MS No.: nhess-2021-8

Dear Referees,

We are sincerely grateful for your constructive comments and suggestions that, we believe, have helped us to make the manuscript clearer, more precise and robust. Following the recommendations, we revised the manuscript based on your reviewers' comments. We address you point-by-point all the answers and we will modify the manuscript accordingly. Please, see the attached file.

Response to review comments by Anonymous Referee #1 (R1)

General comments:

R1.1 This review article aims to develop a metric to define coastal vulnerability induced by cyclonic hazards in Bangladesh. The vulnerability was defined in terms of physical infrastructure, social and cultural factors, and economic factors. The manuscript is well-written in general. However, the results obtained in this study are nothing special from the nature of coastal Bangladesh, mostly known from various studies. I have a few major observations which I would like the authors to address diligently before it can be considered for publication. Of particular concern is the motivation for carrying out such a study, as well as, its contribution to the existing scientific literature.

Authors' response: Literature on cyclonic flooding vulnerability along the coast of Bangladesh typically examines either physical or social characteristics of the vulnerability to this hazard. This paper takes slightly different approach: it argues the need to consider the socio-spatial specific context which transcends the classical social and economic responses to integrate physical and infrastructural conditions as a basis of understanding and addressing cyclonic flooding vulnerabilities.

First, it sets out the framework in which cyclonic flooding vulnerability should be placed and shows the issue tied to its indicators. Indeed, majority of authors does not explain really the conceptual framework underlying their vulnerability assessment, making more difficult to interpret and re-use their results for scientists and stakeholders.

Moreover, lots of studies used a large set of indicators (i.e., Quader et al. 2017), which are reduced to smaller uncorrelated factors set using statistical methods, such as the principal components analysis, it raises as a consequence complex issues of number of principal components to retain, their significance, and the normalization choice, among other. Contrariwise, we analyzed the relevant indicators related to the cyclonic flooding vulnerability based on expert knowledge from a strict literature review. The literature review is a rich source to understand the main causes, translated as indicators, of social-spatial vulnerability to cyclonic flooding, their relative importance and interactions. Improved incorporation of the regional context helps to select significant indicators, at total 17 in our case, that not only reflect vulnerability as a state (e.g. poverty, age), but also as a situation (e.g. house type, shelter capacity).

Finally, an overview of the conceptualization of socio-spatial cyclonic flooding vulnerability is presented thought the SSVI. It is a simple computation of index which has a more understandable construction and appears easier to replicate for decision makers. Furthermore, unlike other studies which have developed physical or social cyclonic flooding vulnerability assessment, in our study, cyclone hazard flooding has been considered and incorporated in the social vulnerability model (i.e. SSVI).

This paper contributes to bring a paradigm shift, considering the integrated socio-spatial vulnerability, and new perspective to assess the vulnerability to cyclonic coastal flooding. It provides a framework for future research on the topic of integrated socio-spatial vulnerability assessments to cyclonic floods, as a basis for adaptation strategies.

Specific comments:

R1.2 I am surprised to see that several important recent studies were not included in this study, given a systematic review was done.

Authors' response: To be precise, we did not conduct a 'Systematic Review' process. This term was wrongly used in the titles of the Appendix A2 and A3, this has been corrected now. This work goes further than a 'Systematic Review', because in addition to assess the vulnerability indicators to cyclonic flooding drawing on literature, we define a new metric, called 'socio-spatial vulnerability index' (SSVI), as function of both the probability of the cyclone flood hazard and the sensitivity of inhabitants.

Considering, the review process used to collect articles, as mentioned section 4.1, only the articles responding to the following search sequence, in the electronic databases, were considered: ("coastal flood*" OR "sea-level rise" OR "Storm surge" OR "Cyclonic storm" OR "Disaster risk reduction") AND ("Bangladesh" OR "Brahmaputra delta") AND ("*vulnerability" OR "human exposure" OR "coping*").

R1.3 A few examples are given below. I feel the incorporation of these studies will strengthen the motivation and validity of this article:

https://doi.org/10.5194/nhess-19-353-2019 (Islam, Md. F., Bhattacharya, B., Popescu, I. (2019). Flood risk assessment due to cyclone-induced dike breaching in coastal areas of Bangladesh. Natural Hazards and Earth System Sciences, 19, 353-368)

Authors' response: The main objective of Islam et al. (2019) is to estimate the exposed areas to storm surge flood of the polder 48 (Patuakhali district), using a hydrodynamic model under different scenarios in a context of climate change (tide, sea level, dike breach and cyclone landfall angle). This article focuses on flooding, i.e. on the hazard, and not on the population/territory vulnerability to cyclonic flooding. This article was not therefore considered by our literature review process.

https://doi.org/10.1016/j.scitotenv.2019.05.048 (Adnan, M. S. G., Haque, A., Hall, J.W. (2019). Have coastal embankments reduced flooding in Bangladesh?. Science of the Total Environment, 682, 405-416.)

Authors' response: Adnan et al. (2019) analyzed the beneficial and harmful impacts of embankment construction on the territories. They focused on pluvial, fluvial-tidal and cyclonic floods by comparing observed and modelled floods, with and without polders. Islam et al. (2019) article focuses on flooding, i.e. on the hazard, and not on the population/territory vulnerability to cyclonic flooding. This article was not therefore considered by our literature review process.

https://doi.org/10.1016/j.landusepol.2020.104868 (Adnan, M. S. G., Abdullah, A. Y. M., Dewan, A., & Hall, J. W. (2020). The effects of changing land use and flood hazard on poverty in coastal Bangladesh. Land Use Policy, 99, 104868.)

Authors' response: Adnan et al. (2020) were interested in pluvial flood risk, as a function of different land use/land cover scenarios, in five coastal districts: Bagerhat, Jessore, Khulna, Pirojpur, and Satkhira. Although this article answered to the keywords search query, it was discarded because it did not focus on the main issue of our study, i.e. the socio-spatial vulnerability to the cyclonic flood. An interesting point is raised by this work about the influence of the land use/land cover scenarios on the flood dynamics. We note this information is already considered as an input parameter, named soil roughness, in the hydrodynamical modelling schema (Khan et al. 2019) used in our study (section 3).

https://doi.org/10.1007/978-3-319-71093-8_16 (Haque A., Kay S., Nicholls R.J. (2018) Present and Future Fluvial, Tidal and Storm Surge Flooding in Coastal Bangladesh. In: Nicholls R., Hutton C., Adger

W., Hanson S., Rahman M., Salehin M. (eds) Ecosystem Services for Well-Being in Deltas. Palgrave Macmillan, Cham.)

