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Older Terrace Deposit along Teesta river between Main Central Thrust and Main Frontal Thrust in Sikkim and Darjeeling Himalaya: Societal implications

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Abstract:

In Sikkim and Darjeeling Himalayas, human settlements have developed on the depositional landforms like terraces and fan lobes preserved along the Teesta river in the region between the Himalayan Frontal Thrust (HFT) and the Main Central Thrust (MCT). Some of these landforms are under intensive agricultural use.

The microseismicity in the region indicates that it is tectonically active. The recent hazardous activities in this region are caused by combination of landslide and high stream discharge in monsoon time; these are highly risky for transport and human settlements in the study areas.

We prepared a detailed geomorphic map of the region using PAN, LISS and LANDSAT data followed by field checks and examined the lithofacies present in different landforms. The landforms present in the area are terrace, stream fan, channel bars, mountain slopes and flood plains. Strath, paired and unpaired terraces are present at different elevations. Three terrace levels – T3, T2 and T1 – are conspicuous in the region. The T3 terrace is built up of thick sand and gravel units deposited by hyperconcentrated flood flow, channel flow, and preserved all along the river channel. The older fans contain sediments, which were deposited from debris, hyperconcentrated and channel flows.

The older terrace T3 consists of non-cohesive, loose sand with very few granules and gravel fragments. These sandy deposits are stratified to cross stratified; thickness varies from few centimeter to metres. Sandy units are distributed vertically with alternate layers of very thin sheets of pebbly gravels. Angular granular sandy units are present in the middle part of this terrace. The terrace surface is covered with dark brown to black soils with variable thickness. This terrace, at places appears to be tilted (<3°) and is characterized by development of scarps and erosional gullies.

This region is characterized by high precipitation, which leads to high runoff erosion on the terrace surface. First order drainages are developed in the high angle terrace scarps; colluvium and slides have developed on these scarps. The terrace is cut at several places for the construction of roads and buildings. These activities have rendered the terrace more unstable. Before planning any developmental activity on the older terrace surfaces of this region, their lithology, lithofacies and geomorphology must be assessed.