

An Indian-Australian research partnership

Project Title:	Rainfall induced landslides in residual soils	
Project Number	IMURA0288	
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Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. **Infrastructure Engineering** ✓
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

The Research Problem

Rainfall induced landslide is a complex problem which utilise transient seepage analysis coupled with change in soil strength. The descend of the wetting front into the ground during rains cause the flow regime to change from unsaturated to saturated flow.

The above change in the flow through the pores, modifies the physical properties of many residual soils. In their natural state, residual soils are stiff fine grained with nodular gravel and are usually found in undulated terrain. When water seeps through these soils, it disturbs the cemented structure and softens them. The seepage reduces the soil shear strength and mostly triggers landslide events. For example, the 2005 Monsoons in Maharashtra caused many landslides to occur in the Konkan hills which claimed over 1000 human lives. These hills were covered with laterites bounded with oxides of iron. Upon failure, they exposed the underlying parent rock after the rains. In all failures, the loss to homes and infrastructure is equally significant.

In the field, the geometry of the rainfall induced failure is 3-dimensional and warrants rigorous computational effort which is usually ignored during the usual plane strain analysis. Therefore there is an

urgent need to improve our understanding of the risks associated with these soils for existing and new development near slopes.

Project Aims

This research project investigates the changes in the stress state of residual soils because of the development of the wetting front during rainfall as well as their effects of the resulting strength of the ground. In the current investigation, the following aspects will be examined:

- Short term flow and stress changes in the residual soils during rainfall.
- The effect of subsequent pore pressure increase on the final effective stress state.
- To develop research tools which are appropriate for analysing rainfall induced landslides.

Expected Outcomes

This research will lead to the following outcome:

- The understanding of infiltration mechanism of water into cemented laterites,
- A failure mechanism of laterite during wetting and drying cycles, and
- A suitable method for the analysis of slope stability in laterite slopes during Monsoon seasons.

How will the project address the Goals of the above Themes?

The project addresses the theme on Infrastructure engineering. It defines research areas which lead to significant improvement in understanding the cause of failures observed in residual slopes during Monsoons. Long term goals are to develop a network of knowledge and built cross-disciplinary research teams.

Capabilities and Degrees Required

- Candidate should have a First Class or 70% marks in M.E./M.Tech or Equivalent Degree in Geotechnical Engineering or other similar Engineering fields.
- Exposure to skills in performing various triaxial tests will be an additional advantage.