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The potential catchment management through large scale land consolidation for flood and erosion risk mitigation: case study of the Myjava river

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The effects of land use management practices on surface runoff are evident on a local scale, but evidence of their impact on the scale of a watershed is limited. This case study focuses on an analysis of the impact of hypothetical land use changes on the flood regime in the Myjava River basin, which is located in Western Slovakia, which is characterised by the formation of fast runoff processes, intensive soil erosion, and muddy floods. The main factors responsible for these problems with flooding and soil erosion are the basin's location, geology, pedology, agricultural land use, and cropping practices. The main objective of this study was to perform an assessment of the impact of land use changes on flood runoff processes and the water balance.
The GIS-based, spatially distributed rainfall-runoff model was used to simulate mean daily discharges in the outlet of the basin as well as the individual components of the water balance. Various components of runoff (e.g., surface, interflow and groundwater) and several elements of the hydrological balance (evapotranspiration and soil moisture) were estimated under various land use scenarios. Practical, realistic and realizable land use management solutions through large scale land consolidation were based on the redistribution of land use classes (arable land, grass and forest) by respecting permissible slopes in the catchment without significantly changing the area of the respective landuse classes. Such scenarios, which could be economically implemented to mitigate soil erosion processes and enhance the flood protection measures in the Myjava River basin, confirmed the possibility of reducing surface runoff and maximum discharges with applicable changes in land use and land management.

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