Reply to reviewer 2

In this document, P refers to the page number and L refers to the line number. For example, **P1L1-5** refers to page 1 lines 1-5.

Reviewer 2		
1	The paper represents one of the first attempts at quantifying the wildfire- flood hazard interrelationship and evaluating its impacts including societal aspects. For this reason, I believe the contribution is scientifically valuable and deserves publication. The authors effectively replied to the reviewers' comments and overall improved the manuscript. Nevertheless, some minor but essential improvements are still required, to better frame the work into the previous multi(-hazard)-risk literature.	We would like to thank reviewer for acknowledging the importance of the topic and recognizing the contribution of our paper. We also appreciate the valuable feedback provided to improve the manuscript.
2	The authors use extensively the expression "cascading", referring to, e.g., "the occurrence of cascading flooding after wildfires". At line 54, they explain that "cascading here means that the occurrence of wildfires preceding floods will trigger or amplify the risk of flooding". Nevertheless, floods are not directly triggered by wildfires, so it is not proper to talk about cascading. I suggest referring to "standardised" multi-hazard interaction mechanisms classifications available in the literature. What the authors are referring to is a typical case of "disposition alteration" as named by De Angeli et al. (2022), in which "there is no direct triggering of one hazard by another or any simultaneous temporal occurrence. Still, the occurrence of the first hazard can influence the frequency or the magnitude of the second one". This mechanism is also introduced by Tilloy et al. (2019) with the name "change condition". Ref: De Angeli, S., Malamud, B. D., Rossi, L., Taylor, F. E., Trasforini, E., & Rudari, R. (2022). A multi-hazard framework for spatial-temporal impact analysis. International Journal of Disaster Risk Reduction, 73, 102829. Tilloy, A., Malamud, B. D., Winter, H., & Joly-Laugel, A. (2019). A review of quantification methodologies for multi-hazard interrelationships. Earth- Science Reviews, 196, 102881.	We thank the reviewer for raising the concern with the terminology "cascading" used in the paper. In the previous version, we would like to emphasize that the burned area will amplify the risk of flooding, which is true. However, the reviewer made a valid point based on the provided literature. We agreed with the reviewer that wildfires alter the disposition of flood hazard by changing soil characteristics. Therefore, we decided to replace the term "cascading" with "amplify" or "effect" (E.g., **P1L3**). We also explained the interaction between wildfires and floods in the revised manuscript (**P2L54-55**) and highlighted this interaction in Figure 2 (**P6**).

3	The authors wrote that Versini et al. (2013) assessed flood risk, but then they affirmed that Versini et al. provided the hydrological probability of flooding, i.e. they did not assess risk but just performed a probabilistic flood hazard assessment. I invite the authors to be careful to not mismatch hazard assessment and risk assessment.	We thank the reviewer for the careful reading. We changed the word from flood risk to flood occurrence and probability (**P2L47-48**).
4	If I understood well, the manuscript proposes advancements in three complementary directions: 1) The modelling of the interaction mechanism between wildfire and flood, in terms of "disposition alteration" (see previous comment), for what concerns the hazard part 2) The inclusion of socio-economic indicators, for what concerns the exposure and vulnerability dimensions 3) The projection of future risk conditions These different aspects of novelty might be highlighted more clearly in the introduction, which is currently mixing all these concepts. Moreover, it is not so clear the innovation related to the second point. While the modelling of the interaction mechanism between wildfire and flood covers a current gap, the inclusion of socio- economic indicators in flood risk assessment has been already largely explored in the literature. The authors should provide more indications about the innovation of this specific aspect. E.g., is it innovative because it has never been done in that specific case study area?	We thank the reviewer for the suggestion. We highlighted these three aspects in the revised version (**P2L56-P3L65**). Our study is innovative because it includes comprehensive socio-economic indicators for flood risk assessment (see Figure 2). For the exposure component, we include population, economic values of the regions, and road infrastructure. Many studies only consider population or land use as the main exposure component (Foudi et al., 2015; Gain et al., 2015). For the vulnerability component, we consider both physical and social factors, such as topography, land cover, soil infiltration capacity, economic capacity, and institutional capacity. The use of these wide-ranging vulnerability indicators in the flood risk assessment highlights the novelty of our study, which has not been included in many studies (Brouwer et al., 2007; Gain et al., 2015; Cai et al., 2019). We have further developed this advancement in the revised manuscript (**P3L60-64**).
5	I feel a bit uncomfortable with the proposed "classification" of risk parameters into hazard, exposure and vulnerability. Indeed, some of the factors that the authors label as "vulnerability" are hazard parameters. I am referring, for example, to the Saturated Hydraulic Conductivity. More specifically, this is the flood hazard parameter which is "altered" by the wildfire, representing indeed the interaction mechanisms between the hazards that the authors introduced as a novel aspect. This multi-hazard mechanism is not well captured by the graphical representation of Fig. 2. This is also because the Saturated Hydraulic Conductivity is seen as a vulnerability indicator rather than a hazard parameter.	The reviewer expresses concern about the placement of certain parameters under vulnerability, exposure, and hazard, specifically the soil hydraulic conductivity as one of the vulnerability components and not as a hazard parameter. In our study, we aim to make a clear distinction between hazard and consequences, which consist of exposure and vulnerability. We did not classify hydraulic conductivity as a hazard because it is not a hazard itself. This parameter is altered by the hazard, here is wildfire. Wildfires make the area more vulnerable to flooding due to reduced infiltration capacity (**P7L144-146**). Based on this reasoning, we categorized saturated hydraulic conductivity as one of the vulnerability components. In Figure 2, we drawn arrows to link the effects of wildfires for current and future scenarios on saturated hydraulic conductivity. In the revised

		version, we modified the Figure 2 by drawing a red arrow from saturated hydraulic conductivity to runoff coefficient and providing an explanation that wildfires increase the runoff coefficient (**P6**).

References

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