

Plastic and Urban Pollution Conveyed to Inland Waterways by Stormwater

The health of creeks, rivers, lakes, bays and harbours are continually at risk from plastic and urban pollution from stormwater networks after rain events, including microplastics and heavy metal pollutants from vehicle road runoff. We know that over time plastic breaks down to micro and nano plastics, with catastrophic consequences.

80% of plastic and urban pollution comes from the land; most is conveyed by stormwater.

Approximately 13-14 thousand tons of rubbish enters our oceans annually from Australia's coastline. CSIRO principal research scientist Chris Wilcox said the amount of rubbish is greatest on the coastline of city fringes. Correct stormwater management would dramatically reduce Australia's ocean rubbish.

Latched to our human plastic pollution are needless deaths to aquatic animals from ingestion and entanglement. More concerning is the steady disappearance of sediment-dwelling organisms, the primary producers in food chains, from ingesting micro and nano plastic pollution. More study is needed to quantify the health of our waterways at the sediment level. However, we know that we have dead zones, where absolutely nothing lives, in our waterways directly linked to stormwater outlets.¹

Microplastics are widespread emerging contaminants that have been found globally in the marine and freshwater environments. They can accumulate in sediment over time, and therefore, sediment could be a long-term sink for microplastics.²

Road runoff includes *Suspended solids, *Nutrients/organic matter, *Particulate metals, *Dissolved metals, *Poly Aromatic Hydrocarbons, *Free phase hydrocarbons and *plastic polymers from tyre wear pollution.

Tyre wear pollutants (TWP), toxic micro and nano plastics are emerging as a significant issue. Emissions Analytics, a UK based independent global testing and data specialist, reports that vehicle tyre wear is entirely unregulated and that pollution from vehicle tyres maybe 1,000 times worse than the pollution from a car's exhaust. The situation intensifies in heavy vehicles – trucks, SUV's, and electric due to the battery's weight.³

Tyres are about 19% natural rubber and 24% plastic polymers; the remainder is mainly metal and canvas. Uneven road surfaces, the weight of a vehicle, and how people drive all factor into how many bits of vehicle tyres break off and become road sediment. Designed to degrade car tyres lose about one kilogram in weight during their useful life, while truck tyres lose about 2.5 kilos.

Polymers are very large, chain-like molecules made up of many smaller molecules. Approximately 95% of these tiny particles end up in stormwater networks. When they reach inland waterways and oceans, they fall to the bottom of the water due to their denseness, which possibly explains why they have gone pretty much undetected until recent years.

Road sediment pollutants from motor vehicles wash into stormwater during the first few minutes of a rain event—for example, exhaust gases and lubricants release lead, hydrocarbons, nickel and

¹ <https://www.facebook.com/watch/?v=3093758870662898>

² Nakki et al., 2019; Willis et al., 2017

³ <https://www.emissionsanalytics.com/news/pollution-tyre-wear-worse-exhaust-emissions>

bromine. Iron and chromium detach from rusty bodywork, and sulphur, chlorine and cyanide disperse from cooling liquids. Tyres deposit rubber particles containing lead, cadmium, zinc and microplastics on the bitumen.⁴ Currently, in NSW, there are very few filtration traps in place in stormwater to capture these dangerous pollutants. There are no filtration traps connected to road networks across the country.

In Australia road runoff is unmanaged and unregulated.

Across the planet, research into pollutants from tyre wear is in its infancy. In December last year, the US reported mass die-offs in coho salmon. The deaths were caused by 6PPD, a preservative used in car tyres,⁵ and studies in Norway have identified micro and nano plastics released from rubber granules from discarded car tyres for artificial turf pitches, playgrounds and walkways. From Norwegian artificial turf fields alone, 65 tonnes of granules disappear annually on clothing and shoes, which corresponds to approximately 10,000 used car tyres. Most of this flush directly into the sea from machine washing. Stormwater drains convey a further 3,200 tonnes into inland waterways.⁶

On 6 March 2020, Emissions Analytics released data regarding running a family hatchback on brand new and correctly inflated tyres found the car emitted 5.8 grams of TWP per km.⁷

In a lab setting at the Citadel, John Weinstein conducted research exposing shrimp to tyre wear particles. He found the shrimp ate the particles, which clogged in their guts and got stuck in their gills. The shrimp died from chronic long-term effects, in other words, they starved to death, with no more room in their guts to accept food.⁸

A study by Coalition Clean Baltic (2017) reported black fragments from tyre wear as the dominant type of microplastic detected in water inlet and outlet of a stormwater wetland located in Sweden. Further, a QLD wetlands study⁹ found black microplastic fragments in sediment inlet and outlet samples. FTIR confirmed most black fragments in sediment as synthetic rubber-carbon filled isobutylene (or butyl rubber), likely originating from car/truck tyre (Leads and Weinstein, 2019).

Here in Australia, there are approximately 81.2 million vehicle tyres, and each year Australians drive around 238,499 million kilometres,¹⁰ generating approximately 28,000+ tonnes of Tyre Wear Pollution, of which 95% enters our waterways.

The most effective way to reduce and lessen the harmful effects of stormwater pollution into our waterways is to prevent it from entering the aquatic environment by improved stormwater management.

⁴ <https://www.sciencedaily.com/releases/2020/12/201203144228.htm>

⁵ <https://www.sciencedaily.com/releases/2020/12/201203144228.htm>

⁶ <https://thebarentsobserver.com/en/node/7300>

⁷ <https://www.emissionsanalytics.com/news/pollution-tyre-wear-worse-exhaust-emissions>

⁸ <https://www.nationalgeographic.com/environment/2019/09/tires-unseen-plastic-polluter/>

⁹ Microplastic pollution in a stormwater floating treatment wetland: Detection of tyre particles in sediment (2019),

¹⁰ <https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia/latest->