

Response to Referee#1

Note: Comment of Referee 1 is in Blue and Referee 2 is in Green colour

We would like to thank the reviewers for their positive and insightful comments on the manuscript. Our responses to the comments are given below:

Comment (R1)-1: Topic selected for study is appropriate, however, the treatment is not up to the mark.

Response: We appreciate the reviewer for pointing this out. Taking this comment into consideration, we have revised the title as follow: “Design and Application of a Multi Hazard Risk Assessment Survey Questionnaire for the Indian Himalayan Region”. Replaced ‘testing’ with ‘application’.

Comment (R1)-2: References cited are not correct and some references are missing.

Response: Taking this important comment into consideration, we have corrected and included the missing references.

Comment (R1)-3: Paper claims about multi hazard risk assessment, however, there is no explanation given on how various hazards and risks are integrated.

Response: Taking this comment into consideration, we have added Results of Pilot Survey in section 4.5. for better clarity and improved the discussion on multi-hazard risk assessment in Section 5.3.

Comment (R1)-4: Table 2 show the comparison of survey forms. Some of the hazards mentioned are not relevant to the methods listed, e.g.,

1)NDMA forms is only meant to earthquake risk, it has no mention of floods,

Response: We appreciate the reviewer’s insightful observation and we agree that NDMA forms have major concern towards earthquake risk, but NDMA forms also shows concern towards flood. In (NDMA, 2020) form under Soil & foundation conditions, it shows concern towards building built on river terrace, ground with high water table, liquefiable soil etc. i.e. multi-hazards.

2) There is no mention of high winds in BMTPC form. It is suggested to mention only the objectives for which the individual forms have been generated.

Response: We appreciate the reviewer’s insightful suggestion. I would like to highlight that BMTPC (Refer Table 5- Damage Risk to Housing under Various Hazard Intensities of BMTPC, 2019) shows vulnerability of houses towards earthquakes, wind/cyclones, floods etc. Thus, this form includes concern for other hazards.

Comment (R1)-5: Also, manuscript is largely in the report format i.e., with bullets and objective mentioned in the form of flow chart. It is suggested to follow research paper.

Response: We have revised it in section 3.1, 3.3.2.1, 4.2 and 4.2.1 of the manuscript.

Comment (R1)-6: References: Some of the links provided as references are not either not available or there no paper by that reference

E.g. 1) Pradesh, H., Pradeep, R. and Anoop, K. (2016) 'Rapid visual screening of different housing typologies', *Natural Hazards*. Springer Netherlands. doi: 10.1007/s11069-016-2668-3.

Eg.2) Full author list is needed in the paper "Aksha, S. K. et al.(2020) 'A geospatial analysis of multi-hazard risk in', *Geomatics, Natural Hazards and Risk*. 604 Taylor & Francis, 11(1), pp. 88–111. doi: 10.1080/19475705.2019.1710580."

Response: We have updated this section as per referencing format of the Journal. Some of the modifications are as follow:

Eg.1: Kumar, S. A., Rajaram, C., Mishra, S., Kumar, R. P., and Karnath, A.: Rapid visual screening of different housing typologies in Himachal Pradesh, India, *Nat Hazards*, 85(3), 1851-1875, doi: 10.1007/s11069-016-2668-3, (2016).

Eg.2: Sanam, K. A., Lynn, M. R., Luke, j., and Laurence, W. C. Jr.: A geospatial analysis of multi-hazard risk in Dharan, Nepal, *Geomatics, Nat. Hazards Risk.*, 11(1), 88-111, <https://doi.org/10.1080/19475705.2019.1710580>, 2020.

IS-1893 has been revised in 2016. Subsequently there were two amendments. However, authors still use 2002 version.

Response: We would like to thank the reviewer for this positive evaluation. Taking this comment into consideration, we have added the IS Code 2016 provisions in section 4.4 of the manuscript as suggested.

Comment (R1)-7: Authors have prepared a comprehensive multi-hazard form however; they have not indicated how the multi-hazard is computed.

