NOTE ON PRELIMINARY STUDIES OF BOH VILLAGE LANDSLIDE, TEHSIL SHAHPUR, DISTRICT KANGRA, HIMACHAL PRADESH

By

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Introduction:

The western most district of Kangra in Himachal Pradesh has been an arena of frequent natural catastrophe. The district has witnessed these catastrophes in the form of catastrophic earthquake of 1905 to several damaging landslide and flash flood incidences. Most of the part of district constitute a fragile geo-environmental condition due to presence of soft to semi consolidated tertiary rock in lower reaches and presence of closely spaced major Himalayan thrusts in upper reaches. The Boh valley in Shahpur Tehsil, Kangra district, Himachal Pradesh is also a part of the same fragile geo-environment.

The area is located nearly 50 km from Dharamshala and is approachable by all-weather metal road via Shahpur and Darini villages. The Darini-Boh area located at EL $\pm$1400 m along left bank of Brahal Khad. The area is marked by presence of several bouldery colluviums, slope debris and debris cone as the main geomorphic constituent present in the foothill zone hosting nearly all the village establishments. The Boh village is also located at the foothill debris cone of a major hill spur. The hill mass is moderately dissected and forested. The Boh debris cone has arisen out of erosion of an incised gully located on the hill spur. The Brahal Khad has been noticed to have been pushed away by the Boh Debris cone indicating the debris cone to be active in recent geological past.

Geologically, the Boh village area located itself within the Central Crystalline terrain (Morang Fm) exposes several major tectonic feature like Main Central Thrust and Kulu Thrust in downslope proximity and Dalhousie Granite in upslope part. The surrounding bedrocks, as a consequence, are highly fractured and deeply weathered attesting the easy supply of bouldery material for various kinds of valley fills.

The landslide incidence:

The catastrophic landslide occurred at 10.30 hrs (approx.) on 12.07.2021 at Boh village resulting in loss of ten lives and washing away of seven major houses, other constructions, road and agricultural land. The incidence also made the adjoining areas unstable. The damage was caused by a flash flood charged with debris flow in the upslope incised gully triggered by head ward landslide due to incessant heavy rainfall during previous night. Therefore, the incidence at the Boh village can precisely be describe as a debris flow hit. A short curve in nala course at the downstream end, possibly facilitated the spread of debris flow over the entire Boh village establishment. As on date of visit, the Boh village landmass was totally destabilised and can be reclaimed only after proper ground stabilisation applications. The adjoining landmasses on right bank have also been disturbed due the incidence, as evidenced by the presence of titled trees, ground cracks and excessive ground seepage. It has been observed that the adjoining hill masses also suffered moderate landslides disrupting the communication at places.

The Future Menace:

The observations along the nala revealed presence of lot of bed load material comprising rock chips of Morang Formation as well as precariously disposed large boulders of Dalhousie Granite. In view of the steep gradient of the upstream nala/gully, unstable side slope material and landslide prone upstream most part of the nala, the recurrence of debris flow/ flash flood incidence cannot be ruled out. In this effect and in view of rainy season still remaining ahead, it is suggested that the dwellers at Boh and surrounding area may be shifted to a safer place. The above pursuit of safety may also be followed in other villages/ habitats, in particular for those living along nala banks and dormant nala courses. Similar mode of catastrophes appears common in the area and also reported from Basolda village located nearly 18km on Boh-Dharala link road.

Remedial Measures:

1. Rehabilitation of affected inhabitants of Boh and adjoining area to a safer place in view of destabilize ground condition and possible recurrence of incidence at Boh village.

2. The reclamation of the land mass at Boh after proper applications of ground stabilisation measures like compaction, channelizing out the seepage, provisions of drainage outlet, provisions to check ground settling and retaining structure to confine the ground mass, protection wall from nala side etc.

3. Prohibition of flow barriers all along upstream nala course at suitable distances

4. Provision of concrete lined spacious nala course with a provision of culvert on the road ensuring the easy passage of debris flow.

5. Concrete retaining structure all along the road stretch terrace/debris cone material with adequate drainage holes

6. Launch of landslide safety (vulnerability identification) programs in villages/habitat located in such fragile Geo-environmental area

7. Conducting regular contact programs for public awareness of landslide and related incidences in particular during pre-monsoon.

