Blue Lakes

No microplastics, just waves.

NO MICROPLASTICS, JUST WAVES.

Fact sheet on microplastic emissions from car tyres

Within the framework of the "LIFE Blue Lakes" project

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The Life Blue Lakes Project

Plastic is omnipresent. Without plastics, our modern life and work would not be possible. But the light, hygienic and unbreakable material, which can be moulded into any shape and has found its way into all areas of life, also shows disadvantages, for example the huge plastic rubbish carpets that float on our oceans. Another problem becomes apparent under the microscope: **microplastics**. Scientists have already detected microplastics in water, soil, air and even in our food. But what health consequences the tiny particles have on humans and nature has not yet been sufficiently researched.

Therefore, the Lake Constance Foundation and the Global Nature Fund, in cooperation with the Italian nature conservation organisation Legambiente and five other partners, have launched the EU Life project "Blue Lakes" on the topic of microplastics in water bodies. In five lake regions in Italy and Germany (Garda, Trasimeno, Bracciano, Lake Constance and Chiemsee), measures on this topic are being implemented in an exemplary manner with the aim of improving decision-making processes and regulatory framework conditions with regard to microplastics. In the project regions, the involvement of the riparian communities plays an important role. Together, a Lake Paper is to be developed that shows numerous potentials on how plastic consumption and microplastics can be reduced in the communities. The project will also look at the technological side of sewage treatment plants in order to filter out microplastics more efficiently.

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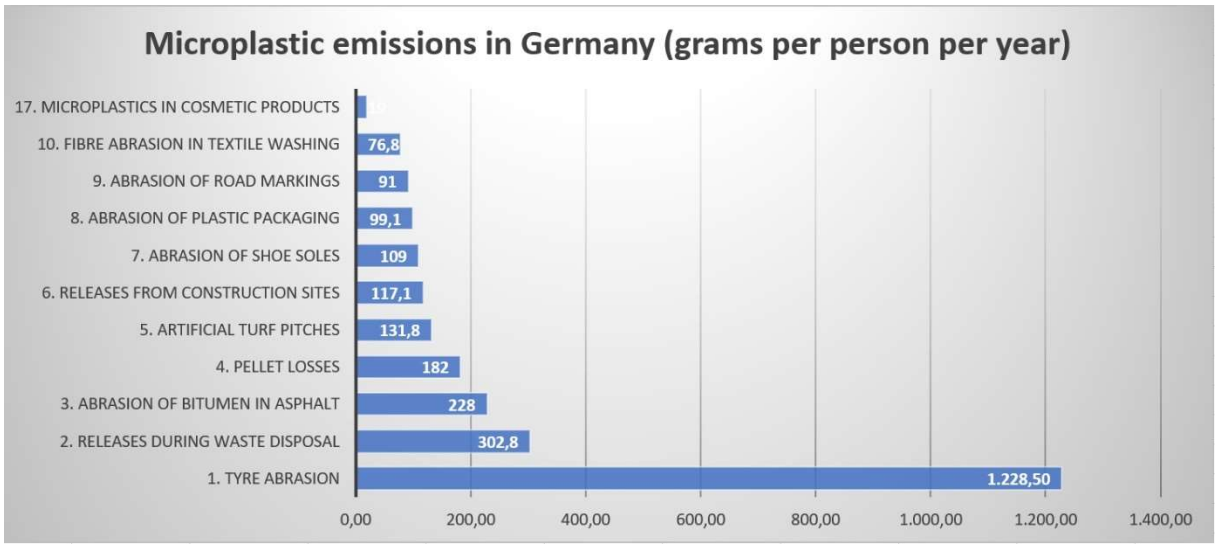
The issue of microplastics has received a lot of attention in recent years. Road and tyre abrasion, fibre fragments from synthetic textiles and plastic particles from cosmetics and cleaning products play a central role in the formation of microplastics. With the Life Blue Lakes project, we want to make a contribution to finding solutions for minimising and avoiding microplastic pollution together with companies.

Further information on the project: https://lifebluelakes.eu/en/

Initial situation

The discussion about the interpretative authority on connections between the tyre industry and microplastics has existed for some time. Unfortunately, those involved have not yet been able to agree on clear statements. There is also no globally uniform definition of microplastics. On the one hand, there are for example the researchers of the Fraunhofer Institute UMSICHT. In a study co-financed by packaging, plastics and cosmetics companies, they come to the conclusion that tyres account for the largest share of microplastic emissions in Germany.