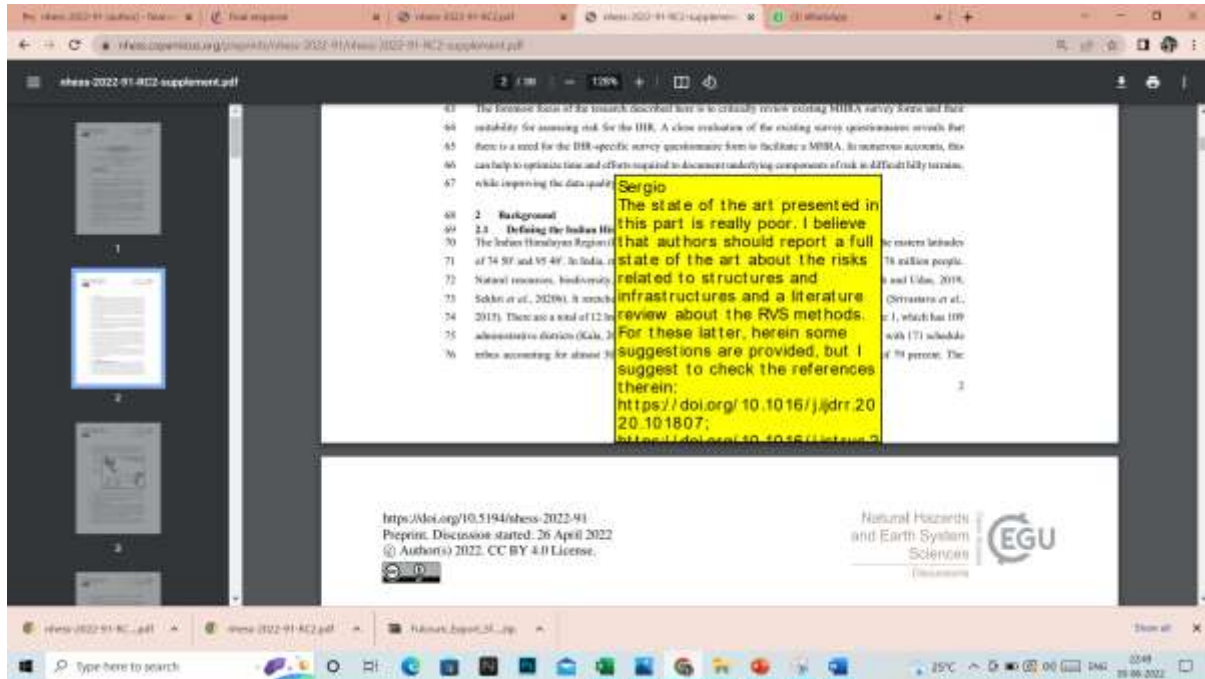
Response: We appreciate the reviewer for highlighting this point and we agree that step wise detail of multi-hazard risk computation is not part of the manuscript, as scope of Risk Calculation study by itself is huge and we have plan to detail it in separate article. Taking this comment into consideration, we have updated basic Multi-Hazard Risk Computation in section 4.4 and added Results of Pilot Survey in section 4.5. This will improve clarity about risk computation using this proposed Survey form. The aim behind this manuscript is to design a Hill specific MHRA Survey form that simplifies data collection process with higher level of respondents' involvement.

Comment (R1)-8: Title of the paper says "Design and Testing of Multi-hazard Rapid assessment questionnaire". However, neither Design part is not discussed in detail nor the testing part is not discussed. It is suggested to include the same for better understanding by the readers.

As mentioned earlier, we have revised the title as follow: "Design and Application of a Multi Hazard Risk Assessment Survey Questionnaire for the Indian Himalayan Region". The design methodology has been updated in section 3.1, Overall research methodology is updated in section 3.2 and figure 2. Application and discussion of the proposed survey form has been added in section 4.5 and section 5.0 of the manuscript.

Response to Referee#2

Comment (R2)-1: The state of art presented in this part is poor. I believe that authors should report a full state of the art about the risk related to structures and infrastructure and a literature review about the RVS methods.

