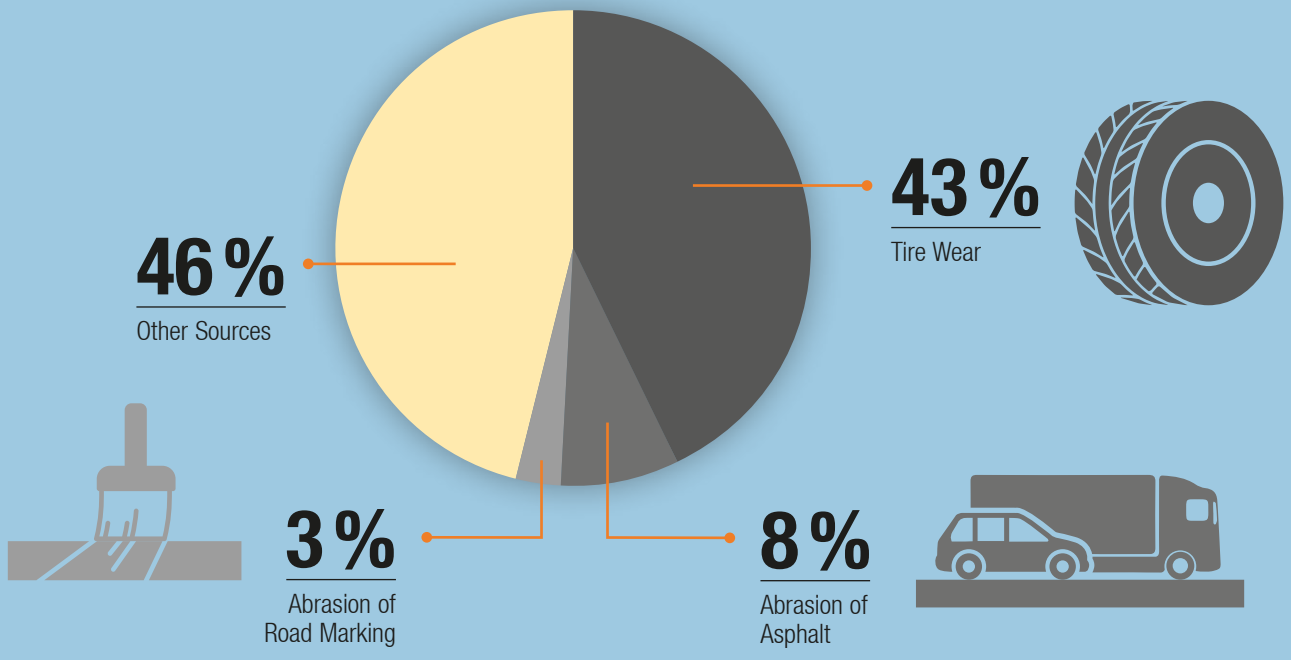
VCÖ
MOBILITÄT MIT ZUKUNFT

Motor vehicle traffic causes more than half of the Microplastic

Abrasion from motor vehicle traffic causes 54 percent of primary microplastics in Germany



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factsheet

VCÖ

Reducing Traffic-Related Microplastic Emissions

Traffic is the primary contributor to microplastic pollution. Tire and brake abrasion are responsible for significant amounts of these harmful particles. Slower speeds and lighter vehicles can decrease wear and tear.

Traffic is the biggest polluter and is responsible for more than half of the microplastics in the environment.[1] Abrasion from vehicle tires is one of the main causes of microplastics. By weight, around 70 percent of the particulate matter caused by traffic comes from tire, brake and road abrasion.[2] Very small particles in particular can enter the human body via respiration and food and cause numerous diseases, for example of the respiratory tract, changes in liver function, brain function or have a negative impact on the development of unborn children.[3]

Reduce tire and brake wear

On average, car tires lose around one to one and a half kilograms of mass over their service life and truck tires even lose around ten kilograms on average. For every 100 kilometers, cars produce around two to three grams of microplastics and truck tires around five to seven grams.[5] In total, the tires of all motor vehicles in Austria lose 21,000 tons annually through abrasion. Of this, 10,000 tons end up in soil and 5,000 tons in water.[4] Microplastics can enter the human body via the food chain.

