

THE EFFECT OF THE LANDSLIDES ON A RURAL ROAD

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Abstract

Following heavy rains, a landslide took place on a rural road which connects two national roads in Argeş County. The platform of the road has been destroyed to a great length, because of the heavy rains with high intensity and duration. The analyzed road is of great interest to the local population as it provides the access road of people from several villages.

The current study aimed at the proposal of restoration works in order to diminish the effects of the natural disaster on this road. The area was firstly studied topographically, then from a climatic, geological and even cadastral point of view (legal and economic).

According to the undertaken studies, a series of works were proposed in order to deal with the current situation, but also to reduce the risk of landslide reactivation.

The proposed works were classical works of land reclamation, such as gabions.

It is important for the solutions to be simple, found in due time and have logical directions to be followed in the future.

Keywords: landslide, access road, topographic surveys, ditch consolidations

1. INTRODUCTION

Landslides in degraded lands are generated especially on steep slopes, in areas with heavy rainfall. The studied area does not have a suitable surface water discharge, and the existing footbridge is clogged up.

The climate and the natural phenomena of the area, the geology and seismicity were studied within this paper. Topographical surveys with both planimetric and level-related details were conducted. This approach allowed us to establish the fact that the area is excavating, the contour line confirming this.

Works have been proposed to solve the situation and reduce the risk of landslides in the future.

2. MATERIALS AND METHODS

The climate factors cannot be characterized by filling the ground with material. Therefore, the core material was based on the observations made by the Meteorological Institute. All the necessary climate data were extracted from the publications of the meteorological institutions within the studied area.

The geology of the land was drafted on the basis of the observations made by specialists, the area being part of the natural Getic Sub-Carpathian unit, characterized by a geological formation specific to the Sub Carpathians.

Seismologically, the classification was made according to the Seismic Design Code, indicative P100/2013.

According to CR 1-1-3 and 1-1-4 /2012 regarding the wind and snow loads, the site has been established for the future works.

The topographical surveys were conducted with GPS SOUTH S86-T and Pentax total station W-822NX, using the RTK method - kinematic measurements.

3. RESULTS AND DISCUSSIONS

Climate interfered especially with the heavy rainfall. The mountain and hill climate specific to the studied area, is characterized by the presence of some average annual temperatures of + 9°C; at the same time, rainfall is heavy reaching up to 600mm (rainfall varies from one year to another). The average frequency of frost days with temperatures below 0°C is of about 125 days/year.

Because of the irregular rainfall, there are either periods with excess of humidity or dry periods. Soil moisture regime is susceptible to significant variations depending on the relief and microrelief, exhibition, vegetation coverage degree, groundwater and surface water.

The proposed site is located in the climate zone II, wind zone IV.

From a geological point of view, the area belongs to the Getic Depression, with geological formations in the area of Paleogene, Neogene and Quaternary. The presence of groundwater at depths between 0,5 and 20 m was signaled.

The relief is represented by the Valley of Arges River and the hills surrounding it, being fragmented by a dense network of torrential valleys. The average altitude varies from a minimum of 600 m in the valley to 900 m up the hill.

From the seismic point of view, the site falls within 7.5 degrees with return period ARI = 225 years and 20% probability of exceedance in 50 years, the computing area with land acceleration $a_g=0.25g$. The value of the corner zone $T_c=0.7$ seconds of the response spectrum (Official Gazette no. 558 from September 3, 2013, indicative P 100-1 / 2013). Wind loading data have $q_{ref} = 0.4$ kN / m² and snow load data have $s_{ok} = 2$ kN / m for the B site (Official Gazette no. 555 from September 2, 2013 Indicative CR 1-1-3 and 1-1-4 / 2012)

The topographic measurements and the cadastral survey brought data regarding the location within the built-up area, the establishment of a support network, planimetric and level-related data of the detail points (Figure 1), the land being owned by the City Council. The road within the studied area is located within the landslide area where the material is located below the original surface before landslip.