Authors' response: Although the book chapter of Haque et al. (2018) might be relevant to the physical characterization of the flood type (fluvial, tidal, fluvio-tidal, storm surge floods) in the GBM delta, it does not deal with the population/territory vulnerability to cyclonic flooding, that is the main issue of our study. Therefore, this paper which fails to meet our search requirements, was not considered in our literature review process. But, following your recommendation, we propose to add this reference in the new paragraph in the introduction about the existing flood types in the GBM delta

https://doi.org/10.1007/s11069-017-3027-8 (Younus Md. A. F. (2017). An assessment of vulnerability and adaptation to cyclones through impact assessment guidelines: a bottom-up case study from Bangladesh coast, 89, 1437-1459.)

Authors' response: Younus et al. (2017) propose an assessment of vulnerability based on a qualitative approach (by participatory rapid appraisal with semi-structured questions and groups of discussions) with the population of the Bawalkor village (Barguna district). Several high vulnerability issues are identified like seed-bed damage, primary occupation loss or culture fishpond loss. A second part of this study concerns adaptation issues (need to reconstruct the shelter, need of relief from the interest of loan for 1 year after the disaster, need to reconstruct roads, and so on). While interesting in its approach, this article does not identify key variables defining socio-spatial vulnerability to cyclonic flooding at the district level based on variables available in public databases. It was therefore not retained through our literature review process.

https://doi.org/10.1007/s41748-018-0034-1 (Hossain et Paul (2018). Vulnerability Factors and Effectiveness of Disaster Mitigation Measures in the Bangladesh Coast. Earth Systems and Environment, 2: 55–65.)

Authors' response: Hossain et Paul (2018) propose a review about the effectiveness of current disaster mitigation measures undertaken by individuals, GOs and NGOs to minimize the cyclone impacts in coastal areas (i.e. Gabura in Satkhira district and Golkhali in Khulna district). Although this article brings a very interesting contribution into the topic, it does not provide more information on population/territory vulnerability to cyclonic flooding than those previously published by the same authors, i.e. Hossain, (2015) and Paul and Routray (2010), and already considered in our literature review process. This article was not therefore considered by our literature review process.

R1.4 The coastal region of Bangladesh is subject to multiple types of flooding such as pluvial, fluvio-tidal, and cyclone-induced storm surge flooding. Cyclonic flood events in this region are usually accompanied by pluvial flooding. Flood vulnerability tends to change with an increase in the complexities of flood events. In this manuscript, the authors have not discussed the complex coastal flooding processes and associated vulnerability in Bangladesh. They could consult some of the articles suggested above.

Authors' response: We agree with your comment, insofar as in the coastal region of Bangladesh, multiple physical processes are responsible for flooding at various spatial and temporal scales - including pluvial, fluvio-tidal, and cyclone-induced storm surge flooding (e.g., Haque et al. 2018). Fortunately, the cyclone-induced storm surges are predominantly during pre- and post-monsoon seasons, when the flow at Ganges-Brahmaputra river system is relatively low.

Fluvial floods, on the other hand, are concentrated during summer monsoon spells, predominantly affecting the floodplains of Brahmaputra. Possible aggravation of the fluvial flood with its coincidence with spring tide has been acknowledged (e.g., the 1998 fluvial-tidal flood case was examined in Adnan et al. 2019). At the same time, co-incidence of Ganges and Brahmaputra flood peak is also noted as an

underlying reason for the flood in 1998, as well as the 1988 flood (e.g. Mirza 2002). Evidently, there is still a research gap that needs to be addressed on this complex coastal setting regarding the fluvio-tidal floods. We have a similar remark for pluvial flooding, that accompanies the cyclonic events (Uddin et al. 2019). The flooding that accompanies this cyclonic/post-cyclonic precipitation is challenging. First, due to uncertainty in the rainfall estimate from model as well as satellite over this region (e.g., Rahman et al. 2011), and second, due to uncertainty in the inland topography. The same topography issue persists for modelling inland inundation from storm surge.

In order to better appreciate this flood complexity and diversity in the coastal region of Bangladesh, we propose to add these sentences in the introduction section:

"These cyclone-induced storm surges are more frequent during pre-monsoon (May) and post-monsoon (October–November) season, when the flow at Ganges-Brahmaputra river system is relatively low and the rainfall moderate (Uddin et al. 2019), thereby reducing the likelihood of experiencing compound events, i.e. combined with other flood types as pluvial and fluvial (Haque et al. 2018). Concerning, the contribution of the heavy rainfall from landfalling cyclones to the floods, in addition to the storm surge, it still remains unexplored for this region. Therefore, hereafter, the study focused only on the cyclone-induced storm surge flood hazard".

Haque, A., Kay, S. and Nicholls, R.J., (2018). Present and future fluvial, tidal and storm surge flooding in coastal Bangladesh. In Ecosystem Services for Well-Being in Deltas (pp. 293-314). Palgrave Macmillan, Cham.

Uddin, M., Li, Y., Cheung, K. K., Nasrin, Z. M., Wang, H., Wang, L., & Gao, Z. (2019). Rainfall contribution of Tropical Cyclones in the Bay of Bengal between 1998 and 2016 using TRMM satellite data. Atmosphere, 10(11), 699.

Adnan, M. S. G., Haque, A., & Hall, J. W. (2019). Have coastal embankments reduced flooding in Bangladesh?. Science of the total environment, 682, 405-416.

Mirza, M. M. Q. (2002). Global warming and changes in the probability of occurrence of floods in Bangladesh and implications. Global environmental change, 12(2), 127-138.

Rahman, M. M., Singh Arya, D., Goel, N. K., & Mitra, A. K. (2012). Rainfall statistics evaluation of ECMWF model and TRMM data over Bangladesh for flood related studies. Meteorological Applications, 19(4), 501-512.

R1.5 Section 4.1: The methodology for selecting articles is not clear. First, I am not convinced with the inclusion of Google Scholar as one of the search engines as it tends to include articles that are not scientifically valid. How did the authors ensure that whether articles obtained from Google scholar are peer-reviewed or not?

