



Vegetation cover as factor controlling slope stability within gully channels: a case study from the Daugava valley (SE Latvia)

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Local disturbances of the vegetation cover, particularly forest cutting has been recognized throughout the world as one of the most important factors affecting the stability of slopes and triggering of landslides and other mass movement processes. However, it is difficult to relate the occurrence of landslides directly to variations in land use and type of vegetation, particularly in gullies presently found under forest. Such old gullies can be observed in many forests of Northern Europe as well in Latvia, but few studies have reported to their genesis and processes within these forms.

Detailed studies of origin of such gullies leads to the conclusion that they are of periglacial origin of the late Pleistocene or that gully incision was most probably triggered by extreme rainfall events at the beginning of Holocene. Although human agricultural activity in Latvia dates some 4.000 – 5.000 years ago, intense disturbance of the vegetation cover and man-induced mass movement processes as well as accelerated erosion began only about 800 – 900 years ago. Morainic plains in upland areas adjacent to deep Daugava valley proved to be suitable landscape for use as croplands during that period, whereas the steep slopes of incised gullies were left vegetated due to difficult or even impossible use of them for agricultural needs.

Results of field studies about mass movement processes in agricultural and natural catchments in Southeast Latvia within the Daugava valley permit to draw certain conclusions about the influence of vegetation cover characteristics on slope stability within gully channels under broad-leaved forest in this region.

Studies of previously occurring landslides together with the lithological character-

istics of these elements and vegetation cover on the gully slopes, indicate whether mass movement was triggered by extreme rainfall events, subsurface flow and piping, human-induced vegetation cover changes, or a combination of mentioned processes.

Landslides initial development depends on many determining and triggering factors. In Latvia however, where the present day topography and lithology has been largely formed by Pleistocene glaciations, particularly by the last Weichselian (Vistulian) event, it was the climate (extreme rainfalls) and geological (lithostratigraphic sequence) indicators that have mainly determined the occurrence of landslides, as well as their morphological features.

It is obviously, that mass movements like rainfall-induced shallow landslides or small scale mudflows on highly steepened gully slopes formed from poorly cemented glacial and glaciofluvial deposits are wide spread, despite the dense vegetation cover. This fact can be explained by steepness of slope, which exceed angle of response, vegetation, in their turn anchor and armour upper part of deposits.

Recognition of the fact that landslides mainly have a “natural origin” within gullies under forest also indicates that they play a vital role in slope denudation processes in gullies.