

The research aims to investigate the effects of climate change on the formation of floods in natural river valleys. In particular, emphasis will be placed on the analysis of water sources that create floods, such as water from: snow melt, river bed, rain and groundwater. The second objective of the study, derived from the first, is to find a link between the vegetation zone (ecological aspects) and the spatial location of the water zones of the aforementioned sources (hydrological and climatic aspects).

The research will be based on simulation of an advanced hydrological model including both 3D groundwater and 2D surface water flows. This model uses novel techniques to track the flow of water from different sources in time and space. In addition to the results of simulation historical data will be used: hydrological and meteorological records and vegetation maps. The impact of climate change will be analyzed using scenarios developed by the IPCC. The results will be analyzed based on advanced statistical and mathematical methods.

Undertaking this research is important because it will allow to verify the recent hypotheses in the scientific literature on the relationship between the water from different sources and the ecology of river valleys. In addition, it will show which parts of river valleys are most vulnerable to climate change and which hydrological and climatic characteristics will have the greatest impact on these changes.