Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2020-76-RC2, 2020

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Brief communication: simple-INSYDE, development of a new tool for flood damage evaluation from an existing synthetic model" *by* Marta Galliani et al.

Anonymous Referee #2

Received and published: 28 May 2020

The paper presents a simplified INSYDE model by reducing the number of damage predictor variables and treating the eliminated predictors as constants in the equations. The authors perform sensitivity analysis to identify the important predictors. From the manuscript, the objectives and the approach are structured and clear. I understand that INSYDE (Dottori et al. 2016) is designed to consider missing/unavailable input data. The default values which go in the place of missing values are based on flood affected regions in Northern Italy. Since the sensitivity analysis for hazard related predictors have already been performed (Dottori et al. 2016), the sensitivity analysis for other predictors and the altered simple-INSYDE equations are potential novel aspects of this study. Some points to improve the manuscript concerning discussions

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and applicability of the simple-INSYDE model. 1. The sensitivity analysis is not very clear. What is the basis for choosing the predictors? Also, does the model performance becomes worse when one/some of the chosen variables are treated as default values? I think, a clearer explanation will help to extend this approach to other synthetic models. Not many synthetic models allow missing variables. So, some details on how to choose the default values may be helpful. 2. Transferability appears to be an advantage of INSYDE (Dottori et al. 2016, Amadio et al., 2019). I agree with the authors that there is a need to reduce complexity in order to make the model widely applicable. But, feeding in more of local inputs as default values may cause serious bias when the model is transferred, as such. The authors mention about this. But, an illustration of how to work around this limitation will add value to the study. 3. It is also not clear how the calibration of simple-INSYDE is implemented (line: 84). Is the INSYDE original model applied with the same set of variables (Table 2) considering the rest as missing/default and then an interpolation is performed or are there additional variables involved? 4. Since both the INSYDE model development and the simplification approach are based on same regions (Northern Italy), it is difficult to judge the general applicability of this simplification approach based on the reported errors. The comparison with same set of simulated buildings appears like evaluating the fit of the interpolation function with same train and test data. An alternative is that the authors may consider providing validation on real damage data like Amadio et al (2019). 5. Since INSYDE is a probabilistic model, some discussions on uncertainty in predictions from both INSYDE and simple-INSYDE will be an interesting addition to the discussions. Minor Comments 1. Some insights into 'why' INSYDE is complex and hard to implement (what aspects?) may add value to the objective. 2. Line 16: reparation may be replaced with repair 3. Line 21: How does this improvement help integration to a GIS software? This is not discussed. 4. Lines 21-24: Reduction in dimensionality of the INSYDE model should be included. The model doesn't completely preserve the multi-variable nature of INSYDE. Some variables are treated as constants in the simple model. 5. In Table 1, it is difficult to understand X. From the

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context, I understood that these are values user has to input. A note will help. 6. Line 45: walls and plants? I think it is a typo. 7. Line 51: Footprint Area is interchangeably used as FA and A (table 1 and 2) 8. Line 70: There is no quantification provided for sensitivity analysis. Hence, the context for 'significantly' is missing. 9. Lines 91-94: The range of acceptable errors is very huge. Given this argument, even the need for important variables considered in simple-INSYDE may be questioned 10. Table 2 needs reference. Also, please introduce a column with full-forms to make it easy for the reader. 11. Lines 100: Please rephrase that simple-INSYDE is a simplified version of INSYDE. The fundamental assumptions and methodologies are from INSYDE. 12. The arrangement of the Discussion section 3 is not coherent. The model is for Northern Italy. But, more focus on wider applicability of such an approach and how to implement this for other regions will be interesting.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2020-76/nhess-2020-76-RC2-supplement.pdf

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