

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

**Anonymous Referee #2**

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Overall quality of the discussion paper ("general comments");

This study focuses on the application of an indicator-based methodology (IBM) for the assessment of physical vulnerability due to debris-flow hazards. The relatively “new” indicator-based method has been proposed, compared with the well-known vulnerability curves (highlighting weaknesses and strengths) and recommendations for its improvement outlined. It is really appreciable the effort made by the Author and the topic is of high value for the scientific community and within the scope of the Journal. Concerning the research, the Author is trying to compare and aggregate two methods that are funded on two different concepts. Vulnerability Curves (VCs) express damage in relation to hazard intensity. IBM mainly refers to the "intrinsic" susceptibility of

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a building to suffer damage if affected by a specific type of event, independently from its magnitude. Generally speaking, it seems that IBM may be only useful to justify the final result, in terms of degree of loss. It has no predictive power: what may I expect if a 2.0 m debris flow event will happen in the future? On the contrary, this kind of information may be extracted from VCs and this is the type of information the authorities mainly require in their spatial planning and risk management activities. IBM is not a stand-alone procedure for vulnerability assessment and it needs information provided by VCs. Moreover, the use of indices undoubtedly increases the flexibility of the method but, at the same time, its subjectivity; and then, weighing indices makes the situation even worse by further raising the level of subjectivity. Probably, a sensitivity analysis has to be performed and results provided to check this important topic. As a general comment, a new methodology should provide clear approaches, rules of application, constraints, etc., in order to define a precise framework in vulnerability studies. On the contrary, in this research, the two methods have not been homogenized and integrated in a general framework but only "put one next to another". Probably, the original source of debate is that too many terms and too many concepts refer to the same thing. This is probably due to the fact that many components (or dimensions) composing vulnerability need to be investigated. Vulnerability is one of those terms that seems to defy consensus usage showing many different connotations, depending on the research orientation and perspective. The review of current vulnerability definitions demonstrates that, at least, two different perspectives exist: the former refers to an engineering and natural science point of view; the latter to a social science outlook. It all depends on the components (dimensions) of vulnerability each school of thought takes into account and privileges. A multi-disciplinary approach is a key-mode of actions in vulnerability studies and this allows each scholar to use his/her own terms and concepts, trying to homogenize them in a single framework. Sometimes less is more. In any case, from a practical point of view, it would be useful to know the real interest of local authorities to be aware of the intrinsic susceptibility of a building to suffer damage not considering the intensity of events. In my opinion, event intensity (and the return period, as well) is

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a primary parameter also to find structural solutions for retrofitting buildings. And, in so doing, for decreasing their intrinsic susceptibility to suffer damage. The English sounds good (but I'm not a native speaker) although some expressions seem to be a little bit ambiguous and confusing; they have to be rephrased. The paper can be considered for publication after major revisions. This means that the Author should provide a clear framework by which each of the methods gives its real contributions in vulnerability studies. Moreover, if possible, self-citations should be a little bit reduced.

Individual scientific questions/issues ("specific comments");

The Author can find many other comments in the attached PDF file.

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-76/nhess-2016-76-RC2-supplement.pdf>

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