

Prioritize tackling toxic emissions from tires, urge experts

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Experts from Imperial College London are calling for more to be done to

limit the potentially harmful impact of toxic tire particles on health and the environment.

The researchers, from Imperial College London's Transition to Zero Pollution initiative, warn that even though electric vehicles remove the problem of fuel [emissions](#), we will continue to have a problem with particulate matter because of tire wear.

Six million tons of tire wear particles are released globally each year, and in London alone, 2.6 million vehicles emit around 9,000 tons of tire wear particles annually.

Despite this, research on the environmental and health impacts of tire wear has been neglected in comparison to the research and innovations dedicated to tackling fuel emissions. The Imperial researchers say that the effect of new technologies on the generation and impact of tire wear should be a priority.

In a new briefing paper, a multidisciplinary group of Imperial experts, including engineers, ecologists, medics, and air quality analysts, have called for as much investment into tire wear research as there is for reducing fuel emissions—and for understanding their interactions.

Lead author Dr. Zhengchu Tan, of Imperial's Department of Mechanical Engineering, said, "Tire wear particles pollute the environment, the air we breathe, the water runoff from roads, and [have] compounding effects on waterways and agriculture. Even if all our vehicles eventually become powered by electricity instead of fossil fuels, we will still have harmful [pollution](#) from vehicles because of tire wear.

"We urge policymakers and scientists to embark on ambitious research into tire wear pollution to fully understand and reduce their impacts on biodiversity and health, as well as research to reduce the generation of

these particles."

Transition to Zero Pollution is an Imperial College London initiative that aims to build new partnerships between research, industry, and government to help realize a sustainable zero pollution future.

Professor Mary Ryan, Vice Provost (Research and Enterprise) at Imperial College London, and a co-author on the briefing paper, said, "Safeguarding our planet and the health of future generations requires us to look not just at a problem from a single perspective, but to take a systems level approach. That's why we need to look beyond just carbon and to consider human-made pollution in all its forms.

"Electric vehicles are a crucial step forward to decarbonize transport, but we need to look at the big picture too. Some are concerned that electric vehicles tend to be heavier, which might increase tire wear. This is exactly why Imperial College London is driving a holistic, joined-up approach to sustainability challenges.

"We will continue to leverage the full strength of our research and influence to find meaningful solutions and help realize a sustainable, zero pollution future."

In the briefing paper, the researchers discuss how tire wear leads to these particles, where the particles end up, their potential effects on people and planet, and why we must act now.

Tire wear particles

As [tires](#) break down they release a range of particles, from visible pieces of tire rubber to nanoparticles. Large particles are carried from the road by rain into rivers, where they may leach toxic chemicals into the environment, while smaller particles become airborne and breathed in.

They are small enough to reach deep into the lungs.

These particles may contain a range of toxic chemicals including polyaromatic hydrocarbons, benzothiazoles, isoprene, and heavy metals like zinc and lead.

Environmental effects

Particulate matter from tire wear is a significant source of "microplastics" in rivers and oceans, and tire wear in cities could pose up to a four-fold greater risk to the environment than other microplastics.

While existing technological interventions such as filters and environmental policies could help to control our ecological footprint, there are huge gaps in our knowledge, understanding, and ability to forecast the impacts of tire wear pollution.

Co-author Dr. Will Pearse, from Imperial's Department of Life Sciences, said, "Tire waste does not naturally degrade and instead builds up in the environment, and may interact with other pollutants as well as biological organisms. Our gaps in understanding make further research and development of new solutions vital so we can limit all types of vehicular pollution."

Health effects

The impact of tire wear particles on [human health](#) is an increasing cause for concern, and the full long-term effects on our health urgently require more research.

There is emerging evidence that tire wear particles and other particulate matter may contribute to a range of negative health impacts including

heart, lung, developmental, reproductive, and cancer outcomes.

Co-author Professor Terry Tetley of Imperial's National Heart and Lung Institute said, "We are growing increasingly concerned by the impact of tire wear on human health. As some of these particles are so small they can be carried in the air, it's possible that simply walking on the pavement could expose us to this type of pollution. It is essential that we better understand the effect of these particles on our health."

Shifting gear

The researchers argue that reducing tire pollution should be seen as a critical part of making transport cleaner and more sustainable, alongside reductions in CO₂ and other exhaust emissions. In tackling the [climate crisis](#), we should design better systems and technologies to protect the environment; and research funding, government policy and regulatory frameworks should reflect this.

The report authors call for policymakers and scientists to investigate the complex problems related to tire-wear pollution, from the basics of wear-particle production, to understanding how these particles affect the health of people and the planet. Potential innovation solutions include particle capture technologies, new advanced materials, and disruptive business models that encourage different transport choices. These need to be coupled to clear policy and regulation and to a broader discussion around urban transport systems.

The research efforts, they say, should include the following:

- Establishing standardized ways of measuring environmental tire wear levels and their toxicity.
- Reducing harm to land and water species and in humans by tightening limits on the use of harmful components in tire

materials.

- Launching new trials to better understand the short and long-term effects of different sized particles on the environment and human health.
- Efforts to better understand underlying wear mechanisms and to propose wear mitigation strategies such as reducing vehicle weight, using advanced driving techniques, and ensuring tire materials pass wear resistance regulations.

More information: Zhengchu Tan et al, [Tyre wear particles are toxic for us and the environment](#) (2023).

Provided by Imperial College London

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