

Authors would like to thank the reviewer for the time taken to review the paper and for the suggestions and comments made. These were found very helpful to improve the manuscript.

Please find below the answers to the comments.

Remark: Reviewer comments are normal text, authors' response is italic text

Review of manuscript: "Flood risk assessment due to cyclone induced dike breaching on coastal areas of Bangladesh".

Overview

The paper describes the methods and suggests tools for the probabilistic flood mapping in a polder area of Bangladesh. The study area selected by the author is interesting in terms of its geographical complexity and challenges related to the data collection. The methods used are rather simplified and aimed at giving a general overlook on the problem.

Authors: Thanks for the comments

The main concerns

There are however, some major concerns about the idea behind methods and scenarios selection. The research questions should be addressed in Discussion section. One of the main problems is the description and structure of Study area and Methods sections. Some additional references are required in places where it is not clear where exactly the data or information come from. In addition, there is a large amount mistakes in language usage, both grammar, punctuation and word selection. The figures are not consistent throughout the manuscript. Therefore, my recommendation is to return this manuscript to authors for major revisions.

Authors: We acknowledge the concerns raised by the reviewer. We will revise the manuscript to bring more clarity in the description of the study area and the presented methodology. We will further update the discussion section with the research questions. More specific answers are provided in the following sections.

General comments

Reviewer:

Study area. Due to the specific conditions of the region, it is important to give more clarity and structure to this section. Probably it is a good idea to consider removing some unnecessary information and add more visualisation to more important aspects that are crucial for this specific research.

Authors: The authors acknowledge the suggestion. More specific information about the study area will be provided and unnecessary information will be removed to improve the description of the study area.

Reviewer:

Research question. Should be stated clearly what exactly is developed within the study and to which degree it is considered innovative.

Authors: The authors understand that the innovation remained unclear in the draft. The main innovation of the research will be presented clearly in the revised manuscript.

Reviewer:

Methodology. Here are major rewritings are required to increase the quality of the paper. Modelling sub-section needs more clarifying in tools selection and usage. In addition, I suggest more description of the data used for model set-ups and calibration.

Authors: The authors acknowledge the suggestion. More detailed information will be provided in the methodology with a flow chart to bring more clarity in the revised version. The description of the data used for the setting up of the model and its calibration will be elaborated.

Reviewer:

The subsection 3.2 Cyclonic scenarios considered; the selection of the values for different scenarios based on the IPCC report is rather subjective. It is suggested to consider regional sea level changes rather than global mean, as there is a significant difference specifically for Bangladesh. This may bring more impact on the outcomes of the study.

Authors: The authors' intention was to present a global methodology applicable to everywhere. The relative sea level rise for RCP 8.5 of IPCC AR5 for the coast of Bangladesh is 0.56 m (GERIC, 2015) which is slightly lower than what was considered by the authors (0.63 m).

Reviewer:

Discussion and Conclusion. It would be worth writing how/if the future studies would improve the current outcomes.

Authors: The authors acknowledge the suggestion. The revised manuscript will have recommendation for future studies.

Reviewer:

The take-home message is rather vague. The discussion section needs major re-writing in accordance to the research questions stated in Introduction. In my opinion such general methods used in this study should be accompanied with rather more detailed (sub)-section on the sources of errors and limitations.

Authors: The discussion section will be adjusted with a reflection on the research questions. Limitations will be added in the research discussion section.

Reviewer:

Heroic assumptions such as “lead to economic growth” and “end the problem of poverty” should be avoided.

Authors: The authors acknowledge the suggestion and the phrases will be removed.

Reviewer:

English. A serious revision of the language is necessary to improve the quality and readability of the manuscript. Among main issues I would outline: plural vs. singular, passive voice use, punctuation, repetitions of the same structures in consecutive sentences/paragraphs, repetitions of abbreviation explanations, articles selection, language use, etc.. The specific remarks do not cover language issues.

Authors: To improve the level of English a native English speaker will be consulted.

Specific remarks

Reviewer:

p.2 line 2. According to Neumann et al (2015) 49% of population located in low elevated coastal zone for the year 2000, at that time the overall population of Bangladesh was 139 mil. Values should be corrected.

Authors: The authors acknowledge the suggestion and the manuscript will be adjusted accordingly.

Reviewer:

p.2 line 11. The number US\$1.67 million seems rather small, needs additional check.

Authors: The authors thank the reviewer for pointing it out. The revised manuscript will be corrected accordingly.

Reviewer:

p.2 line 14. "Raising the crest level ..." the sentence is unclear.

Authors: We agree and the revised line will be: "Raising the crest level was considered as the only mitigating measure".

Reviewer:

p.2 line 15. References needed to indicate which exactly previous studies were done in this matter.

Authors: The authors acknowledge the suggestion and the revised manuscript will be adjusted accordingly.

Reviewer:

p.2 line 17. It needs more clarification how land use zoning address the flood mitigation.

Authors: The authors think that land use zoning is widely used as a flood risk mitigation measure. We will add references to it.

Reviewer:

p.2 line 19. "...of these tropical cyclones will increase..." the statement will is rather confident, however it is likely increase. We are not 100% sure it will increase the intensity of storms. Look further through the manuscript for same errors.

Authors: Indeed, we will rewrite it as follows: "Moreover, the intensity and frequency of these tropical cyclones are likely to increase in the future due to climate change causing more damages."

