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Interactive comment on "Weigh(t)ing the dimensions of social vulnerability based on a regression analysis of disaster damages" *by* Vincent David Corvin Heß

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I thank referee #1 very much for the helpful and mindful comments. In the following, I respond to each point below and detail how I want to change the manuscript to consider each point. I belief the consideration of your comments will improve the manuscript significantly.

> Regarding scientific significance and quality, the paper should discuss the indicators used in the PCA and Regression model beyond providing short references to previous studies. True, the author engage in discussing possi-

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ble reasons for why some indicators fall short of explaining vulnerabilities. A case in point is unemployment which is shown not to have any explanatory power. We know that unemployment is calculated as the share of those actively seeking work plus those having work; that is, the labour force. certain number of the unemployd is receiving unemployment benefits and as such not necessarily poor. Long-term unepmployed and outside the labour force could be more important. In short, the author should do some independent thinking on the subject, not just rely on previous studies.

This is a very good idea. However, the description of used indicators is kept to a minimum on purpose for the following reasons: As you have shown exemplary for unemployment, the effectiveness of social indicators can be quite complex. Nevertheless, indicators are often used as-is in many PCA compositions of vulnerability indices with little or even no reference given. Without wanting to point out single papers, examples include Fekete (2009), Koks et al. (2015), Santos et al. (2017). Our purpose was to replicate this behavior and I did not engage in a deeper discussion of individual indicators in the methods section. The inaccuracy of some of our assumptions is excessively discussed in the discussion section. As you have pointed out, other, not discussed indicators are also problematic, but I do not assume it necessary to discuss every indicator to derive at my conclusions. The main conclusion is that indeed we need a deeper understanding of the social indicators to calculate a more accurate vulnerability index. This becomes clear when we compare the PCA index with the RA index, the latter one which does not depend on any such assumptions.

I suggest appending the following paragraph to section 3.2: Social indicators (Page 5, line 21) to make it clearer we are following standard practice for calculating a PCA based vulnerability index.

“We describe the composition of the indicators and their assumed influence on social vulnerability. We base our assumptions mainly on previous studies or, if an indicator

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has not been used in the literature before, on logical argumentation. We compare this commonly used approach for calculating a social vulnerability index with our vulnerability index approach based on a linear regression, the latter of which requires no assumption on the influence of social indicators."

> From the paper, it seems that the regression analysis was conducted by using all the indicators (plus the added ones), without removing variables that did not show any explanatory power. I suggest the author do some more work on the reggression analysis in this respect; tahat is, one-by-one remowing variables with lowest significance to see what impact this will have on the remaining variables. This also means that the reader should be told what type of regression model(s) has/have been used (e.g. step, enter) and what type of data each variable represent.

As you have correctly assumed, I initially did the regression with all indicators at the same time. I also used the step-method and removed indicators stepwise, beginning with the one associated with the lowest significance. However, we wanted to analyze which indicators are significant at all and if they increase or decrease vulnerability and if this is in line with the assumptions we made. From my point of view, for this analysis it is only important which indicators are statistically significant and which are not. So while the regression coefficients changed and the overall model quality in terms of R^2 increased, we derived at the same significant indicators.

This might be an interesting result, but stepwise regression is heavily discussed and sometimes even considered as data dredging. And since our main results did not change when removing variables without explanatory power the additional, but controversial, step of removing statistically insignificant variables was left out of the paper for the sake of brevity.

If you think it is crucial to include this information in an updated manuscript, I will be

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happy to comply and provide a more detailed description of the regression analysis.

> Regarding the presentation quality, Table 1 states that education INCREASE the vulnerability whereas the text tells the opposite (DECREASE). More important, the variable Population density turns into Population sparsity in section 4.1 and 4.2 (also Table 2 and Figure 1). If not a typing error, this has to be explaned.

Thank you for spotting this mistake. I will make this clearer in the updated manuscript, but section 3.4 and the footnotes of Table 1 already state that I changed population density and fire stations per capita to population sparsity and number of citizens per fire stations for the numerical analysis and thus the representation and the analysis of the results. However, section 4.2. does indeed mix the labels, which I will correct to only use population sparsity in the methods and results section and continue to use population density in the rest of the paper. I will also correct Table 1 to indicate a decreasing vulnerability with increasing education.

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