An Initiative of the German Federal Ministry of Education and Research

Plastics in the Environment

sources • sinks • solutions

Plastics in wastewater

Products, input paths and possible solutions

Plastic waste buildup in a wastewater treatment plant.

Photo: © FiW 2021

„A very wide range of plastic products pollute the environment - we need to greatly reduce plastic consumption overall to prevent this from happening."

Dr. Maria Daskalakis, University of Kassel

The most frequently identified plastic items in the Aachen wastewater treatment plant sorted by product group and occurrence..

Graphic: ©Maria Daskalakis/pixabay.com

An increasing amount of plastics is polluting the environment and endangering humans and animals. Current scientific studies in wastewater treatment plants show that a large amount of various plastic products and plastic packaging ends up in the sewage system and in the environment through various pathways. Legislation has so far failed to take this scale into account. Fundamental measures must therefore be taken.

Large quantities of various plastic products and plastic packaging in the wastewater treatment plants

In the Aachen area, monthly samples were taken in all outgoing material streams at four wastewater treatment plants over a period of one year. In addition, the total input of plastics into storm drains from about 50 streets in the four model municipalities was also recorded over a period of one year. The samples contained a very large number of plastic pieces measuring at least 1 mm. The product origin of many plastic pieces was indeterminable, but about **160 different products and types of packaging** could be identified. In one year, the Aachen wastewater treatment plant alone generated **53 tons of plastic**, which consisted of more than **226 million individual plastic parts** in the outgoing material streams. The actual quantity is even greater, as plastic parts smaller than 1 mm were not recorded.

- **Hygiene products:** Wet wipes, dental floss, sanitary pads, panty liners, tampons, cotton swabs, cotton pads, incontinence pants
- **Packaging:** Produce mesh nets, confectionery, tacking threads, tampon wraps, sanitary pad wrappers, pill blister packs, beverage bottles/caps, tobacco packaging
- **Textiles and applicators:** Fibers, sequins, imitation leather, cords, clothing labels
- **Cigarette filters**
- **Pallets for plastic production and processing, pellets for wheel cleaning**
- **Other:** brush bristles, lollipop sticks, rubber bands, drinking straws, balloons, softair balls, firework debris

Research on the prevention of plastics entering wastewater

The interdisciplinary project „Environmental Policy Instruments to Reduce Plastic Pollution of Inland Waters via Drainage Systems“ examines and classifies the occurrence of plastic pieces of at least 1 mm in size in wastewater treatment plants and street drainage systems in the municipalities of Aachen, Roetgen, Simmerath and Stollberg. Surveys and a laboratory experiment support the analyses. Based on these findings, proposals for environmental policy instruments to prevent these plastic waste inputs are being developed.

Wind and rain carry carelessly discarded plastic products and packaging into waterways via street gutters.

Photo: © FiW

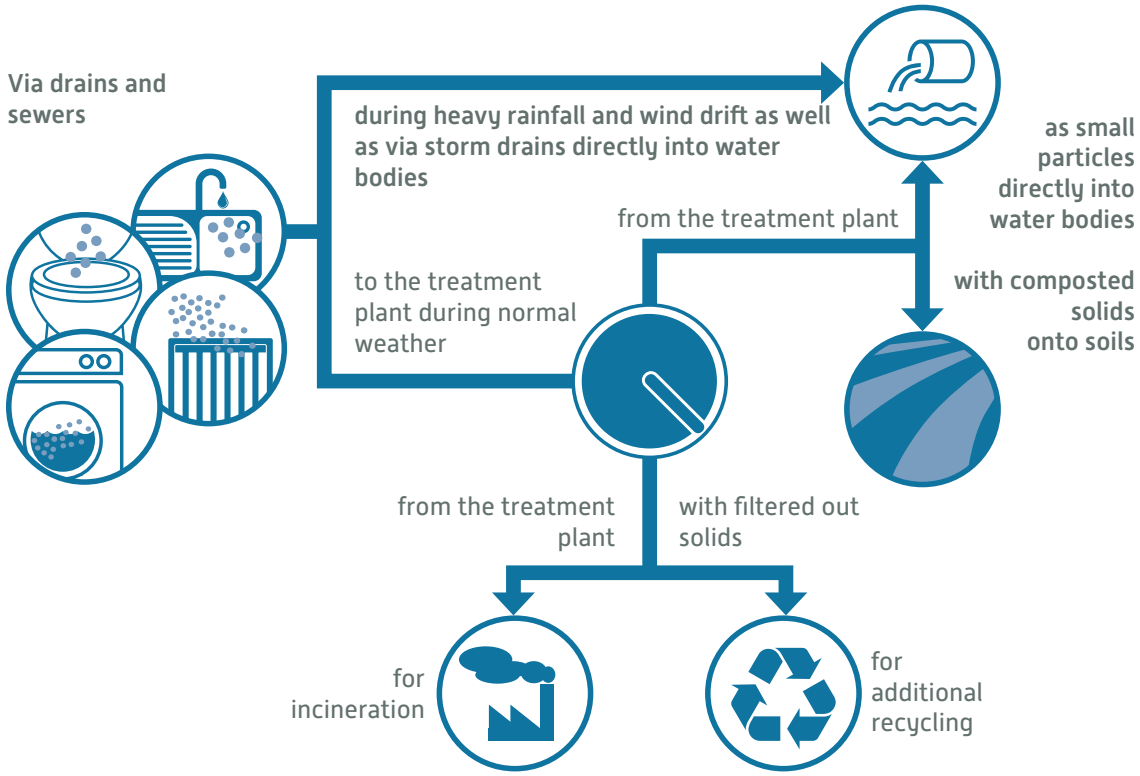
Excessive amounts of plastic end up in the sewage system

Products and packaging containing plastic should be disposed of through waste collection after use. More often, however, they are disposed of improperly via storm drains and gutters into wastewater in private, commercial and public spaces. Reasons for this can be convenience, ignorance or lack of disposal alternatives.

This is how plastic can enter the environment through the sewage system

One way in which plastic enters wastewater treatment plants is via the sewer system, and a small proportion of it may enter water bodies directly. However, other entry routes into the environment are more significant:

1. during heavy rain, wastewater contaminated with plastic is washed past the treatment plants directly into bodies of water.
2. separate rainwater drains carry plastic particles from storm drains directly into water bodies.
3. plastic-containing sewage sludge and likely also screenings from wastewater treatment plants can enter the environment as agricultural fertilizer on soils, sand trap material in landfills, or through recycling in construction projects.



Plastic enters wastewater and the environment through a variety of pathways.

Graphic: © Maria Daskalakis

Fundamental measures are needed – the Single-Use Plastics Directive is insufficient

In order to reduce the diverse inputs of plastics into the environment, the number of plastic products used must be greatly reduced. To this end, the legislator must ensure and promote the switch to plastic-free products and packaging as well as the elimination of unnecessary products as comprehensively as possible. In doing so, single-use products must be replaced by reusable alternatives where possible in order to protect natural resources. The EU's Single-Use Plastics Directive, which only addresses a few plastic products, falls short of this goal.

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Authors
Daskalakis, Maria*; Breitbarth, Marco*; Hentschel, Anja**; Kaser, Simon**

Institution
University of Kassel, Working Group Environmental Policy*; Darmstadt University of Applied Sciences, Department of Environmental and Energy Law**

Contact
daskalakis@wirtschaft.uni-kassel.de

Design
Noreen Matthes, Ecologic Institute; Tanja Dohr, FiW Aachen

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