

Inspection note on the recent visit to Syari Landslide, Deorali, Gangtok, East District, Sikkim

Geological Survey of India, North-Eastern Region, State Unit: Sikkim, Gangtok

A large crack was reported on 09.08.2018 on Upper Syari road, near Deorali, Gangtok, East District, Sikkim. (Fig. 1). The location is in the vicinity of residential complex of Auditor General (AG) office, Government of India. The failure was initiated on 10.08.2018. The landslide (zone of depletion) is located at a location having coordinates 27°18'57"N and 88°36'24"E and the area lies in the Survey of India Toposheet No. 78A/11. A visit was made to the affected area and field investigation was carried out on 14.08.2018 to assess the landslide and evaluate the causative factors by the officers of Geological Survey of India, North Eastern Region, State Unit: Sikkim, Gangtok.

Preliminary field observation confirmed that the Upper Syari landslide was characterised by a slow movement along with fall of debris material along a steep slope ($>45^\circ$), due to the bulging and action of gravity. This resulted in the accumulation of huge amount of debris just behind the AG residential complex. The dimension of this landslide is small, having length of about 80 m, width of about 150 m, height of about 60 m, total run out distance of about 100 m. The depth to failure surface being more than 2 m (deep seated). The failure is debris slide, which are quite common in Himalayas. During the active movement of this failure, a huge impact of moving rock boulders and a relatively moist debris have been created on the residential buildings. The type of overburden is weathered and unconsolidated rock and soil having thickness of 1-2m. The rocks are highly fractured. The failure has been initiated with the appearance of cracks which subsequently enlarged. There is excess overburden pressure, which resulted in bulging and failure of slope material. Geomorphologically, the affected area is lowly dissected with sparse vegetation. Some parts of the affected area are also having agricultural land along with heavy settlements.

The tentative geoscientific reasons of this landslide as observed could be i) slope failure, ii) heavy rainfall, iii) local shearing/ fracturing rendering poor quality of slope material, iv) pore water pressure v) steeper slope morphometry. During last few days there had been significant rainfall in the area. Hence, pore water pressure developed due to long saturation of antecedent rainfall could have also played a pivotal role in triggering this failure.

This failure damaged buildings, roads, water supply line and power supply lines but fortunately no casualties took place. A proper heavy load bearing gabion wall along the slope is required immediately to hold the overburden material and to keep the buildings safe. Proper drainage is essentially required to avoid any other failures.

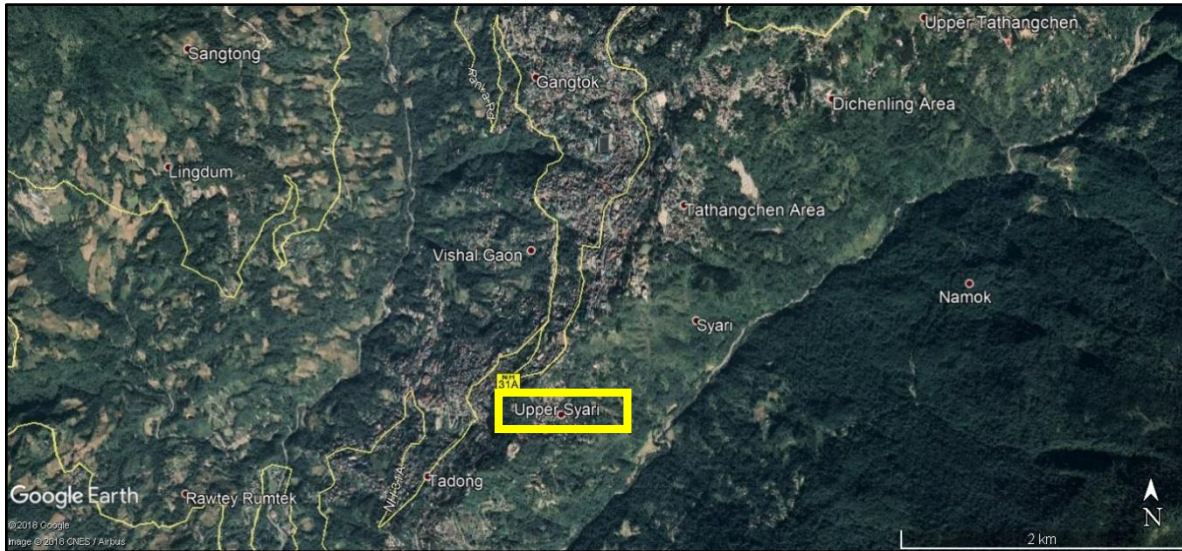


Fig. 1: Location of Upper Syari failure (Source: Google Earth)



Fig 2: The affected slope due to failure in Upper Syari.



Fig. 3 & 4: The failure affecting the slope and the buildings in Upper Syari.

42-Point Geo-parametric attribute of Landslide (Causes, Remedial Measures & Others)

No	Field	Description
1	Slide No (LS .No.)	<i>State: Sikkim/district: East District/toposheet: 78A/11/year: 2018/serial no.</i>
2	State	Sikkim
3	District	East District
4	Toposheet	78A/11
5	Name of the slide/ failure	Upper Syari, Deorali, Gangtok
6	NH/SH/Locality	Near Butter fly Chowk, Syari, Deorali, Gangtok
7	Latitude	27°18'57''N
8	Longitude	88°36'24''E
9	Length	80 m
10	Width	150 m
11	Height	60 m
12	Area	12X10 ³ sq m
13	Depth	2 m
14	Volume	24X10 ³ cu m
15	Run out distance	NA
16	Type of Material	Debris
17	Type of movement	Bulging and slope failure
18	Rate of movement	Slow
19	Activity	Active
20	Distribution	NA

21	Style	<i>Single</i>
22	Failure mechanism	<i>Bulging and slope failure</i>
23	History	<i>Date of initiation: 7th August 2018, subsequent reactivations 9th August 2018</i>
24	Geomorphology	<i>Moderate to steep slope</i>
25	Geology	<i>The rocks of the surrounding area belong to Kanchanjunga gneiss of CCGC (Central Crystalline Gneissic Complex) as basement rock, covered entirely with paleoslide material.</i>
26	Structure	<i>NA (As the area is completely covered by heavy settlement).</i>
27	Land use/ Land cover	<i>Sparse trees and heavy settlement</i>
28	Hydrological condition	<i>Seasonal stream</i>
29	Triggering Factor	<i>Excess load of the settlement. Excess rain water percolation, creating hydrological pressure, resulting in the failure.</i>
30	Death of persons	<i>Nil</i>
31	People affected	<i>None</i>
32	Live stock loss	<i>Nil</i>
33	Communication	<i>Road (blocked/damaged), disruption in water supply line and power cables</i>
34	Infrastructure	<i>Cracks on the road and in the settlement</i>
35	Agriculture/forest/Barren	<i>Sparse trees</i>
36	Geo-scientific Causes	<i>Combination of excess load of the settlement along with pore water pressure</i>
37	Remedial measures	<i>Evacuation from the affected area, making arrangement for proper drainage and diversion of flowing stream, erecting gabion wall</i>
38	Remarks, if any	<i>Cracks appeared on the road first and then enlarged within 24 hrs.</i>
39	Photos. Sketch of Plan & section of the slide	<i>Attached with note.</i>
40	Summary/Abstract	<i>Attached with note.</i>
41	Pdf	<i>Attached</i>
42	Landslide Category	<i>Type.....</i>