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## Reply on RC2

Chih-Chung Chung and Zih-Yi Li

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Author comment on "Rapid landslide risk zoning toward multi-slope units of the Neikuihui tribe for preliminary disaster management" by Chih-Chung Chung and Zih-Yi Li, Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-409-AC2>, 2022

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The authors appreciate the advice. The manuscript has been revised according to suggestions. The responses to general comments are detailed as follows.:

- The authors appreciate the suggestion. Susceptibility is typically applied for the landslide risk assessment of large-scale geological conditions accompanied by common environmental factors, such as slope degree and lithology. To rapidly assess the landslide risk of a tribe region, this study refers to the susceptibility findings of deep-seated landslide inventory and carefully includes Activity analysis, especially for a small-scale slope unit. The revised Activity is based on the Activity Area Ratio (AAR) principle and the categories of dip sliding and colluvium indexes from the previous experience. Hence, the proposed Activity aims to examine the evolutions of slope units through DEM and aerial photos of different periods. Regarding this, Activity 1 is modified to measure the activity level of the dip sliding along a slope unit, while Table 2 examines the activity level of the colluvium layer on the surface of a slope unit. The relation between the bedding and the slope considered in the Activity 1 is further applied to comprehensively appraise the rock's exposed condition through the high-resolution DEM and aerial photo interpretation.
- Thank you for the correction, the "cliff" should be "scarp", which has been corrected, and the method is suitable for slow-moving slopes.
- Thank you for the suggestion. The revised manuscript will add the activity analysis process of slope unit No.11 as an example in the text to explain in detail.
- Thank you for the suggestion.
  
- The landslide event in 2016 is not included in the risk analysis.
- The proposed method intends to provide a rapid analysis according to the scoring indicators in the tables after obtaining the initial geological, DEM, and aerial photo data. Indeed, identifying scarp in the activity analysis will take a little time because it is necessary to compare the evolution of possible features at different times for the exact location.
- According to the official observations in the recent decade, the Neikuihui tribe is the only one with a landslide for validation. Although only one regional analysis is revealed, the authors believe that the proposed rapid risk zoning process is ready to be applied in the next phase at other hillside tribes.

The responses to the specific comments:

- Thank you for the suggestion. The word "Tribe" is what we mean.
- Thank you for the suggestion. The paragraph collects significant risk analysis findings and the corresponding applications to reveal the basics of the risk analysis research method. For example, Varnes et al. provided the risk assessment principle in 1984 as  $\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}$ ; Corominas and Mavrouli (2011) stated a completed deep-seated landslide risk assessment must include Susceptibility, Hazard, and Vulnerability. The authors believe these are important and relevant documents closely related to this study.
- Thank you for the suggestion. The context has been revised: They are the inhabitants who lived here before, named aborigines in Taiwan. Since the Neikuihui tribe has only one external road and frequent rockfall disasters, most residents have moved north to Kuihui Village, and only about 15 households are left in the Neikuihui tribe.
- Thanks for your suggestion. The text has been edited: Figure 2e is a 1:25,000 geological map of the Central Geological Survey (2020). The strata include the Tatongshan layer and the Aoti bottom layer, respectively, of which the Tatongshan layer is composed of black hard shale and siltstone interbedded, often forming steep slopes along the river bed. The bottom layer of Aoti is sandstone with a coal seam.
- Thanks for the suggestion. Fig. 1 adds a new scale to the main map of Taiwan and provides a compass and road lines corresponding to the Neikuihui tribe area. Since the perspective view is visually complex, we suggest keeping the 3D maps updated with high quality for better visualization.
- Thank you for the suggestion. Fig. 2 will be re-output with the highest quality, and the hillshade map is also provided.
- Thank you for the suggestion. When delimiting sloping land units, the authors utilized slope aspect, slope, ridgeline, river valley line, and geology for analysis, leading to the different area sizes of the slope units. The authors spent much time examining the activity of the large slope unit through the aerial photo and DEM, as mentioned in the previous response.
- Your statement is indeed correct. The authors divide the total score in analysis into three levels (low, medium, and high) or five levels (extremely low, low, medium, high, and extremely high) according to the standard practices on risk management as proposed by previous kinds of literature.
- Thank you for the suggestion. The authors add the vulnerability analysis process of slope unit No.11 as an example in the text to explain in detail.
- Thank you for the correction. Previously, we mainly quoted the vulnerability index formula mentioned in the article of Papathoma-Köhle et al. (2019). Based on your suggestion, we replaced it with the literature of Papathoma-Köhle et al. (2017), which is closer to the research content.
- Thank you for the suggestion. The range and location of the dip slope at slope unit 4 are from the 1/25,000-scale official distribution maps of geologically sensitive areas provided by the Geological Survey of the Ministry of Economic Affairs of Taiwan. Despite the range and location of the dip slope being rough as mapping to the slope unit 4, this study preliminarily assumes the slope unit 4 as a dip slope.
- Thank you for the correction. The authors have corrected the number of households in No.5. in Table 12, and changed the total score and figures accordingly.
- Thank you for the correction. We removed the word No.8.
- Thank you for the suggestion. This part is wrongly planted and has been modified to CCC.