



## Methodology for natural and antropical hazards'assessment regarding land instability phenomena-case studies in Romania

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Methodology for natural and antropical hazards' assessment regarding land instability phenomena-case studies in Romania

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This paper is seeking to launch and to integrate data acquiring and processing technologies, technologies that are subordinated to geological and geophysical techniques, for the evaluation of land properties and of the state of land degradation in areas where natural and antropical hazards related to shallow layers' dynamics are probable.

Since evaluating and diminishing land degradation process due to landslides ( took as in its extensive meaning) demand data regarding physical and geological characteristics of the lithologic complexes implied, the project has as a main objective to increase the possibility for the principal geophysical methods of shallow land layers' resolute investigation ( seismometry, electrometry).

In Romania, in 2001, law 575 was adopted: "Law regarding the approval of the Plan for the national territory fitting out- Section V- Natural risk areas". It mentions that a Romania "Landslides Risk Map" should be edited.

In these circumstances, in order to establish the potential and the probability for an area to be affected by soil instability phenomenon ( caused by natural or antropical factors), according to the COM 232/2006, Chapter 2, Section 1, Article 6, the first step that has to be made is to identify and classify risk areas from the studied region. The region will than be verified every 10 years and the measure taking program will than be made public and revised every 5 years.

Areas affected by landslides can loose the following functions ( COM 232/2006, chapter 1, article 1):

- Soil functions
- Bio-mass production
- Accumulation, filtering and transforming
- Biodiversity
- Physical and cultural environment
- Raw materials
- Carbon Geological environment and archeological heritage
- Landslides x x x x x x X

Our studies were focused on determining the principal factors that influence land instability phenomena and physico-mecanic properties of the deposits, on estimating natural and antropical hazards that cause these phenomena, on their monitoring, as well as on elaborating a digital model( hazard map for the chosen areas).

In the past few years, one has used applied geophysics more and more often, as a related method for the study of superficial land characteristics. Major development of geophysical technologies and of technologies used for the studied matter (seismic and electrometric) can be caused by the integrated-measures system, the development of the informational techniques, the small-dimension equipment, in a few words the increase the reliability of the specific methodologies for the practical applications.

Identifying the physical causes that lead to land movements represents the central matter taken into consideration by us. The study method that was proposed consists in determining and measuring some physical surface parameters in the area of the studied slopes and the near-by/proximity areas. The data that were obtained would be systematized in data-bases from which diagnosis and prognoses will result.

Once computer-related technology and data collection from land, air, space, was perfectioned, new GIS applications were implemented. They proved to be useful, covering an extended array of matters, from high-quality mapping to soil usage planification, natural resources management, ecological and demographic studies, environmental risk factors monitorising.

The experience cumulated in geophysical investigations ( Cristea et al., 2006; Maftei Raluca et al., 2006) shows that the proper research method of soil slather contains to perform detailed and extra detailed observations ( high resolution seismic refraction profile, vertical sounding of electrical resistivity) combined with geological prospecting and sample preservations.

Based on the elements shown above it is possible to delimit zones with potential in developing landslides. The methodology used for making the map with zones of landslide hazard is based on the following principles:

- the criteria of analysis are based on eight factors(geomorphology, hydrogeology, hydrology-climate, geology etc.), symbols a, b, c...h;
- three degrees of potential in developing landslides are considered (low medium and high), with probability from zero to very high;
- the cooefficients of risk (K) are calculated based on depending on the potential and the probability of landslide occurrence;
- among the factors which control the occurrence of landslides, lithology and geomorphology are considered the most important;

in order to delimit an area on the slope, with a specific lanslide potential, the average risk

- the territory for which the hazard map is made is divided into polygonal areas as homogeneous as possible with respect to the factors used for the landslide risk;
- for each polygonal area the risk coefficient (K) is evaluated, according to the criteria adopted for analyses;
- finally, using the above formula, the average risk coefficient of the polygonal area is determined, and the map of risk is drawn.

The synthesis of the results will be materialized in digital maps of susceptibility to land instability, the graphical representations being done with the use of GIS.