

Abstract

The dissertation presented was aimed at conducting and verifying the method of assessment of hydro-morphological conditions of selected fragments of river valleys, located in an urbanised drainage basin, on the basis of data obtained from the airborne laser scanning technology. The work objective defined this way has served to prove the thesis saying that making an analysis of the data and products obtained from the laser airborne scanning, makes it possible to perform an assessment of hydro-morphological conditions of river valleys in the urbanized areas, with the quality inaccessible with other methods. At the same time, the necessity of conducting site inspections relates only to selected elements of assessment of hydro-morphological conditions.

As the object of the research selected, there were chosen twenty 500 m-long fragments of river valleys, in the central, urbanized, part of the Upper Silesia region. The tests were performed on the basis of the cloud of laser points in the Standard II of the national ISOK project, with a density not less than 12 points per m², and were obtained using the topographic LIDAR.

As it follows from the literature survey conducted, this was the first trial to assess hydro-geo-morphological conditions of the river valleys located in the urbanized areas, and conducted using the data coming from the airborne laser scanning. The utility of the problem investigated is related both to the necessity of conducting such investigations, resulting from the Framework Water Directive, and from Water Law, as well as from social pressure towards improvement of the living conditions in the cities, including the riverside areas.

The investigations performed within the thesis presented have been verified on the basis of site studies that were conducted using the URS (Urban River Survey) method, the most popular one in Europe, in assessing the hydro-geo-morphological conditions relative to city-located rivers.

An analysis of the results of research conducted, together with relating them to the current state of knowledge, enabled, apart from proving the thesis of the dissertation, to formulate the following conclusions, among the others:

- On the basis of the data from the laser airborne scanning, one can make a preliminary hydro-geo-morphological classification of the sections of river valleys,

- Use of the laser scanning technique may become the basis for identification of the changes within the vicinity of the river valley, and become an important element in the hydro-morphological monitoring of the rivers,
- Using the laser scanning technique to assess the hydro-morphological conditions may be used in the valorization of the river valley section, and preliminary planning of revitalization actions,
- Laser scanning technique is the best method to investigate the inter-relationships of the hydro-morphological conditions and the conditions in the river basin,
- Utilization of the airborne laser scanning data may be a basis for assessment of the continuity of the river valley, and identification of barriers for fish migration,
- Lidar data are distinctly suitable to transformation of the morphology of the river valley and flora structure in its surroundings,
- To investigate the morphology of the river bed, and structure of vegetation below the water level, another method should be used; an alternative here may be testing using bathymetric scanner, outside site studies.

The dynamic development of tele-detection techniques over the last decades allows to expect that the data coming from the airborne laser scanning will be updated in a manner similar as airborne photographs currently made. The further development will be also conditioned with the cost reduction of data acquisition, and wider and wider access to dedicated analytical software, both commercial and open source. Such a development process, together with the capabilities offered by the laser scanning technique, will enable to perform more accurate investigations of the relationships between the changes in the river basin, and effects in the river valleys, and quality of surface waters. The proposal of using this technology is particularly attractive in the urbanized areas, where the dynamics of changes is the highest, and impact on the environment most significant.

The airborne laser scanning may be used in identification of actions and areas to be fulfilled in order to improve the hydro-morphological conditions of river valleys, thus approaching the objectives of the Framework Water Directive, meaning, at least, obtaining good ecological condition of waters.