Despite mountain rivers are typically seen as a relatively pristine ecosystem providing high floral and faunal diversity and numerous goods for human populations, recently they have become substantially polluted by macroplastics, mainly deposited on accumulations of dead wood fragments (called 'wood jams') occurring in the river channels. However, the mechanism explaining this high macroplastic trapping efficiency of this jams in river channels has not yet been quantitatively explored. This project aims to challenge the following research questions:

1. What amounts (by weight and volume) of macroplastic are deposited in wood jams in relation to characteristics of wood (e.g., size, dominant woody debris type, vegetation species sourcing woody debris)?
2. In what degree does river characteristics control the amount of macroplastic trapped on a given wood jam type?
3. What are the predominant types of plastic deposited on wood jams and does their proportion differ between different types of wood jams and river channels?
4. How fluctuations in river water levels control deposition of macroplastics on wood jams?

We hypothesise that macroplastic is deposited on the existing wood jams during low to moderate floods, which do not result in destruction or moving of given wood jam (H1); wood jams situated at elevated, more resistant to erosion surfaces (e.g., gravel bars or head of vegetated islands) will store macroplastic for longer time than these occurring at lower elevations, more prone to erosion by river flow (H2); free, wild-migrating river reaches are trapping more macroplastic (total mass, item number) than narrow, regulated ones (H3); the amount of plastic stored on wood jams does not depend on the size of wood jams, but on its 'roughness', i.e,. the presence of trees/shrubs with a spreading crown (H4); in particularly littered river sections, the volumetric proportions of wood and plastic in wood jams may be equal, while the large majority of wood jam mass will be wood (H5).

The study will be conducted along six different-size Carpathian rivers (Raba, Czarny Dunajec, Rogoźnik, Dunajec, Białka and Biała Tarnowska rivers) having contrasting single- and multi-thread channel patterns. Our preliminary research in Carpathian watercourses indicated, that exposed river sediments and areas covered with herbaceous vegetation stored significantly lower amounts of macroplastic debris than vegetated islands and wood jams. We have also documented that unmanaged, multi-thread reach 2.4 times wider than the neighbouring channelized reach, stored 36 times greater amount of macroplastic per 1 km of river length.

In order to achieve the assumed goals, aerial maps using a drone and digital elevation models will be created. Based on these data and field reconnaissance, river sections will be selected and then subjected to an inventory of wood debris and macroplastics deposited on it, along with the assessment of the wood/plastic amounts by weight, volume and polymer types. Subsequently, an assessment of conditions in the channel during flood flows will be performed to explain how often jams with a specific elevation above the water surface are flooded and how large a flood is able to destroy the investigated jams.

Our project is designed to provide elementary knowledge on macroplastic trapping efficiency of wood jams which can be further applied to clean-up operation planning, designing macroplastic trapping infrastructure and developing mitigation strategies. From a scientific point of view the project will provide novel information on riverine macroplastic storage processes which substantially enrich the existing models of macroplastic routes through the mountain rivers. From a practical point of view, the project will provide knowledge applicable for developing future mitigation strategies for the Carpathian rivers and other mountain rivers affected by plastic littering. If the Carpathian rivers pretend to meet the requirements of the Water Framework Directive by the means of achieving a proper ecological status, the reliable information on the existing plastic pollution must be precisely collected and implemented into practical solutions. By complex quantification of the amounts of macroplastic trapped by wood jam our project will guide future mitigation strategies.