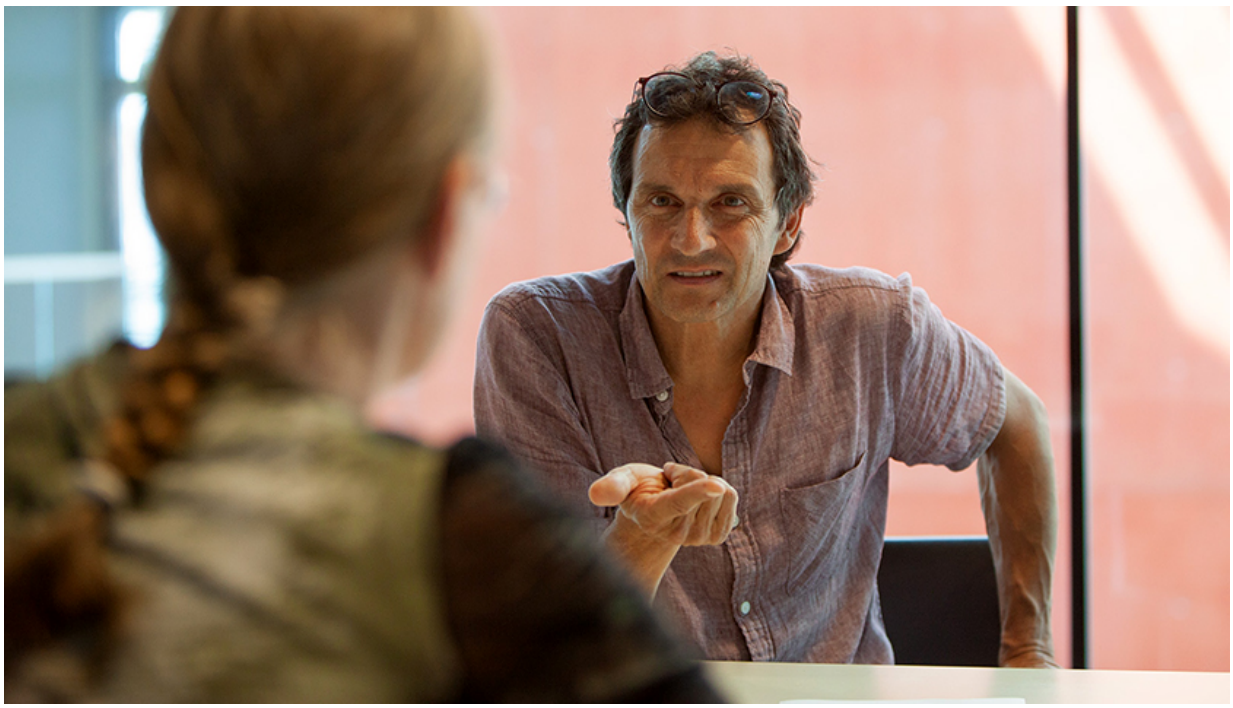


“Do microplastics belong in our environment? No!”

September 8, 2020 | Bärbel Zierl
Topics: Drinking Water | Wastewater | Pollutants

Process Engineer Adriano Joss from Eawag water research institute has been working for many years on wastewater treatment plants and the removal of micropollutants from water. Together with Ralf Kägi, Head of the Eawag Particle Laboratory, he has compiled the current status of knowledge on microplastics. In an interview, he presents the most important findings. We have recently posted detailed information on the website “Microplastics in the environment”.

Adriano, together with Ralf, you have compiled all the published facts about microplastics for a highly acclaimed paper. What was the reason for this?

We have received numerous enquiries from authorities and the public regarding microplastics. When we looked for answers, it was a little frustrating. We found widely differing statements on microplastics in the environmente as well as high levels of relatively insignificant microplastics particles per cubic metre. Very little is still known about the harmful effects on humans and the environment. Ralf and I therefore carried out a literature search to present the current state of knowledge.

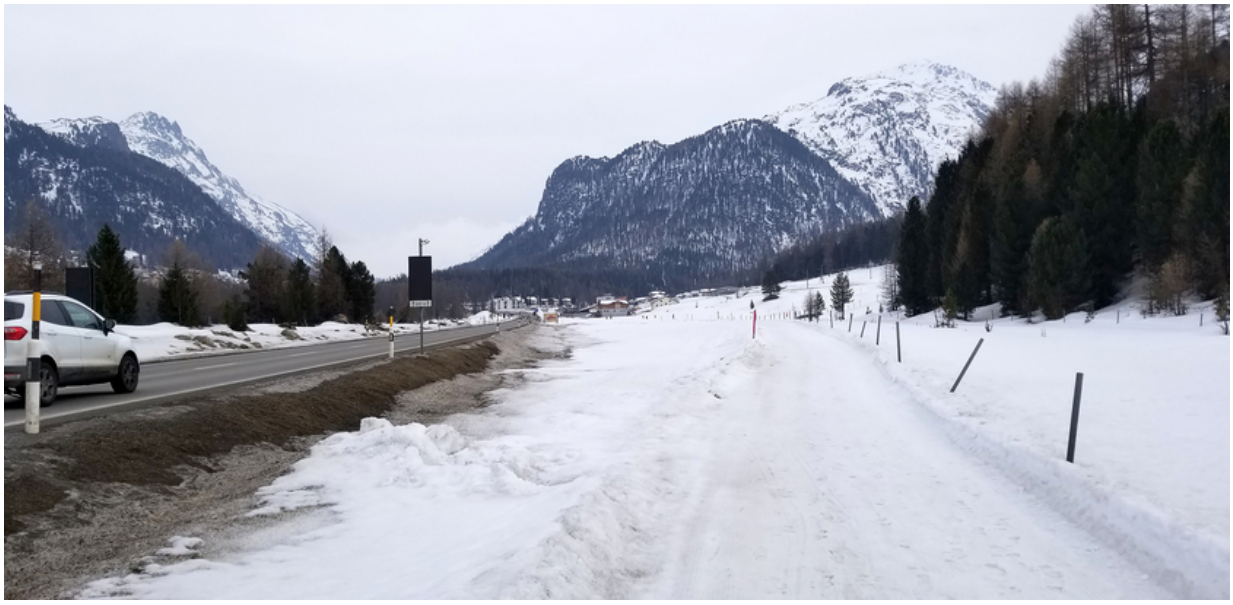
What were your most important findings?