Data Source: Microplastics Consortium Study (2018) of the FraunhoferInstitute for Environmental, Safety, and Energy Technology UMSICHT, Germany.

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According to the UMSICHT study (Bertling 2018), an average of around 998 g of these particles are produced per person and year by car tyres, around 89 g by truck tyres, 15.6 g by bicycle tyres and 228 g by the abrasion of bitumen in asphalt. The authors define the particles produced by the abrasion of car tyres as primary type B microplastics (Bertling 2018). This means that the microplastic emissions already occur during the use of the product and not only through weathering and decomposition processes in the environment, as is the case with the second category, secondary microplastics.

A completely different stance on the issue is taken by various players in the tyre industry, who, in a coalition initiated by the World Business Council for Sustainable Development (WBCSD) generally do not use the term "microplastics" in connection with emissions caused by tyre wear. In most cases, the term "tyre road and wear particles" (TRWP) is used; in rare cases, the term "microrubber" is also used. Road and tyre wear particles consist of approximately half road surface and half tyre wear. These combine together to form a mixture that can no longer be separated and, with sizes of 0.01 to 0.1 mm, falls into the category of microplastics. Most sources define microplastics as solid particles containing polymers between 0.0001 and 5 mm (ECHA 2020). Some of the researchers assume that portions of the particles from natural rubber are biodegradable. However, whether and under what conditions such degradation processes take place is still controversial and the subject of current research (Baltruschat 2020).

Tyre wear generated on roads is partly carried into the surrounding environment with the air or washed away to the roadside with rainwater. In the best case, it is transported via the sewage system to wastewater treatment plants. But even then, there is no guarantee that the particles caught by the filters of the sewage treatment plants do not end up in natural waters. Sewage treatment plants with fourth or fifth treatment stages can remove some but not all of such trace substances (BUND 2018). The intention is

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to expand these technologies, but the costs are still very high (IWW 2021). Accordingly, it seems obvious not only to catch the emissions that have already occurred (end-of-pipe), but also to develop (technological) approaches as quickly as possible to reduce the formation and spread of microplastics as early as the product development stage.

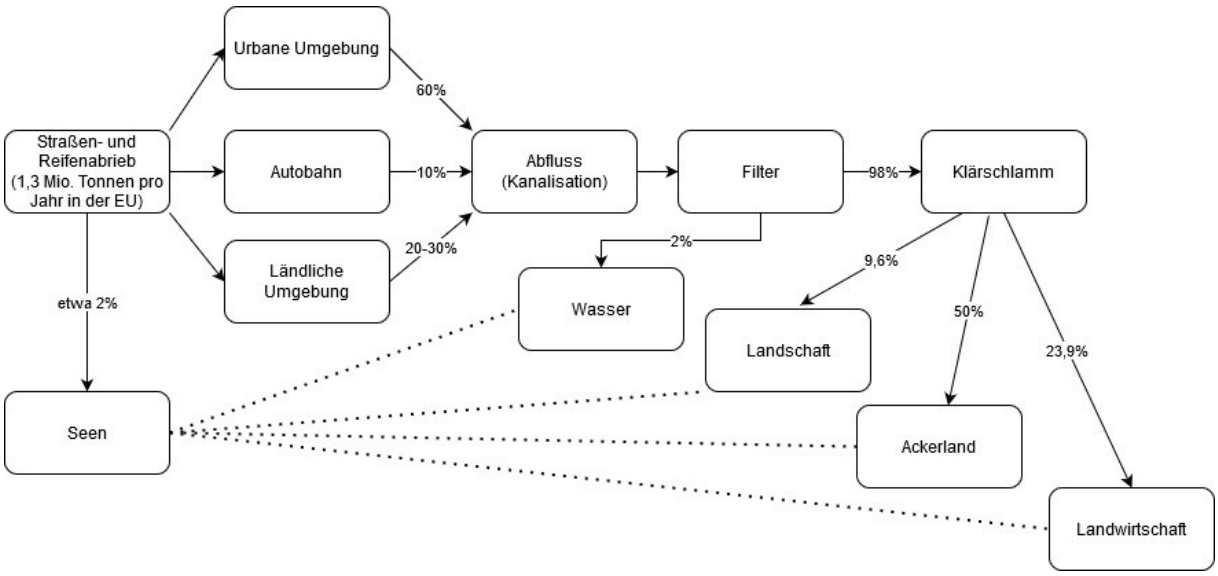

Fig.: Distribution pathways of tyre abrasion particles in the environment (own illustration)

