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Research Report

Sci Vis Vol 13 Issue No 2
April-June 2013
ISSN (print) 0975-6175
ISSN (online) 2229-6026

The 2013 rockslide disaster of Aizawl, Mizoram, India

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Received 30 May 2013 | Accepted 7 June 2013

Abstract

The early morning landslide (at 2:45 a.m. local time) of 15 May 2013 shocked the city of Aizawl, India. An abrupt rockslide forced a series of building collapse at Laipuitlang all the way down to Ramhlun Venglai area, which have been very high landslide prone regions of Aizawl. The disastrous landslide covered an area of 1025 sq m and an estimated volume of about 8 Mm^3. From the massive wreck, 17 corpses were exhumed, 8 persons were rescued alive, from the collapse of 15 houses. The area has a history is violent and dangerous geologic events during the last century. The ultimate collateral damage could have been due to a combination of the soft and high porous rock bedding, the steep slope, heavy rainfall, thunderstorm, anthropic destruction of the rock bed and overweight constructions. This brief report presents a summary of our observations pertinent to the landslide activities based on our field investigations. This report particularly focuses on the geological implications related to the landslide development, and identification of the landslide mechanism and its triggering factors.

Key words: Aizawl; Laipuitlang; landslide; rockslide; sandstone.

Introduction

On 15 May 2013 a rockslide occurred at the border of Laiputlang and Ramhlun Venglai municipal local council areas of Aizawl, the state capital of Mizoram, India (Fig. 1,3,4). The incidence situated at the eastern side of Aizawl, located between 23°44'60" N & 92°43'16" S at 1120 m above mean sea level. 17 persons were found dead under the thick concrete slabs, and 8 persons were rescued by the State Disaster Search and Rescue Team (Fig. 5). The rockslide totally destroyed 15 houses (7 RCC buildings and 8 Assam type buildings) including community hall and an evacuated 4 storeyed RCC building of Public Works Department (PWD) of Mizoram.

The area had experienced huge rockslides in 1957 and 1968 after unsafe cutting of rock bed for quarrying. Mizoram Remote Sensing Application Centre (2011) mentioned this area as 'Very High' in hazard class at Micro Level Landslide Hazard Zonation Mapping of Aizawl

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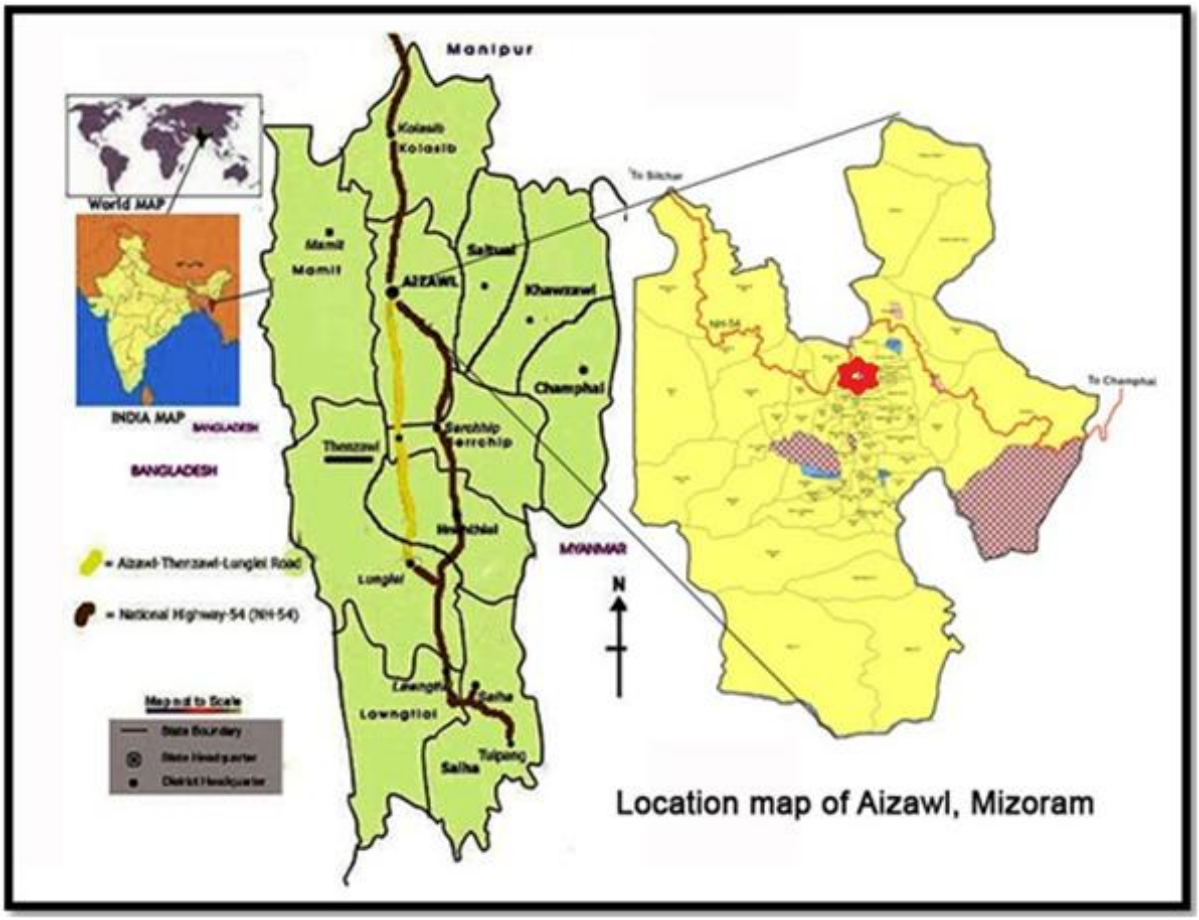

Figure 1. Location map of Laipuitlang, Aizawl.

