WHY USE GEOPHYSICS IN ENGINEERING GEOLOGY? CASE STUDY- TELEGA, PRAHOVA COUNTY

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Within the framework of FP7 DIGISOIL project, Telega landslide ("La Butoi") has been selected to be investigated through geophysical techniques. This paper deals with its geophysical characterisation mainly through electrical resistivity tomography (ERT).

This landslide presents the distinctive feature to be controlled by salt dissolution at its base, bottom of the valley located in the middle of an anticline structure. Consequence of this chemical phenomenon is the genesis of caves and voids inside and between salt blocks and surroundings flysch. This complex geological and structural context is thought to generate destabilization of the flank of the Telega valley, at least on the left bank of the Telega River. Field observations show that this dissolution process is apparently increasing, manifested by several collapses at the base of the landslide with in particular economical consequences for the spa located at the foot of the landslide.

The geophysical investigations carried out during 2009, 2010, 2011 allowed us to characterize precisely the morphology of the base landslide and provide a good estimation of the moving mass. The thickness of the upper sliding layer ranges between 2 and 10 meters. The volume computed for the Telega landslide reaches about 240,000 m^3.

Resistivity data show that the moving mass is rather conductive (few tenth of Ωm) while the basement is highly conductive (~1 Ωm).

Geophysical data show that the landslide can be split in few smaller landslides.

Telega village, separated by Campina through Doftana River, is situated at 5 km from it, in the western part of Prahova County. The village covers a medium altitude relief (550m) characterized by irregularities of ground, many valleys and swales crossed by streams.

Its surface is crossed by the 45055' North latitude parallel and 260 East longitude meridian. These elements determine the temperate-continental climate aspect

On the left bank of Telega valley, the landslides effects have a large extension, in some places being catastrophic. Among these, the one called at „Butoi" area (fig.1, fig.2) presents a huge interest according of its produced destructions and because of the influence on Telega Spa, main communal road etc. the slope is affected on a 0,4 suare kilometers, the morphology presenting a lot of scars, sometimes with escarpment aspect, land waves of different amplitudes and counter slope surfaces.

Geophysical research by resistivity imaging method had to determine the detailed structure of the upper subsoil, to explain phenomena that cause dynamic processes of land instability. Investigated area was limited to the profiles L (landslide axis), T1, T3 and western limit of slide (fig.3).

The method applied was vertical electrical sounding (VES) using SuperSting R8/+64 authomatic resistivity and IP imaging system and inversion software EarthImager 1D, EarthImager 2D, and EarthImager 3D. Field methodology used the following parameters:

- measurements on 13 transversal sections, parallel, according with the figure below;
- Schlumberger command file 64-30-4, which involves Schlumberger measuring device type with passive cable with 64 electrodes, a maximum ratio AB / MN 30 and the depth of investigation four times electrode spacing;
- 2 m electrode spacing, which provides a detailed exploration of underground to depths up to 8 m;
- equidistance of the profiles as 10 m.

