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Case Study of a Landslide in Thit Seint Gon Village, Myanmar

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Abstract: A landslide incident in Thit Seint Gon Village was investigated by the Department of Geological Survey and Mineral Exploration, Myanmar. The landslide had resulted in extensive structural damage to houses and infrastructures including a highway. The field study revealed contributing factors as well as precurser signs leading to the landslide incident. Possible solutions are proposed to mitigate the hazard, enhance early warning and prevent future disaster.

Keywords: Landslide mitigation, disaster mitigation, Myanmar.

INTRODUCTION

Landslides are a serious problem in Myanmar, affecting the economy and social wellbeing. In September 2017, initial crack signs appeared before a roadway structure completely failed, following heavy rainfall in the vicinity of Thit Seint Gon. The Ministry of Natural Resources and Environmental Conservation Myanmar carried out field investigations from 17-23 October 2017, to understand the event and propose solutions.

Thit Seint Gon Village is situated in the Mogok Township (Gemstone Tract) of Mandalay Region, Myanmar. The population is very sparse and mostly consists of the Lisu race. The village lies on the Mogok-Mandalay highway and is located between Sa Khan Gyi Village and Kyat Pyin (Figure 1). The area is a hilly region and is almost above 1000 m in elevation. It consists of steep slopes located on the southern part of a mountain of 1320 m in height. Generally, the slopes are more than 50° with sparse vegetation. The annual rainfall is between 2000-4000 mm. Approximately 112 days of heavy rainfall was observed in August. The average temperature is about 19.5°C and the lowest temperature is 13°C in January, which is the cold season.

The rock units of the study area (300,000 m^2) are made up of quartzite, calc-silicate rocks, marble, sandy soil, alluvium and leuco-granite (Figure 2). The weathered leuco-granite has low strength in engineering properties. Crack signs are common in the sandy soil of weathered leuco-granite.

METHOD

Field investigation conducted in the Thit Seint Gon area used a geological map of 1:1000 scale. Previous findings served as a basis for the current investigation. Records indicate that the upper portion of the slope failed in 2008 due to heavy rainfall. The soils collapsed about 2-3 m in the weathered leuco-granite and remained as scarps in some places.

KEY FINDINGS

The direction of the initial cracks were NW-SE and about 15-20 cm in width. The apertures of initial cracks ranged from few mm to 10 cm. The occurrences were found continuously along NE-SW at most places and along NW-SE at some places (Figure 3). It was reported that water seeped out at four places near the roadway and buildings. The concrete floors of several houses in the village were damaged and the road was uplifted by about 20-30 cm by stress from the upper portion of the slope. No crack signs were found at the southern part of the road. All of the crack signs and damages occurred in the weathered leuco-granite rocks (Figure 4).

Figure 1: Location of the Thit Seint Gon Village.

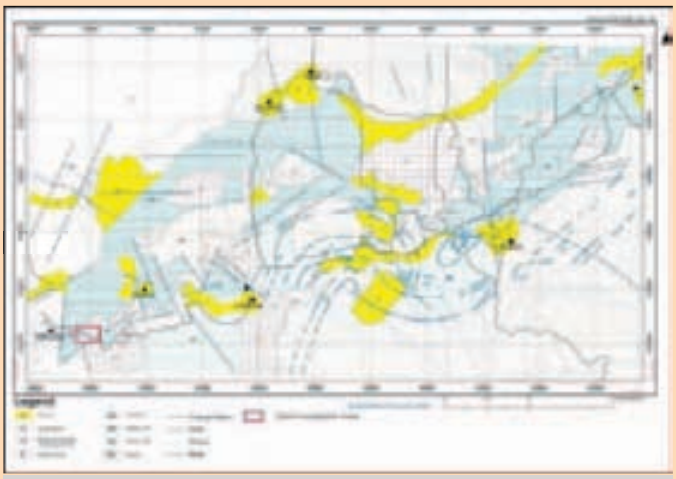

Figure 2: Geology of the Thit Seint Gon Village.

