Comment on nhess-2021-363

Anonymous Referee #2

Referee comment on "INSYDE-BE: adaptation of the INSYDE model to the Walloon region (Belgium)" by Anna Rita Scorzini et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-363-RC2, 2022

The paper 'INSYDE-BE: Adaptation of the INSYDE model to the Walloon Region (Belgium)' describes a procedure to adopt a detailed synthetic flood damage model for residential buildings for the application in a region different from that for which it has been originally developed, i.e. Italy.

The INSYDE model is based on a component-wise evaluation of physical damage to residential buildings using expert knowledge and evidence from the scientific and technical literature about underlying damage mechanisms. This modelling concept is replicated in the target region (Belgium) using desktop and field surveys with the aim, to accommodate local specific characteristics of flood hazards and residential buildings. The authors present a sensitivity analysis that investigates the influence of various model input variables on damage estimates.

The paper is reasonably structured and well written. It touches on the important topic of how we can improve the spatial transfer of flood damage models, and thus should be of high interest to the readers of NHESS. Accordingly, I recommend the paper for publication.

However, I see some aspects which require clarification and/or additions to make the paper stronger. The major points are the following (please find further minor comments and typo corrections in the attached marked-up manuscript):

1 (Section 3.2.1): I suspect a sort of circular argument underlying the sensitivity analysis. The sensitivity analysis investigates changes in the model output (damage estimate) for changes in the different model input variables (using a one at a time approach). Hence, the sensitivity of the model output to these changes depends essentially on the assumptions underlying the model structure and damage functions.

Therefore you may not infer general conclusions from that, e.g. like * an 'overwhelming importance of water depth on the flood damage estimation (p17 l354)' * '… flow velocity… has been shown to have a negligible influence on the damage estimation' because this only depends on the model assumptions.

Please rephrase these paragraphs in a way you have done, for instance, on p20 l 396 and rather derive some useful guidance on which data to put most effort during data collection.

Please check if equation 3 represents what you have analysed within the sensitivity analysis. Did you really consider the difference between positive and negative changes in the different inputs in relation to the reference? How do you obtain positive and negative changes from that as presented in Figures 9 and 10? It would be also good to formulate equation 3 in a way to expresses percentage changes, as it is later reported in Figures 9 and 10.

2 (Section 3.3): This entire paragraph merely tells the reader more than that no appropriate data for thorough model validation are available in the target region. Instead, it would be more interesting to present alternative approaches for model validation, e.g. picking up ideas discussed in other papers on model comparison (e.g. Wagenaar 2016, Gerl et al. 2016, or ensemble approaches Figueiredo 2018).

You briefly pick up this aspect in the conclusions but I think it deserves more in-depth discussion in section 3.3. As the study does not include proper testing of the adopted model I highly recommend conducting a benchmarking exercise by comparing the outcomes of INSYDE-BE to other damage models in the region.

3 (Section 3.1.3): Please indicate the reference year for unit prices in table S1 and indicate a resource for transferring these values to different years, e.g. statistics on building price indices.

4 (Section 4): the statement that the procedure for the adoption of the INSYDE model to the Walloon region is replicable for any other synthetic model (p21 l440) is not supported by the results of this study.

Additional References Wagenaar, D., Bruijn, K. M. de, Bouwer, L. M., and Moel, H. de: Uncertainty in flood damage estimates and its potential effect on investment decisions, 16, 1–14, https://doi.org/10.5194/nhess-16-1-2016, 2016.

Please also note the supplement to this comment:

https://nhess.copernicus.org/preprints/nhess-2021-363/nhess-2021-363-RC2-supplement.pdf