Reviewer:

p.2 line 26. Which exactly severe consequences specifically in Bangladesh? Look at Neumann et al (2015) for ideas.

Authors: As suggested we will refer to Neumann et al. (2015).

Reviewer:

p.3 line 3. It is recommended to visualise coordinates in Figure 1.

Authors: We will add the coordinates in Figure 1.

Reviewer:

p.3 line 6. The source of census data is missing.

Authors: We thank the reviewer for pointing it out. The revised manuscript will mention the source of the census data.

Reviewer:

p.3 line 12. Consider the importance of putting the local names of seasons to the manuscript.

Authors: The local names of the cropping seasons have been mentioned. However, the calendar months are mentioned as well and therefore, Authors think that any lack of clarity is not obvious.

Reviewer:

p.3 line 15. Some figures on the land subsidence rates may bring more light on the severity of the problem in the region.

Authors: We will search for any studies describing land subsidence rates and if available, we will report it.

Reviewer:

p.4 line 12. “Model set up” rather than “model development”

Authors: Thank you for the suggestions. As we are unable to identify the mistake, we will consult a native English speaker for clarity.

Reviewer:

p.4 line 20. The reference on FINMAP is missing.

Authors: We will add a reference to FINMAP.

Reviewer:

p.4 line 26. More details on the computation mesh are recommended.

Authors: The spatial resolution of the computational mesh has already been mentioned. It is unclear what additional details on the computational mesh are required. We will explore this issue.

Reviewer:

p. 5 line 9. The version of the model is missing.

Authors: We have used version 5 of the HEC-RAS tool. This information will be added in the revised manuscript.

Reviewer:

p.6 line 17. I would include the figures on the land subsidence.

Authors: As mentioned above, we will search for any studies describing land subsidence rates and if available, we will report it.

Reviewer:

p.6 line 23. The figures of SLR indicated could be updated to the ones for 2100.

Authors: The Authors’ intention was to state the probable sea level rise suggested by IPCC. The authors will take a look and adjust the manuscript if required.

Reviewer:

p. 7 line 15. It is better not to describe indirect damages if they are not consider further.

Authors: *We have not elaborated on indirect damages. We have just defined it to bring clarity.*

Reviewer:

p.8 line 16. More reasoning for choosing of the figure of 50% would bring more light on the selection.

Authors: *Muktadir and Hasan, 1985 stated in their study that the rural house hold of Bangladesh usually are built around a large country yard. The land classification by the Ministry of Land defines the whole house hold including the country yard as residential area. But the damage curve considered for the residential area was for the damage to the house and the country yard will not have significant damage if flooded. Considering this the authors tried to exclude the country yard from the residential area. The satellite image of the area indicated that the about half of the area of residential complex (house hold) is usually empty. Therefore, the figure 50% was considered.*

Reviewer:

p.9 line 7. “More research...” is rather suitable for conclusion.

Authors: *Authors acknowledge the suggestion and the manuscript will be adjusted accordingly.*

Reviewer:

p.9 line 16. This definition of risk was presented earlier by Helm 1996. See Helm, P. (1996). Integrated Risk Management for Natural and Technological Disasters. Tephra, 15(1), 4-13.

Authors: *Authors acknowledge the suggestion and the manuscript will be adjusted accordingly.*

Reviewer:

p.10 line 9. It is not clear where M and N are in your formula.

Authors: *The parameters M and N were defined in the manuscript following the equation. We will explore to bring further clarity.*

Reviewer:

p.11 Figure 4. The boundaries are not clear, some simplification of shapes could bring more readability to the map.

Authors: *Authors acknowledge the suggestion and will put more effort to increase the readability of the map.*

Reviewer:

p.12 Figure 5. There is some confusion what exactly this figure is supposed to show.

Authors:

Authors' intention was to depict the effect of different variables of the scenario development. For example: to depict the effect of sea level rise, two scenarios with keeping all the other variables (except from sea level rise) constant and changing the SLR, were compared. Authors acknowledge that this requires clearer explanation and the revised manuscript will be adjusted.

Reviewer:

p.15 Figure 8. The map layout is not consistent with other maps.

Authors: The difference with other figures mostly appear due to the presence of legends in Figure 8. The purpose of this figure is also different from other figures and as such some dissimilarities in layout may not matter. We will look into the possibilities of bringing a consistent layout.

Reviewer:

p.15 line 6. Some elaborate clarification why 0.5 m is used. My guess, some damages might be underestimated by selecting such high value.

Authors: The developed damage curves suggest that the damage for flood depth below 0.5 m is minimal. Moreover, the authors tried to explore the effect of living with flood concept. Also tried to consider the uncertainty of the DEM and the 2D inundation model. The depth as 0.5m is an arbitrary depth. For a country where flood is a recurrent phenomenon with larger depth, living with flood might be already adopted by the local people. Moreover, this arbitrary was used for PMFs and the estimation of damage due to flood was not affected.

Reference

Climate Service Center Germany (GERIC) and KfW Development Bank, 2015, CLimate Focus Paper: Regional Sea Level Rise South Asia, Hamburg and Frankfurt am Main.

Muktadir, M.A. and Hasan, D.M., 1985, December. Traditional house form in rural Bangladesh: a case study for regionalism in architecture. In Regional seminar on Architecture and the Role of Architects in Southern Asia (pp. 19-23).