

## ***Interactive comment on “Seismic vulnerability and risk assessment of Kolkata City, India” by S. K. Nath et al.***

### **Anonymous Referee #2**

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The paper presents a case study of multi-criteria seismic risk assessment for the city of Kolkata (India), with a population of 14 millions (2011 Census). Supplementary to the earthquake engineering work, the study makes an intensive use of Satellite data and GIS technology for many of the necessary parameters. A seismic risk study for such a huge city is a remarkable task and the work described in the paper is expected to involve a large number of persons over several years. Such studies are of importance, not only for the scientific community but also for local authorities.

However the paper seems to have some weak points:

- there is no description of the regional seismicity (the city is large, but to what seismic sources it is exposed? what magnitudes can these sources produce? what earth-

C868

quakes and what damage was experienced by the city? (only a reference to an event in 1934 exists, and it is poor);

- building typology is evaluated using satellite images and visual interpretation techniques; the construction material identified through these techniques has in many cases a limited correlation with the structural material and with the structural type, this brings a not at all negligible uncertainty of the final results (and the matter of uncertainty is not clearly addressed in the paper);

- the building typology identified in this way has little correlation with the exercise of computing damage probabilities (at the end of the paper) for 4 model type buildings, and with the description of the 5 building categories from BIS (2002); - even the authors mention HAZUS methodology, in their paper the classification of structural system, heights, and seismic design criteria does not follow the HAZUS approach;

- the vulnerability curves that seem to be used in the computations are given for structural typologies different then those identified from satellite images;

- building age is also identified using satellite data from different periods, so the results may also incorporate significant uncertainties; moreover, the classification in classes is not made in relation with the evolution of the seismic design regulations, so such age classes have a limited relevance for seismic vulnerability and risk;

- the site-structure quasi-resonance is investigated based on a rough structural type classification (different from the other classifications within the paper) and fundamental period of vibration evaluation, and on the site predominant frequency identified through H/V technique (data coming from an impressive 1200 site measurements campaign); the ambient vibration-based site predominant frequency does not match the site predominant frequency during earthquakes so frequently, and almost never in case of strong earthquakes; since no data about the potential earthquakes and ground motions in the region is presented, it is hard to evaluate the appropriateness of the approach given in the paper;

C869

- the seismic hazard microzonation is in fact a ground multi-hazard and ground properties microzonation through a hazard index; authors don't give any details regarding the different hazards and ground properties, and they are only referring to another paper submitted to NHESS and present some small figures, more details are however welcomed;
- through the paper, the comparison of different data with the historical observed data from past earthquakes is quite weak;
- the references are rather limited;
- due to the large size of the city the figures are sometimes quite hard to read.

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