

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2022-183

Anonymous Referee #2

Referee comment on "Scenario-based multi-risk assessment from existing single-hazard vulnerability models. An application to consecutive earthquakes and tsunamis in Lima, Peru" by Juan Camilo Gómez Zapata et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-183-RC2>, 2022

A. General comments

The manuscript investigates a novel method for accounting for damage accumulation on large building portfolios exposed to sequential earthquake and tsunami hazards. This work is of great interest to the readers of NHESS. The paper is well-structured and clear, despite very minor typos. However, some contents of the current manuscript need to be clarified and a few sections to be improved before the paper can be considered for publication.

A.1 Lines 100-103. The purpose of this study is stated in these three sentences. The aim is relatively clear, however it remains unclear how the state-dependent fragility models are obtained. This is one of the critical parts of this methodology and should be briefly explained at this stage, as this would help the readers.

A.2 Lines 125-130. Regarding the integration of a set of modular components, the authors should provide a clearer definition of "inter-scheme compatibilities" and "their related compatibility levels between inter-scheme damage states". I recognise that these concepts are described in more detail in the following sections, but this paragraph is quite difficult to read. It is not clear what these "conversions" are and how they make it possible for a cumulative assessment of the damage.

A.3 Lines 160-177. The AeDES forms have been consistently used for post-earthquake damage assessment. The authors state that these can also be used for tsunami: why? Also, did the expert elicitation help to adapt these forms to tsunami damage?

A.4 Lines 178-185. What are the details of the expert elicitation? Who took part in this exercise? Did the expert elicitation involve experts in earthquake and tsunami engineering? What are Scheme A and Scheme B? Are A and B earthquake and tsunami, respectively? It is quite confusing.

A.5 Lines 203-227. State-dependent fragility functions are developed for accounting for the cumulative damage. It is not clear the fragility function for a building type damaged by the earthquake and then by the tsunami is obtained. What are the scaling factors? How are these calculated, based on what ad-hoc calibration? The authors should clarify this key element, which remains quite obscure in the application as well.

A.5 Lines 275-300. If the case-study area is by definition constrained by the presence of both perils, why do the authors present the SARA buildings data for the whole city?

A.6 Figure 11. I would present a similar work-flow for the general methodology earlier in the manuscript.

B. Specific comments

B.1 Line 34: Indian Ocean Tsunami

B.2 Line 83: consider also Petrone et al. (2017) as a relevant study on tsunami analytical fragility functions for a single building.

B.3 Line 96: "to" repeated twice.

B.4 Line 111: "scenario" instead of "scenarios"

B.5 Line 114. Please clarify the meaning of "vulnerability modes"

B.6 Line 127. The authors refer to the "purple part" and then "red part" and so on – however the use of colors might be challenging if the paper is printed using greyscale. I would suggest to use a different way to identify the different components in Figure 1b.

B.7 Line 645. Amend typo "an\"