

**An Impact Chain-based exploration of multi-hazard vulnerability dynamics. The multi-hazard of floods and the COVID-19 pandemic in Romania**

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**Review – 2nd round**

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**I sincerely thank the authors for kindly replying to all my comments and putting valuable effort into improving the readability of their manuscript. The paper is now clearer and generally easier to read and understand.**

Nevertheless, I still recommend fixing the following aspects before publication:

**1. Introduction.** Despite the implemented changes, the narrative of the Introduction remains fragmented. Lines 22-32 introduce the challenges of the COVID-19 pandemic. Then, the focus shifts to the evolution of multi-(hazard)-risk approaches and the related terminology, followed by vulnerability and its dynamic nature. After several lines, the discussion returns to COVID (line 62). Furthermore, the paper's aim is presented in a disjointed manner (lines 42-44, then lines 92-94, and finally 107 onwards). I suggest the authors reorder the concepts and present them in a more linear and logical sequence. This will not only enhance readability but also strengthen the presentation of the quality and added value of the work.

**2. Setting the scene.**

- I suggest modifying the title of Section 2.1 to "Flood risk occurrences in Romania".
- In lines 119-120, the authors state, *"Other secondary hazards (e.g., strong wind, landslides) co-occurred with the other two, but their role was of lesser significance in the analyzed multi-hazard context."* It would be beneficial for the authors to provide further clarification. Does "lesser significance in the analyzed multi-hazard context" imply that these secondary hazards were less impactful compared to the other hazards under consideration?
- Line 146, *"Flood risk management is not sufficiently documented in Romania, as demonstrated by the lack of databases regarding the occurrence and impacts of floods"*. I think it would be more appropriate to avoid mentioning risk management here and rephrase it as follows: *"Flood occurrences and the quantification of their associated impacts are not sufficiently documented in Romania, as evidenced by the absence of relevant official databases."*

**3. Methodology.** Thanks to the restructuring performed by the authors, this part is now much easier to read and understand. To further improve it, I suggest clarifying the following:

- It is not so immediately clear to the reader if the authors built their impact chain from zero following the methodology developed in the Paratus Project, or if they used as a starting point an Impact Chain developed in the Paratus project but based on the methodology developed outside the project by Eurac. I mainly refer

to this unclear sentence: *“Building the Impact Chain initially developed within the Paratus Project”* (lines 201-202). I invite the authors to clarify this aspect from the beginning.

- The synthetic explanation of the Impact Chain construction in Section 3.1 lacks mention of all the steps depicted in Fig. 3. Furthermore, even when these steps are referenced, the text doesn't consistently use the labels that appear in the figure. To enhance the clarity of the methodology, I encourage the authors to ensure better alignment between the text in Section 3.1 and the content depicted in panel 1 of Figure 3.
- Section 3.2 would benefit from minor restructuring to enhance reader comprehension of the steps outlined. The authors wrote *“This broadening of the original application of the Impact Chain was done by 1) introducing new types of elements (i.e., augmented vulnerabilities, derived impacts), 2) establishing new types of connections between the impacts/adaptation options and vulnerabilities, and 3) ranking the vulnerabilities in the Impact Chain based on their augmentation. These steps were implemented to construct an enhanced Impact Chain, building on the previous version that documented the unfolding of the selected co-occurrent hazards in Romania in 2020-2021.”*, but then, a few lines later, they start saying that *“The first step was to perform an in-depth analysis of the vulnerabilities in the Impact Chain.”* To ensure coherence, it is essential to present the steps in the correct order, and, also in this case, to refer more to the steps reported in Fig.3. Additionally, it would be helpful to introduce and define the new types of elements (i.e., augmented vulnerabilities, derived impacts) earlier in the text, perhaps before discussing the new types of connections. This anticipatory approach can enhance clarity and understanding for the reader.

#### **4. Results**

- Lines 398-401: *“Some vulnerabilities underwent multiple transformations into derived impacts [...] The explanation lies in the fact that multiple impacts can augment the same vulnerability, creating also a derived impact that reinforce the impact that generated the augmentation.”* The concept expressed in these sentences is not so easily understandable. I invite the authors to consider rephrasing it.
- Despite *“the intricate configuration of the Impact Chain does not allow for a proper visualisation within this paper”*, I think that it would be highly beneficial, even essential, to include some graphical representations of the derived impacts described verbally in Section 4.3. This section constitutes the core of the work and would be communicated more clearly and effectively by introducing some 'extracts' from the Impact Chains to aid in visualization.

Moreover, I strongly suggest the authors double-check **grammar and typos**.