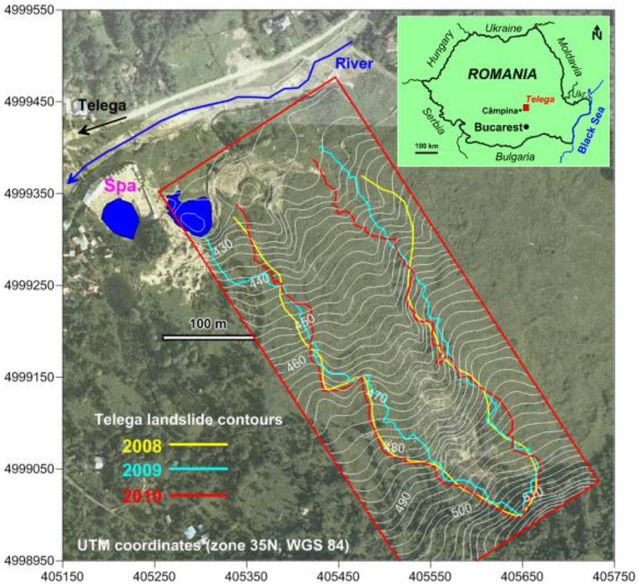

Figure 1: Telega landslide location

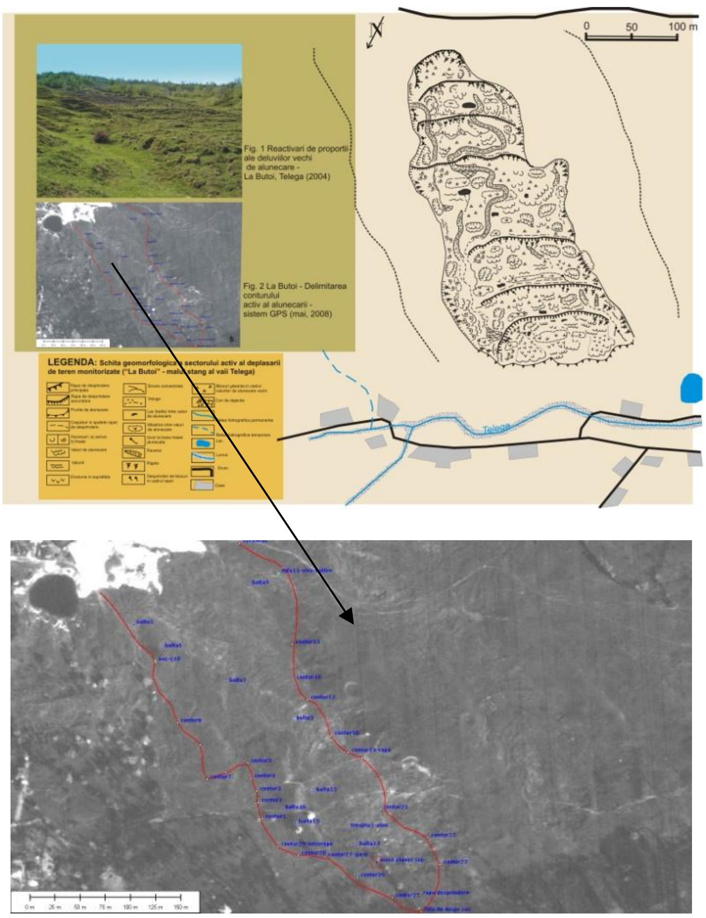

Figure 2: Telega landslide details

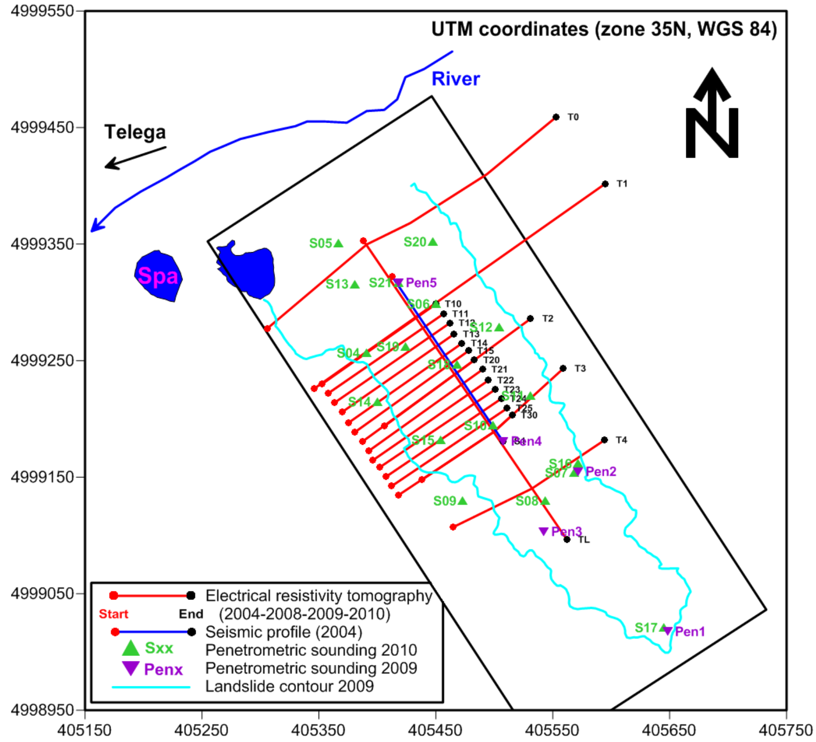

Figure 3: Location of geophysical measurements and penetrometric soundings

Results obtained directly consist in 2D sections of inverted resistivity sections along each profile, starting from the apparently stable area from west to landslide axis. By processing the primary data, will be built more longitudinal sections parallel to the corresponding profile section L, in the western part of the slide. Finally, will be obtained 3D images of the structure of subsoil space.

Profile T10 starts at the intersection of the L longitudinal profile with T1 transversal profile measured in 2009 and continues to the SW on a different route from the latter, hence the difference between their topographic surfaces. There are evident differences between T10 section and T1 section. Vertically, inverted resistivity section does not exceed the conductive horizon above the salt massif. In the resistive horizon above the surface landslide, resistivity shows different variations of the structure and composition. Here, the landslide surface continues to depth beyond the western limit of landslide observed on the surface. Finally, near the landslide axis (m 104), the landslide surface dip suddenly. At 2 m depth another shape is the limit of separation between two horizons with different resistivity, which may represent a shallow landslide surface. In conditions of heavy rainfall, it will activate a priority.