

COST Action TU1202**Impact of climate change on engineered slopes for infrastructure****WG3 workshop**

IBIS Gara de Nord Hotel, Bucharest

Tuesday 22 October 2013



Attending: Herbert W. ter Maat, Stanislav Lenart, Fotini Kehagia, Francesco Gentile, Emma Keszeyné Say, Gabor Telekes (DC Rapporteur), Yu-Jun Cui, Po-Kai Wu, Amin Askarinejad, Piotr Osinski, Anh Minh Tang, Ross Stirling, Manuel Oliveira.

Meeting notes/minutes

Welcome and Introduction***Presentation of new members***

Herbert W. ter Maat (The Netherlands): Researcher Land-Atmosphere Interactions, Wageningen UR, Environmental Sciences Group (ESG), Earth System Science – Climate Change. (*Project on Climate change effects on road and railway; Focus on winter situation; Correlation between GMS and KNMI: Temperature (air, road, GMS station); Freeze/thaw cycles; Climate scenarios*).

Stanislav Lenart (Slovenia): Researcher at Slovenian National Building and Civil Engineering Institute (ZAG). (*Landslides, road and railway construction, natural hazards; Use of vegetation net to enable more effective slope stability; Dynamic characterization of fine-grained soils; Unsaturated soils; Laboratory studies on coarse soils; Large-scale test on reinforced soils; Monitoring and field tests, modeling; Road embankment improving with injection of highly expansive polymer; Staged-construction of GRS retaining structures; Freeze/thaw cycles*).

Emma Keszeyné Say (Hungary): Professor at Ybl Miklós Faculty of Architecture and Civil Engineering (*Geotechnics: unsaturated soils, underground water flows; Professional experiences*).

Amin Askarinejad (Switzerland): Researcher at ETH Zurich. (*Physical modeling of a vegetated slope subjected to rainfall; Full-scale experiment: Ruedlingen experiment, 10 m large; Root reinforcement. Analytical simulations; Centrifuge modeling (slope, soil with vegetation): reinforce of slope by root; Direct shear stress on soil with vegetation*).

Piotr Osinski (Poland): PhD student at WULS, Faculty of Civil and Environmental Engineering, Department of Geotechnical Engineering, Warsaw, Poland. (*Interaction between root systems and soil influencing mechanical parameters of soil; Soil suction changes due to vegetation cover on slopes; FOS calculation models; erosion effect as a slope failure causing factor; Landfill site; Unsaturated soils; Engineered slopes with vegetation*)

Presentation of Fotini Kehagia

State-of-the-art and discussion on several questions related to the content of the SOTA paper: Climate change in Europe; Scenarios; Natural slopes: Factor of Safety; Statistical overview of earth slopes that show distress; Article: Impact of global warming on natural slopes; Stabilization measures; Report: Adaption to climate change.

SOTA paper

After discussion, the following layout of the SOTA paper was adopted.

Title: Atmosphere – vegetation – soil interactions impacts on engineered slopes: A review on recent advances.

1. *Introduction (Anh Minh Tang, Fotini Kehagia)*
2. *Soil/atmosphere interactions (Manuel Oliveira)*
 - a. *Soil water infiltration, movement and deep infiltration (Manuel Oliveira)*
 - b. *Soil water evaporation (John Gowing)*
 - c. *Transpiration (Yu-Jun Cui)*
 - d. *Freeze/Thaw cycles (H.W. ter Maat, Stanislav Lenart)*
3. *Impact of soil-water pressure (Sergio Lourenco)*
 - a. *Small-scale aspects on soil/water interaction (Sergio Lourenco)*
 - b. *Soil water retention properties (Cristina Jommi)*
 - c. *Suction effects on shear strength (David Toll, Emma Keszeyné Say)*
 - d. *Rainfall-induced slope instability (Amin Askarinejad, Piotr Osinski)*
4. *Mechanical impact of vegetation (Francesco Gentile)*
 - a. *Effects of roots on soil mechanical properties (Francesco Gentile)*
 - b. *Role vegetation on slope stability (Sarah Springman)*
5. *Surface and internal erosion (Piotr Osinski)*
 - a. *Mechanisms of erosion (John Gowing)*
 - b. *Slope instability induced by erosion (Piotr Osinski)*
6. *Desiccation cracks (Ross Stirling)*
 - a. *Development of desiccation cracks (Anh Minh Tang)*
 - b. *Effect of crack on soil properties (Ross Stirling)*
 - c. *Crack-induced slope instability (Ross Stirling)*
7. *Climate change impact (Herbert W. ter Maat)*
 - a. *Climate change prediction (Pedro Viterbo)*
 - b. *Climate change impacts on slopes stability (Herbert W. ter Maat)*
8. *Conclusion (Anh Minh Tang)*

