in association with

Cost-benefit analysis of policy measures reducing unintentional release of microplastics

A study for the European Commission (DG Environment)

Second stakeholder workshop – 24 November 2021

Background note on Tyres

1. INTRODUCTION

The aim of this study is to provide environmental and techno-economic analysis and support to the Commission on possible actions to reduce the presence of unintentionally released microplastics in the environment, in particular from plastic pellets, synthetic textiles and automotive tyres.

A first stakeholder workshop was held on September 30th, 2021 and presented the scope methodology and initial analysis.

A second series of stakeholder workshops will be held as following:

> Textiles, on November 22nd, 2021
> Tyres, on November 24th, 2021
> Pellets, on November 25th, 2021

This background paper is intended to inform discussions at the stakeholder workshop for tyres. It provides a short summary of the problem definition and baseline assessment and an initial long list of possible measures for addressing microplastic emissions from tyres. Key points for discussion at the workshop are also presented.

The main aim of the workshop is to discuss and develop a list of measures that could be implemented to tackle the release of microplastics from tyres.

A tentative agenda of the workshop is as follows.

> Plenary - Introduction (10 minutes)
> Plenary - Presentation by the project team (30 minutes)
> Breakout sessions (the participants will be divided into four groups) (1h30)
> Plenary – reporting from the groups (40 minutes)
> Plenary – Next steps (10 minutes)

2. PROBLEM DEFINITION

Tyre wear is caused by the friction process between tyres and the road surface. Accordingly, tyre wear is emitted wherever vehicles travel. In scientific literature the term 'tyre wear' is often used even if the hetero-aggregates of 'tyre and road wear particles' (TRWP) are meant.[1] The term TRWP (tyre and road wear particles) is also defined as "discrete mass of elongated particles generated at the frictional interface between the tyre and the pavement surface during the service life of a tyre" (ISO Terms & definitions). From the point of origin, it can either be transported directly into the three environmental compartments (soil, air, water) or indirectly through remobilisation and deposition. The majority of tyre wear is initially deposited on or near the road surface. The fine fraction (PM10) can be transported much further by airborne drift.

A key driver of tyre wear emissions is driving mileage. It is expected that there will be a significant increase in road transport volumes over the next decades. The Joint Research Centre (JRC) show a 16% increase in passenger road transport between 2010-2030 and 30% for 2010-2050. Freight transport is estimated to increase by 33% by 2030 and 55% by 2050[2] unless measures are taken to reduce the carbon footprint.

[1] B. Baensch-Baltruschat et al. / Science of the Total Environment 733 (2020) 137823

[2] Alonso Raposo et al. 2019 The future of road transport: implications of automated, connected, low-carbon and shared mobility: Publications Office. ISBN 978-92-76-14318-5, doi: 10.2760/668964, JRC116644

