

## ***Interactive comment on “Open space suitability analysis for emergency shelter after an earthquake” by J. Anhorn and B. Khazai***

**Anonymous Referee #3**

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This manuscript presents an approach for the assessment of the suitability of open-space shelter sites in the case of an earthquake event. It is based on an Open Space Suitability Index (OSSI) that is aggregated from a series of weighted suitability indicators (qualitative approach) on one hand, and a capacitated accessibility measure (quantitative approach) on the other hand. This original approach is then applied and demonstrated in the selection of adequate open space sites for Kathmandu Metropolitan City (KMC).

The clear and comprehensive presentation of the OSSI approach, as well as the extensive literature review, make this manuscript a very useful contribution to the field of post-disaster management. Therefore this article is recommended for publication in the NHESS journal, provided the revisions suggested below are addressed by the

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authors.

Major Comments:

1. For the computation of the quantitative capacitated accessibility measure, the authors have selected a “worst case earthquake scenario” (i.e. Mid-Nepal earthquake with Mw 8.0). It is unclear in the manuscript whether the authors have computed themselves this scenario or if they have used results from former studies. Some clarifications would be appreciated, as well as a map showing the ground motions intensity levels and the damaged buildings / wards.
2. One may question the sensitivity of the OSSI to the choice of the earthquake scenario. Have other scenarios been considered (e.g. with similar intensity levels, but from a different fault location, possibly leading to another spatial distribution of the ground motion throughout the city)? Also the concept of “worst case earthquake scenario” may be very subjective, as it depends on which measure / performance indicator is used to quantify the impact (Ground motion level? Collapsed buildings? Casualties? Aggregated direct losses?). On what grounds has this scenario been selected as the worst case?
3. In order to compute the capacitated accessibility measure, a network analysis has to be performed. However, it is unclear if the actual damage of the road network is accounted for in the post-disaster conditions. At one point, it is mentioned that non-seismically designed bridges on the Bagmati River are assumed to have collapsed, but this assumption does not seem to results from a systematic assessment of the road network functionality after the earthquake. Especially, the road blockage due to the debris from the adjacent collapsed buildings may be critical criterion in a very dense urban morphology with narrow streets.
4. The data used for the KMC application seem inconsistent with each other, regarding the year they were produced. For instance, the age of the building stock data (i.e. 1998) casts some doubts on the validity of the final results, especially for a city with

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such a fast growing rate. Some justifications are proposed by the authors, by using the ratio of building stock to population. However, this shortcoming does not provide any details on the actual composition of the building stock, i.e. whether some specific building typologies have gradually replaced others during the past 15 years. This could have a lot of impact on the total number of shelter seeking persons, as well as the spatial repartition of the damages (for instance, in the case new neighbourhoods have been developed with specific building typologies).

5. Regarding the formulation of the OSSI, is there a mathematical / conceptual justification to build the index as a multiplication of both qualitative and quantitative factors? It seems logical that the CAMos ratio acts as a corrective multiplicative variable for the OSSI, but maybe some explanation/justification on how the others got this equation would be welcome.

As a concluding remark, it is recommended that the authors acknowledge the possible flaws of their application. Maybe a paragraph listing the different shortcomings and the corresponding possible refinement strategies should be added, in order to make it clear that the final results are based on various assumptions.

Minor Comments:

- p.4 l.26: “rationale” instead of “rational”;
- p.5 l.24: “Most . . . softwares . . . are based”;
- p.18 l.10: 342 300 instead of 242 300;
- Figure 3: it would be interesting to add on the same figure the total OSSI of the selected open spaces (as a second data bar for instance), in order to have an idea of the actual impact of the CAMos factor.

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