Even for microplastics that can be caught by the filters of sewage treatment plants, it is not always guaranteed that they will not be released back into the environment. This is because only a certain proportion of the sewage sludge from the plants is incinerated. Of the total of 1.7 million tonnes of sewage sludge (dry matter) from municipal wastewater treatment plants in Germany in 2017, for example, more than 28 % was used as fertiliser in agriculture or landscaping measures (BMU 2017). A study published in 2018, for example, shows 150,000 microplastic particles per hectare on German fields (Piehl 2018). What proportion of these ultimately end up in surface

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waters and groundwater – and thus in our food chain – is still completely unclear at the present time.

In general, not much is currently known about the effects of microplastics in the environment. However, there are some risks that are increasingly in the focus of experts. For example, microplastics are long-lasting and persistent and cannot be decomposed by microorganisms. Due to the small size of the particles, microplastics already start at the bottom of the food chain and are taken up, for example, by sediment-eating or water-filtering organisms such as mussels. The small plastic particles can injure the stomach and intestinal tract or the gills of the organisms, prevent food intake or accumulate in the living organisms (bioaccumulation). Another aspect makes microplastics problematic in the environment. Pollutants and microorganisms can attach themselves to the rough surface of the particles. These can be pathogens or environmental toxins such as pesticides, which first bind to the particles via the input pathways or in waters. In addition, harmful additives can be released during the decomposition processes in the environment. These can be heavy metals such as zinc or cadmium, plasticisers or other toxic substances originally introduced together with the microplastics. Road and tyre abrasion consists of only about 40-50% natural and synthetic rubber. In addition, there are about 30-35% soot particles, silicones, lime, 15% of tyre and road abrasion are plasticisers, 2-5% are sulphur and tin oxides, 5-10% preservatives. Microplastics, including all enriched environmental toxins, are passed on through the food chain and eventually end up in fish and thus also on people's plates (Roch 2015).

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Possible solutions to reduce microplastic emissions associated with tyres

There are different ways for tyre manufacturers to approach the issue of microplastics. The following examples show approaches.

1. Research and generate knowledge

First of all, it should also be important for companies to generate knowledge, i.e. to ensure that the causes of microplastic emissions are researched further. Even if science, such as the research project conducted by the Fraunhofer Institute (Bertling 2018), is already making great progress, the participation of companies in research is still insufficient. This includes, for example, understanding which production processes, materials, processing steps or usage behaviour cause particularly high levels of tyre wear. But issues such as researching alternative materials are also important.. When companies make use of research results, they should nevertheless be thoroughly examined. For example, the Cardno ChemRisk scientists commissioned by the Tire Industry Project have been repeatedly criticised for spreading misinformation. Basically, a company that works with false findings and assumptions is not in a position to establish a functioning risk management system and thus runs the risk of not recognising risks in time.

2. Finding solutions together

Researching and tracking sustainability risks can be time-consuming and expensive. A good way to deal with this challenge is to act together with actors who have similar goals. One example is the exchange with the European TRWP platform initiated by ETRMA (European Tyre and Rubber Manufacturers' Association) and CSR Europe. Basically, the tyre industry is very well networked and could be a role model for other

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industries in this aspect. Well-coordinated dialogue processes are a necessity when it comes to initiating sustainability processes.. Nevertheless, such exchange formats remain ineffective if they are not used to implement the measures envisaged. Cooperation with environmental organisations, scientists and other stakeholders is almost always useful in order not to lose sight of the goal of sustainability. A good example of this is the cooperation project RAU (tyre abrasion in the environment) at the TU Berlin.

