



Shaping the escarpment zone of lowland river valleys by landslides: a case study in the Vistula Valley (northern Poland)

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Landslides in lowlands are less frequent than in mountains, uplands or coastal regions. In lowlands, they are found mostly in the escarpment zone of river valleys. In this geomorphological position, landslides were investigated in the middle of the Lower Vistula Valley (northern Poland) ($53^{\circ}12'N$ $18^{\circ}11'E$ to $53^{\circ}25'N$ $18^{\circ}30'E$). Landslides develop there within Quaternary tills, sands and clay. Particularly important is the Pliocene clay layer, with glaciectonic deformation, present in many places in the lower part of slopes. Determination of contemporary activity of landslides in the escarpment zone is based on field work, such as a detailed inventory and documentation of the landslide forms, geotechnical and geological drillings, geodesic measurements, and analysis of aerial photographs. The research revealed a significant role of landslides in old and contemporary shaping of the relief of the escarpment zone of the river valley. The detailed inventory and documentation of landslides in the study area have indicated the existence of nearly 200 landslides of various size, up to 70 000 m². Shearing slides are the most common type of landslides, often in the multiple rotational form. Contemporary active forms account for 30%, regularly active for 38%, and inactive for 32% of the identified landslides. Depending on geomorphological zones, landslides cover 6-30% of the area of the slopes, and about 3-20 landslides are found per 1 km of escarpment zone in the slope area. Currently, in the study area the most important factor of landslide activation is precipitation. This study was supported by the Virtual Institute of Integrated Climate and Landscape Evolution (ICLEA) of the Helmholtz Association and the research project no. N N306 0860 37 Polish Ministry of Science and Higher Education.