
Reduction of the Input of Microplastics via Wastewater into the Aquatic Environment

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Abstract

Microplastics are discharged from urban areas into the aquatic environment via sewage, combined sewage and stormwater and therefore directly affect by the system of wastewater disposal. The mass-related results of the present work indicate high degrees of microplastic elimination with conventional mechanical-biological wastewater treatment of over 99% and orders of magnitude about 99.9 – 99.99% with downstream filtration processes (sand and cloth filters). The results show that combined sewer overflows and stormwater discharges from traffic areas are major emission sources. Due to a lack of standardisation and in particular due to different sampling and sample preparation methods, the measured values from the literature are still difficult to reproduce and compare without detailed contextual information. In order to assess the performance of the analytical methods developed and the quality of the data obtained in the present study, the measurement accuracy of the individual analytical steps was determined by calibration measurements using an independent reference measurement method (by recovery tests). A combined measurement uncertainty of $\pm 85\%$ can be estimated for the entire analysis procedure, which must be included when interpreting the data. The measurement uncertainties in sampling account for the largest proportion. These could be quantified and included with the help of a test rig. The main consideration was the distribution of particles in the water column and the detection during sampling on a technical scale. The study concludes with a rough estimate of the microplastic input from urban water management for the whole catchment area of Germany and recommendations for action for decision-makers.

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Keywords: Microplastics, Waste Water Treatment Plants, Storm Water, Combined Sewer Overflows, Measurement uncertainties