As the Greek prefix „micro“ suggests, microplastics are small plastic particles or fibers. Microplastics consist of particles with a diameter of up to five millimetres.[4] The very small particles in particular can enter the human body via respiration and food, where they pose a potential health risk.[3] Studies using electron microscopes show that the particle size of tire abrasion ranges from ten nanometers to several hundred micrometers. In comparison, the diameter of a human hair is around 120 micrometers.[6]

Tire abrasion should not be underestimated

When power is transmitted between the tire and the road surface, particles are rubbed off the contact surface. Tire abrasion consists of the same components as the tread. This includes synthetic rubber, natural rubber, carbon black, silicon, various additives and zinc. In the environment, tire abrasion forms a lumpy conglomerate of tire, road and other dust particles.

The extent of tire abrasion depends on a variety of factors, such as driving style, engine power, vehicle weight, torque, load, tire position, tire pressure, material properties, age of the tire as well as road and weather conditions.

Brake wear is particularly damaging

In Austria, 21,000 tons of tire abrasion are released into the air, water and soil every year.

When braking, the friction between the brake disk and brake pad causes abrasion of small and tiny particles. Depending on the composition of the brake disk, these may contain elements such as barium, copper, zirconium, chromium, tin, iron or magnesium in addition to carbon. High temperatures of up to 600° C can cause violent chemical reactions and tiny particles, which are thrown directly into the environment.

Brake abrasion is influenced by the weight of a vehicle, the braking time, the composition of the brake discs and pads, the rotor temperatures, the sliding speed and the contact pressure.[7]

Brake abrasion ranges from around 0.8 to 2 grams per 100 kilometers for passenger cars, from around 1.5 to 3 grams per 100 kilometers for light commercial vehicles and from around 5 to 9 grams per 100 kilometers for heavy commercial vehicles.[8]

Environment and people are heavily polluted

Micro- and nanoparticles from tire and brake wear are released from the road into the air, soil, surface water and sewage treatment plants. From there, they can enter the human body directly or indirectly and cause health problems.

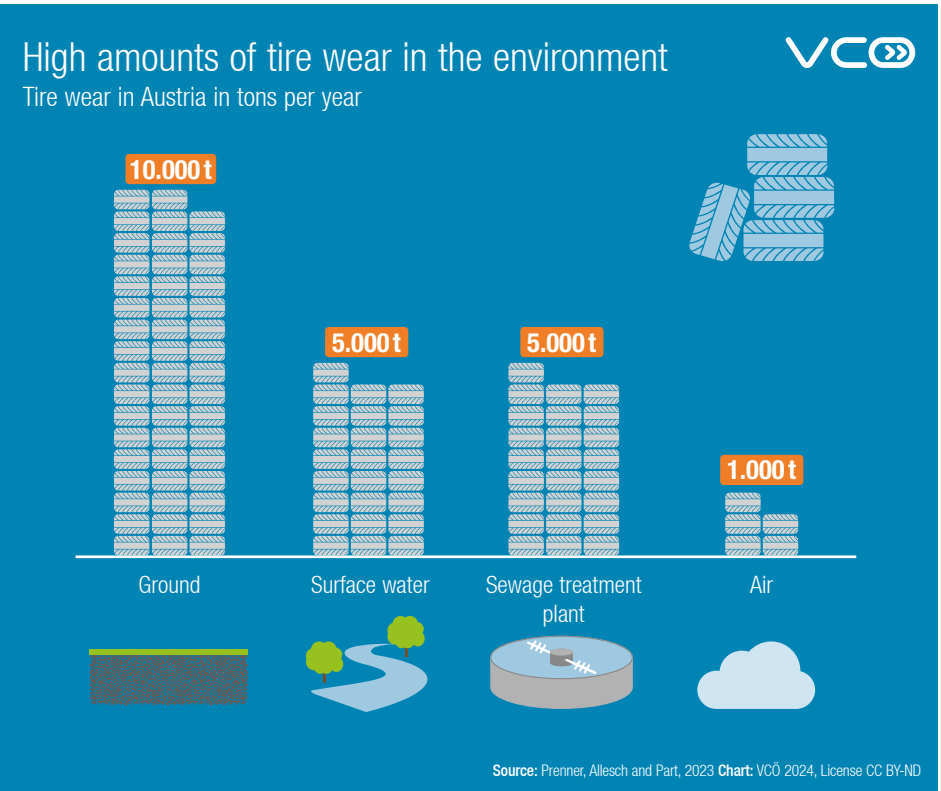
Around 20 to 30 percent of the tire mass consists of organic chemicals, which are added as plasticizers, vulcanizing agents and anti-oxidants.[9] These are particularly hazardous to health in bulk. Various additives can lead to changes in liver function, insulin resistance, embryo development, the reproductive system and brain function.[10] Particles from brake abrasion have a complex chemical composition and are suspected of being carcinogenic and highly toxic.[11]

