

Review NHESS 2013-0278 “Adaptability and transferability of flood loss functions in residential areas“, published as NHESSD 1:3485-3527

Generally, the assessment of flood vulnerability functions and their applicability to a wider set of case studies is of considerable interest for the readers of Natural Hazards and Earth System Sciences. Thus, a paper such as NHESS-2012-0278 should be considered for publication. However, even if the manuscript is well-written and the structure is good, there are some issues that should be considered before the manuscript may become acceptable.

1. From my point of view the manuscript is not very well balanced with respect to the initial goal to transfer damage models to other regions. While the majority of the literature cited is dealing with flood damage (and consequently corresponding depth-damage functions), there should at least be a discussion on the differences of flood risk assessment in lowland rivers (such as Elbe, Mulde, Rhine mentioned in the cited studies) and mountain streams such as the branch of the Lech river the authors were studying¹. The flood characteristics, and consequently the incurring damages or at least damage patterns are highly variable between lowland rivers (static inundation) and mountain rivers (dynamic inundation). This should be discussed in the respective introductory part of the paper. Moreover, since this study has been conducted in the Eastern European Alps, more efforts should be undertaken to describe the current research gap here: there are some studies around related to the application of different flood damage models in Europe, but none of these studies approached mountain rivers so far. The authors may also wish to refer to Totschnig et al. (2011) and Totschnig and Fuchs (2013) with respect to vulnerability functions to be used for mountain streams (this also corresponds to the results presented in Table 4: none of the German loss estimates was within the 95% interval – different process dynamics? Different building types? Different land-use characteristics?).
2. Similarly, the item “private precaution” may be tricky to implement since the dynamics of the two process groups (mountain rivers versus lowland rivers) are highly variable: what may be appropriate with respect to lowland river flooding (sand bags) may be not sufficient to resist the high erosive forces in mountain rivers (you may wish to see Holub et al. (2012) for details).
3. The approach to work on a grid-based information of values at risk exposed (section 2.2.3) is one possibility. How do these values correspond to the object-based values published by Keiler et al. for Western Austria (1,900-600 €/m² depending on the building category), since the suggested range (€224-353/m²) seems quite rough in comparison to object-based data here. Please see again my concerns of applying information from lowland rivers to mountain catchments. The authors were stating to assess uncertainties in the assessment, so why not also comparing results from similar studies? So far, some of these studies are just mentioned in the introductory part, which makes it also difficult to assess the “added value” of this NHESSD contribution to the scientific field of flood risk management.
4. How representative is your result provided by the adapted FLEMO_{AT} in comparison to the three other models mentioned? Here it would be good to see a more balanced comparison between “your” model and those of other scholars. Please do also properly introduce your applied model variations – it is not clear to me how many variations or model runs were performed with which parameter variations. Moreover, when comparing Table 4 to the statements made in section 3.3 (comparison..., pages 3505 ff.) it seems a bit unclear which results are compared to what – it would be probably good to see the reported loss data

¹ Moreover, most of the citations originate from one „group“ working on flood risk management, while those working on flood risk in mountain catchments are by chance not considered (with the exception of Papathoma-Köhle et al. (2011)) – it would have been worth to perform a proper literature research on studies related to flood depth-damage/vulnerability functions in the European Alps, since the test site clearly shows characteristics of mountain rivers.

here. Please be also aware that the figures reported by Habersack et al. (2004) may be not representative for your catchment – your damage data collected is not only marginally higher but almost one third higher, which may be attributed to the “extreme hydrological impact” – see my remarks above: I highly doubt that it is really possible to adapt vulnerability curves from lowland rivers to those from highland rivers.

Some minor remarks:

Page 3488: It is not true that indirect costs only occur outside of inundated areas, they can (and do) also occur as a direct result of the contact with the water body.

Page 3488: Also intangibles can be monetized, they just do not have a market price and therefore evaluation techniques have to be applied (see the works from Andrea Leiter and Magdalena Thöni, both originally from Innsbruck University – you may know them).

Page 3491, line 16: remove 1971-2006, already stated in line 14

Page 3492, line 4: please explain Bebbers Vb here, since this is very specific and may not be known to the international readers of NHSS

Page 3492, line 23: breach

Page 3494, line 12: what precisely is the added value of information here if the data is not shown???

Page 3499: I did not get the difference between the official and new categorization of buildings in Austria (two-family houses versus semi-detached house etc. -> needs more explanation)

Page 3504, lines 16ff.: Should go to conclusion section

Page 3510, lines 16ff: I am wondering whether the homogenous means in terms of building types, in terms of process patterns or triggering processes, or a combination from them – probably this is one of the core challenges throughout the entire paper. What does make the Austrian sample similar to the Bavarian, and why there is the difference to the study from Saxony?

References suggested:

Holub, M. et al. (2012): Mountain hazards: reducing vulnerability by adapted building design. *Environmental Earth Sciences* 66 (7). p. 1853-1870

Totschnig, R. et al. (2011): A quantitative vulnerability function for fluvial sediment transport. *Natural Hazards* 58 (2). p. 681-703

Totschnig, R. & S. Fuchs (2013): Mountain torrents: quantifying vulnerability and assessing uncertainties. *Engineering Geology* 155. p. 31-44