Assessment of Vulnerability to Rainfall Induced Cut Slope Failures in Central Highlands, Sri Lanka

C.N.Subasinghe, Scientist, Landslide Research & Risk Management Division, National Building Research Organisation

In landslide prone areas, vulnerability of housing structures is assessed so that adaptation methods can be introduced to reduce risk during hazards. With the scarcity of flat terrain, people tend to construct their houses after the excavation of mountainous slopes without proper land-use practices, causing devastating cut slope failures during prolonged and intense rainfall. However, socio-economic considerations are also important when considering cut slope failures and the influence of human activities. As such, this approach is timely, and needed to overcome risk associated with cut slope failure, especially in developing countries. This study is an attempt to assess both the physical vulnerability of housing structures and the socioeconomic conditions of dwellers, to provide a holistic understanding of cut slope failure disasters. Extensive fieldwork is vital to understanding cut slope failure disasters due to a lack of relevant data at a household level. This study is novel in that it uses data relating to cut slope failure hazard, vulnerability of housing structures and socio-economic conditions of each household to understand the relationship between these variables and overall vulnerability. Sri Lanka was selected for the study as it has the highest frequency of cut slope failures compared to other landslide types. Data was collected using a semi-structured questionnaire survey and extensive field survey, conducted with randomly selected households (N=322) in cut slope failure areas of central highlands, Sri Lanka, in January and February 2020. Indicator-based methodology and regression analysis were used to assess the vulnerability. We found a clear relationship between the socio-economic characteristics of communities and vulnerability to cut slope failure hazard in Sri Lanka. The results reveal that the choice to start, and continuing, living in areas of cut slope failure risk, as well as to move away from these areas, was dependent on different priorities for communities. 30% of houses were constructed on steep slope areas, 70% constructed on moderate slope areas, with no houses constructed on gentle slope areas. 82% of housing structures having moderate vulnerability to cut slope failures. Socioeconomic conditions, such as household per capita income and education level of the household head, also had a significant influence on vulnerability to cut slope failures. The findings of this study will assist policymakers in landslide disaster management to consider the social and economic conditions of communities and reduce cut slope failure risk in the future.

Keywords: Cut slope failure, Physical vulnerability, Indicators, Socioeconomic, Household level