3. Rethinking product development

In product development, the needs and wishes of customers can be matched with the possibilities of technology, because the desire for more sustainability will continue to grow, especially among potential customers of the future. Sustainability is becoming increasingly important. Those who work with outdated assumptions can lose access to the market in the long term. Even small changes, such as removing production residues (e.g. rubber bristles) before tyres go on sale, can lead to valuable improvements. Long-term product development, such as researching new materials and their properties, requires perseverance and long-term strategies.

4. Capture the entire life cycle

For the tyre industry, there are currently relatively few opportunities to influence the production processes that affect tyre wear. But this does not mean that tyre manufacturers cannot act to take responsibility together with companies in related industries. For example, the exchange with suppliers of autonomous driving technologies means that the influence of driving behaviour on the generation of tyre wear can already be taken into account during development. In the planning and construction of roads, insights from the tyre industry can be used to reduce overall emissions when selecting the appropriate road surface. Another possibility is to get

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involved in research into innovative ideas such as the Tyre Collective (a hoover for car tyres) so that technology and efficiency can be improved and ultimately less abrasion is released into the environment. The impact of new technologies such as electric drive also require adjustments for which tyre industry knowledge can provide valuable support. The heavy batteries of e-cars, for example, increase the weight of vehicles and thus also abrasion.

5. Material selection

Tyres consist of a complex, extensive mix of different components. For each of these materials, it is important to continuously research possible alternatives, also taking into account microplastic emissions. Numerous alternative materials such as wood, moss, guayule, straw, beet are currently being researched for their suitability for tyre production. Which of these rubber alternatives can reduce microplastic emissions has not yet been fully clarified, but the question is a central criterion. Natural and synthetic rubber are substitutable for some products and functions. However, the decision in favour of one of the two materials should not be based on price alone, because natural rubber is not only biobased and thus potentially renewable, but also causes lower amounts of tyre abrasion (Fraunhofer 2019).

6. Thinking holistically about sustainable issues

Unfortunately, there are not always easy solutions when it comes to sustainability. Ambitious companies in particular can experience that solving one sustainability issue creates another problem. For example, there are findings that the biomimetic synthetic rubber BISYKA causes up to 30 percent less tyre abrasion (Fraunhofer 2019). However, this is made from fossil resources and causes high amounts of CO_2. It is precisely such complex issues that need to be kept in mind. But questions about the biodegradability and the high land requirements of biobased materials such as natural

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rubber, especially in tropical cultivation areas, have not yet been clearly answered. Natural raw materials are therefore not always the better alternative across the board. It requires a holistic approach that goes beyond the consideration of current trend topics. This is not always easy and requires constant and continuous improvement processes.

7. Communication and marketing

As soon as a company has fulfilled its own responsibility (e.g. optimisation of production processes), a suitable communication strategy can be developed for suppliers, other companies, existing and potential customers (marketing) and other stakeholders. For example, the knowledge gained can serve as a stimulus for other companies that may not yet be as far advanced in sustainability. Customers also play an important role in the prevention of tyre wear. Driving behaviour has a great influence on the formation of tyre wear. Regularly checking the tyre pressure also contributes to the prevention of emissions. It is therefore important to make customers aware of such parameters. The tyre trade plays a decisive role here.

Political and legal requirements on microplastics in the tyre industry

In connection with the European Green Deal, a ban on microplastics has been discussed again and again for several years. Specifically, this refers to the seventh annex of the REACH Regulation. The REACH Regulation regulates the handling and introduction of chemical substances into and within the European market. The European Chemicals Agency (ECHA), in consultation with the Risk Assessment Committee (RAC) and the Socio-Economic Analysis Committee (SEAC), has developed a proposal between 2017 and 2020 on how to restrict the intentional use of microplastics in the future.. This microplastic ban from the European Green Deal, if

adopted, will thus ban intentionally introduced microplastics (primary microplastics). Unfortunately, this draft law regulates only a minimal proportion of the microplastic emissions generated, at around 0.2 per cent, and only under certain boundary conditions (EEB 2020). For the tyre industry, the current draft law is therefore of little significance. Other sectors such as the chemical industry saw previous drafts as too imprecise and too stringent, as polymers were not further defined in the previous drafts of the law and at the same time particles with already a few nanometres (1 nm for particles) were part of the definition. For companies, these very small particles are difficult to distinguish from polymeric materials. There is therefore a risk that the definition will lead to contradictions and legal uncertainty (VCI 2019). ECHA has reacted to this criticism and adapted the microplastic definition so that, among other things, nanoplastics are no longer part of the definition (ECHA 2020). Environmental organisations criticise this adjustment, as nanoparticles are considered particularly toxic and can also penetrate human cells (EEB 2020.

