Analysis of Slope Stability on Road Cut Slopes; a Case Study at Badulla-Bibile Road and a Cost-Effective Proposal for Future Road Cut Slope Studies

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Sri Lanka is frequently affected by hydro meteorological disasters, one of which is slope failure triggered by unusual intense rainfall. Post-disaster inspections reveal the lack of preliminary investigations being carried out on cut slope failures. The first objective, which was a slope stability analysis on proposed cut slopes of Badulla-Bibile road was designed in a three-fold methodology including Preliminary Study, Field Investigation and Laboratory Investigations. Laboratory investigation consisted of Sieve analysis, Liquid limit, Direct Shear and simple pour pile method. The data were interpreted with reference to slope geometry and soil strength. Geometrical interpretation identified that 32.5% of natural and 73.3% of cut slope failures were possible. The soil analysis interpreted using Unified Soil Classification System reveals that silty gravel, Lean Clay, Silt, Silty Sand, Clayey Sand soil types were present. All these soils were known to be cohesion-less and changing the slope angle was identified to be the ideal mitigation. The second objective was to understand the importance of preliminary study in future road cut slope. This proposed method includes geometrical and soil study. Geometrical study is done with three criteria considering the slope angle, slip angle, friction angle, strike of slip and strike slope. The soil analyses are performed using Unified soil classification system considering the Sieve analysis and Liquid limit test. Identified properties of the soil were modeled in Slope W software to check the factor of safety. This method to find the soil properties is cost effective and less time consuming than direct Shear method. This study has considered direct shear as a conventional method and interpreted for a location. Both results were coinciding, and a conclusion can be drawn that the proposed cost effective basic method is economical which can be used as a preliminary study in future road projects in Sri Lanka.

Keywords: Slope stability, Slope geometry, Mitigation, Strike of slip, Slope failure