We focused mainly on where microplastics come from and what role wastewater treatment plants play in discharging them into the environment. The short answer is: wastewater treatment plants do not play a major role. The most important source is vehicle tyre abrasion. If you want to tackle microplastics, you have to start with the source of the problem: traffic. The second important source is plastic decomposition .

Überlandstrasse 133
CH-8600 Dübendorf
T +41 58 765 55 11
F +41 58 765 50 28
info@eawag.ch
www.eawag.ch
eawag aquatic research

How much of a contributing factor is traffic?

In Switzerland, every car produces roughly estimated, one kilogram of microplastic rubber abrasion per year . The pollution can be seen very clearly in winter. A few metres from the road, the snow is practically white. Along the road it is all black. I maintain that this is mainly rubber abrasion from the cars.



The discoloured snow along the road is probably largely from tyre abrasion. (Photo: Adriano Joss)

What is the situation with the decomposition of plastic?

The quantities of plastic that we humans release are incredible. Worldwide, each person is responsible for generating roughly estimated, 50 kg of plastic every year. Around half of it ends up in the environment. In Switzerland, however, we manage the situation a little better because most of the plastic ends up in the rubbish before being taken to the waste incineration plants where it is incinerated to create carbon dioxide and water. However, in countries where plastic waste is disposed of in open landfills, it is only a matter of time before the wind blows everything away and spreads it everywhere. Over the years, it then decomposes and becomes microplastics.

Why do wastewater treatment plants not play a major role in the pollution caused by microplastics?

Our wastewater treatment plants in Switzerland separate particles efficiently. The waste is pre-treated to a sedimentation process before moving to a second stage with a grit chamber and finally into a biological sludge system. The sludge in particular traps most of the plastic particles. By retaining the sludge, we ar able to remove over 90 percent of the microplastics from the water. A sand or membrane filter can also be installed as a further measure. It is not really that expensive and this final step eliminates almost all the rest.

What happens with the sewage sludge?

In Switzerland, sewage sludge is incinerated, but in other countries, it is also used in agriculture. This can amount to significant discharges for the soil. Larger quantities can accumulate in this way over many years.

Recently, we hear more and more about nanoplastics. Do wastewater treatment plants have to be retrofitted for this?

No. In his work, Ralf Kägi has shown that practically all nanoparticles in water, whether plastic or other materials, bind to the sludge in wastewater treatment plants that have biological sludge systems. This means that the wastewater treatment plants commonly used today already remove more than 99per cent from the water.

Is our drinking water contaminated with microplastics?

Microplastics do not normally come into play here. Only a small amount of microplastics has so far been found in Swiss surface waters used for drinking water. Sand filters and flocculation filtrations are also used in drinking water treatment. The efficiency of these elimination processes is currently being investigated in collaboration with the Zurich Water Supply. We currently only ingest small amounts of microplastics through water. We are likely to absorb much more from the air we breathe as it contains, for example, the abrasion of textiles. Foodstuffs, too, often contain microplastics.

Can the small plastic particles be easily detected in water or in the environment?

No, analysis is a challenge. The problem is that besides the artificial organic material plastic, we also have natural organic materials such as wood, skin or bones. Furthermore, some components of plastic, the monomers, are also found in nature. There is a wide range of plastics, e.g. plastic that can be easily heated to 200 degrees in a pan, or plastic that already liquefies at these temperatures. The different types must usually be identified by their chemical makeup in order to distinguish them from natural materials. That is not always easy.

What interests you most about microplastics in the environment?

What I find particularly exciting is the question of how we as a society deal with the problem. Are we prepared to demand the development of low-emission car tyres or to demand that the manufacturers of toothpaste or creams stop using microplastics? Good substitute products made from natural ingredients are readily available today. So far, there is not enough pressure for something to be done. The pollution level is still not high enough in most places in Switzerland. Nevertheless, we must ask ourselves: Do microplastics belong in our environment? Even in small concentrations? My answer: No!

Cover picture: Raoul Schaffner, Eawag

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Fate and removal of plastic in wastewater treatment Presentation by Adriano Joss, Ralf Kägi [pdf, 1 MB]

Überlandstrasse 133
CH-8600 Dübendorf
T +41 58 765 55 11
F +41 58 765 50 28
info@eawag.ch
www.eawag.ch

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Microplastics in the environment

Contact

Adriano Joss

Tel. +41 58 765 5408

adriano.joss@eawag.ch

Ralf Kägi

Tel. +41 58 765 5273

ralf.kaegi@eawag.ch

Bärbel Zierl

Science editor

Tel. +41 58 765 6840

baerbel.zierl@eawag.ch

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