An Initiative of the German Federal Ministry of Education and Research

Plastics in the **Environment**

sources · sinks · solutions

Microplastics around dams

How do plastic particles behave in reservoirs?

The MikroPlaTaS team takes sediment samples in the Lippe River reservior. The researchers are investigating the occurrence and quantity of microplastics.
Photo: © WWU

„Natural biogeochemical processes can contribute to sinking of plastic particles in dams and reservoirs. Ongoing studies investigate how stable this sedimentation is and what effects on sediment-based organisms may occur."

PD Dr. Katrin Wendt-Potthoff, UFZ

Nowadays plastic is not only ubiquitous in the world's oceans, but also in many in-land waters. In certain areas, such as reservoirs or dams, the flow velocity decreases. As a result, the particles previously suspended in the current start to sink to the bottom of the water column and can accumulate in the sediment. The particles in the sediment no longer interact with organisms in the water nor are they further transported toward the sea.

Why do light plastic particles sink to the bottom?

In addition to the natural suspended matter (e.g. sand or organic particles), microplastics with a higher density than water (e.g. PVC, PET) sink when flow velocity is reduced. Plastic particles (polymers) with a lower density than water (e.g. PE, PP) should theoretically remain buoyant and continue to float despite the reduced flow. However, lightweight polyethylene (PE) can often be detected in the sediment around dams. Moreover, polymers in the range of milligrams per gram or less can be found in reservoir sediments.

This may be due to the following reasons:

1. Build-up of biofilms on the particles
2. Aggregation of suspended solids and mineral formation

Biofilms change the properties of microplastics

Biofilms form wherever water comes into contact with surfaces for a long period of time (e.g. slippery steps at swimming areas of lakes). Biofilms are comprised of microorganisms (bacteria, fungi, algae) that colonize a surface. Extensive growth can cause lightweight plastic polymers such as PE to become heavier and sink to the bottom in bodies of water. Particles can be stirred up again by currents or burrowing animals. This becomes less likely, however, the more the natural suspended matter becomes sediment and the thicker the sediment layer thus becomes.

Researchers prepare microplastic particles for experimentation and study how they behave under controlled conditions in the field.
Photo: © UFZ

Aggregation and mineral formation increase the density of plastic particles

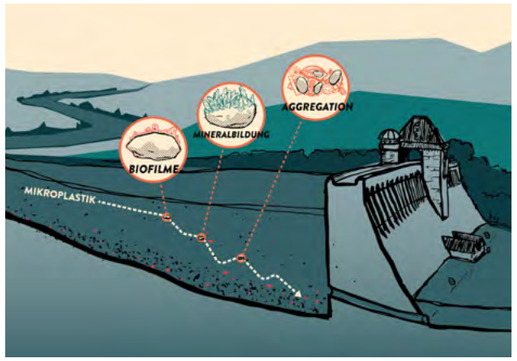
Single-celled organisms (algae, blue-green algae) and dead plant or animal remains are examples of particulate matter in the water column that can form compounds with plastic particles. The resulting aggregates usually have a higher density than water - and thus sink. The formation of minerals such as lime or iron compounds can also occur, which can bond with plastic and cause it to sink.

Before determining the microplastic content, the lake sediment is separated into particle size categories.
Photo: © UFZ

Research on microplastics in reservoirs: Sedimentation, distribution, impact

The partner institutions of the joint project MikroPlaTaS worked both in the field and laboratory. Among other things, they took sediment and water samples in dams and reservoirs (e.g. Bautzen, Lippe, Ems dams) to analyze them for microplastics.

Based on these results, the risks posed by microplastics to aquatic and sediment communities will be assessed in cooperation with implementation partners in order to derive concrete measures for environmental education and the management of localized discharges.



Particle sedimentation in areas with stagnant flow, exemplified by a dam.
Figure: © Per-Olaf Walter, WWU

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