Mapping the Geometric Characteristics of a Landslide using Airborne Lidar Data

Sanjeewa G.D.I.[1]*, Thibbotumunuwe M.R.B[1], Udayakantha P.M.A.K, Jayasinghe R.J.M.R and Welikanna D.R.[2]

1. Sri Lanka Air Force, 2. Faculty of Geomatics, Sabaragamuwa University of Sri Lanka
rcsanjeewa@gmail.com

ABSTRACT

Nearly 20% of the land area in Sri Lanka is identified as landslide prone. The increasing population density and expansion of settlements over hilly areas in Badulla district have significantly increased the risk for landslides. As a result, the urban resilience in these regions has decreased raising substantial threats to livelihood. In this backdrop characterizing and mapping the existing landslide geometry, referring to their longitudinal and cross-sectional profiles and the rate of change of slopes is highly important. These characteristics are vital for land slide zonation mapping. Among the large range of methods and techniques developed for determining landslide zonation mapping most preferred method was the detail collection using ground surveys using methods such as RTK GNSS surveys and topographic surveys. These methods provide the most reliable information about landslide geometry, but they require heavy labour and time. LiDAR technology is capable of acquiring faster, denser and more precise information about land terrain surface, allowing the 3D geometrical modelling of the topography at different scales. LiDAR is mainly used for landslide investigation to create accurate and precise high-resolution digital elevation models (DEM) in raster grids or triangulated irregular networks (TINs), which are 3D point clouds with a high density of information. LiDAR sensor mounted in a drone can be effectively used for mapping these landslide prone areas. Execution of LiDAR surveys systematically to collect the most important details related to landslides is highly important. The main objective of the study is to survey and map the landslides in Badulla district. Two different urban and suburban landslide prone areas along with the Badulla Passara road were mapped using an airborne LiDAR sensor. The generated detailed DEM`s reveal the heavy deformation that exists in these land slides providing the possibility to detail out the land slide geometry. The study details the planning out of the airborne drone surveys and the detailed processing of point cloud data in order to map the landslides. The importance of the study for the first responder such as SLAF is highlighted in case of emergency to warn the population about the threats and evacuation.

Keywords: LiDAR, landslide susceptibility map, digital elevation model