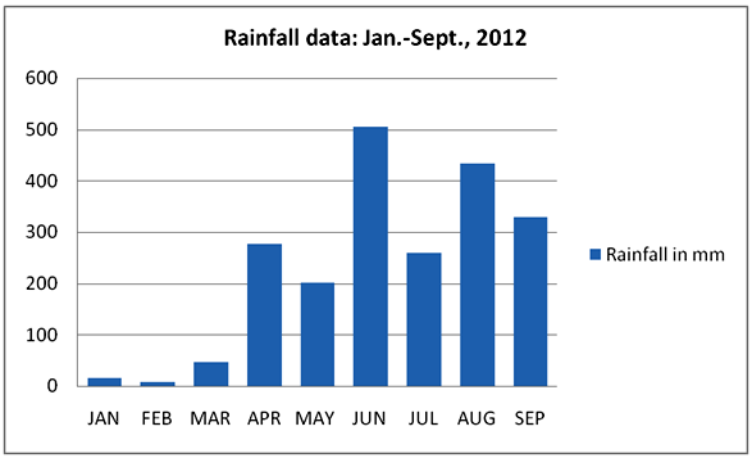

Figure 2. Rainfall data in Aizawl at the time the danger was noted.

Table 1. Rainfall data, January 2012 to 10th May, 2013.

Month	Rainfall (mm)	Month	Rainfall (mm)
January 2012	15.3	February 2012	7.3
March 2012	46.9	April 2012	277.5
May 2012	201.1	June 2012	505.5
July 2012	260.1	August 2012	432.8
September 2012	328.9	October 2012	298.0
November 2012	121.1	December 2012	0.0
January 2013	0.0	February 2013	3.3
March 2013	4.7	April 2013	64.9
1st May 2013	0.0	2nd May 2013	3.2
3rd May 2013	0.0	4th May 2013	31.2
5th May 2013	42.5	6th May 2013	31.0
7th May 2013	28.6	8th May 2013	22.5
9th May, 2013	64.0	10th May, 2013	35.7

Table 1. Rainfall data, January 2012 to 10th May, 2013.

Figure 3. Laipuitlang Rockslide view from Ramhlun Venglai.

Figure 4. Marked line indicated one storey failure of the affected residential at the toe region.

Figure 5. Action of State Disaster Search & Rescue Team at the rupture surface.

Figure 6. Photograph showing the rapture surface, crown and minor scraps.

City.[1] On September 2012, after heavy rainfalls of about 2064 mm (Table 1, Fig. 2), cracks were observed at the rock bed and soil, retaining walls and PWD RCC building which occurred at the crown along the Laipuitlang road. By the suggestion of geologists' from Geology and Mining Resources Department, Government of Mizoram, PWD building was vacated, and ordered to be demolished. But, before taking action, the rockslide destroyed the building, and observed as the factor that increased the catastrophic disaster for settlements at the toe region.

Geological Conditions

The area falls under Middle Bhuban Formation of Surma Group (Miocene to Upper Oligocene) of deltaic complex. The main rock type was soft sandstone, and intercalated by siltstone. The bedding of the rock thickness was about 3 m, and observed as highly weathered. The bedding was covered by thin soil and poor vegetation. The general strike direction of the area was N45°E, and N40°E, and dip amount are 43° and 47° towards east respectively. The general slope of the ruptured surface was 48°. Groundwater was pumped at the toe region, and reported as good even in winter season and not so deep. Spring water was also occurred at the southern side of affected area along the Tuikhurhlu stream.

The bedding of the rock was disturbed by water from the surrounding seepage and rainfall, and unsafe cutting at the southern side for building construction. A tension cracks are observed on the top of upper surface, and near the minor scarp, but not observed on the slope face (Fig. 6).

Triggering Mechanisms

Aizawl and its surrounding areas are highly susceptible to landslide. Landslides reported in and around Aizawl area are mainly caused by

heavy rainfall, unsafe cutting, steep slope and immature rock.[1-4] Due to the described geological conditions, unsafe cutting of rock bed decreased resisting force at the toe region and triggered for sliding, after followed by rainfall and strong storms (just before and during the incidence), and increased the force of gravity of unstable rock volume by huge 4-storeys RCC building caused the disastrous rockslide at Laipuitlang. The detailed geotechnical conditions of soil and rock could be studied only after thick debris and materials are removed.

CONCLUSION

Laipuitlang rockslide is one of the worst disastrous rockslide after South Hlimen quarry rockslide that took place in 1992. This plane failure may be prevented when investigated the factors of rock instability. Rock bolt to be applied at rock bedding, decreasing the load of the crown and proper drainage systems are suggested for mitigation of in and around the affected area.

ACKNOWLEDGMENTS

We are grateful to the local council authorities of Laipuitlang and Ramhlun Venglai and to the authorities of Directorate of Mizoram Science & Technology, Govt. of Mizoram for providing us necessary information.

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