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## Reply on RC3

Mihai Ciprian Mărgărint et al.

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Author comment on "Risk perception of local stakeholders on natural hazards: implications for theory and practice" by Mihai Ciprian Mărgărint et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-37-AC3>, 2021

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### Author's responses to referees

#### Referee #3

##### General comments:

- **The authors present a case study from Iasi, in Romania, where they explored local stakeholders' risk perception concerning multiple natural hazards. They conducted 118 surveys with five different types of stakeholders (school heads, priests, police officers, mayors, and farmers). They found that different stakeholders show different perceptions of risk, also due to the geographical location of their community. The idea behind the paper is interesting and relevant, as often these groups work as a bridge between authorities and local communities and play a fundamental role during disasters.**

**Answer:** We thank you for your appreciation of this work and for the time and effort to review it.

- **However, there are some concerning aspects that the authors should address before this paper can be considered for publication in NHESS. I will list them here, together with some minor/technical corrections.**

**Answer:** We thank the referee for the helpful comments and suggestions, and we will respond to all the concerning aspects.

##### Specific comments:

- **1) Article structure – Section 2.1-2.2-2.3 are very detailed, so much so that the reader loses sight of what the paper is about. I think it is relevant to provide information on the geomorphology, climate and natural hazards history of the area, but this can be done more concisely. Instead, I would give more space to literature on risk perception and stakeholders role in communities during disaster, which are now confined to the short introduction and should be expanded (this is the core of the paper, after all).**

**Answer:** Indeed, the space for presenting the study area and specific risk-related aspects

seems to be a bit long. The particularities of the recent transformations of the built-up areas in Iași Metropolitan area represented a major issue that should be presented in this paper because it is part of the rationale of the study. In the updated version we present more concisely the settings of the study area (rows 108-236) and some information that is not strictly related to the risks induced by natural hazards has been removed. In the introduction and discussions we included several references (here some of the others that will be included) to enhance the literature on risk perception:

Burningham, K., Fielding, J. and Thrush D.: "It'll never happen to me": Understanding public awareness of local flood risk. *Disasters*, 32(2), 216–238, doi: 10.1111/j.1467-7717.2007.01036.x., 2008.

Grothmann, T. and Reusswig, F.: People at risk of flooding: Why some residents take precautionary actions while others do not, *Nat. Hazards*, <https://doi.org/10.1007/s11069-005-8604-638>, 101–120, 2006.

Heijmans, A.: Vulnerability: A matter of perception. Benfield Greig Hazard Research Centre. London. Disaster Management Working Paper, 4, 1–17, 2001.

Plapp, T. and Werner, U.: Understanding risk perception from natural hazards: examples from Germany, in: RISK 21 – Coping with risks due to natural hazards in the 21st century, edited by Ammann, W., Dannenmann, S. and Vulliet, L., Taylor and Francis, 2006.

Plattner, T., Plapp, T., and Hebel, B.: Integrating public risk perception into formal natural hazard risk assessment, *Nat. Hazards Earth Syst. Sci.*, 6, 471–483, <https://doi.org/10.5194/nhess-6-471-2006>, 2006.

Santoro, S., Pluchinotta, I., Pagano, A., Pengal, P., Cokan, B., Giordano, R.: Assessing stakeholders' risk perception to promote Nature Based Solutions as flood protection strategies: The case of the Glinščica river (Slovenia), *Sci. Total Environ.*, 655, 188-201, 2019.

Schneiderbauer, S., Fontanella Pisa, P., Delves, J. L., Pedoth, L., Rufat, S. et al.: Risk perception of climate change and natural hazards in global mountain regions: A critical review, *Sci. Total Environ.*, 146957, <https://doi.org/10.1016/j.scitotenv.2021.146957>, 2021.

Siegrist, M. and Gutscher, H.: Natural hazards and motivation for mitigation behaviour: People cannot predict the affect evoked by a severe flood. *Risk Anal.*, 28(3), 771–778, doi: 10.1111/j.1539-6924.2008.01049.x, 2008.

