

Interactive comment on “Integrated evaluation of water-related disasters using the analytical hierarchy process under land use change and climate change issues in Laos” by Sengphrachanh Phrakonkham et al.

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We wish to thank you all for your constructive comments in this round of review. Your comments provide valuable insights to refine its contents and analysis. In this document, we try to address the issues raised as best as possible

C1

Q:The title seems to be long and less declarative. Changing to “Mapping” might be a good fit than “Evaluation”

A:The title now been amended as suggestion

Q:The abstract may be improved – highlighting generalization of results and limitations of this study approach

A:For the limitation of this study, we added it in the conclusion part and added the limitation briefly from the part as follows. The integrated hazard maps can pinpoint the dangerous area through the whole country and the map can be used as primary data for selected future development area. There are some limitations of the AHP methodology, which supposes linear independence of alternatives and criteria.. The conclusions was added by the following sentences. There are some limitations of the AHP approach. AHP approach supposes linear independence of alternatives and criteria. It is recommended for the future study to make a comparison between AHP and other multi criteria decision making approach. Moreover, for modelling the hazard map in smaller area, topographic information should have higher resolution for better understanding the hazard by local people

Q:Introduction may restructure – pushing the facts about the case study (national) a bit later, better say something at the very beginning about international facts as a motivation of this study

A:We agree with the referee about restructure of introduction. Therefore, we have added international facts in the beginning of introduction section as bellow: Now a day, natural disasters take a few thousand people life around the world and lose about a hundred billion USD every year (UNISDR, 2015). Additionally, Dilley (2005) has analyzed that about 700 million people and about 100 million people in the world are affected by at least two hazards and three or more hazards, respectively

Q:It is understandable, the author is introducing the AHP as a method in the introduc-

C2

tion; however, the objective comes very late. Here it may help to be short, but specific to the research gap. Anyway, AHP related discussion are also part in the method section.

A:The text in introduction section now been amended as suggestion

Q:In the methodology, it remain unclear –about sensitivity analysis. It was done or not! If not why not?

A:In this study we did not apply sensitivity analysis because parameters were calibrated by a trail and error method comparing with observation data

Q:Under land use – only “forest and cropland” has been considered – is it because of data availability?

A:Reviewer’s comment is right. We can considered only “forest and cropland” on land use according to the Laos national report (Laos national report, 2012)

Q:AHP is a popular method for making expert judgement; however, it can be very complex and time consuming to communicate with the expert respondents; it might be interesting for the readers to learn from your experiences. Moreover, what are the criteria for being an expert for answering your AHP Matrix?

A:All experts for the questionnaire are working in the administrative divisions in field of our concerned hazards and risk and have experienced the disaster survey and the communication to local people.

Q:Some of the discussion may help – why not other MCA approaches was considered like ANP. . . .

A:We explained why we choose AHP method instead of other MCA methods, from line 103 to line 117 in the introduction section.

Q:There are number of literatures has been already included – it might be relevant to look more on: <https://www.sciencedirect.com/science/article/abs/pii/S2212420915301023>

C3

https://www.researchgate.net/profile/Asad_Asadzadeh/publication/271065059_Assessing_S

A:New citations have now been updated to introduction section from “ line 78 to line 80 For instance, Asadzadeh (2014) used TOPSIS model to find the solution in urban and regional planning issues and evaluated for site selection of new towns. “ line 97 to line 99. For example, Asadzadeh (2015) used factor analysis with ANP (F’ANP) to construct a new set of parameters for earthquake resilience indicator.

Q:The presentation of the results needs to be improved further. For example, the cartographic presentation e.g. color combination may rethink for better visualization of results. For example, following presentation of the whole study area map, it will be nice to see some high resolution map by zoom on some specific critical area for a close look on the output.

A:New figures for the critical areas have now been amend as referee suggestion.

Q:The discussion might be highlighted about the combination experience of multiple data sources, what are the major challenges. So far you have been using open data and automated workflow!! How about transferability and reproducibility of your proposed approach for countries that are having similar context and challenges.

A:We appreciate too much for your suggestion. The text in discussion section now been revised to provide more detail our challenges. Ungaged areas have difficulty of analysis. Therefore, multiple open data sources were used in this study. Also poor observed data for disasters makes it difficult to calibrate and validate the results. It will be necessary to transfer qualitative data to quantitative data. The proposed approach in this research are not directly transferable and reproduceable in other countries that are having similar context because of the different in institutional and culture. Other countries can apply our proposed approach to produce their integrated hazard map but the weight priority of each hazard may depend on their expert judgements.

Q:The conclusion may summarize the significant results and contributions (i.e. in bullet

C4

points).

A: The text in conclusion section is revised to summarize the significant results and contributions as follow: "The southern region has high and very high hazard areas comparing with the central region and the northern region. The Northern region has the lowest hazard area among three regions. " Total very high hazard area on the integrated hazard map with the anticipated change increases from 3.2% for RCP 2.6 to 3.27% for RCP 4.5 and up to 3.3% for RCP 8.5 in the near future (2010-2050) scenario. For the far future (2051-2099) scenario, the very high hazard area increases from 3.23% for RCP 2.6 to 3.52% for RCP 4.5 and up to 3.71% for RCP8.5

Please also note the supplement to this comment:

<https://nhess.copernicus.org/preprints/nhess-2020-195/nhess-2020-195-AC2-supplement.zip>

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