Landslide Engineering 2008

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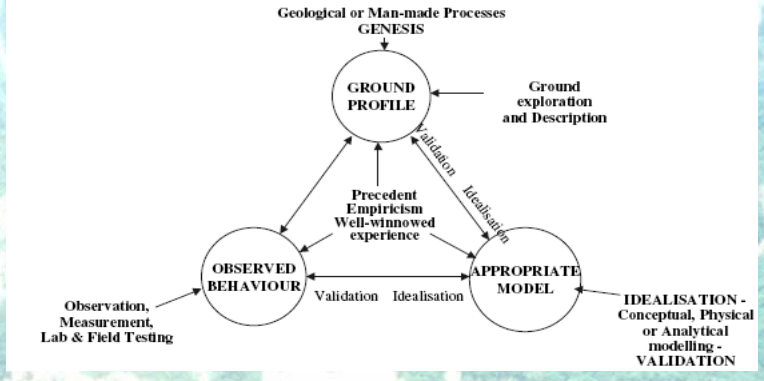
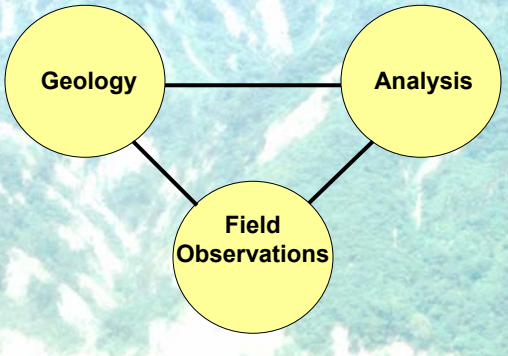
Basic Principles:
The Burland Triangle



John Burland, 1987, 2007

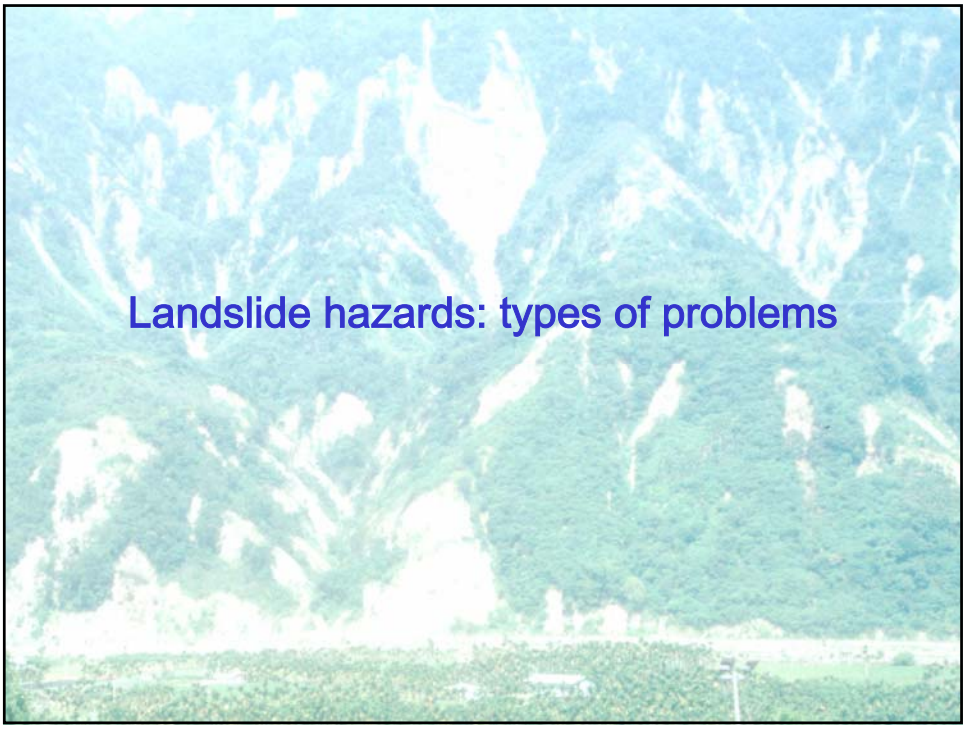
Basic Principles:
The Burland Triangle, generalized



John Burland, 1987, 2007

Common misconceptions:

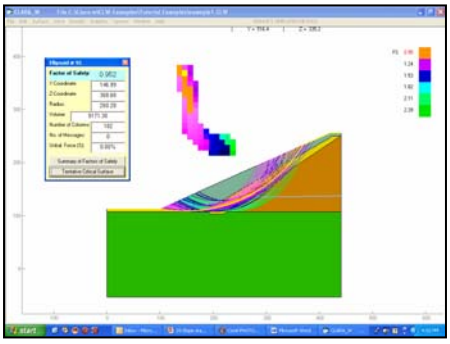
1) A result backed by analysis is always superior to that based on subjective judgment
2) A theory is reliable if all the mathematics is correct
3) A theory that is more complicated is always superior to that which is simple
4) A theoretical (statistical) hypothesis can replace missing data
5) Complex field or remote sensing measurements are always more reliable than simple observations
6) A good theory needs no calibration against field observations
7) “Unreliability” is caused only by the variation of the ground (i.e. we are reliable, the ground is not)



Type A: Individual slope stability

Questions:

1. What is the probability of failure?
2. What will be the performance of the slope as a function of
   climate
   earthquake?



Available tools:

- Stability analysis (deterministic or probabilistic)- does not provide temporal probability of failure
- Deformation analysis (deterministic)

Type B: Individual existing landslide

Questions:

1. What is the probability of failure?
2. What would be the consequences of a failure

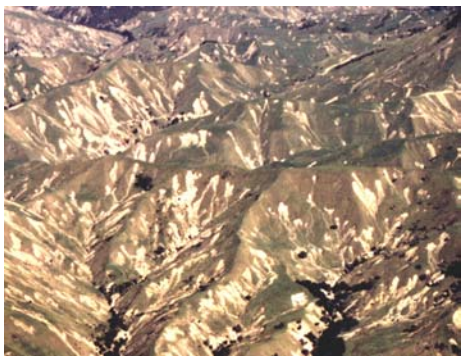
Available tools:

- Stability analysis (deterministic or probabilistic)- does not provide temporal probability of failure
- Deformation or runout analysis (deterministic)

Type C: Landslide susceptibility zoning

Questions:

1. What is the distribution of landslide susceptibility?
2. How should land use be controlled to minimize hazard and risk?



Available tools:

- Susceptibility mapping methods: subjective geomorphic, parameter correlations, objective correlations, analytical methods: GIS-based
-(cf. Soeters and VanWesten in "Landslides")

Type D: Setback lines

(Special case of susceptibility mapping)

Questions:

1. What setback is sufficient to reduce probability of failure to an acceptable value?

Available tools:

- Stability analysis, empirical approach: do not provide temporal probability

Type E1: Hazard maps in the runout area (based on analysis of deposits)

Questions:

1. What is the distribution of hazard intensity and impact probability in a deposition area?
2. Determine risks

Available tools:

- Empirical frequency- magnitude relationships
- Runout analyses

Type E2: Hazard maps in the runout area (based on analysis of landslide sources)

Questions:

1. What is the distribution of hazard intensity and impact probability in a deposition area?
2. Determine risks

Available tools:

- Methods of susceptibility mapping
- Empirical frequency- magnitude relationships
- Runout analyses