

## ***Interactive comment on “INSYDE: a synthetic, probabilistic flood damage model based on explicit cost analysis” by F. Dottori et al.***

**Anonymous Referee #2**

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The authors present a probabilistic model to assess flood losses based on a synthetic approach. Damage functions are based on different building characteristics, such as the footprint, the number and height of floors, the maintenance and the year of construction. As such, the authors state that their model is better suitable for an ex-ante assessment of losses than conventional empirical approaches. This model may be useful during vulnerability and risk assessment, and the manuscript is therefore suitable for publication in NHESS.

I have some remarks regarding the structure and content of the manuscript which may be useful to improve the piece of work:

- In the Introduction the authors made a quite tricky statement when comparing empirical to synthetic approaches in vulnerability assessment: Their main argument is that

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the relatively scarcity of observed damage makes it difficult to derive vulnerability functions from empirical data, and to validate and calibrate them. In contrast, they state that a synthetic, expert-driven approach may be better because the issue of data availability is solved. My concern about this statement is that also experts may be wrong, and – on the other hand – also the empirical models available make usually a statement about uncertainties (see e.g., Kreibich et al. 2010 for commercial buildings exposed to river flooding, Thielen et al. 2008 for residential buildings exposed to river flooding, or Totschnig and Fuchs 2013 for residential buildings and guest houses exposed to torrential flooding). According to my opinion it is rather the assumed normal distribution with respect to the degree of loss which makes these empirical models susceptible to computational errors, but empirical models are not per se unsuitable in this context. Empirical models are rather suitable to explain observed damages, but of course not necessarily to explain the influence of different buildings parameters that may have led to these losses. Also synthetic models based on expert assumptions or other assumptions are prone to failure – if the assumptions made are not entirely suitable to explain certain system behaviour (subjectivity in evaluation).

- The three bullet points mentioned in the Introduction, page 2, lines 30ff. are not exclusively valid for synthetic models, but also for empirical models. Papathoma-Köhle et al. (2015) have nicely shown this with their “Loss assessment tool for landslides”.
- In Fig. 3, the observed damage is plotted against the modelled damage. This Figure shows that the synthetic approach presented in the manuscript also has to deal with larger uncertainties, and tends to overestimate smaller losses and to underestimate larger losses. This can be also observed by lots of empirical approaches, and makes the initial statement that only empirical models have the challenge of extrapolation and transferability to other case studies than there were developed. So here I suggest that the authors should also weaken their arguments in the Introduction section accordingly.

- The structure of the manuscript is a bit difficult to follow: some of the paragraphs provided in the Results section (e.g., those on validation and sensitivity analysis) should

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be split: the methodological part should go to the Methods section. This will increase the accessibility of the text.

References mentioned:

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Thielen, A. H., Olschewski, A., Kreibich, H., Kobsch, S., and Merz, B.: Development and evaluation of Flemops – A new flood loss estimation model for the private sector, in: *Flood recovery, innovation and response*, edited by: Proverbs, D., Brebbia, C., and Penning-Rowsell, E., *WIT Transactions on Ecology and the Environment* 118, WIT, Southampton, 315-324, 2008.

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