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The Mechanical Behavior of Soils from Ugwueme Landslide, Nigeria

Hiroshi Fukuoka (1) and Ogbonnaya Igwe (2)

(1) Disaster Prevention Research Institute, Kyoto Univ., (fukuoka@scl.kyoto-u.ac.jp), (2) Dept. of Geology, University of Nigeria, Nsukka (igwejames@hotmail.com)

Climate change and global warming effects are getting obvious in Nigeria by increasing floods and landslides. Authors have launched joint research on evaluation of susceptibility change of landslides under extreme rainfall conditions in Nigeria. Igwe sampled soils from sliding surface of the Ugwueme Landslide, induced by torrential rainfall in 2008.

In this abstract, engineering properties of soils from the landslide site are presented. The sample was red, sandy tropical soils. The shear behavior and the dominant factors controlling the deformation of the soils were investigated by means of a new ring shear apparatus. This series of tests were purposed to reveal the detailed pore pressure generation under fully saturated condition to simulate the landslide onset behavior under heavy rainfall condition. Undrained and drained tests at different normal stresses were conducted on normally and over-consolidated soils having the same relative density. Following the consolidation of saturated sample, shear stress was applied until the sample reached the steady state after failure and long shear displacement.

Test results show that liquefaction is the major mechanism controlling the deformation of the soils and that the higher the normal stress or over-consolidation ratio the greater the brittleness index. Normally and over-consolidated soils all liquefied regardless of normal stress and over-consolidation ratio, with over-consolidated specimens having higher values of brittleness index than normally consolidated ones. This research found that whereas increase in either normal stress or over-consolidation ratio resulted in a corresponding increase in peak strength, the steady state strength of the soils was unaffected. Normally and over-consolidated specimens all reached the same steady state strength indicating that in highly liquefiable soils, changes in normal stress or over-consolidation ratio has little effect on steady state strength, and by implication, on the potential travel distance of a landslide on slopes founded on weak soils.