Authors' response: First of all, we should call to mind that we used four traditional academic citation databases: ISTEX, Science Direct, Scopus and Web of Science. In addition, we chose to complete our analysis with the literature extracted from Google Scholar (GS) database. There are several reasons for this choice: GS is free of use (which is not the case of Scopus and Web of Science); and although it was shown that the majority of literature identified using Web of Science was also found using GS (Haddaway et al. 2015), it was also demonstrated that a large fraction (9–30%) of highly-cited documents in the Social Sciences and Humanities could be invisible to Web of Science and Scopus (Martin-Martin et al. 2018). Here, our primary area of concern is the vulnerability of the population to cyclonic flooding, therefore we thought it was important to complete this classical literature analysis with also the results from GS database.

We propose to modify and add this sentence in the main text to justify the use of GS database search engine (section 4.1) :

"Four traditional academic citation databases: ISTEX, Science Direct, Scopus and Web of Science were used for the literature review process. In addition, we completed the analysis with the literature extracted from Google Scholar database. Despite it was shown that the majority of literature identified using Web of Science was also found using Google Scholar (Haddaway et al. 2015), it was also demonstrated that a large fraction (9–30%) of highly-cited documents in the Social Sciences and Humanities could be invisible to Web of Science and Scopus (Martin-Martin et al. 2018)."

Moreover, the table below presents each peer-review journal considered in our literature review process (title, ISSN, CiteScore, highest percentile, publisher). This information comes from the Scopus database).

Table 1

Nb	Title	Type	Peer-Review	ISSN	CiteScore	Highest percentile (from Scopus)		Country	Publisher
						%	Rank	Subject Area		
1	Applied Geography	journal	yes	1436228	6,4	95	29/679	Geography, Planning and Development	Netherlands	Elsevier BV
1	Aquaculture International	journal	yes	1573143X, 09676120	2,9	73	89/334	Agronomy and Crop Science	Netherlands	Springer Netherlands
1	Climate and Development	journal	yes	17565529, 17565537	4,1	88	27/239	Development	United Kingdom	Taylor and Francis Ltd.
1	Disaster Prevention & Management	journal	yes	9653562	2,1	62	105/275	Health (social science)	United Kingdom	Emerald Group Publishing Ltd.
2	Disasters	journal	yes	03613666, 14677717	3,2	88	30/249	General Social Sciences	United Kingdom	Wiley-Blackwell Publishing Ltd
1	Ecological Economics	journal	yes	9218009	6,9	93	44/637	Economics and Econometrics	Netherlands	Elsevier
1	Ecology and Society	journal	yes	17083087	7,5	93	25/370	Ecology	Canada	The Resilience Alliance
1	Environment and Urbanization ASIA	journal	yes	09763546, 09754253	1,1	56	88/200	Urban Studies	United States	SAGE Publications Inc.
1	Environmental Development	journal	yes	22114645	4,8	91	57/679	Geography, Planning and Development	Netherlands	Elsevier BV
1	Environmental Hazards	journal	yes	14642867, 17477891, 18780059	2,2	76	293/124	Sociology and Political Science	United Kingdom	Taylor and Francis Ltd.
1	Environments	journal	yes	20763298	0,7	27	152/210	General Environmental Science	Switzerland	MDPI AG
1	Geomatics, Natural Hazards and Risk	journal	yes	19475713, 19475705	5,2	89	20/187	General Earth and Planetary Sciences	United Kingdom	Taylor and Francis Ltd.
1	International Journal of Climate Change Strategies and Management	journal	yes	17568692	2,4	72	67/239	Development	United Kingdom	Emerald Group Publishing Ltd.
7	International Journal of Disaster Risk Reduction	journal	yes	22124209	4,4	89	9/795a	fety Research	United Kingdom	Elsevier Ltd.
1	International Journal of Disaster Risk Science	journal	yes	21926395, 20950055	3,6	84	108/679	Geography, Planning and Development	United States	Springer Science + Business Media
1	International Journal of Environmental Research and Public Health	journal	yes	16617827, 16604601	3,0	66	174/516	Public Health, Environmental and Occupational Health	Switzerland	MDPI Digital Publishing Institute
1	Journal of Agriculture and Environment for International Development	journal	yes	22402802	0,8	43	114/203	General Agricultural and Biological Sciences	Italy	Italian Agency for Development Co.
1	*Journal of Bangladesh Institute of Planners****	*journal*	*yes*	*20759363, 24088587*	---	---	---	---	*Bangladesh*	*Bangladesh Academy of Sciences*
1	Journal of Coastal Conservation	journal	yes	18747841, 14000350	2,2	54	73/160	Nature and Landscape Conservation	Netherlands	Springer Netherlands
1	Journal of Environmental Assessment Policy and Management	journal	yes	14643332	1,6	56	293/679	Geography, Planning and Development	Singapore	World Scientific Publishing Co. Pte Ltd
1	Journal of Environmental Management	journal	yes	10958630, 03014797	7,6	95	15/333	Management, Monitoring, Policy and Law	United States	Academic Press Inc.
1	Marine Policy	journal	yes	0308597X	5,3	97	19/685	Law	United Kingdom	Elsevier Ltd.
1	Mitigation and Adaptation Strategies for Global Change	journal	yes	15731596, 13812386	5,7	87	48/370	Ecology	Netherlands	Springer Netherlands
7	Natural Hazards	journal	yes	15730840, 0921030X	5	87	28/217	Water Science and Technology	Netherlands	Springer Netherlands
6	Ocean and Coastal Management	journal	yes	9645691	4,3	79	46/219	Aquatic Science	United Kingdom	Elsevier BV
1	Professional Geographer	journal	yes	14679272, 00330124	3,1	79	142/679	Geography, Planning and Development	United Kingdom	Taylor and Francis Ltd.
2	Regional Environmental Change	journal	yes	14363798	6,5	76	20/83G	lobal and Planetary Change	Germany	Springer Verlag
1	Science of the Total Environment	journal	yes	00489697, 18791026	8,6	92	10/132	Environmental Engineering	Netherlands	Elsevier
2	Sustainability	journal	yes	20711050	3,2	80	132/679	Geography, Planning and Development	Switzerland	MDPI AG

Nb: Number of items considered in our literrature review

ISSN: International Standard Serial Number

CiteScore (from Scopus): Measuring the average citations for a journal. This is calculated by the number of citations within the past three years divided by the number of all items published in the same years. The higher the CiteScore, the more valuable the journal is deemed to be.
****: Journal not referenced in Scopus database*

Martín-Martín, A., Orduna-Malea, E. & Delgado López-Cózar, E. Coverage of highly-cited documents in Google Scholar, Web of Science, and Scopus: a multidisciplinary comparison. Scientometrics 116, 2175–2188 (2018). https://doi.org/10.1007/s11192-018-2820-9

Haddaway NR, Collins AM, Coughlin D, Kirk S (2015) The Role of Google Scholar in Evidence Reviews and Its Applicability to Grey Literature Searching. PLoS ONE 10(9): e0138237. https://doi.org/10.1371/journal.pone.0138237

R1.6 The authors said that "This review excludes non-peer-reviewed articles, in the aim to obtain a state of the art's review of the current knowledge extracted from scientific literature only, to make sure of high scientific quality standards in the selected articles". How did they define "high scientific quality standards"? This comment does not apply to articles obtained from other search engines.

