

**MS No.: nhess-2021-8**

We thank the Editor and the reviewers for their constructive comments that have helped us to significantly improve our manuscript. Please find below a detailed response to the Referee#3 comments point by point. Following the Editor's suggestion we have been proofreading our manuscript by bilingual person. Changes and corrections appear in the track change document.

**Response to review comments by Anonymous Referee #3 (R3)**

**R3.1** Line 15, 48, 62: It appeared to me that the authors used the terminologies – “sensitivity” and “Susceptibility” interchangeably. These terminologies should not be used as jargon which is generally avoided. Each terminology has its specific definition and use.

**Answer:**

In the manuscript, the term "sensitivity" is used to refer to the degree to which a system is modified or affected, either adversely or beneficially, by perturbations (following the definition of the IPCC AR4).

Then "Sensitivity [to cyclone flooding]" is properly used :

line 15 "sensitivity of delta inhabitants"

line 59 "the sensitivity of people "

line 62 "vulnerability and individual/group sensitivity"

line 68 "sensitivity of inhabitants"

line 514 "sensitivity of inhabitants"

line 646 "the sensitivity of delta inhabitants"

In the manuscript, the term "susceptibility" refers to the potential to suffer a loss as a result of perturbations.

Then "Susceptibility [to loss]" is also properly used :

line 48 "Vulnerability has many facets influencing each other and may also be measured by susceptibility to loss, on physical (natural and man-made environments), social, economic, institutional and systemic levels. "

**R3.2** Line 307: The author used the terminology “coastal wall” to refer to the coastal embankment which is not appropriate. Because the coastal wall is a specific type of structure that is different from the embankment.

**Answer:**

To avoid confusion, the term "coastal wall" has been replaced by "coastal embankment".

**R3.3** The methodology should explicitly mention the definition of vulnerability used in constructing the SSVI.

**Answer:**

We are not sure to understand the Referee's point. The definition of vulnerability used in our study is discussed in *Section 2: Overview about the vulnerability concept and its indicators* and in *Section 4: Assessing vulnerability to cyclonic coastal flooding in Bangladesh from a literature review*.

We considered a cyclone flood event in this integrated and interdisciplinary framework, as the intersection between physical vulnerability and individual/group sensitivity, resulting into the concept of 'socio-spatial vulnerability' to cyclone flood (Forrest et al., 2020). We defined 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, plainly presented in *Section 5: A socio-spatial vulnerability index* and in *Figure 2*.

**R3.4** The author did not consider any indicators related to social capitals (e.g. network, relationship, etc.). It should be clearly explained with reasons that this SSVI did not include the social capital.

**Answer:**

The social capital is defined as the whole of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalized relations of inter-knowledge and inter-recognition.

In our literature review, only three articles mention social capital: Islam et al, 2014, Islam and Wlakerden, 2014, and Ahsan and Warner, 2014. In these references, social capital is mentioned in the post-disaster phase as an important element of coping. However, in our approach, we have chosen to assess vulnerability without including coping as a component of the vulnerability, which we consider to be a separate and distinct area of research from the one of vulnerability.

Moreover, it is difficult to evaluate the social capital of individuals quantitatively without using surveys and, more generally, qualitative approaches, which is not the purpose of our research. This limit is mentioned in *section 6.3 Limits of the research*, lines 620 to 627.

**R3.5** The SSVI index considered the length of the embankment at each district as an indicator of cyclone protection (474). In lines 305-308 the author argued that these embankments are often in bad maintenance and there are some illegal activities that further weaken the embankment. Therefore, the length of the embankment may not be considered as an indicator of cyclone protection, especially the cyclone with 50 year return period without exploring the design of those indicators. Because it is also important to know whether those embankments were designed to withstand such an event.

**Answer:**

We remind here that the justification of each factor, 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 (please see also our reply R1.9 to the Referee#1).

Moreover, although some dikes and embankments could be in poor condition, this information is currently not publicly available and is not accessible through databases neither.

In our hydrodynamic modelling we reported the water level with cyclonic surge with 50-year return period (for a climatology of 3600 synthetic cyclones) and not the "cyclone with 50 year return period " as mentioned by the referee. We have chosen the "50-year return period" because, the recent cyclones that made damages produced water level higher than 50-year return level. But in any case it is mean that the embankments are designed with 50-year return level, there is no connection to that. The embankments are what they are - as best as we could find from the available dataset.

Once again, based on our literature review, it seems reasonable to assume that they always play a role in protecting people against cyclonic flooding.

**R3.6** Moreover, the role of these embankments against storm surge is controversial. It is true that these embankments have been found effective somewhere against low storm surge but there is an issue of a false sense of security as well (Kibria & Khan, 2017; Parvin et al., 2019; Sadik et al., 2018; Shah Alam Khan, 2008). Further, the author should also mention that there are other important indicators/variables of vulnerability which they could not consider here, for example, access to cyclone shelter, evacuation behaviors, etc.

**Answer:**

We agree with this remark and in the *Discussion section*, we mention the limits of this variable (lines 582 to 598). Access to cyclone shelter and evacuation behavior are also mentioned and discussed, respectively, lines 599 to 610 and lines 295 to 299.