

Spontaneous restoration - how does it influence biogeomorphological functions of river channels?

The accessibility of water resources, including the risk of flooding or drought, and the functioning of riparian ecosystems depend on the current structure of river channels. Long-standing strong human pressure has led to significant changes in the river courses, thereby disrupting the above-mentioned functions. For example, the disappearance of multi-thread channels characteristic of mountainous areas, such as the Carpathian Mountains, is widely observed in Europe. The canalization and reduction of the valley-forming role of river beds results, among other things, in a lowering of the groundwater level and a threat to rare species.. The need to restore the proper functioning of freshwater ecosystems and local water retention has led to a growing interest in river restoration and its recognition in the legislation. However, technical measures aimed at restoring natural channel features in regulated rivers are still uncommon, and one of the obstacles to their large-scale implementation is cost. Therefore, geomorphological processes that occur naturally and lead to similar results are a promising addition to restoration efforts.

Some sections of Carpathian rivers tend to naturally restore the multi-thread channel pattern despite river regulation and construction of bank reinforcements, while others retain a permanently regulated character. The recognition of the reasons for the local occurrence of this phenomenon and links between riverbed patterns and their biogeomorphological functionality are the main objectives of this project. These objectives will be achieved by: a) identification of the river channel development over the past 200 years; b) determination of factors supporting or limiting contemporary restoration of multi-thread zones in regulated rivers; c) assessment of the effectiveness of spontaneous river channel restoration in the context of groundwater retention and natural habitat quality.

The study will cover selected mountain rivers in Poland and Slovakia. Archival aerial photographs and topographic maps, including those dating back to the mid-19th century, will be used to analyze changes in the course of river channels. Detailed data on the contemporary characteristics of the channels, i.e. landforms, the presence of woody debris and habitat structure, will be obtained in the field, including using remote sensing. The use of potential habitats will be identified on the example of amphibians, as a group of organisms that depend on the aquatic environment. In addition, hydrological measurements will include both water flow and groundwater levels.

The determination of the extent to which biogeomorphological functions lost due to river regulation can be naturally restored will be made possible by an interdisciplinary approach to this phenomenon. One of the expected outcomes of the study is to establish a link between the variation in the efficiency of spontaneous restoration processes in mountain river channels and local natural and economic factors. Thus, the results of the research could be used to improve the management of riverine areas and enhance their ecological status.