

IPL -265 Annual Progress Report

1. Project Title: Review of Rockfall Trajectories of Cut Slopes of Roads Using a Distribution Model Approach
2. Main Project Fields - 1. Technology Development (database and hazard assessment)

3. Name of Project leader :

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Core members of the Project

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Mr. A. A. Virajh Dias – BSc. (Civil Eng.); MPhil (Earth Science); C.Eng., MIESL – RLVMP, MoD

4. Objectives:

The objective of this research is to review the different patterns of failures and trajectories of cut slopes (rocks) of roads in hill country of Sri Lanka.

5. Background Justification:

The associated failures are usually recognized as; a) falls in rock blocks, topples often due to the lack of support of the underlying layer affected by planar sliding, b) wedge failure and rock fall after detachment of cutting face or in hanging rock faces, c) Large translational rock slide involving both soil and rock layers, d) planar rock slide along the mains structural setting and one or more combined setting meeting at once above.

6. Study Area: Mountainous area of Sri Lanka, covering the Central, Sabaragamuwa, and Uva, administrative provinces.
7. New Project Duration: Five years (January 2022–December, 2027, this is required to extent due to complexity of the rock falling)

8. Progress in the Project:

During the year 2024, significant progress was made on the study aimed at analyzing rockfall trajectories along road cut slopes using a distribution model approach. The work has involved a multi-disciplinary investigative framework combining geotechnical evaluations, field data analysis, and simulation techniques.

a. Field Investigations and Data Compilation

Extensive field surveys were carried out in selected sections across the Central, Sabaragamuwa, and Uva Provinces to assess the conditions of road cut slopes. These investigations included detailed mapping of rock joints and their orientations, along with preliminary geomechanical classifications using scanline techniques. In parallel, laboratory testing was initiated on collected rock samples to determine key physical and mechanical properties such as density, point load index, Poisson's ratio, and elastic moduli, which are critical for evaluating rockfall behavior and slope stability. Other activities were,

- Statistical assessments were undertaken to project failure likelihoods and associated risk levels.
- Correlation analyses between geotechnical parameters and slope stability indicators were initiated.

9. Planned Future Activities the Project

January 2025 - December 2026: 2D model simulation and 3D model simulation using RocFall / Trajec3D

- Continued collection and refinement of field and laboratory data.
- Calibration of the simulation model using updated parameters.
- Planning for integration of findings into slope management and risk mitigation strategies.

January , 2027 - December 2027: Verifying rock fall trajectories and distribution model approach

10. Project Beneficiaries:

The landslide professionals, academics, researchers, planners and people residing in landslide prone areas in Sri Lanka are the beneficiaries of this project.

11. References

- Selby, M.J., (1982), Hill slope materials and processes, New York, Oxford University Press.
- Herath H.M.J.M.K., Jayasooriya J.A.D.N.A., Virajh Dias A.A.,(2018), Pairwise comparisons of Geological evidences in rockfall hazard rating system (RHRHS) for the evaluation of road based potential slope failures in Sri Lanka ,Proceedings of the CECB symposium, Sri Lanka
- Wen-lian Liu, Jia-xing Dong ,Han-hua Xu,Su-gang Sui, Run-xue Yang and Lun-shun Zhou, Trajectory Analysis and Risk Evaluation of Dangerous Rock Mass Instability of an Overhang Slope, Southwest of China, Advances in Civil Engineering, Volume 2021, Article ID 7153535, 15 pages
- RocFall user guide 1998 - 2002 Rocscience Inc.
- Nimani S. Kulathilake L.K., Herath H.M.J.M.K.,Virajh Dias A.A.,(2018),Strength and Elastic Deformation of prominent load bearing Metamorphic rocks in Sri Lanka., Proceedings of the CECB symposium, Sri Lanka.