Dear Editors and Reviewers:

On behalf of my co-authors, we thank you very much for giving us an opportunity to revise our manuscript, we appreciate editor and reviewers very much for their positive and constructive comments and suggestions on our manuscript. We have studied the comments from reviewers, and we have tried our best to revise our manuscript according to the comments.

We have made the following major changes in this article:

1. Debris flow simulation was added, and the description of debris flow simulation methods and simulation results were added in the article. 2. Then, the article structure has been adjusted as follow: 1 Introduction, 2 Study area, 3 Data and methods (3.1 Data collection, 3.2 Methodology), 4 Results (4.1 Hazard cascade, 4.2 Dynamic characteristics of the debris flow, 4.3 Dynamic characteristics of the outbreak flood, 4.4 Damage patterns of buildings, 4.5 Vulnerability analysis of the buildings) 5 Discussion, 6 Conclusion..

3. The intensity characteristics and inundation range of debris flow in the original draft were determined according to field investigation.The conclusion drawn from field investigation were deleted in the origin draft.

5 The chart was redrawn, as shown in Figure 1, Figure 2, Figure 7, Figure 9, etc.

In addition, The main corrections in the paper and the responds to the reviewer's comments are as flowing.

Reviewer 1	Comments	Response
1	It is a multi-hazard situation and you (if I understood well) made only simulations of the final flood event, neglecting the debris flow part. So, you cannot really say that you analysed the full chain as you consider the first part as known and set as a basis.	We have supplemented the simulation results of debris flow, and the subsequent analysis is also based on the dynamic characteristics of the simulated debris flow (**see Page 6 and L. 158-166，see Page 11 and L. 234-246，Figure 6**)

2	The presentation of the maps in general, also those including flood simulation results are not very clear **-** so, some more work is necessary to communicate your results to others.	We redrew the picture using clearer remote sensing image. **(see Figure 6, Figure 7, Figure 9, Figure 17)**
3	Therefore, right from the beginning you should indicate that the core analysis is focused on the final part of the chain, taking the first part as a given element. This will require a restructuring of the paper and thus a major revision	First, we added the debris flow simulation part, and all the analyses were based on the debris flow simulation results (**see P 6 and L. 158-166，see P 11 and L. 234-246**). Then, the article structure has been adjusted as follow: 1 Introduction, 2 Study area, 3 Data and methods (3.1 Data collection, 3.2 Methodology), 4 Results (4.1 Hazard cascade, 4.2 Dynamic characteristics of the debris flow, 4.3 Dynamic characteristics of the outbreak flood, 4.4 Damage patterns of buildings, 4.5 Vulnerability analysis of the buildings) 5 Discussion, 6 Conclusion.

Reviewer 2	**Comments**	**Response**
1	Does the parameters of model or data representative in this case study considering different scales? such as rainfall data, some parameters of models in Table1, or three functions used in debris flow risk assessment. how well does the models' results?	The formula in Table 1 is an empirical formula, and the parameters in it are based on values that are taken from surveys or experience, so it will not take into account the influence of rainfall and other factors.
2	A spatial distribution map of damage might be more clearly show the distance from river channel, also the spatial relationship between vulnerability and factors might be more useful. Besides, does some field investigation or actual evidence that can support the vulnerability assessment?	The spatial distribution map of buildings is shown in Figure 9 and Figure 17. In addition, because our vulnerability analysis is based on dynamic process simulation and field investigation, the results of the analysis are mainly suitable for the study area of this paper, and have not been verified in other areas.
3	This vulnerability assessment mainly focus on the buildings, is it possible to combine some other factors to analysis, so that might be more comprehensive.	Roads and cultivated land in the region were also severely damaged, but it is difficult to obtain the details of their damages in the post-disaster survey due to

		post-disaster rescue excavation, etc., so only the buildings are analyzed in detail in this paper.

Reviewer 3	Comments	Response
1	I think it is more appropriate to use "hazard cascade" instead of "hazard chain". Consider modifying this in the title and the whole manuscript.	Thanks for your advice, we use "hazard cascade" in the whole manuscript. The reference (Cutter, 2018) was cited in the manuscript.
2	L15. For this type of process, it is also more common to refer to it as "dam break", just consider modifying this in the manuscript.	Thanks for your advice, I modified this in the manuscript.
3	L15-L17. Improve redaction.	We rewrite the whole sentence as follows: "This study presents a comprehensive analysis of the characteristics of two hazards and the resulting damage to buildings from the cascading hazards". **(see Page 1 and L. 15-16)**
4	L70-L71. Check grammar	We rewrite the whole sentence as follows: "Our field investigations have revealed that the pattern of damage to buildings in the confluence area of debris flow and flood is distinct from those observed in areas affected by debris flow alone or by flood alone." **(see Page 3 and L. 70-71)**
5	Improve the quality of Figure 1. Maybe, ".eps" file type will be better to make the name of the province readable on the map. And make the font size bigger. Same for the legend.	We redraw this figure.
6	L116. The units must be better written as: "4700 m.a.s.l.". Check this in the whole manuscript.	We corrected the error in the whole manuscript.
7	L117. Avoid using qualifier words, e.g., "hot", "humid", or	We rewrite the whole sentence as follows:

