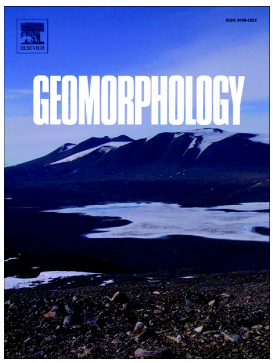

Investigation of landslide failure mechanisms adjacent to lignite mining operations in North Bohemia (Czech Republic) through a limit equilibrium/finite element modelling approach

Claudio Vanneschi, Matthew Eyre, Jan Burda, Lukáš Žižka, Mirko Francioni, John S. Coggan

PII: S0169-555X(18)30301-5
DOI: doi:10.1016/j.geomorph.2018.08.006
Reference: GEOMOR 6469

To appear in: *Geomorphology*

Received date: 5 February 2018
Revised date: 2 August 2018
Accepted date: 5 August 2018

Please cite this article as: Claudio Vanneschi, Matthew Eyre, Jan Burda, Lukáš Žižka, Mirko Francioni, John S. Coggan , Investigation of landslide failure mechanisms adjacent to lignite mining operations in North Bohemia (Czech Republic) through a limit equilibrium/finite element modelling approach. Geomor (2018), doi:10.1016/j.geomorph.2018.08.006

Investigation of landslide failure mechanisms adjacent to lignite mining operations in North Bohemia (Czech Republic) through a Limit Equilibrium / Finite Element modelling approach

Claudio Vanneschi,[a,*] Matthew Eyre,[a] Jan Burda,[b] Lukáš Žižka,[b] Mirko Francioni,[ac] and John S. Coggan[a]

[a] Camborne School of Mines, University of Exeter in Cornwall, Penryn, Cornwall, U.K.

[b] Brown Coal Research Institute j.s.c., Most, Budovatelů 2830, Czech Republic

[c] Department of Engineering and Geology, University of Chieti-Pescara, Chieti, Italy

[*]Corresponding author. E-mail addresses: claudio.vanneschi@gmail.com (C. Vanneschi)

Abstract

Understanding the impact of data uncertainty is a fundamental part of ensuring safe design of manmade excavations. Although good levels of knowledge are achievable from field investigations and experience, a natural geological environment is subject to intrinsic variability that may compromise the correct prediction of the system response to the perturbations caused by mining, with direct consequences for the stability and safety of the operations.

Different types of geoscientific evidence, including geological, geomorphic, geotechnical, geomatics, and geophysical data have been used to develop and perform two-dimensional Limit Equilibrium and Finite Element Method stability analyses of a lignite open-pit mine in North Bohemia (Czech Republic) affected by recent landslides. A deterministic-probabilistic approach was adopted to investigate the effect of uncertainty of the input parameters on model response. The key factors affecting the system response were identified by specific Limit Equilibrium sensitivity analyses and studied in further detail by Finite Element probabilistic analyses and the results were compared. The work highlights that complementary use of both approaches can be recommended for routine checks of model response and interpretation of the associated results. Such an approach allows a reduction of system uncertainty and provides an improved understanding of the landslides under study. Importantly, two separate failure mechanisms have been identified from the analyses performed and verified through comparisons with inclinometer data and field observations. The results confirm that the water table level and material input parameters have the greatest influence on the stability of the slope.

Keywords: Numerical modelling; Limit equilibrium method; Finite element methods; Probabilistic analyses.