

# Urban River Water Level Increase Through Plastic Waste Accumulation at a Rack Structure

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## Abstract

Plastic debris in water systems is a major challenge for our ecosystem, because it is extremely persistent in the environment. Apart from the importance of reducing the amount of plastic entering the ocean, clearing the rivers from debris is important for societal concerns, such as flood risks. Plastic waste accumulation at trash racks leads to a rise in upstream water level and may increase urban flood risk. Until now, most studies of riverine debris accumulation predominantly focused on organic accumulations at trash racks and bridge piers. In this study, flume experiments were used to study the behavior of plastic and mixed debris accumulations. One of the key findings from this study is that plastic debris causes a faster blockage than organic matter, as the plastic blockage contains fewer voids and therefore has a higher blockage density. In addition to the flume experiments, field measurements were performed in the Cikapundung River (Indonesia). This river is one of the tributaries of the Citarum River, which is considered one of the world's most heavily polluted rivers. Combining the results of the flume experiments and field measurements demonstrated that a backwater rise of 1 m/h is plausible for a blocked trash rack in the Cikapundung River, illustrating the additional flood risk caused by plastic pollution. Our results emphasize the need for further quantifying riverine (plastic) debris and investigating its relation to changes in the water system behavior, including its influence on urban flood risk.

## Keywords:

macroplastic, urban hydrology, plastic, flood risk, Indonesia.

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