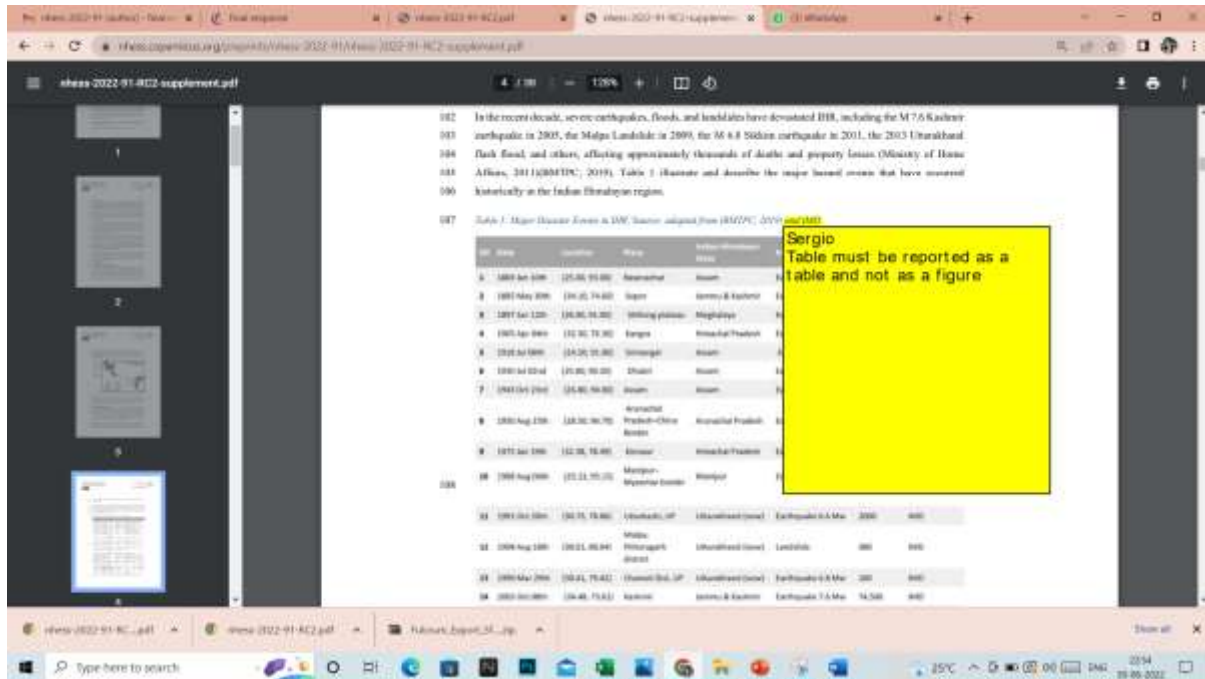


Response: We appreciate the reviewer's insightful suggestion. Taking this comment into consideration, we have modified the Introduction part in section 1 of the manuscript. However, Literature on RVS has already been mentioned in section 3.3.2. of the manuscript.

