Federal Ministry of Education and Research

FONA Research for Sustainable Development BMBF

MicBin – Microplastics in the Danube River Basin

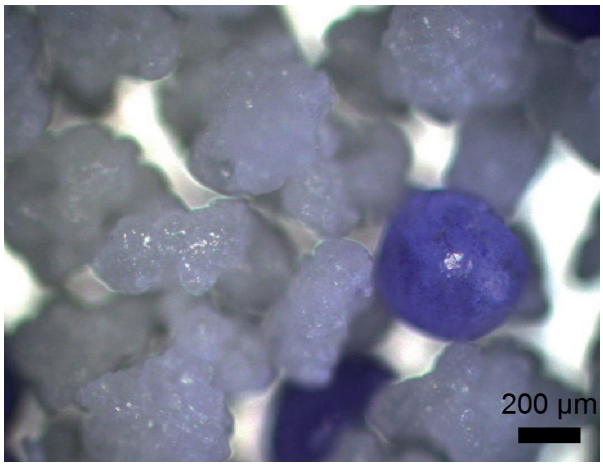
Plastics in the Environment – Sources · Sinks · Solutions

Large quantities of plastics enter the oceans through rivers and streams. However, little is known about the occurrence and transport routes in river basins. The joint research project MicBin aims to conduct an initial assessment of the entry points and the fate of plastic particles of different sizes in the German part of the Danube river basin. This study is primarily focusing on the analysis of microplastics: particles less than 5mm in size. The researchers are identifying quantities of microplastics in several Danube tributaries, investigating sources and sinks, and using models to test possible precautionary measures that can reduce the emission of plastic particles into the Danube river basin.

Measurement Campaigns for Determining Plastic Balance

The project partners are running extensive measurement campaigns at the Danube tributaries Ammer, Loisach, Würm and Amper in order to determine the quantity of microplastics entering the Danube river basin. They specifically focus on small plastic particles with diameters ranging from 2mm to one hundredth of a millimeter (10 µm), invisible to the naked eye. These particles are most frequently found in the environment and therefore of particular importance.

Through extensive sampling, targeted field studies and various analytical methods, the joint research project MicBin aims to identify the most important sources and sinks of microplastics in a large-sized river basin for the first time. The quantity, origin, transport and fate of the particles are being determined on the basis of measurement results and models of the entire Danube area. Researchers are examining wastewater treatment plants, landfill leachate and plastic waste on shores as potential sources of microplastics as well as the hitherto little investigated entry points from agriculture, ersosion and air. Additionally, they are analyzing barrages, soils and low-flow sections of water as potential sinks for microplastics.



Microplastic particles (polyethylene) isolated from a cosmetic peeling product

The project partners are also taking into account various processes such as the relocation, distribution and shredding of plastic waste in watercourses to understand the transport and alteration of the material in the environment. For different types of samples (soil, sediment, wastewater treatment plant effluent, leachate, surface water) sampling and analytical methods are being developed or optimized.

Models for Evaluating Measures in Advance

The measurement results from the rivers and field tests form the basis for further investigations with process- and transport-oriented models. This enables researchers to estimate the total loads of microplastics in the Danube river basin and to trace the fate of particles from land to sea. Using various simulations, they can also evaluate the effectiveness of targeted strategies against microplastics in the environment. These include, for example, local measures, such as the retrofitting of individual wastewater treatment plants, or restrictions that have regional effects, such as a ban on plastic films in agriculture. The models can also be adapted to other river basins and used there in a similar way.

Basis for Future Planning

From analyzing the various scenarios, the project partners will derive promising strategies to reduce plastic pollution in river basins. This could form the basis for future planning and legal requirements. In practice, this can benefit stakeholders such as associations of water and wastewater management, industry and agriculture, competent authorities as well as water supply and wastewater treatment companies.

Plastic garbage in a still water zone on the Danube

Research Focus
Plastics in the Environment – Sources • Sinks • Solutions

Project Title
Investigation and Modeling of Entries and whereabouts in the Danube Area as a Basis for Action Planning (MicBin)

Grant Number
02WPL1447A-G

Duration
October 1, 2017 – September 30, 2020

Funding Volume
EUR 1,919,968

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Website
www.micbin.de

Publisher
Federal Ministry of Education and Research (BMBF)
Department of Resources, Circular Economy; Geosciences,
53170 Bonn

Editorial Work and Design
Project Management Agency Karlsruhe (PTKA)

Print
BMBF

Photo Credits
Front and back page: TZW, Marco Pittroff

Version of
November 2018

www.bmbf.de