8. Settlement/construction for dwelling may be avoided along nala/khad/river banks or flood plain area and along the nala banks and dormant courses.

9. Suitable plantation/afforestation for the stabilization of nala banks and disturbed ground

10. Implementation of safe and scientific methods of slope modification and stabilization.

11. Identification of stable ground for safe construction and urbanization with proper drainage outlets and protection wall.

12. Widespread advance communication/warning to the dwellers regarding heavy rainfall.

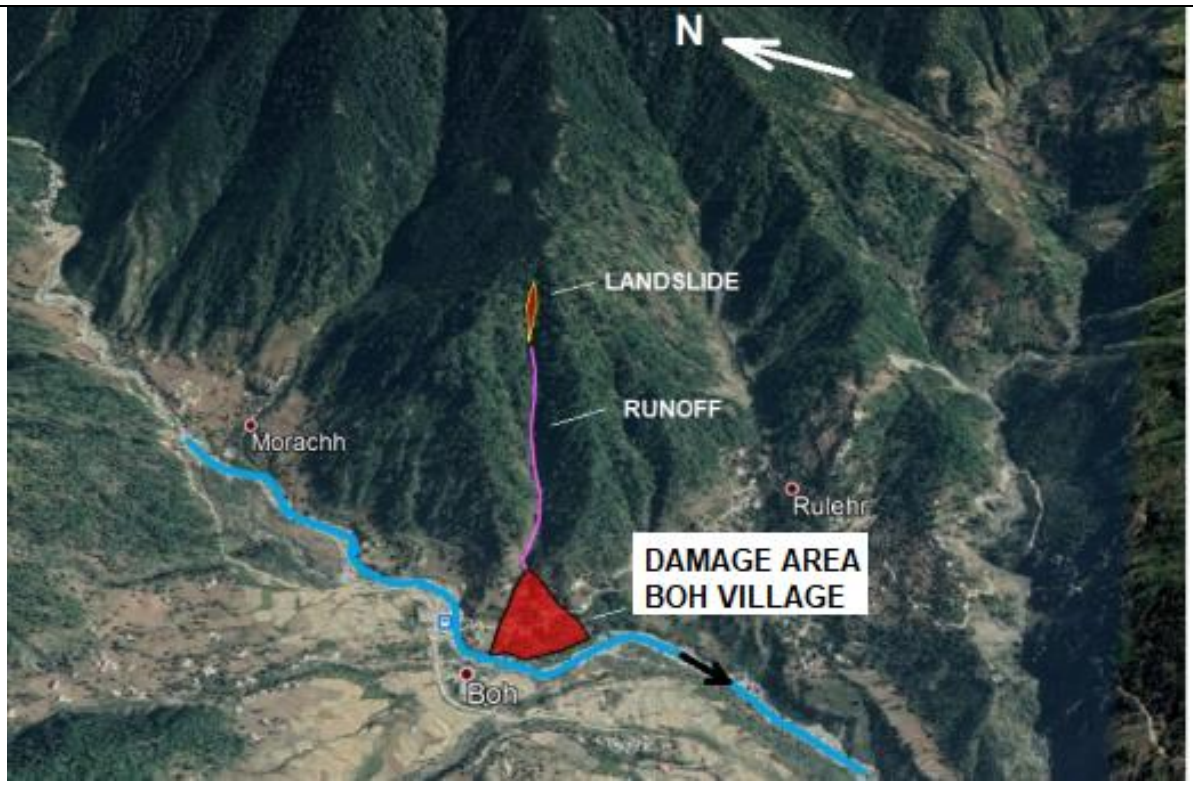

Photo-1: Geomorphic location of Boh village landslide (32º18’41.7”; 76º11’18”), Kangra district, HP. (Source: Google earth)

Photo-2: The perspective view of landslide, runoff and debris flow hit Boh village area

Photo-3: Downstream view of part of runoff

Photo-4: Rock slide in the upstream part of runoff.

Photo-5: The downhill view of debris flow hit Boh village with remains of damaged houses (shown with red arrows)

Photo-6: The curve at the downstream end of nala course possibly lead to spread of debris flow in the Boh village.