

Finite Element-Based Stability Analysis of Roadside Settlements Slopes from Barpak to Yamagaun through Laprak Village of Gorkha, an Epicentral Location after the 7.8Mw 2015 Barpak, Gorkha, Nepal Earthquake

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Abstract : The research employs finite element method to evaluate the stability of roadside settlements slopes from Barpak to Yamagaun through Laprak village of Gorkha, Nepal after the 7.8Mw 2015 Barpak, Gorkha, Nepal earthquake. It includes three major villages of Gorkha, i.e., Barpak, Laprak and Yamagaun that were devastated by 2015 Gorkhas' earthquake. The road head distance from the Barpak to Laprak and Laprak to Yamagaun are about 14 and 29km respectively. The epicentral distance of main shock of magnitude 7.8 and aftershock of magnitude 6.6 were respectively 7 and 11 kilometers (South-East) far from the Barpak village nearer to Laprak and Yamagaun. It is also believed that the epicenter of the main shock as said until now was not in the Barpak village, it was somewhere near to the Yamagaun village. The chaos that they had experienced during the earthquake in the Yamagaun was much more higher than the Barpak. In this context, we have carried out a detailed study to investigate the stability of Yamagaun settlements slope as a case study, where ground fissures, ground settlement, multiple cracks and toe failures are the most severe. In this regard, the stability issues of existing settlements and proposed road alignment, on the Yamagaun village slope are addressed, which is surrounded by many newly activated landslides. Looking at the importance of this issue, field survey is carried out to understand the behavior of ground fissures and multiple failure characteristics of the slopes. The results suggest that the Yamagaun slope in Profile 2-2, 3-3 and 4-4 are not safe enough for infrastructure development even in the normal soil slope conditions as per 2, 3 and 4 material models; however, the slope seems quite safe for at Profile 1-1 for all 4 material models. The result also indicates that the first three profiles are marginally safe for 2, 3 and 4 material models respectively. The Profile 4-4 is not safe enough for all 4 material models. Thus, Profile 4-4 needs a special care to make the slope stable.

Keywords : earthquake, finite element method, landslide, stability

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