PRAGUE GEOTECHNICAL DAYS 2015, workshop on:
LANDSLIDES – ROLE OF GEOLOGY AND GEOTECHNICS
Chaired by: Prof. Carlos Santamarina
Lessons Learned

Preliminary observations

- Cuts ➔ alter pre-existing equilibrium conditions
- Water: the most critical destabilizer. Applies to saturated and unsaturated regimes, and to the presence of different fluids and contaminants
- External factors may act as triggers, including: earthquakes, changes in chemistry, climate.
- Climate effects will gain increased relevance in the coming decades
- Geological changes can take place within engineering time scales.
- The institutional memory vanishes in ~20 years, and organizations become complacent.
- Caution: do not let technology and automation undermine/hinder understanding.

Geological Models:

- Critical for proper analysis: all models are approximations of reality ➔ inherently uncertain.
- Field studies should specifically seek to identify the preexistence of weak seams and previous failure planes. These features must be incorporated in geological models.

Monitoring ➔ Observational method

- There are significant new developments in monitoring tools
- Complemented with powerful numerical capabilities, advanced real-time monitoring allows for the enhanced implementation of the observational method.
- Monitoring must start with the determination of credible baseline and reference measurements

Back-analysis and forensic investigation

- The project history is often partially known. Critical, decisive events may be missing…
- Understand the mode of failure within the framework of a robust geologic model
- Assuming limit equilibrium circular failure is often incorrect
- Reconsider the meaning of "factor of safety" in traditional analyses

Long-term ➔ Repeated loading cycles

- The state of the art in slope analysis is based on short-term response
- Long term response needs to be addressed to take into consideration climate effects, repeated loading cycles (thermal, moisture), and ensuing aging effects in soils and slopes
- A renewed understanding of physical processes and adequate models are needed to incorporate the effects of repetitive loading in long-term analyses

Properties: Understanding soil behavior

- The determination of material properties must properly combine information gathered in situ, in the laboratory, and knowledge captured in databases
- Progressive failure: Design with post peak properties may not be possible in all cases, e.g., sensitive soils. In this case, deformation-limited analyses are required.
- Consider large-strain residual strength parameters (post segregation and alignment) for the analysis of slide displacement
- Given the critical role of fluids, field characterization must consider permeability in detail, including unsaturated regimes and the variation in permeability with degree of saturation.

Broader Context

- Consider acceptable risk level. Consider today's land use and potential land use changes in the future.
- Consider budgetary changes for maintenance and political context
- Be aware of environmental concerns
- Management plans must include periodic review of internal and external reviewers