The focus of the discussion on the adaptation of the EU regulation is thus the definition of microplastics, as this determines whether individual sectors will be affected by the ban or not. . At the same time, the definition decides whether nanoparticles, which are considered particularly toxic, will remain permitted in the future or not. The current draft will be discussed by the EU member states in 2021. It can be assumed that the new regulation with the current adjustments will come into force from around 2022 at the earliest.

Even though the current legislation foresees hardly any restrictions for the tyre industry, it is not guaranteed that these restrictions will remain in place in the future.A survey shows that 83 percent of the people questioned see microplastics as posing high or very high risks to the environment or health (Bertling 2018). These social concerns will hopefully soon influence regulations and laws. As a company, it therefore makes sense

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to deal with this issue at an early stage in order to be well prepared to react to future changes in legislation.

ANNEX

Positions of individual companies in the tyre industry on the subject of microplastics

The four tyre manufacturers with the highest turnover deal with the issue of microplastics mainly in connection with the Tire Industry Project (TIP). The Tire Industry Project does not see any significant hazards from tyre abrasion for the environment and humans and explains in 16 studies conducted by the company Cardno Chem Risk how it comes to these findings (TIP2020). The studies alternately transfer findings from the laboratory to the road and vice versa and are thus highly questionable. Nevertheless, almost all major tyre manufacturers refer to these studies in their sustainability reports and/or websites.

All tyre manufacturers are involved in research into alternative materials whose potential for reducing tyre wear is not yet fully understood.

Bridgestone

The Japanese Bridgestone Group includes Firestone, Nokian, Lassa, Uniroya, Dayton and other smaller brands. The company's tyre business generates 24.2 billion euros in sales per year (2019), making it the world's top-selling tyre manufacturer. Like all tyre manufacturers, the company does not comment on the issue of microplastics and does not mention road and tyre abrasion in its own sustainability report. Bridgestone wants to use only sustainable materials for tyre production by 2050 and is researching, among other things, tyres made of natural rubber from the guayule. Bridgestone is a member of the WBCSD's Tire Industry Project.

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Michelin

The French Michelin Group includes brands such as BF Goodrich, Kleber, Riken, Kormoran, Tigar, Achilles and Strial. The company's tyre business generates 23.6 billion euros in sales per year (2019), making it the second largest tyre manufacturer in the world in terms of sales. The company, like all tyre manufacturers, has so far not commented on the issue of microplastics and does not mention road and tyre abrasion in its own sustainability report either. Michelin plans to use predominantly (80%) materials from biomass for its own tyre production by 2048. To achieve this goal, tyres made from straw, beet and wood are being researched. Michelin is a member of the WBCSD's Tire Industry Project.

Goodyear

The US Goodyear Group includes brands such as Dunlop, Sava and Fulda. Goodyear generates 13.1 billion euros in sales per year (2019) with its tyre business. Goodyear also does not comment on the issue of microplastics and does not mention road and tyre abrasion in its own sustainability report. Goodyear is researching tyres made of moss to capture fine dust (like tyre particles). Goodyear is a member of the WBCSD's Tire Industry Project.

Continental

Continental includes Uniroyal, General Tire, Semperit, Barum and other brands. Continental generates 11.7 billion euros in sales per year (2019) with its tyre business. The company hardly comments on the issue of microplastics. In its own sustainability report, road and tyre abrasion or microplastics are not directly mentioned as terms. However, it does address the fact that Continental will continue to emit "biodegradable particles" and that the reduction of these

particles is not currently part of the company's sustainability goals.Continental plans to enable 100% emission-free mobility by 2050. Whether these biodegradable particles mean tyre abrasion remains unclear. Continental, for example, is researching dandelions as an alternative source of natural rubber. Continental is also involved in the RAU (Tyre Abrasion in the Environment) project at the Technical University of Berlin, which aims to better identify tyre abrasion in environmental samples. However,Continental does not communicate the project on its website or in its sustainability report. The company is a member of the Tire Industry Project of the WBCSD.

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