Geophysical Research Abstracts
Vol. 13, EGU2011-7543, 2011
EGU General Assembly 2011

Landslide hazard assessment on waste dumps areas in Romania

Case study - Motru cole mine basin, Gorj County

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In Romania, the landslide hazard map, which follows the distribution of the hazard medium coefficient (Km), has as main purpose to support the government representatives regarding the prevention and mitigation of the landslides effects.

Motru coal basin, bounded by Motru Valley and Jilt Nehomir Valley comprises the following exploitations and waste dumps:

- Mines : Horasti; Plostina, Lupoaia; Leurda; Motru West (Rapa) and Boca
- Quarries : Lupoaia şi Rosiuta;
- Waste dumps: Monastery Valley; Bujorascu; Rogoazelor Vallley; Stiucani Vallley; Cerveniei Vallley; Lupoita Vallley; Potang Vallley; Steic; Lupoita; Miculesti- Zastranei Vallley ;

Underground exploitation has begun in 1950, in areas like Lupoaia, Plostina, Leurda, Horasti and in the early ’70 quarries like Lupoaia and Rosia developed. As a result of underground and quarry mining process, huge quantities of steril were tailed, transported and deposited in large waste dumps that have had an accelerated rate of growth.

In Motru mining basin waste dumps are large areas of agricultural land where the steril material resulting from lignite exploitation is stored. These masses of rock are particulary sedimentary structures with a time evolution dictated by high density mechanical and physical properties of spoil deposits, the morphology and surface characteristics of stockpiles as well as by the technology of tailing disposal. The lignite is located in sequences of 13 to 15 layers, different in lithological structure and age.

The hazard map, elaborated in accordance with Romanian Law 575/2001, and GD. 447/2003, reveals that the Motru mining area has prone areas to landslides occurrence around quarries, mines and waste dumps, and also in their immediate vicinity.

Considered economically unprofitable some underground mines were closed and replaced with quarries, but mine decommissioning was not done according to legal standards in force, thus, leaving place for subsidence phenomena. In some cases there has been spectacular sinking, with values that lies between 5 and 6 m. Subsidence was also caused by the closure of gaps left by underground coal exploitation and alteration of the hydrogeological conditions, due to high intensity forced dewatering

In the current situation there is a relative equilibrium of the quarry slopes. They are affected by local landslides that will continue until a natural pressure of the equilibrium distribution of land masses it’s reached. The effects of landslides that affect or will affect the quarry steps can be alleviated by reducing the slope angle from 35˚ to 25˚, by supplying the marginal quarry steps with input material put-down at the base at the slope in increments of 5 m to 10 m with berms between them, afforestation of the slope base and drainage by gabions that can also draw-off the surface waters.

The high degree of susceptibility in waste dump areas is given by the unevenness storage of the steril, by the sliding or crumbling occurred in time and especially by the erosion forms given by land geomorphology depth of the site (inclination, swamps, existence of the intercalation of clay layers between sandy layers, etc.).

Ensuring stability of dumps in order to avoid landslides, water pollution or degradation of the surrounding land, requires monitoring them, and also, cognition of physical and mechanical properties of the deposits that come into their constitution and the secondary reactions that these deposits print in dumps (additional pressure, mass flow etc.) when they come into contact with water coming from precipitation or groundwater aquifers.

Keywords: hazard, waste dump, cole mine