

Macroplastic storage in mountain and foothill rivers



Rycina 1. Macroplastic debris deposited on mineral and organic sediments in the mountain Dunajec River. *Photo: Maciej Liro*

Plastic bags trapped on riparian trees and flowing in the river water became an integral element of modern river landscape. Widespread production of plastic and the related disposal of plastic waste to the environment started in the 1960s. Since that time plastic debris has been found in rivers and oceans all over the world.

Knowledge on riverine plastic pollution is mainly limited to the microplastic fraction (plastic particles < 5 mm in size) and its negative effects on biota. Few studies have focused on larger, macroplastic debris (plastic

particles > 5 mm in size) in rivers. In the case of mountain and foothills rivers, this topic remains unexplored. Although it was documented that fragmentation of macroplastic particles is a key source of secondary microplastic production in rivers, existing state-of-the-art lacks information on *how much?* and *where?* macroplastic is stored in mountain rivers. To narrow this knowledge gap, we plan to investigate four streams in the Polish Carpathians with different levels of human pressures in their catchments and channels to determine relations between macroplastic abundance in rivers and: (a) physiographic and antropogenic characteristics of their catchments, (b) river morphology, and (c) riparian vegetation cover in order to test three hypothesis:

H1: Macroplastic storage is positively related to the input of plastic waste to the river. Plastic input will be quantified using human population density and waste management indexes in the river catchments/subcatchments (at regional scale), and proximity to settlements and transport infrastructure, e.g. roads and bridges (at local scale).

H2: Larger amounts of in-channel-stored macroplastic occur in wider, unmanaged channel reaches typified by lower energy of floodwater at floods of given recurrence intervals than in narrow, channelized reaches typified by higher floodwater energy.

H3: (A) Woody riparian vegetation growing close to river channel traps more macroplastic than that growing in the distal part of river floodplain. (B) In contrast, floodplain surfaces covered by grass/herbaceous vegetation store less macroplastic near the channel than in the distal part of floodplain.

Realization of the project will narrow these gaps by: (i) development of protocols for mapping and sampling macroplastic storage in rivers, (ii) development of conceptual models explaining the processes of and controls on macroplastic storage in mountain and foothill rivers with different natural and antropogenic characteristics, (ii) giving first insight into the levels of macroplastic pollution occurring in mountain and foothill watercourses in the Polish Carpathians that will allow for comparison of plastic abundance with rivers from other regions.