Authors' response: Only peer-reviewed articles (see Table 1) were considered as being of high scientific quality standards because this literature goes through a reviewing process, where studies are verified by the editor and other scientists, the reviewers. In those articles, a scientific methodology is employed to test empirically research hypotheses and to be sure that data gathering, treatment and results analysis are logical, verifiable and reproducible. Moreover, peer-reviewed articles were used in the aim to ease their access for everybody through search engines, excluding internal or not-online reports from private and non-governmental authors, that cannot be found again by other scientists.

We propose to add this sentence in the main text to explain what we mean by the "high scientific quality standards" (section 4.1):

"In those articles, a scientific methodology is employed to test empirically research hypotheses and to be sure that data gathering, treatment and results analysis are logical, verifiable and reproducible."

R1.7 I believe the authors found many articles from the initial search. How the 49 articles were selected? What were the exclusion criteria? The authors need to clarify in their manuscript. Appendix A1 only included the inclusion criteria.

Authors' response: We propose to add this paragraph in the main text to clarify our review process (section 4.1):

"The initial search used inclusion criteria to be certain the first range of articles selected focused on studies about vulnerability to cyclonic floods in Bangladesh. A second selection of the first range of articles screened documents one by one to check if they explored vulnerability to cyclones and if they specifically did focus on areas placed in coastal Bangladesh, and not vulnerability to river flood, for instance."

R1.8 Bangladesh has a long history of implementing various flood adaptation and prevention measures against various coastal flooding. Coastal embankments are the well-known flood protection measures that have been adopted in Bangladesh. Existing studies have quantified the effectiveness of such measures against complex coastal flooding including cyclonic flood events. This article significantly simplifies the actual coastal flood processes. The authors need to discuss how the adoption of various flood interventions alters flood vulnerability in the coastal region.

Authors' response: Please see our reply to point R1.4 concerning the flood complexity in coastal zone. The objective of our study is not to test the effectiveness of cyclone flooding defense measures but to propose a SSVI, based on a picture of the current situation into every district, in terms of dykes and embankments presence, shelter capacity and land cover, through the hydrodynamical modelling. Therefore, a discussion on the adoption of interventions is out of the scope of our study.

However, we propose to add this sentence and reference in the section 3:

"Conventional methods for reducing the effect of cyclonic flooding in this region are: embankments, polderization, coastal afforestation and shelter construction (Rahman et al. 2015)."

Rahman, M. A., & Rahman, S. (2015). Natural and traditional defense mechanisms to reduce climate risks in coastal zones of Bangladesh. Weather and Climate Extremes, 7, 84-95.

R1.9 Line 454-455: According to this study, the length of dykes and embankments is negatively correlated with cyclone vulnerability. But the following study provided various evidence indicating that such embankments were less effective against historical cyclonic flood events. Moreover, these measures promoted associated pluvial flooding. The authors need to justify the selection of various factors used in developing the vulnerability metric. https://doi.org/10.1016/j.scitotenv.2019.05.048

Authors' response: We remind here that the justification of each factors, used in the SSVI index computation, is drawn from our literature review process. Therefore, based on our literature review process, we hypothesized that the presence of dikes and embankments reduces the exposure of populations and territories located behind them. The variable dikes and embankments is cited in 39% of selected articles (i.e. 19 among 49 articles considered, see Appendix B) to define the vulnerability to cyclonic flooding. However, we agree with the Referee#1 about a need for discussion in the text on the possible negative effects that could be also caused by dikes and embankments. Therefore, we suggest to add this paragraph in the Discussion section to discuss this point:

"In recent studies, dike breaching is found to be the reason behind flooding (e.g., Hossain 2015, Adnan et al. 2019, Khan et al. under review). For example, Hossain (2015) mentioned that dikes and embankments may be in very poor condition and may not perform its protective function. Similar results are suggested by Khan et al. (under review) from analysis of the recent cyclone Amphan that

made landfall in May 2020. Additionally, based on the results presented in Adnan et al. 2019, one might argue that the dikes were not adequate to protect against a certain event (either because of its design, or by gradual degradation of the dike). As noted in this article, for Sidr, if the dike has not had breached, the inundation would have been 18% of the coastal area, whereas the dike-breach increased the number to 35%. Unfortunately, presently, dike condition information is not available in public and accessible databases, and according to our understanding, not monitored either. The assumption in our hydrodynamical modelling is that the dikes are in well serviced condition, e.g., dike breaching (which is a different geotechnical process, and far from the scope of this paper) was not modelled. Therefore, we did not include it in our methodology. However, there is no doubt that this issue about the balance between the negative and the positive contribution of dikes and embankments will have to be taken into account in future vulnerability to cyclonic flooding studies in this region."

Hossain, M. N.: Analysis of human vulnerability to cyclones and storm surges based on influencing physical and socioeconomic factors: evidences from coastal Bangladesh, International journal of disaster risk reduction, 13, 66–75, 2015.

Adnan, M. S. G., Haque, A., & Hall, J. W. (2019). Have coastal embankments reduced flooding in Bangladesh?. Science of the total environment, 682, 405-416

Khan, M. J. U., Durand, F., Bertin, X., Testut, L., Krien, Y., Islam, A. K. M. S., Pezerat, M., and Hossain, S.: Towards an efficient storm surge and inundation forecasting system over the Bengal delta: Chasing the super-cyclone Amphan, Nat. Hazards Earth Syst. Sci. Discuss. [preprint], https://doi.org/10.5194/nhess-2020-340, in review, 2020.