Comment (R2)-2: Please ensure high quality figure 1 to 5

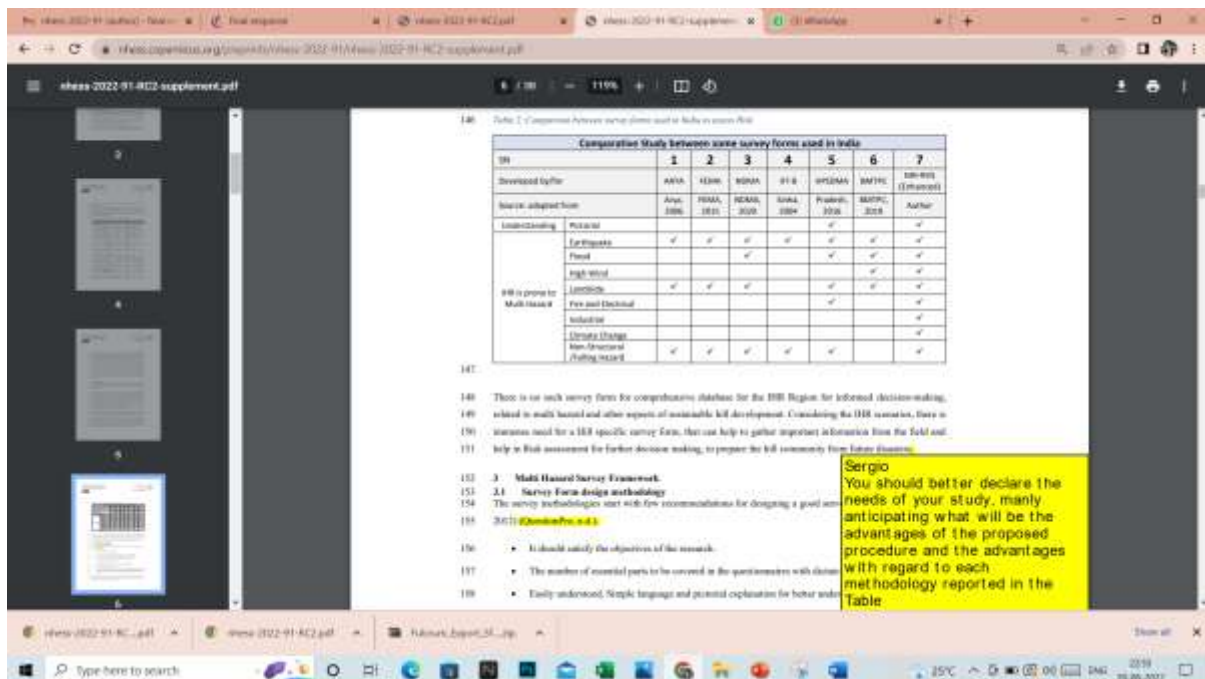
Response: We thank the reviewer's for highlighting this point and accordingly, we have replaced all the figures (identified by referee-Figure 1 to 5) with high quality pixels. We will send the figures in separate files.

Comment (R2)-3: Table must be reported as a table and not as a figure



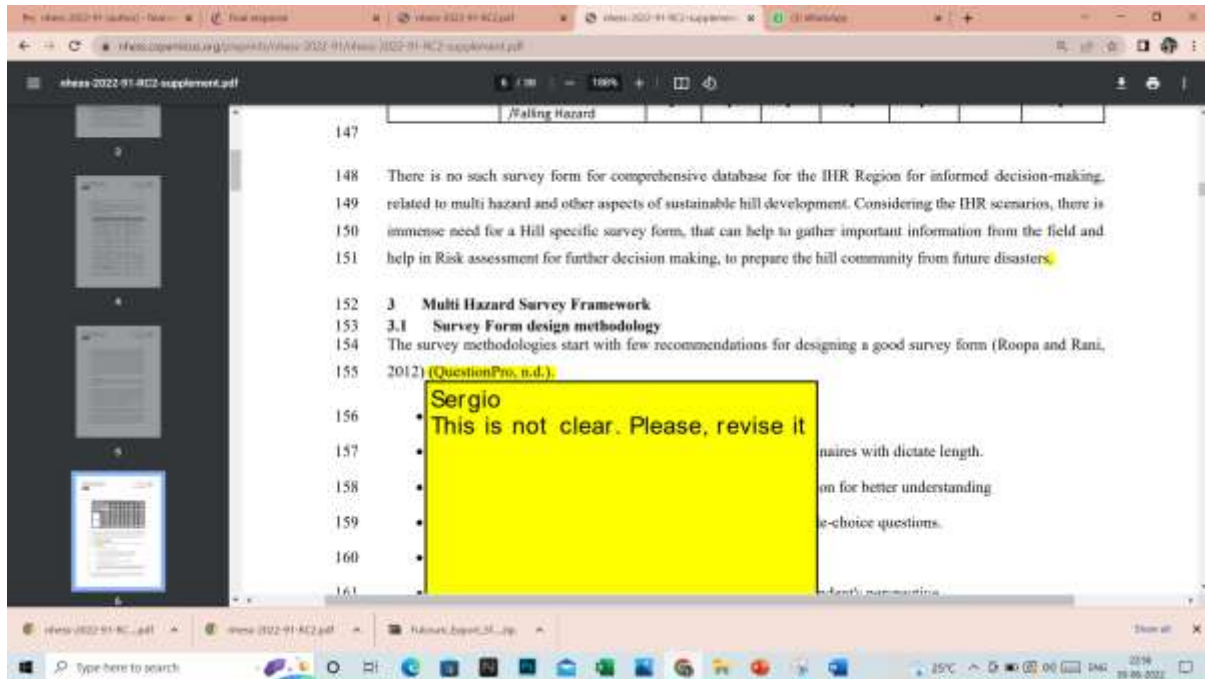
Response: We appreciate the reviewer’s insightful suggestion; accordingly, we have updated the Table 1.

