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Preliminary Geotechnical Investigation of Two Basaltic Landslide Sites in Mauritius, Offshore Africa

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Landslide hazards in developing areas in Mauritius became a great challenge as well as a fundamental concern for the government and the citizen of the country. In recent years, landslide disasters have caused losses of both public and private properties. In 2005, a large-scale landslide at Chitrakoot affected 54 houses and infrastructures, and it was reactivated in 2006, damaging another 14 houses. Vallee Pitot landslide is frequently reactivated in these years and threatening several houses in densely-populated zone. Although the long-term annual precipitation show slightly decreasing trend, number of tropical cyclone over Mauritius is clearly increasing at least in the past 3 decades. Being of volcanic origin, Mauritius has observed dramatic and quick weathering of the soil which may partly contributes to creating landslide-prone geo-environment. This study focuses on the preliminary geotechnical investigation of the above-mentioned two basaltic landslide areas in Mauritius.

Recent investigation was conducted jointly by JICA (Japan International Cooperation Agency) and Ministry of Public Infrastructure and Land Transport of Government of Mauritius on both sites from 2012 to 2015 to survey the landslide surface and to implement countermeasures works. In the field investigation, aerial photo interpretation was used to investigate the zone of cracks and scarps for both sites. The landslide areas for Chitrakoot and Vallee Pitot were estimated to 1.8 km^2 and 5,000 m^2 respectively. Both sites are located in the highly populated area in the capital city of Mauritius. The geological features of the sites were studied with the borehole core logging data obtained from 6 boreholes and it was found that possible sliding surface was observed in the colluvium layer consisting of gravels and stiff silty-clays, at depths from 6 to 10 m below the ground surface. The rate of landslide movement during heavy rainfall amount exceeding 100 mm/hr was elaborated with past records of extensometers installed on these sites. Colluvium samples from both sites of the same characteristics with the sliding surface were tested in the ring shear apparatus in Japan under different normal stresses reducing from 300 kPa to 50 kPa step-wise at a shear velocity of 0.02 mm/min under drained condition to obtain the residual friction angle (ϕ) and the cohesion (c). Obtained residual friction angle and cohesion of the Chitrakoot sample can explain why the landslide has been reactivated at extreme rainfall events. The shear strength values of the colluvium have been carefully evaluated to assess the critical ground water level and precipitation on those two basaltic areas in Mauritius as well as a method of issuing early warning for evacuation of the citizens.