R1.10 Similarly, the capacity of shelters was perceived to be negatively associated with cyclone vulnerability. However, results from various studies indicated that various social factors are associated with the use of shelters during a cyclone event. During several events, people were reluctant to use cyclone shelters Please see the following study: https://doi.org/10.1111/disa.12062 (Mallick, B. (2014). Cyclone shelters and their locational suitability: An empirical analysis from coastal Bangladesh. *Disasters*, *38*(3), 654-671.)

Such a scenario creates uncertainty in the obtained results. The authors should include a discussion on uncertainties related to the factors considered for the vulnerability metric.

Authors' response: We bring out here that the justification of each factors, used in the SSVI index computation, is drawn on our literature review process. Therefore, based on our literature review process, we hypothesized that the shelter capacity reduces the exposure of populations within a one-kilometer radius of it. The variable shelter capacity is cited in 45% of selected articles (i.e. 22 among 49 articles considered, see Appendix B) to define the vulnerability to cyclonic flooding.

However, we agree with you, as mentioned in the text lines 278-280, some studies pointed it out: "Proximity, poor hygienic condition (Kulatunga et al., 2014), lack in communication means and delivery of sanitation and drinking water (Saha, 2015) are some examples for additional reluctant aspects for many of the families."

A new sub-section "6.2 Representativeness and quality of the data" will be added to the Discussion in order to mention the limits of our study due mainly to the representativeness of the data.

"6.2 Representativeness and quality of the data

Some of the variables used to calculate the SSVI have some underlying assumptions that might differ from reality and may give a false representation of the situation on the field. For example, we assumed that dikes and embankments protect people and agricultural production, but everything depends on

their condition, maintenance and breach presence (Younus and Sharna, 2014; Mullick et al., 2019; Hossain, 2015). As mentioned by these authors, dikes and embankments may be in very poor condition, but this information is not available in public and accessible databases, and not monitored to our knowledge. Therefore, we assume they play their full protective role through their physical presence. In addition, after a cyclone, populations can and do settle on dikes, sometimes the only free public spaces left to the people, and are therefore very exposed (Alam and Collins, 2010).

The shelter capacity is another example of variable that does not appear always representative of the situation on the field. It can be assumed that the presence of cyclone shelters reduces people's exposure and therefore their vulnerability. However, the presence of cyclone shelters in close proximity to homes, within a radius of 1 to 1.5km, does not mean that they are useful and used. Like mentioned by Mallick et al. 2017, shelters are not optimally placed on territories in to order be easily accessible and accommodate as many people as possible, but are rather situated near the supreme classes dwellings. These buildings are not always maintained and do not meet the requirements of the local society: men and women are mixed, there are no women-only sanitary facilities, and people may feel in insecurity (Kulatunga et al., 2014; Saha, 2015). Accessibility to cyclone shelters is also conditioned by the state of the roads. Therefore, we chose to represent the road condition by the variable "paved or unpaved road". However, we can consider this information is valid for estimating vulnerability only before the passage of a cyclone (in the prior-disaster phase) because then the roads can be very damaged as mentioned by Saroar and Routray (2010) during the rainy season."

The lines 505-511 will be shifted in the sub-section "6.3 Limits of the research"

R1.11 Section 6.1: This section lacks in critical discussion of the obtained results. The authors need to discuss how their findings are similar or different from the results of various existing studies.

Authors' response: The definition of vulnerability varies greatly from one study to another, making a comparison difficult between several studies. However, the one made by Quader et al. (2017) seems the most relevant to us in order to perform this exercise.

Vulnerability to cyclone risk has been extensively studied in Bangladesh. However, our study differs from the others on several points:

- its entry by the territory seems more useful to us in order to help decision makers in their decision making and their strategic orientations in risk management,
- a global and deductive approach was given to the definition of vulnerability (and not only for each of its dimensions),
- a robust probabilistic cyclonic flood hazard map was made, based on a dataset of 3600 statistically and physically consistent synthetic cyclone events.
- and finally, the definition of vulnerability alone was elaborated, without the adaptive capacities, but including exposure.

We suggest to complete the discussion section with these new paragraphs:

"Compared to recent studies on vulnerability assessment, our approach differs in several aspects. First, our study is intended to be general in scope, considering the entire population and territories affected by the cyclonic flooding, in contrast to studies that target either a category of population (Alam et al., 2020; Swapan et al., 2020), or a particular site, at the village scale as for example, in Rakib et al. (2019). These highly localized studies have the advantage of being more detailed and enriched with qualitative

observations on the perception and representation of natural hazards, without being generalizable to the scale of coastal districts. These studies are therefore useful at the local level for strategic decision-making and orientation of risk management but remain too specific for the implementation of such strategies at the national level like the deployment of the Delta Plan 2100.

Our study offers an analysis of the vulnerability to a hazard, the cyclonic flooding. It does not voluntarily take into account information on the adaptive capacities of populations and territories as proposed by Uddin et al. (2019). Adaptive capacity, as well as resilience, are fields of study in their own right that must, in our opinion, be distinguished from vulnerability. Indeed, the latter authors integrate, among other things, the presence of local and private banks and the possibility of making loans for small farmers, allowing them to restart their activity after a natural disaster. This information allows to define the capacity of these populations rather than their vulnerability, as distinguished by Quader et al. (2017).

On the other hand, we argue it is essential to integrate the exposure of populations and territories to a hazard in the definition of vulnerability. A population, whatever its socio-economic and demographic characteristics, is not vulnerable if it is not exposed. Contrary to Rabby et al. (2019) and Das et al. (2020) who assess vulnerability solely on the basis of social factors and infrastructural factors (quality of housing, access to drinking water, electricity, sanitation, and so on), the SSVI that we provide integrates the exposure to the hazard. The population densities actually affected by the floods as well as their possibility to find shelter or to be protected by defense structures are essential and indispensable information to the evaluation of the socio-spatial vulnerability. In many studies, only the whole density of population is used to represent exposure (i.e. Isthiaque et al, 2019; Das et l., 2020), without distinguishing the population actually affected by cyclonic flooding.

