



Airborne LiDAR data as a key element of the integrated monitoring of the reservoir shore zone development

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The research of the transformation of the shore zone of artificial water reservoirs are long-term monitoring studies, often covering the entire length of the shoreline of the tested basin. Extremely valuable sources of data in such studies are variously dated cartographic materials: large-scale maps and surveying plans as well as aerial photographs. In recent years, the materials derived from the airborne laser scanning, i.e. light detection and ranging (LiDAR) which are among the most accurate terrain data, gained importance.

The possibility of using data from the airborne laser scanning in the studies of the transformation of the shore zone of a water reservoir will be presented on the example of the Jeziorsko Reservoir on the Warta River (Central Poland). The reservoir was created in the years 1986-1992. It is a typical retention reservoir with large, nearly 5-m, water level changes in a yearly cycle. Its total surface area, depending on the water level, is between 19.6 km² and 242.3 km². The total length of the shore is 44.3 km, of which 14.2 km (32.1%) are embanked. Nearly 40% of the non-embanked shore is still active, and its development is the result of the processes of shoreline erosion, mass movements and accumulation. Most problems are caused by the abrasive shores which represent 27% of the non-embanked shoreline. The height of the accompanying cliff varies from a few cm to 12.5 m. In the years 1991-2009 the shoreline of the reservoir retreated by 6.9 to 18.7 m in the northern part of the reservoir (the cliff of 1-12.2 m) and by 9 to 29.6 m in its southern part (the cliff of 2.0-8.5 m). The cliff recession pace with the development of the shore zone significantly decreased; in the northern part of the reservoir the cliff recession dropped from 1.5 m/y in 1991-2004 to 0.5 m/y in 2004-2009, while in the southern part - from 0.7-2.22 m/y in 1991-2004 to 0-1.12 m/y in 2004-2009.

The study used the airborne LiDAR data from the years 2009 and 2011 in the ALS formats, the raster with a resolution of 0.5 m and the point cloud of the resolution of min. 4 points per m². Their compilation with the materials previously used in the study, such as surveying, the DGP measurements of the upper edge of the cliff (2009), aerial photographs (1991 and 2004), and orthophotomap (1992) made it possible to determine the rate and direction of the transformation of the shore of the Jeziorsko Reservoir since its construction until 2011.

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