Chapter 4
Assessing the Influence of Clay Minerals on Landslides in the Lesser Himalayas

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Abstract Landslide is one of the deadliest hazards in the tectonically active Himalayan Region, particularly in the Lesser Himalayas. Rainfall-induced weathering and the hydrothermal alteration during the formation of the MCT have resulted in the production of hydrophilic clay minerals, which reduces the frictional strength of the slide planes by absorbing water in their interlayer spaces and thus triggers landslides. However, smectite, illite and vermiculite-like clay minerals with higher interlayer spacing enhance the shear strength with an increase in sliding velocity which gives rise to short-term but large-scale landslides, whereas chlorite crystals retain the strain energy within its lattice due to the presence of hydrogen bonds, which joins the talc-like T-O-T layer and brucite like-octahedral sheet and facilitates viscoelastic behaviour even at high-stress regime inhibiting the occurrences of large-scale landslides. Hence, in the NaMu highway section in Nepal, more active landslides are evidenced in the areas where the soil dominantly contains illite rather than those containing chlorite and kaolinite with little or no illite. Moreover, unlike smectite or other clay minerals, the shear strength of chlorite diminishes with increasing slide velocity and results in slow-motion landslides for longer duration or creep, as also observed frequently in parts of the Lesser Himalayas.

Keywords Hydrothermal alteration · Chlorite · Ripplocations

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