Dear Aloïs,

Thank you for your positive feedback on the paper and for your valuable final comments. We believe these additional clarifications have helped address the concepts more clearly.

Please find below our responses to each of your comments.

Thank you again for your time and consideration.

Best regards,
Cristina
on behalf of all co-authors

Public justification (visible to the public if the article is accepted and published):

Dear Cristina Deidda et al.,

I first want to apologize for my delayed reply, I was on parental leave for the past 3 months. Thank you for uploading your reply to reviewers and a track changes document. The article is extremely relevant to the special issue and quality of the manuscript has significantly improved following the comments from reviewers. However, there are a few points related to terminology and consistency in the way you analyse different hazards that I would like to be clarified before publication:

Comment:

• Terminology: You describe your analysis as "**multi-hazard**" in the abstract. Multi-hazards involve multiple individual hazards affecting a specific region and their interrelationships (UNDRR, 2016). I do not think that interrelationships are considered in the article, although hazard "interconnections" are discussed in Section 4.2.1 and some hazard interrelations are acknowledged in Section 3.1. To me, this analysis considers multiple hazards and their impacts on specific infrastructures but is not multi-hazard. I suggest revising the usage of "multi-hazard" through the manuscript and replace "interconnections" by "interrelations" in Section 4.2.1 title, as this is the most widely accepted term.

Answer:

I agree that this term may cause some confusion, since we are not exploring compound events or interconnections in the exposure analysis. We have revised the text to clarify that the analysis and database cover multiple hazards but do not constitute a multi-hazard approach.

I have left the term *"multi-hazards"* in the recommendations (line 724), as we consider it one of the key outcomes of the paper to recommend a multi-hazard approach in the proper sense of the term, including the consideration of hazard interrelationships.

In addition, *"interconnections"* has now been replaced with *"interrelations."* Thank you for this helpful suggestion.

Comment:

• Hazards considered:

In Section 3.1, you discuss impacts of recent climate extremes on transport infrastructure. I find this section extremely interesting. Nevertheless, the hazards and impacts described in the section are inconsistent with the 4 climate hazards analysed in Section 3.2. You mention impacts of storms (l.213, l.214, l.252, l.278, l.279, l.298), coastal flooding (l.270, l.275, l.289, l.320, etc.), flash floods, landslides (sect 3.1.4). Mentioning all these other hazards for which projections was not available is important and relevant. I think that summarizing all hazards and impacts you reviewed and not only the 4 climate hazards for which projections are available in a Table like Table 3 would be beneficial. I acknowledge that these hazards are discussed under the "Other hazards" section. I believe that even if you do not consider these hazards in projections, you do in Section 3.1. I would suggest a light reorganisation of Section 3.2, highlighting evidence you gather on future evolution of storms, flash flood and landslide (building on l.418-421).

Answer:

We have revised the section to also report damage information for the other hazards. These are now summarized in Table A4 in the Appendix, we also added a reference to it in the caption of Table 3. This makes it clear which hazards are included in the projection analysis, while still reporting the impacts of the other hazards for completeness.

In addition, we have included a short summary of relevant findings from the literature in lines 422–428. This strengthens the reasons why these hazards cannot be included in the future projection analysis, while still providing some information about what is reported in previous studies about future projections.

Comment:

o The case of flash floods: You do not consider flash floods in projections because of data unavailability. Two of your 4 case studies of recent event are in fact flash floods (July 2021 flood and Greece floods). This weakens the connection between these events and your analysis of future exposure. Identifying impacts common to floods and flash floods (most of impacts I believe) would be valuable in this context.

Answer:

We added a table in the appendix summarizing the impacts of flash floods, Table A4. Moreover, we give more information in the lines about the challenges of predictions and what is currently found from literature in lines 425-427.

Comment:

• Inconsistency: "This study also does not analyse hazards such as landslides and flash floods. Although these hazards will occur more frequently in the future and have strong negative effects on transport infrastructure (as exemplified by the recent disruption of the Fréjus tunnel, see Fidanza, 2023), the current knowledge and data gaps make it difficult to model and project the future frequency of these events." (l.650). You state with certainty that the frequency of these hazards will increase in the future before acknowledging that the frequency of these hazards is difficult to project into the future. You can use recent literature such as (Lenderink et al. 2025; Marra et al. 2024; Peleg et al. 2025) to back you statement on increasing frequencies of flash floods and landslides in some European regions (i.e., the Alps).

Answer:

Thanks for the suggestion. We adapted the sentence in line 657-661 incorporating the suggested references.

References:

Lenderink G, de Vries H, van Meijgaard E, de Rooy W, van Ulft L, Thompson V, Qiu X and Fowler HJ (2025) A pseudo global warming based system to study how climate change affects high impact rainfall events. Weather and Climate Extremes 49, 100781. https://doi.org/10.1016/j.wace.2025.100781.

Marra F, Koukoula M, Canale A and Peleg N (2024) Predicting extreme sub-hourly precipitation intensification based on temperature shifts. Hydrology and Earth System Sciences 28(2), 375–389. https://doi.org/10.5194/hess-28-375-2024.

Peleg N, Koukoula M and Marra F (2025) A 2°C warming can double the frequency of extreme summer downpours in the Alps. Npj Climate and Atmospheric Science 8(1), 216. https://doi.org/10.1038/s41612-025-01081-1.

I think that the article can be published once you address these minor comments.

Kind regards,
Alois