM_{2.5} – to 20 µg/m³ and could not be exceeded for more than 7 times per a calendar year.

In the recent 10 years noise in the EU member-states and Lithuania has increased by 0.5–1 dBA per year on average, whereas in some cities – even by 10–12 dBA. This is demonstrated by the data of 2006–2007 strategic mapping of Kaunas City, based on which 26.5 thousand inhabitants are affected by the equivalent sound level higher than