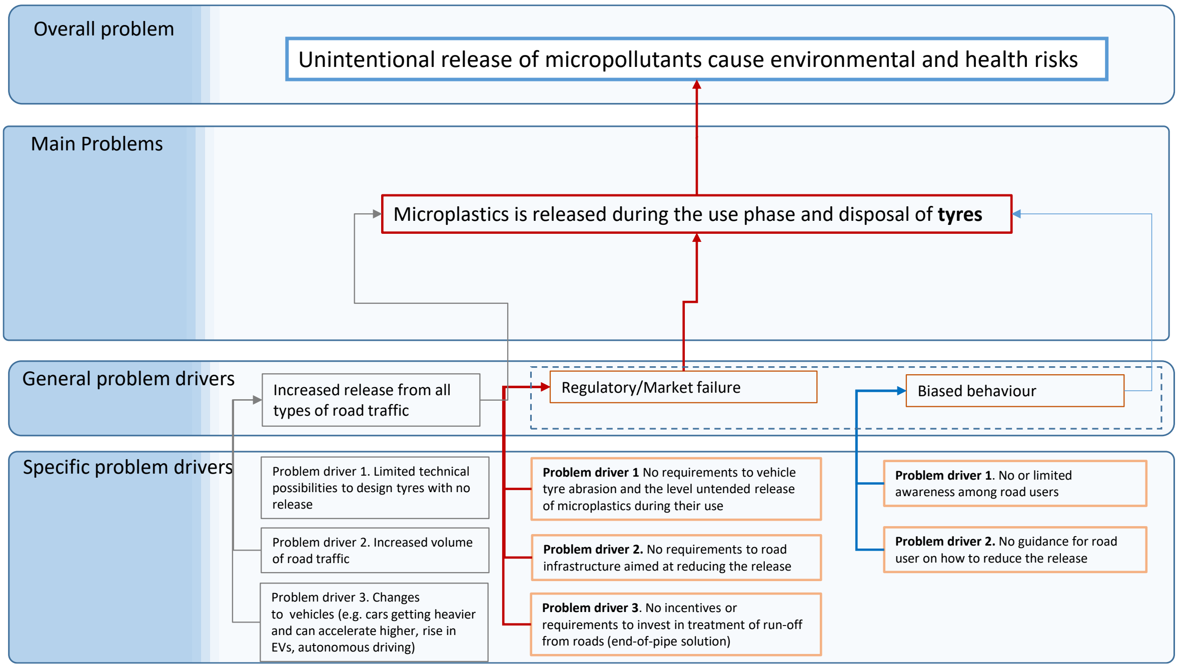

Figure 1: Problem definition tree

The other problem drivers can be divided into the different factors influencing tyre wear: tyre characteristic, road surface characteristics, vehicle characteristics and vehicle operation.

Tyre characteristics

In contrast to exhaust emissions, there are currently no regulations on tyre wear emission limits in the EU. Thus, tyres with high and low abrasion rates are present on the market. However, the Tyre Labelling Regulation provides for a standardised test procedure to determine the emission rate of tyre wear in a uniform manner.[3]

Vehicle characteristics

Vehicle weight and tyre wear are correlated: as the load increases, the tyre wear emission also increases. A market share analysis by Diaz et al.[4] shows the significant development of demand for Sport Utility Vehicles (SUV) in Europe over the last 20 years. Since EV variants are also offered for these SUV models, a decline in the trend is not to be expected.

A shift of passenger vehicles from ICEVs to EVs is assumed and there are some conflicting views on the influence of EVs on tyre wear emissions. Due to the lower energy density of batteries compared to conventional fuels, the absolute vehicle weight may increase when directly comparing vehicle models available as ICEVs and EVs. In this case, tyre wear emissions would also increase. However, further development of the batteries and changes in EV design may mean that weight increases are negated in the future.

[3] Regulation (EU) 2020/740 of the European Parliament and of the Council of 25 May 2020 on the labelling of tyres with respect to fuel efficiency and other parameters, amending Regulation (EU) 2017/1369 and repealing Regulation (EC) No 1222/2009 (Text with EEA relevance)