Comment (R2)-4: You should better declare the needs of your study, mainly anticipating what will be the advantages of the proposed procedure and with regard to each methodology reported in the table



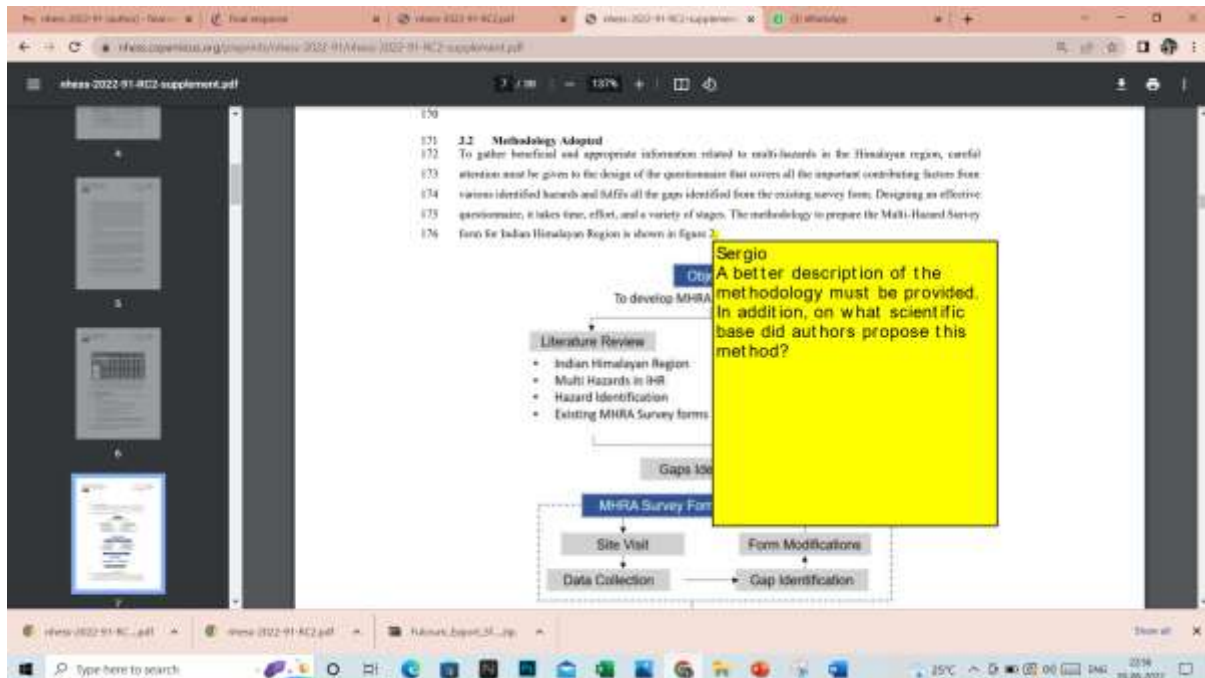
Response: We have refined the need of the study in section 2.3. However, advantage of the proposed procedure is already mention in section 5.2 of the manuscript.

Comment (R2)-5: (QuestionPro, n.d.), is not clear. Please revise it.