Sjöberg, L.: Factors in risk perception, *Risk Anal.*, 20(1), 1-11, <https://doi.org/10.1111/0272-4332.00001>, 2000.

Sujakhu, N. M., Ranjiktar, S., Niraula, R. R., Pokharel, B. K., Schmidt-Vogt, D. and Xu, J.: Farmers' Perceptions of and Adaptations to Changing Climate in the Melamchi Valley of Nepal. *Mountain Research and Development* 36, 15–30, <https://doi.org/10.1659/MRD-JOURNAL-D-15-00032.1>, 2016.

Wachinger, G., Renn, O., Begg, C. and Kuhlicke, C: The Risk Perception Paradox—Implications for Governance and Communication of Natural Hazards, *Risk Anal.*, 33, 1049-1065, doi: 10.1111/j.1539-6924.2012.01942.x, 2013.

- **2) Background – The paper is about risk perception, but very little literature is presented in this regard. The authors mention that the lay public “demonstrated a low perception and readiness”, but where does this information come from? The stated aim of the paper is to “investigate stakeholders’ level of knowledge and cognitive appraisal of natural hazards in order to understand if they think and act differently from the lay public [...] and understand their role during emergencies”. Yet the paper only focuses on the perception of the stakeholder, and no lay person was interviewed, making it impossible to detect any differences in perception. Second, it seems from the introduction (lines 62-75) that the role of the local stakeholders during emergencies is already known and understood.**

**Answer:** Thank you for pointing this. Indeed, we did not include the lay people, and we will rephrase to avoid the mentioned ambiguities. The role of stakeholders is specified by

the law and was presented in the text (lines 47-56 and 62-75). Our study focus is on the perception of stakeholders, given their important role (lines 76-84) in risk management and community preparedness. In the introduction (lines 95-99) we have intentionally shown the level of perception and preparedness of lay people, as investigated in the Romanian literature. As mentioned before, we will add some references to risk perception studies in order to give the reader sufficient background to understand the paper. Thus, the most common drivers of risk perception and preparedness (e.g. age, gender, etc etc.) have not been addressed.

- **The authors investigate perceptions of seven natural hazards but divide all the communities assayed according to only three of these hazards (floods, landslides, soil erosion). How are the other hazards distributed across the communities examined? Do they affect them all with the same frequency, intensity?**

**Answer:** Thank you for pointing these aspects. The division was made initially only to pinpoint the case of specific natural hazards because the purpose of the paper was to check whether the characteristics of natural hazards influence the perception: lines 399-423 (we updated lines 145-149 to specify this). Later, in the interpretation of the data, we also considered this factor as a group covariate. Alongside the hazards that affect large areas, at a regional/national scale (such as droughts, earthquakes) some are related to the local geomorphological settings (floods, landslides, soil erosion), and their negative consequences are felt on a local scale (rows 413-414). We made a synthetic description of the hazards affecting the study area (sections 2.1 and 2.2), and while some references are written in Romanian, we certify that our resume is showing the current knowledge from the literature about the study area.

- **3) Data collection – The authors mention dominant, discretionary, and dormant stakeholders, but these terms are not defined, nor used anywhere else in the paper.**

**Answer:** We have defined the main characteristics of these types of stakeholders, according to the extended stakeholder's salience theory of Mitchell et al, 1997 (the paper was cited: rows 844-846). According to Mainardes et al., 2012 (paper cited: rows: 804-808). "this model includes stakeholder powers of negotiation, their relational legitimacy with the organization, and the urgency in attending to stakeholder requirements" and we adopted this model by considering that these characteristics can differentiate the role of local stakeholders during local crisis generated by disasters. As a consequence, the mentioned paragraph (rows 238-240) was changed, as follows: "Local stakeholders have been selected representing different characteristics in terms of power, legitimacy, and urgency, in accordance with the stakeholder's salience theory of Mitchell et al., 1997. This model includes stakeholder powers of negotiation, their relational legitimacy with the organization, and the urgency in attending to stakeholder requirements" (Mainardes et al., 2012). According to the mentioned classification, the dominant stakeholders (mayors, police officers), discretionary stakeholders (farmers), and dormant stakeholders (professors and priests) have been selected."