However, knowledge of the full toxic effects of brake abrasion is still limited. The smaller the particles are, the easier they enter the bloodstream via the lungs.[7]

Standardized measurement methods are necessary

At the beginning of November 2023, the European Parliament approved the new limit values (Euro7) proposed by the EU Commission for pollutant emissions from passenger cars.[12]

The new regulation will set a limit value for particulate emissions from brakes and tires and rules for microplastic emissions from tires for the first time. This also affects electric vehicles.



The Euro 7 emissions standard is expected to come into force for new vehicles in 2026 or 2027.[13]

More environmentally friendly tires are available

In order to solve the problem of tire abrasion, the industry needs to commit to the development and production of low-abrasion and environmentally friendly tires.[2] This commitment must include the elimination of toxic rubber components, such as certain plasticizers and fillers, in newly developed tires. Tests show that there are tire models in all dimensions that exhibit low wear and good driving safety at the same time.[14] The conflict of objectives between low tire wear and good driving characteristics can already be resolved by many manufacturers.

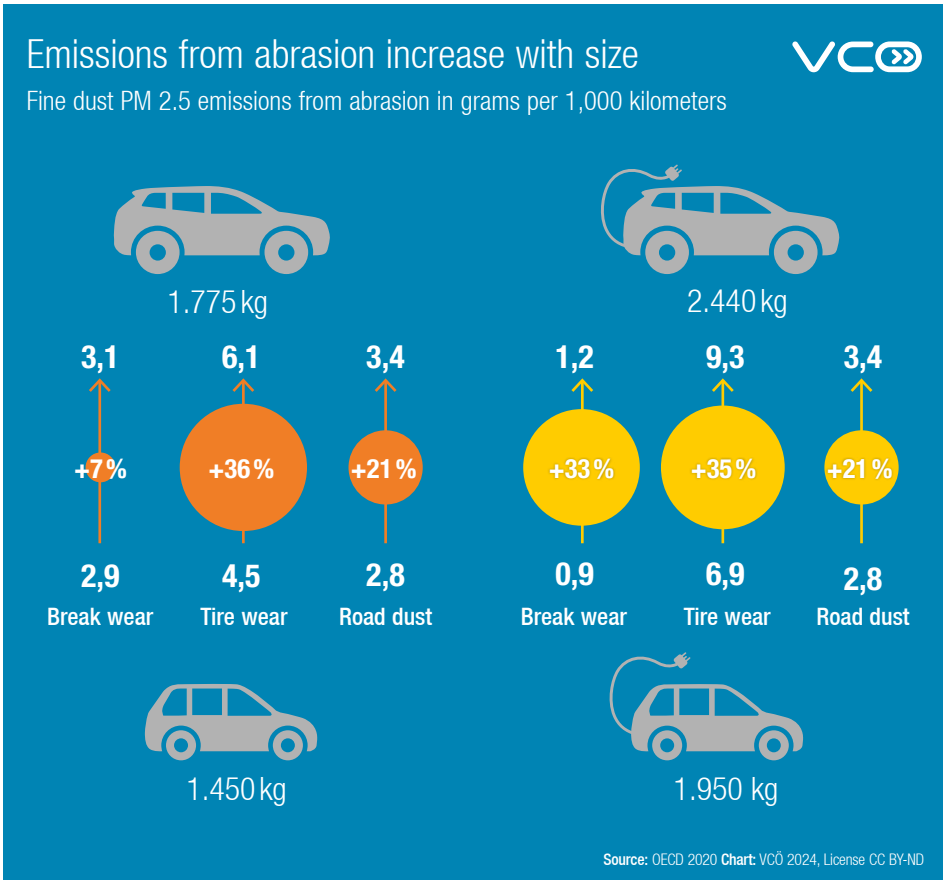
Lighter vehicles are cleaner

The weight of cars is increasing. While new diesel cars registered in Austria weighed just over 1,500 kilograms on average in 2003, the average weight in 2021 was already 1,660 kilograms. The SUVs being pushed by manufacturers are driving up the weight of the car fleet. The SUV share of new cars increased from eight percent in 2005 to 45 percent in 2023.[15]

As lighter vehicles cause less brake and tire wear, measures to reduce vehicle weight are a particularly effective measure, regardless of the drive type.[7] In the case of battery electric vehicles, the higher weight increases tire wear. On the other hand, regenerative braking, in which kinetic energy is recovered by reversing the electrical circuit, reduces brake wear.[7] Incentives must therefore be created so that the vehicle industry brings lighter and smaller electric vehicles onto the market and they are purchased.

Speed reduction and modal shift helps

Lower speed limits have a direct effect through a reduction in brake and tire wear, and also a potential indirect effect through a modal shift to public transport and cycling.[4] In addition, a fuel-efficient driving style can also reduce tire wear. This means, for example, avoiding abrupt braking and rapid acceleration or using the correct tire pressure.[16]



Smaller and lighter cars cause less abrasion emissions than heavy cars. Nine out of ten car journeys are made with only one person in the car.

Thinking about water protection systems

