

Dear authors,

Thank you for your work. I have included my suggestions below.

Best

Abstract

It is concise and technically sound. However, several improvements could strengthen it.

Novelty should be stated more explicitly. Example, abstract repeatedly mentions "integration" and "correlation," but the specific methodological innovation remains somewhat vague. Please explain more clearly what differentiates this study from previous multi-hazard risk models.

In abstract, you can consider including one or two numerical findings that would strengthen the impact of the abstract.

Introduction

The introduction section should explain the difference between the proposed knowledge and existing probabilistic multi-hazard approaches more explicitly. It helps being more comprehensive. A clearer comparison with recent frameworks would help readers better understand the methodological novelty and scientific contribution of the study.

You can also use references of recent multi-risk and cascading hazard studies from the last 3–5 years would strengthen the literature review.

Section 1.3 explains much, some of this discussion may fit better in the methodology section, allowing the introduction to remain more concise.

Methodology

In methods, selected mappings require further justification. A discussion of uncertainty and sensitivity associated with the harmonization procedure would strengthen confidence in the results. Also, additional validation of the integrated multi-hazard framework would improve confidence in the methodology.

The study, captures conditional hazard dependencies but does not clearly model sequential vulnerability changes caused by preceding damage. The implications of this assumption should be discussed more thoroughly, particularly given the focus on cascading hazards.

You acknowledge that path-dependent damage processes are not modelled. This is potentially important because earthquake damage may increase tsunami vulnerability, liquefaction may increase susceptibility to lateral spreading, or cascading impacts may not be adequately represented through simple damage-state aggregation. Because the paper's main contribution is cascading hazard assessment, this limitation deserves greater discussion.

Liquefaction aggravation factors appear empirical. The authors should explain their

derivation, supporting literature, or calibration process.

Only 33 tsunami source scenarios and 10 slip realizations per scenario are used. But it remains unclear whether this sample adequately captures tsunami variability. A brief discussion of representativeness would be useful.

The $\pm 2\%$ threshold used in convergence testing, why it was it. The manuscript should explain why $\pm 2\%$ was selected and whether conclusions are sensitive to this choice.

You can reduce the repetition. Like “hazard intensities are derived consistently from the same earthquake event” or rephrase.

Figure 2 could be improved by indicating where uncertainty enters, where Monte Carlo sampling occurs, or where correlations are preserved.

Results

Results are largely descriptive. Most findings describe what the figures show. Please explain a little, Why does liquefaction dominate over tsunami?, Why does lateral spreading become relevant at intermediate return periods? What aspects of Napier's exposure drive these results? These would strengthen the section.

It seems that the proposed framework suggests uncertainty through multiple hazard and damage models, the results should include uncertainty metrics such as confidence intervals, percentile ranges, or exceedance bands.

Several figures present return periods up to 100,000 years. It is technically possible but such return periods are difficult for practitioners to interpret. You may consider emphasizing 100 years, 500 years, 2,500 years, 10,000 years, which are more commonly used in risk management.

Figure 7 presents building proportions across damage states. However, it would be useful for readers/ adding these, expected number of damaged buildings, percentage increase between return periods, cumulative exceedance probabilities (if possible). Because available presentation seems somewhat difficult to practical implications.

AAMDR is one of the most valuable outputs of the study. But interpretation remains brief. You can address, why do certain zones emerge as hotspots? Which hazards dominate these hotspots? Are they driven by exposure density or hazard intensity? Would be much better.

Discussion

This section largely repeats the results. In particular, it restates findings already presented in Figures 7–9. For example ,shaking is dominant, liquefaction amplifies losses, tsunami becomes important at long return periods, landslides contribute less overall. These are okay, but there is limited effort to place these findings within the broader earthquake risk literature. The discussion section needs stronger engagement with existing multi-hazard risk literature and critically discussing their implications.

There is limited comparison with previous studies. In the paper, there are references like Goda, Dunant et al., Moratalla and Uma, Iannaccone et al. but the discussion does not revisit these studies to explain similarities or differences in findings. Such comparisons would help contextualize the contribution and generalizability of the proposed framework.

The manuscript's main contribution is methodological rather than the Napier case study itself. However, the discussion focuses mostly on Napier-specific results. This is arguably the most important scientific discussion missing from the paper. More attention should be given to the methodological implications of preserving inter-hazard dependencies and the advantages of this approach over independent hazard modelling.

A dedicated "Limitations" subsection would improve transparency. Because there are limitations like no path-dependent damage, no tides/storm surge, no sea-level rise, limited tsunami scenarios.

Discussion and conclusions could be separated. Future research directions are brief, it could be improved.

In conclusion (separated)

The conclusion should sufficiently emphasize the scientific contribution. Now, manuscript's main contribution is the development of an internally consistent probabilistic multi-hazard earthquake risk framework. However, the concluding statements focus largely on general observations. In conclusion, you should use this structure, main findings, scientific contribution, practical implications and future work.

Thank you again for your work.

Best