The paper is composed of 8 sections (including Introduction and Conclusion). Each section is coordinated by one person, with the mission of organizing and contacting each contributor of the section and give coherence to the final text. The sections are composed of several sub-sections. Each sub-section will be written by one or two people (whose names are written beside).

The total length of the paper is estimated at 7000 words (to fit to the QJEGH). To fit this length, each sub-section should not exceed 300 words. Each sub-section should correspond to: (1) one paragraph on the state-of-the-art about the subject; (2) one

paragraph on the results of the contributor; (3) and one figure correspond to the results of the contributor.

The following planning was proposed for the redaction of the SOTA paper:

- End of October 2013: Diffusion of the paper layout to all contributors:
- End of 2013: Contributions sent to coordinator of each section.
- 6 weeks before the next workshop: Reception of contribution from coordinators.

Next steps

The next Workshop of the WG3 will take place in Paris (together with the MC meeting in March 2014). To be coordinated with the WG1.

Three STSMs have been identified:

- Mission in ENPC: Cristina Jommi (begin of 2014)
- Mission in Durham and Newcastle (proposed by David Toll): Piotr Osinski will contact David Toll
- A PhD student of Stanislav Lenart will contact Anh Minh Tang to discuss on a possible mission in ENPC.

It is proposed that the WG3 can be divided in several sub-WGs (after finishing the first SOTA paper) to prepare other papers which are more specific (Collection of data from physical modelling ; Comparison of physical models ;etc).

Updated list of members of WG3

Participants	Affiliation	Country	Newcastle	Bucharest
ASKARINEJAD Amin	Swiss Federal Institute of Technology Zurich (ETH)	Switzerland	×	√
CUI Yu-Jun	Ecole des Ponts ParisTech	France	√	√
GENTILE Francesco	University of Bari	Italy	√	√
GOWING John	Newcastle University	United Kingdom	√	×
JOMMI Cristina	Delft Univ. of Technology	Netherlands	√	×
KEHAGIA Fotini	Aristotle University of Thessaloniki	Greece	√	√
KESZEYNE SAY Emma	Ybl Miklós Faculty of Architecture and Civil Engineering	Hungary	×	√
LENART Stanislav	Slovenian National Building and Civil Engineering Institute	Slovenia	×	√
LOURENCO Sergio	Cardiff University	United Kingdom	√	×
ter MAAT Herbert	ESS-CC (Earth System Science-Climate Change and Adaptive Land and Water Management)	The Netherlands	×	√
OLIVEIRA Manuel	National Laboratory for Civil Engineering	Portugal	√	√
OSINSKI Piotr	WULS, Dept. of Geotechnical Engineering.	Poland	×	√
SPRINGMAN Sarah	Swiss Federal Institute of Technology Zurich (ETH)	Switzerland	√	×
STIRLING Ross	Newcastle University	United Kingdom	√	√
TANG Anh Minh	Ecole des Ponts ParisTech	France	√	√
TOLL David	Durham University	United Kingdom	√	×
VITERBO Pedro	Portuguese Sea and Atmosphere Institute	Portugal	×	×
WU Po-Kai	National Yunlin University of Science & Technology	Taiwan	×	√