At the same time, in the discussion part, we make certain references to the mentioned stakeholder types in different approaches of risk perception main sections.

- **Figure 2 would be easier to read if it were a table. It would also be good to know the % of respondents in the HUA and FUA (e.g. priest 21% of the total, of which 60% in HUA and 40% in FUA). All this info plus that in Fig.2 plus lines 253-261 can be nicely summarized in a table.**

**Answer:** We replaced Fig. 2. and the mentioned text with a table (see the attached file table.pdf - for now, it is provisional, we are working on an optimal better layout for the

revised version of the article), adding the required percentages of HUA and FUA.

- **Line 251 “some stakeholders inviting other members of the community (especially the mayors) into the dialogues”, do the authors mean that the mayor was invited to the interview? I think this could cause some issues as the answer of the interviewee could have been influenced by the presence of the mayor.**

**Answer:** Thank you for pointing this; it is an error in the English translation from Romanian. All the interviews took place individually (the first part: pre-defined questions regarding the assessment of risk perception induced by natural hazards). In few cases, in the second part of the interview (that included discussions focused on environmental and hazardous phenomena in the area) some majors considered as beneficial for other employees (and not another stakeholder) of the mayor's office to take part in the discussion. In fact, we did not include the latter conversation in the results. We rephrased the rows 250-252, in order to avoid any confusion.

- **Lines 262-272 should go in the introduction/background.**

**Answer:** Thank you for this suggestion, we moved and detailed the mentioned text concerning the three main research questions of the paper in the introduction part as suggested also by Referee #2).

- **It is unclear whether the authors conducted questionnaire surveys or semi-structured interviews. It seems to me that they conducted questionnaire surveys (considering that all the questions were close-ended), as they specify in line 246. If they also conducted semi-structured interviews, they should report the questions that were asked (at least the initial ones, but the follow-up ones should be reported too), whether the interviews were recorded, how was consent acquired, whether they were transcribed, and how data from the interviews were analysed.**

**Answer:** Thank you for pointing this aspect. We conducted a structured questionnaire and we have specified this in the paper (the responses were recorded on the questionnaire sheet by an author while the interviewee read his own sheet; the consent was acquired previously when we arranged the meeting with the stakeholder; we did not record the interview). However, at the end of the interview session, the interviewees were free to add any comment or to share memories or past experiences freely. We included some of those free additions to explain some statistical trends. We have clarified it into the methodology part.

- **Table A1 in the appendix should also report the minimum and maximum value for every question asked on a scale. What does “low-high” that sometimes appear in the second column of the table mean? Are those the extremes of the scale?**

**Answer:** We understand the confusion about the scale of measurement used. We used a 5-point Likert scale, that qualitatively was related to: “very low, low, medium, high, very high”. To simplify the table, we used the qualitative label but eventually, we have confused the reader. We have changed the table in accordance.

- **Q13 asks two questions in one, this can be an issue for those respondents whose answer may change depending on the question part (reduce negative consequences of natural hazards vs it should be taken as a priority where you live).**

**Answer:** Thank you for pointing this fact. Actually, the respondent must choose from the indicated items the one that satisfies both criteria as they are highly interconnected. That is the reason behind this wording choice. We have added a note to explain it as a footnote in the table.

