The information potential of satellite remote sensing data in storm flow modeling

The progressing urbanization significantly affects the way in which the space is developed. This results in an increase in sealed and hardened surfaces. Way of land use determines the amount of rainwater runoff, and thus the efficiency of sewerage systems. Compared to traditional on-site measurements, remote sensing data are an extremely useful source of spatial information that can be successfully used to calibrate the parameters of a hydrodynamic model. As a result, obtaining reliable data, including the coefficients identified in the model, can improve the reliability of the remaining coefficients. CN factor (Curve Number) is one of the coefficients determined at the stage of creating catchment models determining the varying degree of land development and its humidity. The aim of the authors’ work is to create a map of land use and land cover (LULC) and estimate impermeable areas in the catchment area of the SiB collector in the city of Kielce. In addition, the aim of the research is to determine the CN parameter using remote sensing methods.

Study area and methodology

The object of the analyses was a city catchment of the area of 62 ha located in the south-eastern part of Kielce. The city covers an area of 109 km² and constitutes the capital of the Świętokrzyskie Voivodeship (Poland). The imperious areas of the catchment are pavements (8.4%), roads (17.7%), parking lots (11.2%), roofs (14.3%), and school playgrounds (1.3%). The total length of the sewer network in the area is 5983 m.

Results

Cropped satellite scenes from Landsat 8 and Sentinel 2B satellites were used for the analysis. The images were subjected to geometric and radiometric correction. NDVI, LAI maps were created based on pre-processed data. In addition, data were collected from publicly available sources such as Urban Atlas, Open Street and BDOT in order to search for the optimal solution for determining the classes of land use and land cover taken into account for calculations of the CN parameter.

Summary

The presented solutions allow to determine impermeable areas much faster than by manual digitization of the content of RGB orthophotomaps. The various built-up area results obtained necessity to create an optimized methodology for these needs. Work to develop the issue is ongoing.