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Comment on nhess-2022-64

Anonymous Referee #2

Referee comment on "Rare flood scenarios for a rapidly growing high-mountain city: Pokhara, Nepal" by Melanie Fischer et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-64-RC2, 2022

The manuscript by Fischer et al. reports on the flood impact assessment over Pokhara, Nepal by defining a set of peak-discharge scenarios as indicators of flood hazards. The authors derive a set of flood information maps by using the HEC-RAS model. Based on the inundation area, they overlay various categories of land-use class, and built-up area to determine the exposure. I believe the manuscript might be useful to the readers of NHESS, water experts, and those working on various aspects of disaster management. As I can see, a fair bit of work has been carried out, however, the current form of the manuscript lacks sufficient novelty and several vital information. Moreover, the usage of a few terminologies such as 'outburst', and 'risk' need justification. Details on the numerical aspects of the flood model set-up, which is vital in justifying the impact assessment are also missing in the text.

Below are my major and minor comments on the manuscript that the authors might consider for revision and re-submission-

1. Introduction- In the current form, the introduction projects more or less about the study region, and flood incidences. It is understandable that the focus of the study is on a mountainous region, however, following a generic (or top-down) approach to flood risk, and other flood-related issues may be desirable. A few statistics on concomitant climate change impacts may also be added here to show the severity of the flooding events.

2. Figure 1- Please add an appropriate legend to describe what the triangles (stations) represent. An inset map of the elevation\topography of the study area may be included within this figure as well.

3. Section 3.2- Not enough justification is provided on the selection of the ten peak

discharge scenarios as inputs to the HEC-RAS model. Moreover, why did the authors consider a range between 1,000 and 10,000 m^3/s? Please elaborate.

4. In continuation to the previous query, a major discrepancy arises with the class intervals (1000 m^3/sec) between each peak discharge. What if there is a peak-discharge falling in the mid-way of two end values, which may not be incorporated appropriately within the flood model, but will add up the impacts on the communities.

5. Line 124: Vertical resolution of ALOS-DEM should be mentioned.

6. Line 127: The authors mention the consideration of around 572 cross-sections of the river channel. A separate figure providing these details may be provided, if possible in the supplementary material.

7. Line 141: The description of the land-use classes is not required to be added to the text. This may be provided in the form of a separate figure in the supplementary material.

8. Details of the time step of the HEC-RAS model simulation, final resolution of flood inundation maps, and courant number must also be added in section 3.2. Further, the justification of considering ALOS DEM (which is a freely available global product) as the bathymetry map for the study area may also be added, as sensitivity (if any) from the DEM will be reflected as inaccuracies in the set of flood inundation maps.

9. Line 164: How was the extent of sediment deposition quantified for the May 2012 flood event from the satellite imagery? How this piece of information was useful to the research addressed in this manuscript? Please justify.

10. The description of "Hazard" in the manuscript is ambiguous. Hazard indicates the severity of an event and is usually represented in terms of floodwater depth, velocity, the residence time of floodwater, etc. As a result of which, directly attaching the discharge scenarios to different levels of hazards is a very preliminary attempt. In another way, authors might consider terming them as low to high hazard classes rather than providing hazard classes as such.

11. Figure 7: The description of hazard classes within various land use classes is very difficult to locate. Some sort of different representation may be thought of here to locate the degree of hazard distinctly within land-use classes or create a separate figure for the same.

12. How did the authors carry out calibration and validation of the flood inundation outputs? Without this, the impact assessment over various land-use classes does not seem fitting.

13. At several places in the manuscript, the term ‘outburst’ flood appears misleading as there is no mention of the temporal dynamics of the flooding event. I request the authors to either justify or remove the ‘outburst’ term wherever it is mentioned in the manuscript.

14. The list of recommendations provided in the manuscript is very generic and applicable to any other case study. I suggest the authors be very specific and structure this section into possible structural and non-structural recommendations for flood management.

15. I am not fully convinced with the title of the manuscript over two points- ‘outburst’, and ‘risks’. The query regarding the usage of the former terminology is already mentioned in one of my earlier comments. The manuscript actually does not quantify ‘risk’, as it does not account for vulnerability as such. The impact assessment addressed in the work is more of an exposure assessment. Therefore, the usage of ‘risk’ terminology may be avoided in the title and elsewhere in the text. Moreover, the hazard is quantified as the extent of the inundated area, which is a very simple form of indicating a flood hazard.