One of our goals in this study is to produce transferable information for decision makers. This is why we chose an approach that combines all the dimensions of vulnerability. We believe the territorial approach is essential in the decision-making process. The first step is to identify which regions are the most vulnerable to a hazard before identifying which dimensions of vulnerability need to be improved. Our results, for example, can help in the deployment of the Flood risk Management Strategies of the Delta Plan 2100 on the districts identified as failing on this dimension of vulnerability. Sub-strategies FR 1.1, 1.2 and 1.3 (Protection by development and improvements of embankments, barriers and water control structures (including ring dikes) for economic priority zones and major urban centres; construct adaptive and flood-storm-surge resilient building; adopt spatial planning and flood hazard zoning based on intensity of flood) for example correspond to the *Cyclone protection and exposure dimension* of the SSVI, for which Shariatpur and Jhalokati districts appear to be the most vulnerable (see figure 4).

The approaches proposed by Uddin et al (2019) for example present a mapping of vulnerability by dimensions: demographic vulnerability, economic vulnerability, agricultural vulnerability, and so on. Without a synthetic map, it is not clear that the decision-maker can decide where and how to intervene on the territory. Other studies are specific to a single dimension of vulnerability, as physical vulnerability (Islam et al., 2016; Islam et al., 2015; Hoque et al. 2019) or social vulnerability (Rabby 2019, Das 2020). The SSVI enables the integration of all dimensions of vulnerability and provides usable information for decision makers.

Thus, comparing vulnerability studies of coastal districts exposed to cyclonic flooding risk remains very difficult because the definition of the vulnerability concept varies greatly from one study to another. Quader et al. (2017) is certainly the most recent study proposing a definition and assessment of vulnerability and the most relevant to our study. The results corroborate that the districts in the mouth of the Meghna (central coast) up to Chandpur and Shariatpur districts, as well as the Bagerhat and Cox's Bazar districts are highly vulnerable. The only notable difference is situated in Shatkhira district, which according to our study is vulnerable, while according to Quader et al. (2017) is very low vulnerable. In detail, the different dimensions of vulnerability are not described in the same way by the

two studies. For example, accessibility to electricity is used to define demographic and basic facilities vulnerability in Quader et al. study, while it is used to define the vulnerability of infrastructure and housing in our SSVI. Similarly, disability is sometimes used to define household vulnerability (SSVI), and sometimes considered as a separate dimension of vulnerability (Quader et al., 2017). Moreover, we used a robust probabilistic cyclonic flood hazard map based on a dataset of 3600 statistically and physically consistent synthetic cyclone events (Emanuel et al., 2006; Khan et al. 2019). While Quader et al. (2017) used a low level of confidence cyclone hazard density interpolated map based on historical cyclone tracks (~160 events in 1877-2015). Although the level of detail provided by this union-wide study is significant, the closeness of the results is meaningful. However, social vulnerability is defined from 141 variables and a consistent workflow with several statistical methods. On the contrary, in our study, we have devoted a strong attention to the theoretical links between indicators and underlying vulnerability to cyclonic flooding, by conducting a strict literature review. Therefore, SSVI is computed from only 17 variables and a simple computation of index appears easier to understand its construction and to replicate by decision makers."

Delta Plan 2100,
http://plancomm.portal.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/dc5b06a1_3a45_4ec7_951e_a9feac1ef783/BDP%202100%20Abridged%20Version%20English.pdf

R1.12 Finally, the motivation for carrying out such a study needs to be very clear. The authors mainly argued that "Thus, more than developing a new vulnerability concept, the novelty of our study lies in the methodological adaptation of existing approaches, like social vulnerability index (Flanagan et al., 2011), to the specific cyclone flooding context." I feel this is not enough. The authors should clearly identify the gaps in the existing literature and explain how this study addresses those gaps.

Authors' response: Please see our previous replies to points R1.1 and R1.11 concerning the novelty of the study.

Response to review comments by Anonymous Referee #2 (R2)

General comments:

R2.1 This article develops the socio-spatial vulnerability of 16 coastal districts of Bangladesh based on the vulnerability indicators at district levels. The contribution of this analysis is not new, as the authors have already shown in their literature review that a growing body of literature describes how vulnerable the coastal communities in Bangladesh are. In this paper, the specification that I see is the combination of people and place vulnerability to compare the districts, which are mostly known from various studies.

Authors' response: Literature on cyclonic flooding vulnerability along the coast of Bangladesh typically examines either physical or social characteristics of the vulnerability to this hazard. This paper takes slightly different approach: it argues the need to consider the socio-spatial specific context which transcends the classical social and economic responses to integrate physical and infrastructural conditions as a basis of understanding and addressing cyclonic flooding vulnerabilities.

First, it sets out the framework in which cyclonic flooding vulnerability should be placed and shows the issue tied to its indicators. Indeed, majority of authors does not explain really the conceptual framework underlying their vulnerability assessment, making more difficult to interpret and re-use their results for scientists and stakeholders.

Moreover, lots of studies used a large set of indicators (Quader et al. 2017), which are reduced to smaller uncorrelated factors set using statistical methods, such as the principal components analysis, it

raises as a consequence complex issues of number of principal components to retain, their significance, and the normalization choice, among other. Contrariwise, we analyzed the relevant indicators related to the cyclonic flooding vulnerability based on expert knowledge from a strict literature review. The literature review is a rich source to understand the main causes, translated as indicators, of social-spatial vulnerability to cyclonic flooding, their relative importance and interactions. Improved incorporation of the regional context helps to select significant indicators, at total 17 in our case, that not only reflect vulnerability as a state (e.g. poverty, age), but also as a situation (e.g. house type, shelter capacity).

Finally, an overview of the conceptualization of socio-spatial cyclonic flooding vulnerability is presented thought the SSVI. It is a simple computation of index which has a more understandable construction and appears easier to replicate for decision makers. Furthermore, unlike other studies which have developed physical or social cyclonic flooding vulnerability assessment, in our study, cyclone hazard flooding has been considered and incorporated in the social vulnerability model (i.e. SSVI).

This paper contributes to bring a paradigm shift, considering the integrated socio-spatial vulnerability, and new perspective to assess the vulnerability to cyclonic coastal flooding. It provides a framework for future research on the topic of integrated socio-spatial vulnerability assessments to cyclonic floods, as a basis for adaptation strategies.

Specific comments:

R2.2 I am a bit concerned about the literature search portal, like google is not such confident sources for academic publication searches. Then it is needed to describe how the final list of the review prepared, based on what criteria the article was selected for review, i.e. exclusion criteria must be written in the methodology section.