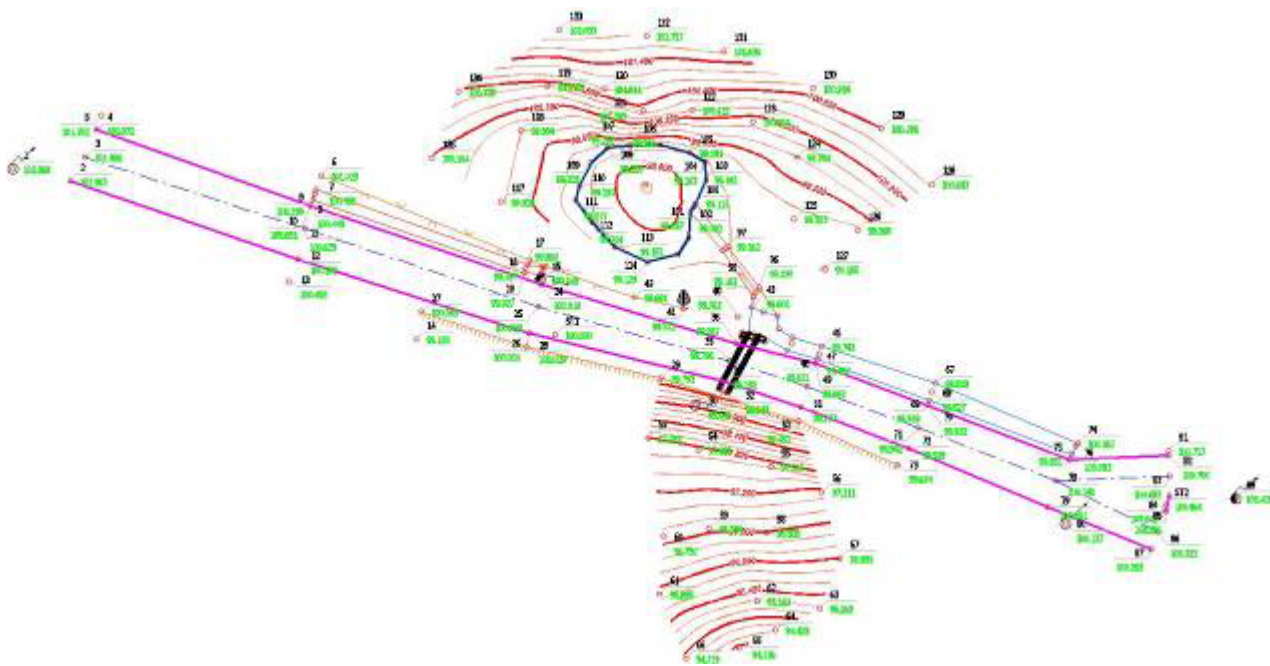


Figure 1. Planimetric and level-related data located in arbitrary system.

4. CONCLUSIONS

The main cause of the landslide was the deficient surface water discharge, the studied area being an excavation area.

Downstream the tubular footbridge, land development is inadequate, the choking up being present. 11.8 m from the center of the road, there is a lower area where, during rainfall, the water is puddly providing landslide.

It is recommended to clean the ditches and to concrete them in order to increase the rate of the drainage, to drain the water on the west or to seed the slope with stabilized plants (perennials), to built a wall (on the right slope) made of gabions filled with rocks, to build a headwall down the river and then restore the road structure. Rainwater will be directed by longitudinal and transversal slopes to earth ditches.

It is important to clean and redesign the existing ditches in order to ensure a proper drainage of waters.

For the proposed works, a project will be drafted immediately and it will also contain an estimate regarding the costs. Marking off the works can be done using the fixed network support created for this project with 70 planimetric and level-related coordinates.

Towards optimization, using the materials and technologies available in the area is recommended, so as to preserve the existing natural landscape.

The proposed works do not affect the soil, microclimate or surface waters. It does not alter the vegetation and fauna, it does not affect other cultural or historical sights.

The effects of the works will include the stabilization of the riverbed by stopping the process of erosion.

6. REFERENCES

- Official Gazette no. 555 from September 2, 2013 Indicative CR 1-1-3 and 1-1-4/2012
Official Gazette no. 558 from September 3, 2013, indicative P 100-1/2013