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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Vulnerability curves versus vulnerability indicators: application of an indicator-based methodology for debris-flow hazards" *by* M. Papathoma-Köhle

Anonymous Referee #1

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General comments:

The paper presents a useful overview and comparison of pros and cons of vulnerability assessment using vulnerability curves and vulnerability indicators. Unfortunately, the author has a tendency to cite her own work more often than is warranted. Furthermore, engineering approaches to modelling physical vulnerability are completely ignored in the paper. For example, the fact that vulnerability curves stem from the fragility curves that were developed for earthquake engineering applications when the earthquake risk assessment software package HAZUS was developed in early 1980s, is not mentioned at all.

Another example of what is not mentioned is that vulnerability curves for various types

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of hazards and various building types can be developed by numerical modelling and simulations. This requires access to and experience with large non-linear finite element codes (like ABAQUS) and could be computationally intensive. However, high-performance computational capabilities are readily available to research organizations and engineers firms these days, and development of vulnerability curves by numerical modelling is becoming more and more popular for earthquakes, tsunamis, debris flows, and even ashfall from volcanic eruptions. It is quite surprising that this approach, which is relatively common in engineering applications, is not mentioned at all by the author.

Specific comments:

Page 2, lines 2 and 3: This statement is strictly not correct. Ignoring the characteristics of the building is a choice made by the person developing the vulnerability curves, mainly because of lack of data. In earthquake engineering, vulnerability curves (which are called fragility curves in that discipline) are developed for different classes and typologies of buildings.

Page2, line 13: The definition of physical vulnerability is not in "conflict" with other, more general definitions of vulnerability. It is just one possible quantitative interpretation of it.

Page 18, line 14: The author seems to forget that physical vulnerability is basically the conditional probability of loss, given that a hazard of certain occurs. A building with high vulnerability will suffer little damage if it is subjected to low intensity hazard. Likewise, a building of low vulnerability may be totally destroyed during an extreme event.

Page 18, line 21: The indicator-based relative vulnerability index could be transformed to site-specific vulnerability curves if enough data exist for doing the transformation. When there is lack of data, the transformation could be based on expert engineering judgement. This of course involves some uncertainty, but the level of uncertainty is not necessarily greater than the variability observed when data are available (e.g. Figure 5 of the paper).

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