Authors' response: We should remind here first of all that we used four traditional academic citation databases: ISTEX, Science Direct, Scopus and Web of Science. In addition, we chose to complete our analysis with the literature extracted from Google Scholar (GS) database. There are several reasons for this choice: GS is free to use (which is not the case of Scopus and of Web of Science); and although it has been shown that the majority of literature identified using Web of Science was also found using GS (Haddaway et al. 2015), it has also demonstrated that a large fraction (9–30%) of highly-cited documents in the Social Sciences and Humanities could be invisible to Web of Science and Scopus (Martin-Martin et al. 2018). Here, our primary area of concern is the vulnerability of the population to cyclonic flooding, therefore we felt it was important to complete this classical literature analysis with also the results from GS database. (see also answer to comment R1.5 and R1.6).

We propose to modify and add this sentence in the main text to justify the use of GS database search engine (section 4.1 Methodology):

"Four traditional academic citation databases: ISTEX, Science Direct, Scopus and Web of Science were used for the literature review process. In addition, we completed the analysis with the literature extracted from Google Scholar database. Despite it has been shown that the majority of literature identified using Web of Science was also found using Google Scholar (Haddaway et al. 2015), it has also demonstrated that a large fraction (9–30%) of highly-cited documents in the Social Sciences and Humanities could be invisible to Web of Science and Scopus (Martin-Martin et al. 2018)."

Martín-Martín, A., Orduna-Malea, E. & Delgado López-Cózar, E. Coverage of highly-cited documents in Google Scholar, Web of Science, and Scopus: a multidisciplinary comparison. Scientometrics 116, 2175–2188 (2018). https://doi.org/10.1007/s11192-018-2820-9

Haddaway NR, Collins AM, Coughlin D, Kirk S (2015) The Role of Google Scholar in Evidence Reviews and Its Applicability to Grey Literature Searching. PLoS ONE 10(9): e0138237. https://doi.org/10.1371/journal.pone.0138237

Considering, the review process applied for collecting articles, as mentioned section 4.1, was used to pick up only the articles responding to the following search sequence, in the electronic databases, were considered: ("coastal flood*" OR "sea-level rise" OR "Storm surge" OR "Cyclonic storm" OR "Disaster risk reduction") AND ("Bangladesh" OR "Brahmaputra delta") AND ("*vulnerability" OR "human exposure" OR "coping*"). (see also answer to comment R1.2 and R1.7).

We propose to add this paragraph in the main text to clarify our review process (section 4.1):

"The initial search used inclusion criteria to be sure the first selected range of articles focused on studies about vulnerability to cyclonic floods in Bangladesh. A second selection of the first range of articles screened documents one by one to check if they explored vulnerability to cyclones and if they specifically did focus on areas placed in coastal Bangladesh, and not vulnerability to river flood for instance."

R2.3 Although the literature review is well-organized and written, I would suggest that the author recheck a few recent scholarships, which may add new dimensions in vulnerability indicators.

Authors' response: Please, see also answers to comment R1.3 of the Referee#1.

Adnan et al. (2019) Have coastal embankments reduced flooding in Bangladesh? Science of The Total Environment, Volume 682, Pages 405-416

Authors' response: Adnan et al. (2019) analyzed the beneficial and harmful impacts of embankment construction on the territories. They focused on pluvial, fuvio-tidal and cyclonic floods and compared observed and modelled floods, with and without polders. As in Islam et al. (2019), this article focuses on flooding, i.e. on the hazard, and not on the socio-spatial vulnerability to cyclonic flooding. This article was not therefore considered by our literature review process. (see also answer to comment R1.3).

Islam Feroz et al. (2019) Flood risk assessment due to cyclone-induced dike breaching in coastal areas of Bangladesh, Nat. Hazards Earth Syst. Sci., 19, 353–368, 2019

Authors' response: The main objective of Islam et al. (2019) is to estimate the exposed areas to storm surge flood of the polder 48 (Patuakhali district), using a hydrodynamic model under different scenarios in a context of climate change (tide, sea level, dike breach and cyclone landfall angle). This article focuses on flooding, i.e. on the hazard, and not on the population/territory vulnerability to cyclonic flooding. This article was not therefore considered by our literature review process. (see also answer to comment R1.3).

Younus, M.A.F. (2017) An assessment of vulnerability and adaptation to cyclones through impact assessment guidelines: a bottom-up case study from Bangladesh coast. Nat Hazards 89, 1437–1459

Authors' response: Younus et al. (2017) proposes an assessment of vulnerability based on a qualitative approach (by participatory rapid appraisal with semi-structured questions and groups of discussion) with the population of the Bawalkor village (Barguna district). Several high vulnerability issues are identified like seed-bed damage, primary occupation loss or culture fishpond loss. A second part of this study concerns adaptation issues (need to reconstruct the shelter, need relief from the interest of

loan for 1 year after the disaster, need to reconstruct roads, etc). While interesting in its approach, this article does not identify key variables defining population/territory vulnerability to cyclonic flooding at the district level based on variables available in public databases. It was therefore not retained in our literature review process. (see also answer to comment R1.3).

R2.4 Though the authors have mentioned based on their reviews that cyclonic storms are the major environmental threat in the coastal districts, also the tidal-surge induced floods needed to be considered, and the severity of vulnerability due to such tidal-surged induced inundations can change overall land use and livelihood pattern of the people. An example can be taken from cyclone Aila 2009, which also motivates people to shift from shrimp to rice cultivation which is absent in their discussion. Authors are suggested to revisit such land use transformation.

Authors' response: We agree with your comment that multiple physical processes are responsible for flooding at various spatial and temporal scale - including pluvial, fluvio-tidal, tidal, and cyclone-induced storm surge flooding (e.g., Haque et al. 2018). In this study, we focus only on the cyclone-induced storm surge flood hazard. However, it is important to note here that, in our modelling of the storm surge flooding probability, the tidal dynamics and riverine flow from Ganges, Brahmaputra, and Meghna are included. Please see our reply to point R1.4 concerning the flood complexity in coastal zone.

Concerning the land use transformation, according to our literature review, the transformation of land use following a disaster is rather a matter of the resilience of populations and their adaptive capacity, i.e. finding solutions to adapt to the new environmental constraints, as soil salinization (Hoque et al., 2017). Moreover, at the district scale, the land use is quite homogeneous and corresponds largely to agricultural areas.

