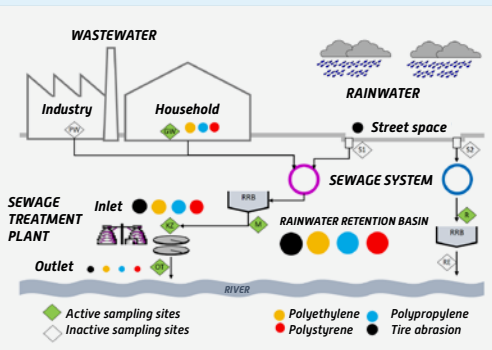


Microplastics in wastewater systems

What is the sampling procedure? What are the challenges?



The pathways of microplastics into the wastewater system are manifold. This results in different boundary conditions to which the sampling procedure for microplastics in the wastewater system has to be adapted.

Grafik: ©Institut Wasser Infrastruktur Ressourcen, TUK (2020)

The use of plastics permeates all areas of human life. As a result, microplastics are generated in various ways and are transported via the sewage system. Little is known, however, regarding the types and size distributions of microplastics found in the various wastewater streams, or the effectiveness of wastewater treatment plants in capturing them and how much of it ends up in the aquatic environment.

The sampling point and sample quantity are deliberately chosen

Wastewater is a complex mixture of water, dissolved substances, solids and air. Its composition varies depending on its origin, sampling location and weather conditions. Even rainwater is a type of wastewater with its own substance characteristics. It is thus a complex task to find the microplastic particles of different types, sizes and shapes and to detect them accurately despite the disruptive influence of the other wastewater constituents. Depending on the type of wastewater, a suitable sampling point must therefore be determined, and a representative sample quantity (up to 1,000 liters) must be collected in order to obtain a sufficiently large microplastic yield in the sample quantity.

“We need reliable sampling strategies to better understand the generation, transport and emissions of microplastics in and via the wastewater system.”

Attaallah Abusafia,
Kaiserslautern University of Technology



Suitable sampling sites, such as this inlet of an underground storm water basin, are not always easily accessible.

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What are the challenges during sampling?

Microplastics are present in wastewater in very small quantities and very small particle sizes; they tend to attach themselves to other solids and exhibit different transport properties (settling, floating or suspension). This complicates the development of a suitable sampling method. During rainy weather, major challenges lie in the strong dilution of the wastewater and in the rain dynamics.

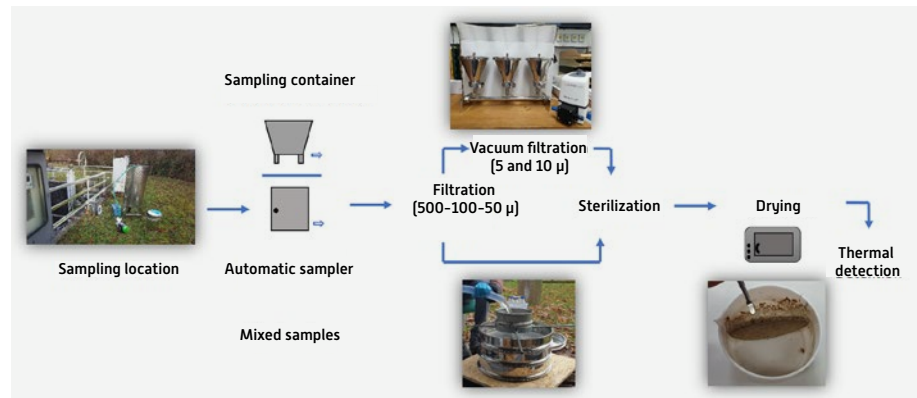
Research on the type, quantity, inputs and prevention strategies of microplastics

In the project “Representative Investigation Strategies for an Integrative System Understanding of Specific Inputs of Plastics into the Environment (RUSEKU)”, the urban wastewater system of the city of Kaiserslautern was sampled.

The goal is developing practical and representative sampling routines and strategies for microplastics which can be flexibly adapted to different boundary conditions. They are designed to provide better knowledge of microplastics occurrence and help identify „hotspots“ of microplastic input.

The sample preparation is carried out in stages – initially at the sampling site, afterwards at the laboratory.

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Processing and analysis of wastewater samples

The wastewater samples are collected in a plastic-free container, prepared on site as well as in the laboratory and filtered using various sieve sizes. In addition, the high hygienic standards require the samples to be sterilized. This is followed by a sample analysis using ThermoExtraction/Desorption- Gas Chromatography-Mass Spectrometry (TED-GC/MS) to determine the amount and type of the microplastics contained in the sample.



Stainless steel collection container [1,000 L] for large sample volumes during rainy weather used to obtain a sufficient volume of microplastics.

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