- **4) Statistical analysis – The analysis of the data is rather shallow, often just a comparison of percentages. The contingency table tests results would be clearer if presented in the form of Chi-square values, rather than with Correspondence Analysis (CA) graphs. In my opinion, they are hard to read, not intuitive, and a distracted reader may even draw wrong conclusions from them. In addition, I don't think it is an appropriate way to represent your results. Running some ordinal logistic regressions would add some depth to the analysis and would give additional insights on the role of type of stakeholder and geographical characteristics in influencing risk perception.**

**Answer:** Thank you for pointing these aspects. As we pointed in the text, we did not consider the application of the parametric statistics, but of the nonparametric (lines 283-287) considering the scientific literature in this regard. In order to understand which is the better methodology that can explain the results, we will add the parametric methods and we will compare the results with the non-parametric ones. Since this might add much more text to the article, we will try to make references to the literature, and put the unnecessary data in the supplementary files (if appropriate).

We will run factor analysis to check whether they represent better our results compared to CA graphs and we will perform also chi-square as suggested. In this case, ordinal logistic regressions are not considered due to the nature of the paper and its variables. The nature of the paper is exploratory in regard to stakeholders and their intrinsic differences not the variables affecting the perceptions overall. Possibly another research paper can follow up with these analyses.

- **5) Results – The results of the statistical analysis are reported only in terms of %, and the correlations are reported through CA graphs (such as in Fig. 5-9-10). I think a much more meaningful representation of the data would be plotting the mean responses for Q2 (perceived impact) and Q4 (perceived likelihood) for each hazard by stakeholder type. This would immediately show potential differences in risk perception and it's more intuitive to read.**

**Answer:** We agree, as we pointed above, we will also consider your suggestions regarding the usage of a different type of statistics and we will argue their applicability. We will definitely include a plot that will point out the indicated idea.

- **6) Discussion – The discussion should go more in depth, and this would be facilitated by a deeper statistical analysis. It would also help to have the discussion structured following the three research questions/themes.**

**Answer:** We agree, we will extend the discussion part focused mainly on the research questions and findings. The statistical analysis will include also more focused methods as we previously pointed.

- **No limitations of the study are discussed, even though there are quite some (e.g. sample size, not surveying any lay person, statistical analysis). The discussion does not tie the results to the literature, and it is therefore hard to generalize the results and compare them with previous (and potentially future) studies.**

**Answer:** Thank you for pointing this. In the forthcoming version of the paper, we will carefully address the limitations of the study. We have purposely not interviewed lay

people, because the literature is moderately rich on this, so we focused attention on the leaders of the communities since they are those who are requested to take action during hazardous events. We agree with the reviewer that the discussions need to be contextualized more with respect to other similar studies, that to authors' knowledge are very few. In this regard, some of the literature will be consulted regarding stakeholder risk perception and leadership outside the natural hazard domain. The study results are somehow difficult to generalize to the specific socio-economic and political progress in Romania, however, some other considerations can be drawn.

- **Research question – Q1 what do the authors mean with “dependency relationship between the threats of different natural hazards”?**

**Answer:** Indeed, there is a certain ambiguity, so we modified Q1 like this: "Is there a difference of perception of the stakeholder regarding the different types of natural hazards?"

- **7) Technical corrections:**

**The manuscript needs in-depth proofreading, some sentence constructs are hard to follow, and there are few typos throughout the paper (I provide some examples below, but the list is not exhaustive).**

**Answer:** We will carefully proofread the paper to avoid any misspell or error and if necessary we will rely on an external professional proofreader in a second stage if the issue is highlighted again by reviewers. The mentioned technical correction will be addressed through the paper.

- **Line 23: “some stakeholders”, communities and authorities are stakeholders too, so I would use “other stakeholders”**

We amended this in the paper with thanks.

- **Line 162: I think there's a repetition in the sentence.**

Amended with thanks. "Especially during the summer," was removed

- **Line 164: it should be “is”, not “if”**

Amended with thanks. We replaced "if" with "is" at line 166

- **Line 203: “persons” can be removed, it’s superfluous.**

Amended with thanks. "Persons" was removed

Please also note the supplement to this comment:

<https://nhess.copernicus.org/preprints/nhess-2021-37/nhess-2021-37-AC3-supplement.pdf>