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Reply on RC1

Chih-Chung Chung and Zih-Yi Li

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-AC1, 2022

Authors appreciate your valuable comments. Following please find the responses in detail:

- Thank you for suggestion, and authors agree the term of "indicator-based". As mentioned in the manuscript, the evaluation indicators in Table 1 are based on the previous logistic result of 2523 collapses in the southern Taiwan, leading to the five major influence factors: lithology, slope, elevation, structural distance, and channel distance. The authors then modified the results by using expert knowledge to establish a susceptibility grades fitted to the rapid landslide risk zoning toward a tribe area.
- Thank you for suggestion. The Abstract content is modified as: "The rapid risk zoning analysis of multi-slope units shows that there is a sloping unit around the Neikuihui tribe with a high level of landslide risk, and this sloping unit did suffer from landslide disasters in the 2016 typhoon event."
- Thank you for suggestion, legends for c and d in Fig.2 have been added for quicker understanding.
- Thank you for suggestion. The content is modified with new citations as: "Quantitative geomorphological and environmental analysis requires the adoption of well–defined spatial domains as basic mapping units. The spatial domains provide local boundaries to aggregate environmental and morphometric variables and perform calculations. Thus, they identify the spatial scale of the analysis (Alvioli et al.,2020). Among the spatial domain processes of delimited slope units, grid-cells and slope units are commonly adapted (Reichenbach et al., 2018). Grid cells, typically aligned with a digital elevation model, are the standard mapping unit choice (Alvioli et al.,2020). Despite their popularity and operational advantages, grid-cells have apparent drawbacks for susceptibility modelling (Guzzetti et al., 1999). First, there is no physical relationship between a grid-cell, or a group of grid-cells, and landslides. Landslides result from slope processes acting at different spatial and temporal scales that result in geomorphological forms of very different shapes and sizes (Malamud et al., 2004; Guzzetti et al., 2012) that are difficult to capture by grid-cells accurately. An alternative to grid-cells and unique condition units are slope units, which are hydrological terrain units bounded by drainage and divide lines (Carrara, 1983; Carrara et al., 1991, Carrara et al., 1995; Guzzetti et al., 1999), and corresponds to what a geomorphologist would recognize as a slope. The size of the slope units can be tailored to the type and size of the landslides, allowing for using the geo-environmental information best suited for the specific landslide type. (Carrara et al., 1991; Alvioli et al., 2016)."

- Thank you for suggestion, we have modified Table 1 accordingly.
- Thank you for suggestion, we have modified Tables accordingly.
- Thank you for suggestion. Please refer to the response of the Comment 1.
- Thank you for suggestion. The sentence is modified as "It is important to calculate how many household, traffic and public Utilities are exposed in risk zoning."
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  Thank you for suggestion. Authors agree that vulnerability depending on the distance to the landslide is simplistic. However, the primary purpose of this study is to establish a raply risk assessment framework for quickly interpreting the collapse of multi-slope units in a tribe area. We have added a description of study limitations to the discussion as follows: "In order to quickly assess the slope collapse risk of an area, especially in the vulnerability analysis, it may be simplistic but efficient to judge the vulnerability score by considering the possible impact area of the slope and the distance from the household / the main traffic road. The main reason is that geological data is limited to comprehensively analyzing the slope collapse risk. However, there are still households in this area, and the economic conditions are disadvantaged. When the survey resources are limited, the administration can easily and quickly remind people in higher-risk areas to relocate to a safe place according to the developed methodology in this study."

- The data interval 0-500 for total accumulated rainfall in Fig.12 has been modified as suggested.
- Based on the above suggestions, we have supplemented the discussion.
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  Thank you for suggestion. Since the purpose of this study is to quickly analyze the slope collapse risk in a region through indicators, it is suggested that after the follow-up assessment of the slope collapse risk in a certain region, the analysis results should be verified by interviewing local residents, experts and scholars.

- Thank you for your suggestion, we will look for a database suitable for storage.
- Thank you for suggestion, the wrong word has been edited.