Microplastics and particulate matter are largely transported uncontrollably into the wider environment by the (driving) wind. Some of them end up in rainwater on adjacent surfaces such as road verges or embankments. Or they are collected in road drains and discharged to watercourses or infiltration systems via drainage facilities. So-called water protection systems retain some of the microplastics. They are already mandatory for new construction or renovation of higher-ranking roads.[17]

Traffic causes too much microplastic

The goal of reducing the harmful effects of abrasion emissions from traffic can be achieved through two strategies. By reducing the amount of particles emitted and by reducing the harmfulness of the materials used. Less vehicle traffic, smaller instead of overweight vehicles and lower speeds reduce brake and tire abrasion and thus the microplastics caused by traffic. Technological measures, more durable materials and the reduction of critical substances in tires and brakes support the process.

Implement planned measures at an early stage

The labeling obligations and minimum requirements for tires proposed by the European Commission must be implemented promptly in order to prevent microplastics from continuing to be released in large quantities and problematic substances from entering the environment. This requires the development of suitable test methods for tire and brake abrasion. These must be implemented quickly, taking into account the current state of development and internationally developed or proposed regulations as well as the work of the industry.

Sources online under:
www.vcoe.at/factsheets

VCÖ recommendations

Tire and brake wear should be significantly reduced by:

- Shifting car journeys to public transport and cycling.
- Reducing the weight of car models.
- Lower speed limits in urban areas and on open roads and highways.

Use sustainable and resistant tires and brakes

- Implement uniform measurement methods and regular testing of microplastics in the EU, including the refinement of test results according to product groups such as tire abrasion.
- Reduce harmful additives and oblige the industry to produce low-abrasion tires.
- Introduce mandatory labeling of tire ingredients at EU level and increase and improve the recycling and reuse of materials.
- In addition, increased use of water protection systems is needed to catch microplastics at an early stage.

Lina Mosshammer
VCÖ - Mobility with a future:
„Microplastics are a health and environmental hazard. Traffic is the biggest cause of microplastics. It is therefore all the more important to take rapid action to significantly reduce the emissions caused by tire, brake and road wear.“

tumi
Transformative Urban Mobility Initiative

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Through TUMI, the German Federal Ministry for Economic Cooperation and Development (BMZ) is supporting climate-friendly, inclusive, safe and affordable mobility in cities globally.

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