	“abundant rainfall”. Instead, write the numbers, such as “minimum average temperature”, “maximum average temperature”, and so on.	“The average annual temperature is 16.2 ° and the average annual rainfall is 949 mm.” **(see Page 4 and L. 115-117)**
8	L127-L139. The calculation of the slopes is wrong, I think. Correct this in the whole document. Thinking of this, it is just a typing mistake or were they introduced in Manning’s equation in this way? Please, be completely sure about this.	The slope is calculated based on the channel profile; I think it’s right. I modified the slope value as decimals **(see Page 5 and L. 126-135)**
9	L131-L132. This is not truly saying something. Consider being very specific about what you describe here or remove the sentence.	We rewrite the whole sentence as follows: “The field investigation indicates that debris flow initiated in the area above elevation of 1990 m a.s.l.” **(see Page 5 and L. 128-1129)**
10	L132-L133. Improve redaction, e.g., the “valley” word does not seem to be suitable for this description with slopes of about “600%”, if it is correct.	We use “channel” instead the “valley”.
11	Improve the figure quality, to see better the date and time.	We redraw this figure.
12	L160-L162. Improve the redaction of the caption.	We rewrite this as follows: **(see Page 10 and L. 219-221)** “Figure 3 Illustration of the hazard cascade process: (a) the normal flow of river flow before the occurrence of debris flow; (b) debris flow blocks the river, creating a dammed lake that destroys the railway, roads, and buildings; (c) the dammed lake bursts, causing a flood that damaged and the road and buildings.”
13	L172. Correct to “Digital Elevation Models”.	We correct this mistake.
14	Table 1. Correct “Rn”.	We correct this.
15	Why use the Manning equation and HEC-RAS to model this type of natural process? Because there are many different models and codes might help to obtain better results as they account for more variables and parameters.	Thanks for your advice. We first use many empirical models based on characteristics of debris flow dam and barrier lake to calculate the peak discharge of the dam break flood, the results vary widely. Considering the uncertainty of the characteristics of the debris flow dam and barrier lake, we used the Manning equation to calculate the peak discharge of dam-break flood. The

		HEC-RAS is often used to model the flood process, See the following articles: Butt, M. J., Umar, M., & Qamar, R. (2013). Landslide dam and subsequent dam-break flood estimation using hec-ras model in northern Pakistan. Natural Hazards, 65(1), 241-254. Mozumder, C., Tripathi, N. K., & Tipdecho, T. (2014). Ecosystem evaluation (1989–2012) of ramsar wetland deepor beel using satellite-derived indices. Environmental Monitoring & Assessment, 186(11), 7909-27.
16	Better support how did you select or compute these Manning coefficient values. Be very specific to make the methodology replicable and/or applicable to other circumstances.	The Manning coefficient values were determined based on the suggested values in the HEC-RAS 5.0 Reference Manual. We add the reference **(see Page 7 and L.183)**
17	L217. Check the original paper out for this equation. Be very specific about what this equation describes, which is the “average” total pressure	This equation is calculated as the average total pressure, we rewrite it as follows: **(see Page 7 and L.190-192)** “Hazard intensity parameters were applied, such as flow depth and average total impact pressure, with average total impact pressure calculated as $P=\rho v^2+0.5\rho gh$ (Zanchetta et al., 2014) where P is the average total impact pressure, ρ is the flow density, v is the velocity, and h is the flow depth”
18	L258. Write the percentage of the “relative error” between the two calculations.	We rewrite the whole sentence as follows: **(see Page 12 and L.258-260)** “resulting in a flow discharge of 2273 m3/s with a relative error of 18% which is comparable to the result obtained by Manning's equation.”
19	Improve the quality of figures 11, 12, 13 and 14, and increase the font size.	We rewrite the whole sentence as follows: **(see Page 20 and L.409-413)** “The impact pressure thresholds for Zones II and III, where vulnerability is equal to 1, are 75 kPa and 110 kPa, respectively. For the same impact pressure and inundation depth, the damage to buildings in Zone (II) is greater than that in Zone (III). ”
20	Improve the quality of figures 11, 12, 13 and 14, and increase the font size.	We redraw this figure.

21	Discussion has to be improved by emphasizing the benefits and disadvantages of using this methodology to analyse buildings' structural vulnerability, based on debris flows and floods.	We added this discussion as follows: **(see Page 25 and L.510-521)** “This study presents a comprehensive analysis of the damage to buildings resulting from a large-scale debris flow and outburst flood hazard cascade. The study develops building vulnerability in different areas of the confluence zone, which is useful for building risk assessment and management along the riverbank. However, some uncertainties and limitations are involved in vulnerability analysis. Firstly, the study did not consider the building's physical characteristics, such as shape, orientation, and maintenance condition. Secondly, in the area affected by the two hazards, the capacity of buildings first damaged by debris flow had declined, leading to a higher failure probability under the impact of sequential flood (Luo et al., 2020). The study analyzed the buildings' structural vulnerability based on debris flows and dam-break flood separately, and did not consider the building response to the primary debris flow or quantify the cumulative effect of the debris flow and the dam-break flood (Luo et al., 2023). A physics-based vulnerability model is required to quantify the dynamic evolution of building vulnerability.” In addition, we supplement the results of the debris flow simulation and adjust the structure of the paper.