

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1  
<https://doi.org/10.5194/nhess-2021-363-RC1>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Comment on nhess-2021-363

Anonymous Referee #1

---

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-RC1>, 2022

---

### Brief summary

The authors aim to adapt the flood damage model INSYDE, which was initially developed for Italy, to the estimation of residents flood damage in Belgium. INSYDE is a very detailed micro-scale flood damage model including 23 explaining variables (six regarding the hazard and 17 regarding the affected building). The variables needed for the estimation are adapted by the means of official hazard maps, statistical data sets, literature reviews as well as field and virtual surveys conducted in Belgium. Many cost functions within the model are adapted to the Belgian context considering the gathered data sets. The adaptation of the INSYDE model is followed by a sensitivity analysis to identify the most influential variables and to quantify the uncertainties by comparing damages estimates from baseline model runs and models runs with one altered variable. The main influencing variables identified are the water depth and ground floor level. The others conclude that the straightforward adaptation of INSYDE is possible thanks to the flexible and transparent methodology.

The topic of the manuscript is interesting and certainly fits to the Journal's scope. The manuscript is clearly written and well structured. The supplement is comprehensive and of good quality as well. Some equations needs to be clarified. The figures are appropriate and mainly of good readability. Transferability of damage models is a very important topic and the degree of detail and the effort put into the adaptation is impressive.

However, the evaluation of the adaptation of the model is difficult. I do agree with the authors that the validation of flood damage models is usually a challenging task and hampered by missing data. Yet, I do think the evaluation and therefore also the conclusion could benefit from a few additional analyses. For instance, a comparison of the adapted and the original model. The difference between the outcomes of the models could give some indications whether the rather high effort of getting all the data sets on the building characteristics etc. is justified. Another point could be the comparison of the very detailed model INSYDE and a very simple stage damage function to assess the difference between the detailed and a more simple approach. The drawback of the missing validation would still be there, but one would be able to evaluate the model outcomes a bit better. This way the authors and the reader could get a better feeling for the value of the very sophisticated adaptation of the model also without having a reliable validation data set. I believe the manuscript would strongly benefit from these additional assessments and therefore recommend the reconsideration after major revisions to give the authors enough time for their implementation.

In addition to these suggestions, I have only very few specific comments listed below.

**Specific comments**

• Equation 3: Is i and j again the sub components of the damage? If yes, why is only i changed and j stays baseline?

â□! Also the equation only gives you one ratio, but Figure 9 and 10 are showing two outcomes for the variables (one negative and one positive). I think I get how you estimate the values for the Figures. But I think eq. 3 does not show what you actually compute. For me it seems, that you compute the following:

$$(D(x_i^+, x_i^0) - D(x_i^0, x_i^0)) / D(x_i^0, x_i^0) \text{ and } (D(x_i^-, x_i^0) - D(x_i^0, x_i^0)) / D(x_i^0, x_i^0)$$

â□! Please clarify.

• Figure 9 and 10: Please use the same x-axis in all plots to ensure a just comparison between the different plots