

Reply on RC1

Ibolya Török et al.

Author comment on "A new approach to assess the impact of extreme temperature conditions on social vulnerability" by Ibolya Török et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-45-AC1>, 2021

Dear Reviewer,

I would like to thank you for the relevant remarks you have made after reviewing the manuscript. These comments are all valuable and helpful for revising and improving the paper. The main corrections and the responses are as follows.

Point 1. Even you in the paper state: "Based on reviews of the related literature, as a rule, we have observed that in most cases the majority 130 of indicators have been selected subjectively and adapted to the main characteristics of the analyzed region. This is a common approach, which could be noticed in most of the vulnerability analyses conducted worldwide.". This text, besides the fact that does not reference literature reviews, is a statement showing that nothing is new and that you just subjectively adopted a common approach to a certain study area. This violates the question: Does the manuscript represent a substantial contribution to the understanding of natural hazards and their consequences (new concepts, ideas, methods, or data)?

Response 1. The first and most important result of the study, following the hazard-of-place approach, is the elaboration of place-based indicators along with a specific weighting scheme for measuring the impact of climate effects on local social vulnerability. Nevertheless, different case studies across countries and regions along with methodological advancements can further enhance the international applicability of the model. Second, analysing how individuals or households respond to the local impact of global climate change is an important issue for policy makers to elaborate strategies for exposure reduction and adaptation capacity improvement.

The present analysis serves as an important tool for local and regional authorities to recognize the natural and socio-economic problems which make these communities more vulnerable, to elaborate local development strategies so that to increase the coping capacities of the population living in those areas. However, since the European Green Deal is a roadmap for making the EU's economy and society sustainable and more resilient to climate change by turning climate and environmental challenges into opportunities across all policy areas and making the transition just and inclusive for all, local communities and authorities could benefit from adaptation support.

Point 2. Further, if we investigate the text, you also state that the objective of

the paper is: "to develop a scientifically based set of vulnerability indicators and calculate the impact of climate factors on people's vulnerability in Cluj County.". Again the scientific requirements of the journal are not targeted: **"Does the paper address relevant scientific and/or technical questions within the scope of NHESS? Does the paper present new data and/or novel concepts, ideas, tools, methods or results?"** Your study is mainly a regional one. This is accentuated by the fact that the presented methodology for general vulnerability assessment is actually the same used by the first author in 2018 in regard to flood hazard, again in a regional approach. The PCA was previously used in vulnerability assessment.

Response 2. The objective of this paper is to provide a methodological contribution for assessing vulnerability at the local level and to promote the integration of climate change into sectoral and local policies for increasing the climate resilience of the communities.

The majority of vulnerability studies are using the PCA techniques in order to compress an original set of variables into a smaller set. The most important strength of assessing social vulnerability by using an indicator-and place-based approach is represented by practical applicability. Thus, once embedded into the wider /national context, it can assess the communities' preparedness' for diminishing the negative effects of natural hazards, representing at the same time a valuable input for policy makers and disaster planners. Thus the assessment of social vulnerability on different scales can be found in Australia (Dwyer et al. 2004), USA (Emrich and Cutter 2011), Norway (Holand et al. 2011), UK (Tapsell et al. 2002), Vietnam (Adger et al. 2012), China (Chen et al. 2013), Indonesia (Siagan et al. 2014), Portugal (Guillard-Goncalves et al. 2014), Brasil (Hummell et al. 2016), India (Mazumdar, Paul 2016) – all applying the PCA analysis in a regional context.

We consider that application papers can be valuable, even if there is no advance to methods. Most of the vulnerability studies are based on the SOVI model, as this method has largely been accepted due to its continuous evolution, pertinence and adaptability.

Point 3. In the conclusion, you state that "This study represents a first attempt for understanding the spatial relationship between social vulnerability and climate change, offering the possibility to be tested in other regions as well" but actually this might be for Cluj County, because in the literature at least this (10.1007/s10113-017-1105-9) should point you in the right direction, that all the approaches are spatial in nature, so a simple mapping does not make it especially spatial. For an example of spatial approach see 10.1073/pnas.0710375105.

Response 3. We have further amended the analysis using the ESDA technique in order to identify the spatial patterns of climate related social vulnerability.

One of the fundamental questions of spatial analyses is whether any regularity can be detected in the spatial distribution of the studied phenomenon, or the spatial distribution of the data is random. In order to detect spatial clustering in the resulted CleSoVI index, we have used the ESDA techniques, focusing both on the Global-, as well as the Local Moran's I statistics. The latter allows us to identify clusters of spatial outliers, i.e. statistical hotspots and cold spots, which in turn allow us to delimit areas characterized by the highest and lowest levels of vulnerability. The high value of Moran's I ($r = 0.360$) suggests a positive spatial autocorrelation at a significance level of $0.05 > p > 0.01$, reflecting a strong clustering process. Thus we could identify four main groups (Fig.6): communes with the lowest level of vulnerability (L-L cluster) can be found in the immediate vicinity of the largest urban centers (Cluj-Napoca), being surrounded by areas with a relatively high level of vulnerability as compared to the central regions (H-L cluster). Settlements with the highest level of social vulnerability (H-H cluster) can be

found in the northern, eastern and southern parts of the county, where the occurrence of extreme temperatures regularly has a negative effect on agricultural production, thus influencing the overall socio-economic development of these settlements as well. The fourth cluster (L-H) includes both urban and a rural settlements of a smaller size, indicating a lower level of social vulnerability, as compared to the surrounding areas.

Point 4. The article is missing a Discussion part where the novelty and the shortcomings of the "new" method.

Response 4. As a first step, we have changed the title of the manuscript to "Assessing the impact of extreme temperature conditions on social vulnerability". We consider, that the discussion part together with the limitations subsection capture the applicability of the used method well enough.

Vulnerability assessment is an important part of adaptation planning and the CLeSoVI index developed in the current paper could represent the first step in this sense, offering the possibility to be tested and applied in other regions as well. We consider that in the near future it is necessary to carry out similar analyses for smaller territorial units, taking into account different factors of natural disasters. This would be essential to identify the socio-economic and demographic characteristics, which increase the capacity of the population to resist, cope with, and recover from disasters. By pinpointing the areas with the greatest need for vulnerability reduction, the developed index could help policy-makers prioritize development measures.

Once again, thank you for your valuable comments and suggestions. I appreciate the hard work and sincerity, and hope that the corrections will be met with approval.