Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2021-144: an interesting approach

Mariana de Brito (Referee)

Referee comment on "Considering human-water-environment impacts holistically in flood management by combining spatial MCDA with cost-benefit analysis" by Cyndi V. Castro and Hanadi S. Rifai, Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-144-RC1, 2021

General comments

In this interesting manuscript, the authors compare different flood risk management options by considering both MCDA and CBA. The topic is interesting and meaningful. Furthermore, the methodology applied is robust and innovative, and the final outputs of good quality. The graphs and Figures produced are in general easy to follow and summarize well the outcomes. However, I have some major concerns regarding the text readability. The entire paper, especially the methods section, could be reduced by 20-25% without losing relevant information. Another criticism is regarding the discussion section, which should be improved to add the limitations of the study. Hence, I recommend moderate revisions.

Specific comments:

- A main problem is that the reasoning for model assumptions is not clearly stated (e.g. for the weighting of the criteria, selection of criteria, as well as the points listed in lines 187 to 216). It is not clear how many stakeholders participated, for instance. For more specific comments see below.
- The methodology section reads too long and it is a mix of literature review and methods. It should be shortened. It is also not linear and difficult to follow. The authors first describe the weighting procedure and only then detail the criteria used. After that, the weighting procedure is explained in detail. I understand that section 3.2 now tries to add an overview, but it is confusing because many details are not explained. Hence, I would suggest to follow a linear description and incorporate the lines 230 to 255 in the other subsections. This way you will avoid repetition.
- Similarly, the results section is wordy. The last paragraphs should be included in the discussion. Furthermore, limitations and future work section should be added. Bellow you can find some suggestions on this (e.g. lack of sensitivity and uncertaintly

analyses).

- Line 40: I would say that MCDM is also a tool for traditional flood management. What is innovative of your research is combining both. I would reformulate this paragraph, stating the advantages/disadvantages of each approach, and how their integrated use can provide better answers for an adequate flood risk management. Here you also need to show previous literature that has also followed a similar approach. Try to find flood-related articles that combine both approaches. If they do not exist, you can also list this as an innovation from your paper. These could be relevant articles, but you have to check if they fit the scope as they are not for FRM.
  https://www.sciencedirect.com/science/article/pii/S2352146515002197
  https://www.sciencedirect.com/science/article/pii/S221204161630420X
  https://link.springer.com/article/10.1007/s40070-019-00098-1
- Line 43: "considered secondary in management frameworks" I disagree that this information is considered secondary. There are hundreds of flood vulnerability studies that show otherwise.
- Line 85-86: This should be in the methods section.
- Line 94-95: This is an important gap you are helping to fill. This should be mentioned in the introduction section
- Table 1: It is not clear how you extrapolated the cost estimate. I suggest adding a new column to the table where you can summarize the impacts you describe in section 2.2.2.
- Line 163-166: this is also a gap. I suggest mentioning it in the introduction.
- Line 195: how did you arrive at this number of 10.000 houses? Please detail it more. The same goes for all other quantitative assumptions
- Line 233: How exactly did you determine the relevant criteria? Was there a systematic procedure in the literature review you conducted? This is a gap that should be listed in the discussion section as different scientists would choose different criteria leading to completely different outcomes. Also, what is this "local knowledge"? Did you consult experts in the field? Or it was based on the author's opinion. This should be clarified.
- Line 239: You need to explain how these weights were defined. How many stakeholders were involved? How were they selected? Where do they work and what is their expertise? If they were based only on the opinion of the authors, this should be stated. Furthermore, this should be added as a limitation in the discussion section.
- Line 256: What do you mean by "exploratory geospatial review"?
- Line 260: By consolidated, do you mean you aggregated several criteria into one? If yes, which and how? You should be clearer on the method used to combine these criteria.
- Line 270: Doesn't the SoVI includes already population density? Wouldn't there be then a redundancy? Ideally you should conduct a PCA or other data reduction techniques. See this article, it may be helpful for the discussion section:
  https://nhess.copernicus.org/articles/21/1513/2021/
- Line 272: It was assumed based on what? On the information provided by Klotzbach et al?
- Line 355: The validation against the stream gauge heights is not mentioned in the methods section. Also, why have you conducted validation for some alternatives and not for some? The validation procedure should be described in the methods.

Technical corrections

- Line 9: As a non-native speaker, I had to google what "community buy-in" means. It may be my ignorance, but perhaps you could just frame it as "community acceptance

and support” or something similar? Still regarding to this, I do not understand why buy-in and resilience are social impacts. For me they are actually the opposite. I would keep "vulnerability" and use other examples here.

- Line 12: remove the (8)
- Line 84: Remove the word “qualitative”
- Line 154: please write “third reservoir (A2, Table 1), so the readers can understand that this is one of the 8 alternatives.
- Table 2: you should add the spatial resolution of these data.
- Line 255: What do you understand by “comprehensive risk dataset” and “ancillary risk datasets”? The difference between the two should be introduced.
- Line 290: I am not sure, but perhaps you can make a table with this information? Right now the text is too dense and difficult to have an overview of the many assumptions.
- Figure 2: the figures have a very low resolution. For the final version please use a pdf or similar graphs.
- Line 300: the information regarding the weighting should come before.
- Line 301: remove “general”
- Line 301: How exactly were these “discussions”. How many stakeholders? How did you achieved consensus between these stakeholders? Was one weighting derived for each participant and then you made an average? The procedure should be clarified.
- Line 305-307: If I understood correctly, you have not done this. Hence, it should be removed from the methods section. I would add this to the discussion, saying what future research could do/limitations in your study.
- Line 307-308: This should be in the discussion section.
- Line 310-312: this is literature review, not methods… I would remove all together.
- Figure 3: the color of the high risk easement should be changed as it is now the same as the color used for the study area border.
- Line 339: the normalization is mentioned 2 times in this paragraph.
- Line 354: Please provide this information in a table format. This way it is easier for the readers to compare the different alternatives.
- Line 354 to 364: The text reads too long and should be cut.
- Table 3: Please add to the legend of the figure what Ci, Ai, CBi, etc mean. It is easier for the readers not to need to search back in the text.
- Figure 5: I like the figure as it summarizes the outcomes and is easy to understand. However, I do not understand why some alternatives are in orange and some in blue. Please add this information to the legend.
- Figure 6: very important figure, but difficult to read because is twisted. Please use portrait orientation. Also, add the legend to the y axis. What do high and low z scores represent? Low z scores represent low social risk, for instance?
- Line 469-486: This is discussion, not results.
- Line 506: Please add a section called conclusion and add the text from here there.