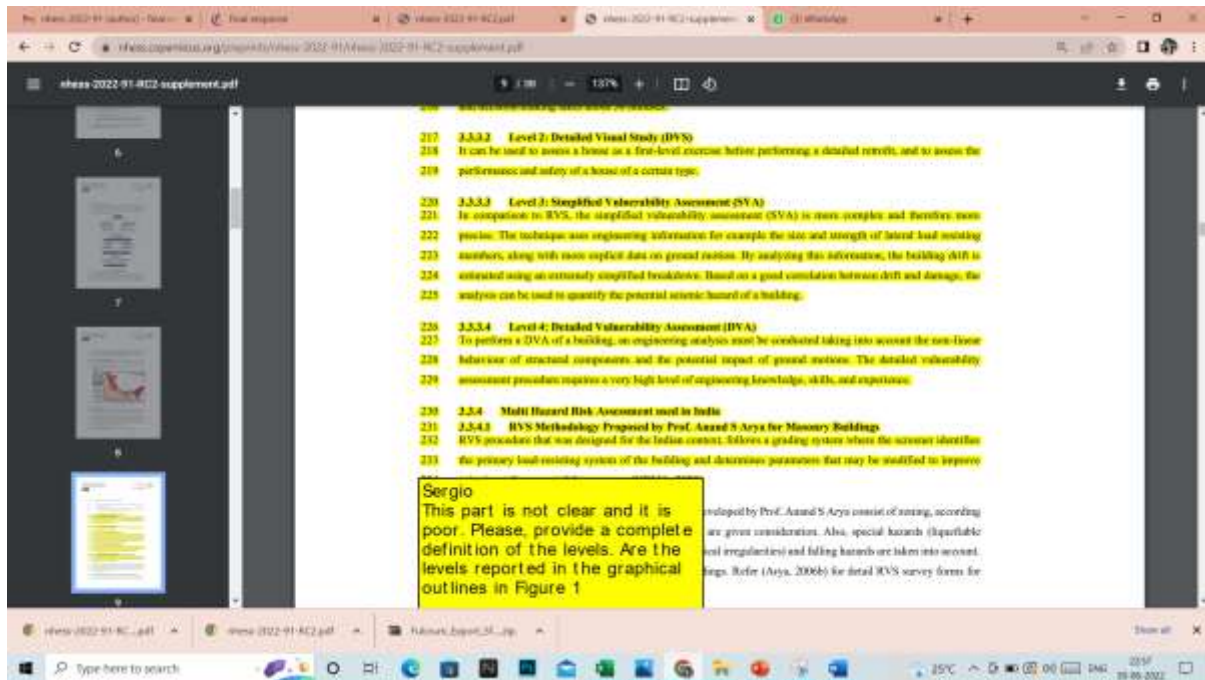
Response: We have revised the design methodology in Section 3.1 and detailed the overall methodology adopted in section 3.2 and figure 2 of the manuscript for better clarity.

Comment (R2)-6: A better description of the methodology must be provided. In addition, on what scientific base did authors propose this method?



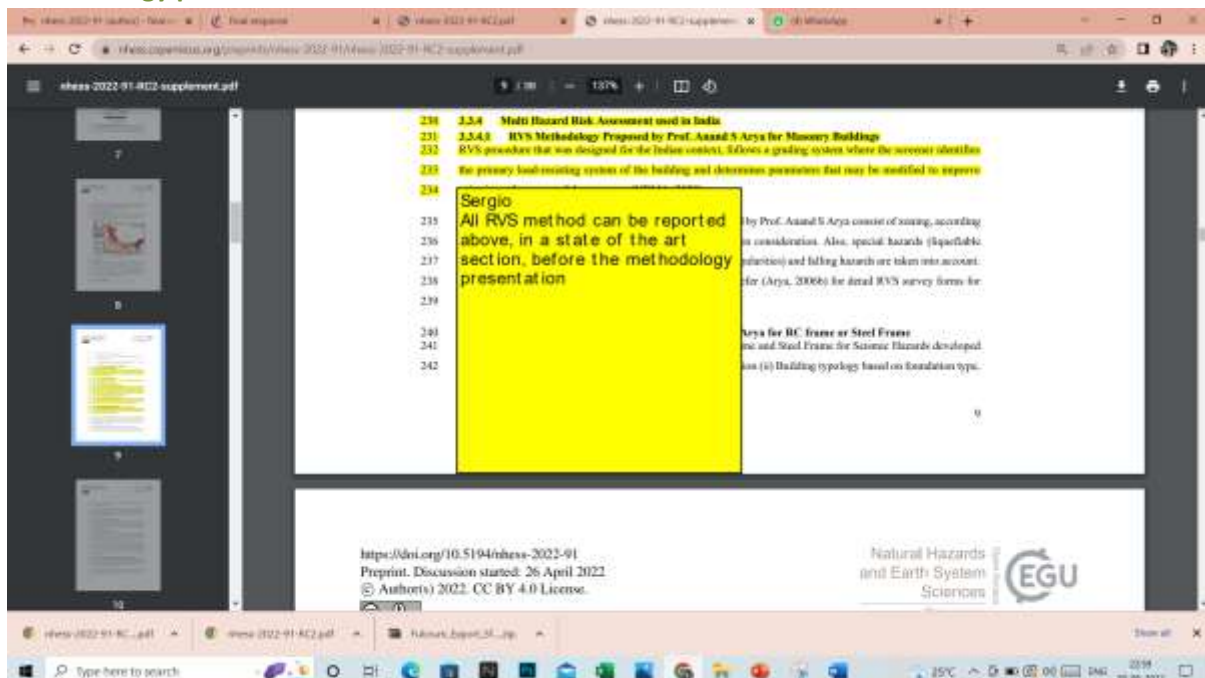
Response: We greatly appreciate the reviewer's thoughtful suggestion. Taking this comment into consideration, we have revised the methodology in section 3.2 and figure 2. We have also detailed it for better understanding and clarity on the overall methodology adoption.