Hoque, S. F., C. H. Quinn, and S. Sallu. 2017. Resilience, political ecology, and well-being: an interdisciplinary approach to understanding social-ecological change in coastal Bangladesh. Ecology and Society 22(2):45. https://doi.org/10.5751/ES-09422-220245

R2.5 Temporal migration or translocal livelihood is one of the major aspects of the vulnerability constructs of the people living in this region. However, the author has not taken into consideration this displacement indicator into their vulnerability index. Taking the displacement indicator of each district might result in different vulnerability indexes for major cities (i.e. districts).

Authors' response: Concerning the temporary, seasonal, or cyclical migration, from our literature review, only one article (Mallick and Vogt 2013) mentioned to taking a displacement indicator in the cyclonic flooding vulnerability estimation. However, this indicator was more mentioned as a post-disaster adaption strategy (e.g.; Younus and Sharna 2014; Sultana, 2010; Rahman et al. 2014; Mallick et al., 2017).

Even though there are historical patterns and systems of mobility of the Bangladeshi households, as strategy to cope with agricultural and environmental variability (Afsar, 2003; Call et al. 2017), the linkage between seasonal/temporal migrations and cyclonic flooding vulnerability is not straightforward. These processes are not a one-off phenomenon that occur in a specific place at a fixed date, making it difficult to measure. Kartiki (2013) showed that it is largely landless and poorest agricultural labourers who temporally/seasonally migrate. Seasonal migration, until six months, usually involves one or two male members of the household, migrating to nearby urban areas. If the temporal/seasonal migration is planned and remunerative this allows livelihood diversification of the household, asset accumulation and increases children school attendance (Kartiki (2013); Mobakar et al. 2002). Therefore, this temporal/seasonal displacement could be reduced indirectly the cyclonic flooding vulnerability. However, it is often the men, the heads of households, who migrate temporarily to find work. The rest of the household remains in place. The women are responsible for protecting and conserving goods and food, and in the event of a cyclone warning, they are reluctant to make the decision to evacuate.

This means caring for all the people present (children and elderly) and taking them to a shelter, sometimes far away, leaving behind all their belongings and food reserves, which can then be stolen or destroyed. In this case a household without head household is indeed more vulnerable than a household where the household is complete. Thus, in this case, this temporal/seasonal displacement could increase indirectly the cyclonic flooding vulnerability.

Afsar, R. Internal migration and the development nexus: the case of Bangladesh. In: Regional Conference on Migration, *Development and Pro-Poor Policy Choices in Asia. 2003. p. 22-24.*

Call, M. A., Gray, C., Yunus, M., & Emch, M. (2017). Disruption, not displacement: Environmental variability and *temporary migration in Bangladesh. Global Environmental Change, 46, 157-165.*

Kartiki, K. (2011). Climate change and migration: a case study from rural Bangladesh. Gender & Development, 19(1), 23-38.

Mobarak, A. M., & Reimão, M. E. (2020). Seasonal Poverty and Seasonal Migration in Asia. Asian Development Review, 37(1), 1-42.

R2.6 Data collected from different years and sources raise the homogeneity in nature and the temporality of analysis. I propose to describe these as limitations.

Authors' response: The dataset periods used in this study vary between 2010 and 2018, but the major part comes from the BBS census of 2014. This is a strong limitation, but no public databases are available for more recent dates. For example, Das et al. (2020), Mullick et al. (2019) and Rabby et al. (2019) used the census of 2011.

Following this recommendation, we propose to add this text in the beginning of the new sub-section 6.2 Representativeness and quality of the data:

"A first limitation concerns the availability of dataset to construct the SSVI. Indeed, the dataset used for this study was produced at different dates: from 2010 for the poverty level, to 2018 for paved/unpaved roads. However, the main information defining social vulnerability comes from the BBS Census of 2014, which gives some homogeneity to the description of the socio-demographic characteristics of the population."

R2.7 Besides the flood risks management is not very new in Bangladesh; it has a long history, including the polderization and adopted indigenous knowledge. It would be great if the author could add/ review how the flood risk management knowledge evolved in these coastal settings and justify why their study related to coastal flooding's socio-spatial vulnerability index is essential. Polderzation and the recent Delta Plan 2100 should be taken into consideration.

Authors' response: Risk management strategies are outlined in Section 3 Region study. They mention the reclamation policy since the 1960s, and the Cyclone Preparedness Program in the 1970s. However, nothing is specified for future years. We propose to mention the Delta Plan 2100 in the discussion section (see also answer to comment R1.11).

"Our results, for example, can help in the deployment of the Flood risk Management Strategies of the Delta Plan 2100 on the districts identified as failing on this dimension of vulnerability. Sub-strategies FR 1.1, 1.2 and 1.3 (Protection by development and improvements of embankments, barriers and water control structures (including ring dikes) for economic priority zones and major urban centres; Construct adaptive and flood-storm-surge resilient building; Adopt spatial planning and flood hazard zoning based on intensity of flood) for example correspond to the *Cyclone protection and exposure dimension* of the SSVI, for which Shariatpur and Jhalokati districts appear to be the most vulnerable (figure 4)."

Delta Plan 2100,
http://plancomm.portal.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/dc5b06a1_3a45_4ec7_951e_a9feac1ef783/BDP%202100%20Abridged%20Version%20English.pdf

R2.8 The authors also address the cyclone shelter and evacuation process into the indicator lists. However, they do not mention how the community people decide the location of those cyclone shelter cum primary schools or any other community infrastructure and how the social elite controls the planning procedures.

Authors' response: Following the recommendation of the Referee #2 and #1, we propose to add this paragraph in the discussion section (see also answer to comment R1.10).

"The shelter capacity is another example of variables that does not seems always representative of the situation on the field. It can be assumed that existence of cyclone shelters reduces people's exposure and therefore their vulnerability. However, presence of cyclone shelters in close proximity to homes, within a radius of 1 to 1.5km, does not mean they are useful and used. Like mentioned by Mallick et al. 2017, shelters are not placed on territories in a way that can accommodate as many people as possible and be accessible, but are rather near the supreme classes. These buildings are not always maintained and do not meet the requirements expected by the local society: Men and women are in a same mixed place, there are no women-only sanitary facilities, and there can be a certain amount of insecurity (Kulatunga et al., 2014; Saha, 2015)."

R2.9 These are significant short-comings along with the revision of the motivations of the study. I would suggest that authors specify why their contribution is novel despite having a larger body of literature on vulnerability assessment of coastal Bangladesh.

Authors' response: Please see our previous replies to points R2.1; and R1.1 and R1.11 concerning the novelty of the study.