Assessment of the population exposed to pluvial floods using very high resolution data: case study of Metković, Croatia

Rapid urbanization and global climate change are leading to increasingly frequent and severe pluvial floods that often affect many people around the world. Assessing the population exposed to pluvial floods is crucial for making optimal decisions in flood prevention and mitigation, but depends heavily on the accuracy of data sets. For this reason, the paper proposes an approach based on very high-resolution data and scenarios that connect hydrological-hydraulic modelling and GIS analyses to estimate the population exposed to pluvial floods. Hazard models and dasymetric models at the level of individual buildings were created, integrating and synthesizing data from various sources. The analysis of pluvial flood hazards in the Metković settlement watershed was conducted following the methodology proposed and developed within the STREAM Interreg project. Flood hazards were assessed through hydrological-hydraulic simulations of surface runoff from precipitation. The basis for these simulations was precipitation defined by design storms for different probabilities. Various spatial layers were collected and generated for hydrological-hydraulic analysis of precipitation runoff, including DTM, land cover, land-surface impermeability, surface roughness, and infiltration (CN curve numbers). The foundation for creating the dasymetric model was building footprints extracted using GEOBIA based on a multispectral model, building height and shape data obtained from processing aerial LiDAR, spatial plan data, population data by statistical circles, and field research. Buildings were classified into residential and non-residential, with residential structures further classified into houses and multi-unit buildings. The results of flood hazard analysis include maps of water depth and velocity, as well as hazard levels for each observed probability. The exposure assessment of the population was conducted through GIS analyses by identifying the number of exposed populations. The results show that the number of people exposed to pluvial floods is significantly reduced, for different probabilities, when using the population count at the building level compared to conventional population datasets. The approach and data obtained can be used to improve the efficiency of emergency interventions, enhance vulnerability assessments, increase the accuracy of local flood models, and better understand the interactions between land cover, climate, population, and floods.

**Keywords**: hazard models, dasymetric model, pluvial floods, Metković, Republic of Croatia