Comment (R2)-7: This part (3.3.3) is not clear and it is poor. Please provide a complete definition of the levels. Are the levels reported in the graphical outlines in Fig1



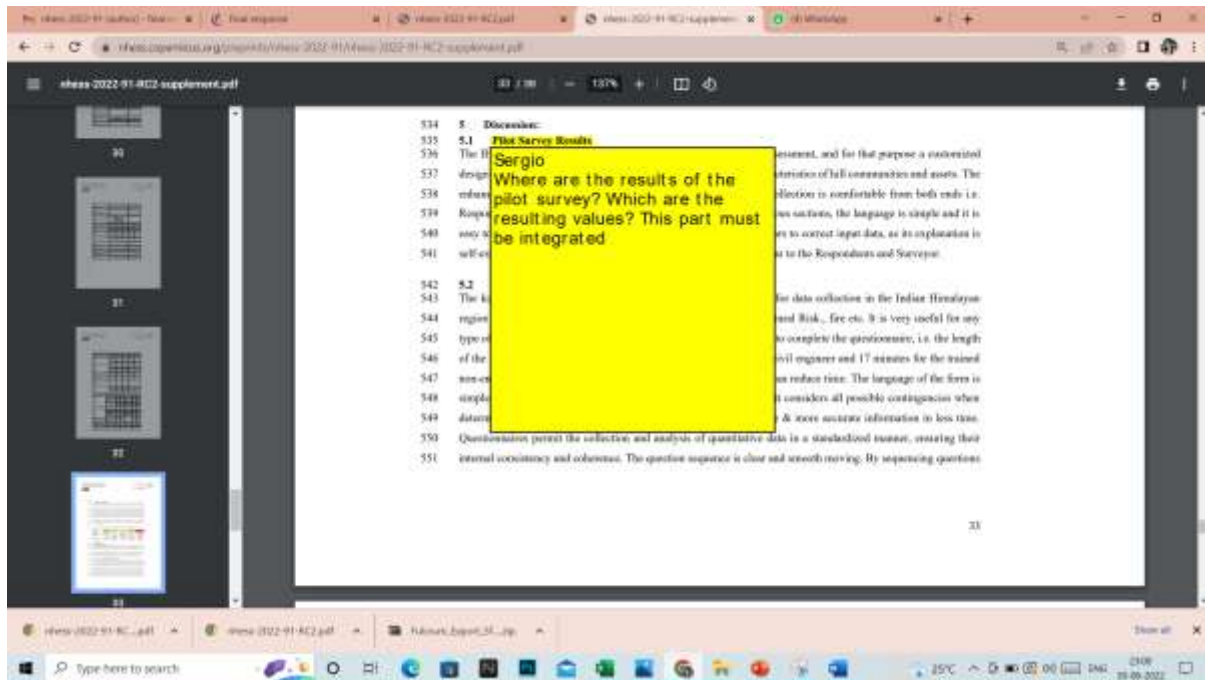
Response: We have revised the section 3.3.3 and incorporated it in the methodology figure 2.