[4] Diaz et al. 2020 European vehicle market statistics 2020/21

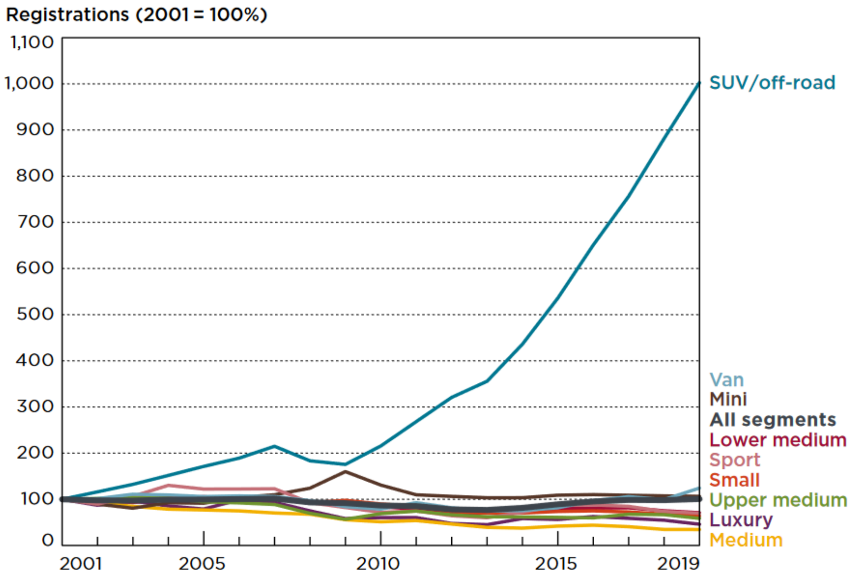

Figure 2: Passenger car registrations by vehicle segment[4]

Another factor to consider is the engine power or drive torque. EVs bring full torque to the road already at start-up. Although efficient traction control (anti-slip control) is possible, there is still a higher point-to-point power transfer, which potentially leads to higher emissions.

Road surface characteristics

The influence of the road surface is mainly due to its roughness. In this context, the use of porous asphalt is under discussion. Although a porous asphalt can have a negative impact on the emission rate, porous asphalt is seen as a positive influence due to its retaining effect.[5] [6]

Vehicle operation

The driving style, in particular, but also the speed, have an influence on tyre wear. Lower speed limits (motorway) are under discussion because of their impact on exhaust emissions. In the future, the influence of autonomous driving or Advanced Driver Assistance Systems (ADAS) on driving dynamics will also increase in relevance.

3. Scale of the problem

Based on a mileage approach, the emitted tyre wear emissions can be estimated. Taking into account the Deltares and TNO[7] emission factor and the current annual mileage data, tyre wear emissions are estimated at 450 000 t/a for the EU27. Furthermore, a preliminary estimate for the final release of tyre wear into the environment was developed, based on the assessment tool of the Plastic Leak project[8].

[5] Baensch-Baltruschat et al. 2020 Science of the Total Environment 752 (2021) 141939
[6] European TRWP Platform 2019 Way Forward Report
[7] Deltares and TNO 2016 Emissieschattingen Diffuse bronnen Emissieregistratie - Bandenslijtage wegverkeer
[8] Peano et al. 2020 Plastic Leak Project. Methodological Guidelines.

Table 1: Preliminary estimate of the final release of tyre wear

		FINAL RELEASE COMPARTMENTS					Well managed waste
	Share of roads	OCEANS (sediments and water column)	FRESH-WATER (sediments and water column)	SOILS	AIR	Other terrestrial compartments	
average		**2%**	**15%**	**64%**	**0%**	**6%**	**13%**
Urban	39%	2%	20%	49%	0%	9%	20%
Rural	38%	0%	3%	94%	0%	2%	0%
Motorway	23%	3%	27%	39%	0%	9%	22%

4. POTENTIAL MEASURES

During the 2nd stakeholder workshop, we will work in groups to establish a list of potential measures to reduce the microplastics emissions from tyres.

The tyre wear emissions can be reduced by measures that affect one or more of the influencing parameters. Furthermore, there are measures to increase the treatment of road run-off. Hence, the potential measures could be grouped in the following way:

Reducing emissions

> Tyre characteristics
  - Ban tyres with high emissions from the market (standardised test method)
  - Development of tyres with less tyre wear emissions
  - Tyre labelling

> Road infrastructure characteristics
  - Alternative surface materials
  - Design of roads

> Vehicle characteristics
  - Limiting the weight of the vehicles
  - Limiting maximum accelerations
  - Promotion of APPs or car equipment that warns the driver when the driving is increasing the wear of tyres

> Vehicle operation including total road transport volume
  - Promotion of bicycle infrastructure and public transport

- Driving bans
- Autonomous driving
- Shift of freight transport from the roads to rail and waterways.

Treatment of emissions

- Decentralised filter systems or sustainable drainage systems
- Optimised street cleaning
- Better capture infrastructure in particular in hot spots