Figure 3: Cross section along the failure plane of the slope.

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Figure 4: Cracks in the weathered leuco-granite rocks.

Figure 5: The sandy soil with sparse vegetation is susceptible to erosion.

The slope movement was influenced by several factors. These include the steep slope angle, torrential rainfall, increasing pore water pressure, lithology condition, local faults and direction of initial crack signs, previous soil slide cases and human activities. The torrential rainfall of 29 August 2017 triggered the landslide. The slope comprised sandy soil with sparse vegetation and is easily susceptible to erosion by the rainfall (Figure 5). As such, excess water increased the weight of the slope material while poor drainage contributed to an increase in pore water pressure.

The strength of the slope materials influence the magnitude and frequency of landslide and related events. The weathered leuco-granite was eroded by rainfall droplets and surface runoff. Considering the high porosity and permeability of the sandy leuco-granite, the soil moisture content and pore water pressure may have increased drastically. Increased pore water pressure from saturation reduces the strength of the slope materials. Many signs of initial cracks, water leakage from the toe of the slope and uplifting of the car road were observed in the area. Field investigation suggests that the landslide was complex; with land subsidence due to sinkholes, rotational movement of discontinuous debris, earth flow under steep slopes and poor cohesion.The identification of areas where landslide hazards may occur is the first step for mitigating landslides in Thit Seint Gon Village (Figure 6). Other recommendations include designing slopes or engineering structures to prevent and control the failure. Loading on the top of the slopes, placing fills on slopes, changing water conditions on slopes and cutting into sensitive slopes should be avoided.

Drainage control is usually an effective way to stabilize a slope. Removal of unstable slope materials (grading), construction of retaining walls, control of surface and subsurface drainage or some combination of these could also be considered.

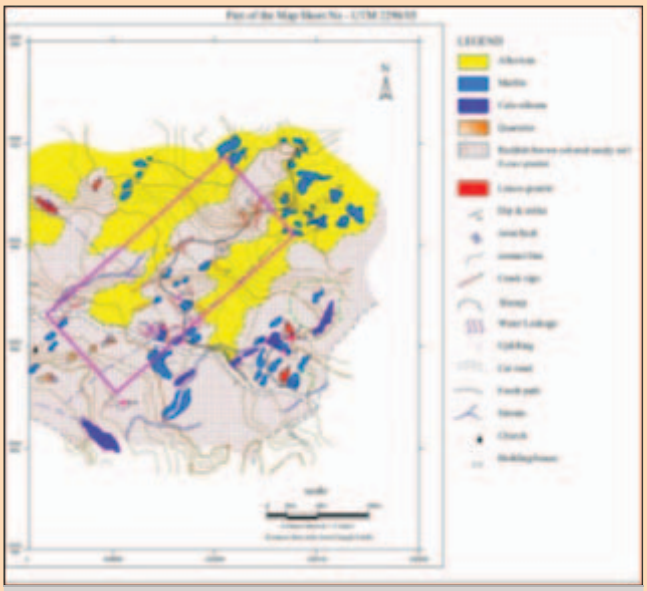

Figure 6: Possible landslide hazardous zones in the Thit Seint Gon Village.

CONCLUDING REMARKS

Landslides in the Thit Seint Gon area were triggered by heavy rainfall. Field investigations revealed that initial cracks indicating potential failures are confined to the weathered leuco-granite that occur in the area. Recommendations made to the local government include getting a geotechnical engineer to design a drainage system for both the surface and subsurface, reinforcement of the earth wall and planting of vegetation, to mitigate and prevent future landslides at the Thit Seint Gon Village.

REFERENCE

D.G.S.E., 2017. Report on field investigation at Thit Seint Gon, Mogok Township for the causes of initial crack signs and uplifting of car road. Department of Geological Survey and Mineral Exploration (Unpublished).