Comment (R2)-8: All RVS method can be reported above, in a state-of-the-art section, before the methodology presentation.



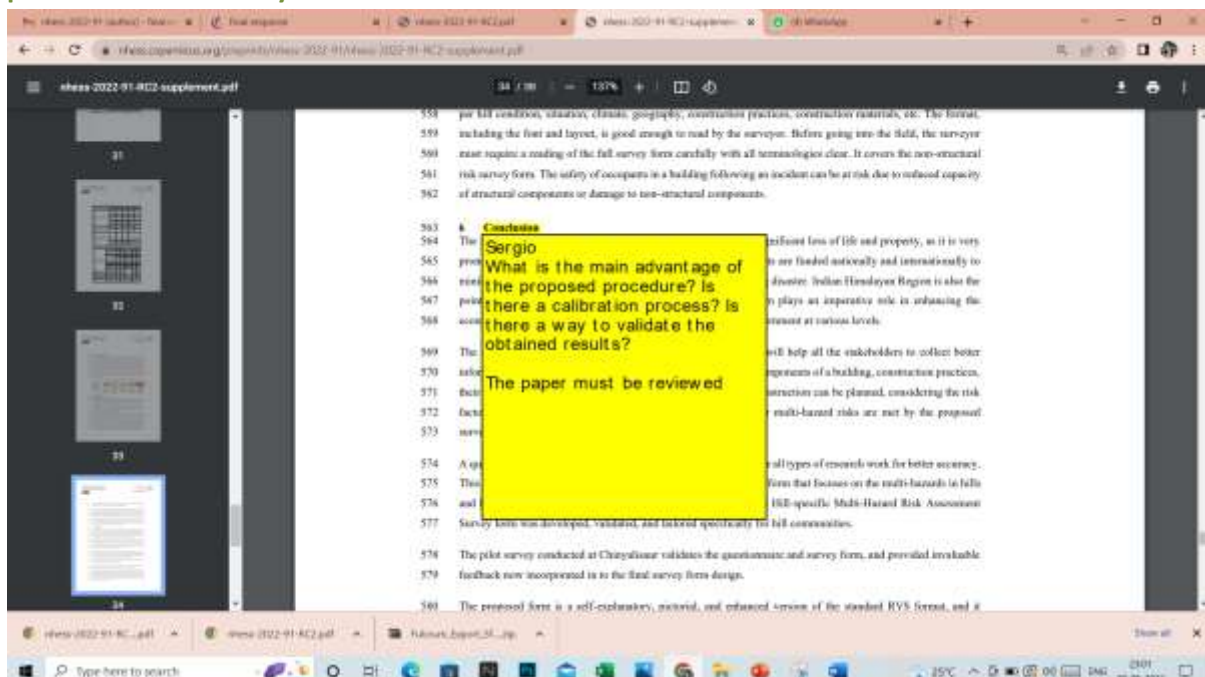
Response: We appreciate the reviewer's thoughtful suggestion. However, considering the structure of the manuscript, after a thorough discussion, we are continuing the flow of the structure as before, i.e. to combine all information related to literature reviews in section 3.3 of the manuscript, including information about RVS.

Comment (R2)-9: Where are the results of the pilot survey? Which are the resulting values? This part must be integrated



Response: We greatly appreciate the reviewer's thoughtful suggestion (which will definitely enhance our work) and we agree with it. Taking this comment into consideration, we have added Pilot Survey of 10 schools and its results in section 4.5 and discussion about its result in section 5.3 of the manuscript.

Comment (R2)-10: What is the main advantage of the proposed procedure? Is there a calibration process? Is there a way to validate the obtained results?



Response: Taking this comment into consideration, we have revised the conclusion part.

We would like to thank the referees once again for taking the time to examine our manuscript. Our manuscript quality has been enhanced by your comments and suggestions.