Natural Hazards
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Discussions

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Interactive comment on "Including informal housing in slope stability analysis – an application to a data-scarce location in the humid tropics" *by* Elisa Bozzolan et al.

Elisa Bozzolan et al.

elisa.bozzolan@bristol.ac.uk

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We thank Reviewer 2 for taking the time to read our paper, for the positive comments and for recognising the contribution this research makes. We think we can revise our manuscript and address the specific comments as follow.

Comment (1): L 83 The MS "promises" that somehow the modelling exercise will take into account climate change. I think this is quite weak in the analysis presented. The authors should discuss a little if climate change projections could be used to define future values of rainfall based on Representative concentration scenarios and simulations by Regional/Global climate models, and mention literature on the subject.

We understand where the Reviewer comment is coming from, as we have adopted a perhaps less common approach to account for climate change in our modelling. In the approach we adopt, sometimes referred to as 'bottom-up' (Groves and Lempert, 2007; Wilby and Dessai, 2010) we do not choose a single climate projection scenarios to define future values of rainfall and propagate them through the modelling chain ('top-down' approach) but rather we uniformly increase the severity of observed rainfall events and use CART to find those combinations of rainfall (and other uncertain input factors) that would produce unwanted outcomes (slope failure in our case). We therefore explore the feasible rainfall space widely, rather than focusing on the potentially more likely space covered (in terms of rainfall intensity and duration) of one or more scenarios (even though we will include this scenario space). In this way we can 1) quantify the effects of other uncertainties (such as uncertain soil properties) compared to climate uncertainty; 2) identify for which values of rainfall intensity and duration landslide hazard starts to significantly increase. These threshold values may then be compared to GCMs projections for a specific place, in order to assess the chances that they be exceeded in the future. We recognise the point is not clear in the manuscript and it requires a better explanation. We will modify part of the introduction to include the above discussion and references.

Comment (2): LL 198-200 The water table height is varied between 0 and 90 % of the slope height. This seems a quite wide range. Perhaps the reasons for this choice could be better explained.

The wide range aims to represent the variability across the ensemble of slopes that can be found in our study region. We then use CART to define thresholds of water table height above which slope failure is more likely to occur. These threshold values can be then compared with levels of water table height of a particular slope and in a particular moment to assess its landslide probability. We will better specify the stochastic generation of the water table in section 2.4

Comment (3): L 234 Perhaps a reference explaining the Latin Hypercube sampling

technique can be useful for readers.

Agreed. We will add a reference explaining the Latin Hypercube sampling

Comment (4) : Section 4.2 and LL 263-275 of the supplement: The objectives of the multi-optimization are quite unusual. Perhaps in this case, an optimization based on ROC (receiver operating characteristics) analysis (i.e.: True and false positives/negatives) could have been employed and would have been more meaningful. At least, literature in the subject should be mentioned.

Optimization based on ROC analysis could have been an option, though we think our approach is also suitable given that our aim was to essentially identify the two parameters of the minimum rainfall threshold line. We already cite a study that employs ROC analysis and a review where it is mentioned (Staley et al. 2013 and Segoni et al. 2018), but a more explicit reference will be made in section 4 of the supplement.

Comment (5): Fig S1 (supplement): Panel (a) is repeated in panel (b), so perhaps it could be removed. Possibly add to the plot the rainfall time series (cumulated sum).

We will modify Figure S1 as suggested

Comment (6): Section S1. Perhaps the case of houses WITH gutters should be explained.

We will explain also the case WITH gutters and not just without in Section S1 as suggested.

Technical corrections L60 (supplement) and L137

Thank you for identifying these. We will address these typographic and grammatical errors and check the whole manuscript and supplement.

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